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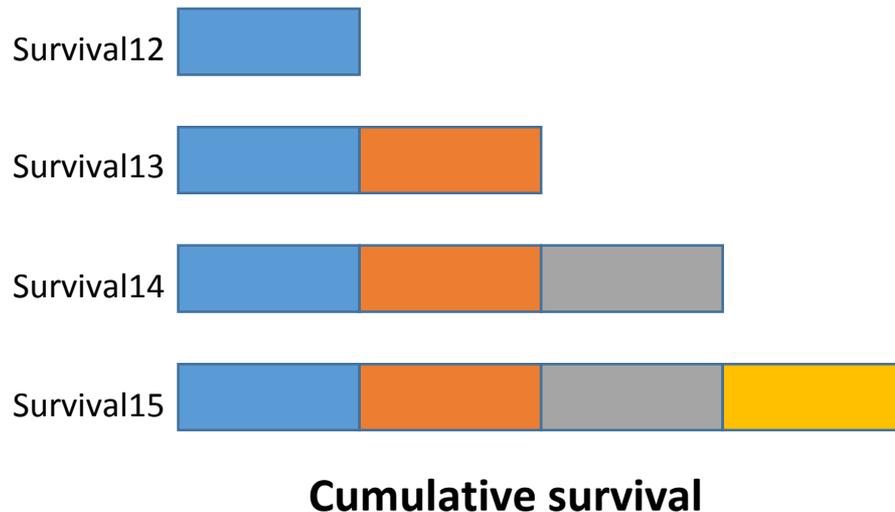
GENETIC PARAMETERS OF COW FUNCTIONAL SURVIVAL AND CONFORMATION TRAITS WITH RECOMMENDATIONS FOR GENETIC EVALUATION

Interbull Meeting - Tallinn
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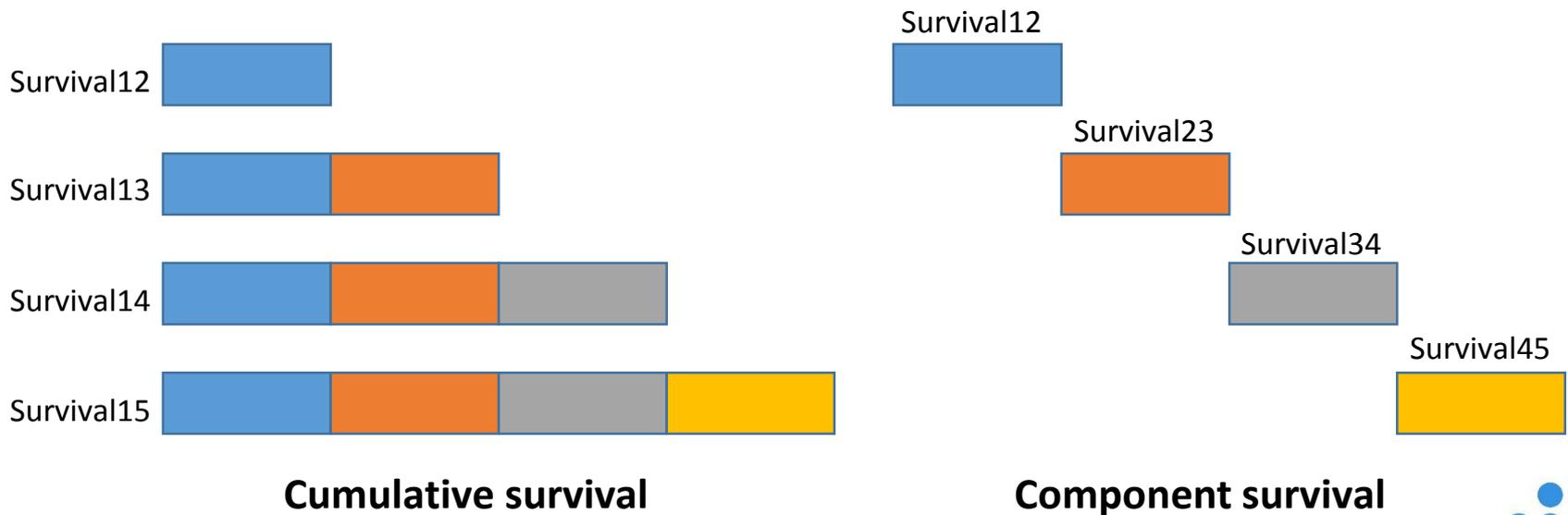
Survival trait definitions

- Current NZ evaluation uses **cumulative** or **part-whole** survival phenotypes
 - ▣ assumes survival from first to fifth lactation is genetically one trait



Survival trait definitions

- Current NZ evaluation uses **cumulative** or **part-whole** survival phenotypes
 - ▣ assumes survival from first to fifth lactation is genetically one trait
- **Component** survival definition is more precise
 - ▣ resolve if reasons for early parity survival differ from later parities



Objectives

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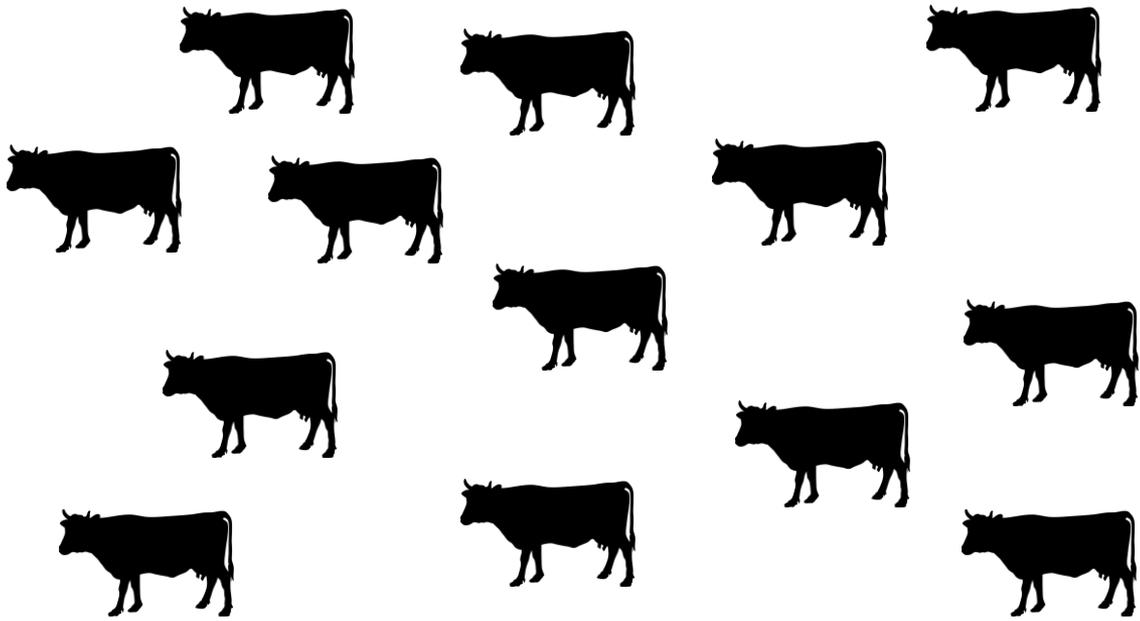
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- Estimate genetic parameters for survival traits and genetic correlations with conformation traits

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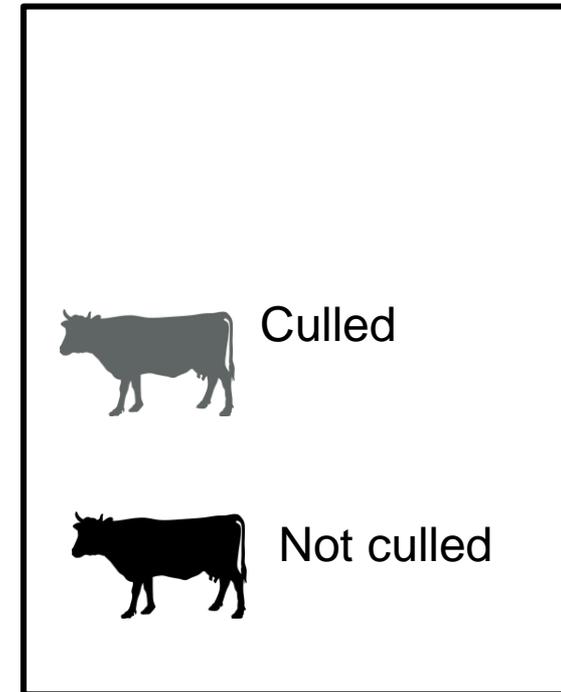
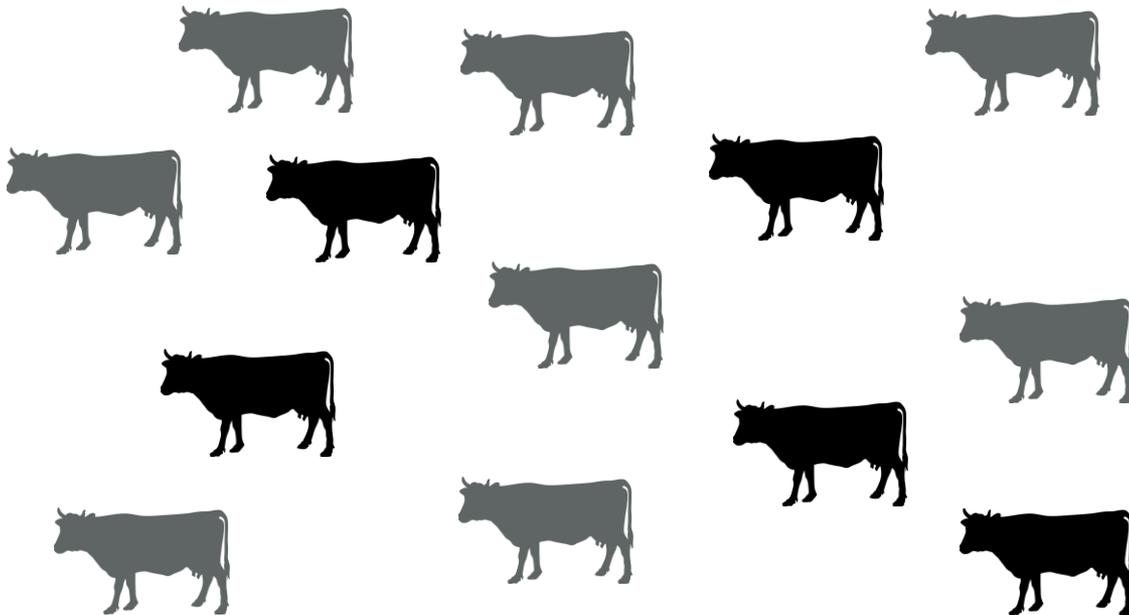
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- Use rules-based approach to define the phenotypes where culling reasons are not recorded
- Estimate genetic parameters for survival traits and genetic correlations with conformation traits
- Use selection index modelling to predict accuracy of survival EBV with and without conformation traits as predictors to define a set of traits to apply in genetic evaluation

Total and functional survival



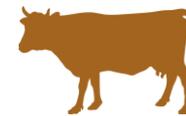
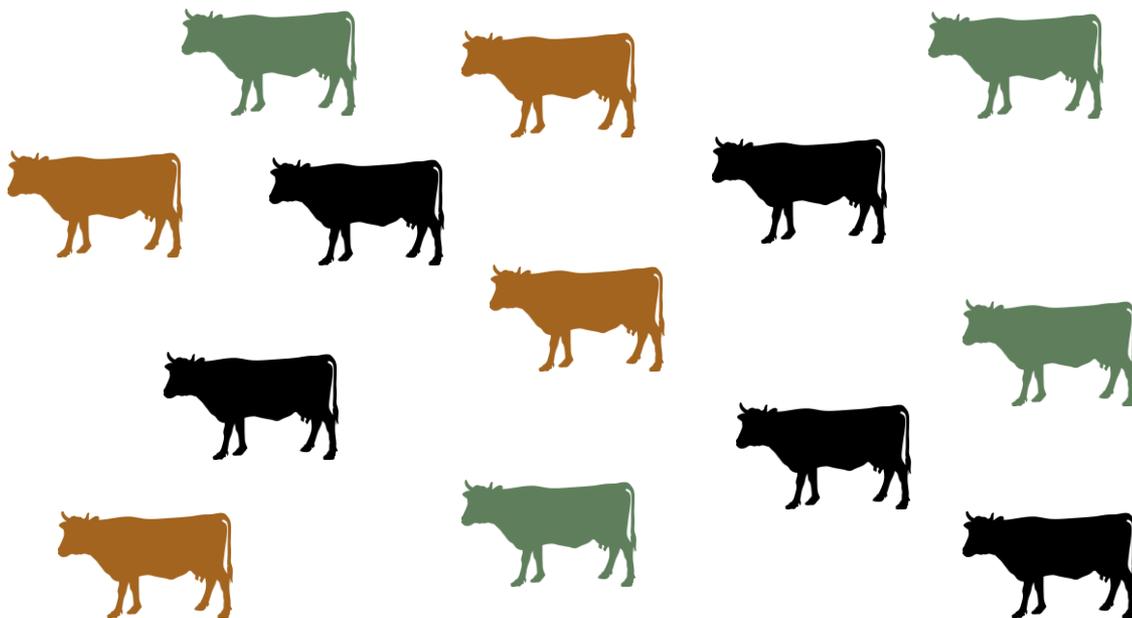
Total and functional survival

Total survival: culling reasons are not considered



Total and functional survival

Functional survival: culling reasons are considered



Culled for low production or low fertility



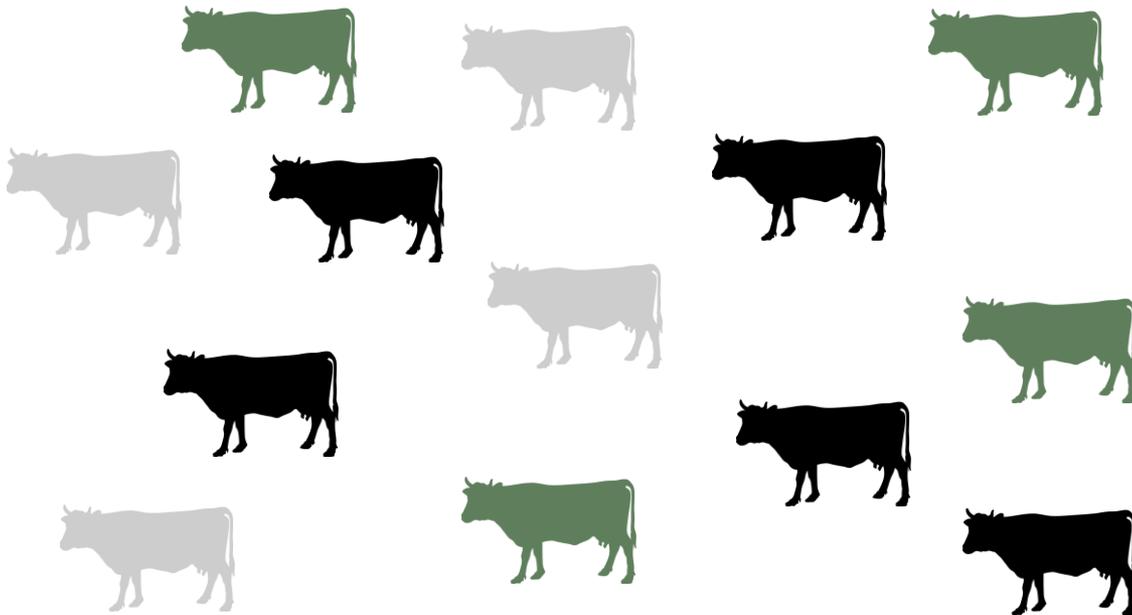
Culled for other reasons

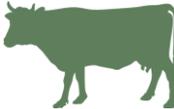


Not culled

Total and functional survival

Functional survival: culling reasons are considered

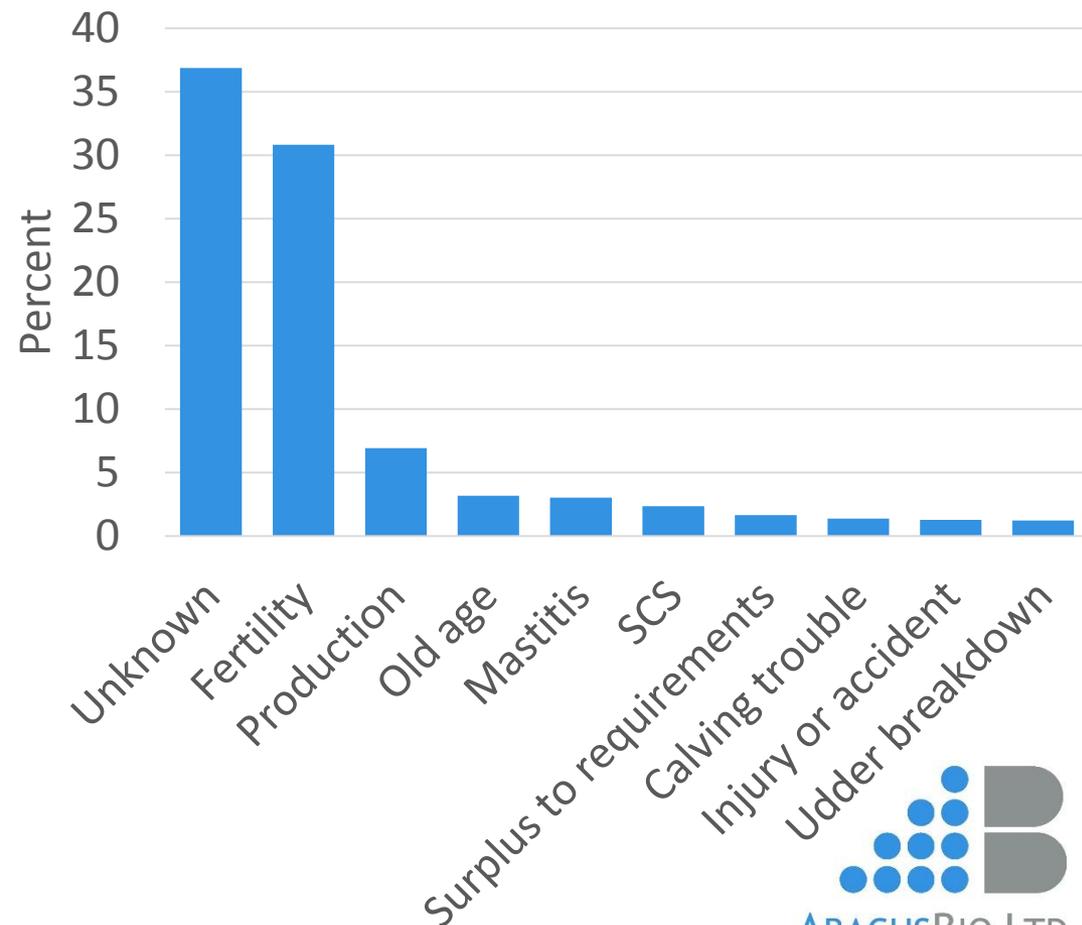


	Record set to missing
	Culled for other reasons
	Not culled

Culling reasons

- Low fertility (50%) and low production (10%) are main culling reasons
- We are interested in health-related culling reasons, e.g. calving trouble, legs/feet, mastitis.

Top 10 culling reasons



Rules to identify cows culled due to infertility or low production

Criteria	Identifies
1. Culling reasons – we know the truth, but if not:	
2. Dry-off codes	Production
3. Pregnancy diagnosis data	Fertility
4. Cows culled after 200 DIM	Fertility, Production
5. Cows culled in large groups at the end of lactation	Fertility, Production
6. Cows with more than 3/4/5 matings before cull	Fertility
7. Cows that calved after 42/63/84/105/126 days in a season	Fertility
8. Herd bottom 1/5/10 % for milk production	Production

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72% of correct prediction

18% incorrect prediction of fertility/production culls (type I error)

8% missed fertility culls (type II error)

2% missed production culls (type II error)

Survival phenotypes

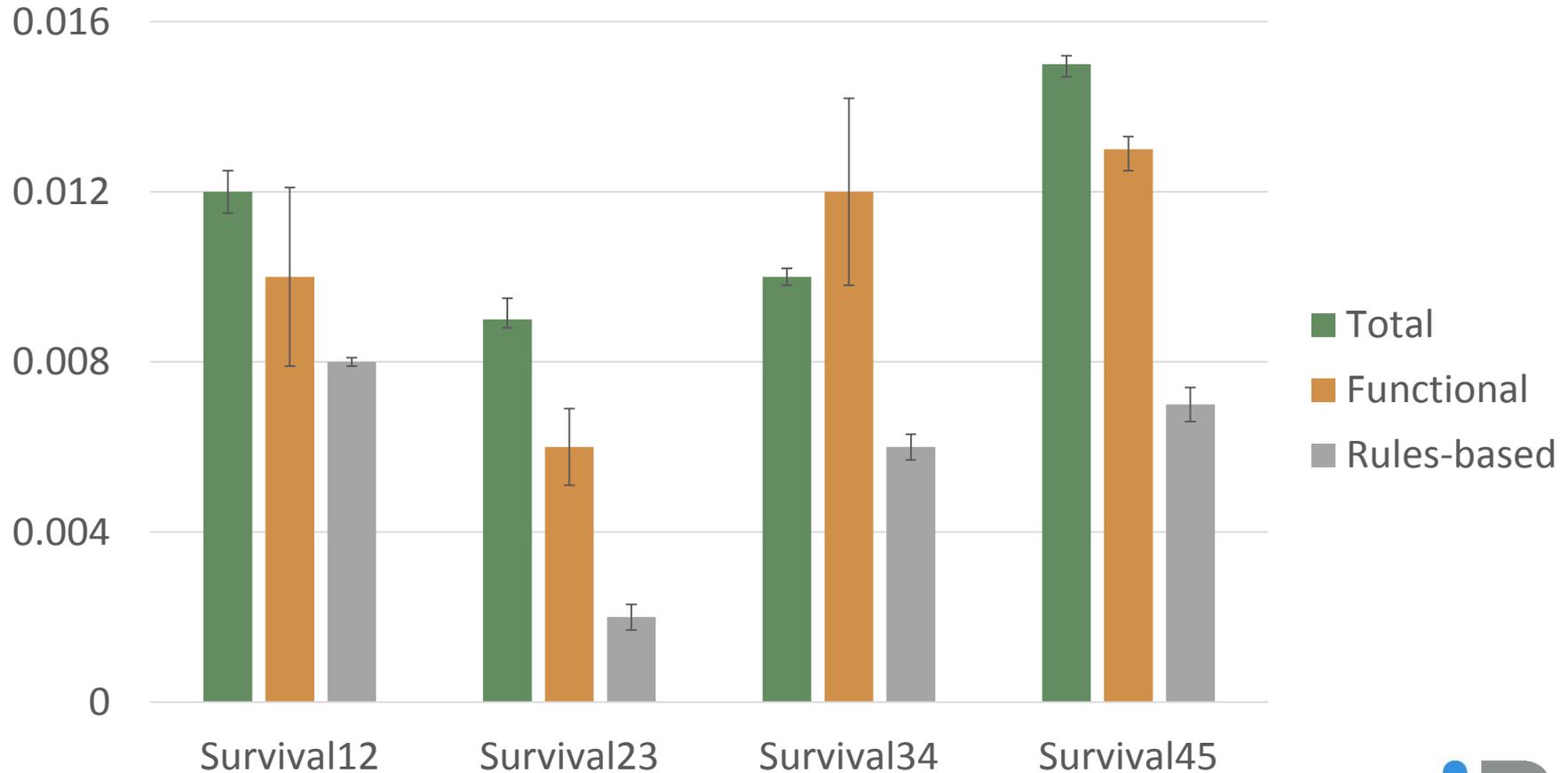
	Trait	Average Survival
Total	Survival12	0.88
	Survival23	0.90
	Survival34	0.89
	Survival45	0.86
Functional (based on known culling reasons)	Survival12F	0.94
	Survival23F	0.95
	Survival34F	0.94
	Survival45F	0.93
Functional (based on rules to identify culling reasons)	Survival12FR	0.95
	Survival23FR	0.96
	Survival34FR	0.96
	Survival45FR	0.95

Model

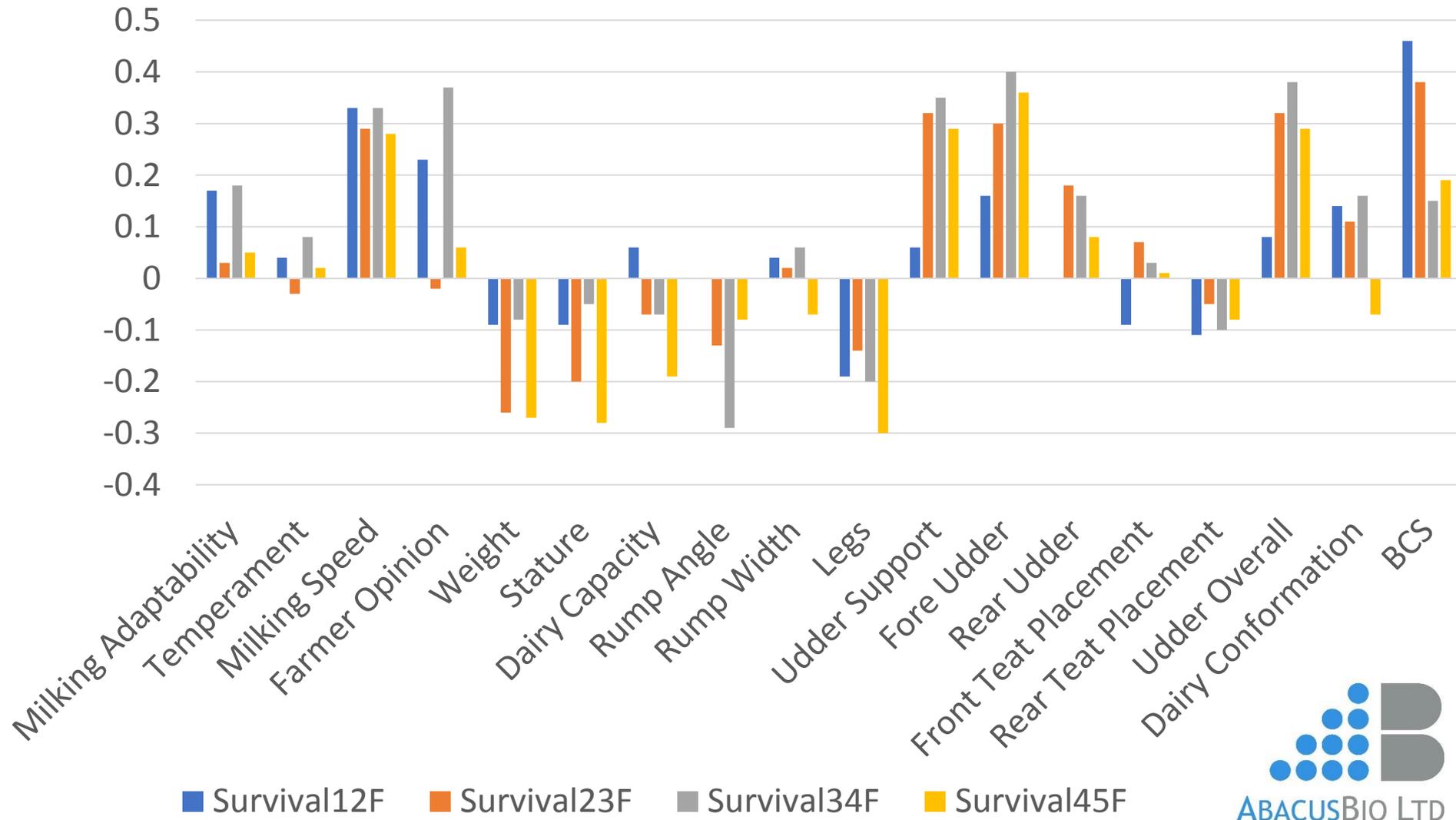
$$y = CG + \text{Age} + HF_{FN} + HF_{NZ} + \text{HET} + \text{REC} + a + e$$

- CG – contemporary group (herd-year)
- Age – fixed linear regression of age at calving
- 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

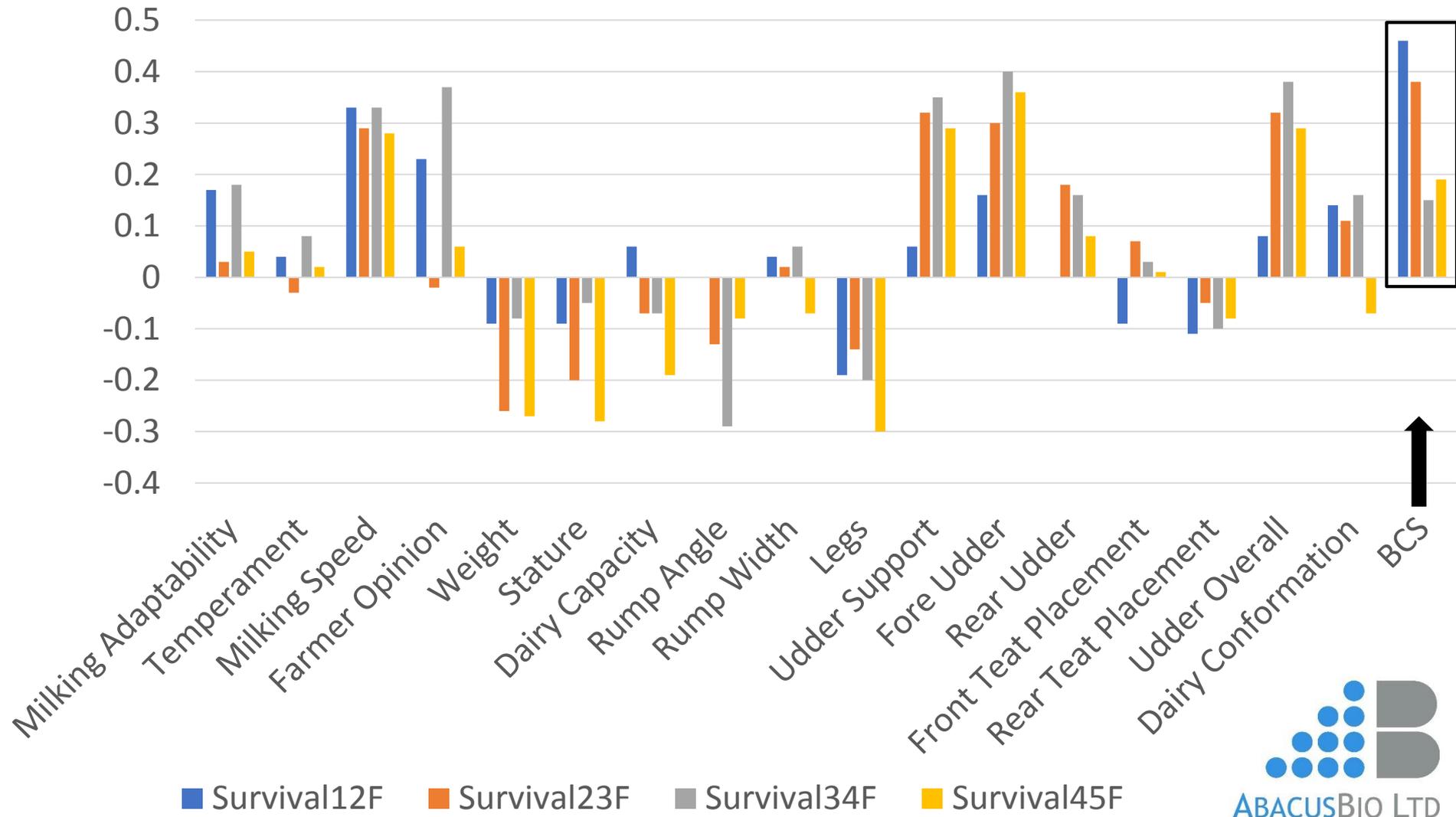
Heritabilities of survival



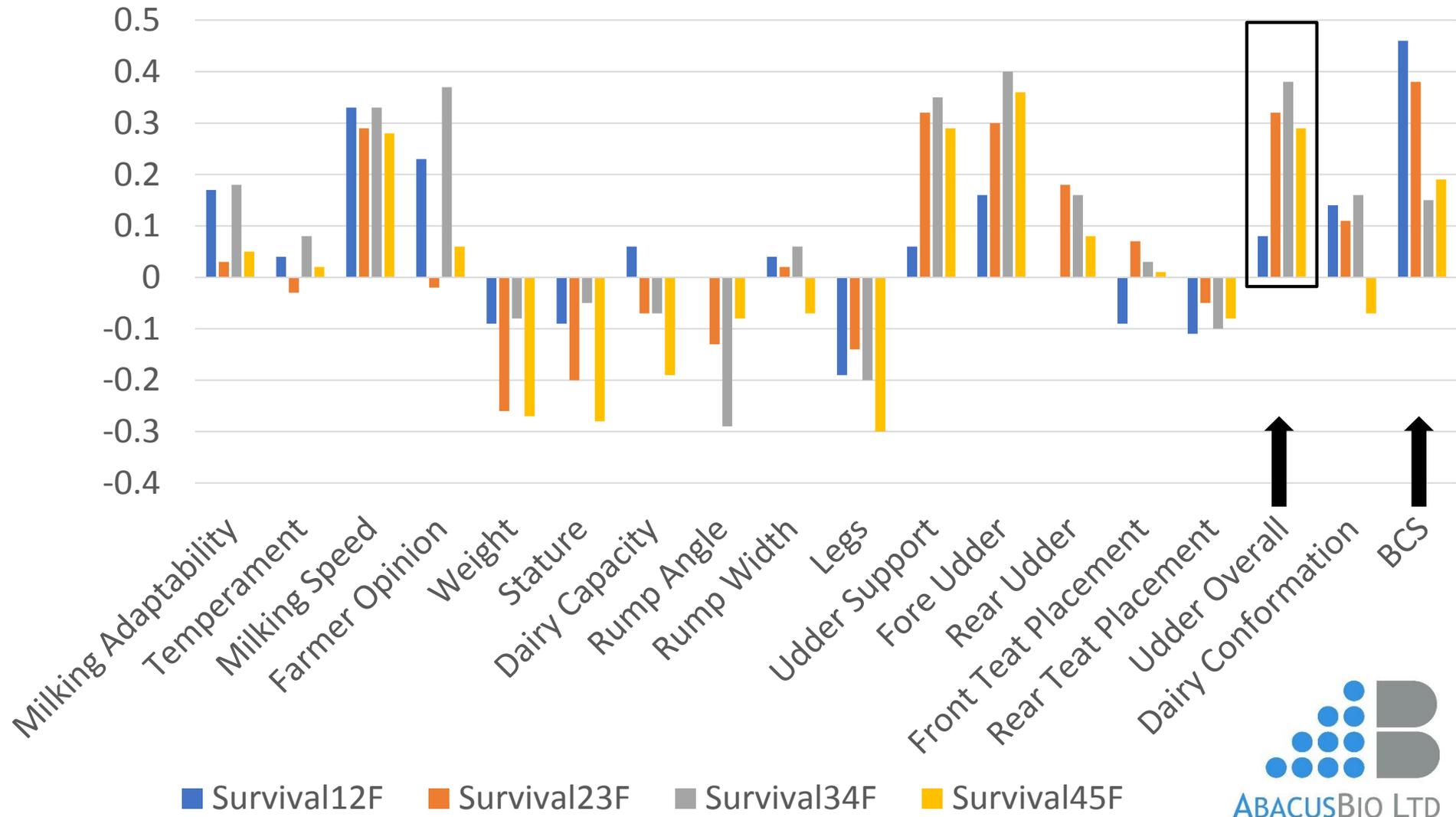
Genetic correlations between conformation and functional survival



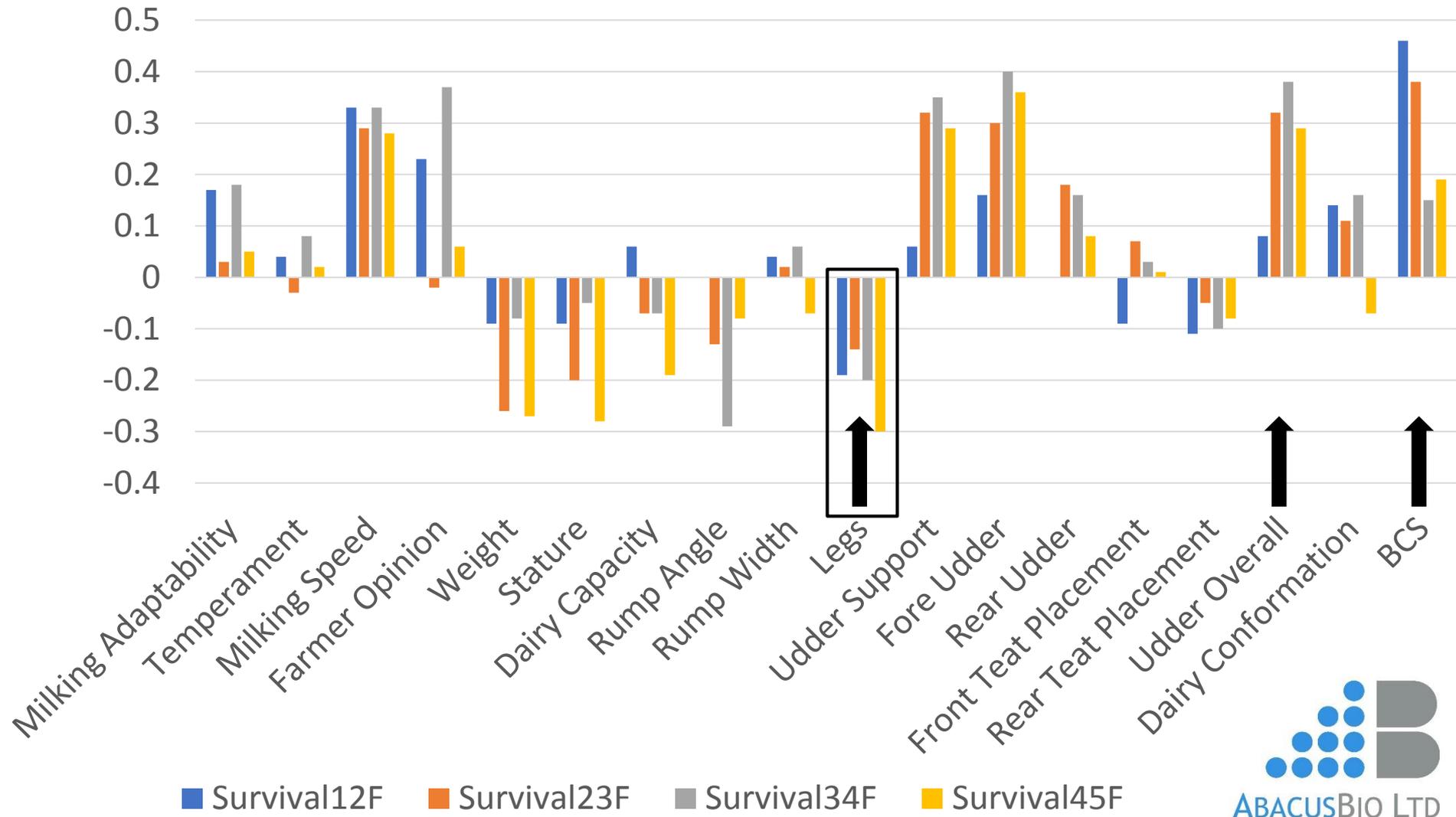
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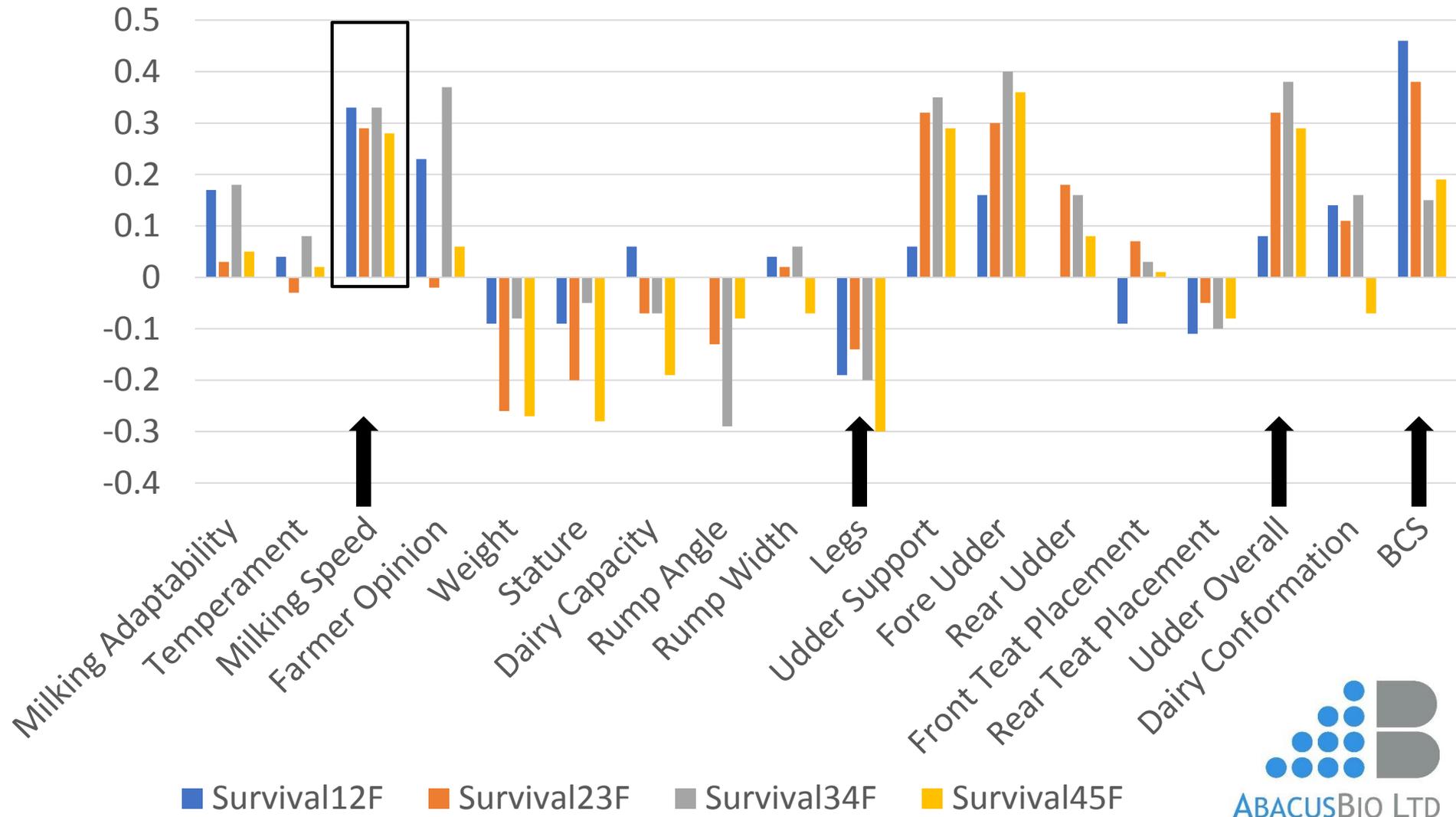
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Genetic correlations between conformation and functional survival



Accuracy of evaluation of survival

- ▣ Predicted accuracies of sire evaluation of functional survival, depending on available phenotypes
- ▣ Overall functional survival as an index:

$$T = BV_{Surv12F} + 0.73 BV_{Surv23F} + 0.47 BV_{Surv34F} + 0.28 BV_{Surv45F}$$

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Indicator traits	Accuracy
Survival12	0.30

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BCS + Udder Overall + Milking Speed + Legs	0.48

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BCS + Udder Overall + Milking Speed + Legs	0.48
BCS + Udder Overall + Milking Speed + Legs + Survival12	0.53

Conclusions

- Functional survival trait can be used for selection in New Zealand

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- Functional survival trait can be used for selection in New Zealand
- Accuracy of evaluation prior to Survival12 phenotype being available can be improved by incorporating conformation traits as predictors
 - BCS
 - Milking Speed
 - Udder Overall
 - Legs

Acknowledgements

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