CONSERVATION GENOMIC ANALYSES OF CROATIAN AUTOCHTHONOUS PIC BREEDS

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ABOUT BREEDS

BLACK SLAVONIAN PIG

- created by earl Pfeifer in the second half of the 19th century
- Mangulica × Berkshire × USA Poland China
- 6 – 8 (10) piglets
- extensive or semi-extensive system
- great capacity to accumulate intramuscular and epidermal fat
- optimal slaughter weight ≥180 kg ➔ ≥18 months

Number of pigs

- Sows
- Boars
ABOUT BREEDS

TUROPOLJE PIG

• Primitive old breed
• First written record from 1352)
  
  Krškopoljska x Šiška
  later in 1840 x unknown (Berkshire?)

• 6 – 7 piglets
• extensive system - traditional feeding
  based on acorns
• weight ≥200 kg ➞ 24 months
MATERIALS & METHODS (ANIMALS)

Selection of 666 animals from 29 domestic breeds and from 6 wild populations (Yang et al. 2017) - 15-20 per breed

- **Wild**
  - Croatian
  - South Balkan
  - Italian
  - Sardinian
  - NE Europe
  - Iberian

- **UK & USA**
  - UK Berkshire
  - UK Hampshire
  - Gloucester Old Spot
  - Tamworth
  - Large Black
  - British Saddleback
  - USA Berkshire
  - USA Hampshire
  - Guinea Hog
  - USA Feral
  - Mulefoot
  - Poland China

- **Central & South America**
  - Guatemala Creole
  - Argetina Semi Feral
  - Brazil Monteiro
  - Peru Creole

- **Continental Europe**
  - Hungarian Mangalatica
  - German Angler Sattle
  - Czech Prestice
  - Poland Pulawska Spot

- **Comercial**
  - Pietrain
  - Landrace

- **Black Slavonian (16)**
  - Turopolje (16)
**M & M - QUALITY CONTROL**

Illumina Infinium PorcineSNP60 v2 BeadChip

- GC score $\leq 0.7$
- GenTrain score $\leq 0.4$
- Only autosomal SNPs with known position
- Gen Call $> 0.9$
- Animals with $< 5\%$ missing SNPs

$45\,000$ SNPs

**M & M - ROH DETECTION AND INBREEDING LEVELS ESTIMATE**

SNP & VARIATION SUITE

- min. 15 homozygous SNP in row
- min. density 1 SNP every 100kb
- no consecutive heterozygous calls
- max. gap between 2 SNP $\leq 1000$kb

Ferenčaković et al. 2013 GSE

- ROH $> 4$Mb $\Rightarrow$ $F_{ROH} > 4$Mb $\Rightarrow$ 12.5 gen ago
- ROH $> 8$Mb $\Rightarrow$ $F_{ROH} > 8$Mb $\Rightarrow$ $\approx 6$ gen ago
- ROH $> 16$Mb $\Rightarrow$ $F_{ROH} > 16$Mb $\Rightarrow$ $\approx 3$ gen ago
M & M - EFFECTIVE POPULATION SIZE ESTIMATE

- MAF < 0.05
- Ne from LD (Corbin et al., 2012)

\[ N_T(t) = \frac{1}{(4f(c_t))} \left( \frac{1}{E[r_{adj}^2 | c_t]} - \alpha \right) \]

M & M - PCA ANALYSIS

SNP & VARIATION SUITE
RESULTS (INBREEDING LEVELS)

- $F_{ROH}>4\text{Mb}$
  - Turopolje: 0.36
  - Black Slavonian: 0.09
  - Hungary Mangalica: 0.37
  - Cinta Cenese: 0.40
  - Iberian: 0.27
  - Bisaro: 0.20
  - British Saddleback: 0.11
  - Landrace: 0.16
  - Pietrain: 0.20
  - Croatian Wild: 0.18
  - Other: 0.11

- $F_{ROH}>8\text{Mb}$
  - Turopolje: 0.33
  - Black Slavonian: 0.07
  - Hungary Mangalica: 0.30
  - Cinta Cenese: 0.23
  - Iberian: 0.17
  - Bisaro: 0.09
  - British Saddleback: 0.14
  - Landrace: 0.16
  - Pietrain: 0.15
  - Croatian Wild: 0.08

- $F_{ROH}>16\text{Mb}$
  - Turopolje: 0.23
  - Black Slavonian: 0.05
  - Hungary Mangalica: 0.16
  - Cinta Cenese: 0.12
  - Iberian: 0.07
  - Bisaro: 0.10
  - British Saddleback: 0.10
  - Landrace: 0.10
  - Pietrain: 0.05
  - Croatian Wild: 0.05
RESULTS (EFFECTIVE POPULATION SIZE)

BLACK SLAVONIAN PIG

TUROPOLJE PIG

\[ Ne_0 = 33.45 \ (95\% CI; 24.21 - 42.76) \]

\[ Ne_0 = 12.19 \ (95\% CI; 5.66 - 18.72) \]
CONCLUSIONS

Black Slavonian

- Good management and marketing of the product lead to increase in number
- Inbreeding is small compared to other breeds
- Effective population size should be monitored
- Closer to the USA and UK breeds

Turopolje

- Near to extinction
- High inbreeding levels
- Low effective population size
- Closer to old and Mediterranean autochthonous breeds
- Much joint effort should be put in revitalisation of the breed
- Need for good sustainable strategy of preservation
Thank you for your attention!
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