Analysis of calving traits with a multitrait animal model with a correlated direct and maternal effect

Animal Evaluation Unit

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Introduction

- Old Survey System
  - Only **second parity** cows (200-250 records per bull)
- Since 2007 two new systems to report the birth of a calf :
  - Voice Response System (VRS)
  - Notification System (MS) part of VeeManager via CRV-website
- **Much more** records per bull from ***all*** cows *including heifers*
  - Quality of new data was checked and proven to be good enough to use in BVE

Aim

- Investigate the feasibility of analysing calving traits with a multitrait animal model
  - For heifers and cows
  - With a correlated direct and maternal effect
  - Instead of sire-MGS model currently used

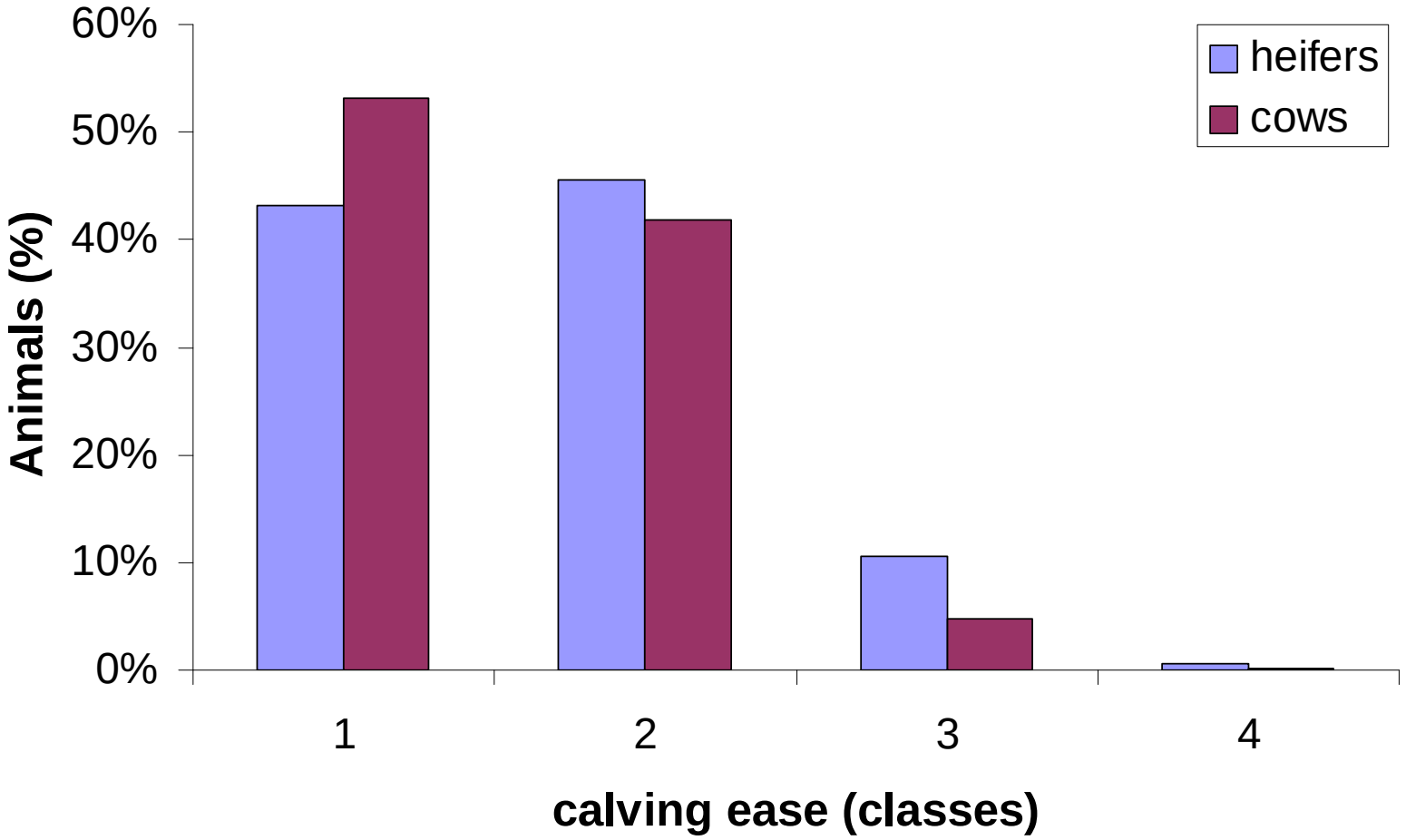
Data selection

- Calvings from 2002 onwards
- Herdbook registered calves with at least 75%HF (for dam as well)
- Gestation length between 260-300 days
- Birth weight between 20-75 kg
- No multiple births
- Extra requirements for VRS and MS:
  - Deviation of calving ease scores per herd per year is at least 0.20 with a minimum of 10 calvings per herd per year
  - No dam-offspring: offspring cannot occur as dam

Statistical Model

- Heifers: Y = S + A + M + HY + calf + cow + E
- Cows: Y = S + P + M + HY + calf + cow + perm + E
  - Y = Observation during birth of a calf for calving ease (transformed), birth weight, gestation length
  - S = Sex — fixed
  - A = Age at calving — fixed
  - M = Month of calving — fixed
  - P = Parity number — fixed
  - HY = Herd x year of calving — fixed
  - calf = Calf born — random
  - cow = Dam of the calf born — random
  - perm = Permanent environment — random
  - E = Residual — random

Data description



Data description (2)

		Heifers	Cows
Gestation length	days	278.8	280.8
Birth weight	kg	39.0	41.6

Heritabilities

		Heifers	Cows
Calving ease	Direct	0.068	0.052
	Maternal	0.048	0.034
Gestation length	Direct	0.391	0.405
	Maternal	0.062	0.048
Birth weight	Direct	0.095	0.115
	Maternal	0.035	0.036

Genetic correlations Heifers

Heifers		CE		GL		BW	
		Dir	Mat	Dir	Mat	Dir	Mat
CE	Dir						
	Mat	*0.25*					
GL	Dir	0.24	0.41				
	Mat	0.01	0.16	*0.09*			
BW	Dir	0.94	0.26	0.29	0.07		
	Mat	0.01	0.24	0.16	0.39	*0.14*	

Genetic correlations Cows

Cows		CE		GL		BW	
		Dir	Mat	Dir	Mat	Dir	Mat
CE	Dir						
	Mat	*-0.39*					
GL	Dir	0.39	-0.12				
	Mat	0.16	0.43	*0.18*			
BW	Dir	0.96	-0.01	0.40	0.03		
	Mat	-0.04	0.73	0.06	0.39	*-0.14*	

Genetic correlations heifers-cows

	Cows	CE 2+		GL 2+		BW 2+	
Heifers		Dir	Mat	Dir	Mat	Dir	Mat
CE 1	Dir	***0.96***	*0.20*	0.46	0.22	0.99	-0.04
	Mat	*-0.33*	***0.82***	0.01	0.18	-0.24	0.60
GL 1	Dir	0.31	0.01	***1.00***	*0.05*	0.47	0.12
	Mat	-0.11	0.69	*0.21*	***0.80***	-0.04	0.26
BW 1	Dir	0.94	0.22	0.43	0.22	***0.99***	*0.12*
	Mat	-0.22	0.16	0.06	0.35	*-0.18*	***0.84***

Discussion

- Direct effect more heritable than maternal effect
- Heritabilities for calving ease in line with countries participating in Interbull:
  - Direct effect: 0.009 - 0.101
  - Maternal effect: 0.011 - 0.121
- Genetic correlations between parities high:
  - Direct effect > 0.95
  - Maternal effect ~ 0.80

Conclusions

- Possible to estimate genetic parameters with an animal model
  - Multitrait
  - With correlated direct and maternal effect
- Ranking between heifers and cows for the direct effect nearly the same
- Change routine evaluation to animal model
  - Include more data
  - Multitrait with direct and maternal effect

Questions?