Individual-based assessment of population structure and admixture levels among Austrian, Croatian and German draught horses

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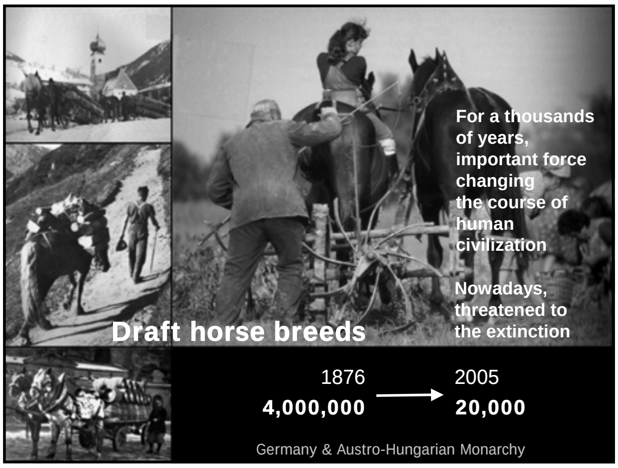
I. Curik



Draft horse breeds

For a thousands of years, important force changing the course of human civilization

Nowadays, threatened to the extinction

1876	→	2005
4,000,000		**20,000**

Germany & Austro-Hungarian Monarchy

General aim:

Conservation genetic analysis

Genetic diversity
- within populations
- between populations

Population structure

Assignment tests

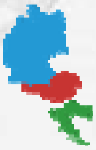
Draft horse populations (11) from Austria, Croatia and Germany

- **30 microsatellite loci (29 chromosomes)**
- **434 (208) horses**

Upgrade on the analysis of Aberle et al. (2004)

Specific aim 1

Political fragmentation



○ SChleswig DH, n = 45

● Mecklenburg CB, n = 22

● Altmaerkisch CB, n =32

● Renish German DH, n = 46

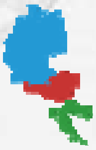
● Saxon Thuringa CB, n = 23

Black Forest Horse, n = 45

○ ○ South German CH, n = 45

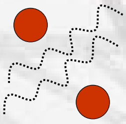
Specific aim 2

Geographical fragmentation



Norik Horse

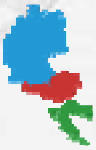
Salzburg (S), n = 45

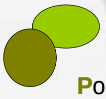


Carinthia (K), n = 45

Specific aim 3

Profit unification





Croatian CB (H), n = 41

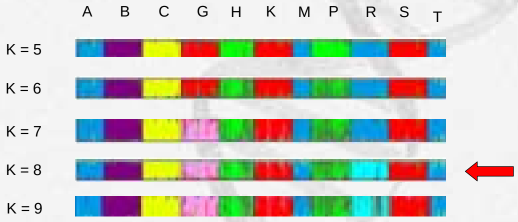
Posavina H, n = 45

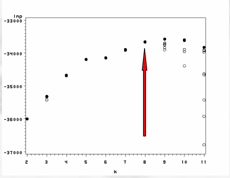
- Meat price in favor of larger breed
- Time difference in subsidies
- Destruction of recording system caused by war

Microsatellite characteristics

	NA	Ho	He
Mean	**9**	**0.68**	**0.67**
Range	**6-15**	**0.29, 0.84**	**0.28, 0.8**
	F_{IS}	F_{ST}	PIC
Mean	**-0.01**	**0.07**	**0.57**
Range	**-0.06, 0.07**	**0.04, 0.14**	**0.09, 0.75**

COR056, **COR071** & **LEX007**, excluded due to (*Hochberg's step-up Bonferroni*), deviation from **HWE**

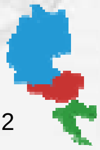




Software:
Structure 2.0 (2002)

Algoritam:
Pritchard et al. (2000)
Falush et al. (2003)

Specific aim 1 (Political fragmentation)



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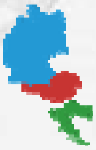
Specific aim 2

(Geographical fragmentation)



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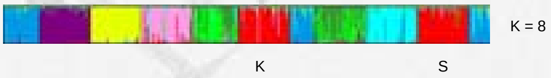
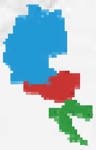


Specific aim 3 (Profit unification)



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Posavina H, n = 45

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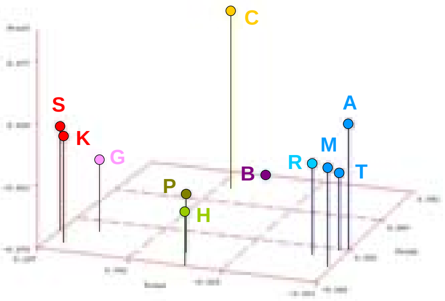
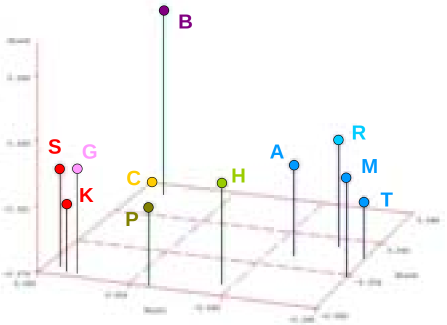
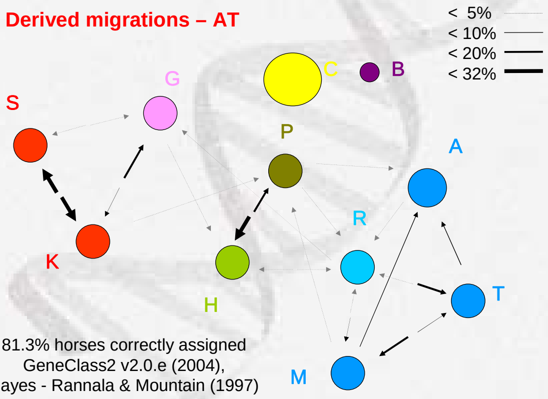
PCA - F_{ST} values (PCA1=0.58, PCA2=0.18, PCA3=0.14)



PCA - R_{ST} values (PCA1=0.46, PCA2=0.26, PCA3=0.14)



Derived migrations – AT



81.3% horses correctly assigned
GeneClass2 v2.0.e (2004),
Bayes - Rannala & Mountain (1997)

Population	N	RMNA	Ne (95% CI)
Altenmaerkish DH	32	5.31	64.0 (53.8, 78.4)
Mecklenburg CB	22	5.64	31.6 (27.5, 36.8)
Saxon **T**huringa CB	23	5.45	48.1 (29.7, 60.4)
Rhenish German DH	46	5.75	46.1 (41.9, 51.1)
A + **M** + **T**	77	5.92	126.5 (111.6, 145.2)
A + **M** + **T** + **R**	123	6.14	141.6 (129.3, 156.1)

MolKin v2.0 (2004), Rarefaction – Hurlbert (1971)

NeEstimator 1.3 (2004), LD – Hill (1981)

Population	N	RMNA	Ne (95% CI)
South German CB	45	6.04	97.6 (82.9, 117.9)
Noriker – Carinthia (**K**)	45	6.05	104.7 (87.3, 129.6)
Noriker – **S**alzburg	45	5.72	164.0 (125.5, 232.9)
K + **S**	90	5.97	259.0 (211.8, 330.2)
G + **K** + **S**	135	6.29	233.7 (206.5, 267.9)
Black Forest H	45	5.60	58.1 (51.8, 65.9)

Population	N	RMNA	Ne (95% CI)
Posavina horse	45	6.46	129.0 (105.2, 165.1)
Croatian CB (**H**)	41	6.68	87.2 (75.0, 103.5)
P + **H**	86	6.64	176.0 (153.7, 207.2)
$P_{q>0.70}$	31	6.03	74.5 (61.5, 94.5)
$H_{q>0.70}$	24	6.37	57.5 (47.7, 94.5)
S**C**hleswig DH	45	5.28	61.8 (54.1, 71.6)

Conclusion

The results obtained:

- **demonstrate the power of microsatellites and new statistical genetic methods in assessing conservation status.**
- **provide basis for making breeding strategies with respect to genetic variability.**