Larval Pacific lamprey *Entosphenus tridentatus* are not susceptible to common fish rhabdoviruses of the Pacific Northwest

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Overview

• Background
• Reasoning
• What we did
• Results & Conclusions
A Little Bit About Pacific Lamprey

- Anadromous
- Adults return to freshwater to spawn
- Critical larval stage lasts 4-6 years
  - Similar habitat as Pacific salmon so experience similar habitat problems
- Metamorphosis
- Ocean migration
Historically

• North American and Asian Pacific Coast and the Columbia River Basin
• Source of nutrients
• Serve an important role in Native American tribes
• Possible indicator of ecological health

Presently

• Half of Northern Hemisphere lamprey considered vulnerable, endangered, or extinct
  – Dams
  – Habitat degradation
  – Poor water quality
  – Exotic species
  – Direct eradication
• Native Americans are losing
  – Cultural heritage
  – Traditional fishing opportunities
  – Have to travel long distance to fish
Information and Education

http://www.fws.gov/pacific/Fisheries/sphabcon/lamprey/index.cfm

• Conservation Initiative • Management • People
Reasoning

• Eagle Creek National Fish Hatchery
• Prosser Yakama Tribal Hatchery
• Unknown pathogen susceptibility
• Vector
Unknowns

- Rearing
- Disease
- Proactive
- VHSV & IHNV
A Day in the Life....

- NFEC
- WFRC
- LCRFHC
- CRFPO
...Unsuspecting Lamprey
WFRC

- Acclimated 7 days
- Unfed
- Natural photoperiod under ambient lighting
- 12°C in sand-filtered, UV treated, aerated
- No sediment or substrate
IHNV & VHSV

- Round Butte IHNV
  - Round Butte State Hatchery
  - 1975 from adult Steelhead

- Salmon River IHNV
  - Salmon River State Hatchery
  - 2007 from diseased juvenile Steelhead

- Pacific NW VHSV
  - BC sea-pens
  - 1999 from Atlantic Salmon
Immersion

- Immersion
- 10 fish/tank, 2 doses of each virus in triplicate
- \((6 \text{ tanks/virus}) \times (3 \text{ viruses}) \times (10 \text{ fish}) = 180\)
- Triplicate control = \((3 \text{ tanks}) \times (10 \text{ fish}) = 30\)
Injection

- **1st Experiment (41 day)**
  - 10 fish/tank x 3 viruses = 30 fish
  - 10 control fish

- **2nd Experiment (6 day)**
  - 6 fish x 3 viruses = 18 fish
  - 2 control fish
Observation

- Tanks observed daily
- Survivors sampled
  - 6 days
  - 12 days
  - 41 days
- Mortality frozen
Evaluation

• Received from WFRC
• Inoculated onto CHSE and EPC
• Observed for CPE
• Results calculated in pfu/g of fish
No Virus

- Immersion
  - 180 fish
  - Low Mortality
  - Negative for virus

- 1st Injection
  - 30 fish
  - Some mortality (handling)
  - Negative for virus
...And We Did

- IHNV (Round Butte) – Negative
- IHNV (Salmon River) – 3+/3*
- VHSV – 2+/4 Positive*
- Morts (Frozen)
  - 2+/6 positive
  - 1 IHNV (Salmon River)
  - 1 VHSV
  - Not quantifiable*

* Well below dose injected
Larval Pacific lamprey are unlikely to serve as hosts, maintain or transmit IHNV or VHSV

- No virus detected in immersion trails
- No evidence of
  - infection
  - virus replication
  - persistence
- No clinical evidence of disease
- Low or no mortality
The Numbers

• Lamprey Injected with ~6666 pfu/g

• Recovered from Lamprey after challenge
  – Salmon River IHNV 396, 410, 2488 pfu/g
  – VHSV 296, 692 pfu/g
What Do The Viruses Represent?

• Round Butte IHNV was from the U clade
  – Ubiquitous throughout British Columbia, Washington & Oregon
  – Not particularly pathogenic to Pacific Salmon

• Salmon River IHNV was from the M clade
  – Commonly found in Steelhead, often diseased, in the Lower Columbia River and Olympic Peninsula

• Pacific Northwest VHSV is the IVa type
  – Found in the Northern Pacific and Northern Atlantic
  – Not pathogenic to Pacific Salmon
Pesky & Problematical

• Just figuring out how to hold and challenge

• Assumptions
  – That lamprey would have similar disease signs as Salmonids
  – And that freezing affects would be similar as well

• Ability to recover virus from frozen samples
  – Virus lost to freezer
  – Frozen samples were more toxic to cells
  – Would have been better to screen fish as they die

• Timeline not established with one injection treatment
  – Not really a big issue in my mind because not a likely mode of transmission
What next?

• Aside from figuring out what the rearing parameters are...

• Will an infection in larval lamprey transmit to other cultured species
  – Could be important at places that have Salmonids spawning directly in hatchery effluent.

• Other?