ABACUSBIO LIMITED

DairyNZ

NEW APPROACHES TO FERTILITY EVALUATION IN A SEASONAL CALVING SYSTEM

Interbull Meeting - Berlin
May 20, 2014

K. Stachowicz, G. Jenkins, P. Amer, S. Meier

Objectives

- Investigate alternative trait definitions for calving and mating traits
- Estimate genetic correlations of “best” fertility traits with other fertility, production and conformation traits
- Develop filtering methods to identify CIDR interventions (synchronisations) in heifers
- Estimate variance components for heifer fertility, including correlations with cow fertility traits

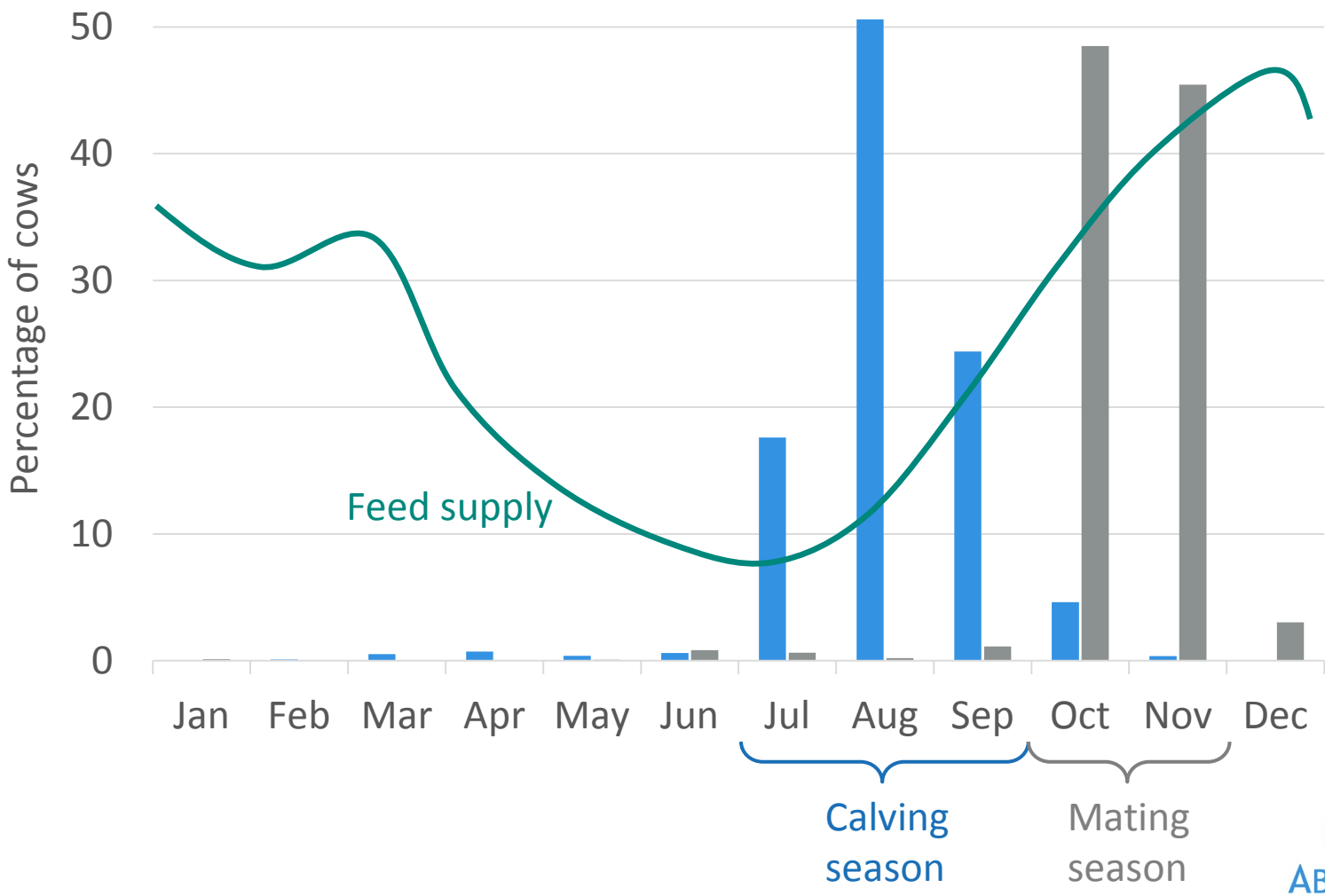
AbacusBio Ltd

The data

- Industry wide data
- 35 million records (1989 to 2013)
- First mating date
- Last mating date
- Calving date

AbacusBio Ltd

Seasonal calving system in NZ



ABACUSBIO LTD

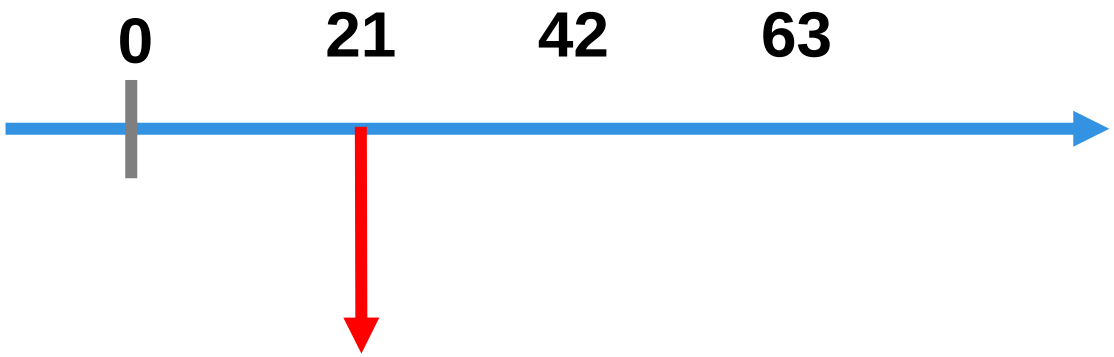
Methods for defining start dates

- Start dates are difficult to define
- Planned Start of Mating (PSM):
  - 3 alternative definitions
- Planned Start of Calving (PSC):
  - 4 alternative definitions
  - Considered PSM + 282 days (gestation length)

AbacusBio Ltd

Mating traits definitions

Planed start of mating (days)

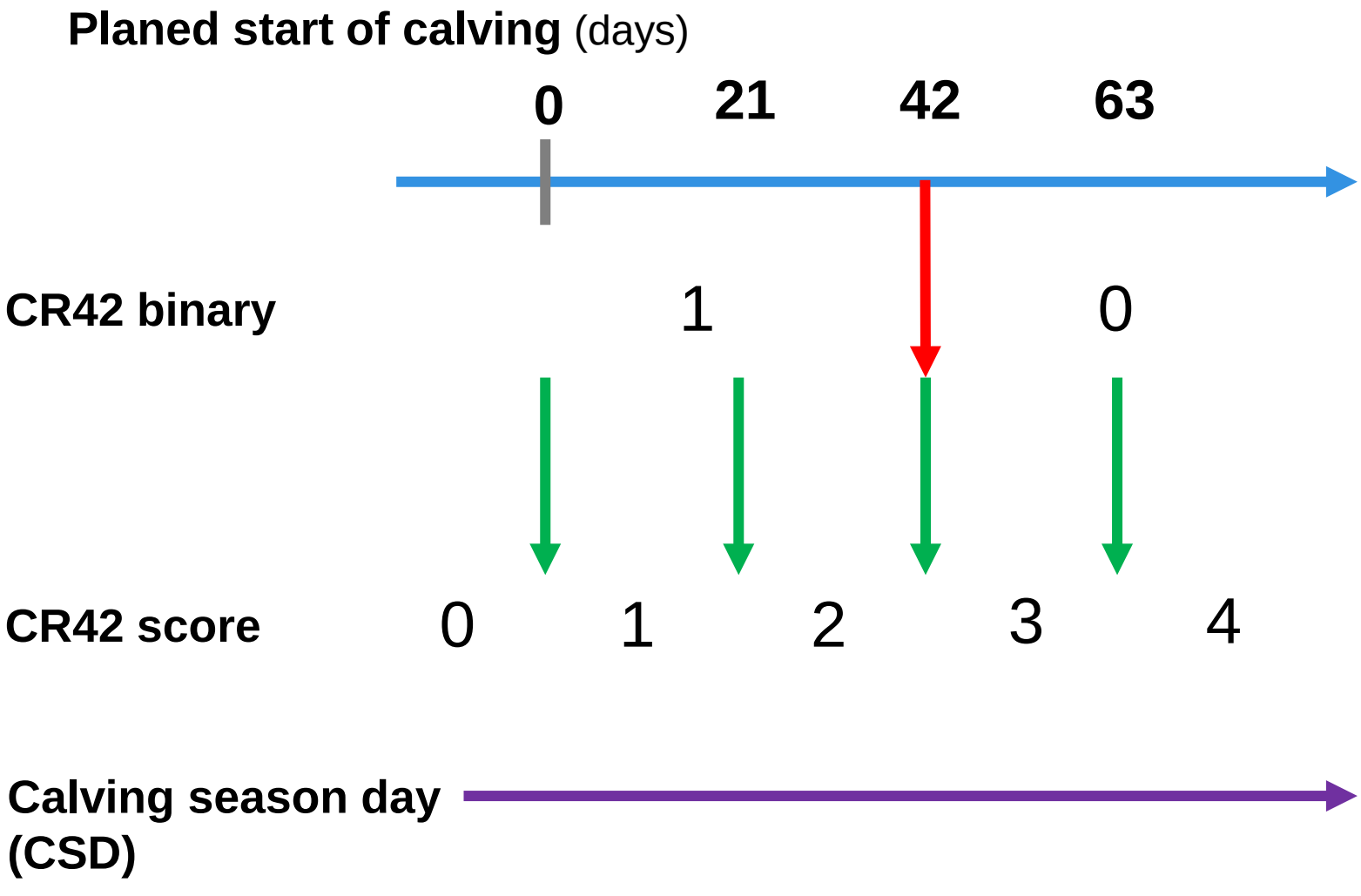


PM21 binary 1 0

Mating season day (MSD)

AbacusBio Ltd

Calving trait definitions



ABACUSBIO LTD

Model

$$y = CG + AgeC*Breed + HF_{FN} + HF_{NZ} + HET + REC + a + e$$

- CG – contemporary group (herd-year-age)
- AgeC*Breed – fixed regression of age at calving nested within breed
- HF_{FN} & HF_{NZ} – breed effect of foreign and NZ HF
- HET – breed specific heterosis effect
- REC – breed specific recombination effect
- a – random animal effect
- e – residual

AbacusBio Ltd

Mating traits heritability estimates

- Little difference between heritability estimates with different planned start of mating (PSM) definitions
- Binary trait slightly outperforms continuous trait

PSM definition	PM21	MSD
1	0.028	0.028
2	0.030	0.028
3	0.029	0.028

Calving traits heritability estimates

- Little difference between heritability estimates with different planned start of calving (PSC) definitions
- Highest heritabilities for continuous trait

PSC definition	CR42 binary	CR42 score	CSD
1	0.010	0.023	0.026
2	0.010	0.025	0.026
3	0.010	0.023	0.026
4	0.010	0.022	0.026

AbacusBio Ltd

Other heritability estimates

Trait	Heritability
Calving interval	0.03
Interval between first and last mating	0.01
Non-return rate	0.01
Calved/not-calved	0.01

AbacusBio Ltd

Genetic correlations with PM21 & CSD

- Protein percentage the best fertility predictor trait

Trait	PM21	CSD
PM21	**---**	**-0.82**
Milk	-0.09	0.13
Fat	0.03	-0.05
Protein	-0.08	0.02
Fat %	0.08	-0.14
Protein %	0.04	-0.22
F/P ratio	0.09	-0.03

AbacusBio Ltd

Genetic correlations with PM21 & CSD

- Protein percentage the best fertility predictor trait

Trait	PM21	CSD
PM21	---	-0.82
Milk	-0.09	0.13
Fat	0.03	-0.05
Protein	-0.08	0.02
Fat %	0.08	-0.14
Protein %	**0.04**	**-0.22**
F/P ratio	0.09	-0.03

AbacusBio Ltd

Genetic correlations with PM21 & CSD

- BCS recorded in early lactation is most useful as predictor of fertility

Trait	PM21	CSD
LWT	0.03	0.15
BCS (1-50 DIM)	**0.31**	**-0.27**
BCS (50-90 DIM)	0.24	-0.19
BCS (90-140 DIM)	0.34	-0.18

AbacusBio Ltd

Genetic correlations with PM21 & CSD

- Interval between first and last mating could be useful as predictor of fertility despite low heritability

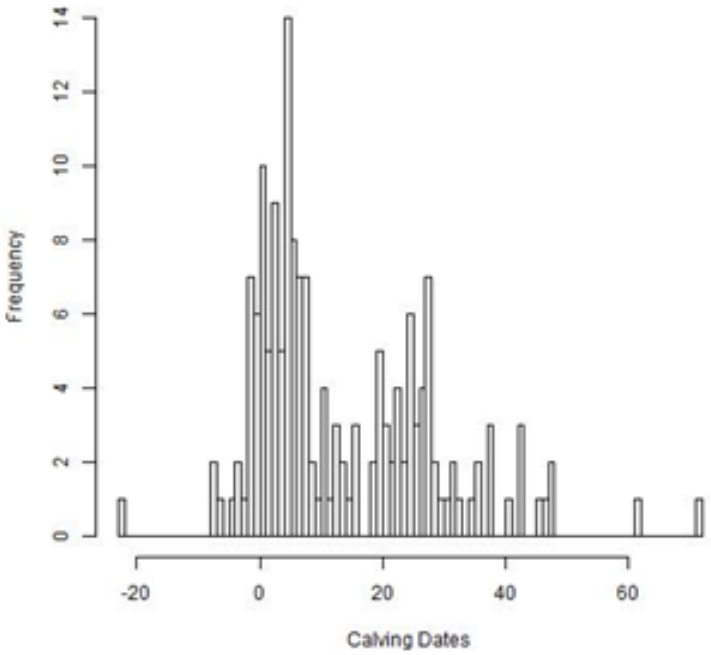
Trait	PM21	CSD
Calving interval	-0.77	-0.05
Interval between first and last mating	**-0.40**	**0.63**
Non-return rate	**-0.27**	**0.58**
Calved/not-calved	0.16	0.02

AbacusBio Ltd

Heifer calving season day (CSD)

- Heritabilities (bold) of heifer calving season day and genetic correlations with cow calving season day

	h^2	σ^2_G
No edits	**0.025**	0.79
Synchrony CG>100	**0.012**	0.52
Synchrony CG>150	**0.020**	0.73



AbacusBio Ltd

Conclusions

- Calving season day continuous and PM21 binary recommended for further analysis
- Start mating and calvings definitions had minimal impact
- BCS useful predictor, milk traits less useful
- Synchronies very difficult to detect
- High genetic correlations of heifer fertility with cow traits

DairyNZ

AbacusBio Ltd

Acknowledgements

"This project is funded by New Zealand dairy farmers through DairyNZ Incorporated and the Ministry for Primary Industries through the Primary Growth Partnership"

DairyNZ

AbacusBio Ltd