



Genetic variation to hypoxia tolerance in developing Atlantic salmon

Sarah Andrewartha, Matthew Hamilton, Nick Elliott , Peter Frappell

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Breeding for Robustness

***The ability to continue high production potential
with resilience to stressors
in a wide variety of environmental conditions
(Knap 2005)***

- What is the measurement trait?
- How and when can we measure it?
 - Efficiently
 - In large enough numbers
- Is there variation within the population?

Breeding for Robustness

***The ability to continue high production potential
with resilience to stressors
in a wide variety of environmental conditions
(Knap 2005)***

- Pathogens
- Nutrition
- Production system and management
- Environment
 - temperature
 - dissolved oxygen

Hypoxia as stressor

Oxygen consumption



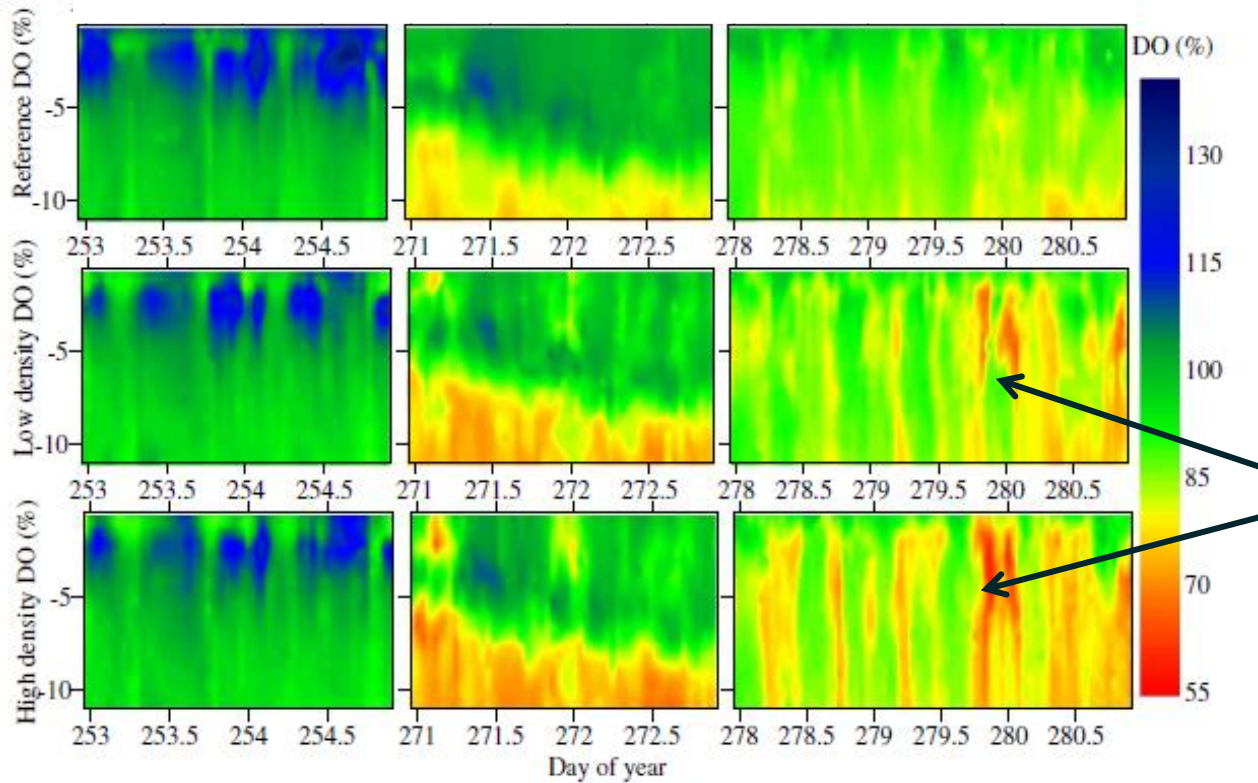
Metabolic rate



Production potential

Measure under variable conditions

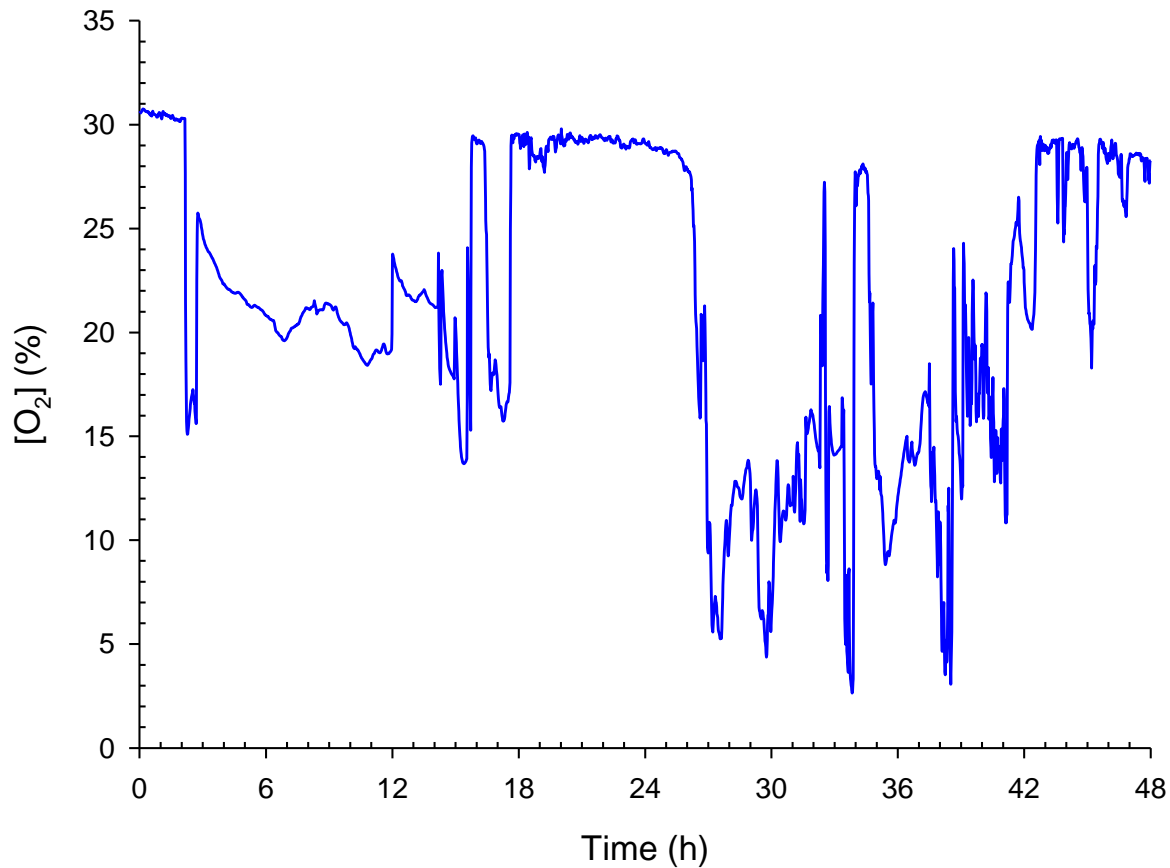
Hypoxia in sea cages



Low dissolved oxygen

Johansson et al 2006

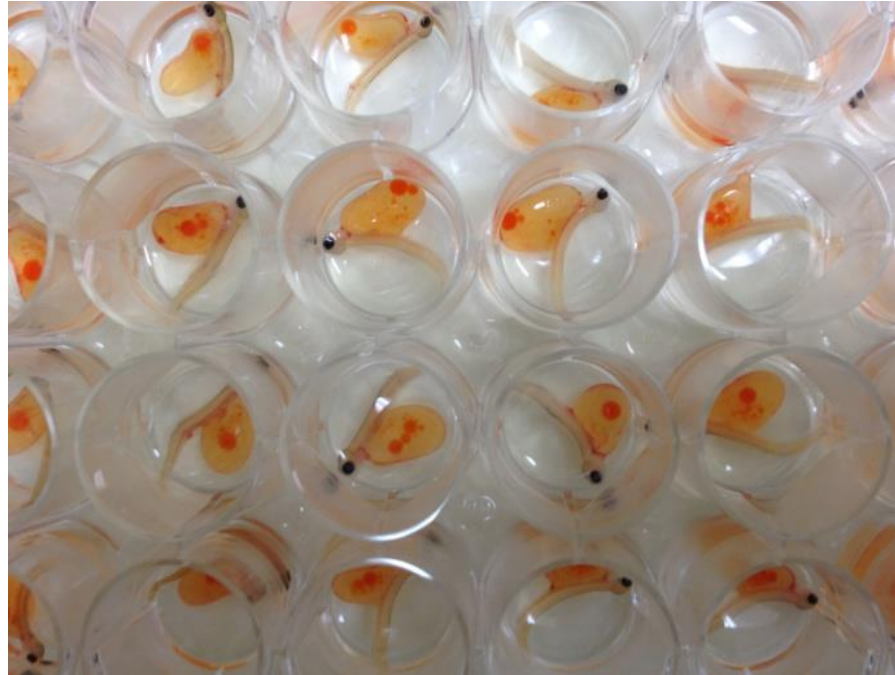
Hypoxia in hatchery



Wood et al, unpublished

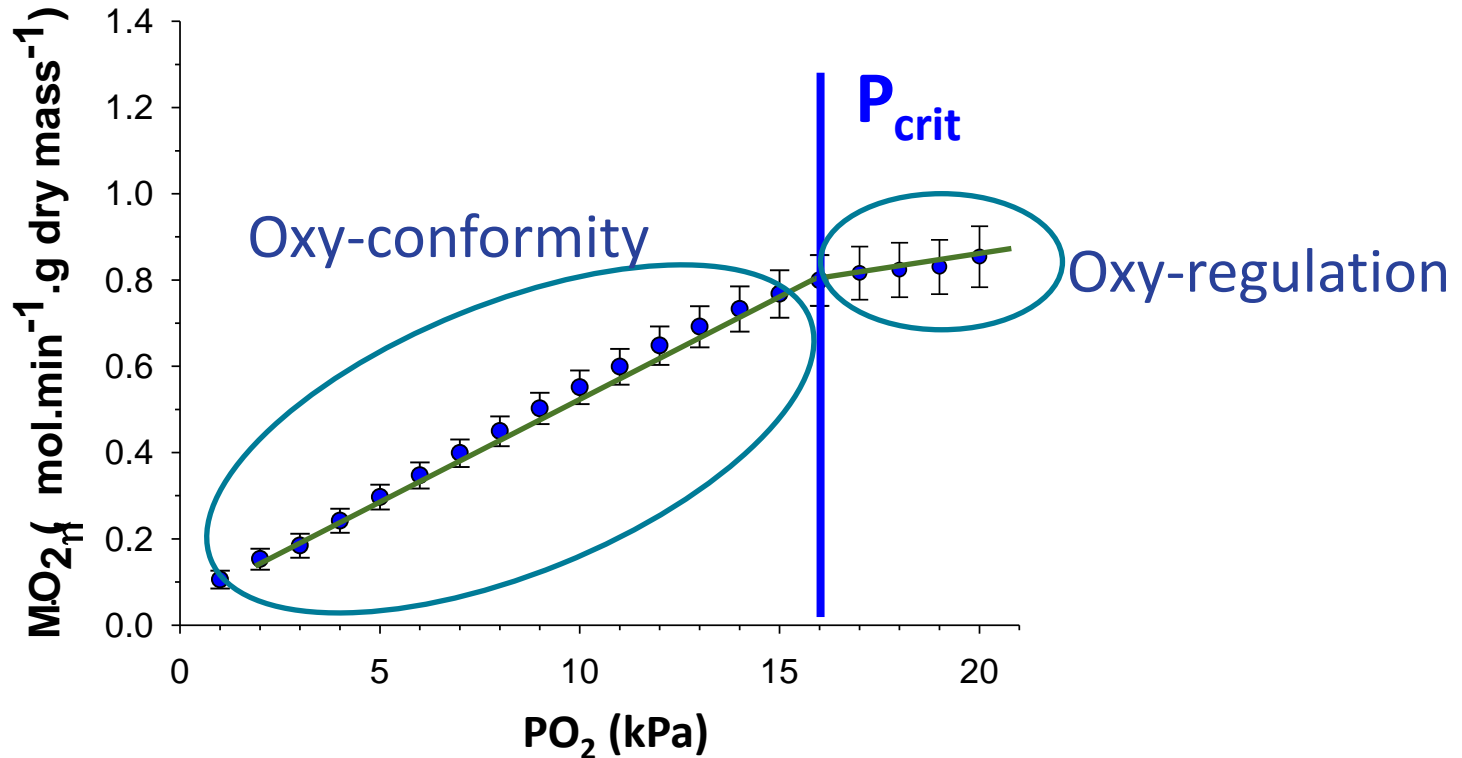


How did we measure it?



Closed chamber respirometry

What did we measure?

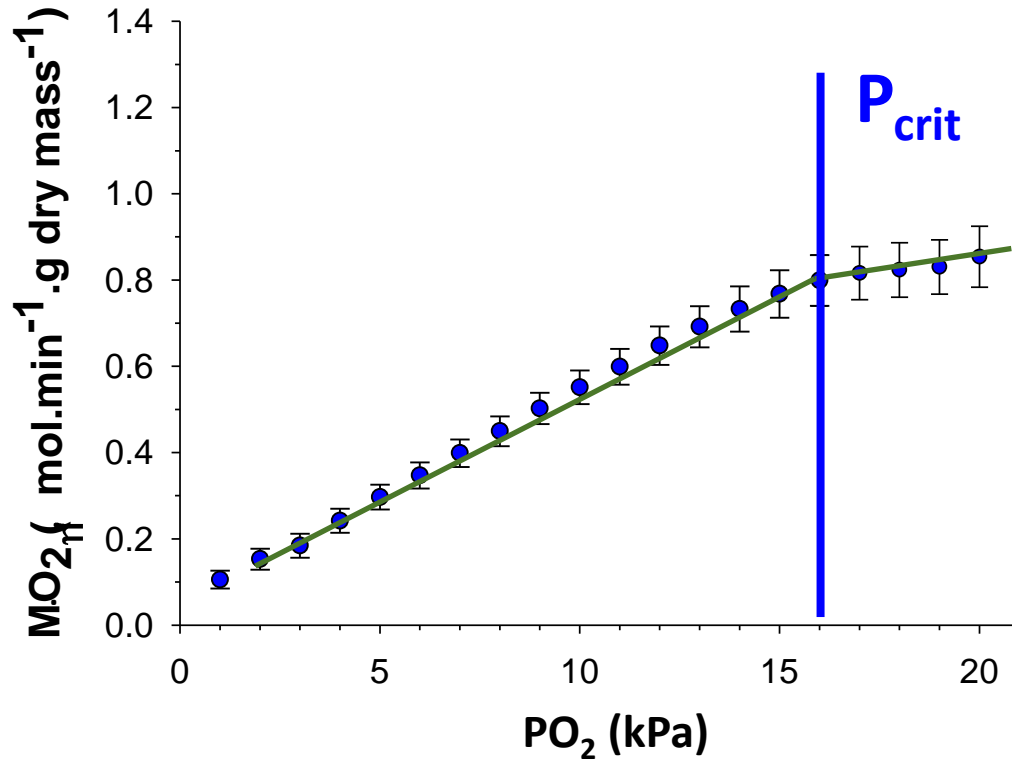


$\uparrow P_{\text{crit}} = \uparrow$ hypoxia sensitivity

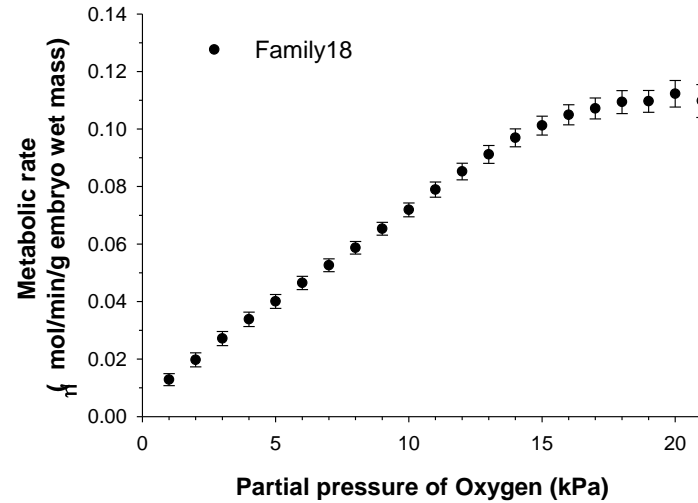
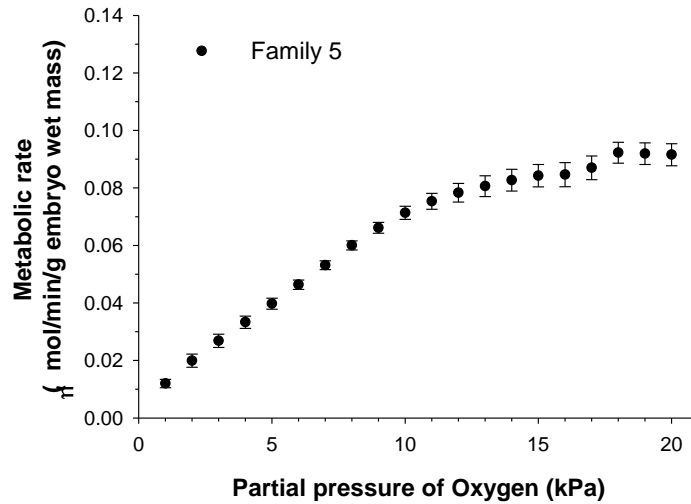
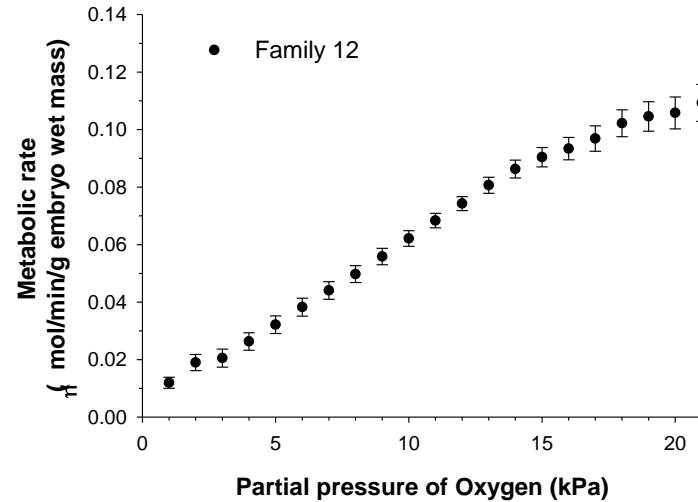
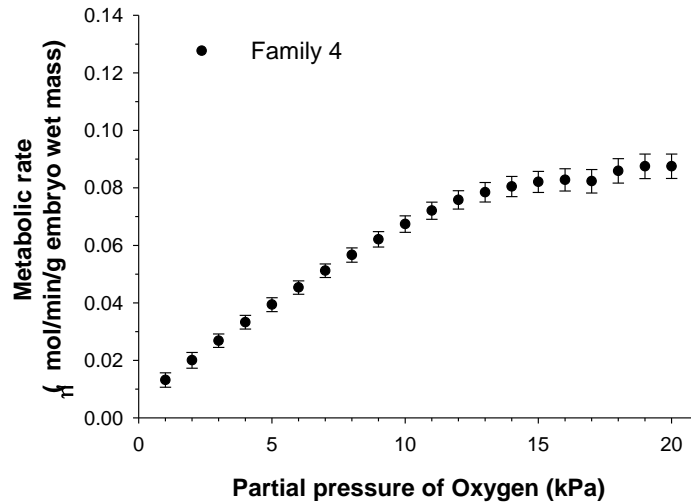
Analyses

- Full-sib families
 - 32 families eyed-egg stage (312 dd)
 - 26 families yolk-sac alevin stage (504 dd)
- Closed respirometry, multi-well plates
 - eyed egg stage n = 14-20
 - yolk-sac alevin stage n = 16-24
- To obtain Pcrit values fitted non-linear (Weibull and logistic) models

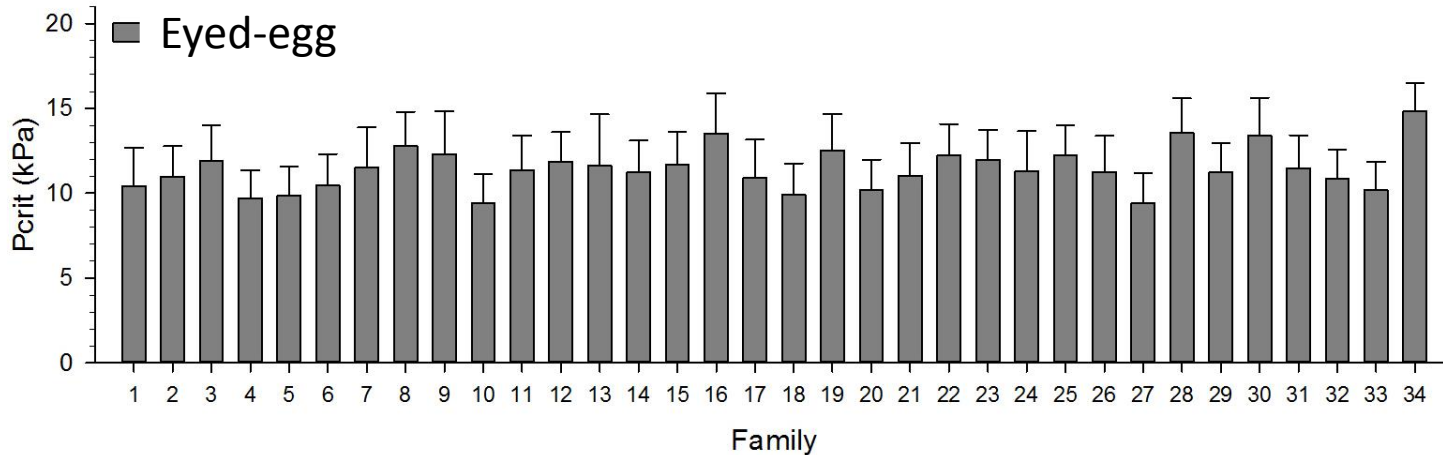
Calculating P_{crit}



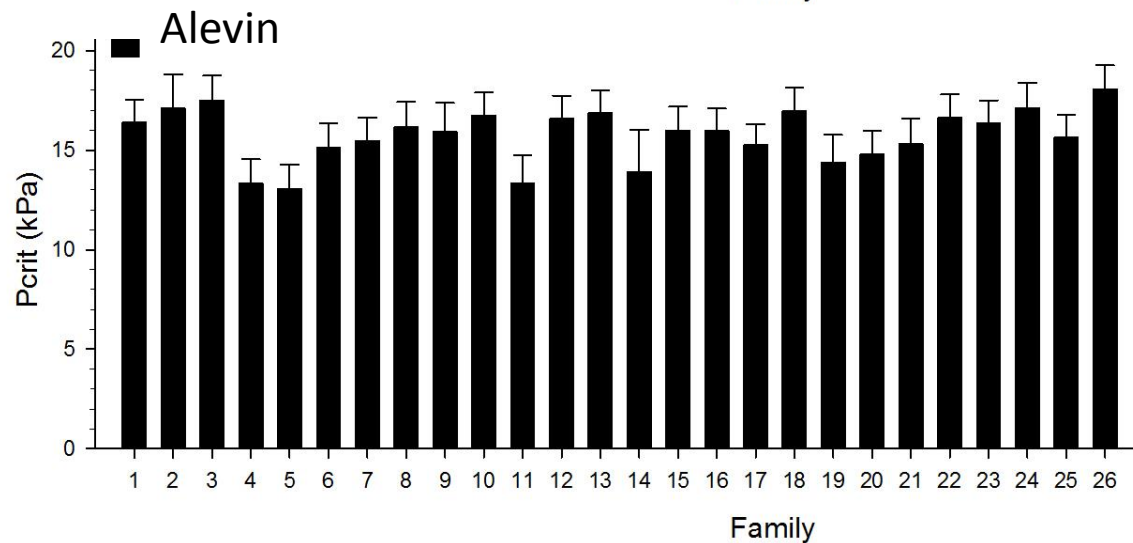
What did we observe?



Pcrit / hypoxia tolerance variation



$h^2 = 0.15$
(0.08)



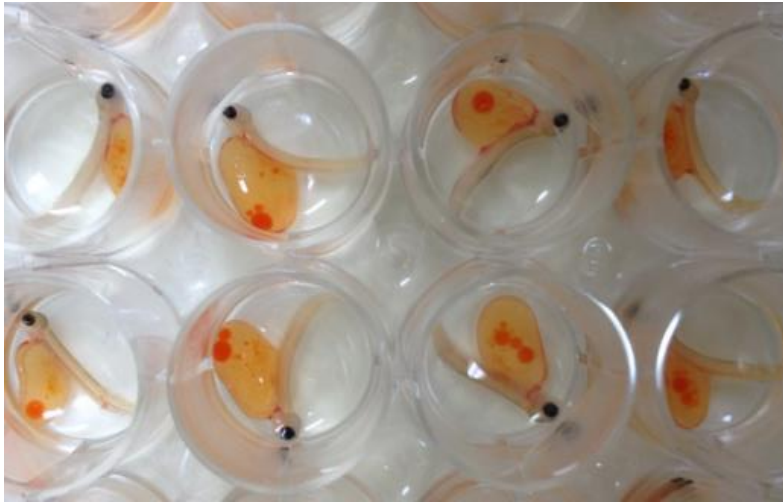
$r_g = 0.60$
(0.34)

$h^2 = 0.37$
(0.13)

Hypoxia tolerance and robustness

- Genetic variation (in development stage)
- Correlation with age?
- Correlation with other traits?
- Closed chamber respirometry not efficient as a measurement trait

Thank You



Contact:

Nick Elliott

nick.elliott@csiro.au

Matthew Hamilton

matthew.hamilton@csiro.au

Sarah Andrewartha

sarah.andrewartha@csiro.au

Peter Frappell

peter.frappell@utas.edu.au

