



Better Breeding Today.  
**Brighter Life Tomorrow.**



# **Genomic selection for AGD resistance in a pedigree breeding programme**

**3RD GILL HEALTH INITIATIVE MEETING  
GALWAY MAYO INSTITUTE OF TECHNOLOGY  
16 – 17 APRIL 2015**

**Alastair Hamilton and Alan Tinch  
Landcatch Natural Selection Ltd**

# Breeding for resistance

Reduced reliance on control measures

Improved welfare

Increased efficiency – reduced environmental footprint

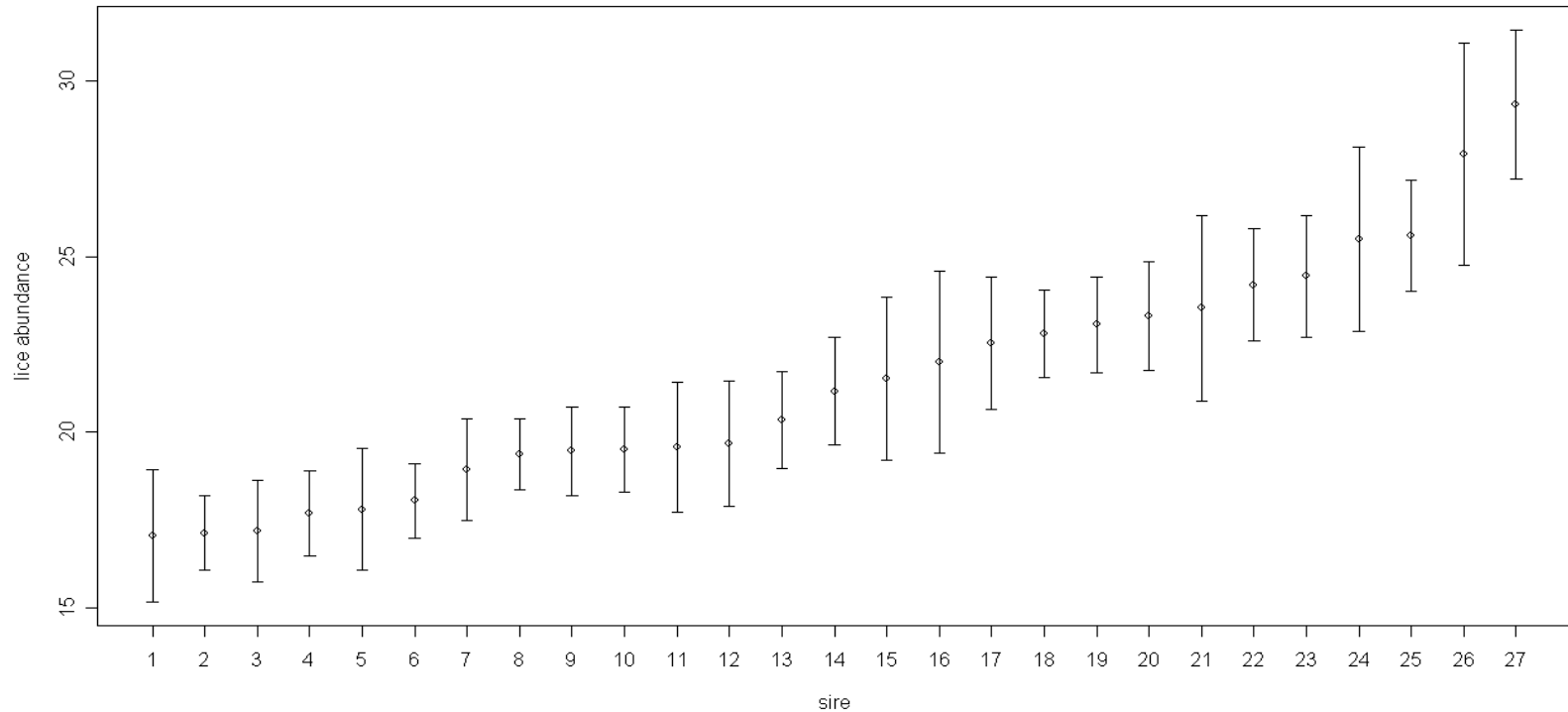
Improved public perception

Improvements are permanent and cumulative

## 3 Steps to breed for a new trait

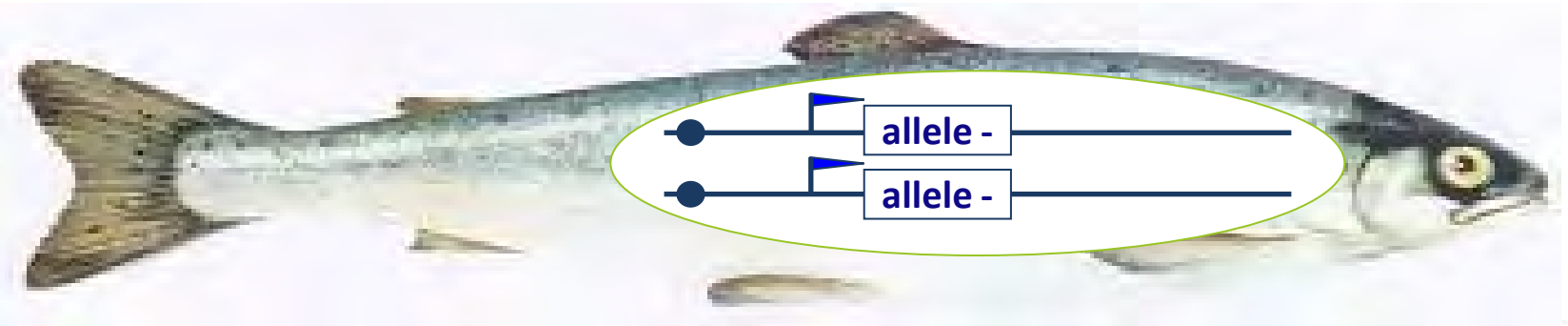
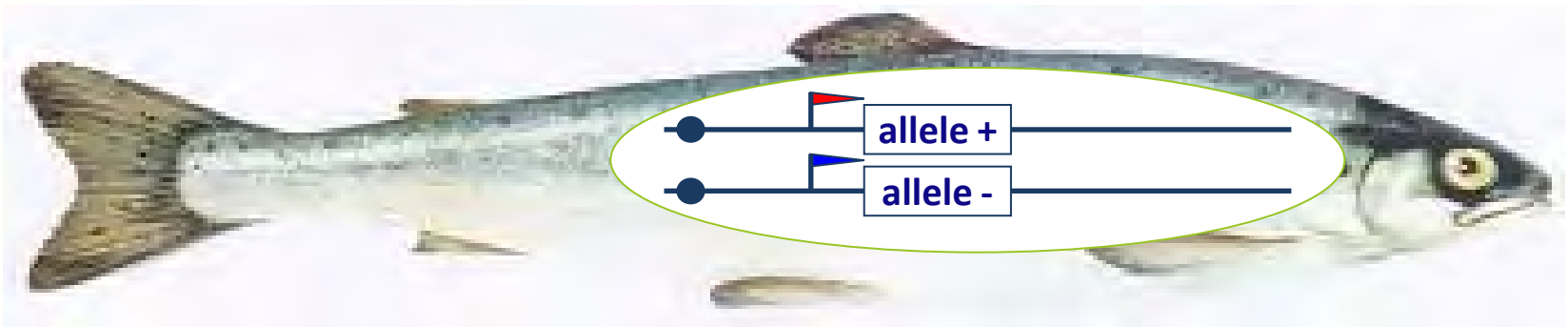
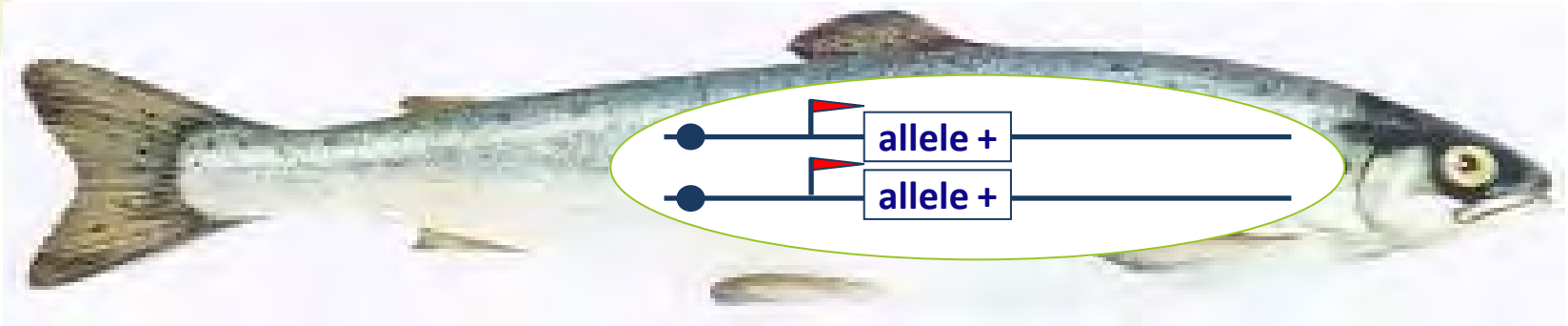
- Is it inherited? – measure the trait and estimate heritability
- Look for major genes? – Marker-Assisted Selection
- Use Genome Wide Markers (SNP Chip) to enhance selection by identifying individuals with the best composite genotype

## Lice abundance v's sire



- Selections for sea lice resistance made on broodstock ova
- Continuing trial work to home in on marker / map to SNP chip

# Marker-Assisted Selection



# Effect of IPN QTL on survival

Survival rate		Father's variant	
		Resistant (+)	Susceptible (-)
Mother's variants	Resistant (+)	(+ +) 91-100%	(+ -) 38-60%
	Susceptible (-)	(- +) 67-78%	(- -) 0-29%

# The Way Forward?

- Marker Discovery: a gene for everything?
- Can we “pick and mix” our genetics?



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## 'Obesity gene' increases appetite

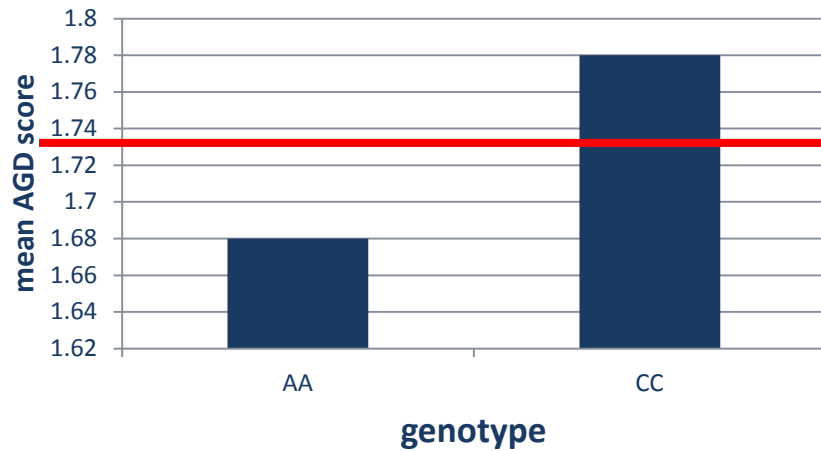
Obesity is in your genes, according to a study which found that one in six people inherits a trait which makes them feel less full after eating.



One in six people inherits a trait that makes them feel hungry again shortly after eating Photo: PA



# Identification of significant QTL



Population mean = 1.73

	AA	CC	t	p
Mean	1.68	1.78		
SD	0.69	0.71		
SEM	0.02	0.02	3.1929	0.0014

# Development of a High-Density Salmon SNP chip



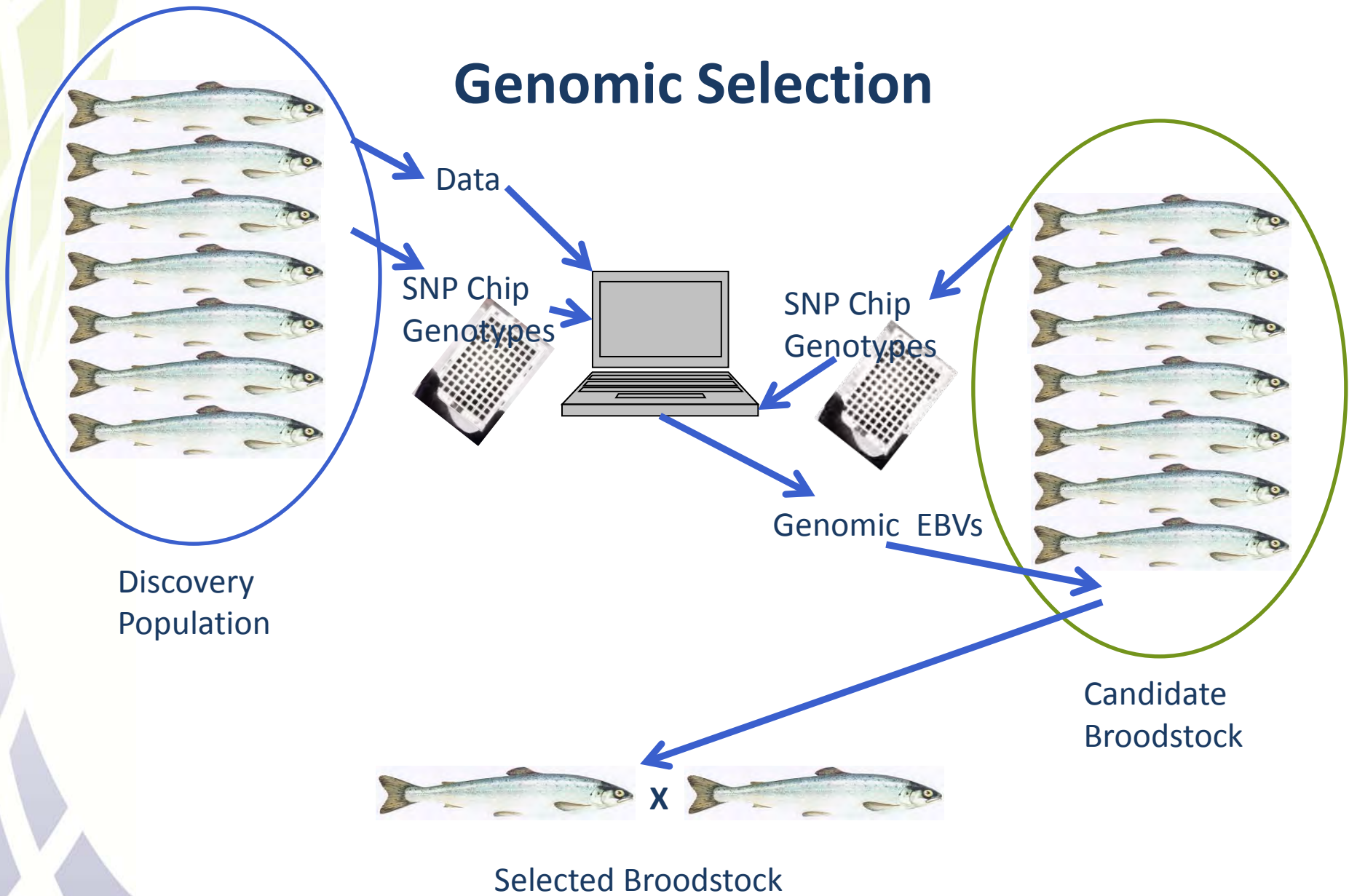
Affymetrix Axiom array  
< 286k SNPs



Technology Strategy Board  
Driving Innovation

**Landcatch**  
A Hendrix Genetics Company

# Genomic Selection

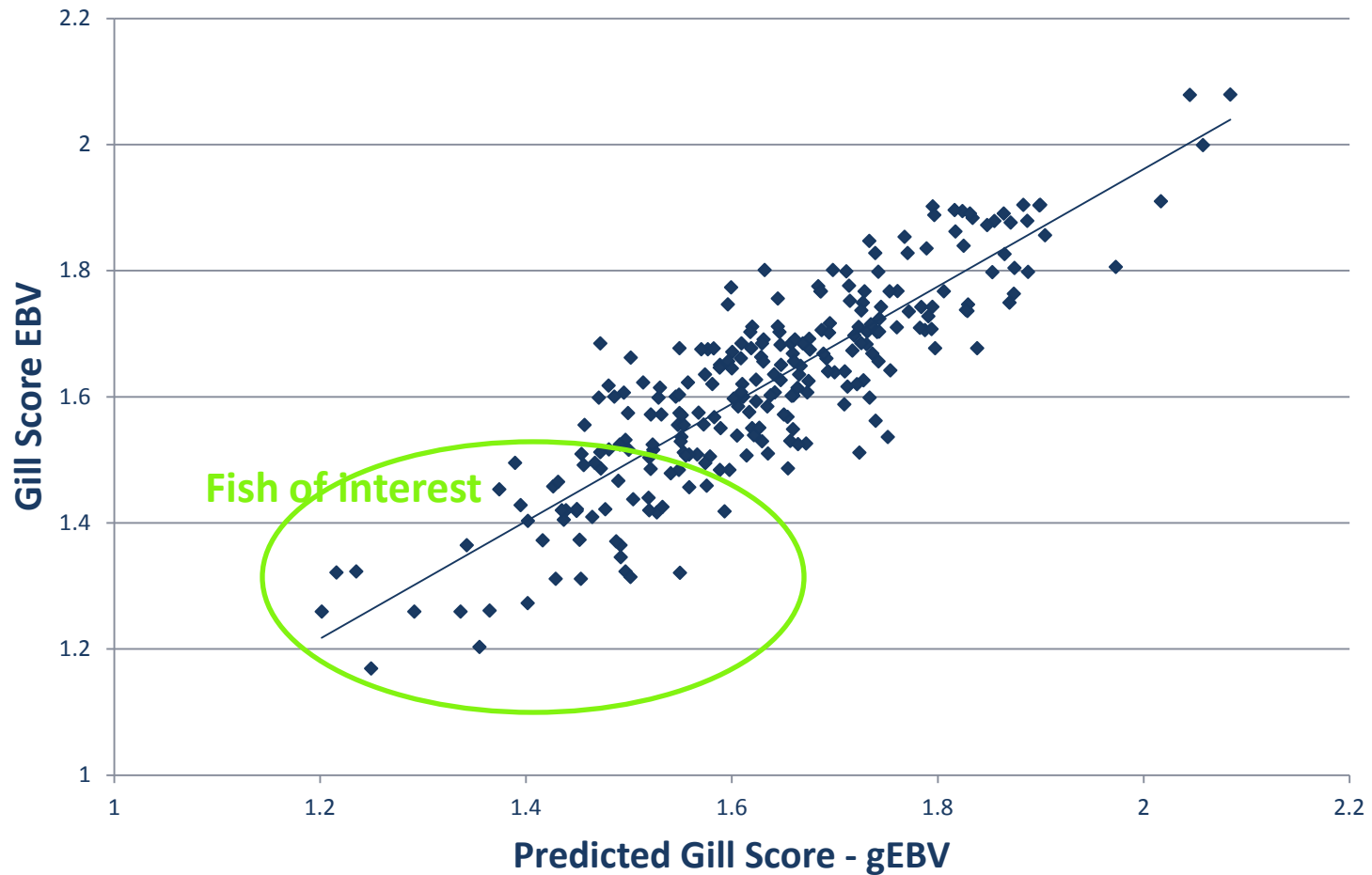


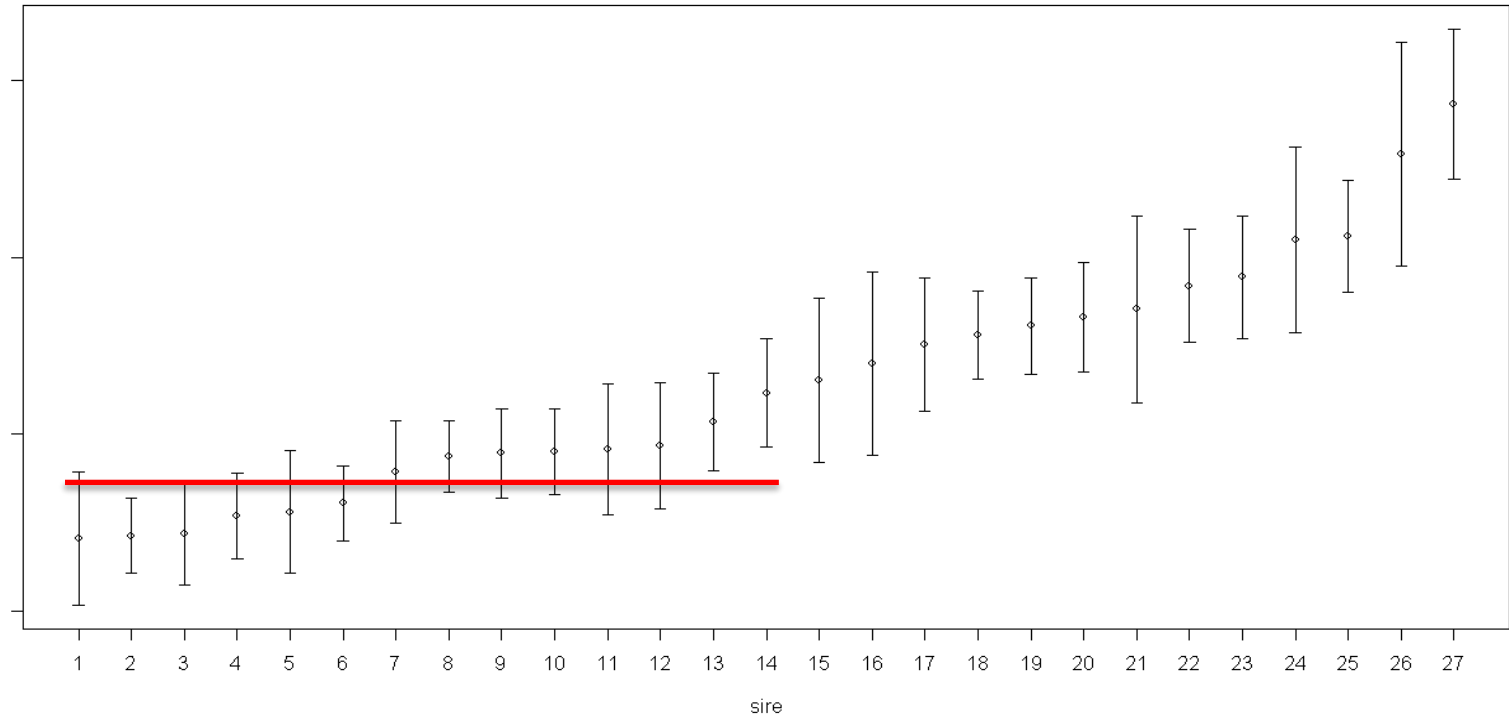
Discovery Population

Candidate Broodstock

Selected Broodstock

# AGD Gill Score predictions via chip genotype

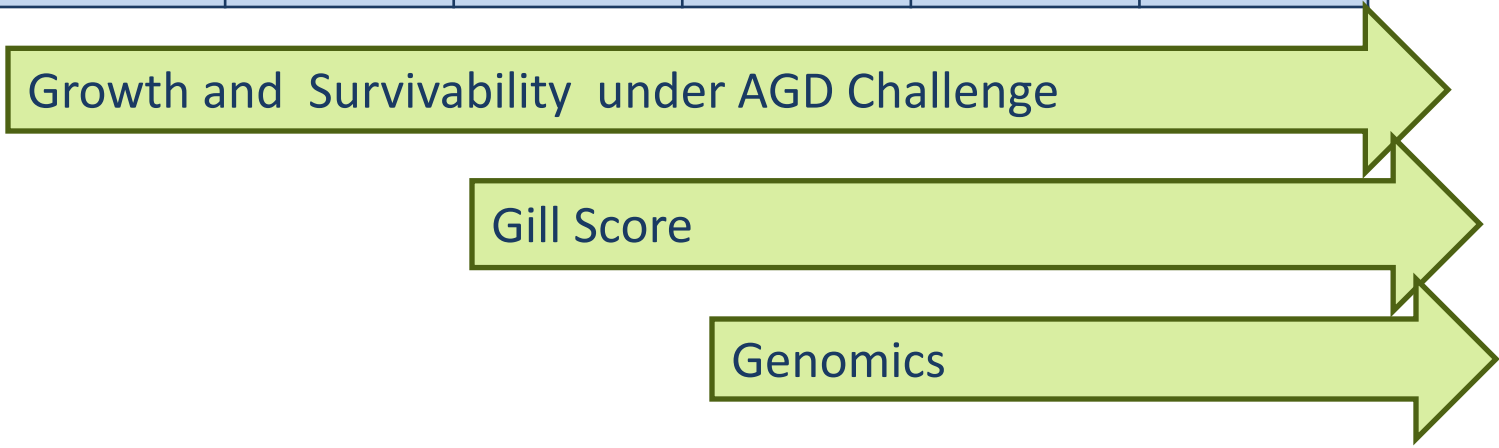




# Timescale

Eggs	2011/12	2012/13	2013/4	2014/15	2015/16	2016/17
Year Class	2007	2008	2009	2010	2012	2013

AGD  
Selection



# Breeding for AGD Resistance– 3 Steps

## Is it inherited?

- $h^2 = 0.17$
- **Major gene?**
- 2 significant QTL, large number with minor effect

## Genomic Selection?

- Landcatch Scotland – **Autumn 2014:**  
Elite broodstock with genomic ebv's.

# Round Up

- Genetics – Genomics – improved disease resistance
- Step by step
- Not single gene – usually...

***Successful breeding companies will continue to embrace new technology to improve health and welfare of farmed animals***