CALIBRATE 2024 PARTICIPANTS WORKSHOP

Benchmarking Atlantic salmon (*Salmo salar L.*) performance to test translation of research from experimental to commercial systems using omics techniques

Experimental Platform for Aquaculture Production (EPAP)

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I chose a BECRC PhD because of my passion for aquaculture, my desire to be involved in an industry-academia collaborative project, and my interest in developing expertise in omics techniques.

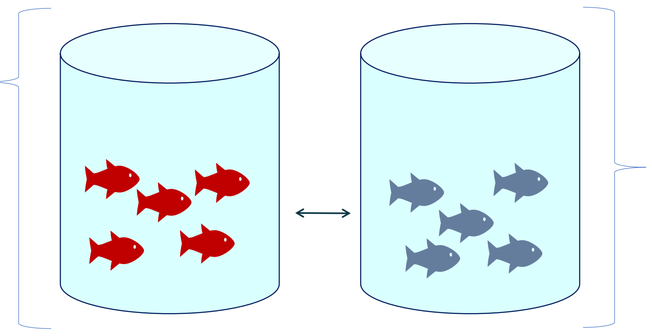
Following my PhD, I aspire to become an aquaculture researcher in fish physiology and nutrition.

Research background and experimental design

- Tasmania is the largest producer of seafood and Atlantic salmon in Australia[1]
- Tasmanian salmon are cultured in their upper thermal limit 16-18°C[2]
- Temperature ↑ DO ↓ oxygen consumption ↑

Hotspot for ocean warming

Same design tested in two separate experiments at different starting sizes: Post-smolt (400g) and Adult (2.5kg)



Post-thermal (19°C & 80 % DO) 12 weeks n=24 (8/performance group)

Post-recovery (15°C & 100 % DO) 7 weeks n=24 (8/performance group)

Performance groups targeted

HIGH

MEDIUM

LOW

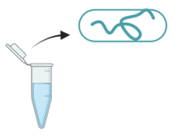
Aims

- Understanding proteomic and metabolomic response in Atlantic salmon exposed to sub-optimal conditions
- Understanding the effects of different sizes on salmon response
- Understanding the molecular mechanisms underpinning differential performance groups, and potential biomarker discovery

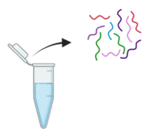
Research methodologies

Proteomics | **Chemical composition** | **Metabolomics**

1 Atlantic salmon liver and white muscle

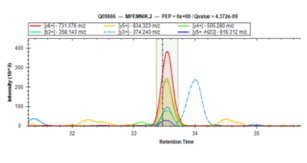


2 Protein extraction

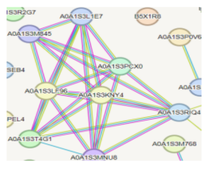


3 Trypsin digestion

4 Peptide separation and analysis using nano HPLC/MS



5 Protein identification and quantitation

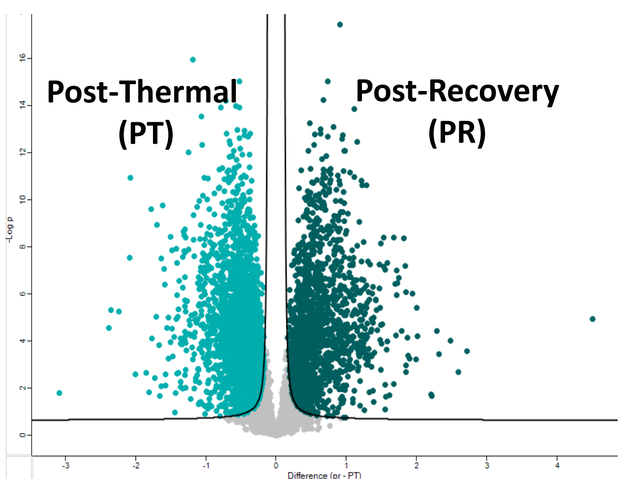


6 Statistical (FDR <0.05) and bioinformatic analysis

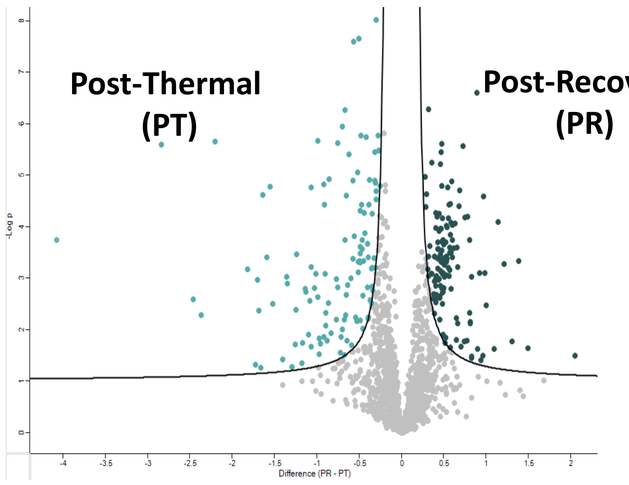
7 Biological interpretation

Preliminary results

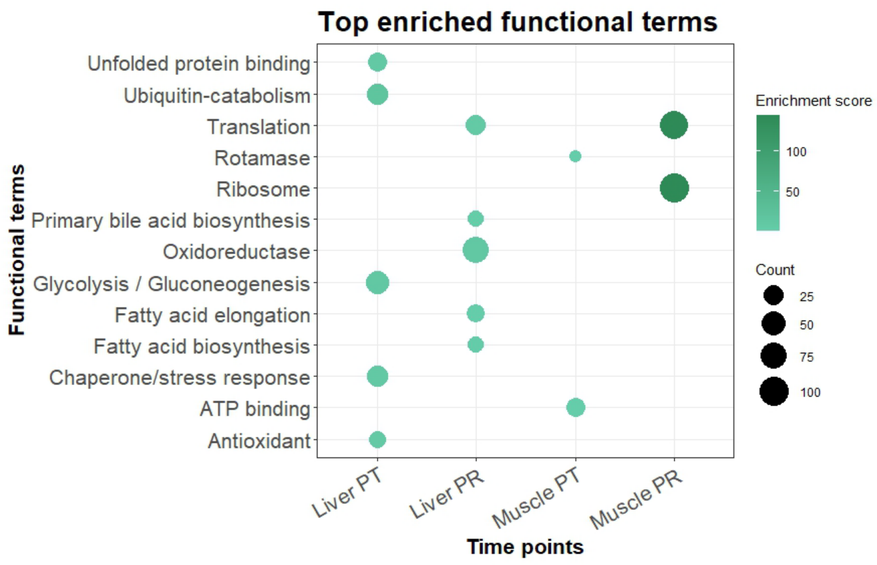
Liver



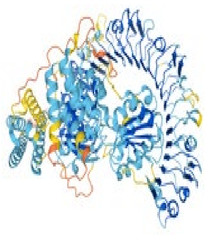
White muscle



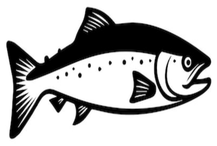
Top enriched functional terms



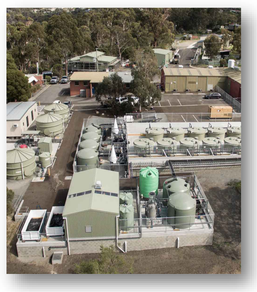
Initial findings



Protein turnover and LC-PUFA biosynthesis were the most affected mechanisms during sub-optimal environmental conditions



SERPINh1 reconfirmed as a potential biomarker of thermal stress at the proteomics level



EAF as a translational tool to identify molecular mechanisms and potential biomarkers for commercial outcomes

Potential impacts

Quantifying salmon performance under climate change in current and future offshore sites

References

1} Curtotti, R, Dylewski, Cao, A and M, Tuynman H., 2023. Australian fisheries and aquaculture outlook to 2027−28, ABARES research report, Canberra, March, https://doi.org/10.25814/vzbj-nw33. CC BY 4.0

2) Nuez-Ortín, W.G., Carter, C.G., Nichols, P.D., Cooke, I.R. and Wilson, R., 2018. Liver proteome response of preharvest Atlantic salmon following exposure to elevated temperature. BMC genomics, 19, pp.1-13. https://doi.org/10.1186/s12864-018-4517-0.