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Genetic selection can reduce aggression behaviour in group-housed mink

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Introduction

Group housing mink becomes common

Benefits:

- Increase production
- improve welfare

Problem:

- More bite marks in group housed mink

Bite marks:

- related to aggression and fearful behavior.
- an indicator of reduced animal welfare

Solution

- Genetic selection

Succesful if bite mark is genetically inherited.

There is no study whether bite mark is genetically inherited or not

Objective

Estimating genetic parameters for bite mark in group-housed mink

Material and Method

Four mink in Cage

Bite mark collected in 1985 mink

998 male and 987 female

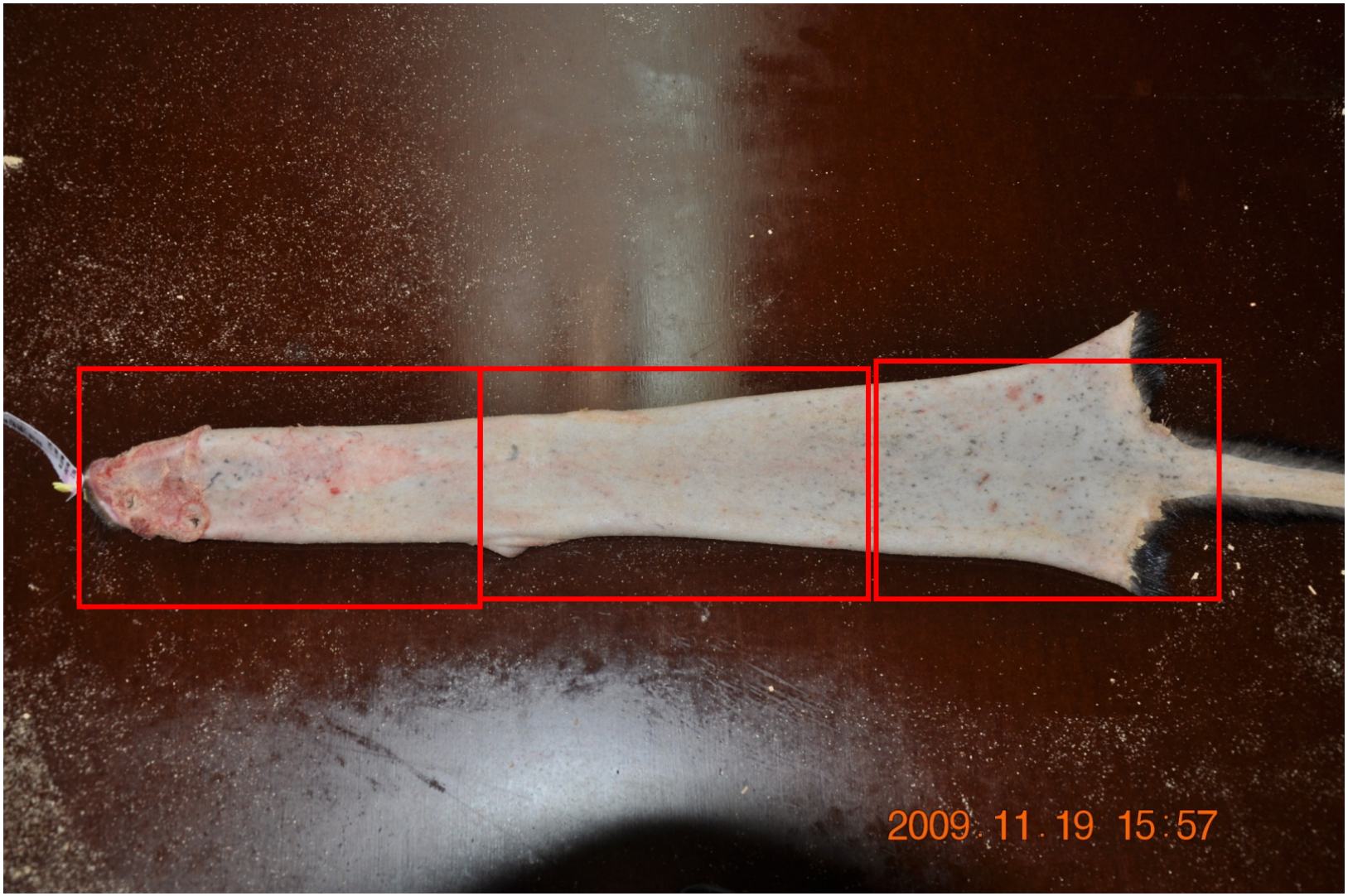
136 sires and 349 dams

Bite mark score at :

Neck, body, tail region of the body

and total of neck, body , tail.

Grading of bite marks



Grading of bite marks

Subjective Grading

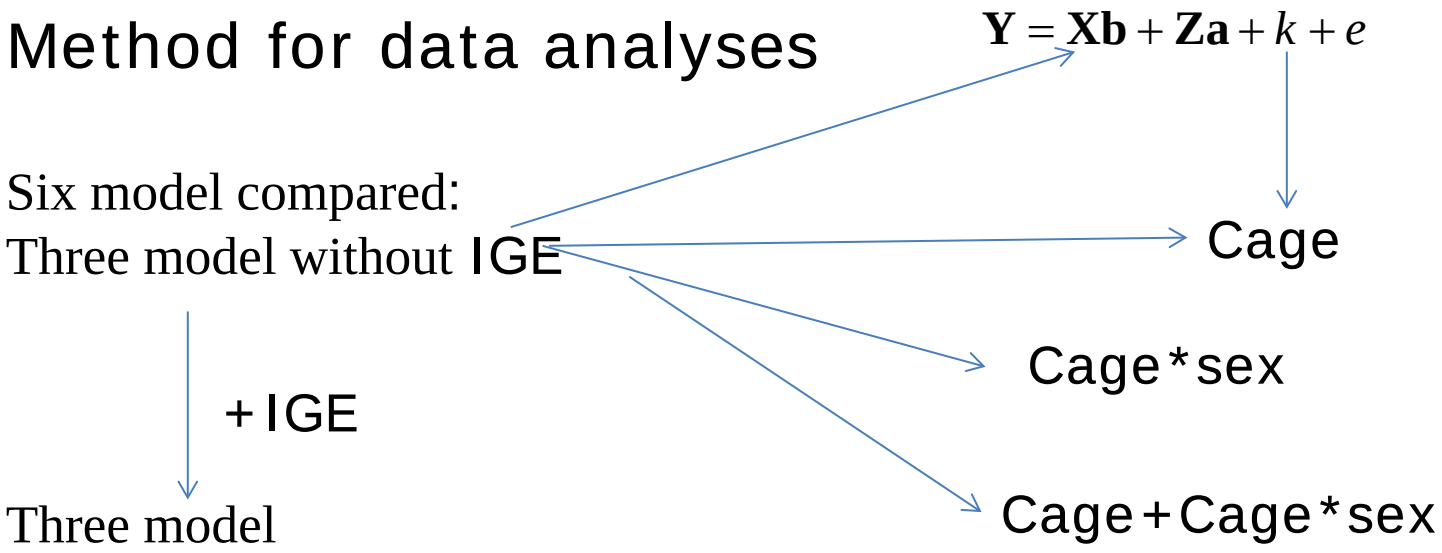
Bite score	Number of bite marks
0	0
1	1-5
2	6-10
3	11-15
4	16-20
5	21-25
6	26-30
7	31-35
8	36-45
9	More than 45

- Group housed mink → Social interaction

May be heritable

Indirect Genetic Effect(IGE)

Method for data analyses



The best model based on AIC is:

$$\mathbf{Y} = \mathbf{Xb} + \mathbf{Z}_D\mathbf{a_D} + \mathbf{Z}_S\mathbf{a_s} + W\mathbf{g}_s + \mathbf{e}$$

Genetic parameter estimates: $\sigma^2_{A_D}, \sigma_{A_{DS}}, \sigma^2_{A_S}$

$$A_{TBV_i} = A_{D_i} + (n-1)A_{S_i}$$

$$\sigma^2_{A_T} = \sigma^2_{A_D} + 2(n-1)\sigma_{A_{DS}} + (n-1)^2\sigma^2_{A_S}$$

$$h_D{}^2 = \frac{\sigma^2_{A_D}}{\sigma^2_P} \qquad T^2 = \frac{\sigma^2_{A_{TBV}}}{\sigma^2_P}$$

Results

Genetic parameter estimate BMS in different parts of the body

Parts of the body	$\sigma^2_{A_D}$	$\sigma^2_{A_T}$	$r_{A_{DS}}$	σ^2_P	$h_D{}^2$	T^2
Neck	0.26	1.65	**0.55**	3.54	**0.07**	**0.47**
Body	0.37	2.56	**0.67**	4.95	**0.07**	**0.67**
Tail	0.34	2.19	**0.99**	5.31	**0.06**	**0.41**
Total	2.95	19.13	**0.90**	31.03	**0.10**	**0.61**

Conclusion

- Indirect genetic effect contribute substantial amount of heritable variation.
- Similar result found in survival of laying hens.
- Positive correlation between direct genetic and indirect genetic effect :

Individual who bite more receive more bite.
Individual who bite less receive less bite.

→ Cooperative type of interaction

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Genetic selection that includes

both direct genetic effect and IGE can reduce bite mark possibly aggression behaviour.

For total bite mark with sib selection scheme :

$$R = i\rho\sigma_{A_T}$$

R is about 4.14 bite marks/generation

Thus, average total BMS reduced from 6.47 to 2.33 in single generation.

It is possible to produce mink with: lower level of biting.

- Thank you