

UNIVERSITY of TASMANIA



Institute for Marine and Antarctic Studies

# Pacific Oyster Breeding Program

Andrew Trotter

Senior Research Fellow, Centre for Fisheries and Aquaculture

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# Outline

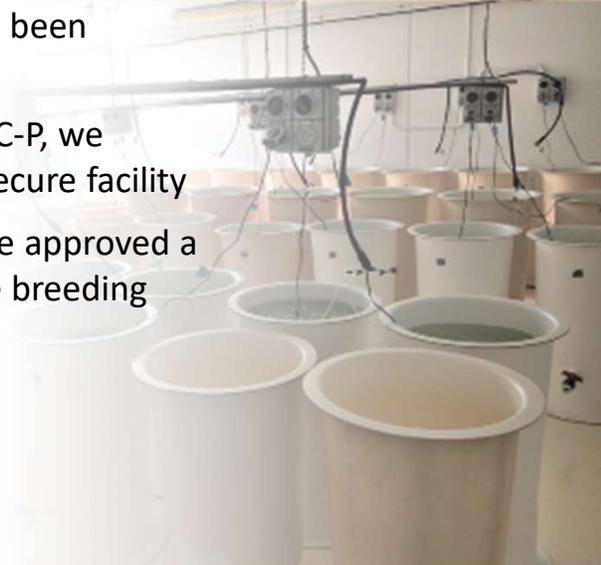
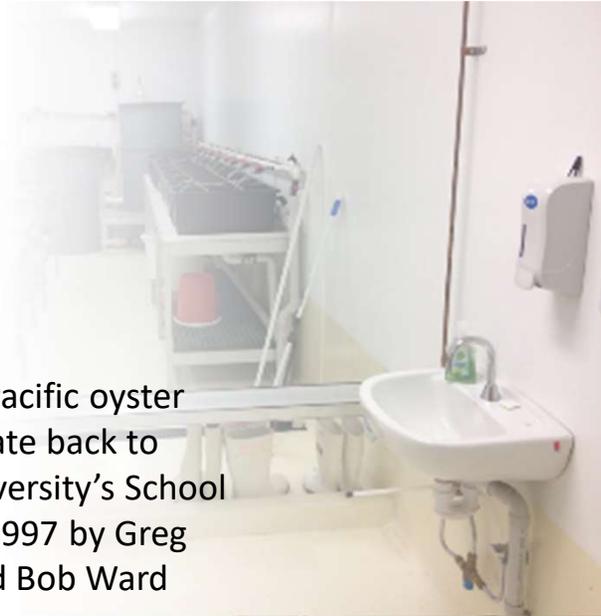
History of the collaboration

Supporting the breeding program

Broad overview of the FRDC 'Genomics Grant'

## History of the collaboration

- The origins of the Australian Pacific oyster selective breeding program date back to formative research at the University's School of Aquaculture and CSIRO in 1997 by Greg Maguire, Peter Thompson and Bob Ward
- From 2010 – the breeding has been conducted at IMAS Taroona
- In 2016 on the back of the CRC-P, we developed an accredited biosecure facility
- In 2022 the SMRCA Committee approved a 10 year project to support the breeding program





## Supporting the breeding program

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Utas-IMAS support of the breeding program is via predominantly via the SMRCA

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The portfolio of research projects supported by the SMRCA is developed using input from research advisory groups that represent all sectors. There is oversight of resourcing and performance by an advisory committee. Projects have varying lifecycles and as one is completed, resources are shifted to other research needs

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Research Advisory Groups (RAG) – the Shellfish Aquaculture RAG comprises members from Oysters Tasmania, DNRE (e.g., *Marine Resources*, *ShellMap*, *Biosecurity Tasmania*), IMAS TSIC, FRDC, IRG, ASI, AAGA, CSIRO

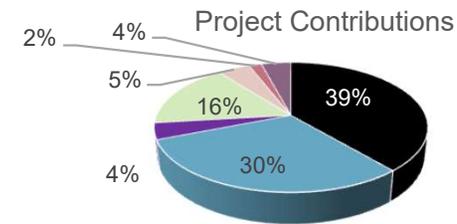
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Shellfish Aquaculture RAG has long recognised the importance of the breeding program

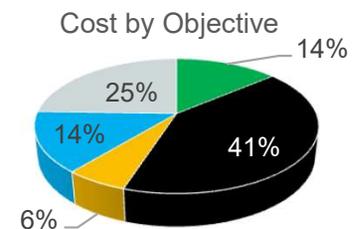
In the last three years the Shellfish Aquaculture RAG has listed the 'transition to genomics' as a research high priority

## “Developing the tools and articulating the value proposition for genomic selection in Pacific oyster selective breeding”

- Partners: IMAS, ASI, CAT, Utas ICT, CSIRO
- Total project value of \$957,967
- \$370,969 from the FRDC
- \$586,998 IK (ASI, IMAS, Utas ITC, CAT, and CSIRO)
- Five Objectives
  1. Economic cost benefit;
  2. Evaluate genotyping tools;
  3. Develop tagging and biopsy protocols;
  4. Proof of principal for phenotyping Pacific oyster meat condition with machine learning; and
  5. Husbandry management for better sex ratios.



- FRDC
- IMAS in-kind
- Utas ICT in-kind
- ASI in-kind
- CAT in-kind
- CSIRO in-kind
- Growers in-kind



- Economic cost benefit
- Evaluate genotyping tools
- Develop tagging and biopsy protocols
- Machine learning - oyster meat condition
- Husbandry management for better sex ratios

# Objective 1: economic cost benefit

- The bio-economic modelling aims to describe the value proposition arising from the use of genomic selection in the ASI Pacific oyster breeding program
- This project has three distinct phases:
  - (1) Update Kube *et al.* (2009) bio-economic model with current costs, current farming systems for SA and TAS separately for use in estimation of economic weights;
  - (2) Understand of economic value of selective breeding for POMS resistance; and
  - (3) Use the model for current practices in SA and TAS to estimate the additional profit that may be due to the increased rate of gain associated with genomic selection.

*What is the bottom line? “is this worthwhile for industry”*



## **Team**

- Steven Rust (IMAS)
- Lewa Pertl (ASI): Lead
- Peter Kube (CAT)
- Curtis Lind (CSIRO)

## Objectives 2 & 3: evaluate genotyping tools and develop tagging and biopsy protocols

- The purpose of this objective is to evaluate genotyping tools and options with the aim of identifying;
  - (1) a genotyping strategy - what 'platform' would be used;
  - (2) genotyping costs;
  - (3) genotyping data assessment; and
  - (4) a genotyping provider.
- This work will inform how operational genomic selection could be undertaken – providing the core detail for the 'next steps' in moving to a genomics platform.
- In addition to this, we will develop protocols for undertaking biopsies and tagging individual oysters that are suitable for the operational application of genomic selection in oysters
  - i.e., protocols must be able to be implemented at scale in a timely and cost-effective way – “customised” to what is needed future application of this program

*What is the bottom line? “how can this be done – leading to commercialisation”*



### **Team**

Klara Verbyla (CAT): Lead  
Lewa Pertl (ASI)  
Peter Kube (CAT)  
Curtis Lind (CSIRO)  
Andrew Trotter (IMAS)

## Objective 4: Proof of principal for phenotyping Pacific oyster meat condition with machine learning

- The project seeks to develop a “proof of principle” for phenotyping meat condition with machine learning
- This is probably the most difficult and least reliable phenotype to measure – using the conventional metrics
- The software would measure the:
  - (1) size of the shell and meat to assess the space occupied by the meat within the shell (fullness);
  - (2) colour of the meat would be used to assess the glycogen/gamete cover; and
  - (3) individual animals would be ranked and scored using the machine learning algorithm.
- The prototype would be validated against the conventional metric for assessing condition. CSIRO will run a comparison analysis of the two methods



### Team

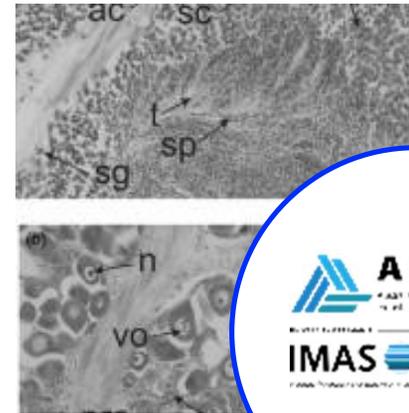
Byeong Kang (Utas-ICT): Lead  
Muhammad B. Amin (Utas-ICT)  
Ananda Maiti (Utas-ICT)  
Wenli Yang (Utas-ICT)  
Andrew Trotter (IMAS)  
Lewa Pertl (ASI)  
John Wright (ASI)  
Curtis Lind (CSIRO)

*What is the bottom line? “demonstrate a cutting-edge approach to phenotyping”*

## Objective 5: Husbandry management for better sex ratios

- The purpose of this project is to undertake research to help guide broodstock management to produce commercially desirable sex ratios in ASI families
- Hatcheries in Tasmania have noted sex bias to females. The sex bias has several consequences for hatcheries including less favourable breeding pairs and additional time to source parents (also a problem for a genomics breeding program)
- This project will examine all historical ASI data for effect driven by family, holding location, and age
- Field and laboratory experimentation will be used to test for effects that can be used to manage sex ratios in broodstock

*What is the bottom line? “can we understand and manage this problem”*



### **Team**

John Wright (ASI): Lead  
Andrew Trotter (IMAS)  
Curtis Lind (CSIRO)  
Greg Smith (IMAS)



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**Thank you**

[andrew.trotter@utas.edu.au](mailto:andrew.trotter@utas.edu.au)