



# Evaluating maternal traits in the Austrian Murbodner cattle: Genetic parameters and inbreeding depression



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# Murbodner cattle



- Ancient Austrian cattle breed, dates back to 4th century BC (Celtic-Illyrian)
- Became widespread in the Eastern Alps and Alpine foothills.
- Recognized as a Styrian local breed in 1869
- After the 2<sup>nd</sup> WW, Murbodner quickly displaced by Fleckvieh



# Murbodner cattle



- Last breeding organisation dissolved in 1970
- In 1982, ÖNGENE started preservation program for Murbodner breed
- Since 2003, Murbodners managed by Murbodner Breeders Association
- Current breeding goal: meat and milk production

- Currently, Murbodner  
product in Austrian su



sive local



# Current Murbodner situation



- 469 registered herds, 4,025 registered cows, average herd size: 9 (ZAR)
- Breed is registered as endangered, ensuring farmer subsidies
- Compulsory mating advice program based on pedigree inbreeding coefficients of expected offspring (ÖNGENE)

Lebensnummer	Name	GebDat	Belegstier		Inzuchtgrad %
AT 667.554.617	SONNE	13.07.10	AT 644.808.147	HUGO	0,62
			AT 188.912.216	KOMET	1,04
			AT 329.343.272	BARI*04	1,38
			AT 110.196.605	MANO	1,59
			AT 488.302.117	BOSS	1,68



- Both AI and natural mating bulls. Thresholds AI: 2% NM:4%

# Current Murbodner situation



- Ten AI bulls per year selected based on pedigree and performance
  - Semen is collected and distributed (storage is limited)
  - Breeding Values have never been estimated
  - Farmers are very interested in genetic selection
  - Current population size shows good potential
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# Genetic selection in the Murbodner

- ÖNGENE project to combine restricted inbreeding with genetic selection
- Long-term objective of the project
- Objective of current study:

Evaluate the genetic parameters, inbreeding statistics and inbreeding depression of/on important traits for the Murbodner population

- Traits: Calving Ease (CE), birth weight (BW) & 200-day weight
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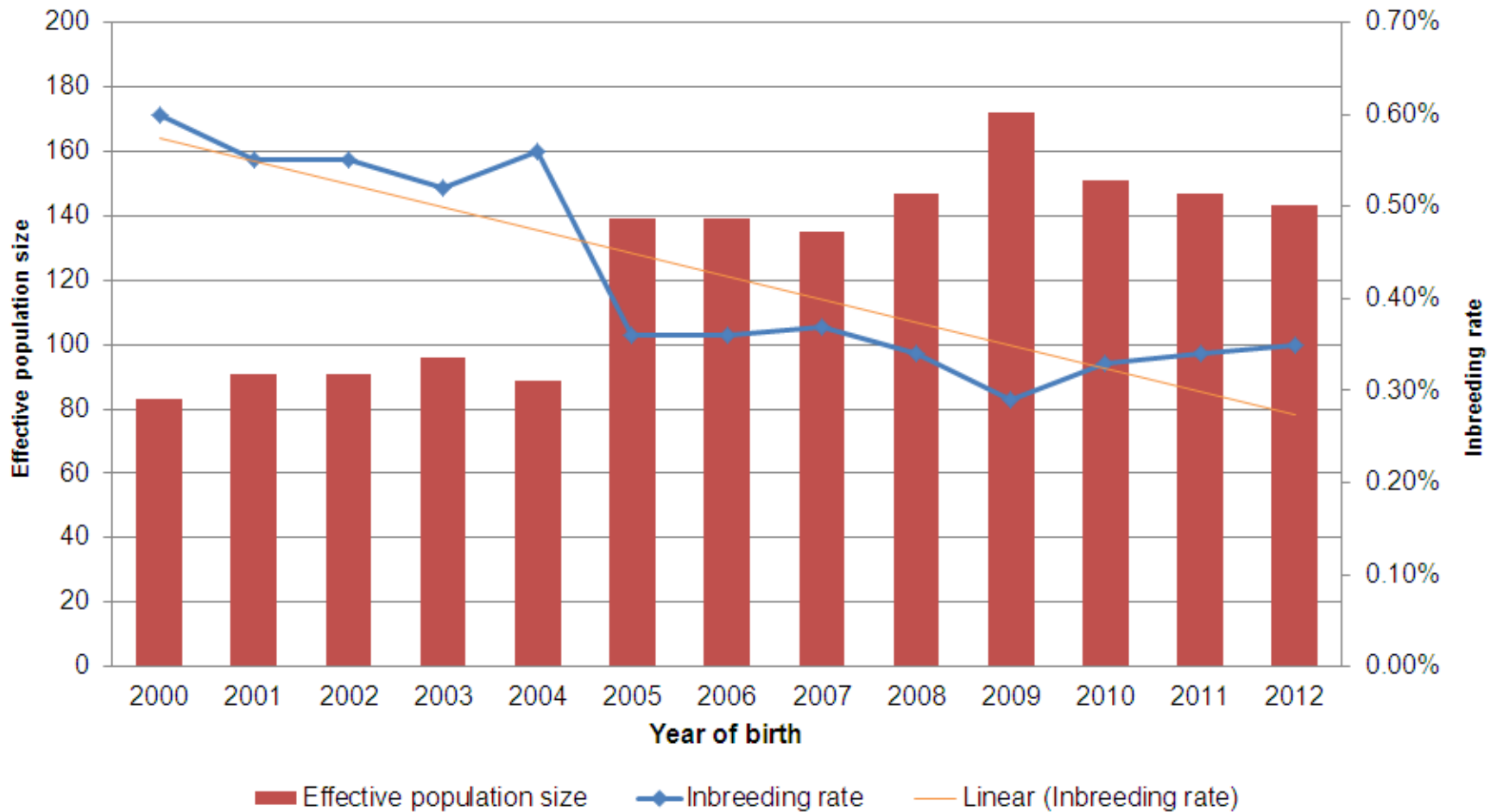
# Data



- 25,154 CE records, 16,295 weight records (2000-2013) (Zuchtdata)
- 22,497 merged records, approximately 500 herds, 450 sires
- Up to 10 parities, 20% first parity records
- Inbreeding coefficients estimated with Relax2 (Stränden and Vuori, 2002)



# Inbreeding Statistics





# Phenotypes

- 4 grade-scale: Easy, Normal, Difficult, Caesarean (farmer recorded)

CE	1 <sup>st</sup> parity (%)	>2 <sup>nd</sup> parity (%)	Total (%)
Easy	57	75	70
Normal	31	21	24
Difficult	11	3	5
Caesarean	1	0	0

- Weight traits: 90-280 days: 200 day weights.

	Mean (kg) ± std
Birth Weight	41 ± 5
200-day	231 ± 60



Pictures by Murbodner Association

# Genetic parameter estimation, CE

- Correction for unrealistic CE scoring by farmer
- Only single births
- Animal Model (ASREML, Gilmour et al. 2006)

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## Fixed

Sex of calf\*parity

Age of dam\*parity

Year\*month of calving

Herd

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## Random

Animal

Dam

Herd\*year

Perm. Env.

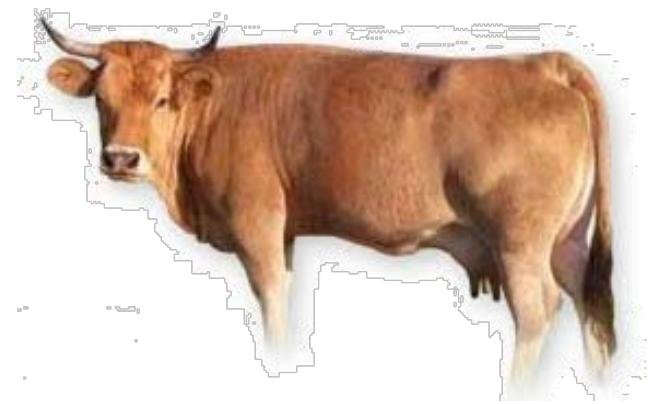
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- Scores transformed to mean z-values on underlying normal distribution
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# Genetic parameter estimation, weight

- Animal Model (ASREML, Gilmour et al. 2006)

Trait	Fixed	Random
BW	Sex, parity, Age of Dam, Year of calving, herd	Animal, Dam, Herd*year, Perm. Env.
200 day	Parity, Sex*Age at recording, herd, Age at recording <sup>2</sup> , Year*month of recording	Animal, Dam, Herd*year, Perm. Env.



# Results - Genetic parameters

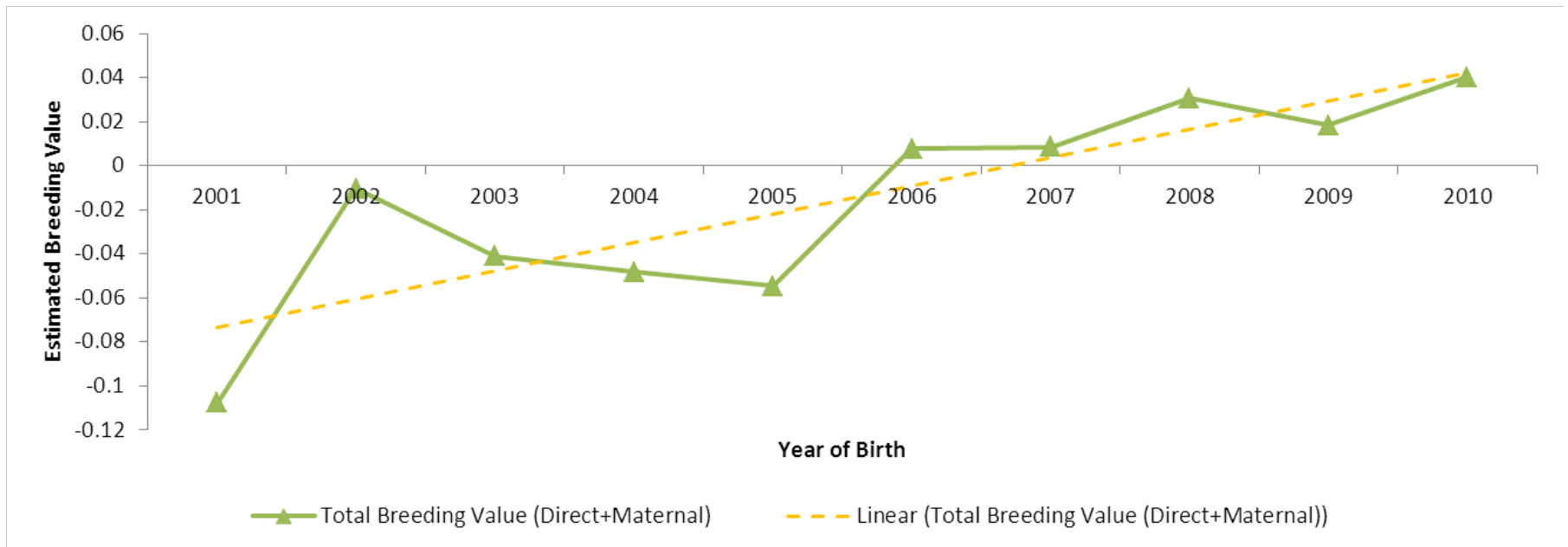
- Calving Ease:

	Calving Ease - direct	Calving Ease - maternal
Calving Ease – direct	$0.17 \pm 0.04^*$	
Calving Ease - maternal	$-0.44 \pm 0.10^*$	$0.07 \pm 0.02^*$



\*  $P < 0.05$

# Genetic Trend Calving Ease



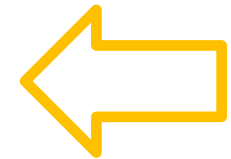
# Results - Genetic Parameters

- Weight traits

	Birth weight - direct	Birth weight - maternal
Birth weight - direct	$0.49 \pm 0.05^*$	
Birth weight - maternal	$-0.57 \pm 0.05^*$	$0.31 \pm 0.03^*$

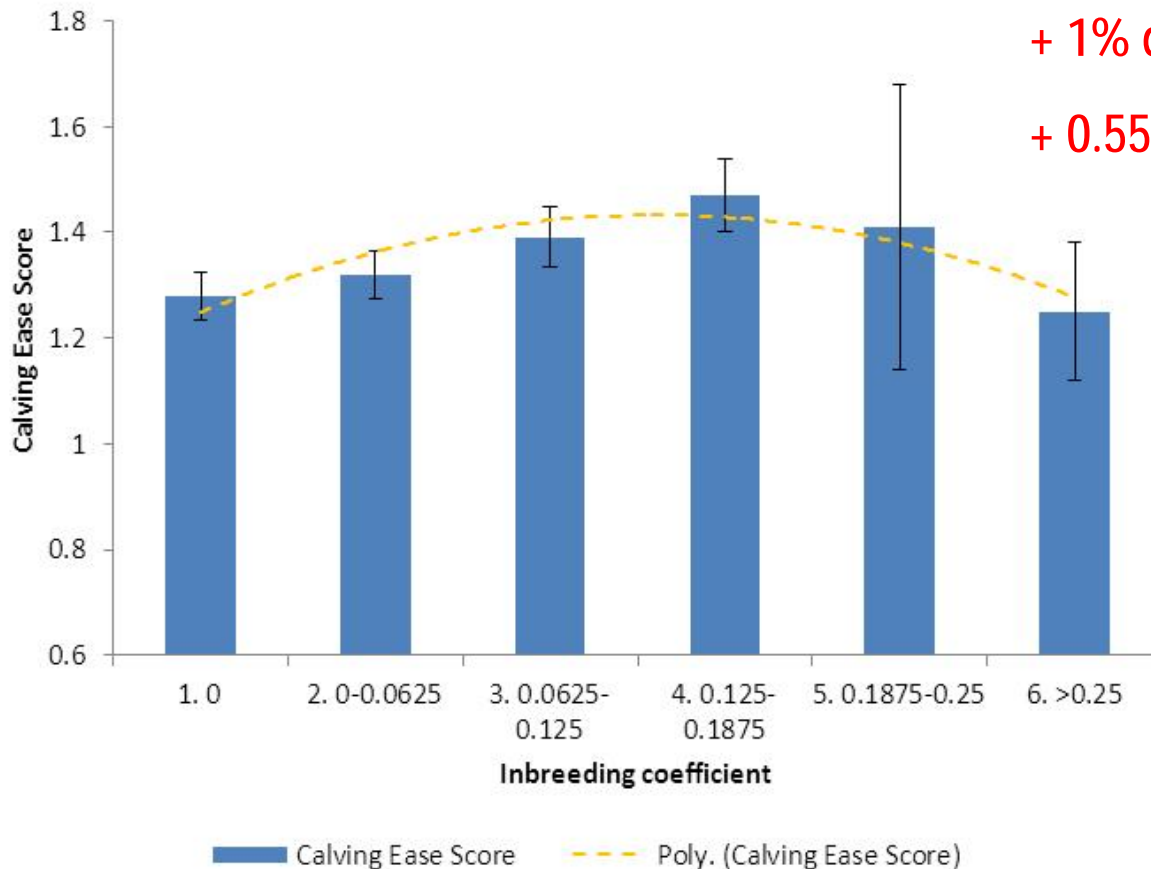
	200 day weight - direct	200 day weight -maternal
200 day weight - direct	$0.11 \pm 0.03^*$	
200 day weight- maternal	$-0.37 \pm 0.13^*$	$0.17 \pm 0.02^*$



\* P<0.05

# Results - Inbreeding depression

- Calving Ease: Inbreeding coefficient calf and dam fitted as fixed effect



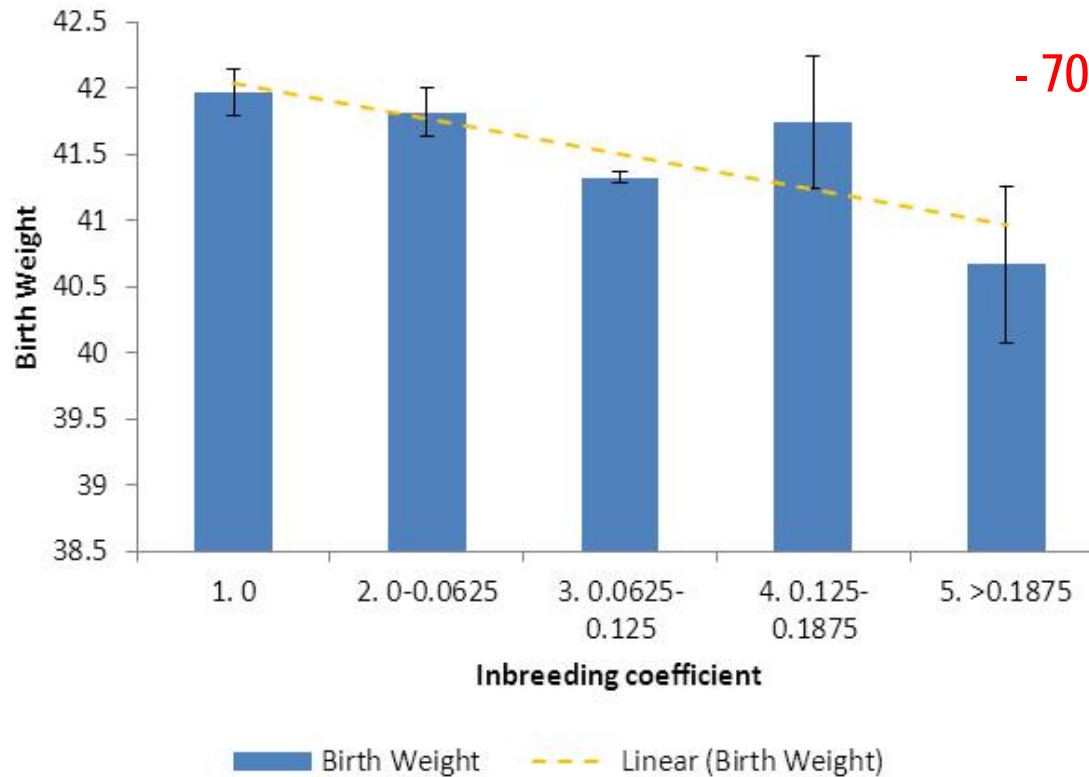
+ 1% dam inbreeding coefficient =  
+ 0.55% probability for difficult calving

Category	LS mean	P<0.05
1:	1.28	a
2:	1.32	b
3:	1.39	c
4:	1.47	c,d
5:	1.41	a,b,c,d
6:	1.25	a,b,c,d

# Results - Inbreeding depression

- Birth Weight: Inbreeding coefficient calf and dam fitted as fixed effect

+ 1% animal inbreeding coefficient =  
- 70 gram birth weight

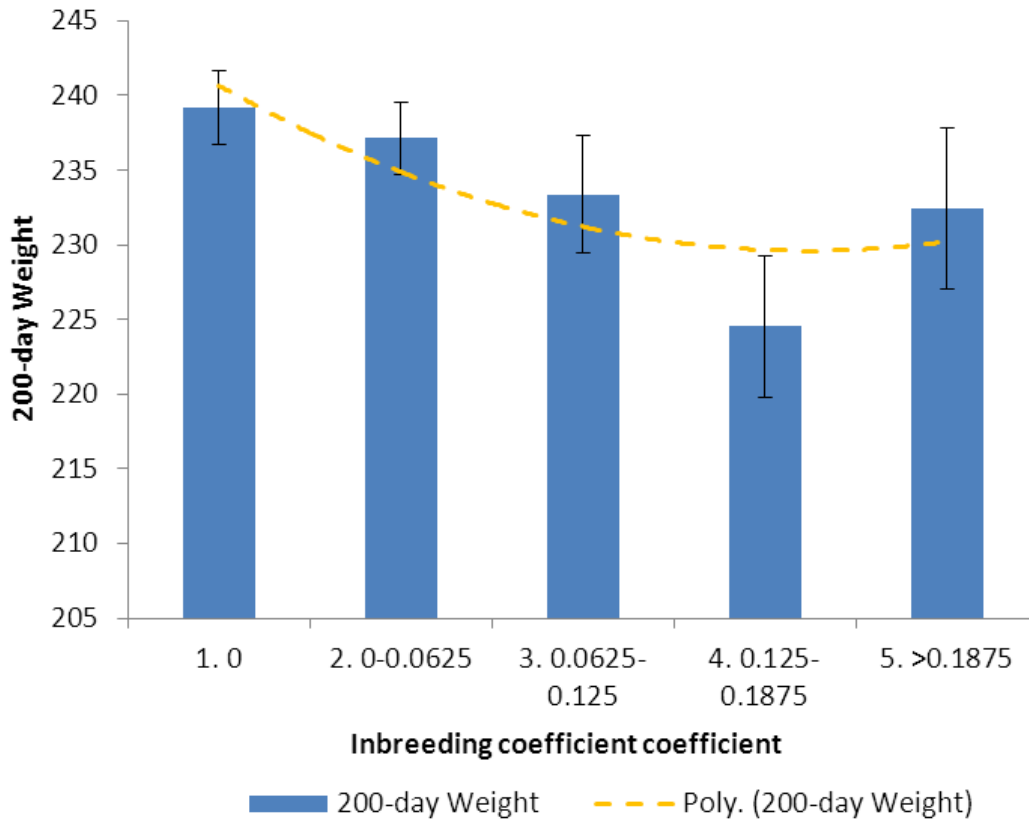


Category	LS mean	P<0.05
1:	41.97	a
2:	41.82	a
3:	41.33	b
4:	41.74	a
5:	40.67	c



# Results - Inbreeding depression

- 200-day: Inbreeding coefficient calf and dam fitted as fixed effect



+ 1% animal inbreeding coefficient =  
- 0.98 kg 200-day weight

Category	LS mean	P<0.05
1:	239.19	a
2:	237.13	a
3:	233.36	a
4:	224.55	b
5:	232.42	a,b

# Discussion



- Heritabilities are consistent with literature (Koots et al, 1994)
  - Dam inbreeding depression CE consistent with McParland et al. 2008
  - Dam inbreeding depression may be due to smaller dam size
  - Inbreeding depression weight traits consistent with Carolina et al. 2008
  - Moderate inbreeding depression weight traits confirms tendency of greater inbreeding depression effect in fitness traits
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# Conclusions



- Current worrying Murbodner calving performance
  - Population suffers from inbreeding depression
  - Estimation genetic parameters and EBVs feasible
  - Significant inbreeding depression shows a double advantage of continuous inbreeding restriction alongside novel genetic selection
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Thank you for your attention



ZuchtData  
EDV-DIENSTLEISTUNGEN GMBH

