BLUE ECONOMY
COOPERATIVE RESEARCH CENTRE

Australian Government
Department of Industry, Science, Energy and Resources

AusIndustry
Cooperative Research Centres Program

# SHORT SUMMARY

# 2.20.002 Key Challenges for Offshore / High Energy Salmon Aquaculture Production

## INTRODUCTION

Atlantic salmon is the second most economically valuable aquaculture species and has the ninth highest production globally (FAO 2020). Norway dominates the sector when production, innovation and research investment are considered together. Of the other main producing countries, Canada and Scotland also have considerable research capability. Chile has production to match Norway, and China is emerging as a contributor around offshore/high energy technology development.

In Australia, the Tasmanian Atlantic salmon aquaculture industry dominates seafood production and accounts for over half of aquaculture and a quarter of all seafood production (Mobsby 2018). Tassal, Huon Aquaculture and Petuna are all vertically integrated and grow salmon from egg to market. Chinook salmon aquaculture is dominated by New Zealand where New Zealand King Salmon (NZKS) is the largest producer. It is marketed as King Salmon, and whilst the global industry is currently relatively small New Zealand is making considerable investments to grow the industry.

These four companies are partners in the BE CRC and have members of this Scoping Project's Research Team. The BE CRC has considerable capability for applied salmon research and four research organisations are represented on the Research Team (RT). This Scoping Project aims to meet a critical need to understand current knowledge and optimise our strategy for meeting unmet end-user needs.

## KEY POINTS

The unique nature of Tasmanian Atlantic salmon and New Zealand King salmon is recognised. Research should use local stocks whilst testing and translating knowledge generated elsewhere to make best use of BE CRC resources.

There are knowledge gaps that BE CRC research should address immediately through:

a. Incorporation of a Production Assessment Tool to capture key production biology data. This will support benchmarking and be used to make comparisons and predictions that support decision making for more effective R&D and changes to production SOPs.

b. Projects aimed to improve growth and production efficiency at current offshore / high energy sites with the aim to improve current production SOPS. Research should support decision making in production management and consider smolt quality, feed formulation, feeding management, impact of abiotic factors and product quality at harvest.

c. Developing an advanced approach to monitoring health and welfare that adopts available and emerging technology to be remote, autonomous and real-time and is tuned to local issues.

Research Program 2 takes the lead to develop linkages and incorporate facilities by:

a. Building research teams to address the immediate needs of the salmon industry and opportunities presented by the transition to offshore / high energy sites.



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b. Ensuring BE CRC salmon research projects collaborate with ongoing or future large research projects in Australia and New Zealand to access families from selective breeding programs.

c. Identifying opportunities to access facilities that have the potential to generate new knowledge and conduct research that improves production at current offshore / high energy sites and informs the use of future sites.

The BE CRC includes salmon as part of the strategy for long-term development of integrated aquaculture systems for deployment at offshore / high energy sites. Temperate integrated systems would include salmon production at the core, recycle salmon waste streams and take advantage of renewable energy and oxygen by-products to increase the efficiency.

RP2 maintains ongoing dialogue with salmon stakeholders and that is encapsulated by the BE CRC structures and processes. In particular:

a. The mechanisms to ensure effective cross-linkages between Research Programs are continued.

b. The BE CRC through RP2 leads in the formation and management of a salmon production biology network that includes salmon aquaculture industry, aquaculture service industry, research organisations and organisations involved in education and training.

## THE CHALLENGE

The specific challenge is to develop unique BE CRC research projects that address salmon industry production biology needs in a fast-moving space where priorities change, only some research is pre-competitive, solutions offer competitive advantage and there are major international initiatives that may or may not provide solutions for our local industry.

Long-term challenges include resolving different stakeholders' priorities to achieve integration of multiple aquaculture species and of aquaculture with renewable energy systems.

## THE OPPORTUNITY

The immediate opportunity is for the BE CRC to conduct focused research that provides timely solutions to production biology issues identified from current operations. Setting up a Production Assessment Tool is an opportunity to benchmark progress and inform decision making around research priorities. Combining the significant expertise and resources across BE CRC partners presents a considerable opportunity to make progress.

On a longer timeframe the advanced position of salmon aquaculture can inform the development of offshore aquaculture for other species as well as the integration of multiple species.



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## OUR RESEARCH

The Horizon Model was used to develop the research questions, with different timeframes and levels of challenge.

Five major themes were thoroughly explored through discussion in the expert Project Team and through workshops and 59 research questions were identified. These were distilled into five major projects:

| |
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| Monitor and Mitigate: Develop technologies and procedures for real-time and remote monitoring of fish health and welfare in offshore / high energy sites and incorporating assessment of external environmental risks. |
| Producing smolt for offshore: Develop a future smolt strategy to integrate onshore, inshore and offshore sites to ensure cost effective harvest production of optimal quality fish year-round. |
| Experimental platform: Adopt or develop models to support a Production Assessment Tool, a Species Selection Tool and integration and translation of data across different experimental facilities. |
| Breeding fish for offshore: Assess GxE of pedigreed fish in offshore / high energy sites to re-evaluate the overall breeding goal. |
| Maintain and enhance growth performance: incorporate feeds and feeding technology; smolt quality; early maturation; critical abiotic factors (temperature, DO, current velocity); critical biotic factors (feed-days, growth depensation, submergence); feed formulation and nutrient requirements. |

## OUTCOMES

Clear view about the range and extent of research and development that could be achieved by the BE CRC by identifying 59 research questions, 9 PhD topics and 5 major project themes. Recognition of critical areas to address immediately in order to set the foundations for effective R&D in production biology.

## NEXT STEPS

Initiate projects identified as requiring immediate attention to address knowledge gaps as listed above in 1.7.4.



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## PROJECT TEAM

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## PROJECT REPORTS/PUBLICATIONS

Carter, C. et al. (2020). Key Challenges for Offshore / High Energy Salmon Aquaculture Production, 2.20.002 – Final Project Report. Blue Economy Cooperative Research Centre.



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