

Genetic gains achieved over 10 years of selective breeding for resistance to amoebic gill disease in Atlantic Salmon (*Salmo salar*)

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Freshwater broodstock



Marine growout



AGD in Tasmania



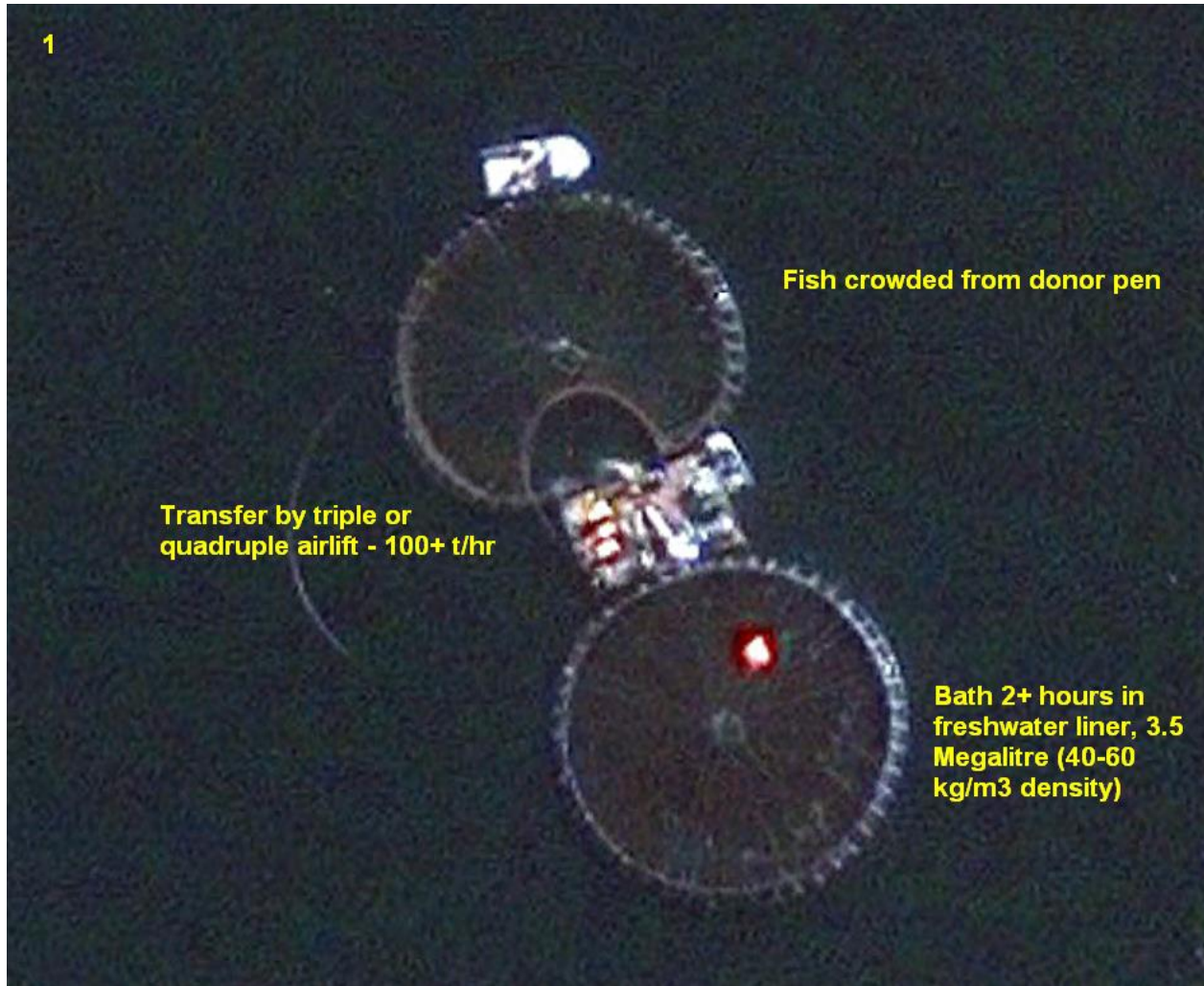
- 1960's
 - Eggs imported to Australia
- 1984
 - Eggs imported into Tasmania
- 1986
 - First commercial harvest of 53 tonnes
- 1988
 - First AGD outbreak
- 2005
 - Family based selective breeding program initiated with CSIRO
- 2012
 - First genetically improved smolt put to sea
- 2013
 - 100% of smolt are genetically improved

Gill lesions

Causative agent: *Neoparamoeba perurans*



Freshwater bath treatment



Understanding AGD



- Marine sib-test challenge
 - 3-6000 PIT tagged smolt per year
 - Repeated natural infections
 - All fish gill scored between 0 and 5 for AGD
 - 5 infection cycles in unselected groups
 - Heritability is low and variable at 1st infection
 - Heritability is moderate and consistent in subsequent infections

Purpose built cages



- Wavemaster 10x10m cages in pairs with 2m work platform in centre
- Fish are moved from one side to the other as they are gill checked

Checking individual fish



10 year classes of data

Individual gill scores	140,022
Measured individuals	43,866
Measured families	1,713
Sires represented	797
Dams represented	750

	AGD1	AGD2	AGD3	AGD4	AGD5
h^2	0.14	0.34	0.37	0.26	0.26

r_g	AGD1	AGD2	AGD3	AGD4	AGD5
AGD2	0.46				
AGD3	0.23	0.79			
AGD4	0.17	0.56	0.82		
AGD5	0.23	0.54	0.51	0.74	

Cumulative gain in primary traits



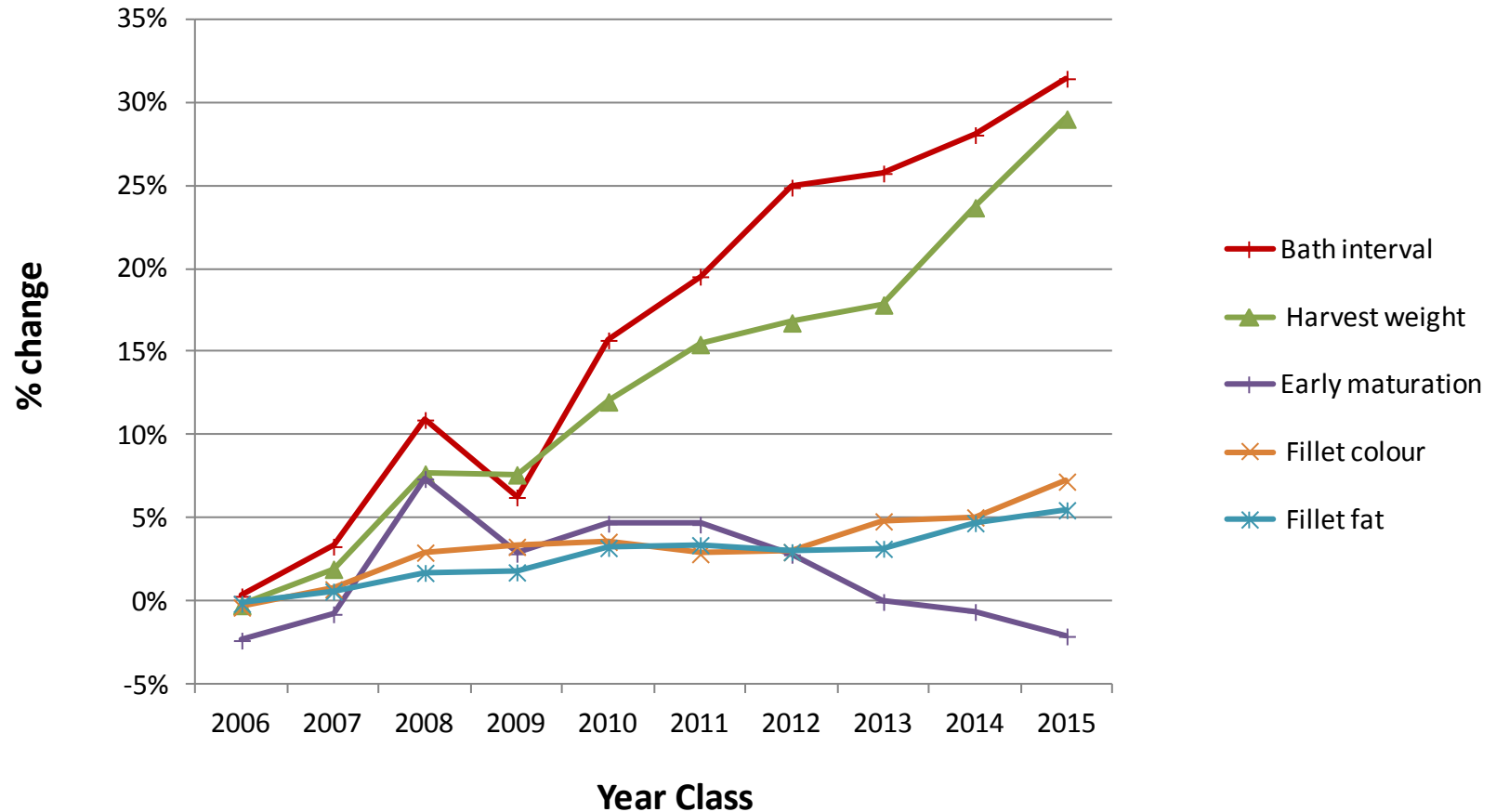
Genetic trend in selective breeding population



No adverse change in secondary traits



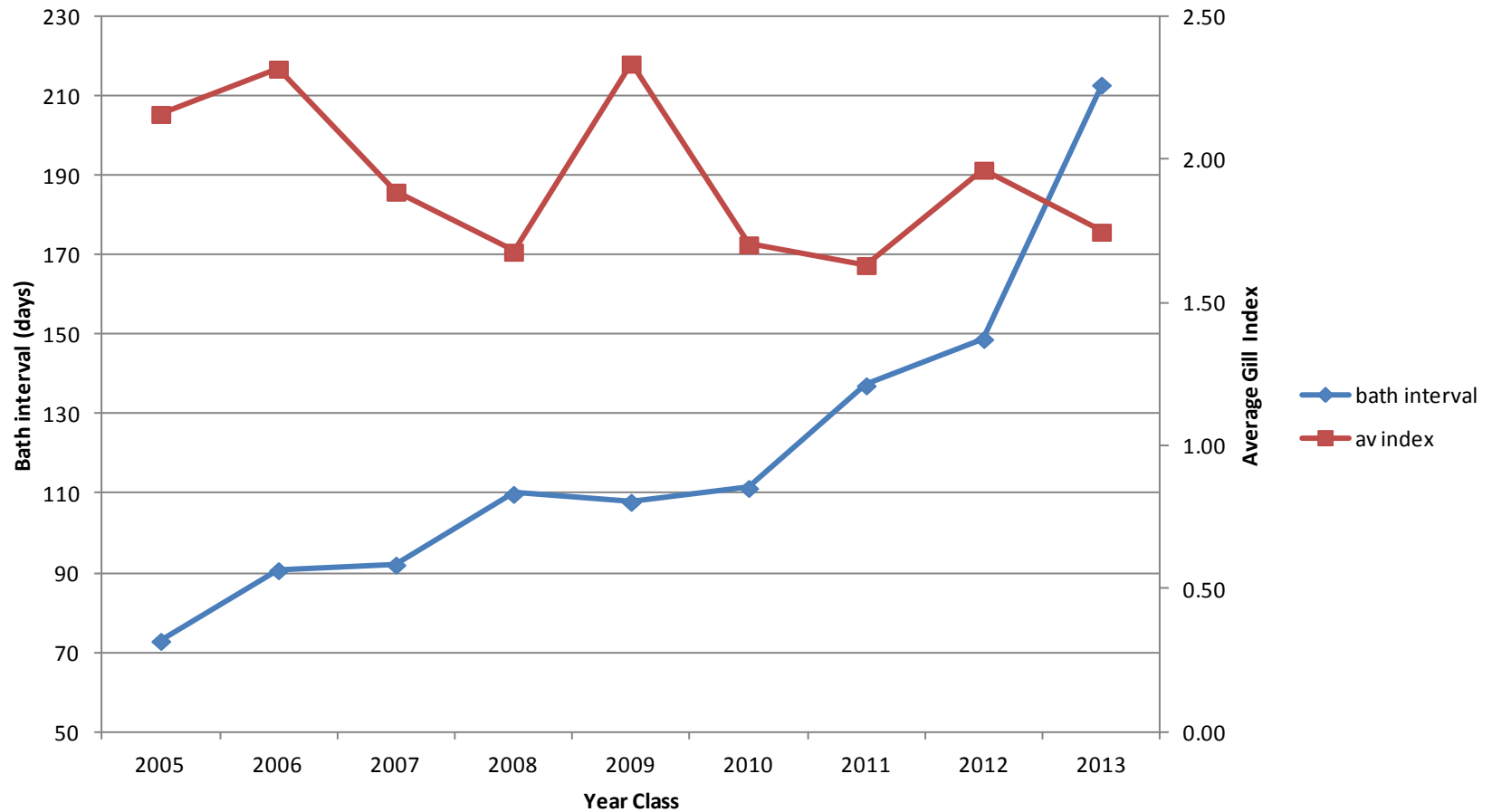
Genetic trend in selective breeding population



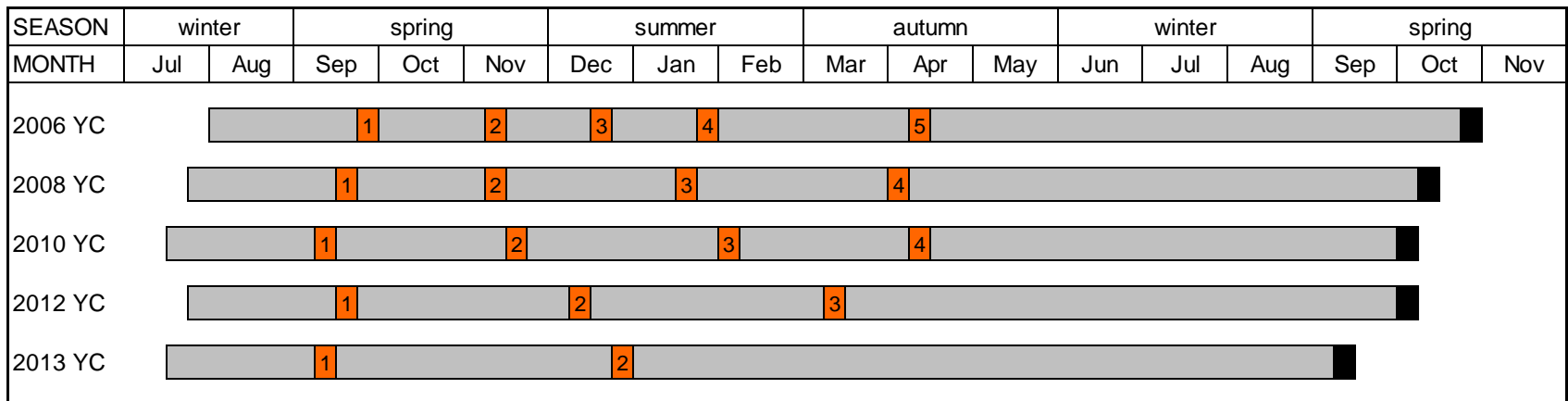
Phenotypic trend






Phenotypic AGD trend in Marine Sib-test group



Phenotypic trend



-  Marine grow-out period
-  AGD infections (n = 1 to 5)
-  Harvest

Super Dad

HIS STATS

INDIV_ID	2003000137
Hatched	2003
Died	2008
Number matings	6
Tagged progeny	235
Tagged grand-kids	2,541
Grand-kids as parents	30
Alias	"Super Dad"

HIS PERSONAL DETAILS

Bath interval	+58%	<input checked="" type="checkbox"/>
Harvest weight	+21%	<input checked="" type="checkbox"/>
Early maturation	-8%	<input checked="" type="checkbox"/>



Commercial impact



- Access to freshwater limits site selection
- Estimated to increase COP by \$1.25 / Kg
 - \$Millions invested in bathing infrastructure
 - Labour
- Peak infection is summer
 - Water temperatures of 18 deg C
 - Fish require handling, resulting in poor growth / mortality

Commercial impact



- Perspective
 - 2 regions, 1 with AGD, 1 without
 - Both harvest approximately 5,000 mt HOG
 - With AGD: 53 full time staff
 - No AGD: 23 full time staff

Year Class	Average no. of baths	Predicted % gain in bath interval
2010	12.5	1.7
2011	10	7.0
2013	8.5	15.1

Future challenge

- Measuring strong expression of AGD
 - Multiple marine sites
 - Earlier input
 - Developing a tank challenge system
- Genomic selection
 - SNP
 - QTL

Acknowledgments

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tassal
PURE TASMANIA

ALL VISITORS & CONTRACTORS
MUST WEAR A HAT

THIS IS A FARM VISITOR
CONTROLLED SITE
ALL VISITORS AND CONTRACTORS
MUST WEAR A HAT AND SUNGLASSES
WHEN ON SITE AND MUST WEAR
THEIR OWNERSHIP AND LIABILITY