

Genetic parameters of fertility and grading traits in Finnish blue fox



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Introduction and objectives

- ❑ New national breeding value evaluation of blue fox started in 2015
- ❑ Objectives of this study were to update and estimate (co)variance components between grading and fertility traits for the new national evaluation
- ❑ This is the first study where the genetic parameters of these 8 traits were estimated simultaneously with multiple-trait animal model

Methods

- ❑ Observations from 42 462 animals in 9 farms
- ❑ Pedigree contained 47 177 animals
- ❑ Depending on the trait, the fixed effects in the model were: farm-year of mating, number of matings, mating method, time of birth, age of dam and gender
- ❑ Random effects in the model: litter, animal and residual
- ❑ REML estimates of variance components were computed using DMU program

Results

- ❑ Heritability estimates for the 1st litter size, pregnancy rate and whelping success were low (0.05-0.14)
- ❑ Grading size and quality had moderate heritability estimates 0.27 and 0.21, respectively
- ❑ Genetic correlations between animal grading size and fertility traits were unfavourable (from -0.15 to -0.53)
- ❑ Grading quality and guard hair coverage had antagonistic relationships with all the studied fertility traits (from -0.21 to -0.54)



Conclusions

- ❑ Larger animals with excellent fur quality tend to have worse than average reproductive results
- ❑ Grading size and quality have highest genetic correlations with the fertility traits
- ❑ Litter size, pregnancy rate and whelping success evaluations are likely to benefit from the multiple-trait model where both grading size and quality are included

Table 1. Number of observations (N), mean, standard deviation (s.d.), estimated phenotypic variance (σ_p^2), proportion of litter variation (c^2), heritability (h^2) and their standard errors (s.e.) for the grading traits, 1st litter size, mating success and whelping success.

Trait	N	Mean	s.d.	σ_p^2	$c^2 \pm s.e.$	$h^2 \pm s.e.$
Grading size	37681	3,86	0,78	0,4074	0,11 \pm 0,01	0,27 \pm 0,01
Color darkness	18428	2,98	0,82	0,6558	0,08 \pm 0,01	0,64 \pm 0,01
Guard hair coverage	35306	4,17	0,74	0,3443	0,09 \pm 0,01	0,23 \pm 0,01
Color clarity	27957	4,15	0,74	0,3432	0,10 \pm 0,01	0,21 \pm 0,01
Fur quality	42452	4,07	0,73	0,3234	0,11 \pm 0,01	0,22 \pm 0,01
1 st litter size	13812	5,71	2,95	8,3082	0,03 \pm 0,01	0,14 \pm 0,01
Mating success	21332	1,88	0,32	0,0997	0,03 \pm 0,01	0,05 \pm 0,01
Whelping success	18810	1,73	0,44	0,1872	0,01 \pm 0,01	0,06 \pm 0,01

Table 2. Estimated genetic correlations with standard errors between mating success (Mate), whelping success (Whelp), 1st litter sizes (LS) and live animal grading traits (size, fur colour darkness, guard hair coverage and overall quality) in the Finnish blue fox..

Trait	Darkness	Guard hair	Clarity	Quality	1 st LS	Mate	Whelp
Size	-0,01 \pm 0,04	0,31 \pm 0,03	0,34 \pm 0,04	0,65 \pm 0,02	-0,53 \pm 0,05	-0,15 \pm 0,08	-0,44 \pm 0,08
Darkness		0,25 \pm 0,03	0,08 \pm 0,04	0,03 \pm 0,04	0,08 \pm 0,05	0,10 \pm 0,07	0,05 \pm 0,08
Guard hair			0,72 \pm 0,03	0,72 \pm 0,02	-0,36 \pm 0,06	-0,24 \pm 0,08	-0,31 \pm 0,08
Clarity				0,71 \pm 0,03	-0,32 \pm 0,06	-0,15 \pm 0,09	-0,36 \pm 0,09
Quality					-0,54 \pm 0,05	-0,21 \pm 0,08	-0,37 \pm 0,07
1 st LS						0,46 \pm 0,09	0,56 \pm 0,09
Mate							0,40 \pm 0,12