Identifying indicator traits that can be used to breed for breech strike resistance

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Objectives - Scientific

- Quantify importance of indicator traits for breech strike in un-mulesed sheep in summer (Armidale NSW) and winter rainfall (Mt Barker WA) regions
- Estimate genetic parameters to design effective breeding programs for multi-trait improvement
- Assist industry with ASBVs of indicator traits

Industry issues with un-mulesed sheep

- Are un-mulesed sheep selected on breech indicator traits more resistant to breech strike?
- What impact on income resulted from selecting sheep on breech indicator traits?
- Are there sheep that are naturally resistant to breech strike?

Australian Wool Innovation, DAFWA & CSIRO Breeding Project 2005-2010

Group	Purpose
Select A	Intense selection for resistance both rams & ewes
Select B	Demonstrate progress in a commercial flock (rams only)
Control	Unselected control
Mulesing	Comparing Un-mulesed Select A vs Mulesed Control

Acknowledgements

Contributing Flocks – WA and NSW

Mount Barker, Western Australia

2005 drop ewe weaners:
- Billandri
- Cherry Tree Estate
- J Coole & Co
- Felspar Pty Ltd
- GSARI
- C D, D N & S H Herbert
- Kilandra Pastoral Co
- Majuba
- I & D Robertson
- W M & V A Webb

Ewes for 2006 mating:
DAFWA Research Stations:
- Badgingarra
- GSARI
- Mt Barker

Sire flocks 2006 mating:
- Calcookara (Cojack)
- Centre Plus
- Cherry Tree Estate
- Cranmore Park
- Rylington Merino
- Toland
- Yeendalong Farm (Abbott)
- GSARI (control)

Sire flocks 2007 mating
- Wallinar
- Margan
- Centre Plus WA
- Calcookara (Garreth)
- Majuba
- Rylington Merino

Armidale, New South Wales

2005 drop ewe weaners:

Auchen Dhu Park
Cressbrook
Gostwyck
Goyarra Poll
Hazeldean
Mirramoona
Quambaloo Poll
Ruby Hills
Whyworry Park
Yalgoo

Ewes for 2006 mating:
CSIRO Armidale resource flock
(fine wool base)

Sire flocks 2006 mating:
- Calcookara
- Centre Plus
- Cressbrook
- Parkdale
- Quambaloo Poll
- Ruby Hills
- Severn Park
- Toland
- T13 (control)

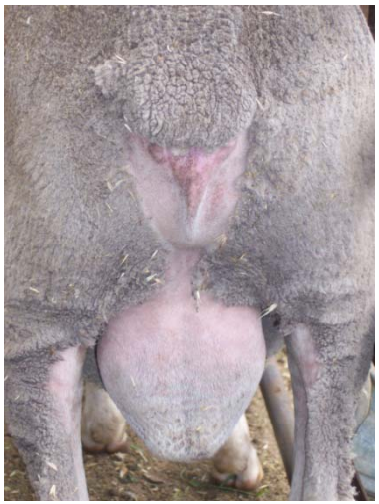
Selection of sires used in WA

Rylington Merino

Cranmore Park

Abbott

O'Halloran



Cojak

Garreth

Centre Plus

Original design

Screened-in 600 mature and 600 ewe lambs

	Mulesed	Un-mulesed
Select A	100	100
Select B	100	100
Control	100	100

600 Mature ewes (from Research flocks)

600 Weaner ewes (from Industry flocks)

Half progeny mulesed, half progeny unmulesed

Design change in WA 2008

Mulesing stopped in 2008, all progeny unmulesed

More focus on sire differences rather than selection lines

Rylington flock (high worm resistant 600 ewes) added

Initial Breech strike flock continued

Select A	200 ewes
Select B	200 ewes
Control	200 ewes

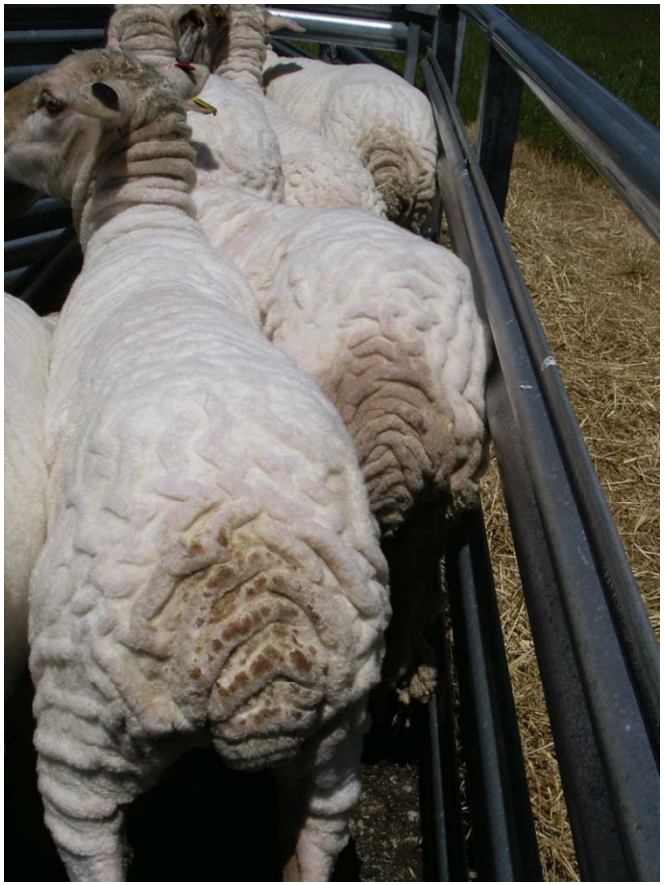
Management of flocks

- Very intensive monitoring of sheep
- Fly activity was monitored with traps
- No blanket preventative treatments were applied.
- WA - Lambs and hoggets managed to “best” identify resistant and susceptible individuals, crutched just before shearing
- Mature ewes normal crutch time to minimise risk of lamb loss
- Struck sheep treated immediately with short acting treatment

2005 Drop Industry Ewe Hoggets

Intense selection

Control



Bio-clipped

Number of animals – Mt Barker WA

Number of sires	62	
Number of dams	1703	
Number of progeny		
2005	678	
2006	437	
2007	468	
2008	1172	
2009	1410	(weaned)
TOTAL	4265	

Usable records for this presentation 4162

Unused records including 2009 drop 2683

(2009 drop will be included in final project analysis)

Bio-clipped 2007 born drop

Note variation

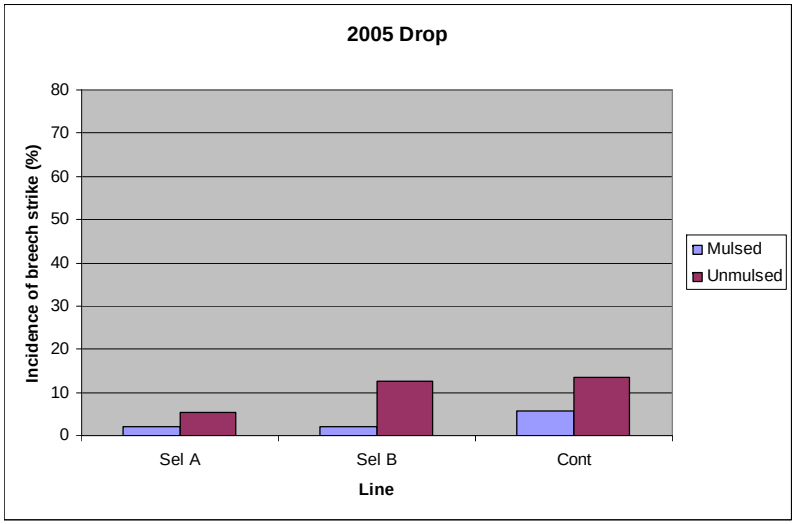
Measurement program- indicators

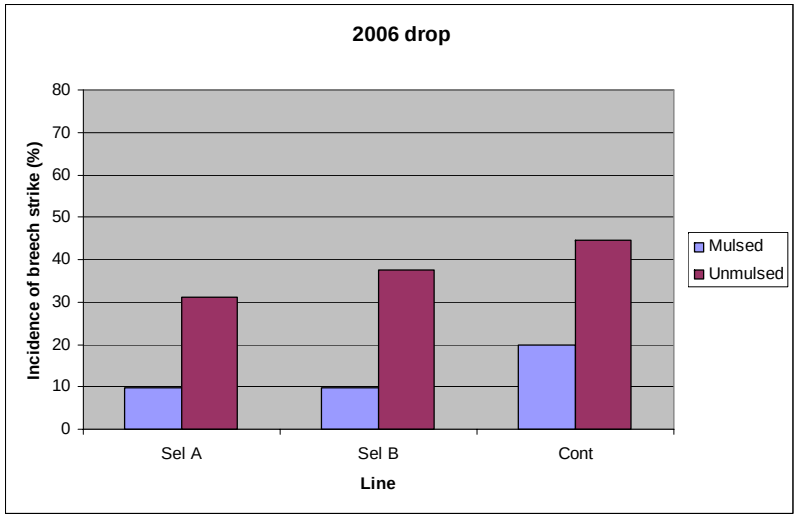
Indicator traits	Marking	Weaning	Hogget	Adult
Wrinkles	***	***	***	***
Diarrhoea (dags)	*	**	***	***
Worms (WEC)		**	***	***
Breech cover	*	**	***	***
Colour (suint)		**	***	***
Urine stain	*	***	***	***
Other traits	***	***	***	***

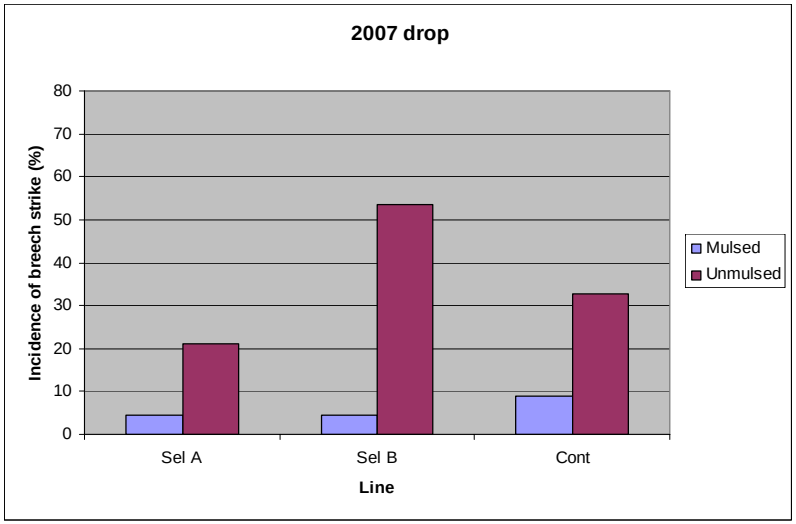
Basic flock statistics

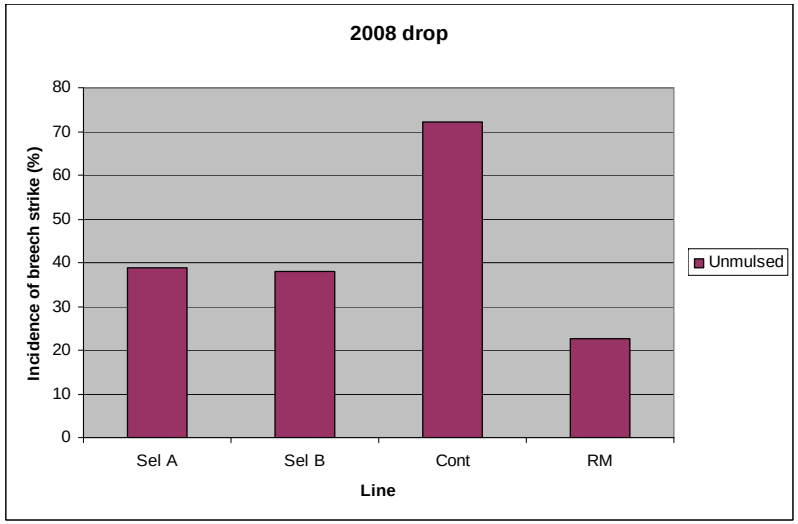
	Hogget ewes	Mature ewes born 2005-2007
Body weight (kg)	47	50
Greasy fleece weight (kg)	4.1	4.2
Fibre diameter (micron)	18.8	19.1
Breech wrinkle	1.0	1 - 1.5
Breech cover	3.5	3.5
Dag score	3.5	2.1
	Not crutched	Crutched

Incidence of breech strikes lambing to hogget shearing

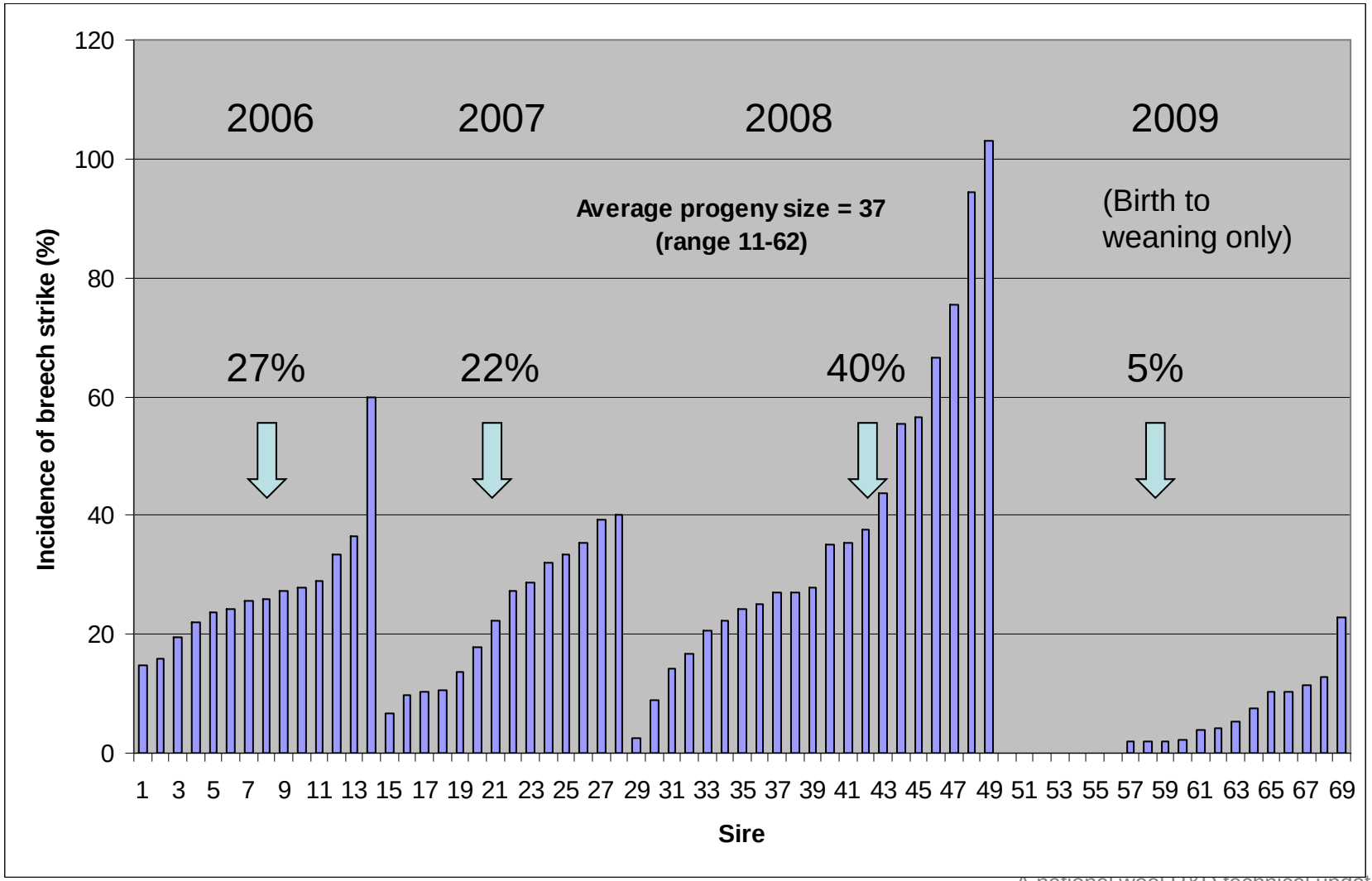




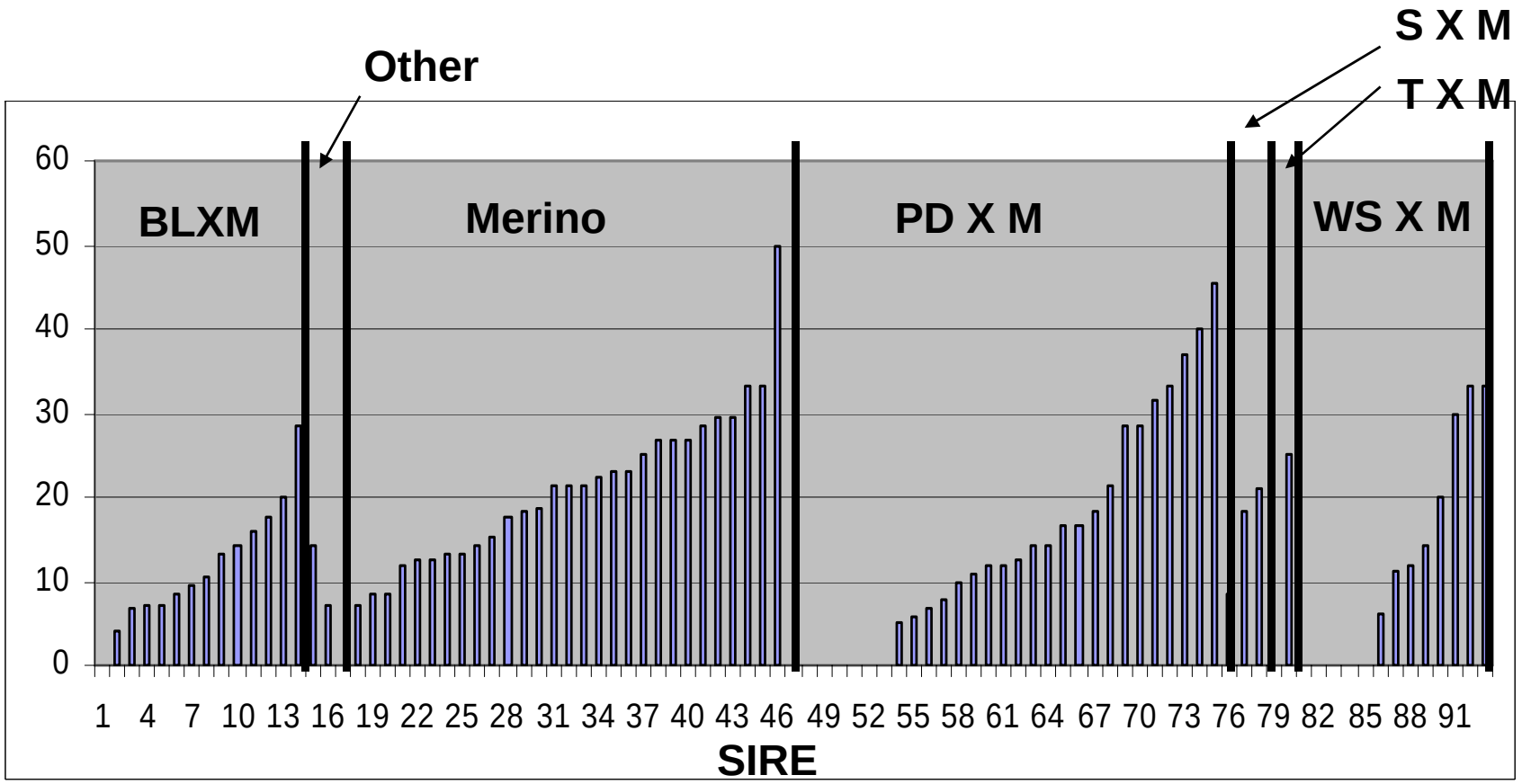




Incidence of breech strike from birth to hogget shearing for different sires



Sire group differences of un-mulesed progeny in Sheep CRC Information Nucleus Flock at Katanning



Fleece Weight is not strongly correlated with Breech Flystrike

Message

There are differences in breech strike between cross breeds and large differences between sires within Merino breed

progeny
tested
breech
flystrike
resistant
Merino
sires

Elucidating the underlying differences

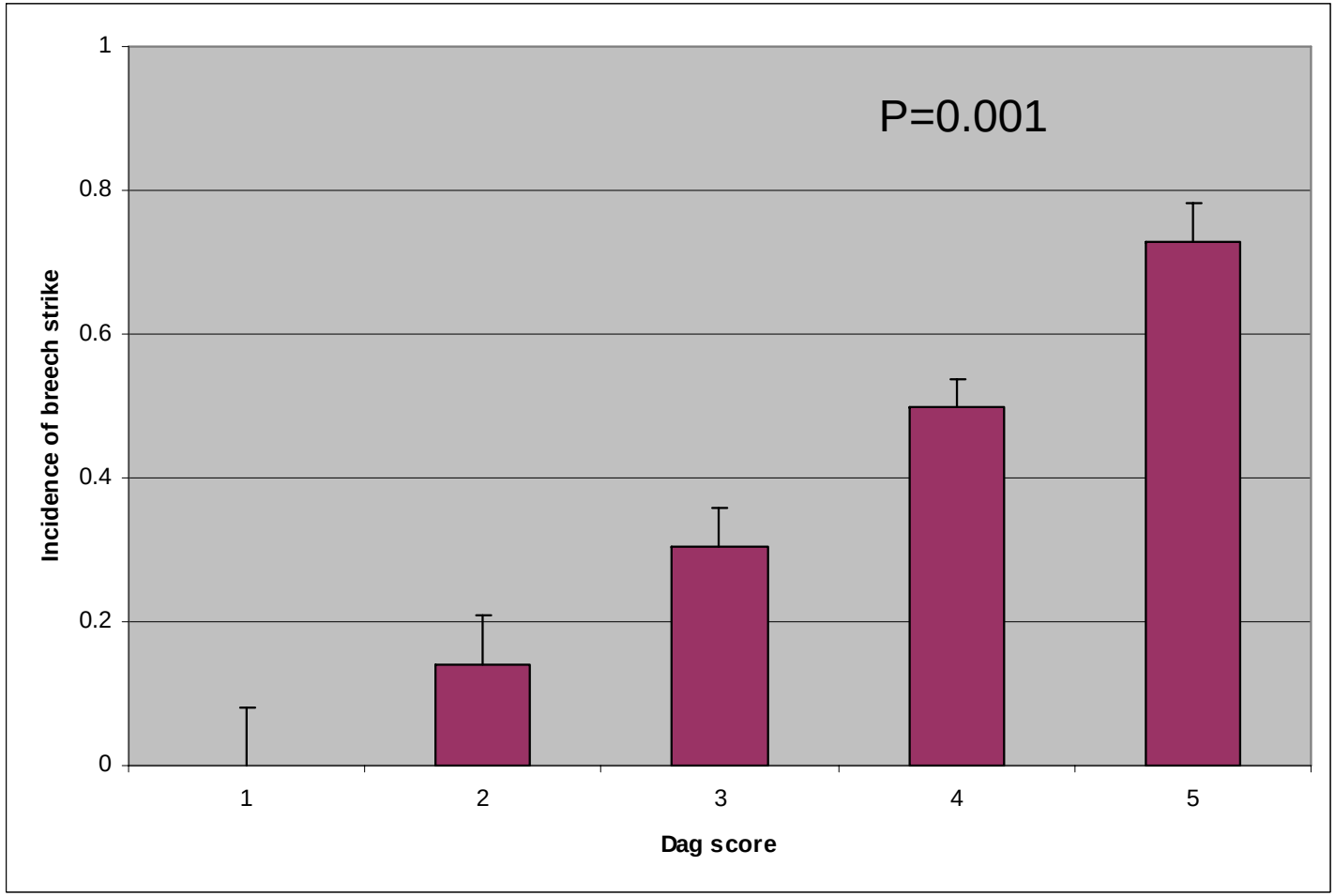
Breech strike and the indicator traits to hogget age

A national wool R&D technical update
June 2010

Australian Wool Innovation Limited

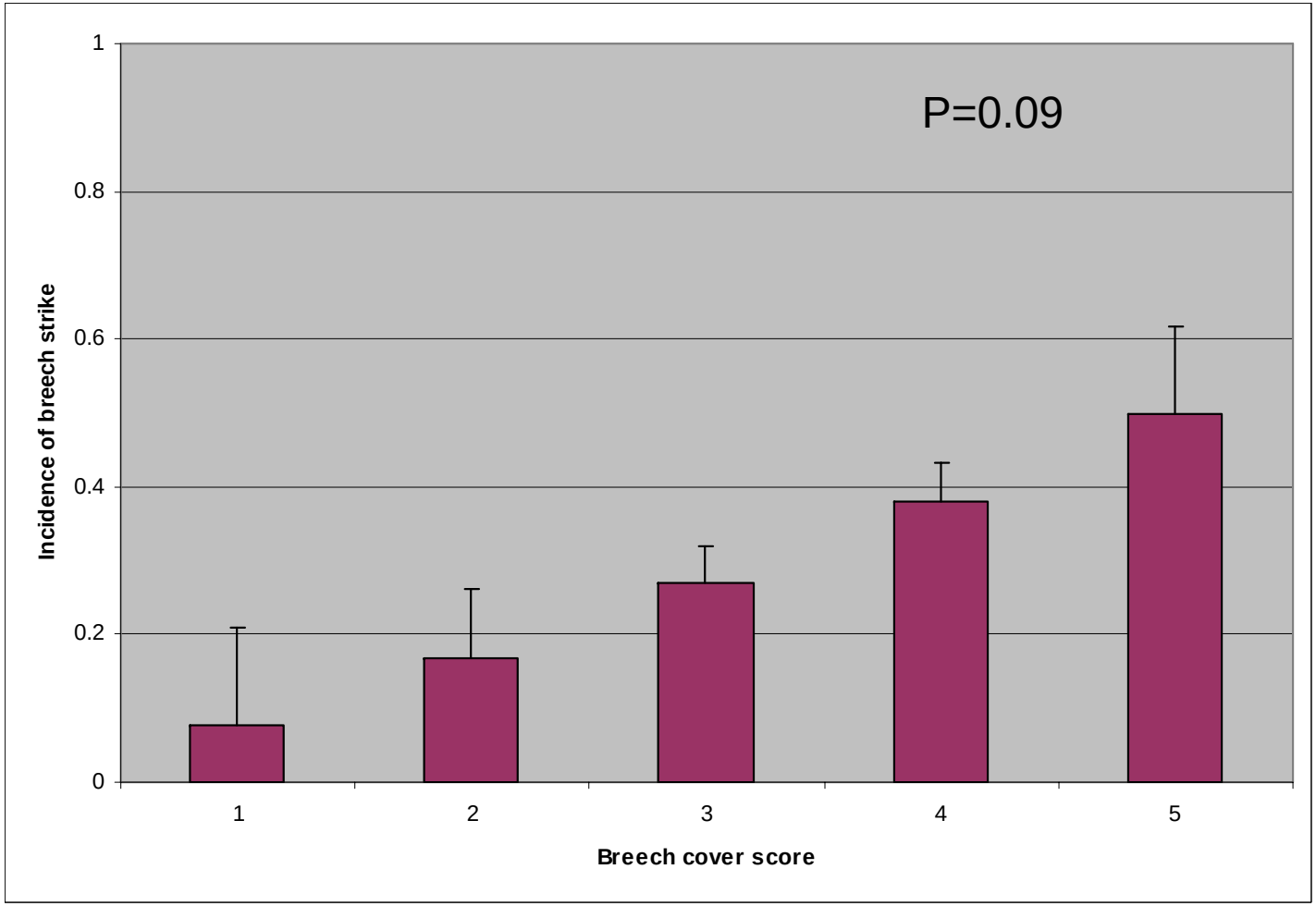
Breech strike and dag score to hogget age.

Dags dominate all other indicator traits at Mt Barker



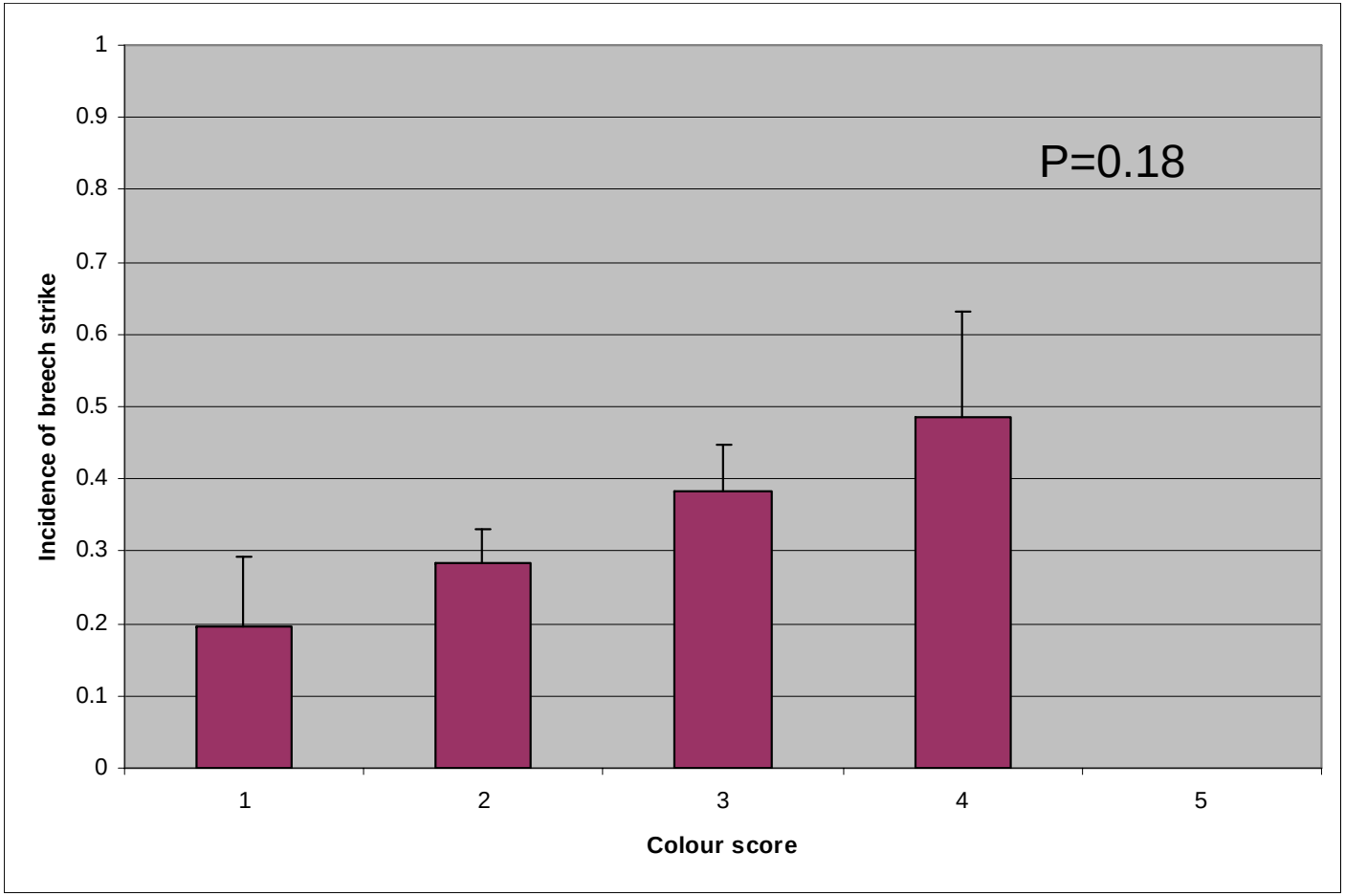
Adjusted for the other indicator traits

Breech strike and breech cover to hogget age



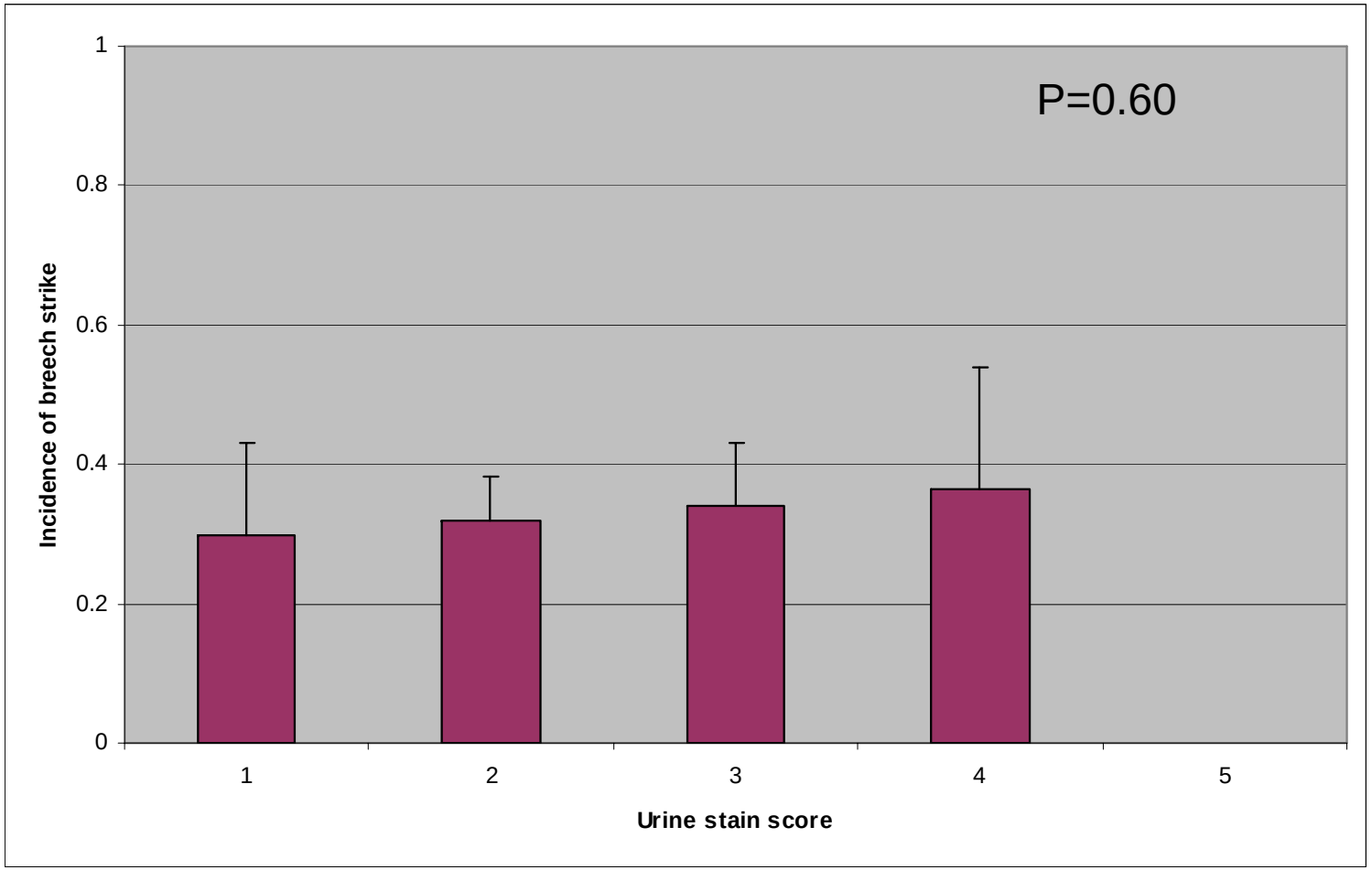
Adjusted for the other indicator traits

Breech strike and wool colour to hogget age



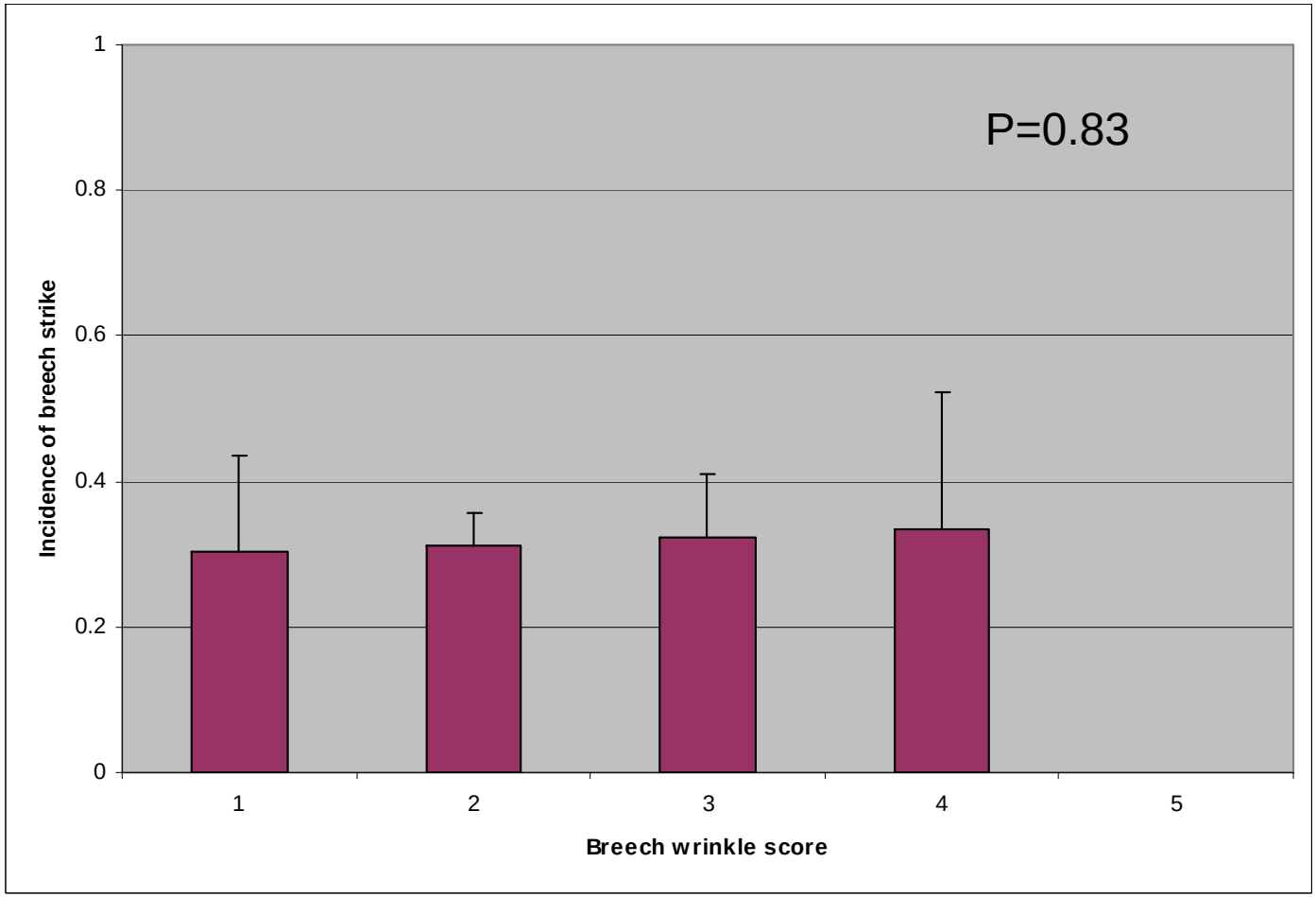
Adjusted for the other indicator traits

Breech strike and urine stain to hogget age



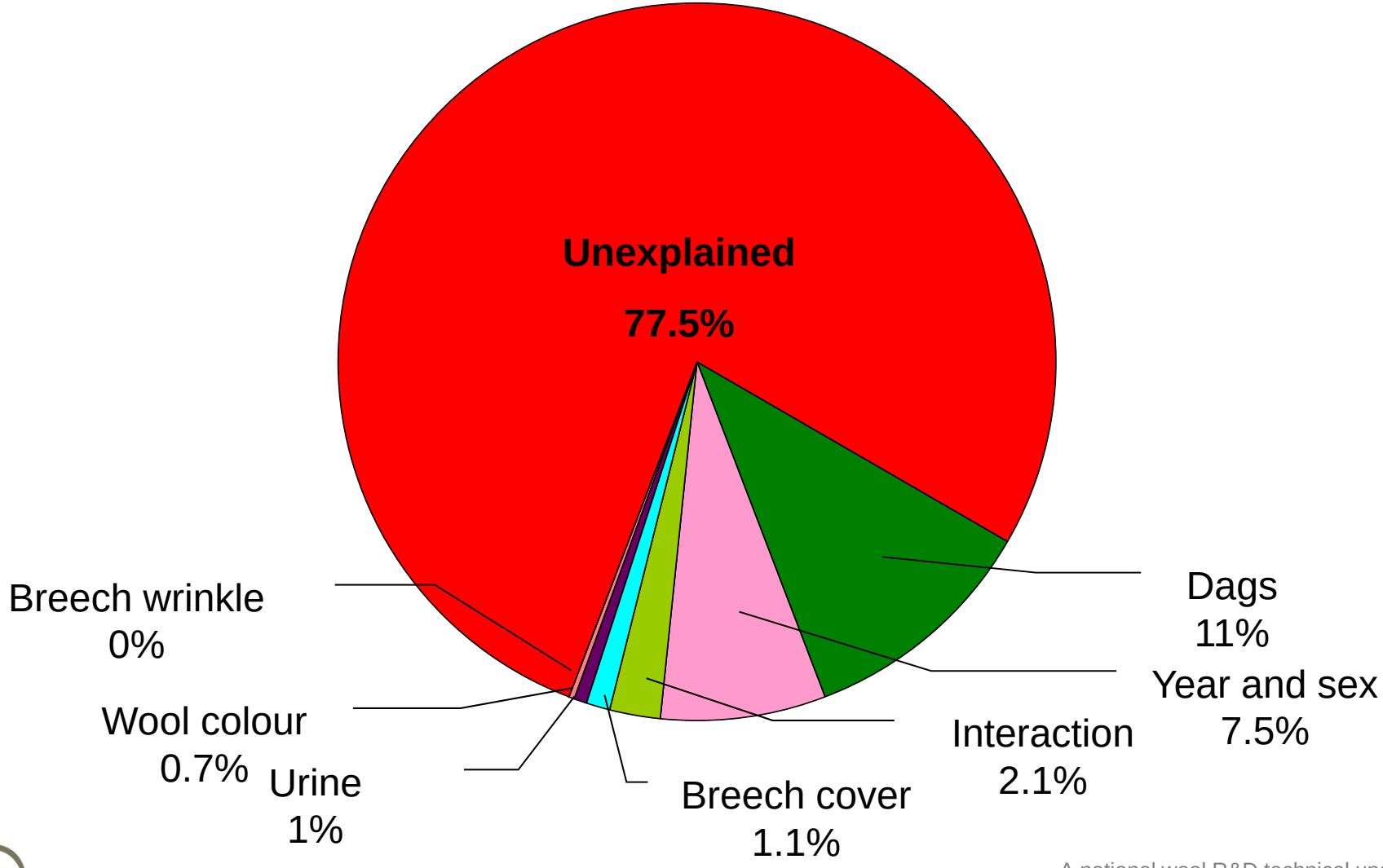
Adjusted for the other indicator traits

Breech strike and breech wrinkle to hogget age



Adjusted for the other indicator traits

Contribution of indicator traits (to hogget age) to breech strike for unmulesed 2005-2008 drops



The 4 main indicator traits (**17%)** and known environmental factors such as year, sex and paddock **(8%)** currently explain around **25%** of all the variation between unmulesed animals that were breech struck

Approx **75%** of all the variation between unmulesed animals that were breech struck remained unexplained

For the 2005, 2006 and 2007 drop animals to hogget age, mulesing explained **26%** of the variation in breech strike and the 4 main breech indicators **12%** and environmental factors **8%**

Approx **54%** of all the variation between the animals that were breech struck remains unexplained.

Causes of adult ewe flystrike (crutched at normal times unlike hoggets) is yet to be analysed

Additional indicator traits assessed

Faecal consistency score

Dag moisture score weaning

Dag moisture score spring

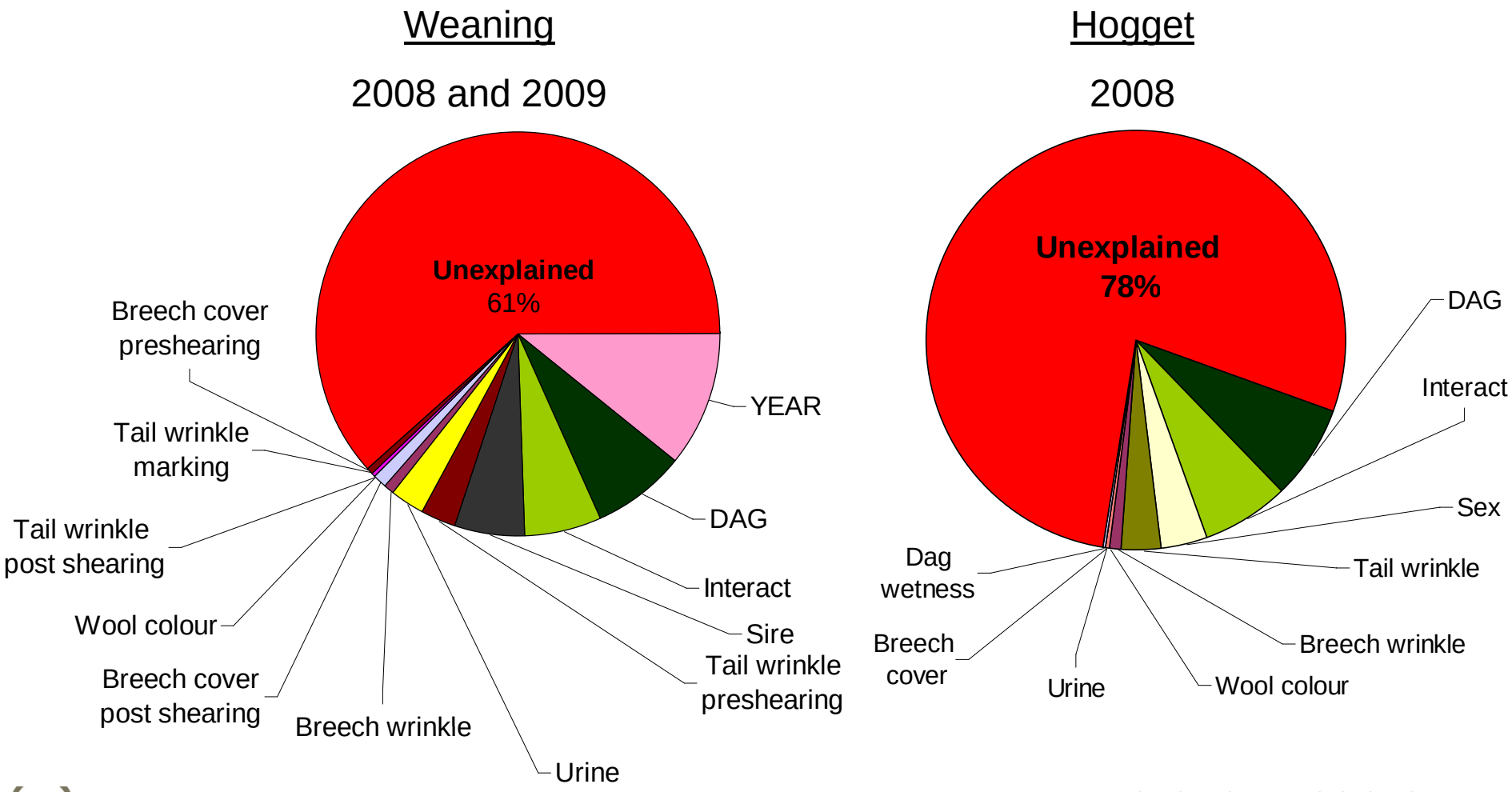
Tail wrinkle pre-weaner shearing

Tail wrinkle post-weaner shearing

Breech cover pre-weaner shearing

Breech cover post-weaner shearing

Contribution of all indicator traits to weaning and to hogget age (unmulesed) breech strike



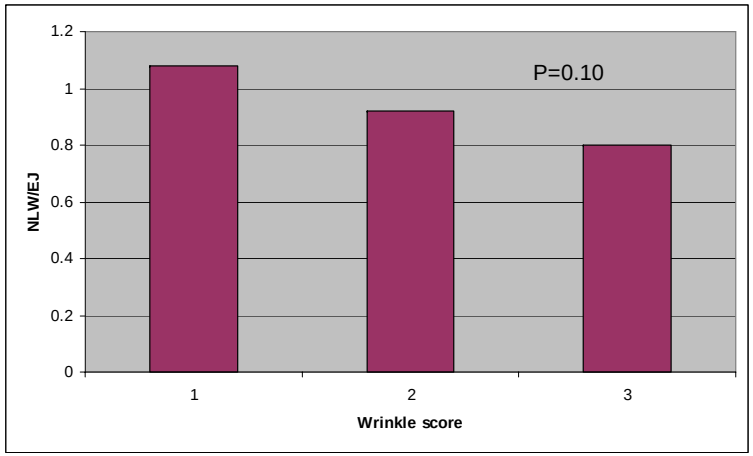
Message

IN A HIGH DAGS ENVIRONMENT AND VERY PLAIN FLOCK

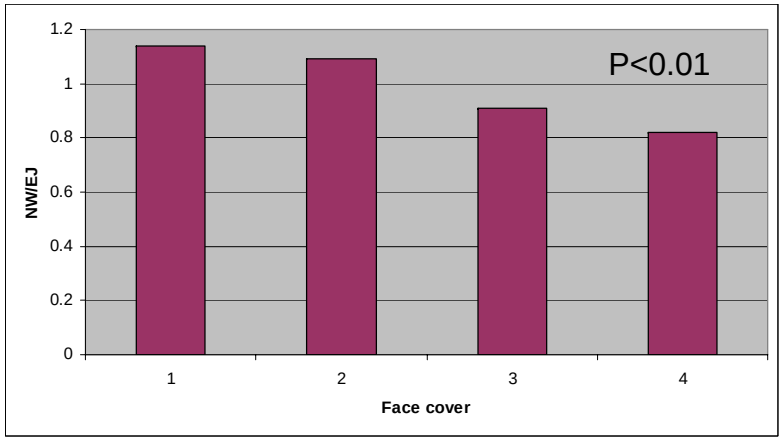
- The known indicator traits and environmental factors explain approx 20% of the variation of breech strike and mulesing another 25%
- 55% of breech strike variation currently remains unexplained and subject of further R&D

Effect of indicator traits on the number of lambs weaned per ewes joined

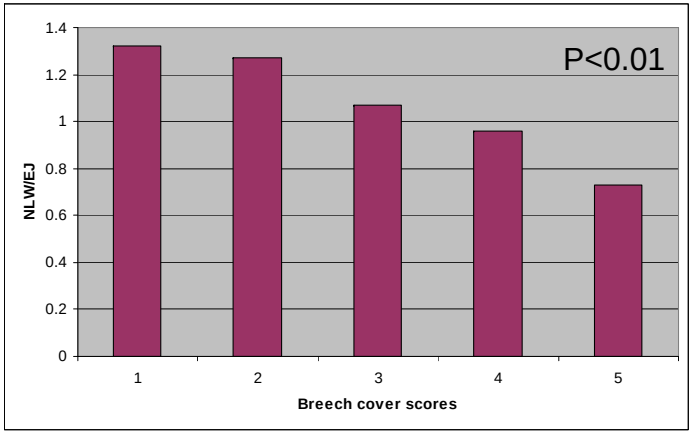
Breech Wrinkle



Face cover



Breech cover



Predicted annual gross income of the lines

2005-2007 drops

Can we breed for resistance to breech strike and its indicator traits?

Genetic parameters of breech strike and its indicator traits at weaning age

Trait	r_g	r_p	Heritability
Breech strike to weaner shear			0.16 ± 0.03
Dags	0.68 ± 0.11	0.22 ± 0.02	0.23 ± 0.04
Urine	0.23 ± 0.16	0.07 ± 0.02	0.32 ± 0.06
Tail wrinkle pre-weaner shear	0.09 ± 0.19	0.18 ± 0.02	0.22 ± 0.06
Tail wrinkle post-weaner shear	0.31 ± 0.14	0.08 ± 0.03	0.53 ± 0.08
Breech cover pre-weaner shear	-0.13 ± 0.14	0.01 ± 0.02	0.62 ± 0.06
Breech cover post-weaner shear	0.10 ± 0.17	0.07 ± 0.03	0.30 ± 0.07
Wool colour	0.11 ± 0.13	0.06 ± 0.02	0.57 ± 0.06

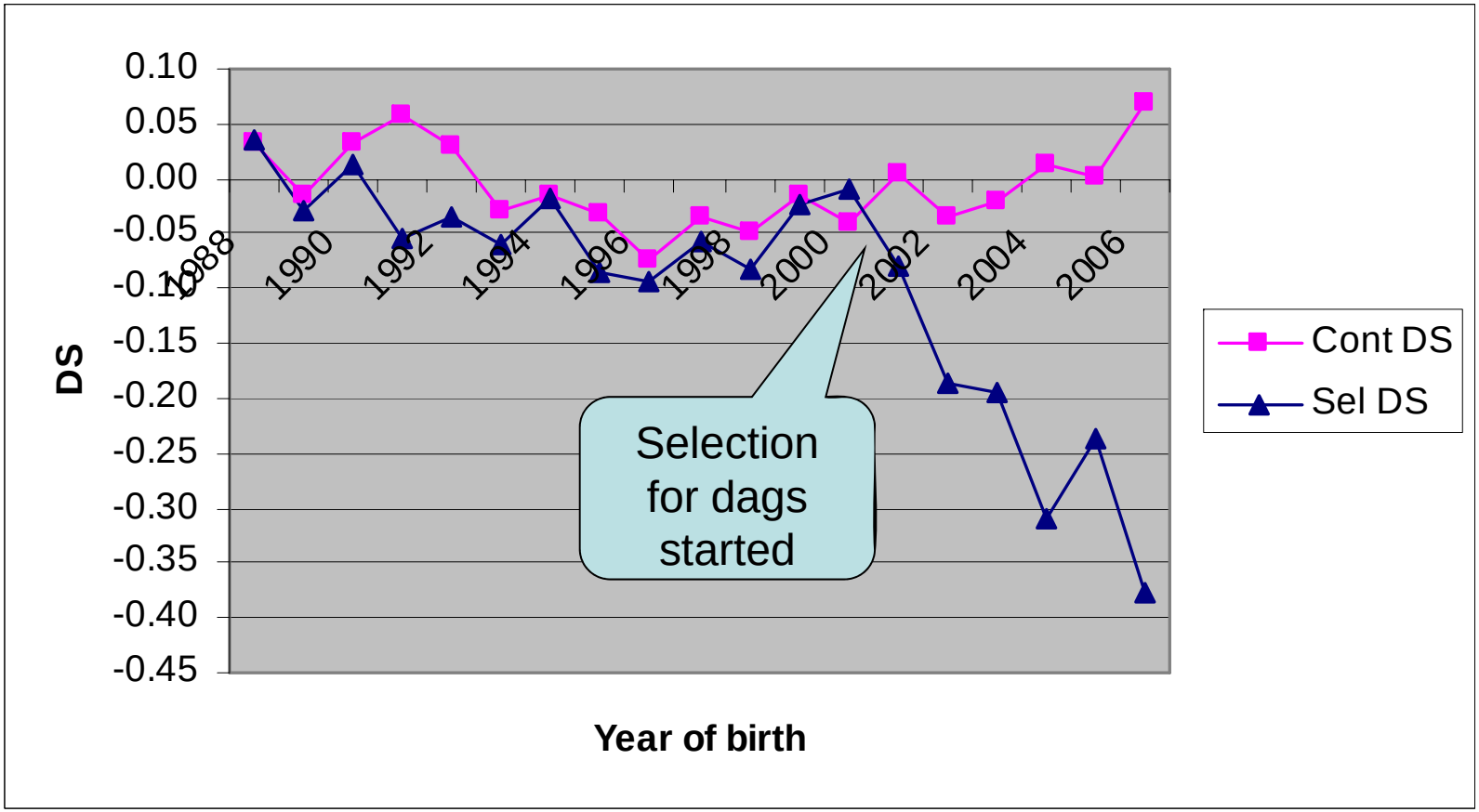
Log transformed

Genetic parameters of breech strike and its indicator traits at hogget age

Trait	r_g	r_p	Heritability of total breech strike
Breech strike			0.38 ± 0.04
Dag score	0.42 ± 0.13	0.19 ± 0.02	0.36 ± 0.07
Dag moisture	0.25 ± 0.14	0.16 ± 0.03	0.49 ± 0.08
Urine	0.08 ± 0.10	0.07 ± 0.03	0.09 ± 0.07
Breech wrinkle	0.06 ± 0.10	0.04 ± 0.03	0.67 ± 0.07
Breech cover	0.21 ± 0.10	0.02 ± 0.03	0.60 ± 0.06
Crutch cover	0.00 ± 0.11	0.03 ± 0.03	0.49 ± 0.07
Wool colour	0.07 ± 0.10	0.07 ± 0.03	0.72 ± 0.06

Log transformed

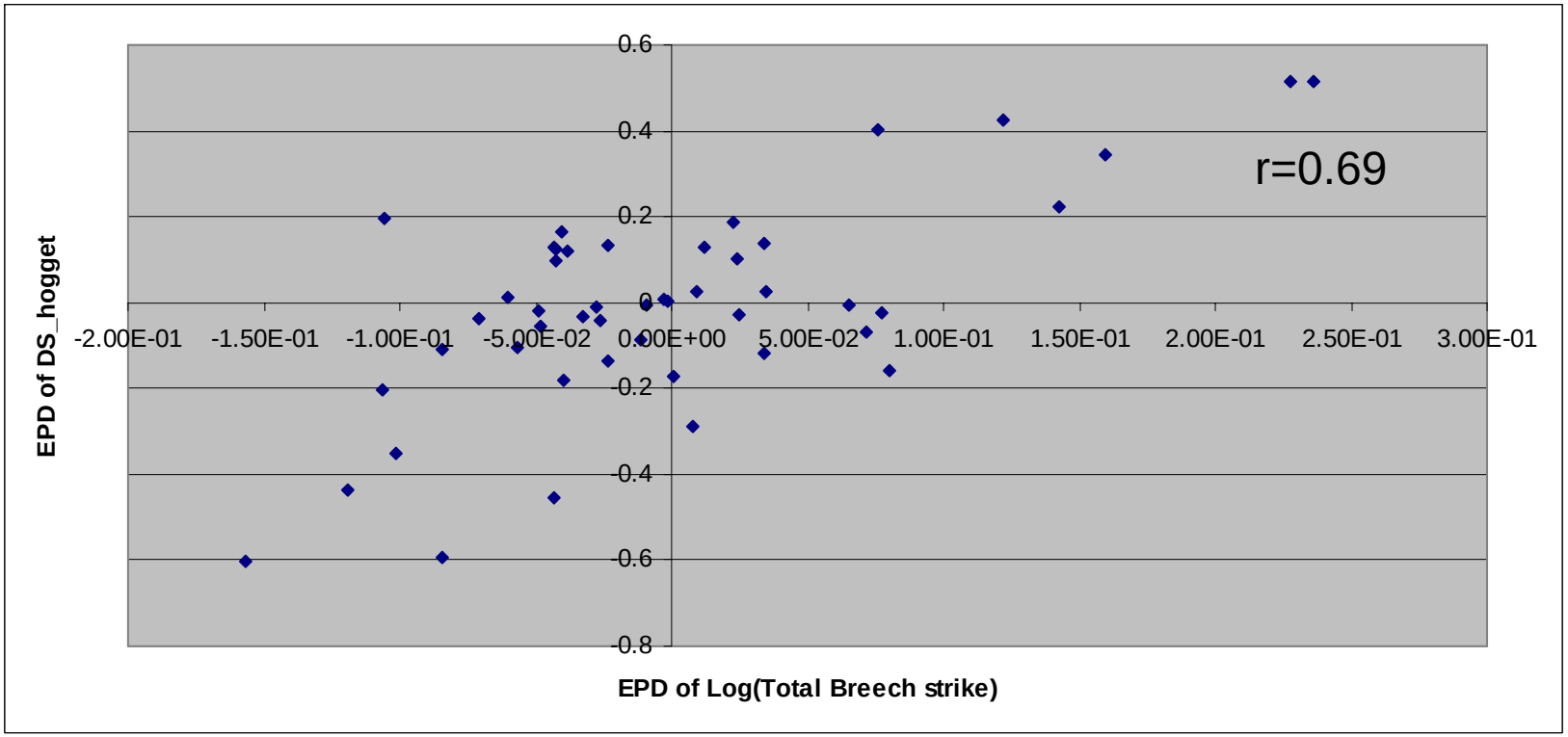
Genetic trends for selection against dags in the Rylington Merino control and selection flocks



Selection on EBV for dags works!!!!

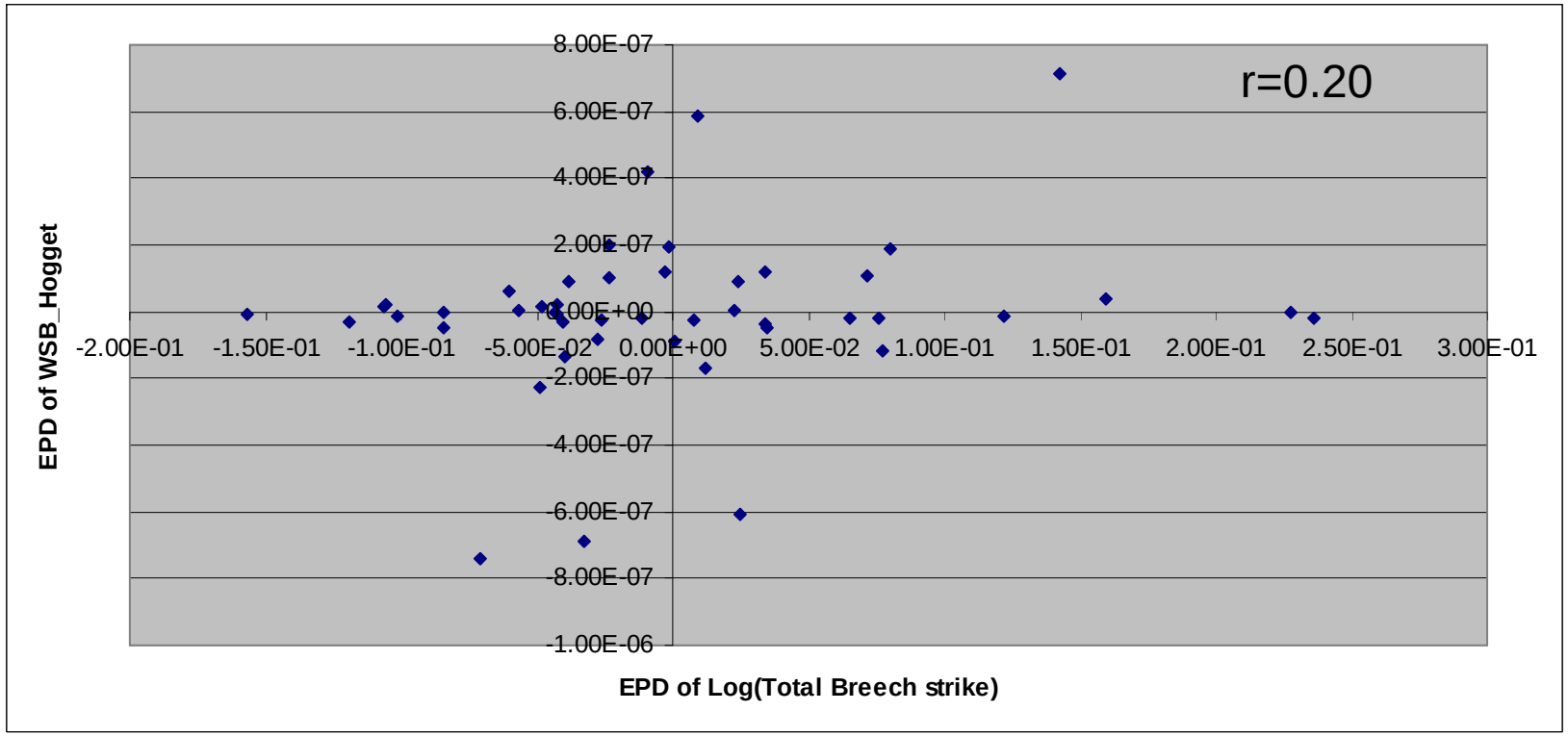
What is the relationships between indicator traits and total breech strike of sire progeny groups measured at hogget age?

Dag score and Total Breech strike of sire progeny



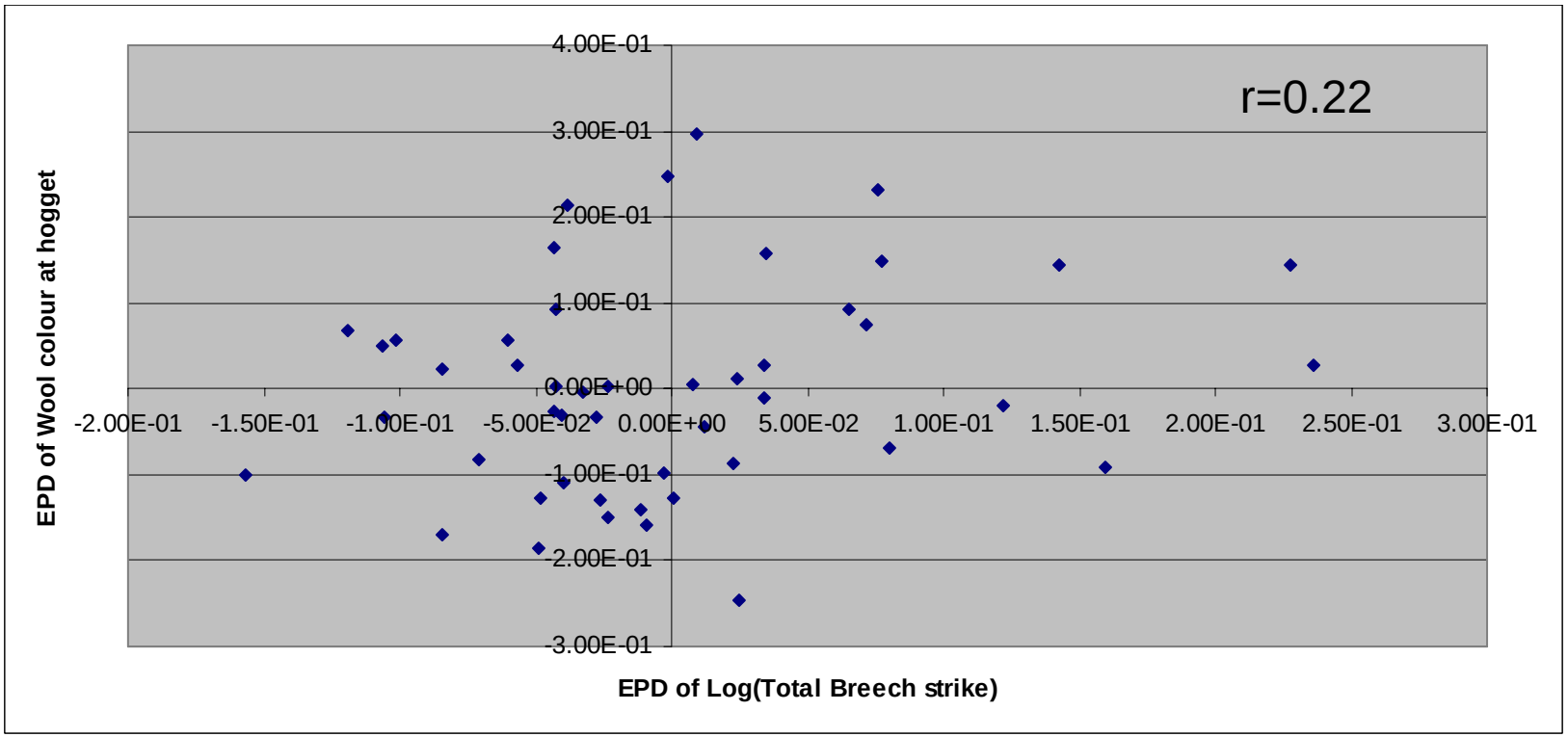
EPD – Expected progeny differences

Wrinkle score and Total Breech strike of sire progeny



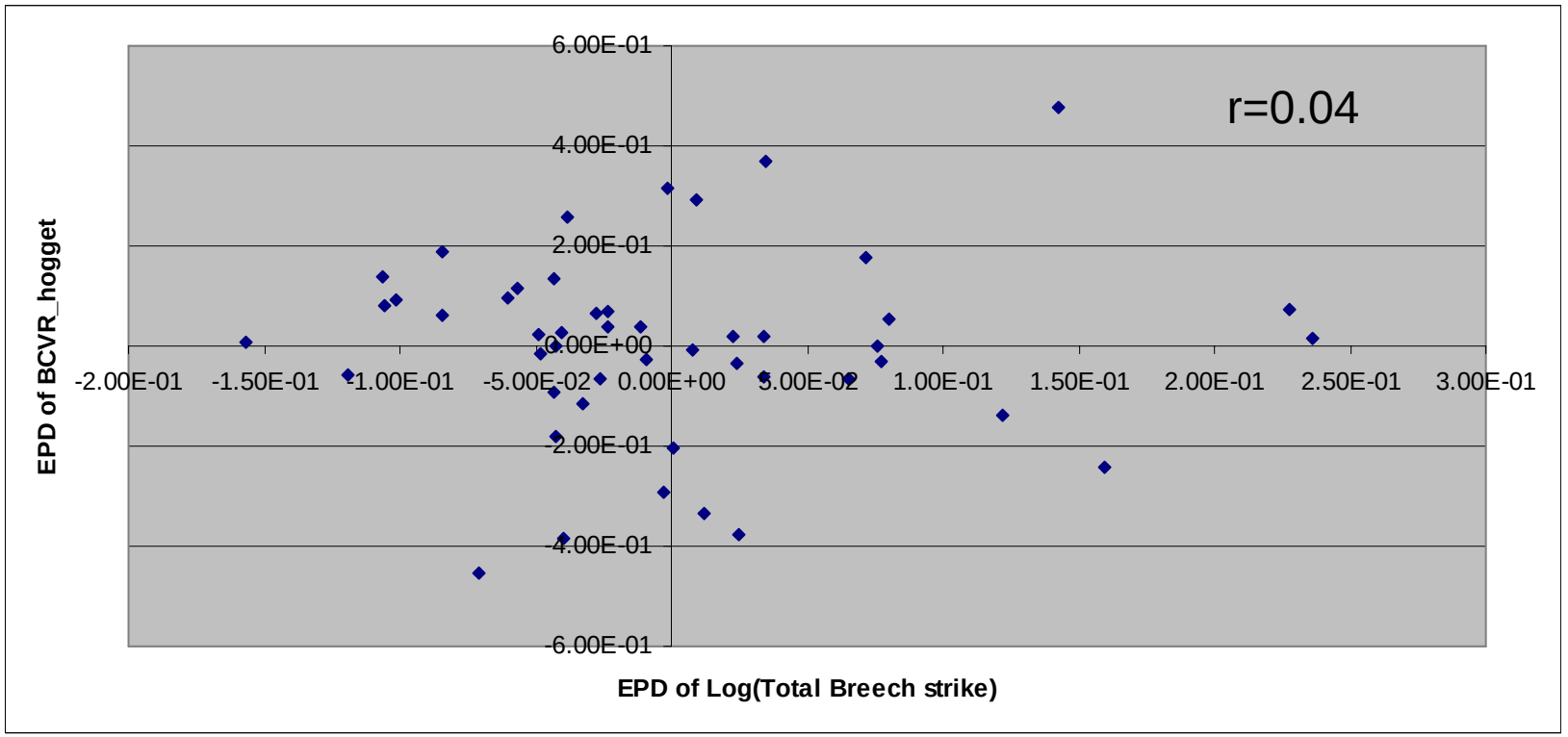
EPD – Expected progeny differences

Wool colour and Total Breech strike of sire progeny



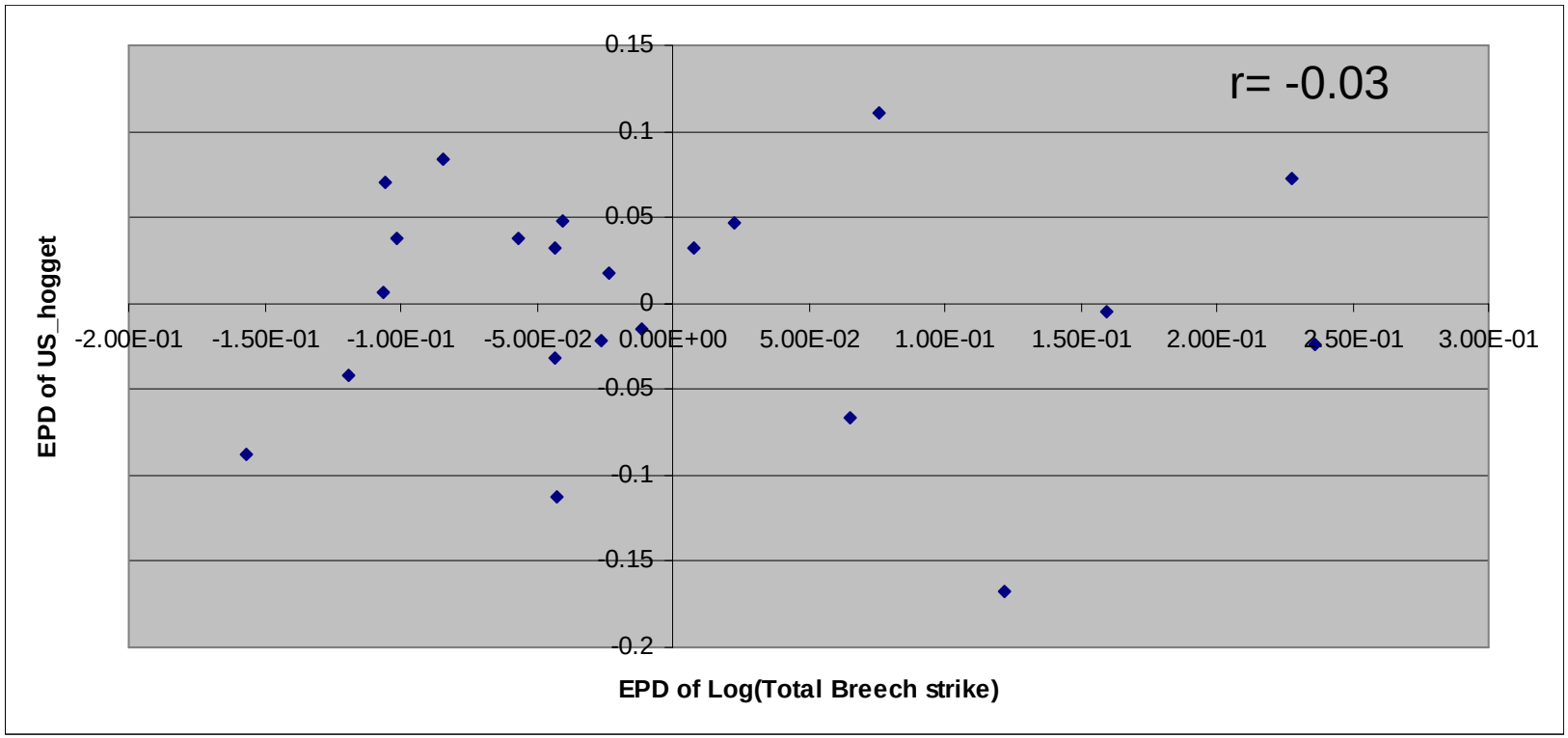
EPD – Expected progeny differences

Breech cover and Total Breech strike of sire progeny



EPD – Expected progeny differences

Urine stain and Total Breech strike of sire progeny

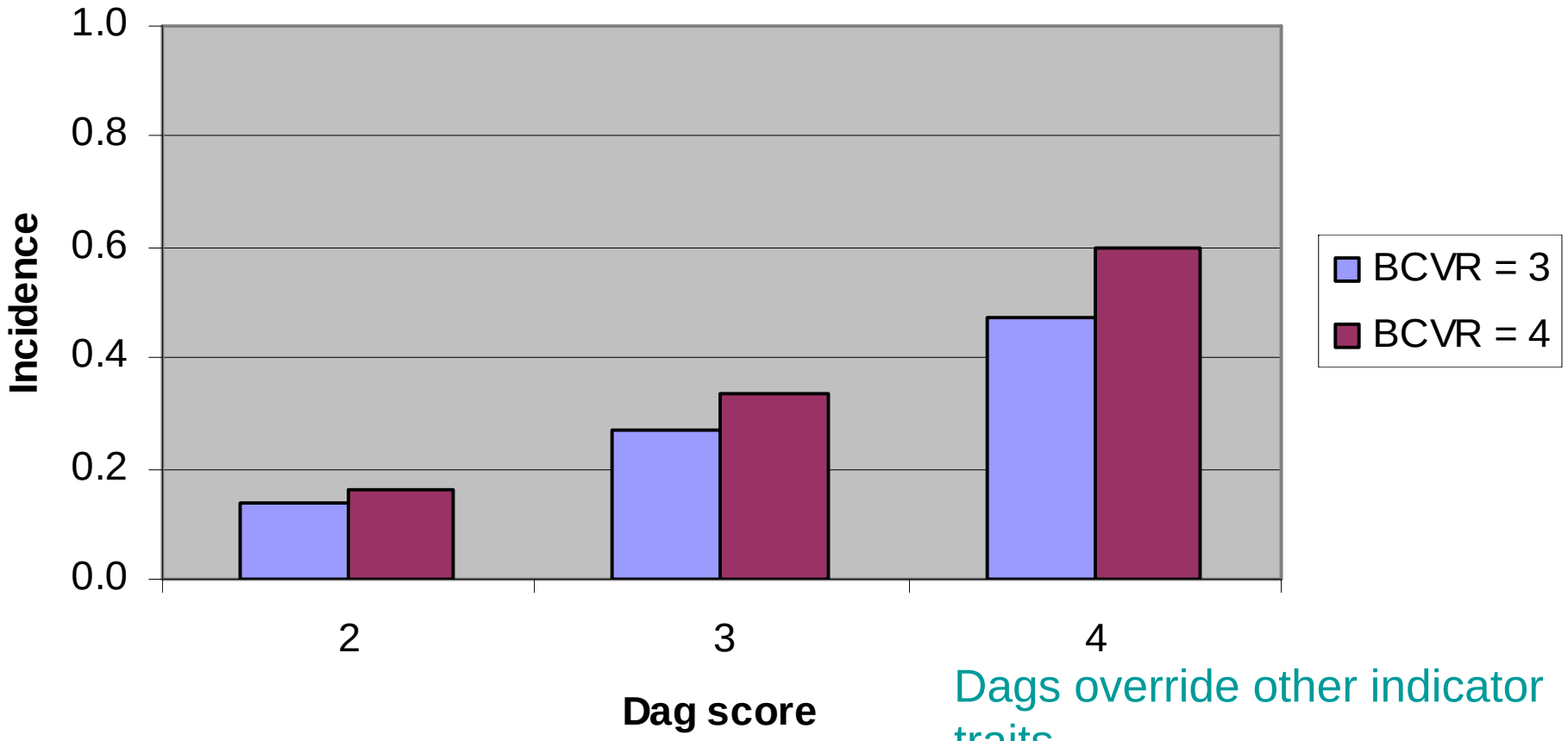


Message

Apart from dags no strong relationships exist between breech strike and the main indicator traits in Mt Barker WA environment with a plain bodied flock

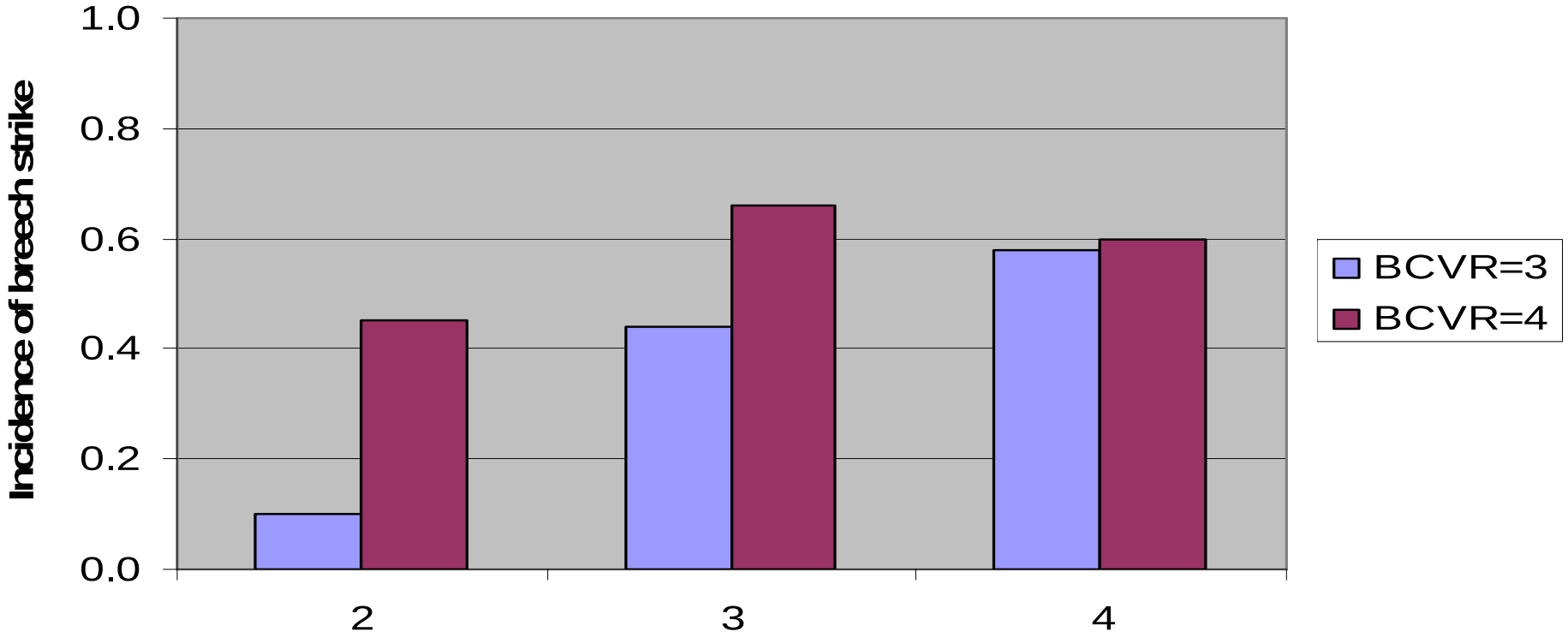
However…..when dags are low other indicator traits become important

Importance of dags and breech cover when wrinkle score =1 to weaning



Dags override other indicator traits

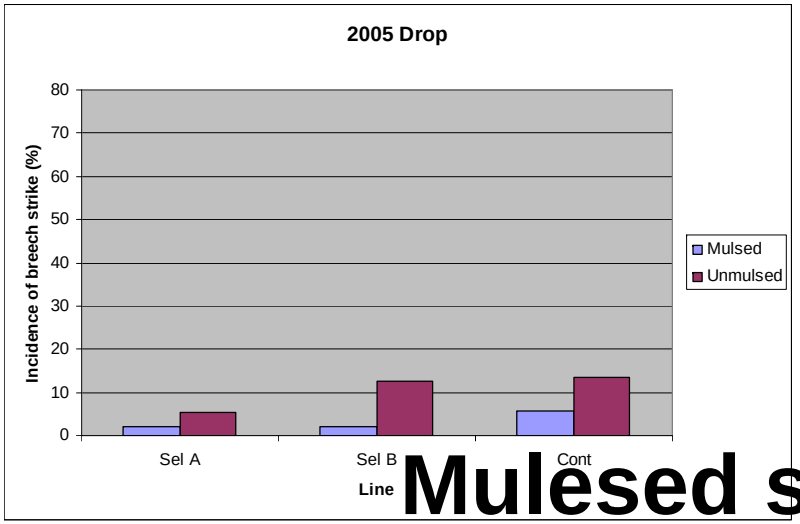
Importance of dags and breech cover when wrinkle score = 2 to weaning

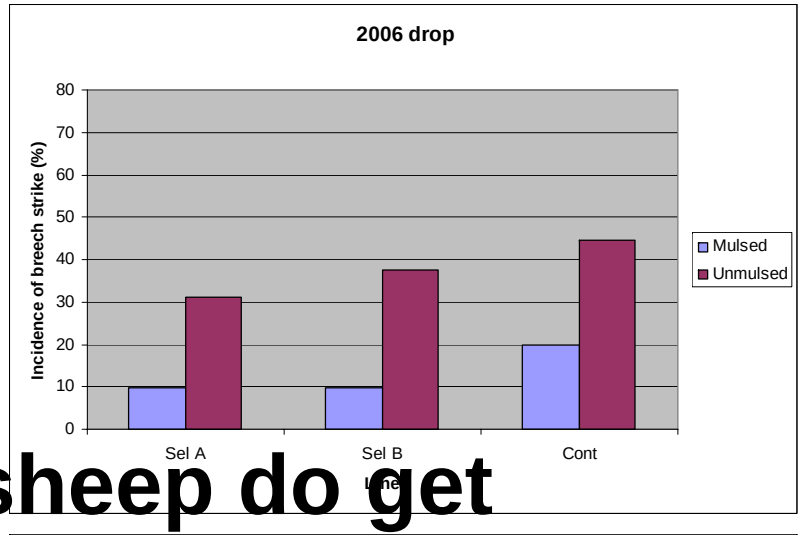


When dags are low, wrinkle and breech cover are important

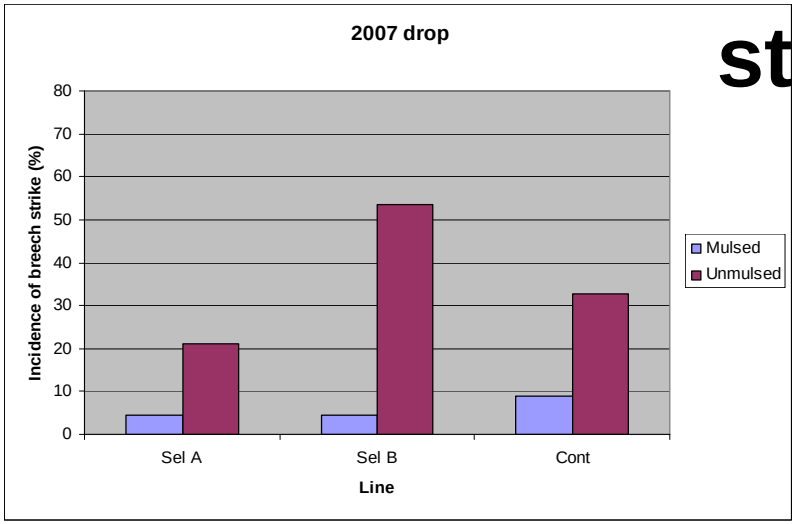
Dags override other indicator traits

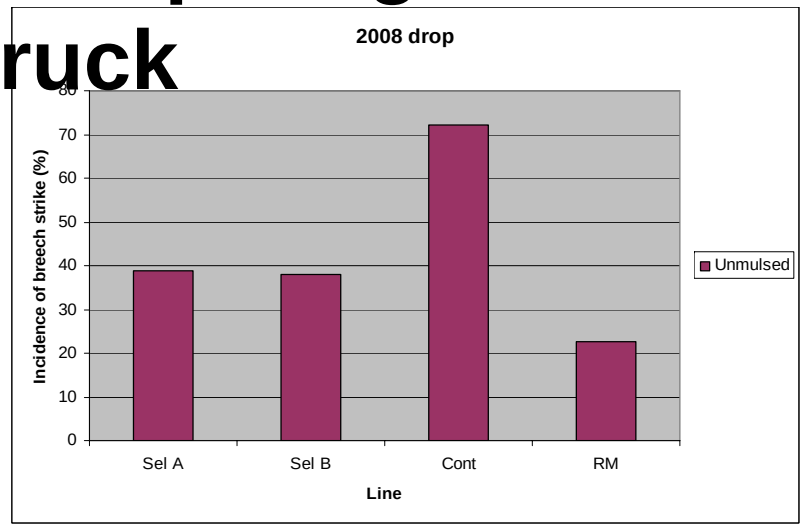
Incidence of breech strikes from birth to hogget shearing



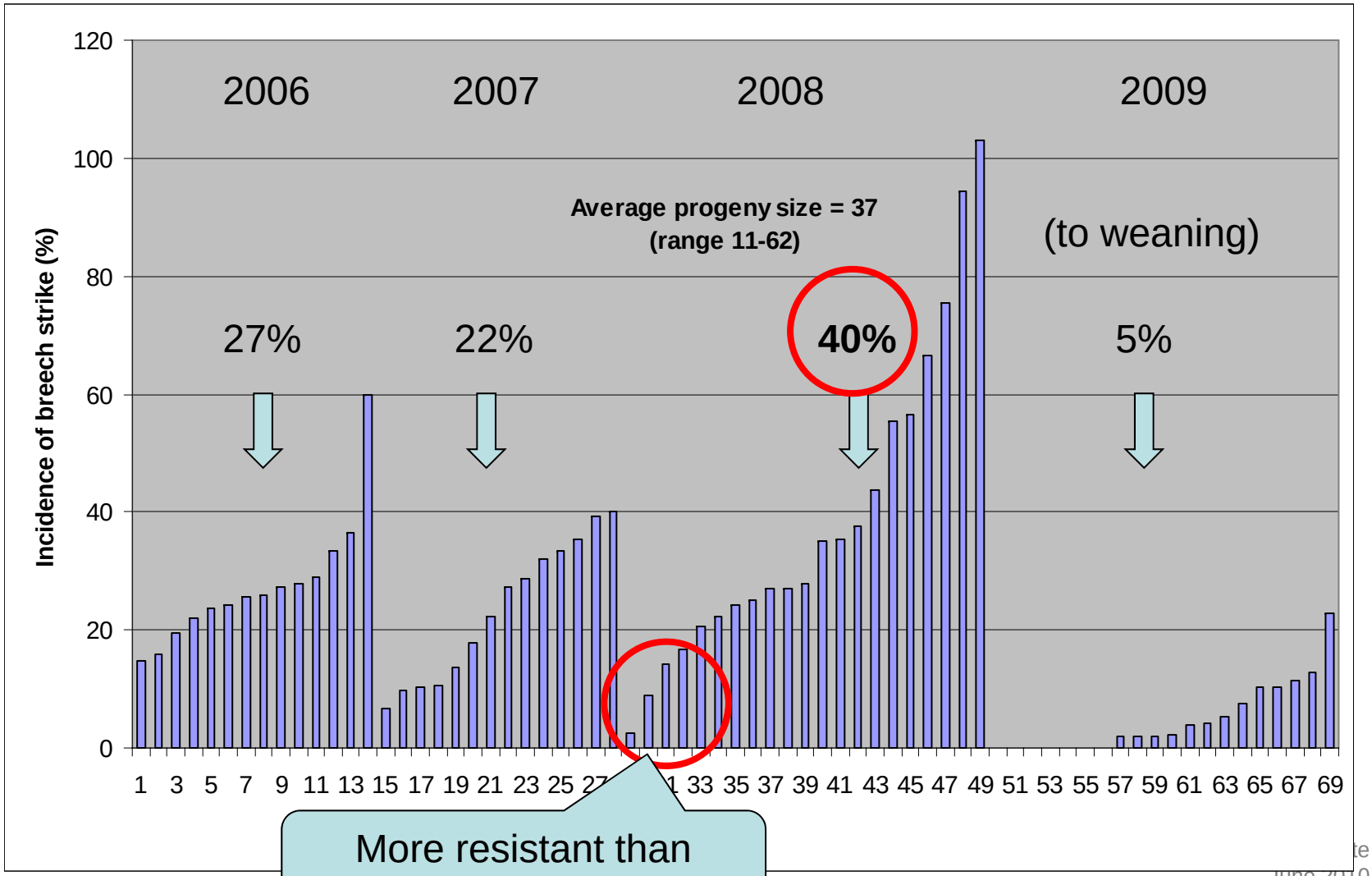


Mulesed sheep do get struck





Incidence of breech strike of different sires progeny groups from birth to hogget shearing

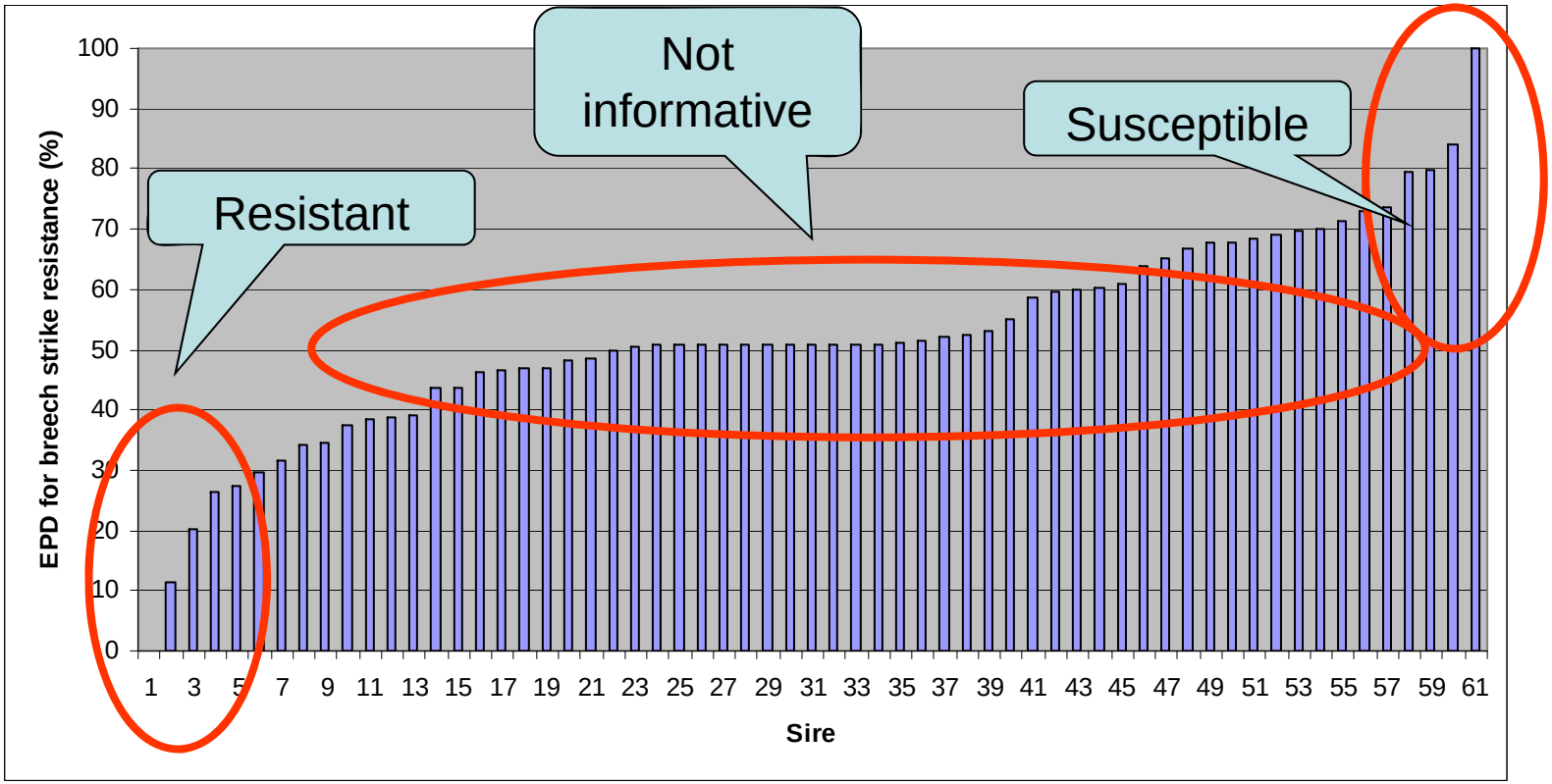


What might explain the unexplained variation?

Wax, suint and/or its ratio?
Chemical composition?
Odour?
Immune response?
Bacterial population composition of fleece?
Others?

Further R&D has been approved by AWI

Adjusted sires values for resistance to breech strike in the Mt Barker flock



One out of about every 10 sires would be relatively resistant

Averages of indicator traits to weaning of extreme sire progeny groups for breech strike

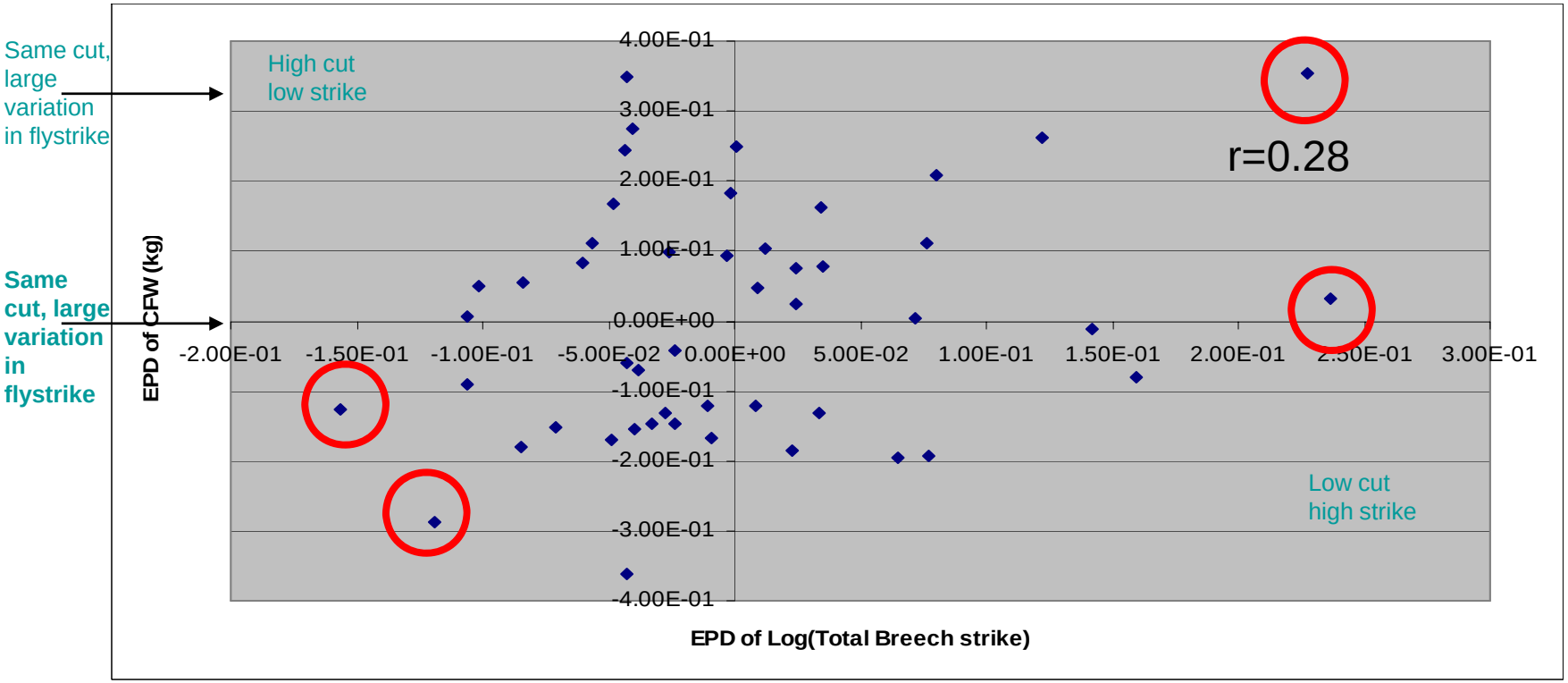
	Resistant		Susceptible	
	Sire 1	Sire 2	Sire 3	Sire 4
Incidence of breech strike (%)	**2.5**	**8.9**	**102.9**	**94.3**
Number of progeny	41	44	35	31
Weaning weight (kg)	28.8	25.2	23.3	24.3
Dag score	1.3	1.3	1.7	1.6
Breech wrinkle	1	1	1	1.1
Tail wrinkle pre shearing	1.2	1.1	1.1	1.2
Tail wrinkle post shearing	1.2	1.5	1.7	1.6
Breech cover pre shearing	3.6	3.3	3.6	3.5
Breech cover post shearing	2.8	2.7	3.4	3.1
Urine stain	1.2	1	1.3	1.3
Wool colour	2.6	2.5	2.6	2.5

Average of indicator traits to hogget age of extreme sire progeny groups for breech strike

	Resistant		Susceptible	
	Sire 1	Sire 2	Sire 3	Sire 4
Incidence of breech strike (%)	**2.5**	**8.9**	**102.9**	**94.3**
Number of progeny	41	44	35	31
Hogget weight (kg)	52.6	56.9	55.1	50.3
Dag score	**2.1**	**2.4**	**3.3**	**3.4**
Breech wrinkle	1	1	1	1
Breech cover	2.7	2.6	2.8	2.6
Urine stain	1.2	1.4	1.5	1.4
Wool colour	2.5	2.7	2.8	2.6

Will selecting directly for breech strike resistance result in reduced production?

Clean fleece weight and Total breech strike of sire progeny

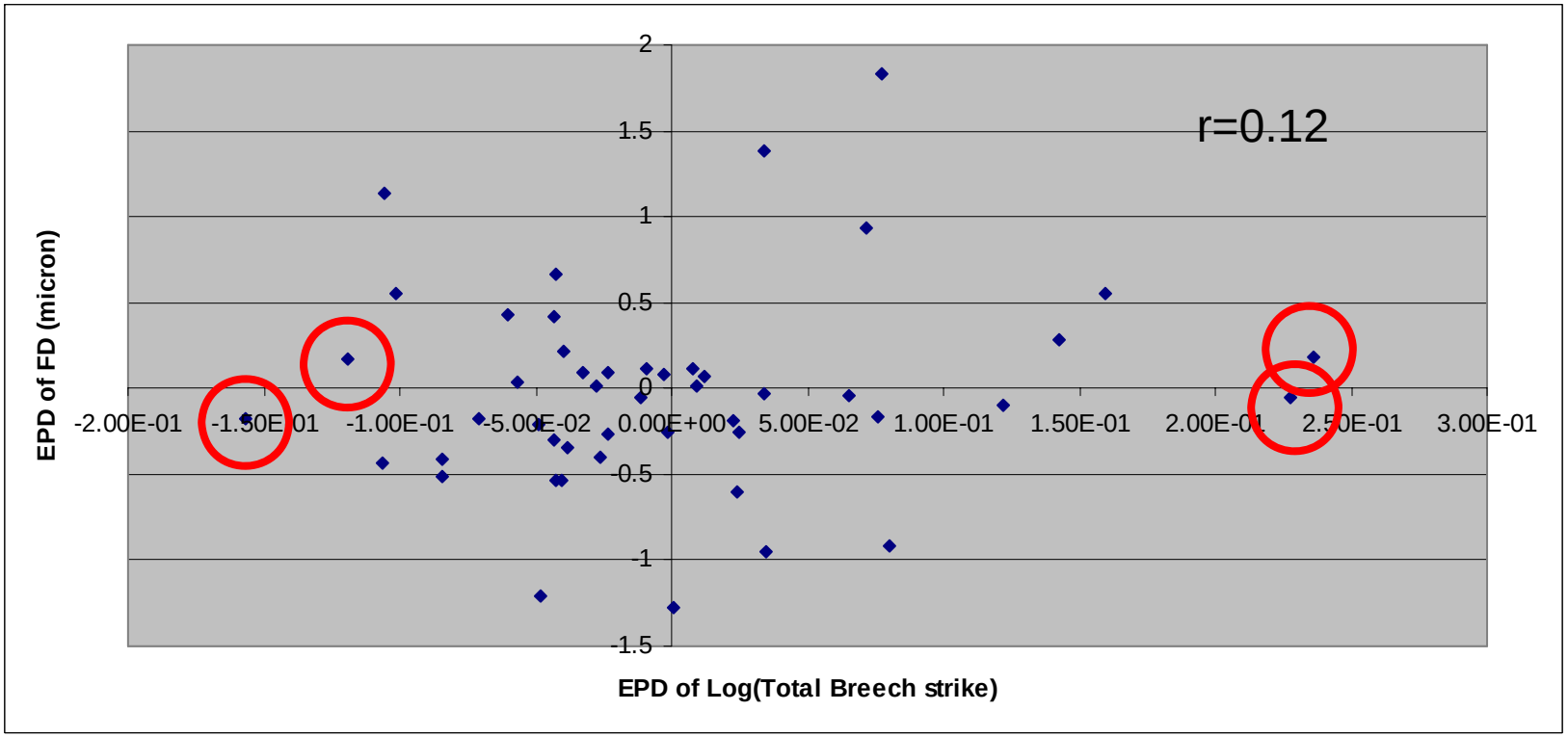


Only moderate correlation between cut and flystrike.

High cutting resistant animals do exist (left top quadrant –Same as for cut and fibre diameter)

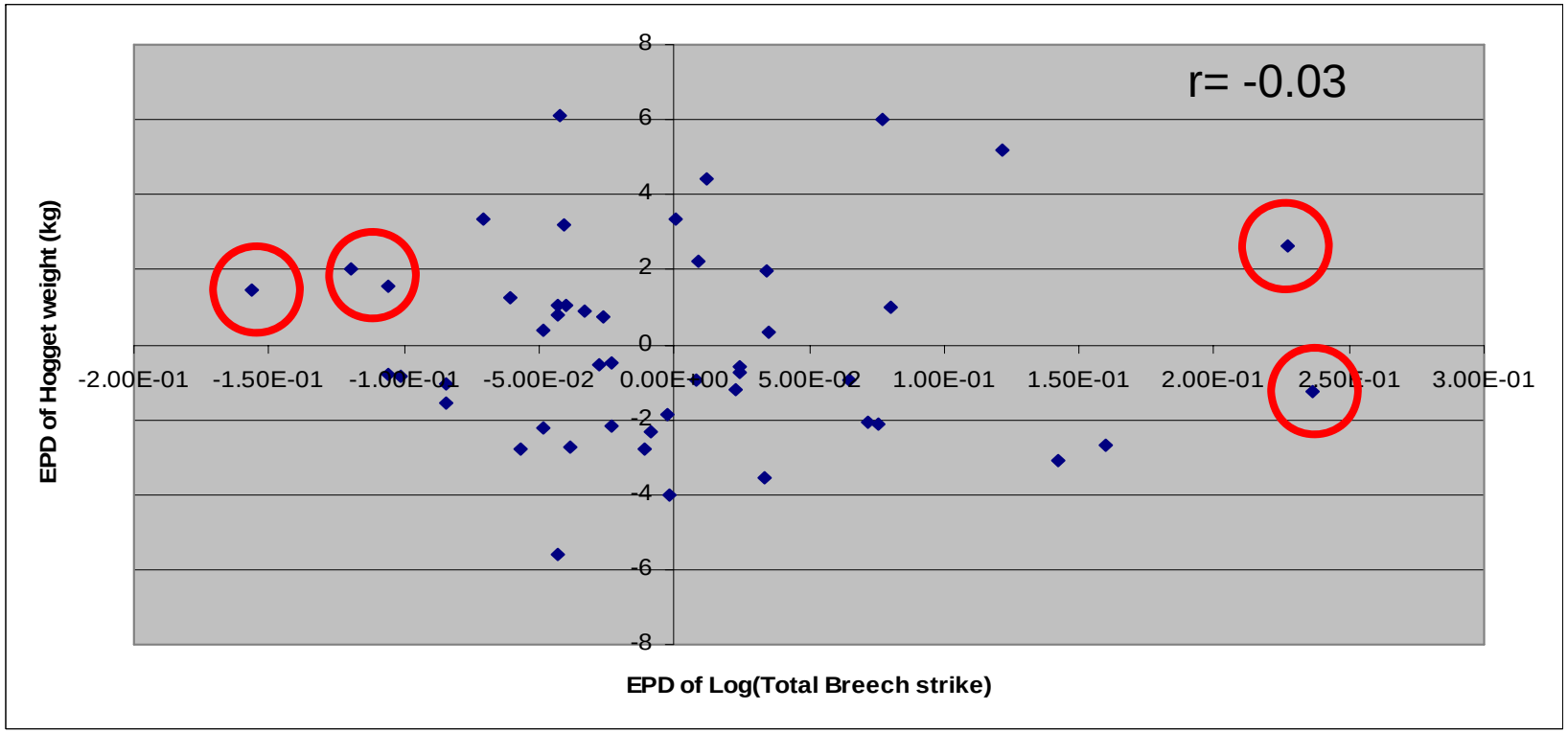
Need to find these high cutting low strike animals

Fibre diameter and Total breech strike of sire progeny



Very low correlation between micron and flystrike over a 3 micron range

Hogget body weight and Total breech strike of sire progeny



No correlation between body weight and flystrike

EPD – Expected progeny differences

??% of this sire's progeny were struck

??% of this sire's progeny were struck

??% of this sire's progeny were struck

??% of this sire's progeny were struck

103% of this sire's progeny were struck!

94% of this sire's progeny were struck!

9% of this sire's progeny were struck!

3% of this sire's progeny were struck!

The way forward

1. Generate ASBVs for indicator traits

   For dags, breech cover, tail wrinkle and wool colour

   (When dags are low other traits are important at Mt Barker)

2. Evaluate changes in indicators and production over lifetime of ewes

3. Further R&D approved to identify additional indicator traits

4. Facilitate identification of resistant sires in national flock?

5. Include other wool sheep breeds??

6. De-sensitise scour prone sheep

7. Extend current information to industry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