Inbreeding status and conservation possibilities of the endangered Faroese Horse

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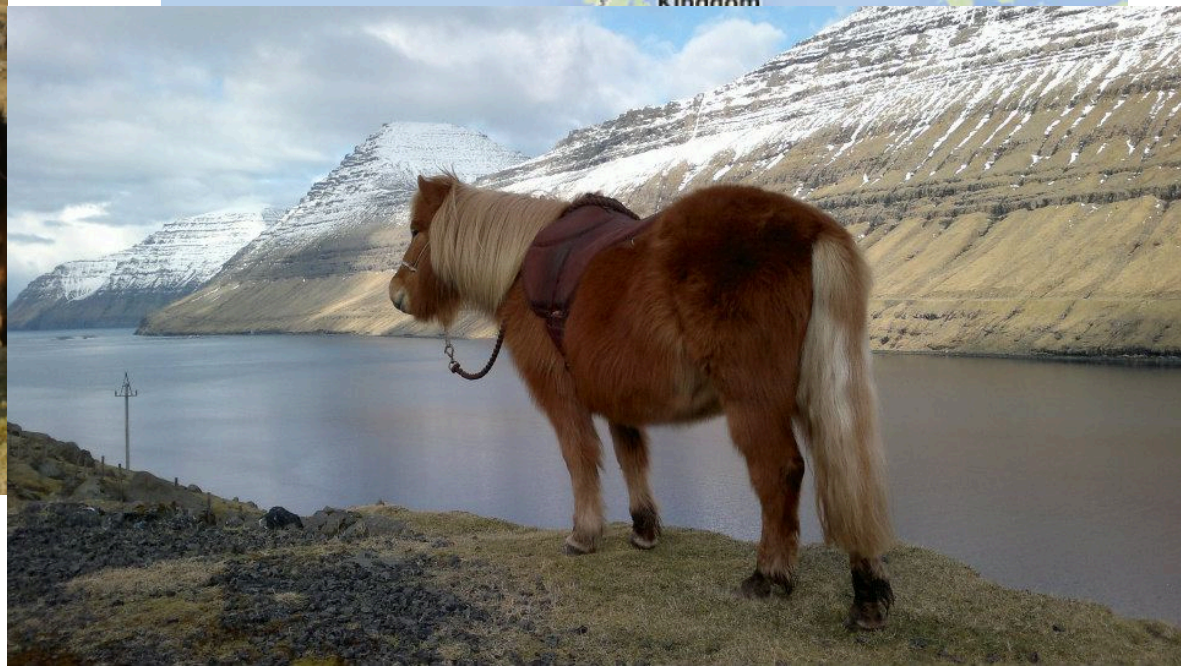
NordGen

The Faroese horse



History

- Faroese horse
  - Arrived to Faroe Islands
    - 762 Irish monks
    - Up to 1100 by settlers
- Extensive use
  - Gathered when needed
  - Otherwise left alone
- Around 1800 app. 800 horses
- Today 63 horses (from 5 horses in the 1960's)

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Objective

- Document
  - Development in inbreeding since bottleneck
  - Genetic contributions of ancestors
- Test
  - Use of Optimal Contribution Selection to minimise future rates of inbreeding

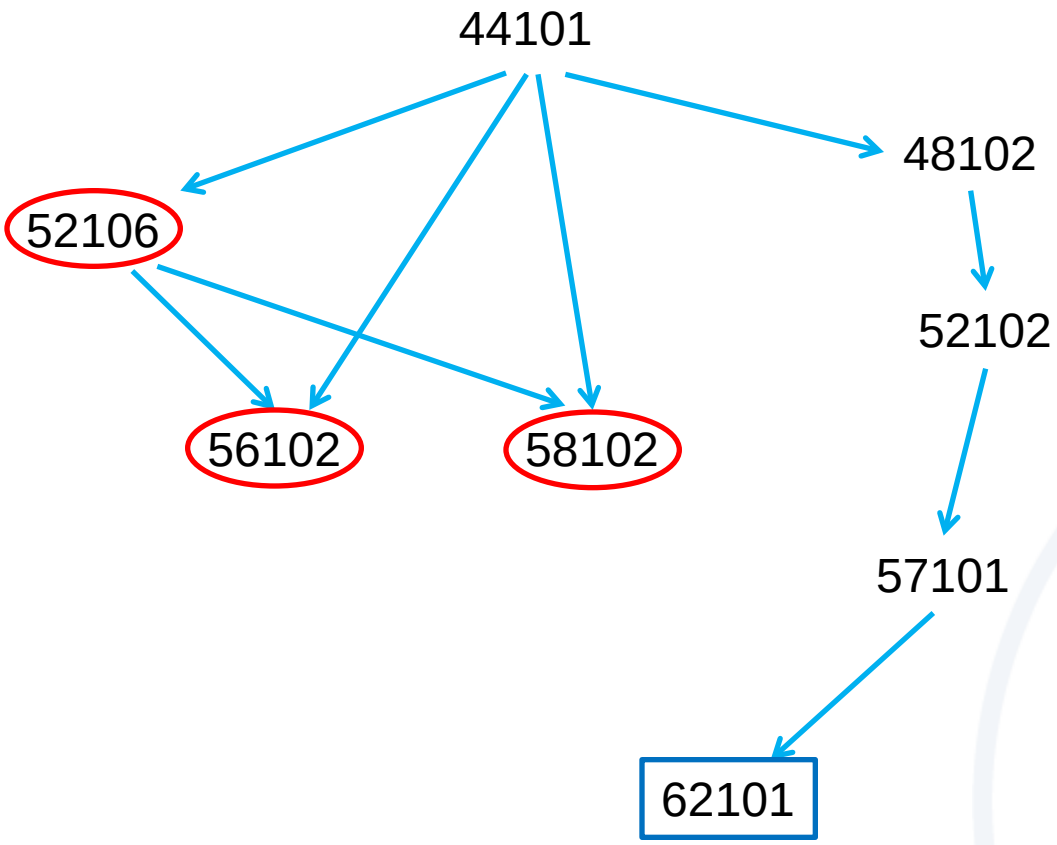
Material

- Full pedigree
  - 146 individuals born 1917 onwards
  - Bottleneck in 1960's
    - 4 mares and 1 stallion
  - Indicator
    - Availability for breeding in 2013

Methods

- EVA software (available at www.nordgen.org)
  - Pedigree Completeness
  - Individual Inbreeding Coefficients
  - Genetic contributions of ancestors
- Individual rates of inbreeding
  - $\Delta F_i = 1 - \sqrt[EqG_i - 1]{1 - F_i}$ (Gutierrez et al. 2008)
- Effective population size
  - $N_e = \frac{1}{2\overline{\Delta F}}$
  - Older data truncated to compute recent N_e

Pedigree - bottleneck



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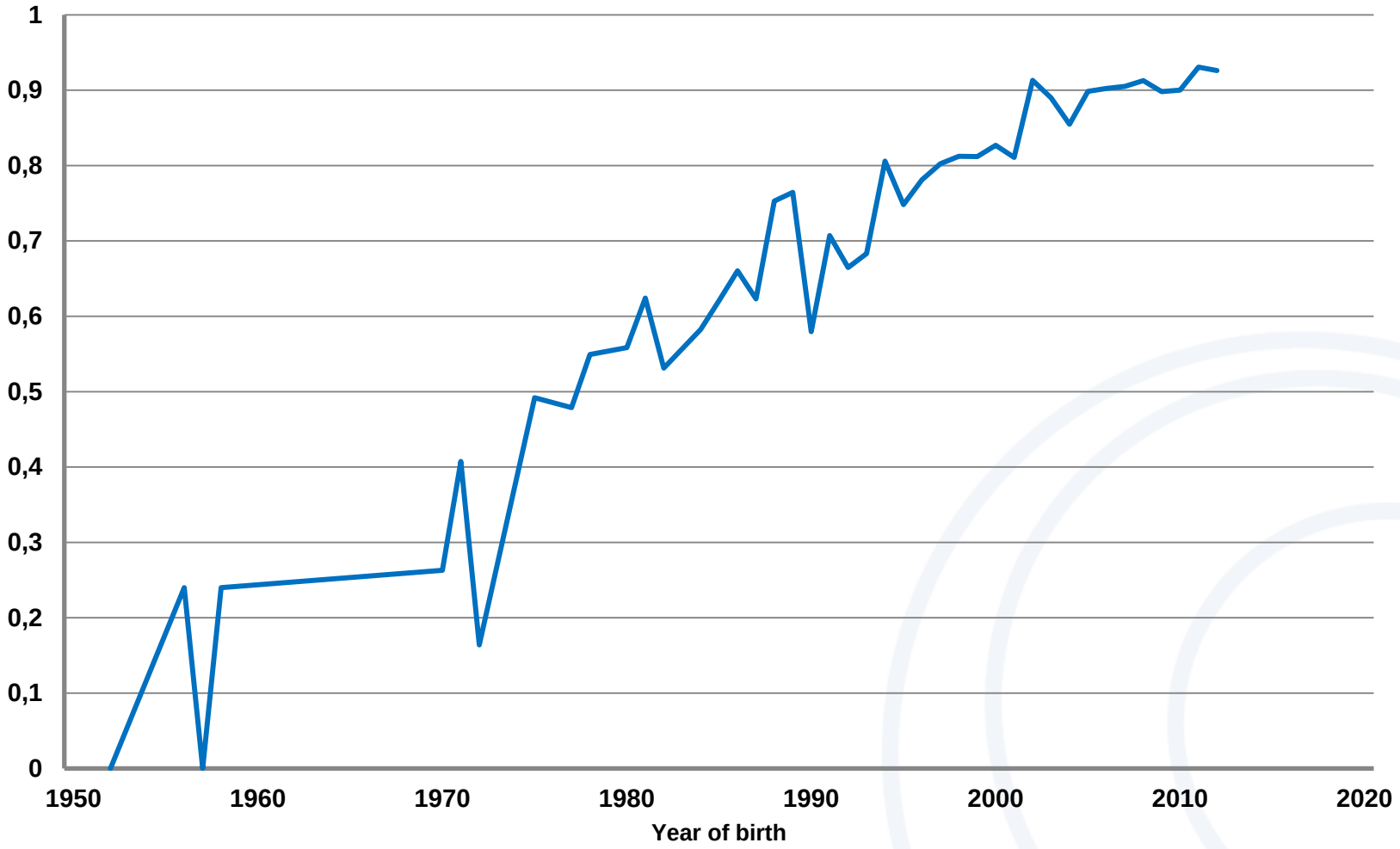
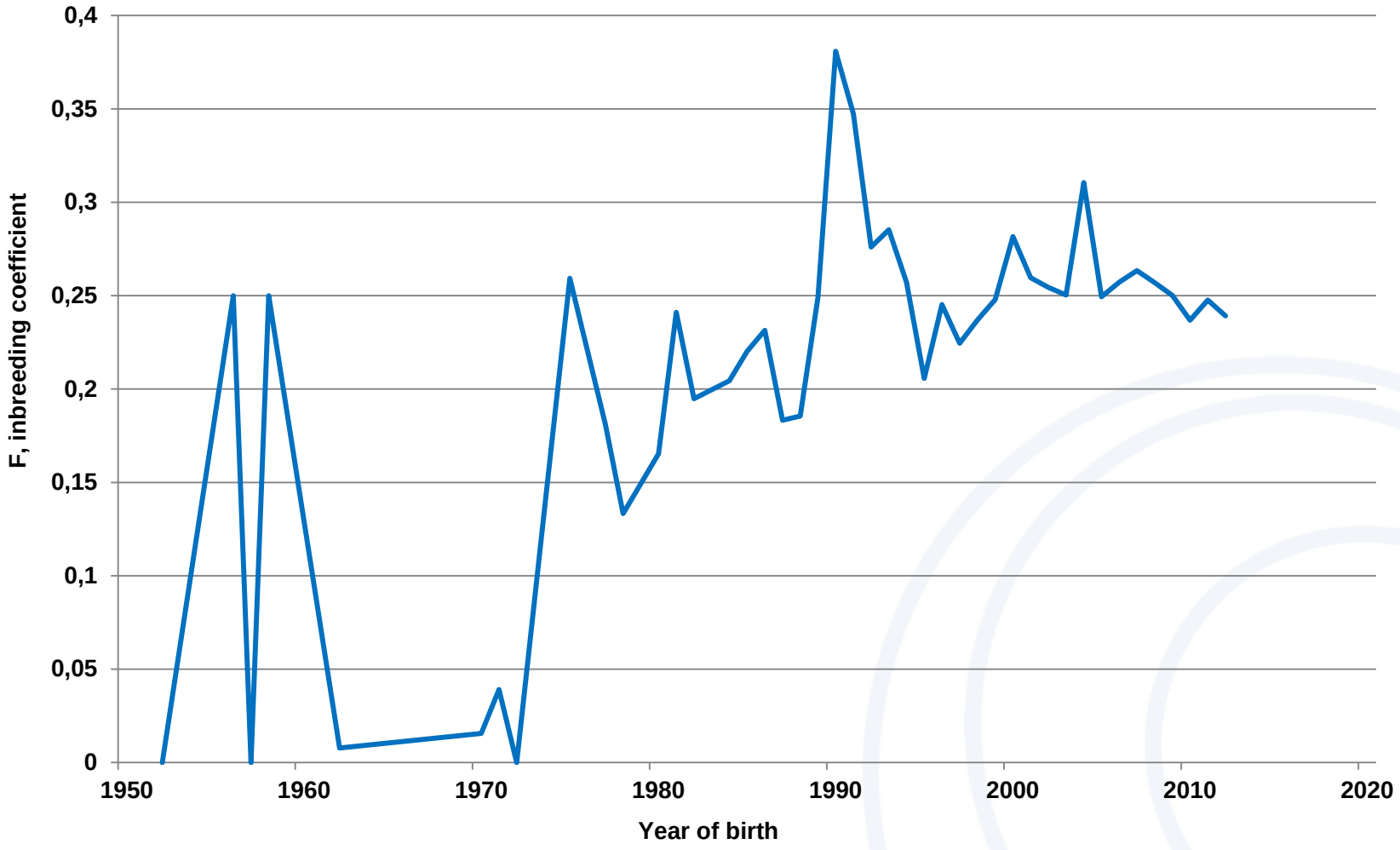
Pedigree Completeness

5 generations



Inbreeding


0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
F, inbreeding coefficient
1950
1960
1970
1980
1990
2000
2010
2020
Year of birth

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Effective population size

- Reference: Horses born 1995-2012
- Complete pedigree: $N_e = 8.7$
- Pedigree 1975-2012 $N_e = 9.4$
- Pedigree 1985-2012 $N_e = 34.3$

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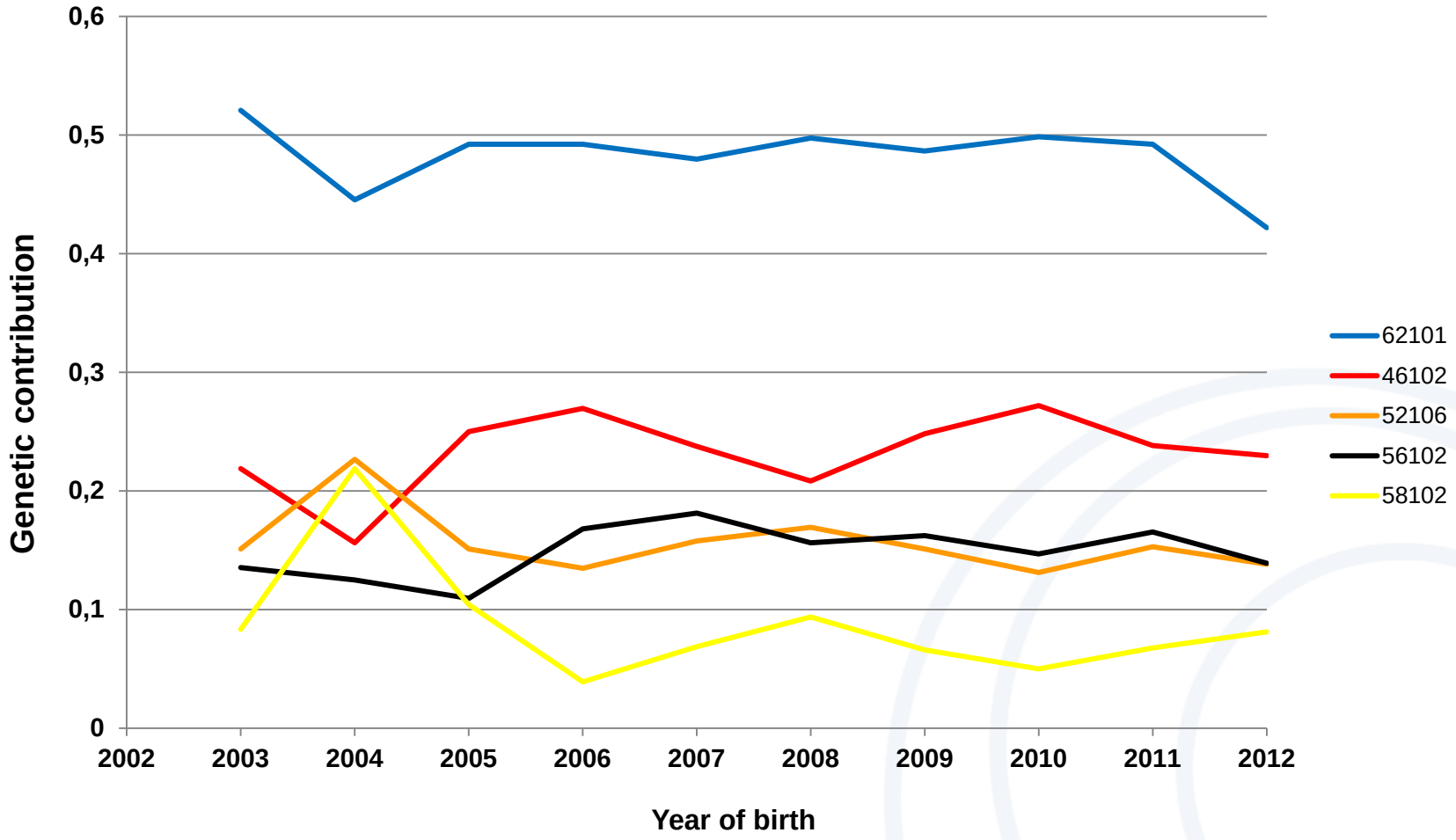
Genetic contributions



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Optimal contributions

- Candidates
  - 19 stallions
  - 24 mares

- Selection of mates to minimise average relationship of the last generation including the next cohort
  - 6-12 matings selected
  - Constraints on stallion use

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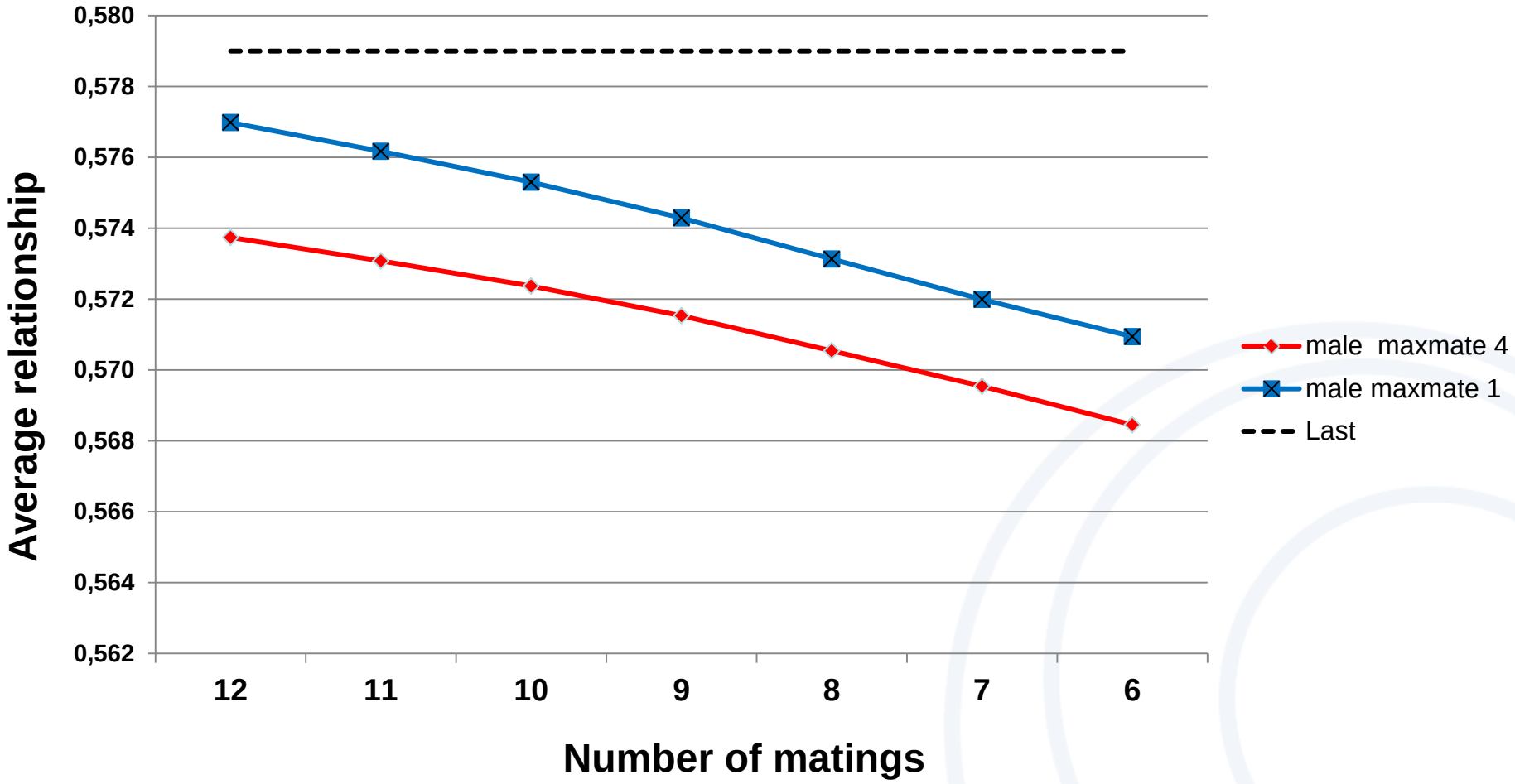
Optimal contributions



Conclusions

- Small endangered breed
  - Severe bottleneck
- N_e critically low
  - Increasing
  - Pursue options to expand population
- Optimal contribution selection recommended
  - Minimises long-term rate of inbreeding
- Monitor fitness related traits

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