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Genetic variability of the Skyros pony breed and its relationship with other Greek and foreign horse breeds

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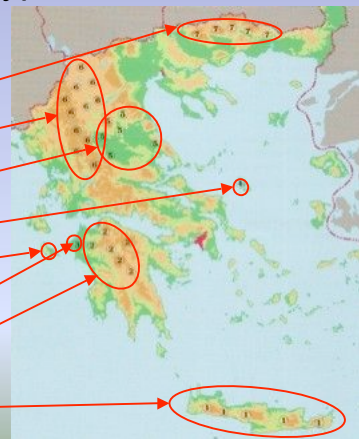
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Context

- Greece: 6 (to 8) native breeds identified on basis of phenotypes and genotypes (Zafrakas 1991)

Rhodope horse
Pindos horse
Thessalias horse
Skyros pony
Zakynthos horse
Elis valley/Andravidas horse
Elis mountain/Pinias horse
Cretan horse





Context



- Greece: 6 (to 8) native breeds identified on basis of phenotypes and genotypes (Zafrakas 1991)
- Risk status: critical-/endangered- maintained
- Skyros pony:
 - Distinct phenotype
 - Less genetically similar to the other breed that the other breeds are to each other (Apostolidis *et al.* 2001)



Objectives



- Based on pedigree and marker data:
 - Quantify genetic variability in Skyros breed
 - And:
 - Compare levels of genetic among 7 Greek breeds
 - Estimate genetic distances between them
 - Compare them with other domestic horse breeds



Materials & Methods



- 2 independent samplings
 - 232 horses from 7 breeds
 - 75 Skyros ponies from 2 related groups
- Tested at
 - 7 blood group loci
 - 10 biochemical loci
 - 12 microsatellite loci
 - 16 microsatellite loci
 - + Collect of pedigree information

→ No pedigree information collected in first sampling
 → samples can not be related



Materials & Methods



- Statistical analysis
 - *Inter-breed* variation
 - Observed/Expected heterozygosity (H_o / H_e)
 - Total and mean number of alleles (TNA / MNA)
 - + Nei's modified genetic distance (D_a)
 - *Intra-breed* variation

DNA

 - H_o, H_e, TNA, MNA
 - $PIC = \text{Polymorphism Information Content}$

Pedigree

 - Generation-equivalents (g_{eq})
 - Effective number of founders (f_e)/ancestors (f_a)/ founder genomes (N_g)



Intra-breed variability

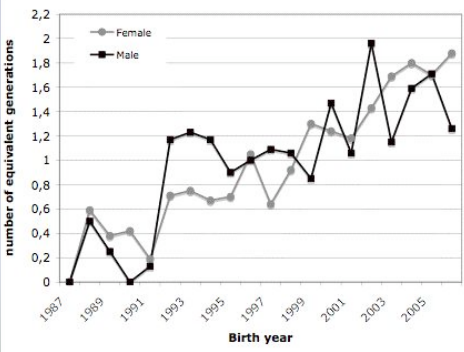
- Molecular parameters describing the genetic variability in the Skyros pony population
 - TNA per loci: 4 to 10, MNA: 5.86 → 2.6 (Tokara horse) to 9.55 (*Selle français*)
 - 10 highly polymorphic loci (PIC > 0.5)
 - heterozygosity value moderate to high ($H_o > 0.5$)
 - Average H_e : 0.619, average H_o : 0.638
 - H_e from 0.432 (Tokara) to 0.820 (Mongolian),
Lowest values: 0.432 (Tokara) to 0.649 (Taishu),
0.506 (Sorraia), 0.609 (Exmoor)

¹ Kakoi *et al.* 2007, ² Rognon *et al.* 2005, ³ Glowatzki-Mullis *et al.* 2006, ⁴ Luis *et al.* 2007



Intra-breed variability

- Skyros pony: pedigree completeness
 - 77% of the animals recorded after 1989
 - 35.45% (26.33%) have both (one) parents unknown
 - geq increase with birth year of individuals
- Pedigree completeness increase



Birth year	Female (geq)	Male (geq)
1987	0.0	0.0
1988	0.5	0.5
1989	0.4	0.4
1990	0.4	0.4
1991	0.4	0.4
1992	0.7	0.7
1993	0.8	0.8
1994	0.8	0.8
1995	0.7	0.7
1996	0.7	0.7
1997	0.8	0.8
1998	0.8	0.8
1999	0.8	0.8
2000	1.2	1.2
2001	1.2	1.2
2002	1.2	1.2
2003	1.8	1.8
2004	1.6	1.6
2005	1.8	1.8
2006	1.8	1.8



Intra-breed variability



- Skyros pony:
Concentration and origin of the genome

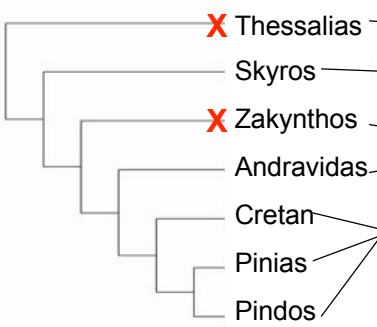
Number of recorded animals	395	
Number of ancestors explaining 70%	10	13
Number of ancestors explaining 50%	5	6
Effective number of founder animals	13.3	Valera <i>et al.</i> 2005
Effective number of ancestors	13.1	
Effective number of founder genomes	10.3	

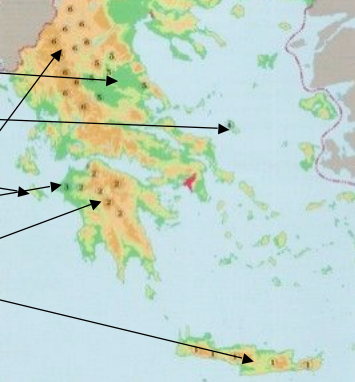


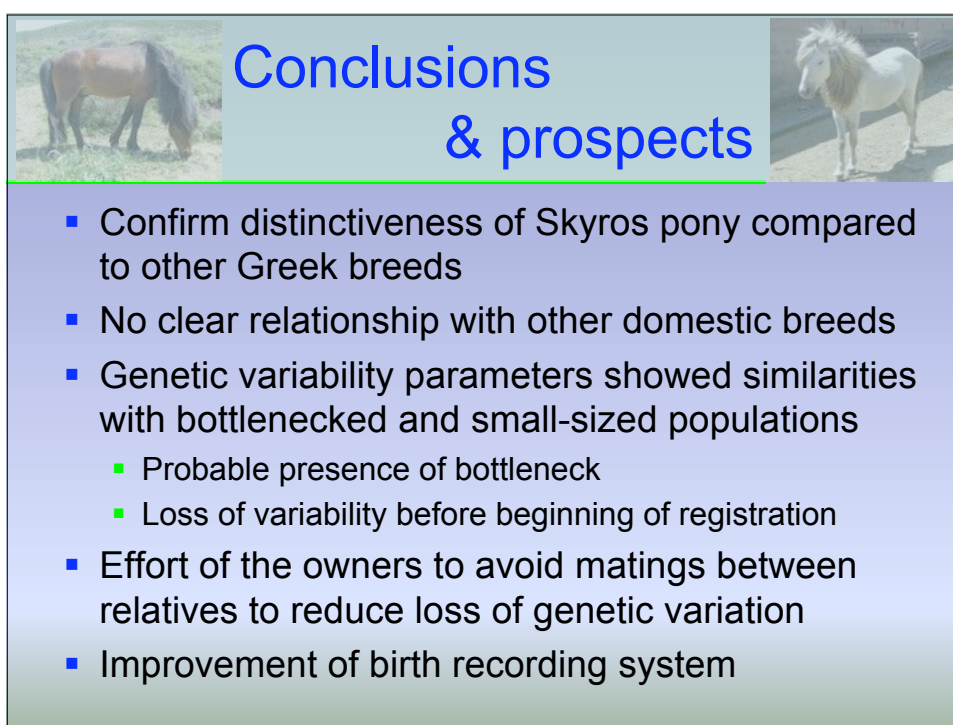
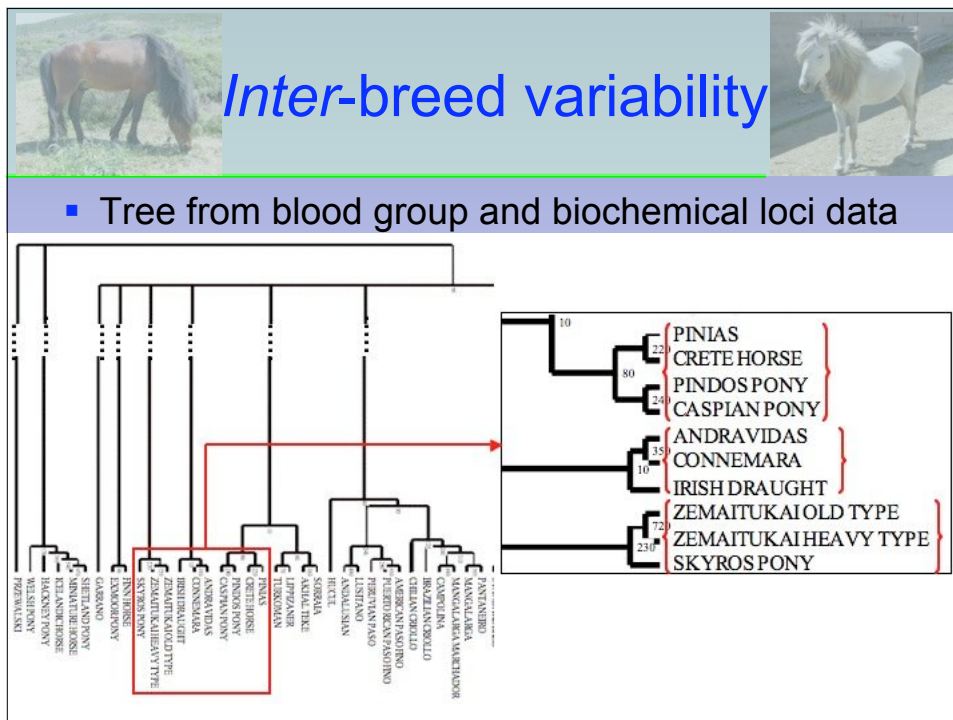
Inter-breed variability

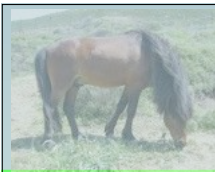


- No alleles unique to any of the Greek breeds
- Level of variability in the range for domestic horses
- Breeds not as closely related as expected from geographic distances

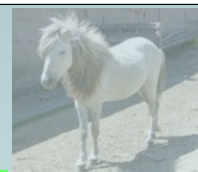








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Thank you for your attention

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