Stress Management: Fish Health on the Cowlitz River

Fish health challenges and mitigation strategies

2025 Cowlitz Science Conference and Annual Program Review

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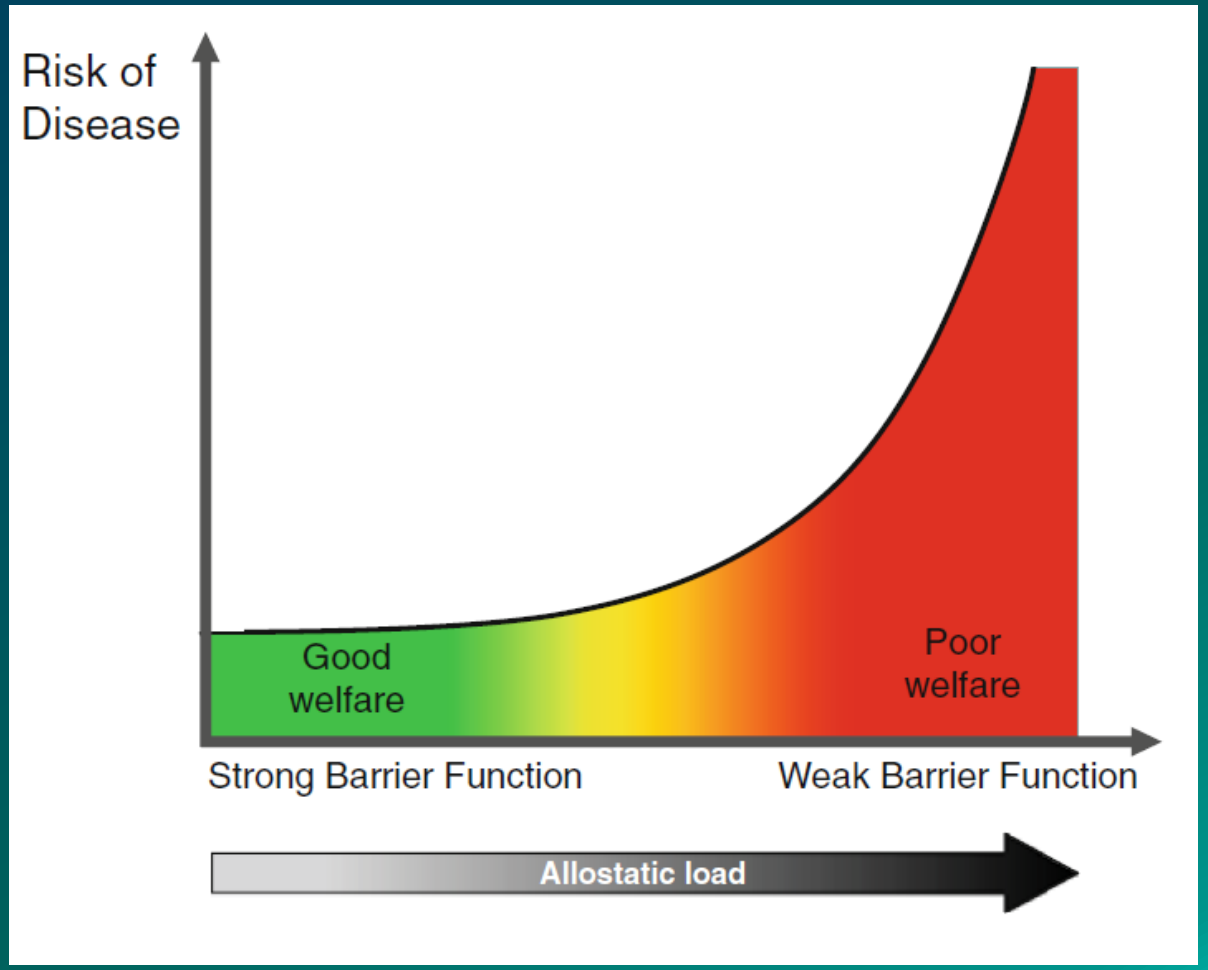
TACOMA POWER

A constant struggle to maintain homeostasis increases disease risk

Primary and secondary **stress responses** are associated with substantial **energetic costs**, and particularly under conditions of repeated and chronic stress, this will eventually lead to decreased growth, reduced swimming capacity, **impaired disease resistance** or lower feeding activity.

In this way, stressful husbandry conditions compromise, via the stress response, the health status of the fish and favor disease.

- Senger et al. 2011. Health of farmed fish: its relation to fish welfare and its utility as welfare indicator.



Host Defense:
- Good nutrition
- Immunostimulants
- Antimicrobials
- Vaccination

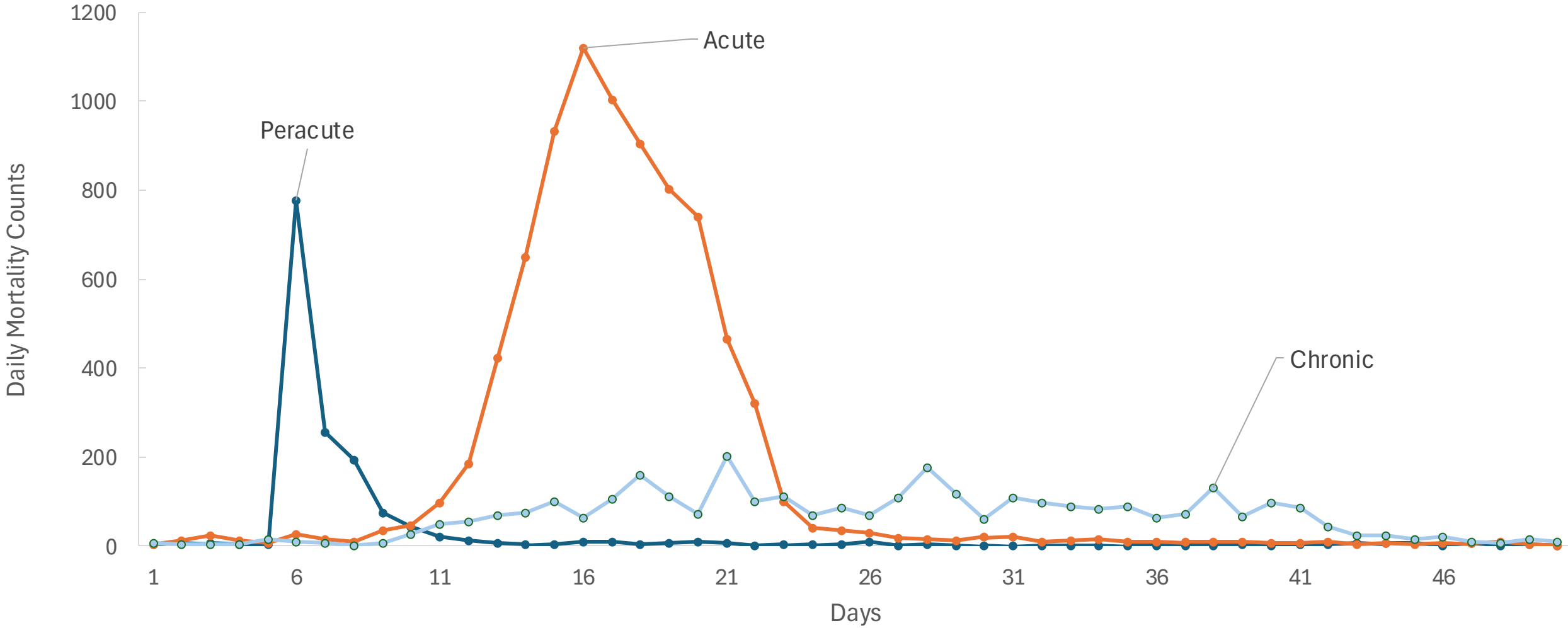
Biosecurity:
- Proper disinfection
- Isolated tools
- Pathogen-free water
- Topical therapeutics

Improved Habitat:
- Proper flow/exchange
- Optimal fish density
- Ideal water chemistry
- Minimized handling

Stressors

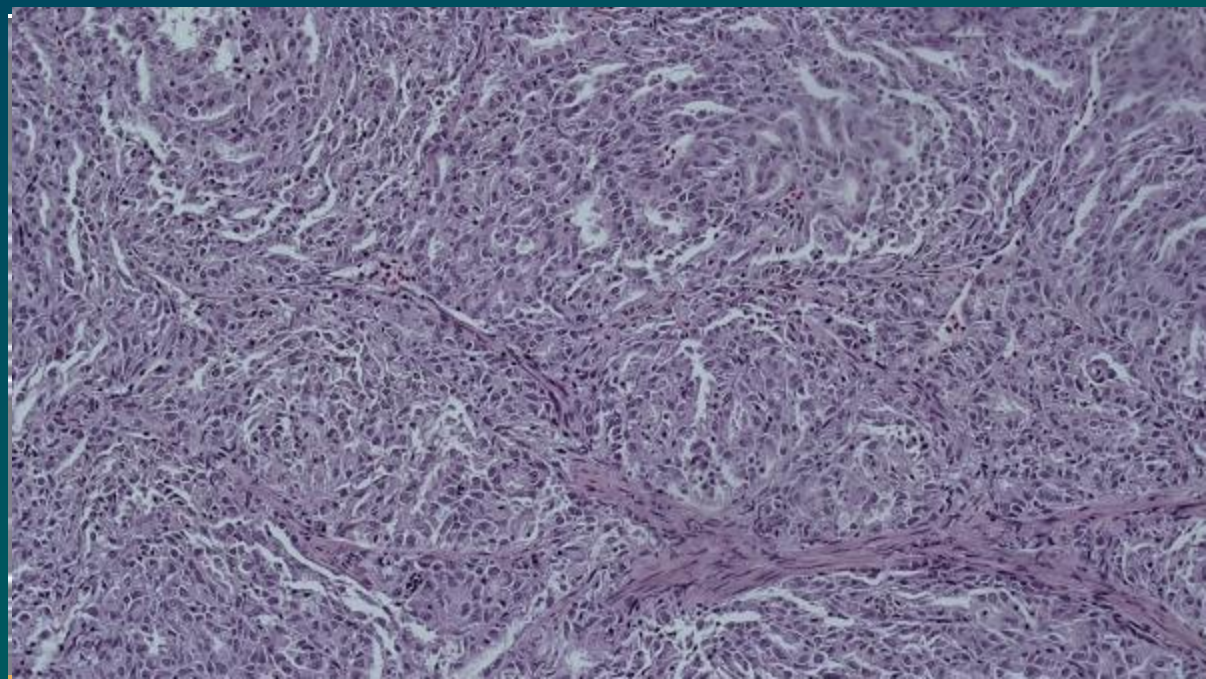
- Predation
- Feed/nutrition
- Flow/loading density
- Population dynamics
- Weather
- Temperature
- Water Quality
- Smoltification

Mortality rates important metric for diagnosis of condition(s)



Primary responsibility is routine and diagnostic monitoring

- Gross exams on site
- Culture-based assays
- Molecular assays
- Histopathology
- Toxicology



Specific pathogen monitoring

eDNA monitoring

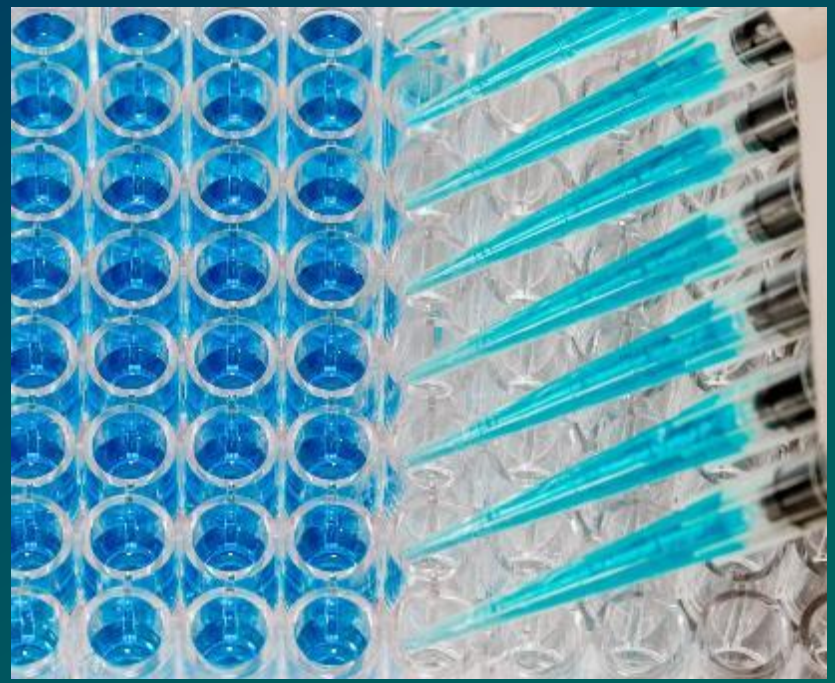
Monthly and Release surveys

Drug and therapeutic assistance

- Advise on proper use
- Assist with new therapy implementation
- INAD coordination
- Broodstock injections

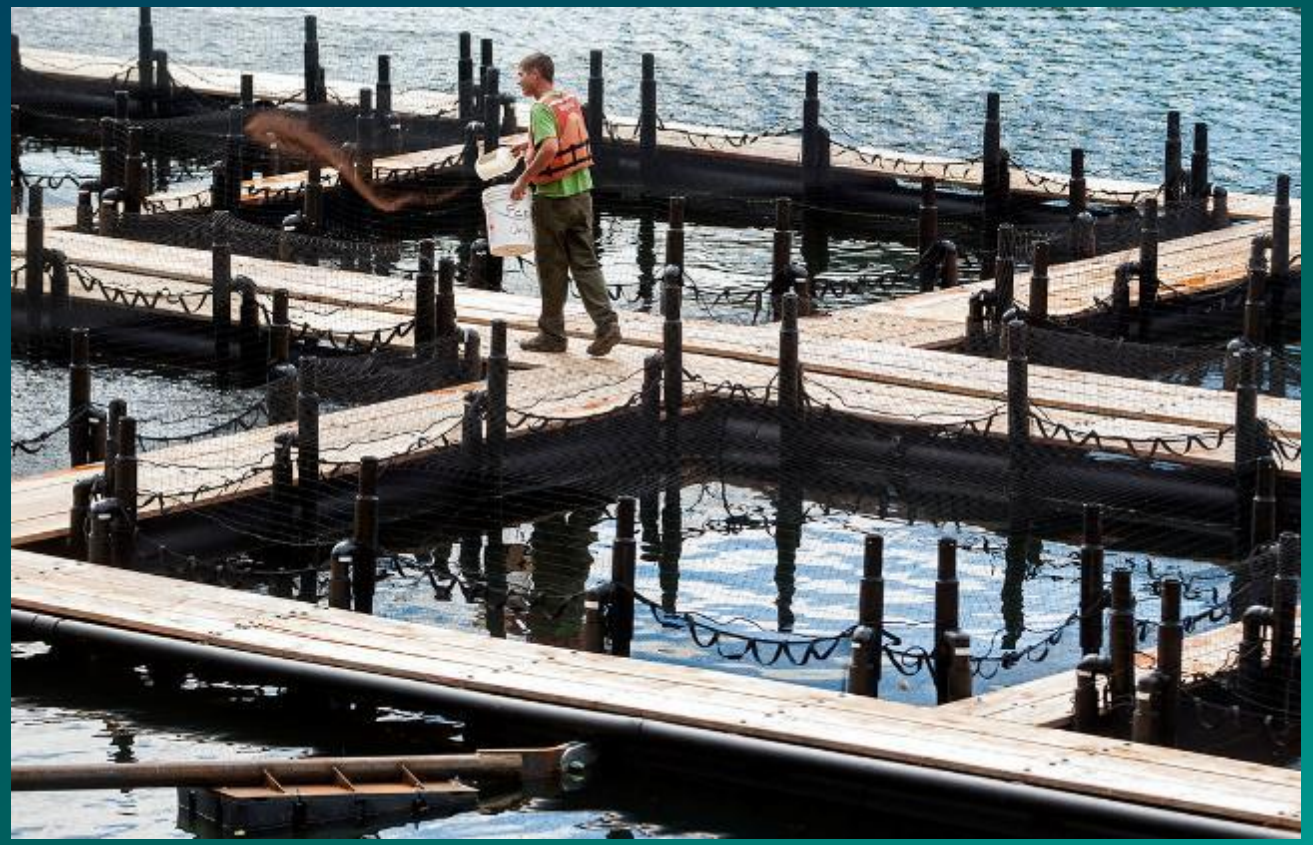
Pathogen surveillance according to Co-Manager's Salmonid Disease Policy

- ELISA sampling
- Virology



Cowlitz Salmon has a real estate problem

- Marking/tagging bottleneck in spring overlaps with yearlings
- Hopeful the net pens will help alleviate some density challenges
  - So far yearling coho have appeared healthy this year



Fall Chinook

- Difficult to quickly mark millions of fish, can lead to space bottlenecks
- Nutritional gill disease

Mitigation strategies:

- **Continued coordination for optimal marking strategy and elucidate if lower density does avoid secondary dropout**
- **Look into dietary supplements to improve feed response**
- **Work with M&E to investigate any post-release survival impacts**

In spring 2024, lower number of returning adults resulted in lower egg take. The upshot of the decrease in eggs was that hatchery could keep density index low (<0.10) throughout rearing

Spring Chinook

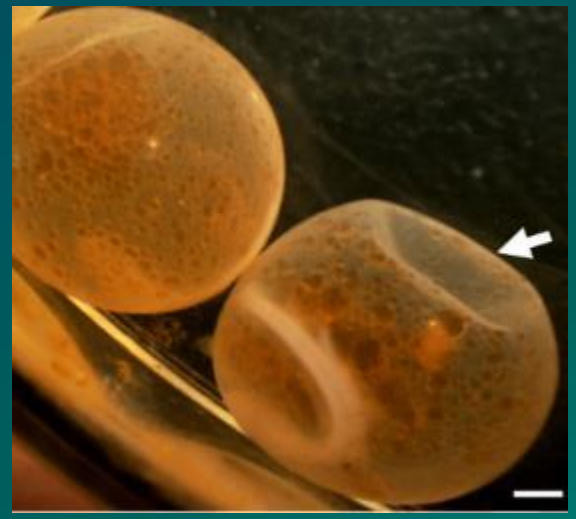
- Marking/tagging bottleneck can lead to increased densities
- Multiple smoltification events = clinical BKD
- *C. shasta* – associated loss in late summer

Mitigation strategies:

- **Continue vitamin supplementation to mitigate *C. shasta* in summer**
- **How does smolt feed control prolonged smolting events?**

Cowlitz Trout – mitigating BCWD through stress management

- Bacterial coldwater disease (BCWD)
  - Many presentations throughout steelhead lifecycle
  - Multi-factor stressors lead to disease development from fry to smolt
- Incubation stage
  - Soft eggs can lead to bacteria invasion leading to increased fry mortality
  - Ovadine flushes
- Early rearing juveniles
  - Bacterial gill disease, ChT trials unsuccessful
  - Probiotic + yeast supplementation
- Older juveniles dorsal nipping/saddleback lesions



Increasing water hardness

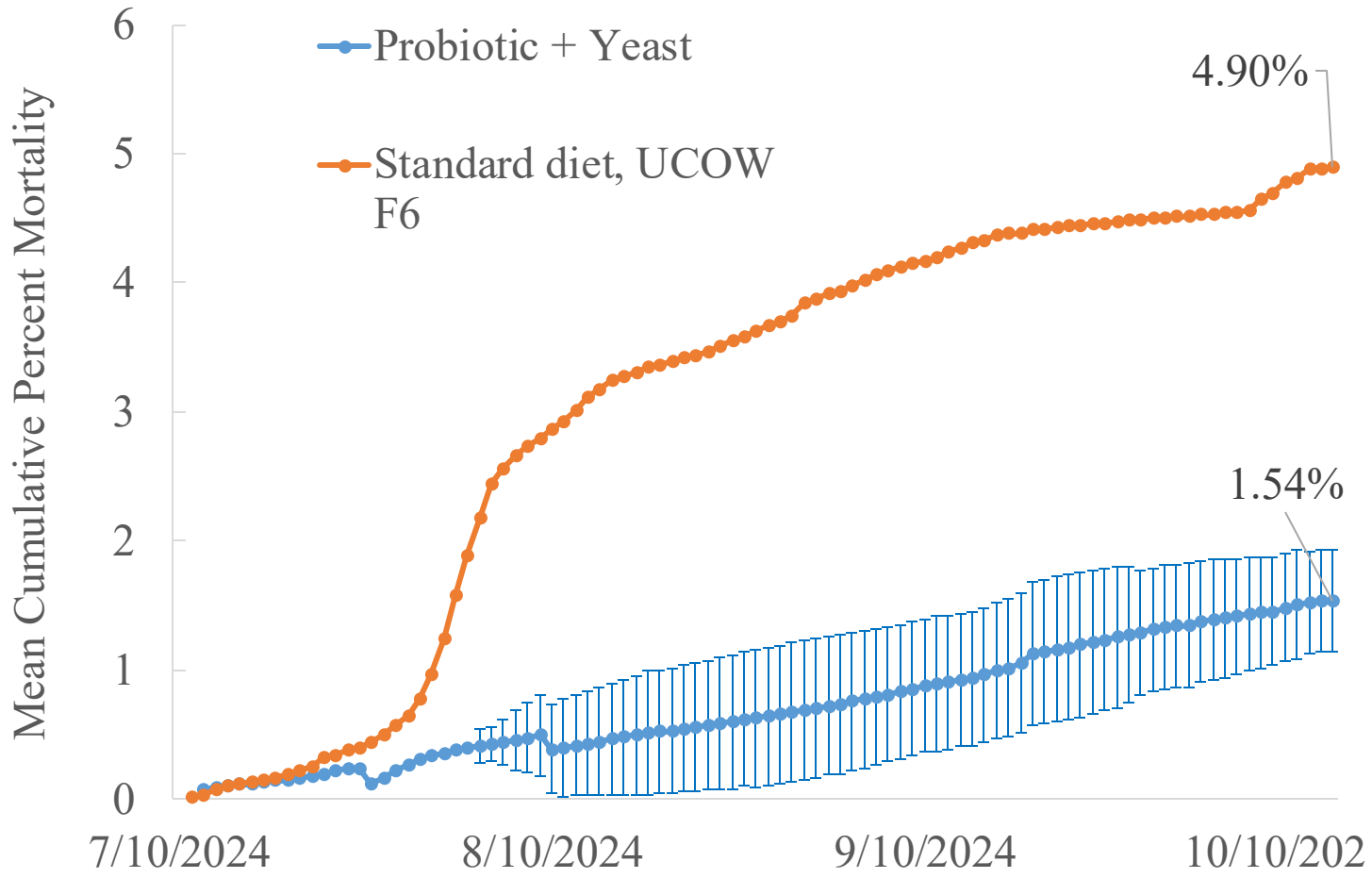
- Water hardness is historically low

(~13 – 40ppm)

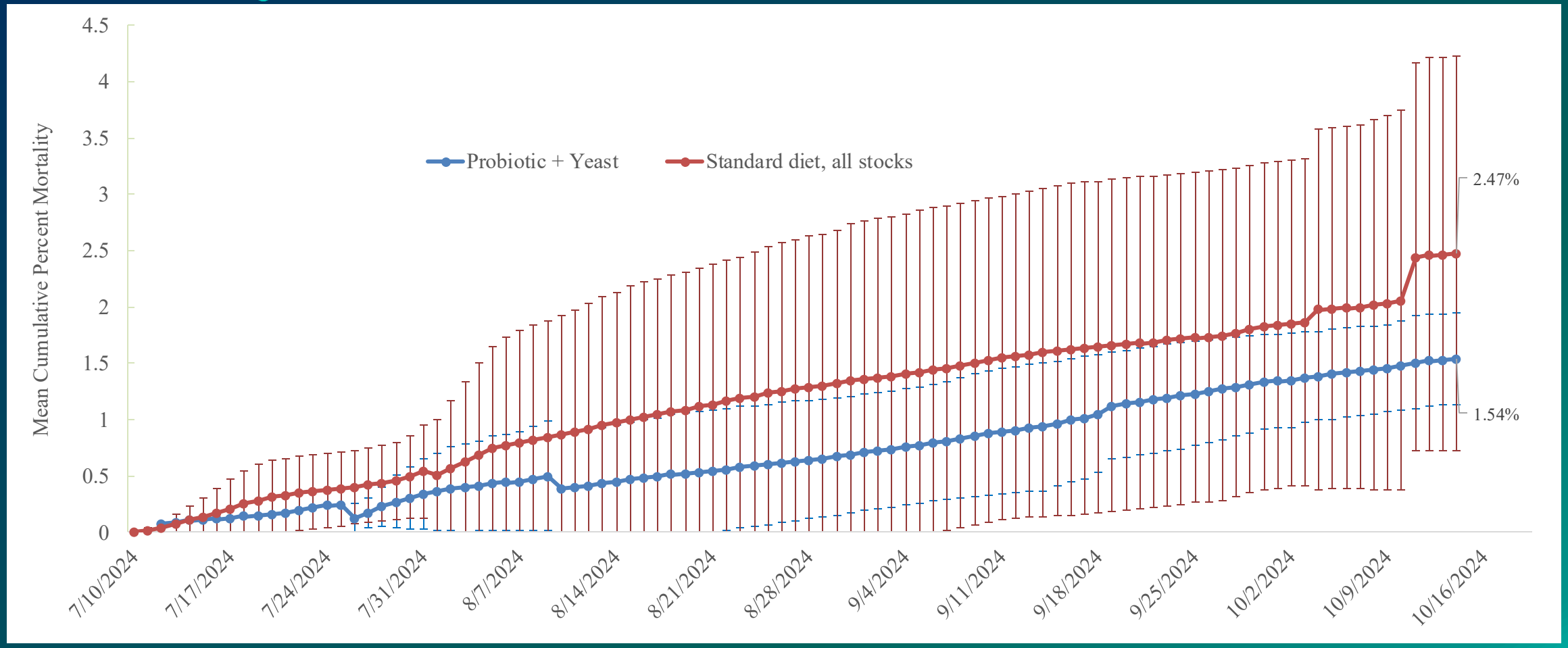
  - Optimal around 100ppm
- Mitigation strategy involves calcium/magnesium supplementation
  - No success with mineral blocks, calcium carbonate substrate in shallow troughs
  - Further work will establish the amount of material needed to increase to recommended hardness within incubation

Probiotic + Yeast

Preliminary results showed improved survival compared to standard diet



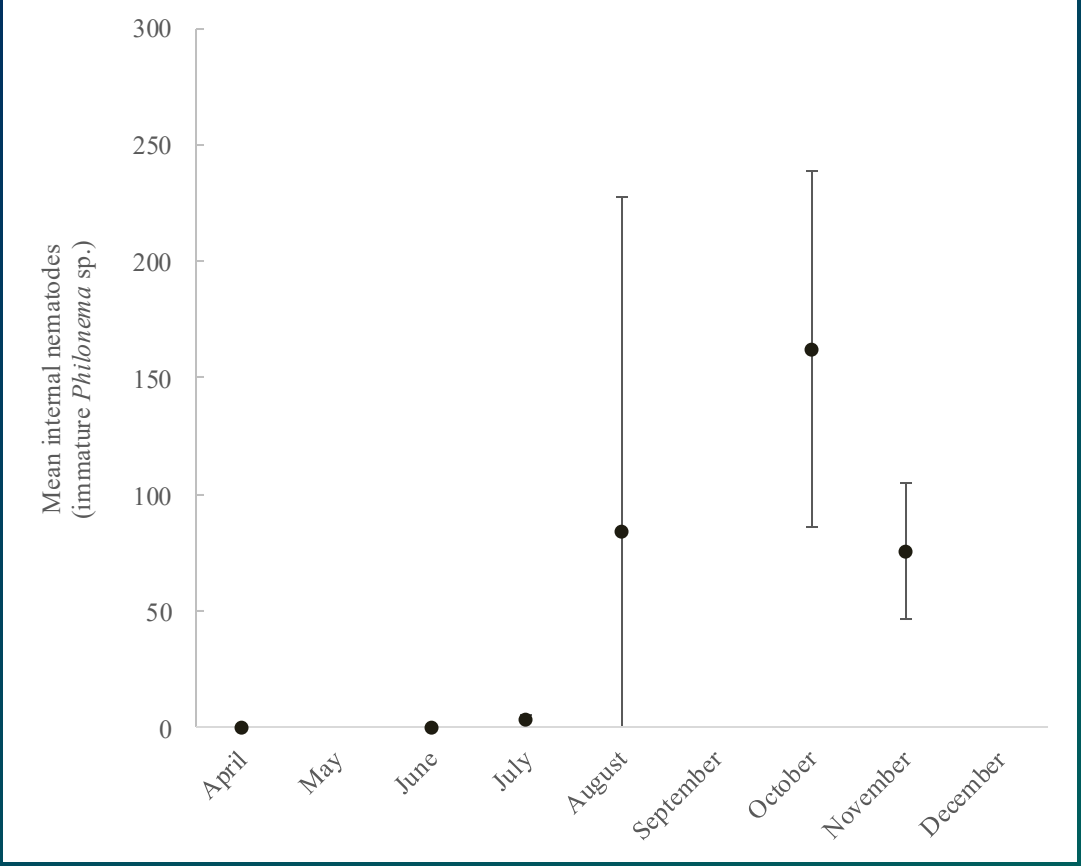
Cumulative percent mortality reduced compared to all standard diet units

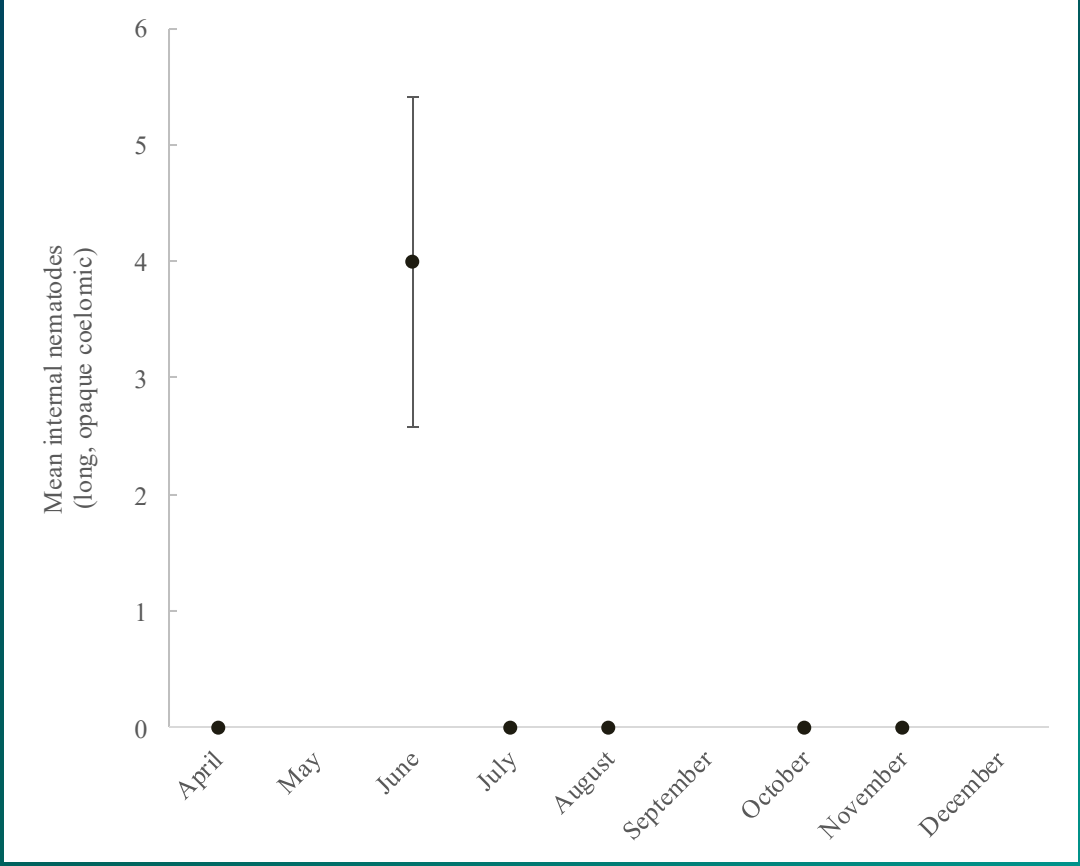


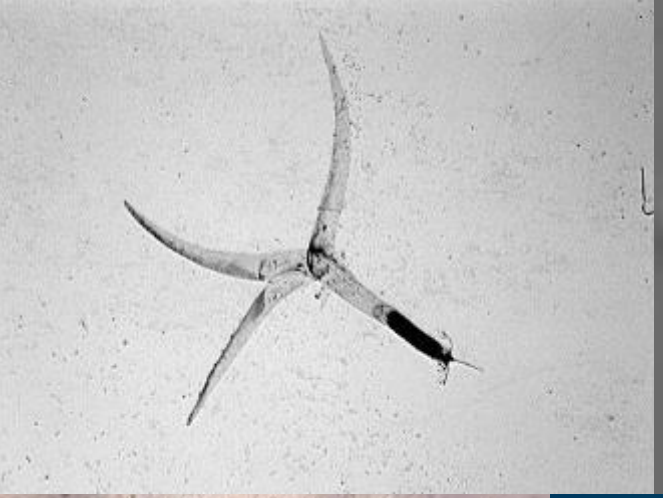
NOR smolt monitoring

- Opportunistic sampling of moribund/fresh dead smolts collected at Mayfield and smolts trucked from Cowlitz Falls
  - Specific pathogens of concern: **IHNV, *C.shasta*, BKD**
    - Only really detect *C.shasta* via molecular methods
  - Copepods, coelomic nematodes observed as potential source of increased loss at Mayfield
    - *Philonema oncorhynchi* at different stages

Nematode intensities were lower compared to past years



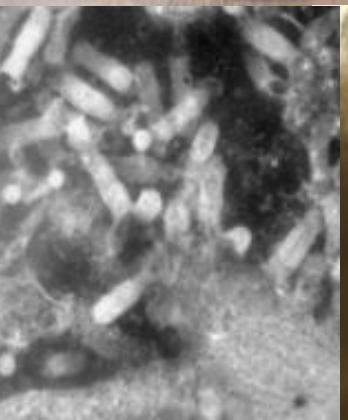


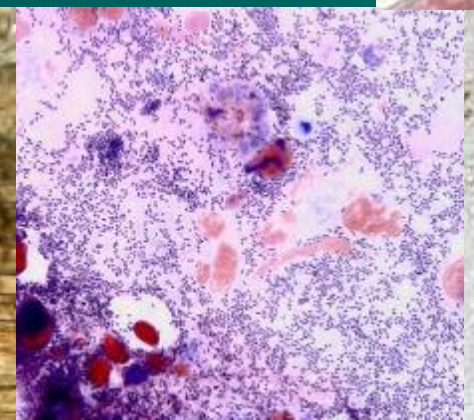


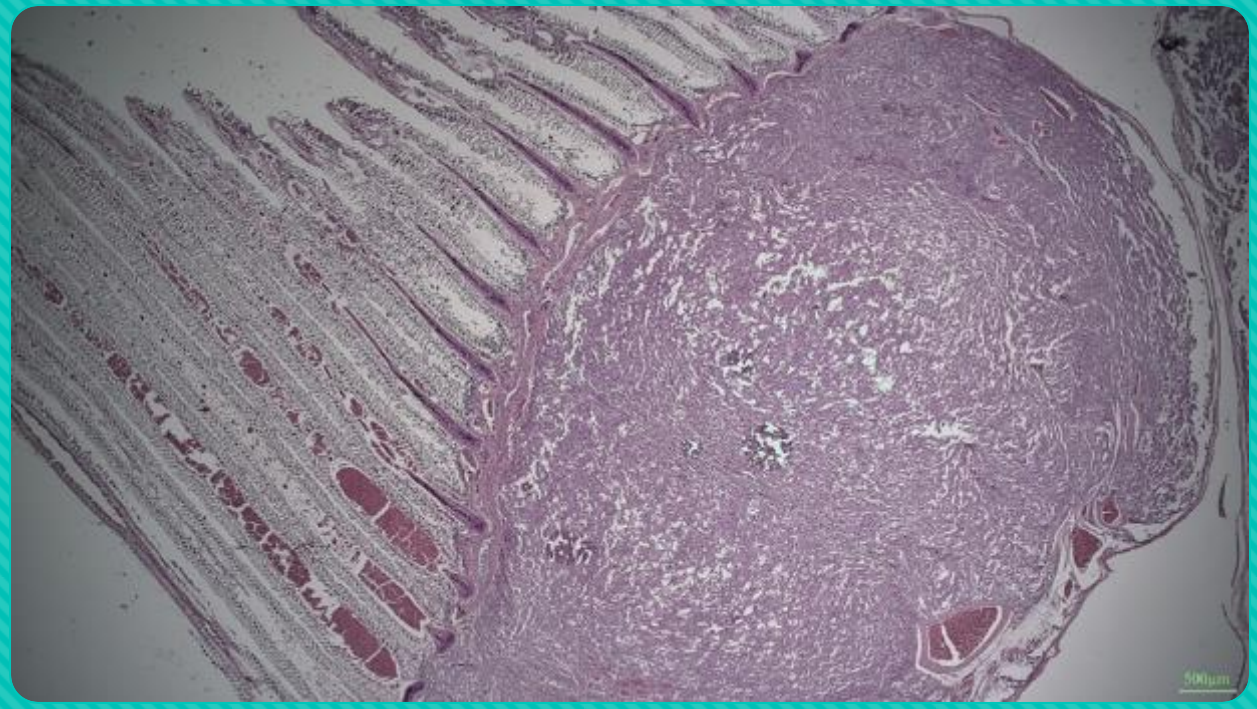


Questions?

photos: www.fishpathogens.net

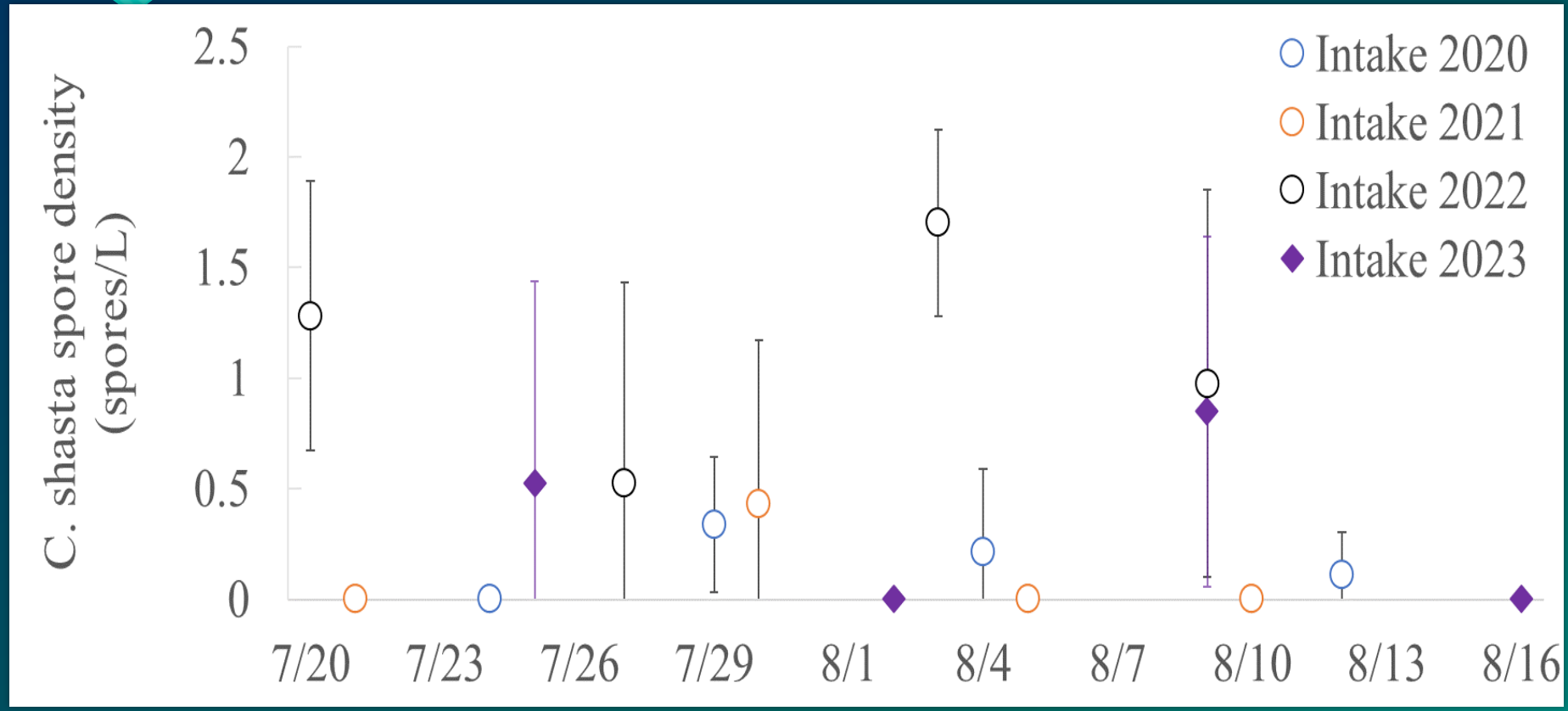



Gill/thyroid carcinoma in NOR coho smolts

Smolts (age 2+) starting in summer 2024 were collected Mayfield. Presumptive thyroid carcinoma but underlying cause is still unknown

C. shasta eDNA monitoring at Cowlitz Salmon



No dredging occurred from 2020 – 2022 (open circles) and did occur again in 2023 (closed diamonds)