

AWI Breech Strike R&D Technical Update
Maritime Museum, Sydney
20th August 2014

Tony Schlink
DAFWA



Update on Breeding for Breech Strike Resistance in Western Australia

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Julia Smith and Mt Barker technical staff

Department of Agriculture and Food Western Australia



Breecch Strike



- *Lucilia Cuprina*, the “Australian” Sheep Blowfly.

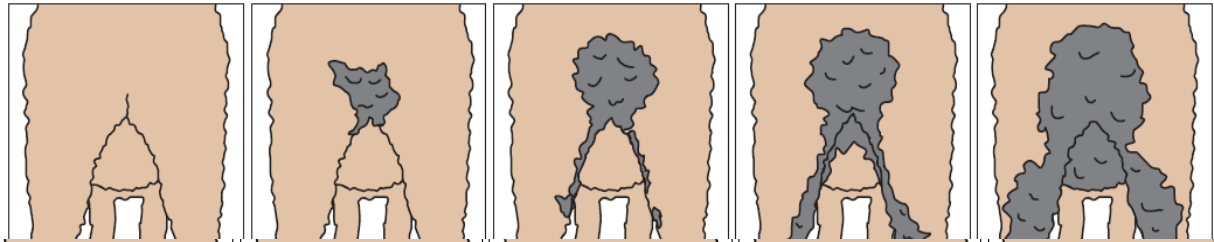
Introduced to Australia in the early 1900's

Cost to the Australian Sheep industry =
\$280 million per year

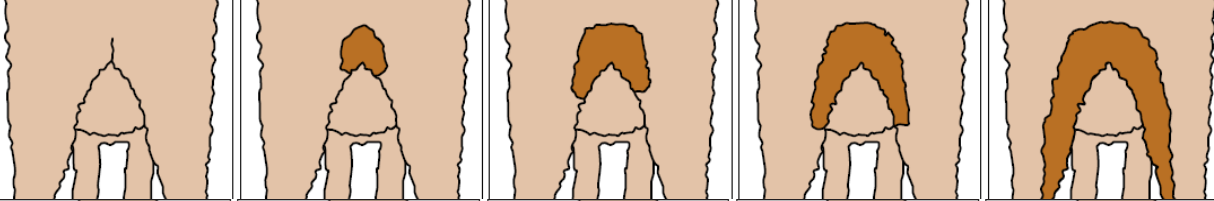
AWI Initiated a New Study in 2006

- **Identify and quantify indicator traits for breech strike in un-mulesed sheep in a winter (Mt Barker) and summer (Armidale) rainfall regions**

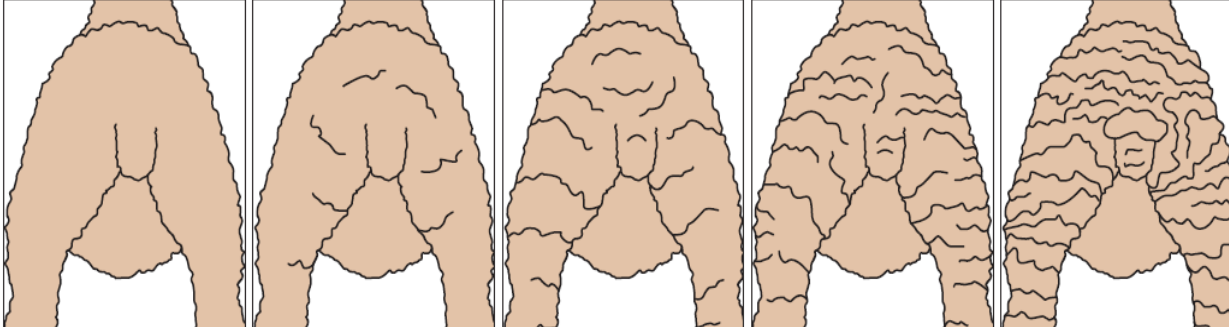
Dags



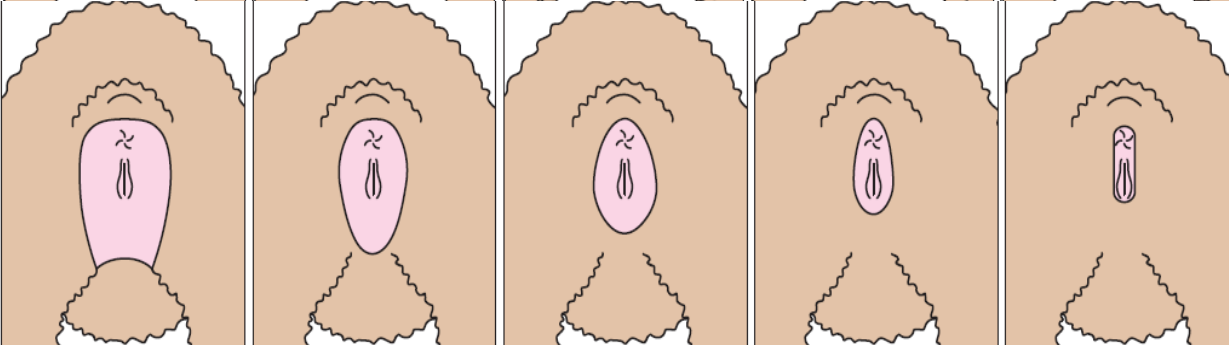
Urine



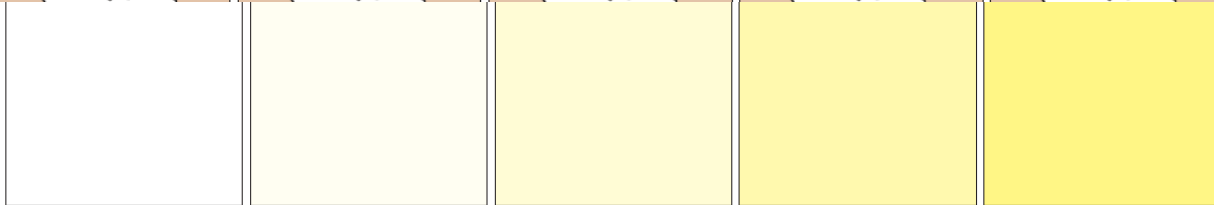
Wrinkle



Cover



Colour



Score 1

Score 2

Score 3

Score 4

Score 5

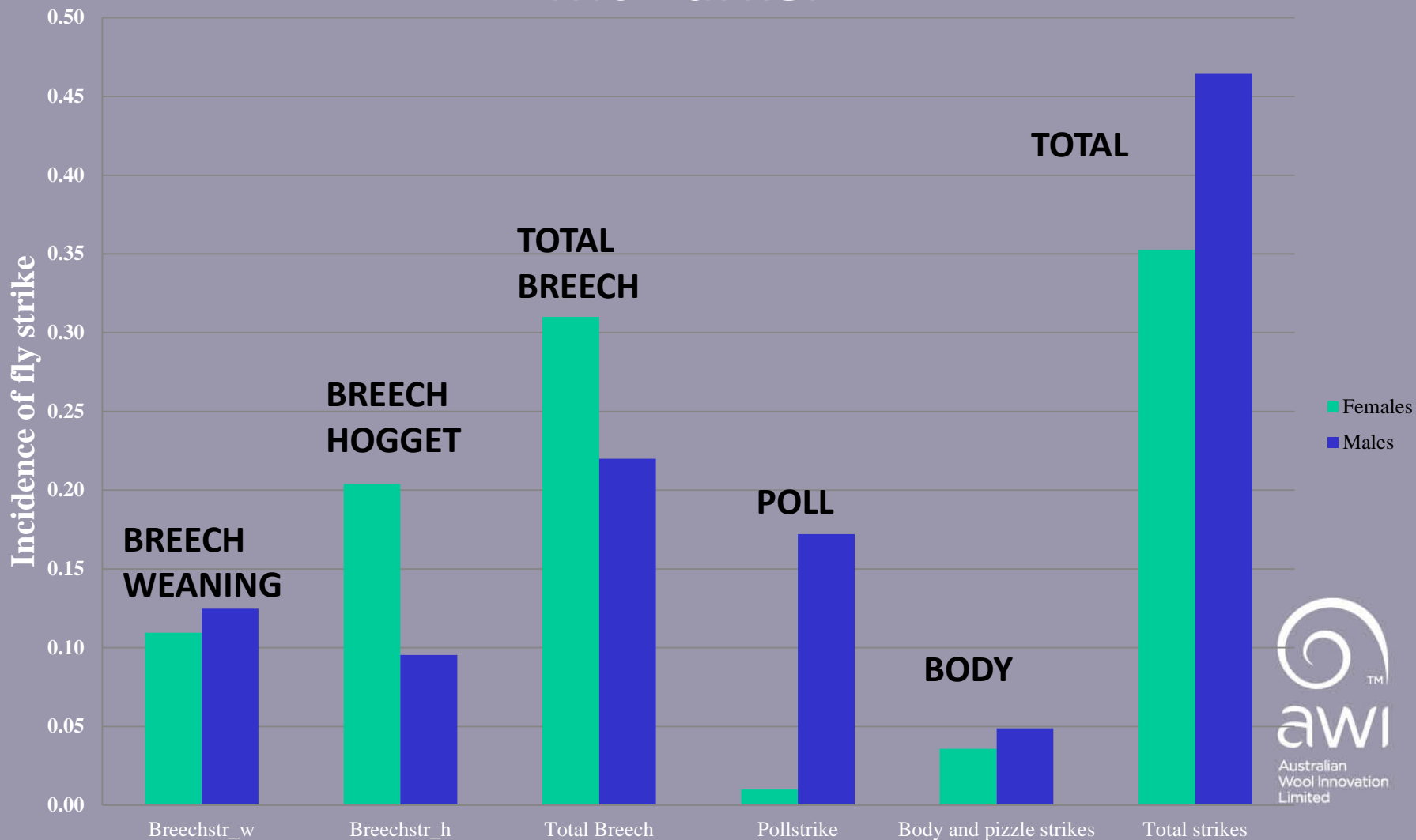
Management

No Crutching (First 4 years)

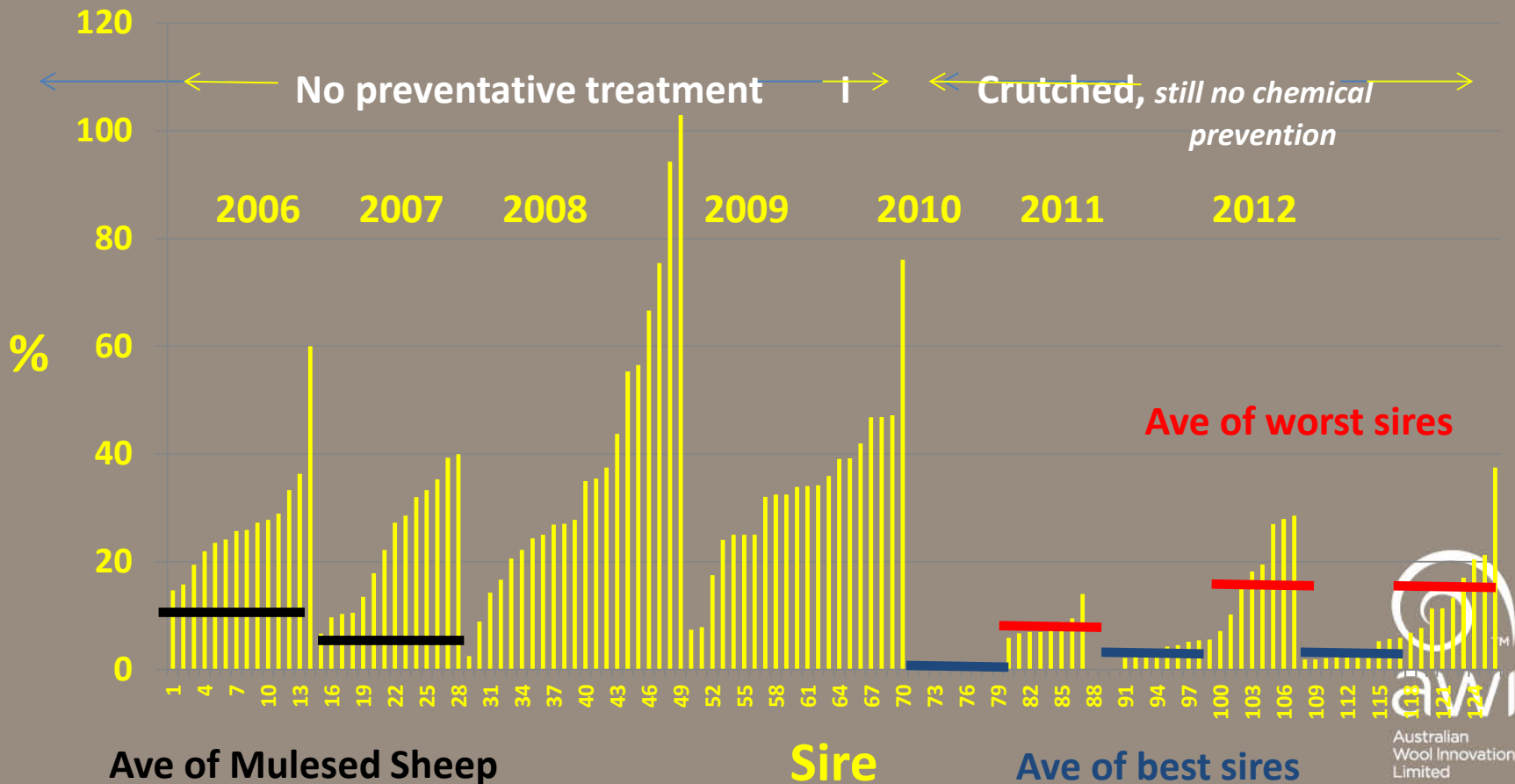
No Mulesing from 2008

No Jetting all years

Incidence of Fly Strike over first 4 years Un-mulesed Sheep Mt Barker



Sire Progeny Group Differences in Breech Strike (Birth to Hogget Shearing)



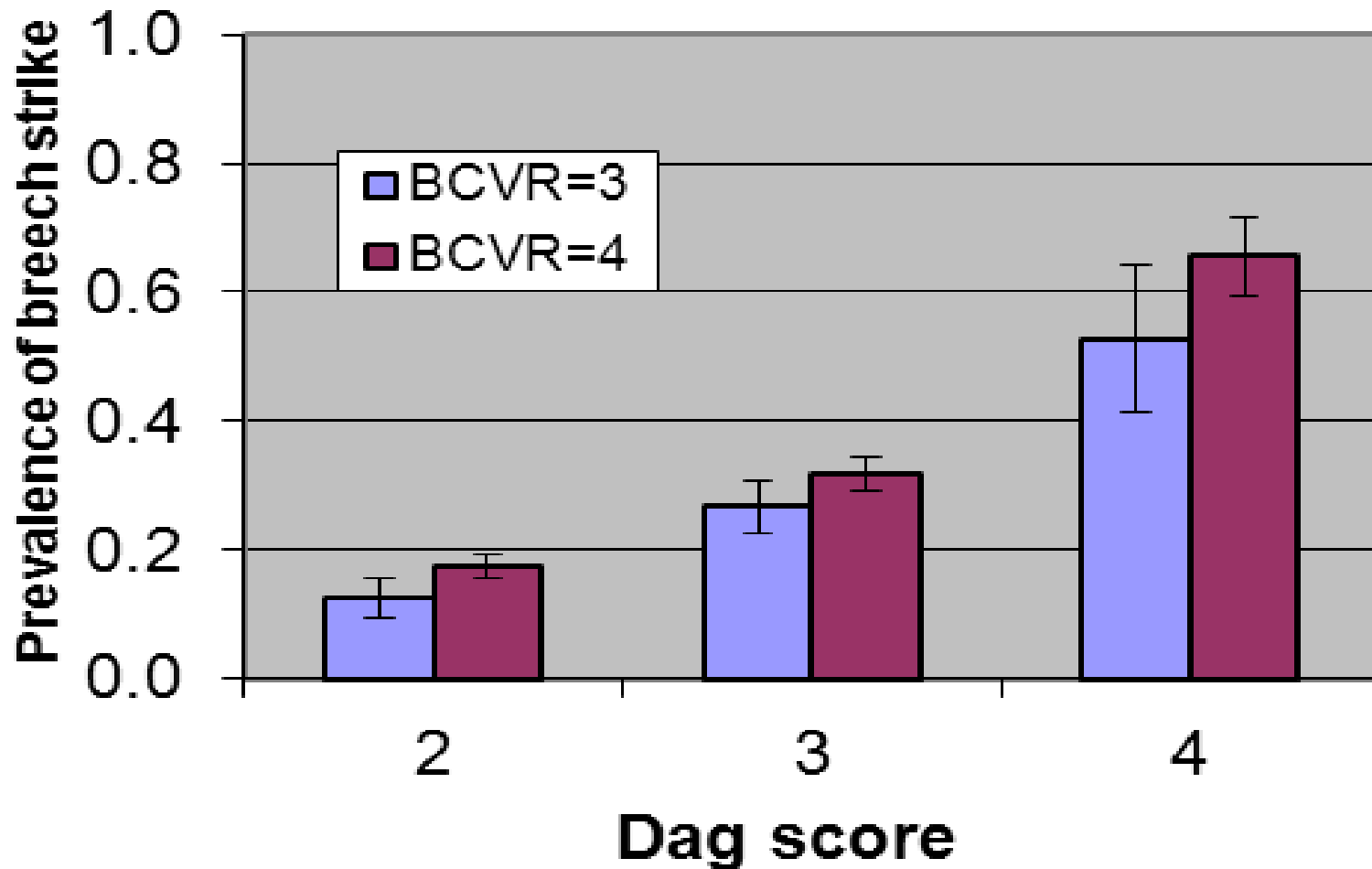
Inheritance of Breech Strike

Trait	V_P	h^2	se
Breech_Total	0.73	0.51	0.10
Breechstr_Weaning	0.55	0.57	0.13
Breechstr_Hogget	0.58	0.57	0.16
	r_g	r_P	
Breechstr : Weaning vs Hogget	0.44	0.29	

Breech strike is very heritable

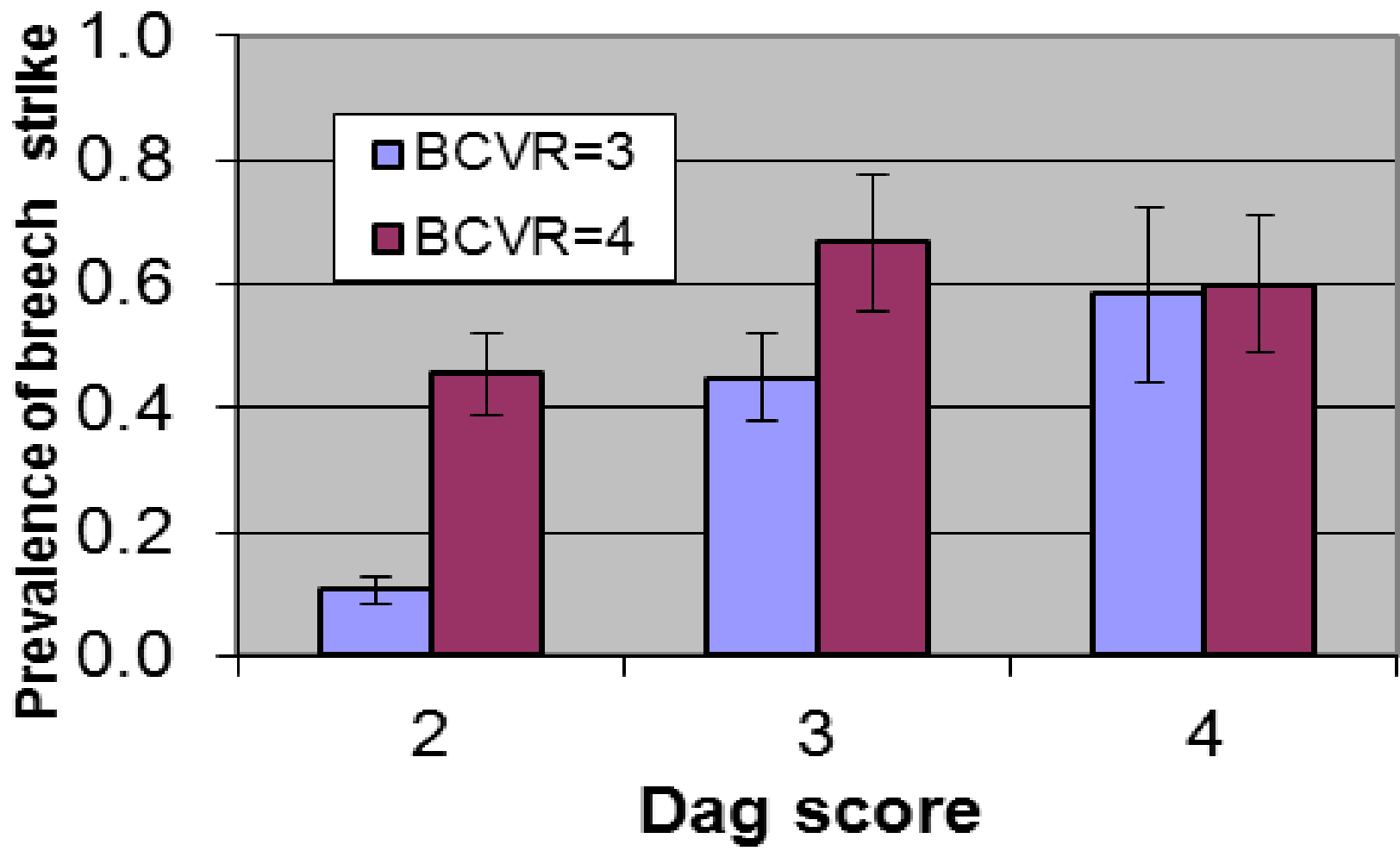
2005 to 2009 drops

Incidence of Breech Strike within: Breech Wrinkle score = 1 Winter Rainfall Region



2005 to 2009 drops

Incidence of Breech Strike within:
Breech Wrinkle Score = 2
Winter rainfall region



Rams from the Resistant vs Susceptible Lines Mt Barker



Resistant



Susceptible



2012 Drop Hoggets Winter Rainfall Region

Susceptible

Resistant



Key Indicator Traits in Winter Rainfall Environment

Trait	Correlated Response/Direct Response
Dags at hogget	0.60
Urine stain at weaning	0.59
Dags in spring	0.57
Neck wrinkle marking	0.47
Neck wrinkle hogget	0.47
Body wrinkle hogget	0.45
Dags post weaning	0.45
Dags yearling	0.44
Face cover at weaning	0.44
Face cover at yearling	0.39
Breech wrinkle at yearling	0.39
Dags at weaning	0.36
Dags at marking	0.34
Neck wrinkle post weaning	0.34

Importance of Key Indicator Traits

Mediterranean Environment South West WA (Mt Barker)

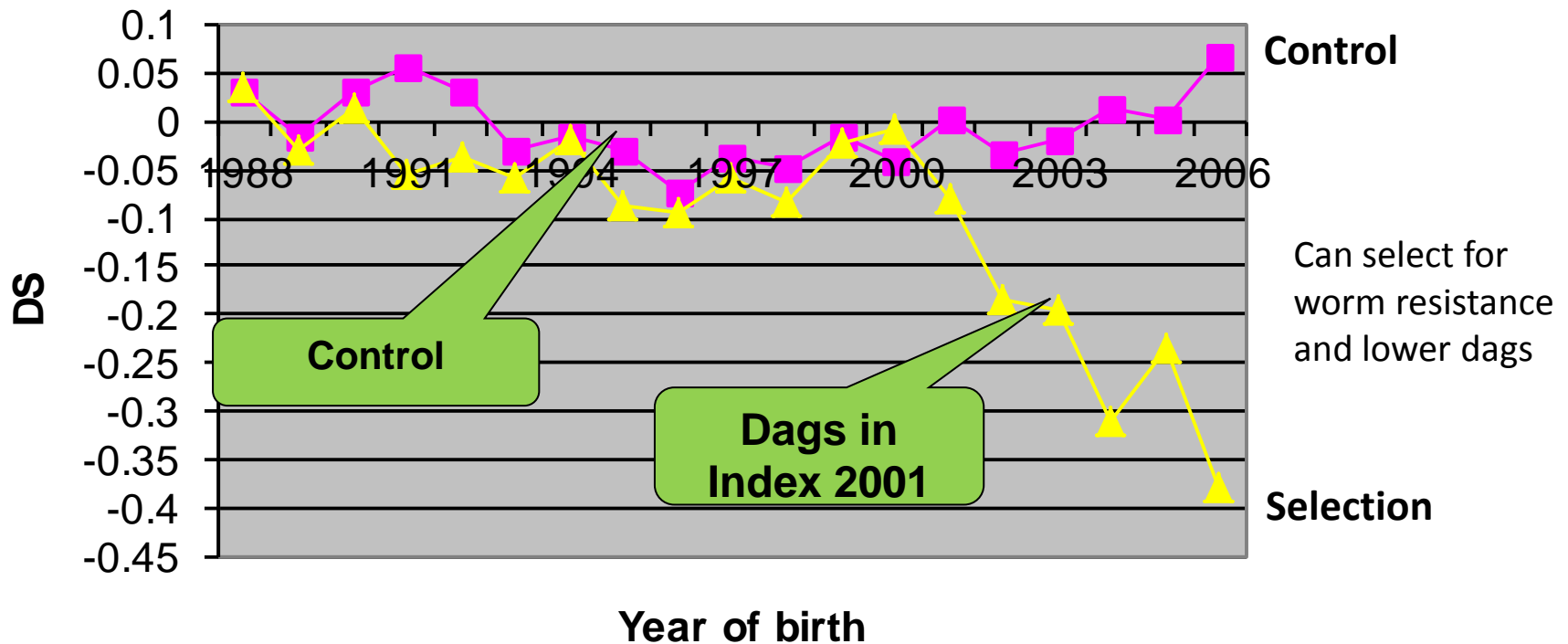
1. Dags
2. Urine stain
3. Wrinkle
4. Face cover

(Very different to CSIRO Armidale Flock)

Selection Against Dags in Rylington Merinos

EBV Dag Scores

Rylington Flock, long term selection for worm resistance

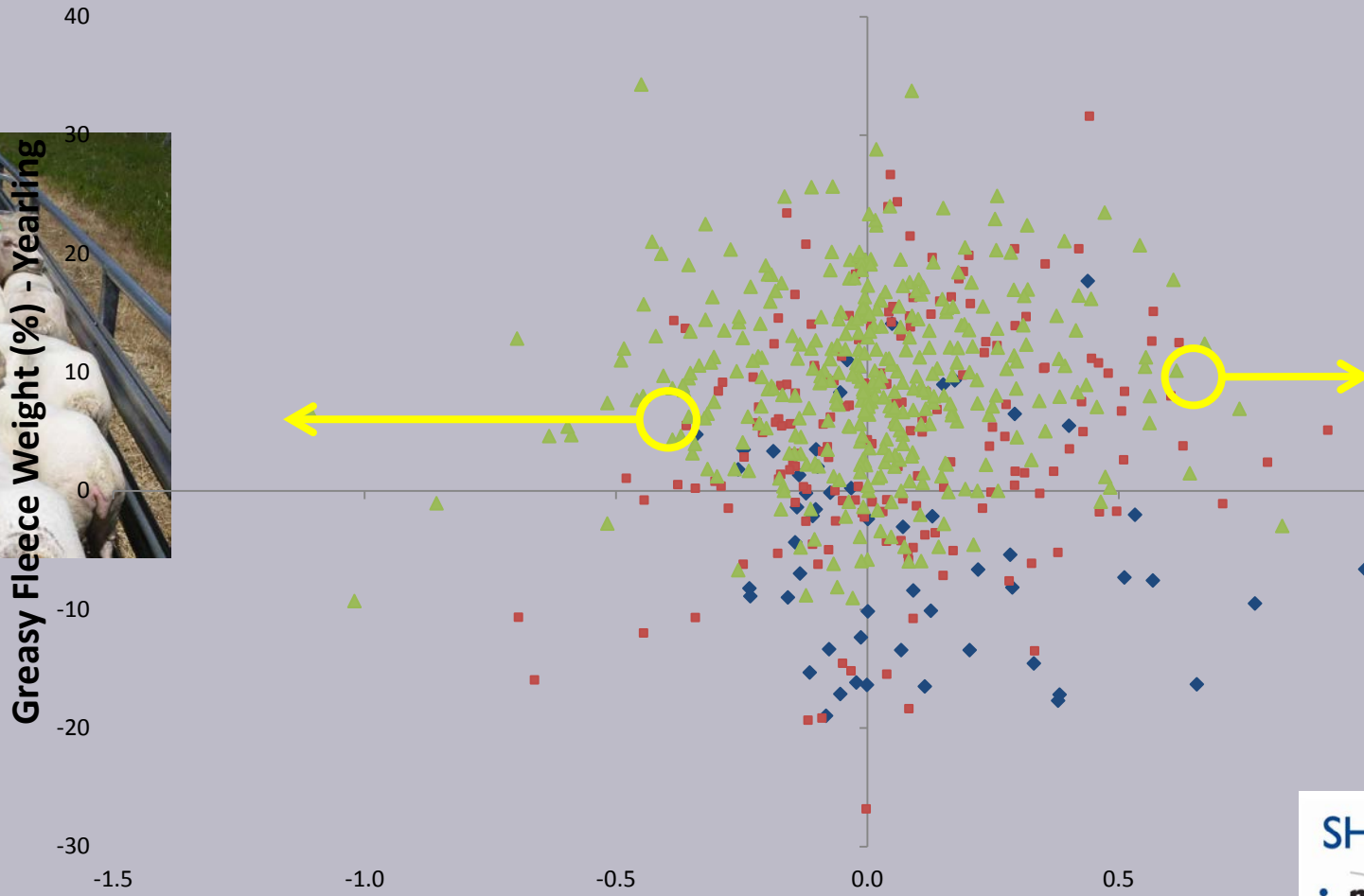


WRINKLES

AMSEA Wrinkle Score x Greasy Fleece Weight

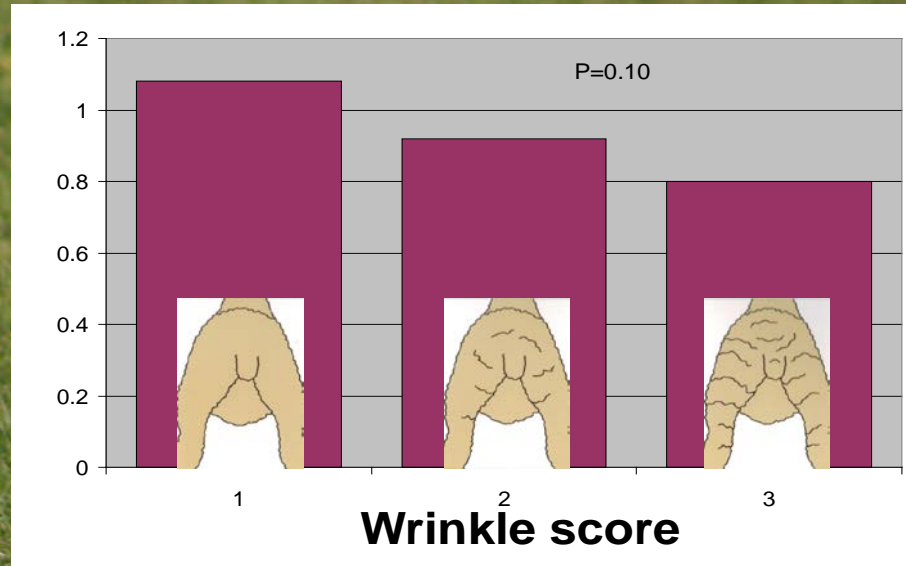
ASBV (560 AMSEA Sires; sorted by YFD)

◆ Superfine - YFD < -2.5 ■ Fine - YFD < -1.0 ▲ Medium - YFD > -1.0

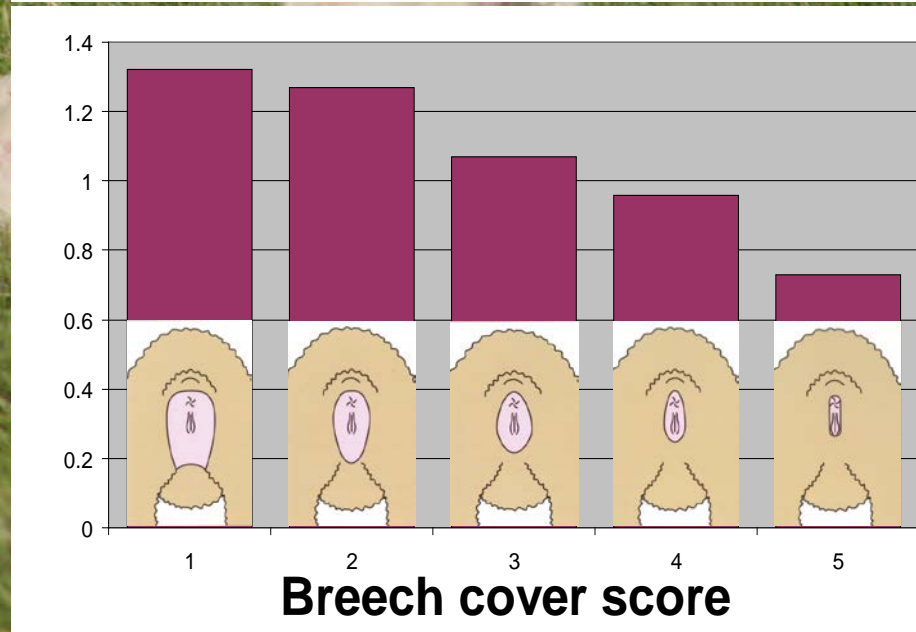


Reproduction

Lambs weaned per
ewe joined

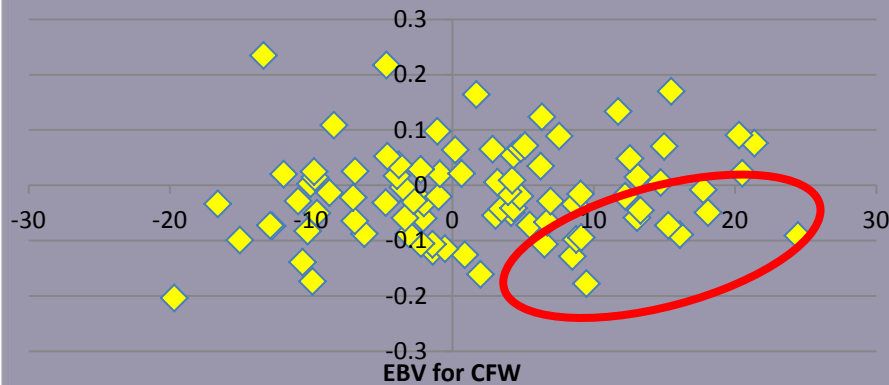


Lambs weaned per
ewe joined

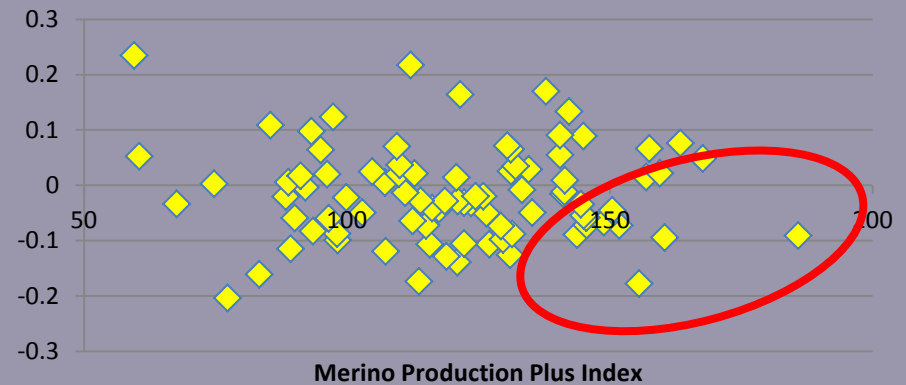


Relationship Between Production and Breech strike (Birth to hogget shearing)

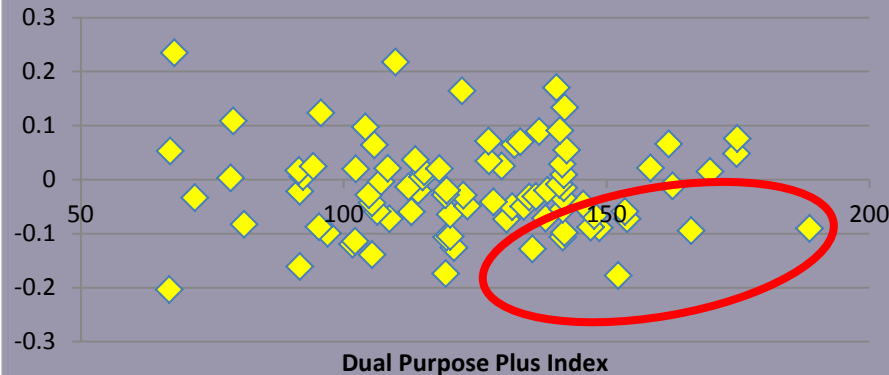
CFW vs Breechstrike



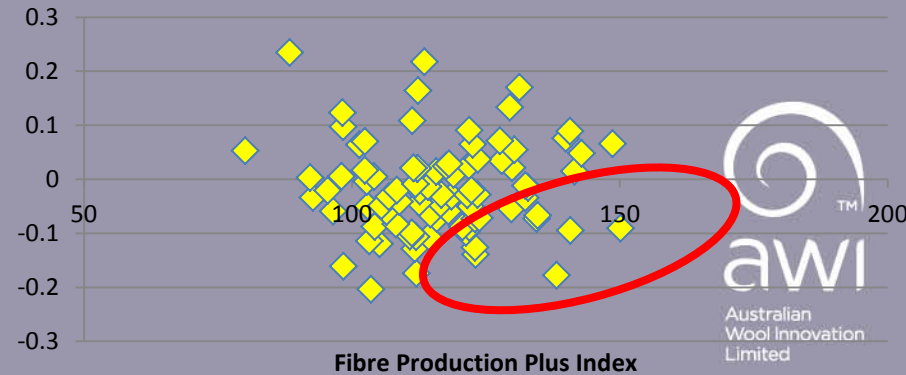
MP+ vs Breechstrike



DP+ index vs Breechstrike



FP+ index vs Breechstrike



Sheep Genetics

Public Web Search



Animal ID	YWT	YFAT	YEMD	YCFW	YFD	YDCV	YCUR	YSS	YWEC	EBWR	EBCOV	LDAG	FP+	MP+	DP+ ↓	7%DP
MT BARKER AWI BREECH FLOCK-072614	7.1 94%	0.2 76%	1.0 83%	24.7 86%	-1.6 91%	-0.2 88%	-4.4 90%	0.8 84%	43 84%	0.2 93%	0.3 92%	-0.5 89%	150 67%	186 58%	189 52%	191 37%
MT BARKER AWI BREECH FLOCK-103603	8.4 78%	0.2 61%	0.4 67%	29.9 70%	-1.2 77%	-0.8 68%	-16.2 75%	-0.2 64%	-26 72%	0.0 87%	-0.4 89%	0.4 73%	146 47%	181 42%	185 37%	187 30%
MT BARKER AWI BREECH FLOCK-030549	10.5 91%	0.1 60%	1.1 69%	9.1 83%	-0.2 89%	-1.6 85%	-0.5 88%	4.8 81%	-36 83%	-0.1 90%	-0.5 91%	0.1 87%	144 61%	177 51%	182 43%	178 36%
MT BARKER AWI BREECH FLOCK-112817	8.8 77%	-0.3 55%	0.3 63%	19.2 68%	-1.8 76%	0.2 66%	-7.0 74%	-1.9 63%	2 65%	-0.1 80%	0.1 80%	-0.2 67%	148 45%	183 40%	178 35%	184 29%
MT BARKER AWI BREECH FLOCK-112903	9.3 79%	0.5 57%	1.8 65%	13.8 70%	-0.5 77%	0.3 69%	2.1 76%	-0.7 65%	-56 70%	-0.2 81%	-0.1 83%	-0.4 71%	134 47%	159 41%	171 35%	174 30%
MT BARKER AWI BREECH FLOCK-072500	5.9 93%	0.8 74%	1.9 81%	13.4 84%	-0.4 90%	-0.9 87%	-0.8 89%	2.1 83%	-75 82%	-0.1 93%	0.2 91%	0.2 88%	142 69%	157 64%	169 60%	171 36%
MT BARKER AWI BREECH FLOCK-103521	11.0 92%	-0.3 56%	0.8 65%	21.3 80%	-0.2 86%	-0.8 83%	-4.6 85%	3.3 78%	9 86%	-0.2 92%	0.6 89%	-0.2 86%	131 56%	162 46%	159 37%	167 35%
MT BARKER AWI BREECH FLOCK-114504	5.1 80%	0.2 55%	0.4 63%	15.2 67%	0.0 76%	-1.0 66%	-2.8 74%	2.1 63%	-21 71%	-0.2 83%	-0.1 88%	0.1 71%	130 47%	153 43%	157 38%	153 30%
MT BARKER AWI BREECH FLOCK-073707	11.8 93%	0.5 74%	1.5 82%	12.7 85%	0.8 91%	-0.9 88%	-0.1 90%	3.1 84%	-3 84%	-0.2 93%	-0.4 92%	0.0 89%	118 73%	145 69%	153 66%	155 36%
MT BARKER AWI BREECH FLOCK-114901	7.6 74%	0.3 56%	1.0 64%	7.5 68%	0.2 76%	-0.9 67%	6.0 75%	4.2 63%	-80 63%	0.0 78%	0.0 74%	0.1 65%	132 46%	149 41%	152 36%	148 28%
MT BARKER AWI BREECH FLOCK-093621	5.9 89%	0.0 76%	0.7 83%	9.7 82%	-1.4 88%	-0.7 84%	-5.8 87%	1.0 81%	-46 82%	0.0 91%	-0.1 89%	-0.2 85%	138 63%	156 55%	152 50%	154 35%
MT BARKER AWI BREECH FLOCK-112817	8.3	0.4	1.5	10.5	0.5	-0.5	-3.6	1.2	-37	0.0	-0.2	-0.1	116	139	148	151

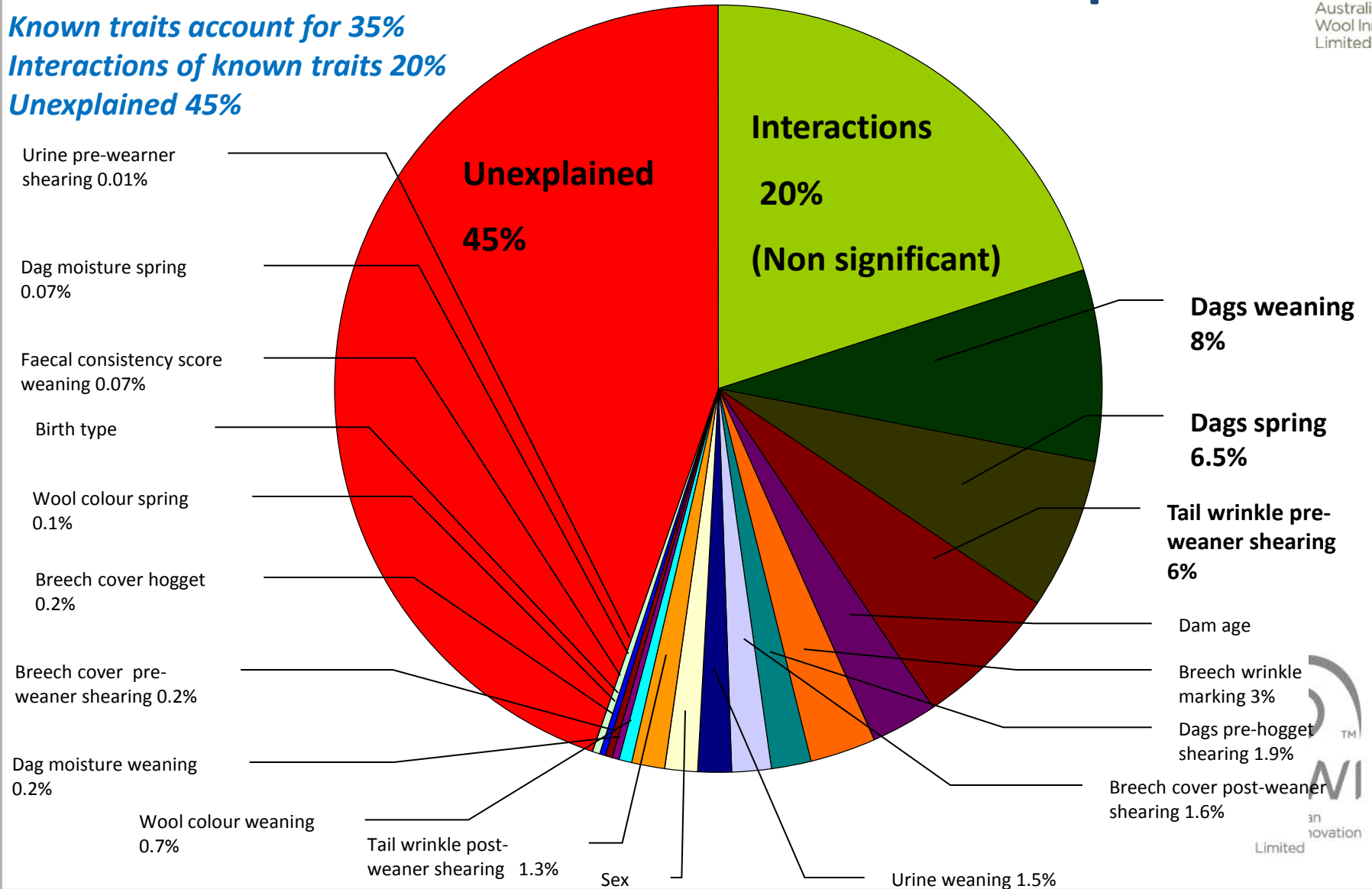
Conclusions

- **Breech strike heritable**
- **Identified indicators traits**
- **Indicator traits – heritable**
- **Indicator traits effective**

However

Indicator Traits Contributing to Breech Strike in WA - 2009 Drop

Known traits account for 35%
Interactions of known traits 20%
Unexplained 45%



What Explains the 45% Unexplained Variation?

Wax, suint, moisture?

Odour – specific chemicals?

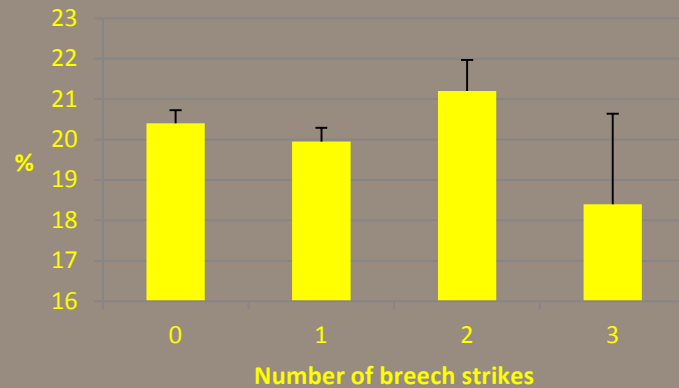
Immune response?

Others?

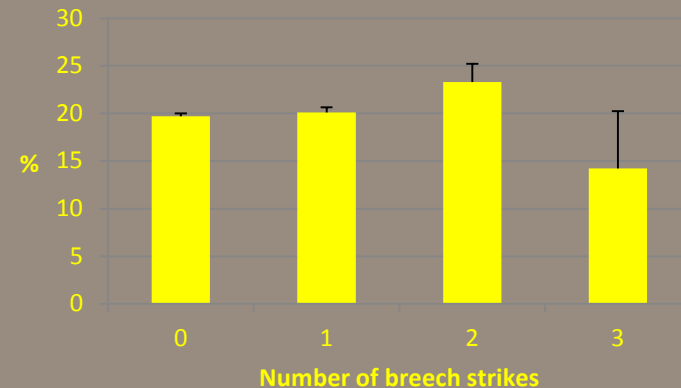


Effect of Wax, Suint, Dust and Moisture on Breech Strike

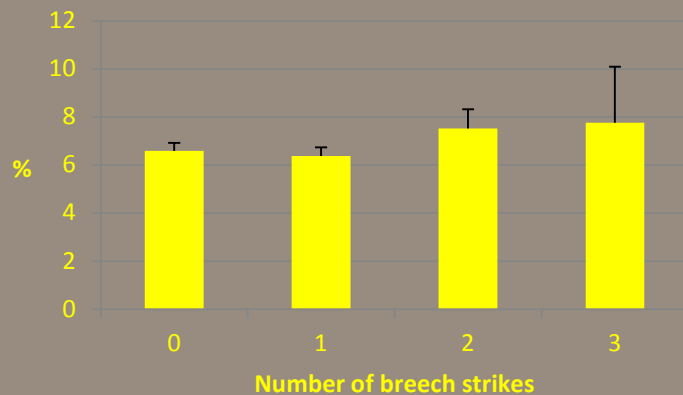
Moisture



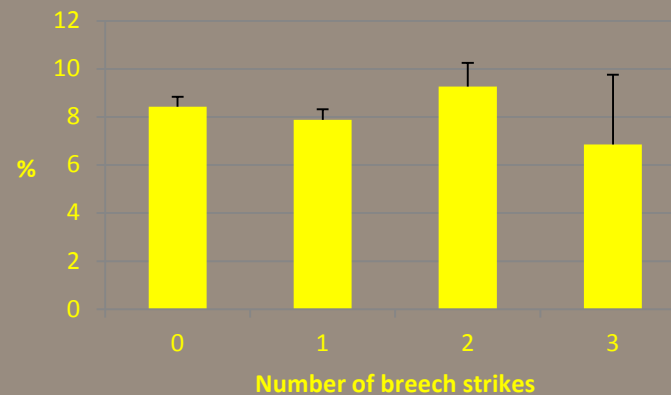
Wax



Dust



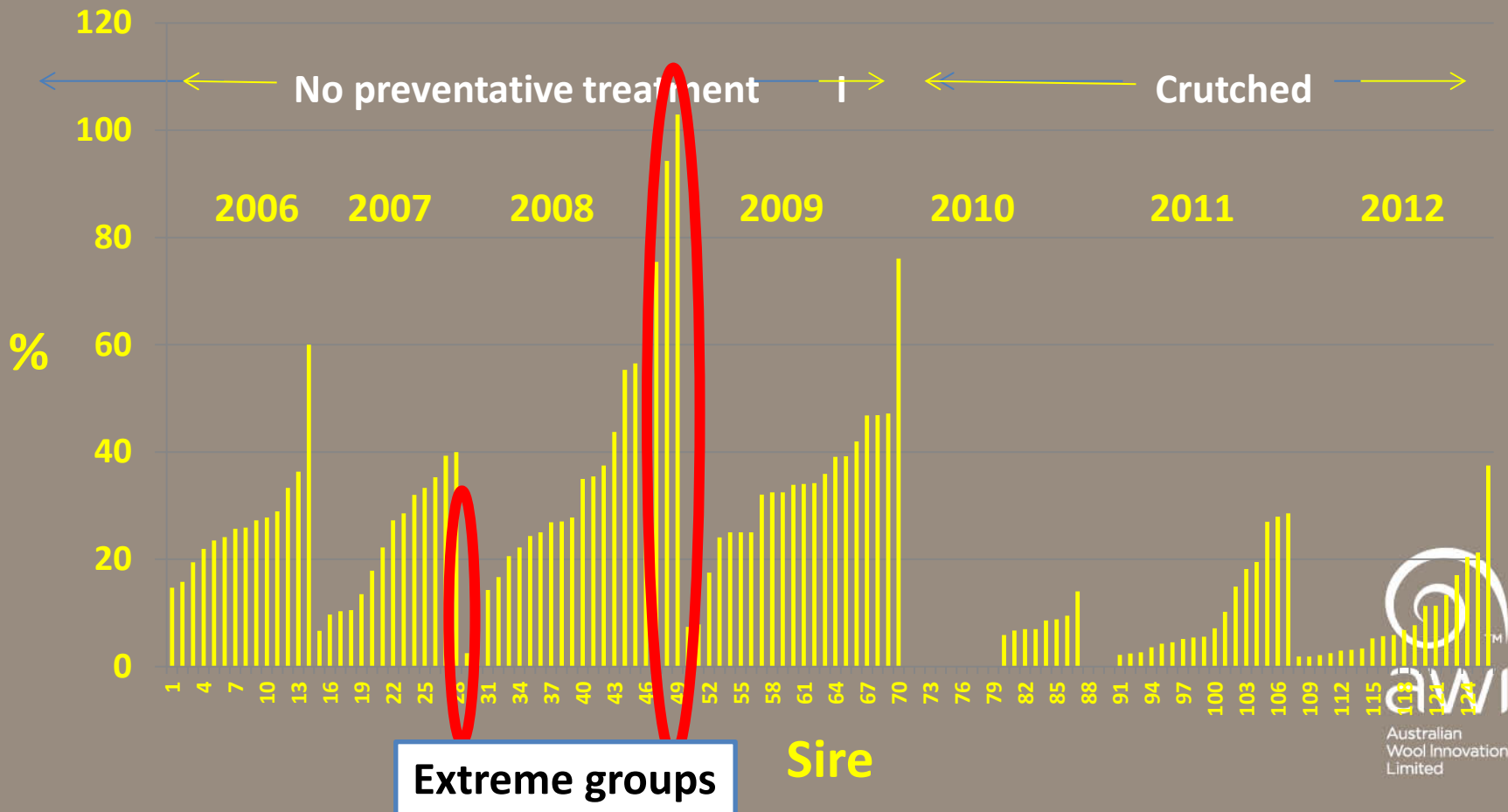
Suint



No stand outs; above traits having limited impact

Sire Progeny Group Differences in Breech Strike

(Birth to hogget shearing)



Incidence of Breech Strike of Extreme Groups over Time

Trait	No	Resistant		Susceptible	
		%	n	%	
Hogget ♀ & ♂	85	5.7	66	98.6	
3 year ♀	32	0.0	37	54.2	
4 year ♀	31	0.0	33	10.7	
5 year ♀	27	0.0	30	16.5	

All ewes were regularly crutched prior to lambing

Indicator Traits at Weaning of Extreme Sire Progeny Groups for Breech Strike

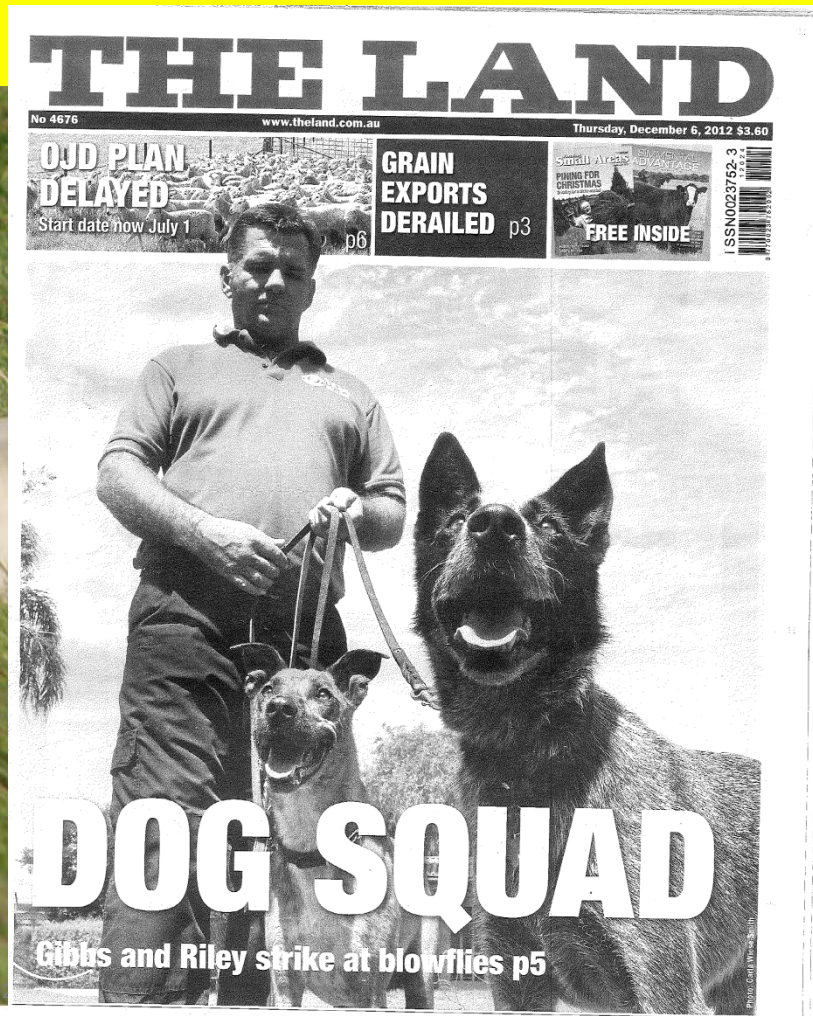
	Resistant		Susceptible		P-value
	Sire 1	Sire 2	Sire 3	Sire 4	
Incidence of breech strike (%)	2.5	8.9	102.9	94.3	<0.001
Number of progeny	41	44	35	31	
Weaning weight (kg)	28.8	25.2	23.3	24.3	<0.001
Dag score	1.3	1.3	1.7	1.6	<0.001
Breech wrinkle	1	1	1	1.1	0.35
Tail wrinkle pre shearing	1.2	1.1	1.1	1.2	0.12
Tail wrinkle post shearing	1.2	1.5	1.7	1.6	<0.001
Breech cover pre shearing	3.6	3.3	3.6	3.5	0.15
Breech cover post shearing	2.8	2.7	3.4	3.1	<0.001
Urine stain	1.2	1	1.3	1.3	0.02
Wool colour	2.6	2.5	2.6	2.5	0.10

Indicator Traits at Hogget Age of Extreme Sire Progeny Groups for Breech Strike

Traits	Resistant		Susceptible		P- value
	Sire 1	Sire 2	Sire 3	Sire 4	
Breech strike%	2.5	8.9	102.9	94.3	<0.001
Progeny No's	41	44	35	32	
Dag score	2.1	2.4	3.3	3.3	0.22
Breech wrinkle	1.0	1.0	1.0	1.0	0.90
Breech cover	2.7	2.6	2.8	2.7	0.20
Urine stain	1.2	1.3	1.5	1.4	<0.01
Wool colour	2.5	2.7	2.8	2.7	0.03

Potential Traits

Odour – Call in the Dogs





Video showing novice trained dogs identifying wool samples from resistant lines and ignoring wool samples from susceptible lines

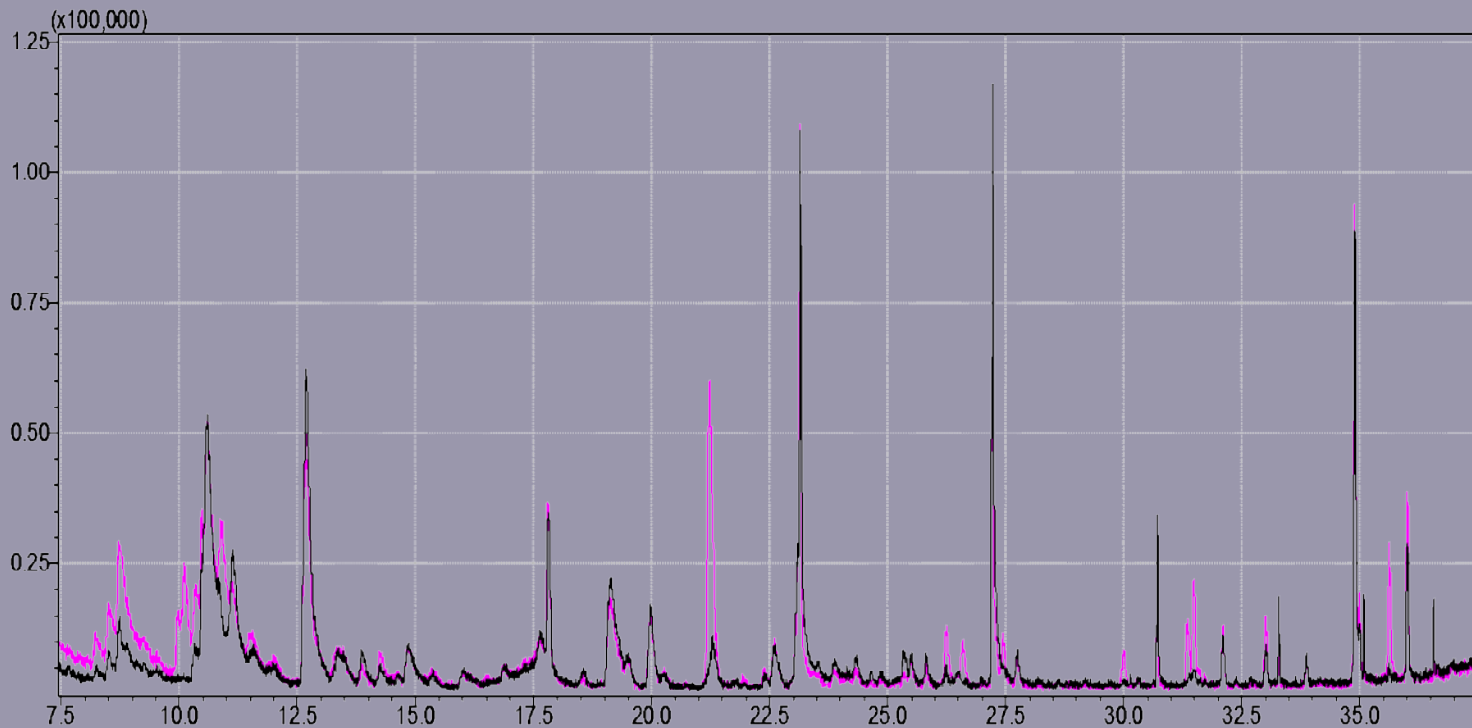
Accuracy of Detection

Dogs

Test samples	Accuracy	
	Resistant	Susceptible
Trained (Mt Barker samples)	100%	100%
Blind test (CSIRO samples)	82%	92%

This was a scoping study only due to a number of un controllable variables, it created more confidence to invest in more formal odour and bacteria studies

Chemical Odours Components



Gas chromatograph profile of odour components from a resistant and a susceptible sheep (University of WA - Joe Steer)

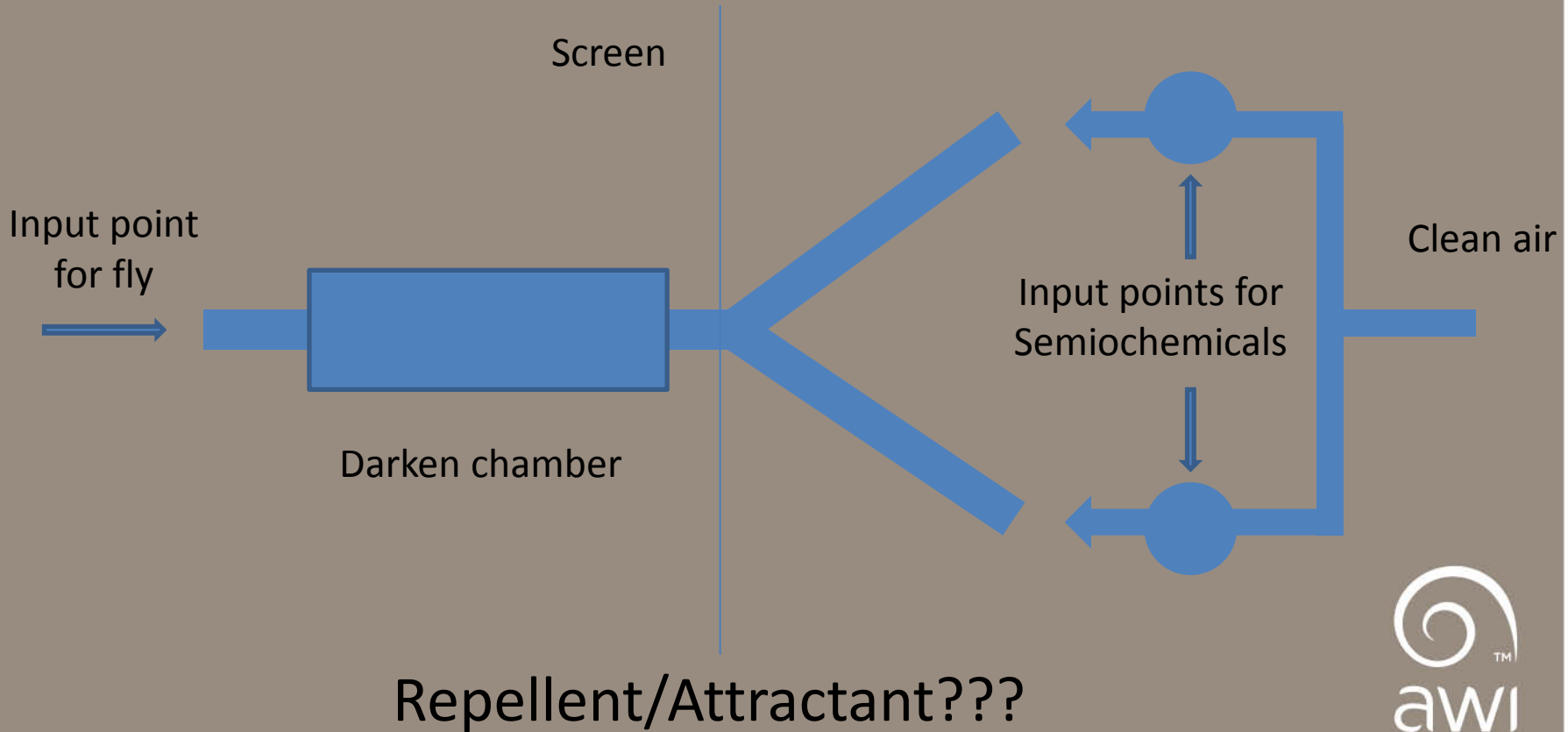
Gas Chromatograph/Mass Spectrometer Analysis

Preliminary analysis (n=74)

- from flock extremes
- 310 peaks identified
- ~30 peaks account for 80% of variation in Breeding Value for Breech Strike
- All 2012 and 2013 drop crutchings sampled July 2014



- Olfactometer
- University of WA
- Joe Steer, PhD student



MICRO – ORGANISMS

Only 5% bacteria can normally be cultivated

DNA – Test for >4000 bacterial species

Identify micro-organisms in & on skin & on wool

6 Surplus rams tested

3 resistant and 3 susceptible rams

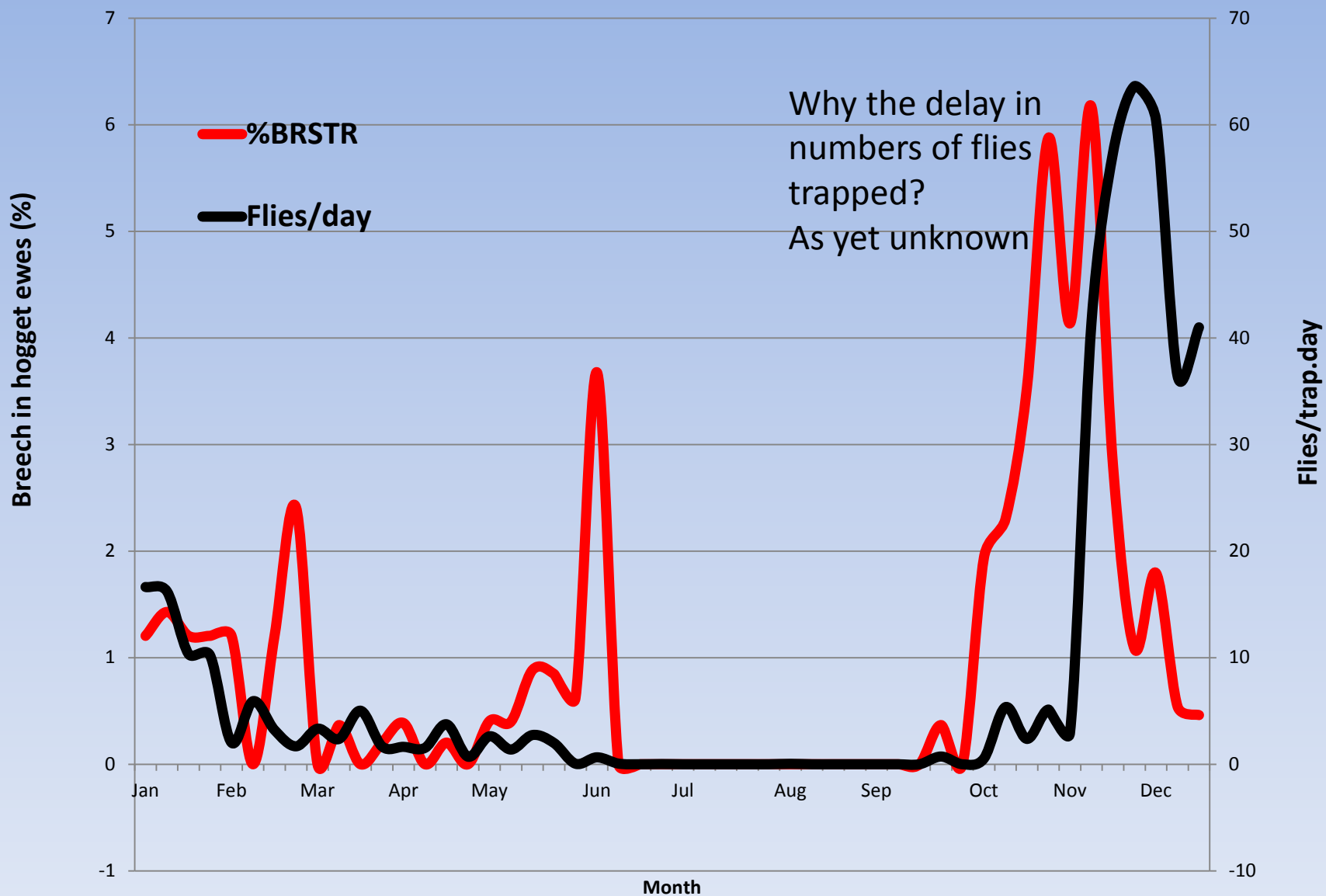
Micro-Organism Differences Between Lines

2012 and 2013 drops to be skin sampled in September 2014

2014 drop skin sampled at weaning

Taxon	Res/Susc
Armatimonadetes	only R
Chlorobi	only R
NKB19	only R
Nitrospirae	only R
OD1	only R
SR1	only R
TM6	only R
WPS-2	only R
WS2	only R
WYO	only R
Thermi	12.423
Planctomycetes	7.102
Cyanobacteria	6.317
Acidobacteria	5.643
Gemmatimonadetes	5.260
Chloroflexi	3.371
Actinobacteria	2.291
Proteobacteria	2.022
BRC1	1.679
Fibrobacteres	1.319
Fusobacteria	1.236
Bacteroidetes	0.985
TM7	0.793
Elusimicrobia	0.400
Deferribacteres	0.314
Firmicutes	0.237
Spirochaetes	0.217
Verrucomicrobia	0.201
Tenericutes	0.121
Lentisphaerae	0.094

Limited Opportunities for Strike!



Data from 2006 to 2013

Fly Numbers by Location



What Influences Fly Distribution?

• Sheep

- Sheep in paddock = 7 flies/day
- Sheep absent = 4 flies/day

• Trap location

- Trees = 6 flies/day
- Open = 6 flies/day
- Near water = 3 flies/day

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)

Thank you



Department of
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