Pleiotropic effects of a QTL region for androstenone level on pig chromosome 6

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64th EAAP, 28th August 2013

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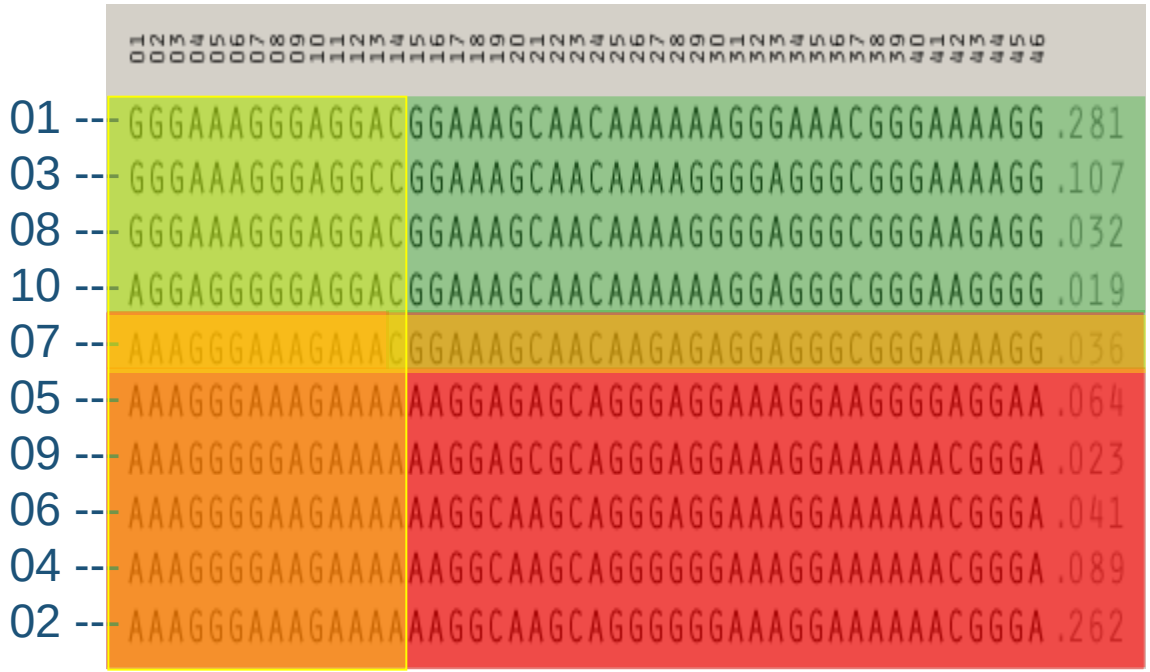
Introduction

- Boar taint: Unpleasant flavor and odor of pork
- Androstenone is a main compound causing boar taint
- Piglets are castrated to prevent boar taint

Alternative methods to control boar taint are needed

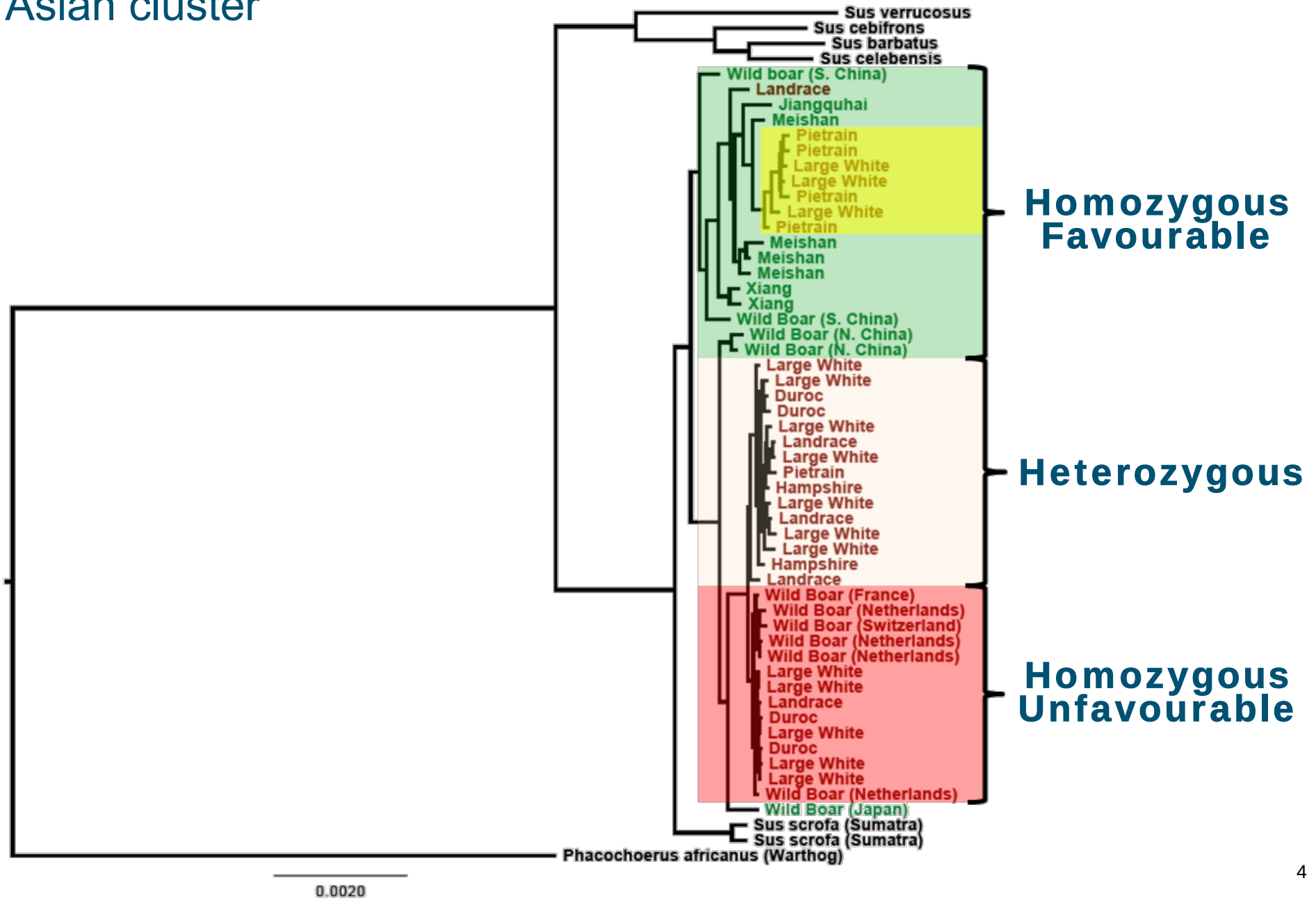
Previous study

- SSC 6 is related to androstenone level (Duijvesteijn et al., 2010)



(Hidalgo et al., under review)

Phylogenetic tree: European pigs with favourable haplotypes in Asian cluster

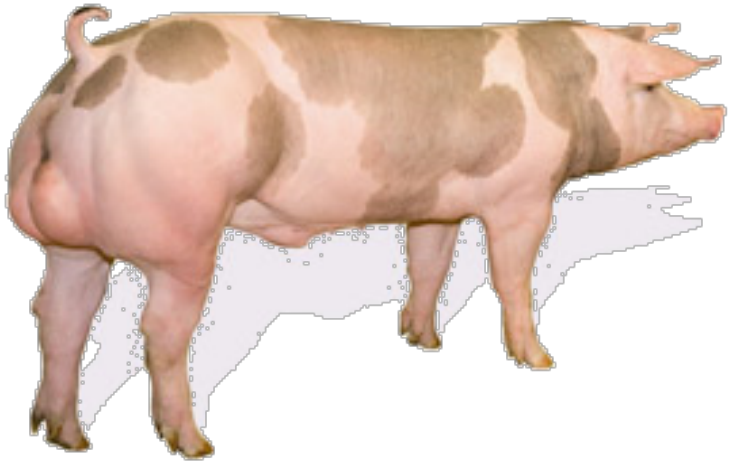


Objective

Examine potential pleiotropic effects on important pig production and reproduction traits from the Asian low-androstenone haplotypes on SSC6

Material and Methods

- Three commercial lines:
  - Dutch Landrace
  - Large White
  - Pietrain



Material and Methods

- Growth traits:
  - Growth rate (g/day)
  - Backfat thickness (mm)
- Female reproduction:
  - Litter birth weight (kg)
  - Total number born (piglet)
  - Birth weight (kg)
  - Number of teats (teat)
- Male reproduction:
  - Sperm motility (% of motile cells)
  - Number of spermatozoa per ejaculation (billions)

Material and Methods

- SNP marker selected
- Association study using ASReml 3.0

$$y = Xb + Za + SNP + e$$

y = vector of observations of the studied traits;

X = incidence matrix for fixed effects contained in the b vector;

b = vector of fixed effects coefficients;

Z = incidence matrix of genetic values contained in a vector;

a = vector of direct genetic effects coefficients;

e = vector of random errors coefficients.

Results

SNP association and effect for traits in study in three commercial lines

	Dutch Landrace	Large White	Pietrain
N[1]	313-1430	200-1280	145-864
MAF	0.19	0.46	0.15
Growth Rate (g/day)	5.27 (3.61)	2.05 (2.97)	0.24 (3.02)
Backfat Thickness (mm)	-0.03 (0.12)	0.08 (0.08)	-0.06 (0.07)
Litter Birth Weight (kg)	-0.09 (0.15)	-0.06 (0.10)	-
Total Number Born (piglet)	-0.08 (0.15)	-0.09 (0.10)	0.06 (0.22)
Birth Weight (kg)	0.02 (0.02)	-0.01 (0.01)	-
Nr. of Teats (teat)	0.11 (0.06)*	0.11 (0.05)**	-
Sperm Motility (% of motile cells)	1.18 (0.36)	-0.36 (0.33)	-0.19 (0.59)
NSPERM (billions)	-1.33 (1.57)	3.58 (1.59)**	3.00 (2.36)

[1] Number of animals genotyped for the SNP
*Significant association at the 10% level between SNP and trait
** Significant association at the 5% level between SNP and trait
NSPERM = Number of spermatozoa per ejaculation

Discussion

QTL for NTEAT in a Yorkshire x Meishan F2 population (Zhang *et al.*, 2007)

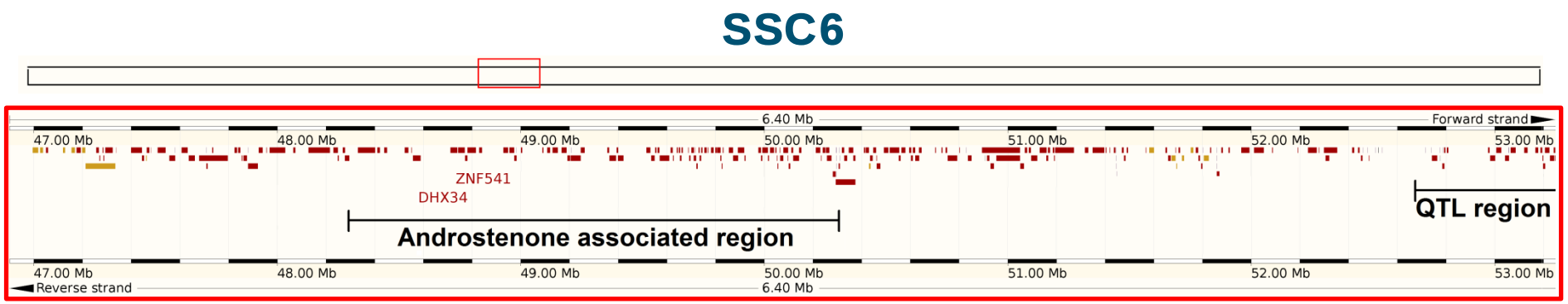
↳ Meishan alleles increase NTEAT

No significant correlation androstenone x NSPERM (Uzu & Bonneau, 1980)

Candidate genes

↳ Zinc finger protein 541 (*ZNF541*)

DEAD/H box polypeptide 34 (*DHX34*)



Conclusion

Selection for the Asian low-androstenone haplotypes on SSC6 does not negatively affect other traits

Thank you!

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