CALIBRATE 2024 PARTICIPANTS WORKSHOP

BLUE ECONOMY COOPERATIVE RESEARCH CENTRE

Australian Government Department of Industry, Science and Resources AusIndustry Cooperative Research Centres Program

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The Problems with Pin Bones

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I embarked on this PhD journey with the Blue Economy CRC to be part of research efforts dedicated to improving the health and welfare of farmed fish.

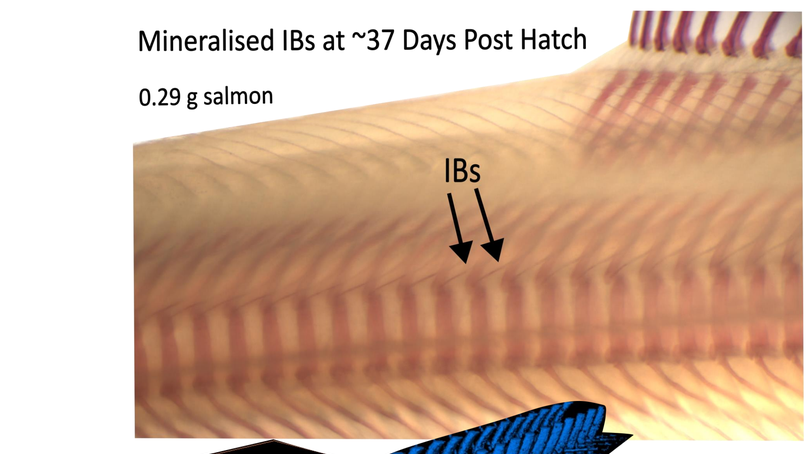
Beyond my doctoral studies, I aspire to persist in endeavours aimed at enhancing the welfare of aquatic animals, including ongoing research, science communication and working with non-profit organisations focused on aquatic animal welfare.

What are we doing?

Investigating intermuscular bone (IB) development and emerging abnormalities in New Zealand farmed Chinook salmon *(Oncorhynchus tshawytscha).* IBs, commercially known as pin bones, are small spicule-like bones embedded in the muscle fillets of basal teleost species. In farmed fish IBs are recognised for their impact on fish processing, negative effect on the economic value of fish and as a consumer health concern if ingested. Skeletal deformities are a persistent welfare and production problem in salmonid aquaculture, which threatens to impede industry growth. It is very plausible that the underlying mechanism resulting in IB abnormalities is likely compromising skeletal health more broadly.

Aims:

1. Determine when and how IBs develop.
2. Investigate the differences in strength and bone mineral content between normal and abnormal IBs.
3. Understand the influence of commercial production strategies on IB development.
4. Assess the potential of sustained swimming to influence IB strength and mineralisation.
5. Investigate the association between IB development and abnormalities, with spinal curvature and overall skeletal health.

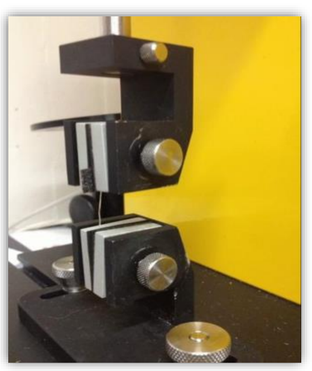


Why are we doing it?

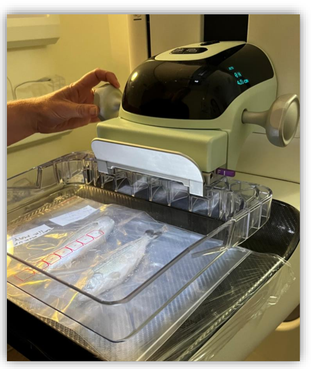
- A healthy skeletal system is fundamental to fish welfare and performance.
- This study will help fill significant knowledge gaps in the development and function of salmon IBs and deformities of the fine bones of fish.
- Inform on fish skeletal robustness considering the future off-shore expansion of aquaculture in high energy, high flow environments.
- Understand how production practices and rearing environments influence IB strength and mineralisation and advise strategies to prevent IB abnormalities and reduce processing costs.
- Identify mitigations to improve overall skeletal health and improve the health outcomes of fish in offshore sites.

How are we doing it?

- Monitoring the development of IBs and skeletal health of four production groups from hatching to harvest.
- Analysing abnormal IBs from an affected population of harvest sized fish.
- Analysing IBs from salmon subjected to low (0.3 bl s−1) and moderate (0.8 bl s−1) flow regimes for ten to eleven months *(Prescott et al. 2023)*.
- X-ray/mammography of salmon > 10 g.
- Whole-mount staining of salmon < 10 g.
- Tension analysis to measure bone strength.
- Measuring bone mineral content (calcium and phosphorus) using ICP-MS.
- Histology.



Tension analysis
(Balaban et al. 2015)



Mammography
(Pacific Radiology)