GENETIC VARIATION IN PACIFIC OYSTERS FOR RESISTANCE TO *Ostreid herpesvirus-1*

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NSW GOVERNMENT Industry & Investment

ASI Thoroughbred Oysters

AUSTRALIAN SEAFOOD COOPERATIVE RESEARCH CENTRE

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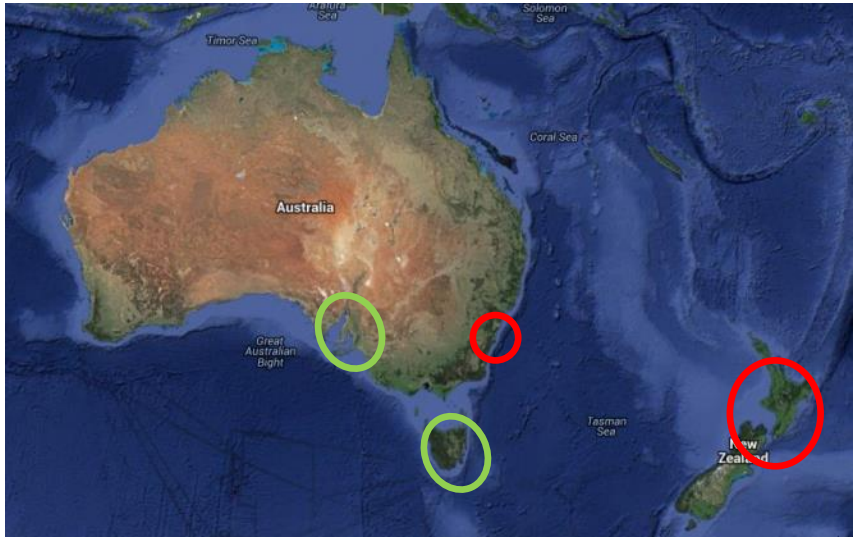
The Spread of Oyster Herpes Virus

Ostreid herpesvirus 1

- Affects only Pacific oysters
- New mircro-variant with high virulence

Outbreaks:

- France 2007-08
- New Zealand Mar 2010
- Australia Nov 2010



The Spread of Oyster Herpes Virus

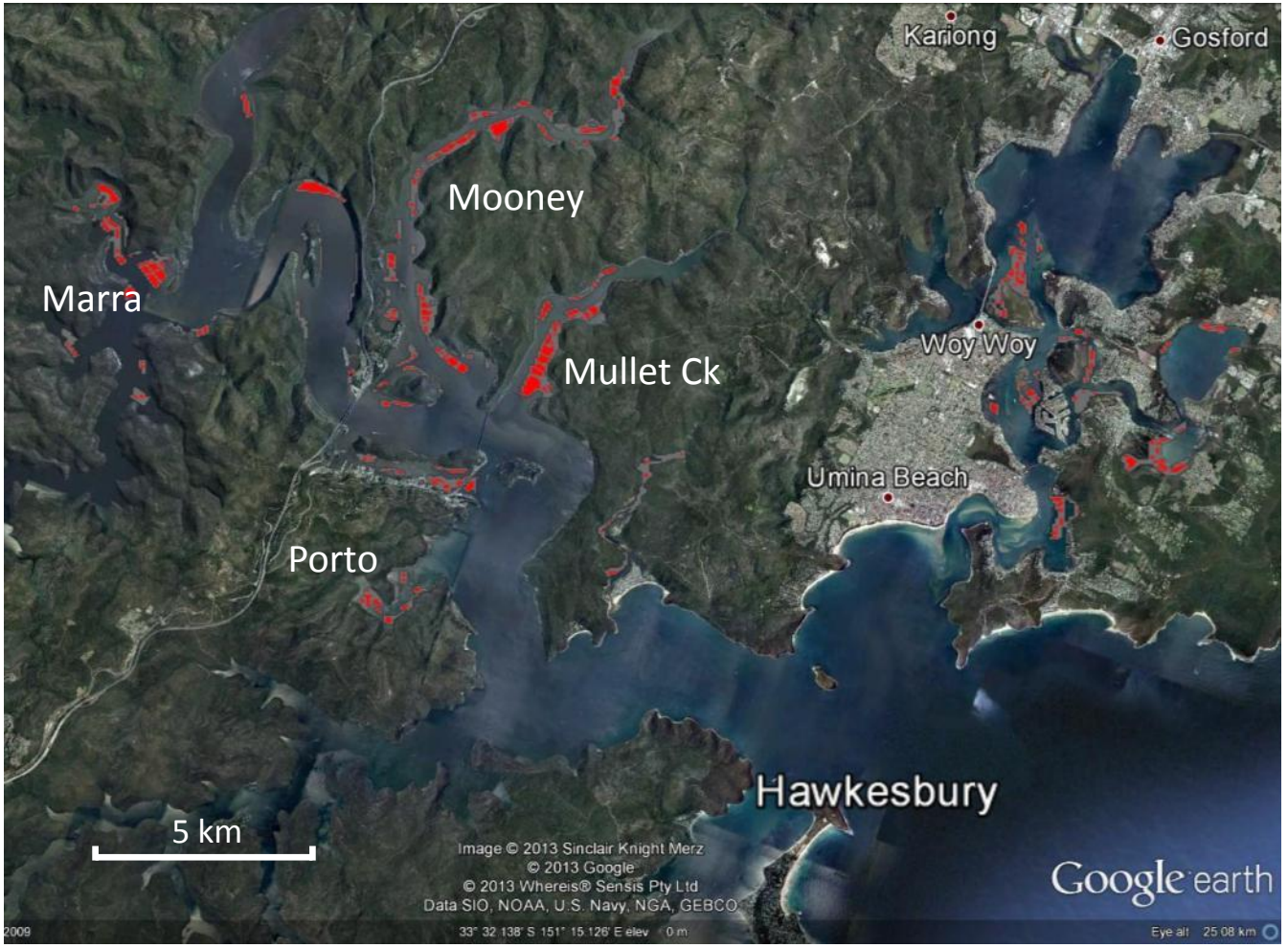
SPREAD IN AUSTRALIA:

- Georges River Nov 2010
- Sydney Harbour 2011
- Hawkesbury River Jan 2013

Sydney Region
New South Wales Central Coast

The Spread of Oyster Herpes Virus

- DAY 1 10 AM: First sighting (30% mortality on one lease)
- DAY 1 5 PM: mass mortality on that lease
- DAY 3: 10 million dead oysters ($3M loss)
- DAY 8: Entire system affected



Aims

Breed for resistance to OsHV-1

The science challenge:

- Is there resistance in our population?
- Genetic parameters of resistance?
- How can we measure resistance?
- How long before economically useful resistance?

Data analysis and summary

- Australian breeding population (up to 9 generations)
- Six field challenges and two laboratory challenges
- Two ages (4 to 6 months and 12 months)
- Analysed using ASReml;
  Sire model with pedigree structure (binary data)

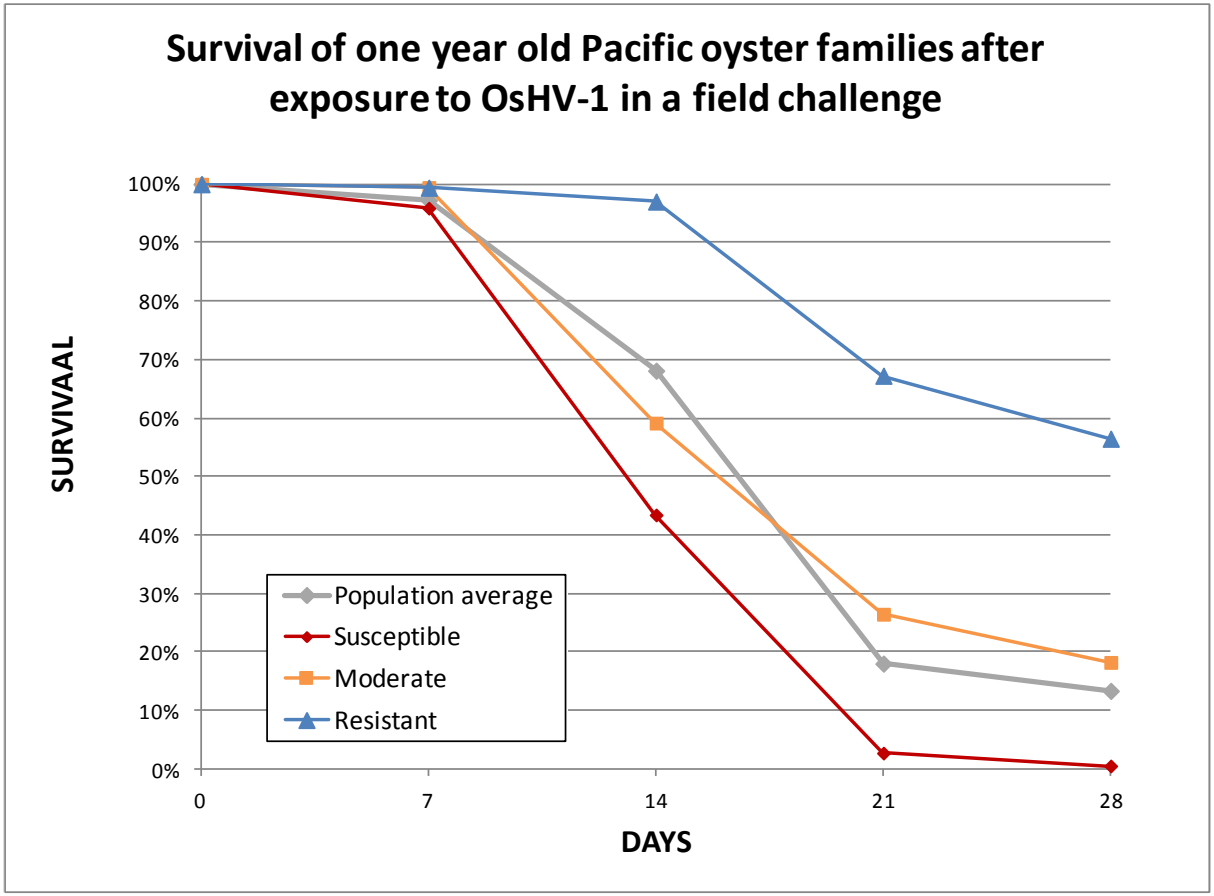
Number year classes challenged	3	2011, 2012, 2013
Total number of families	175	
Total number of parents	345	
Number animals challenged	56,658	


FIELD CHALLENGE NOV 2012
ADULTS (AGE 12 MONTHS)

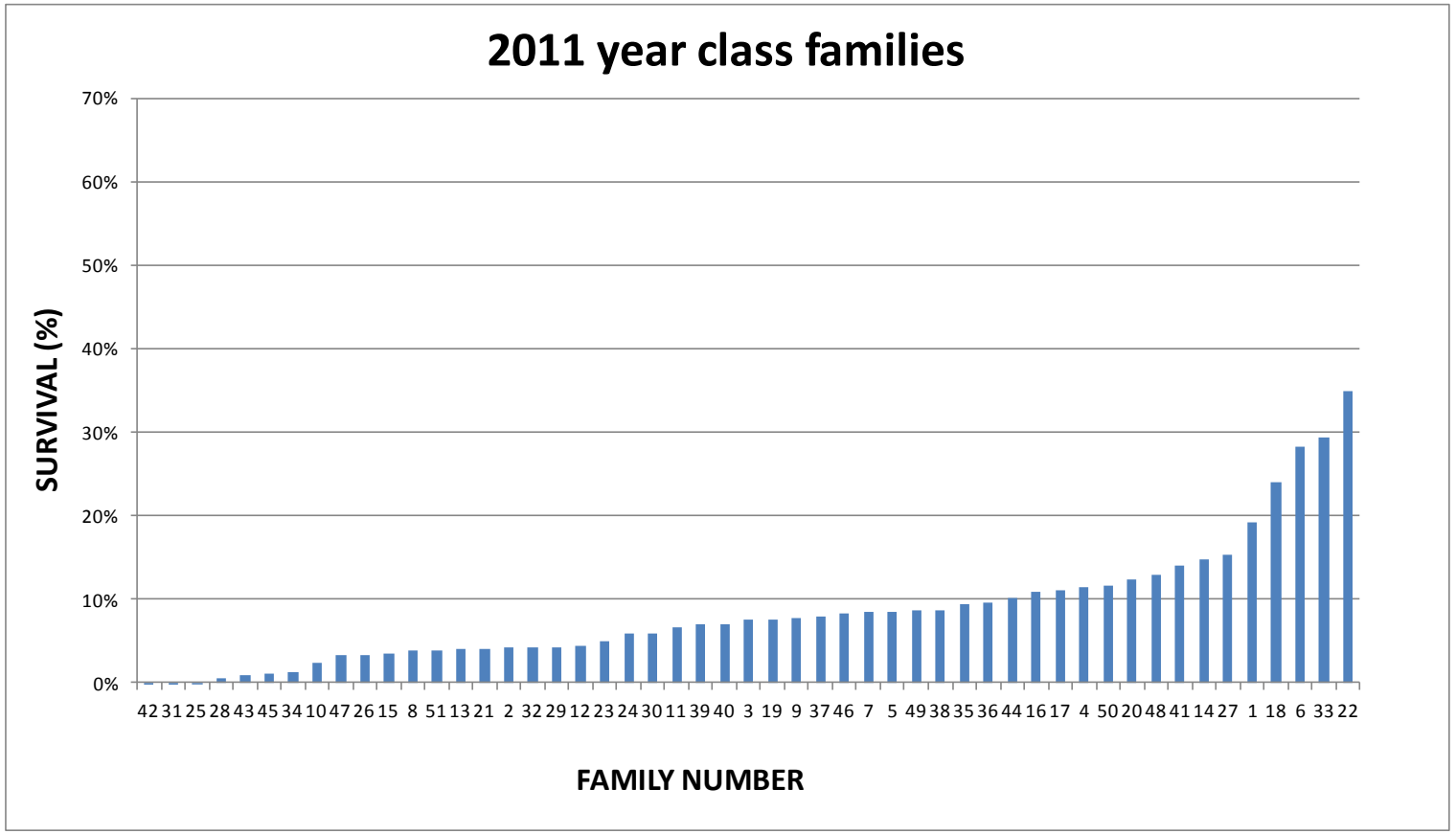

SURVIVAL = 0%


52%
5%
8%
0%
3%
25%
2%
3%
0%
3%
3%
0%
2%
2%
0%

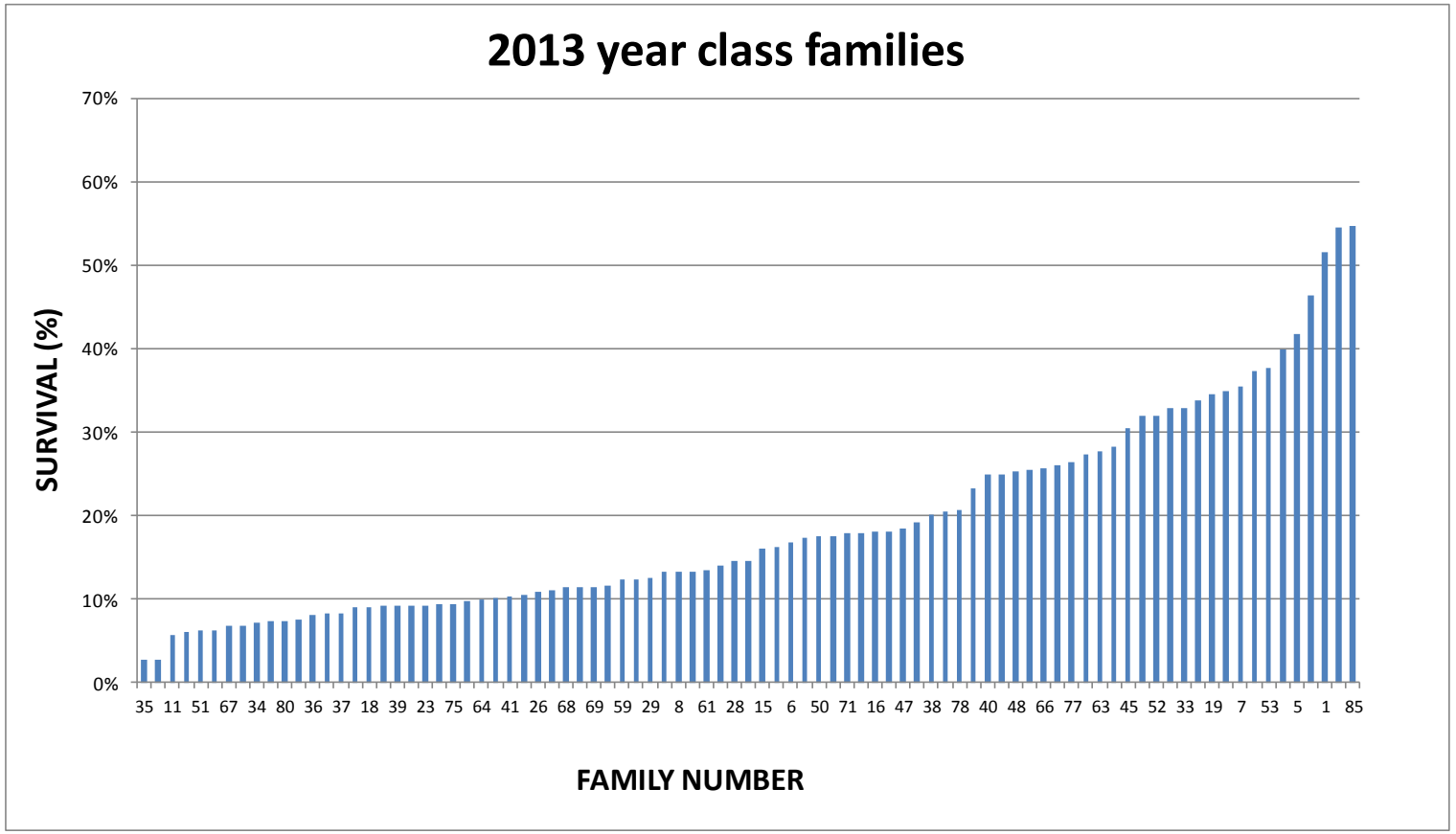
Disease progression in a field challenge



Unselected families



Selected families



Difficult to get a good field challenge

TRIAL	Description	h^2	Test day survival	
1	2011 YC spat	0.38	47%	☑
2	2011 YC adults	0.18	20%	☑☒
3	2012 YC spat	0.53	91%	☒
4	2012 YC adults	0.60	29%	☑
5	2013 YC spat (a)	-	No mortality	☒
6	2013 YC spat (b)	-	No mortality	☒
7	2013YC adults	0.46	18%	☑

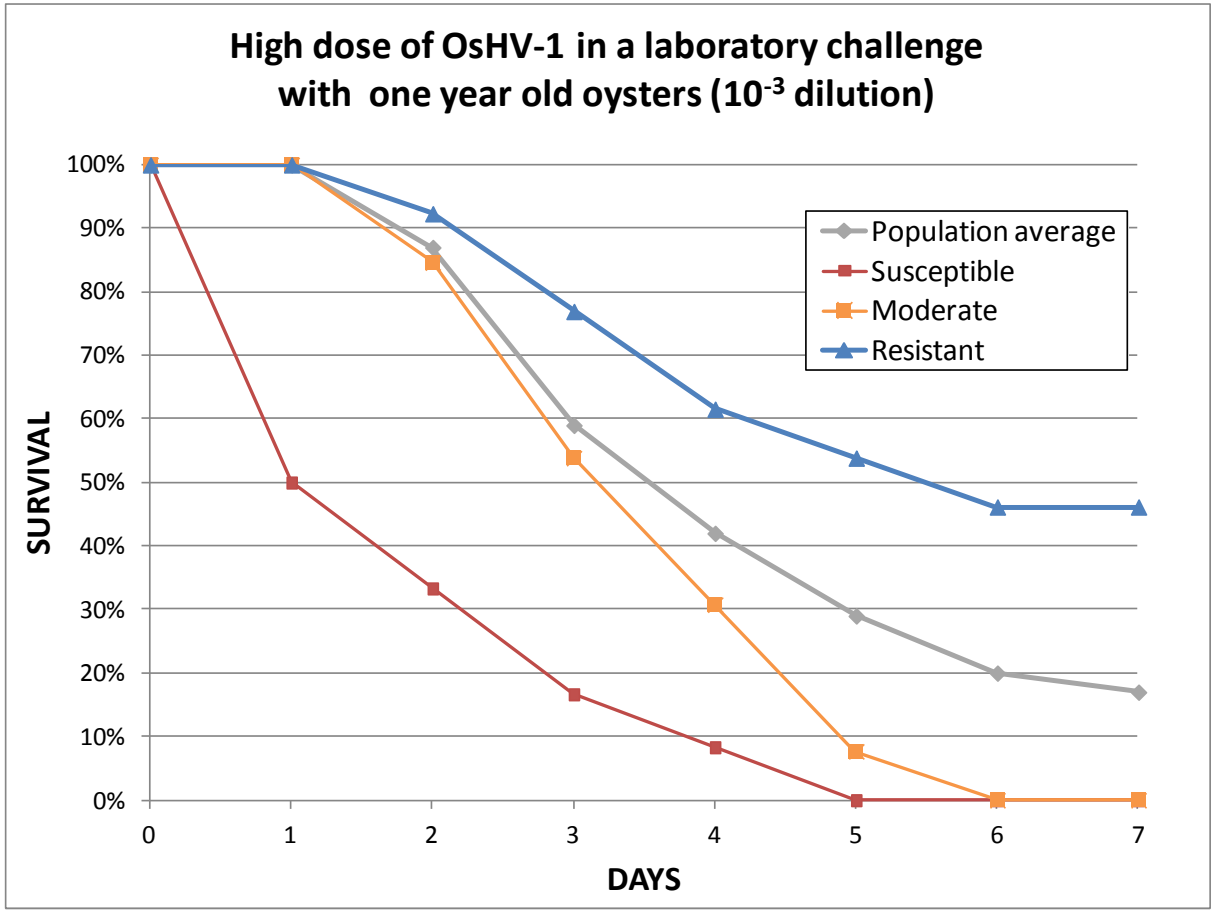
Laboratory Disease Challenge

Done in a biosecure laboratory
(NSW Department of Primary Production)

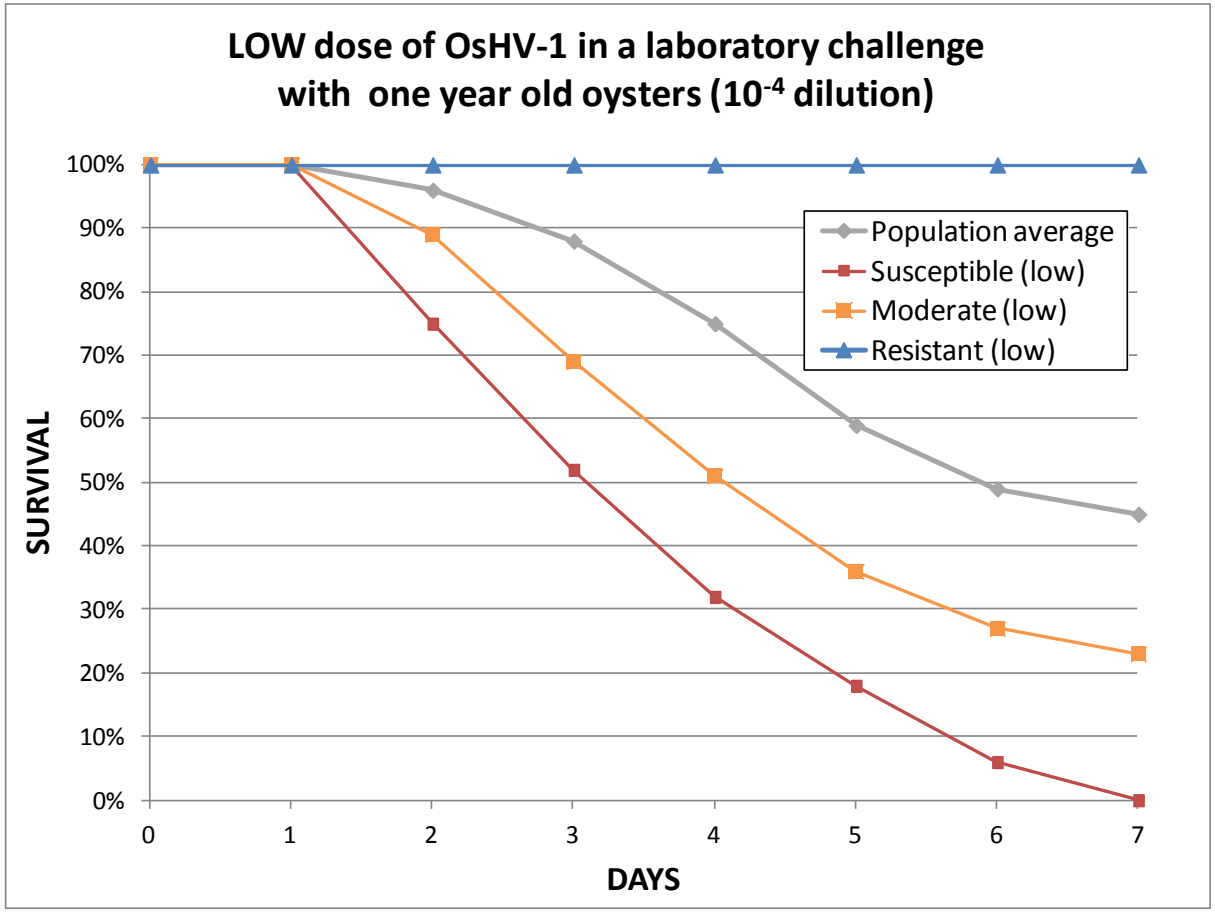
Uses stock virus solution
(cryo-preserved) stock

Immersion of relaxed oysters

Disease progression in a lab challenge



Disease progression in a lab challenge (low dose)



Genetic parameters – heritabilities

TRAIT	h^2 (*se*) observed	h^2 underlying
Field survival (spat)	0.39 (*0.09*)	0.61
Field survival (adults)	0.27 (*0.04*)	0.55
Laboratory survival (spat)	0.18 (*0.11*)	0.28

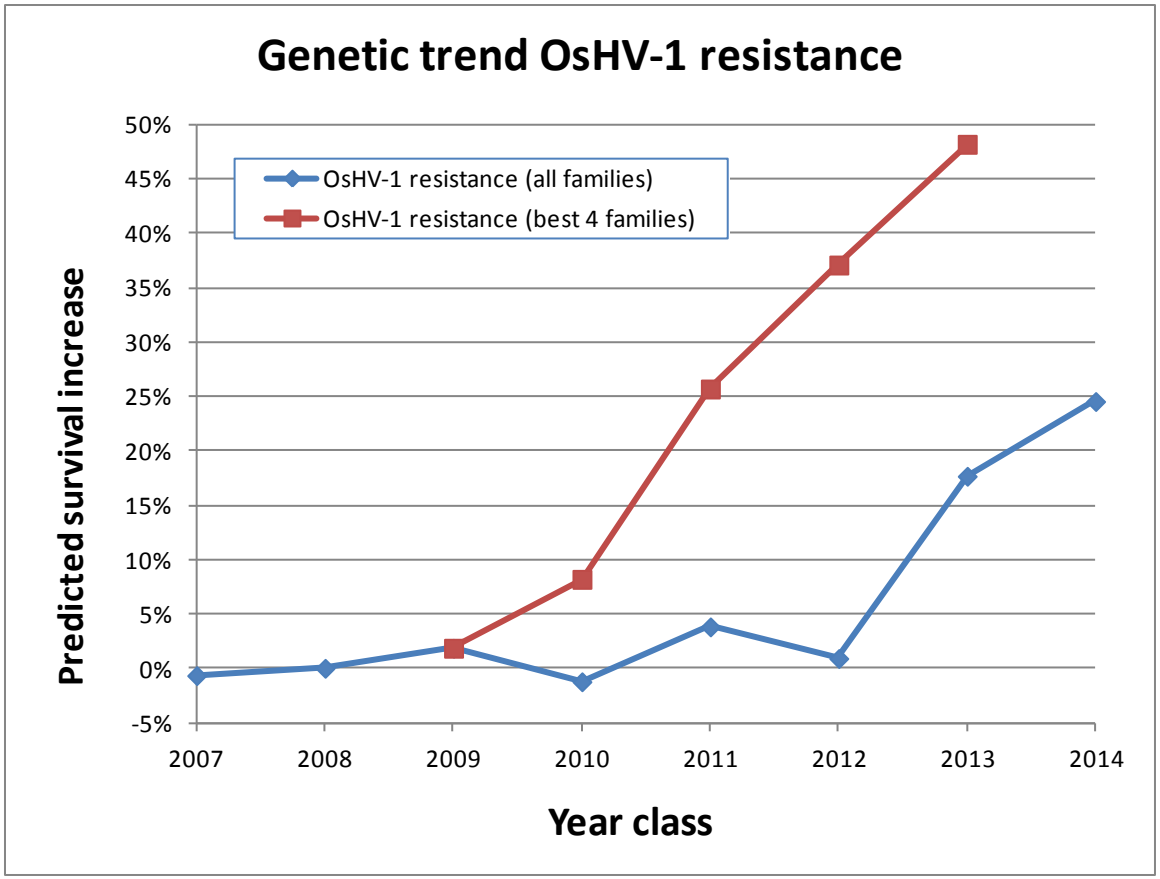
Genetic parameters – genetic correlations

TRAIT	h^2 (observed)	h^2 (underlying)	Genetic correlations r_g (*se*)	
			Field suv. (spat)	Field suv. (adult)
Field survival (spat)	0.39	0.61		
Field survival (adults)	0.27	0.55	0.85 (*0.08*)	
Laboratory survival (spat)	0.18	0.28	0.71 (*0.30*)	0.61 (*0.24*)

Genetic correlations – test days

	Field challenge survival (r_g)		
	Day 7	Day 14	Day 21
Day 14	0.74		
Day 21	0.02	0.77	
Day 28	0.03	0.77	0.99

Genetic gains



Conclusions

- There is genetic variation for OsHV-1 resistance in our population
- Field challenges presents logistic difficulties for applied breeding, and a reliable laboratory challenge is needed
- Selective breeding is providing a means to mitigate the impact and risk of this disease

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