Effect of genomic selection on allele frequencies of QTL associated to number of teats in pigs

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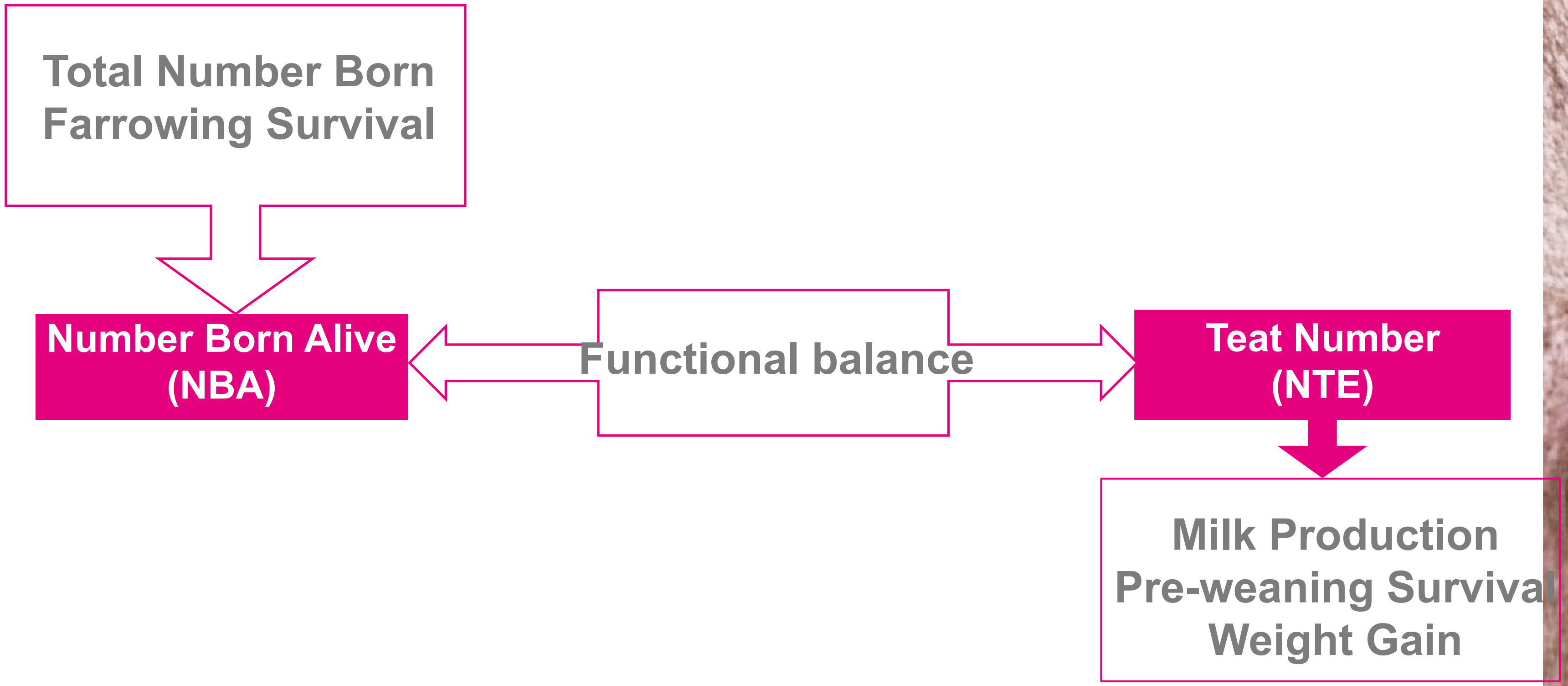
Topigs Norsvin

Every piglet needs a teat!



Total Number Born
Farrowing Survival

Number Born Alive (NBA)

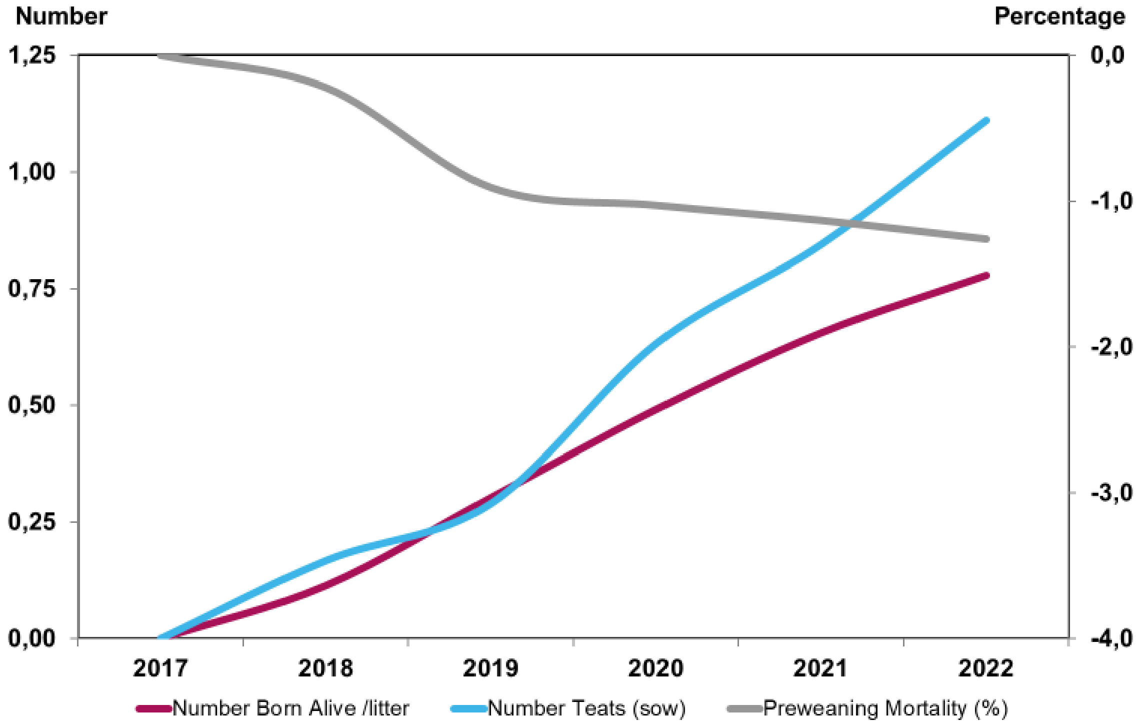
Functional balance

Teat Number (NTE)

Milk Production
Pre-weaning Survival
Weight Gain

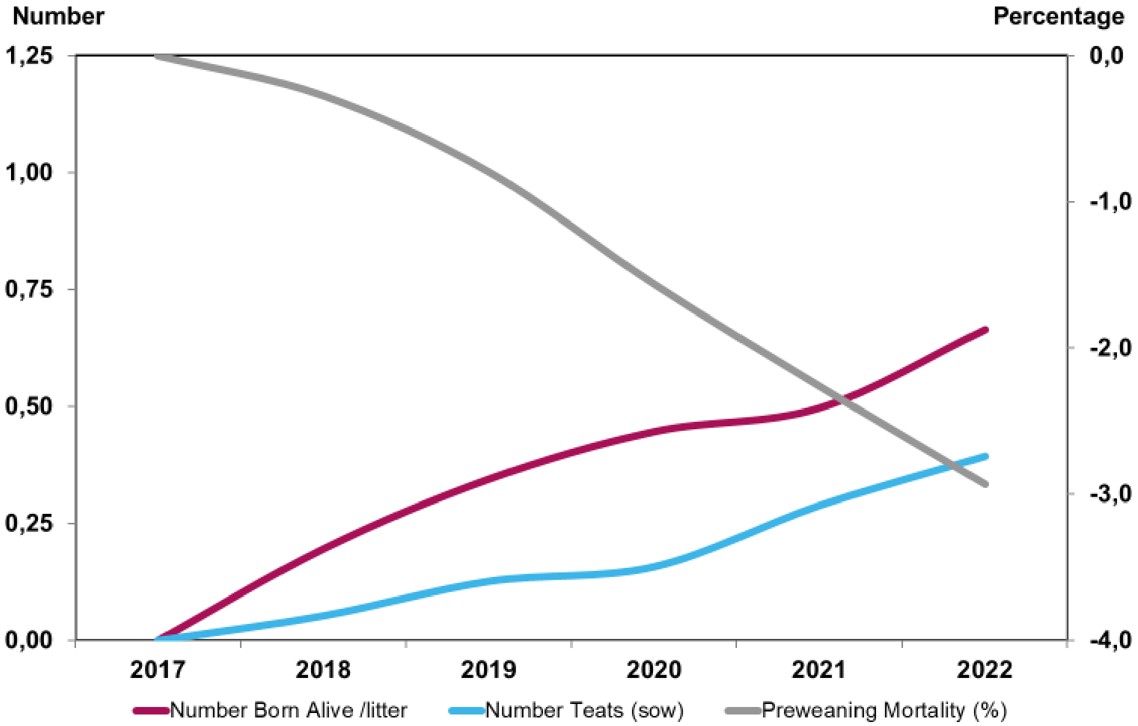
Genetic trends

Landrace



- Number of teats ahead with progress in litter size

Large White



- Increase in litter size and in number of teats in the last five years

OBJECTIVE

Better understand the impact of GENOMIC SELECTION on NUMBER OF TEATS

by following the changes in allele frequency across generations on different QTL regions affecting NTE in two maternal lines.

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346420

Available information

- Number of teats on males and females.
- Phenotypes: 1,380,975 Landrace (Born 2006-2023)
  1,893,122 Large White (Born 2006-2023)

- Genotypes: 375,610 Landrace (Born 2012-2022)
  346,420 Large White (Born 2012-2022)

- Genotyped on Illumina GeneSeek custom SNP chips (25K, 50K or 80K)
- Imputed to 660K in two steps (genotyped → 50K → 660K)

Line difference of 1.25 teats

Landrace 17.25 teats in average

Large White 16.02 teats in average

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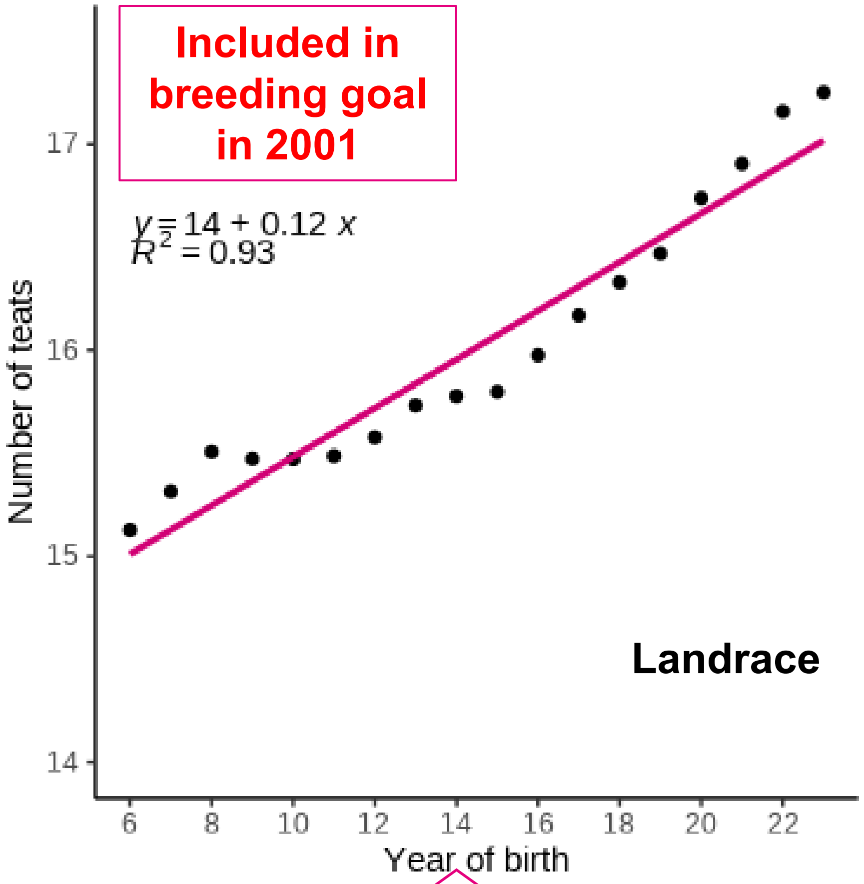
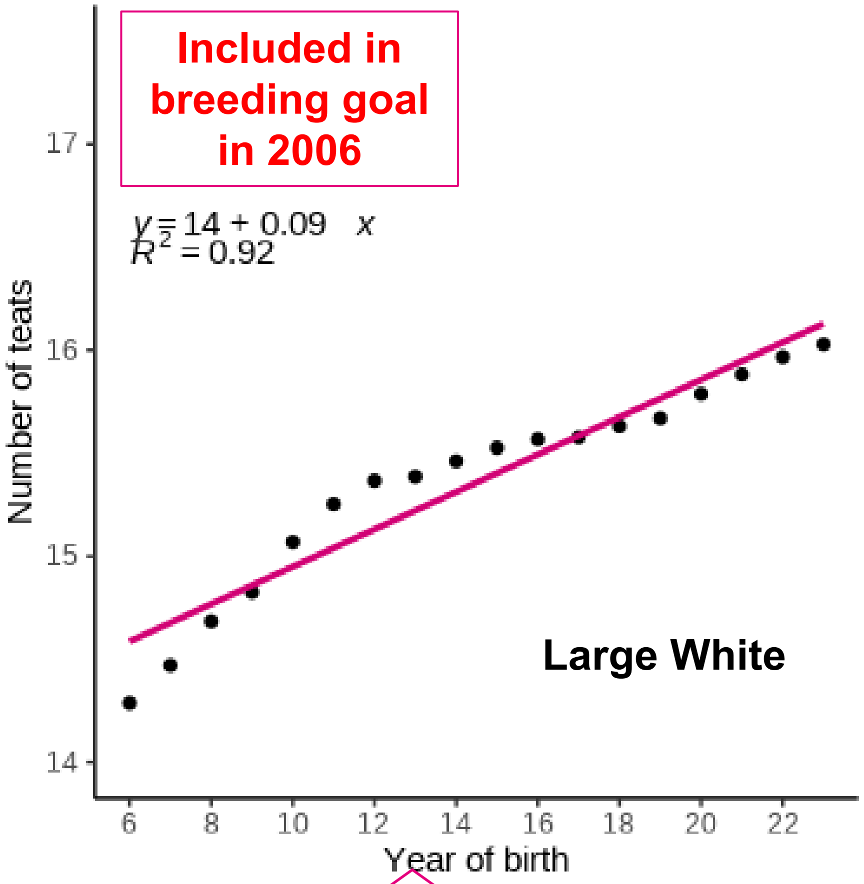
Phenotypic trend in teat numbers differs



Included in breeding goal in 2001



Included in breeding goal in 2006

Adoption of Genomic Selection

More variation present in Landrace

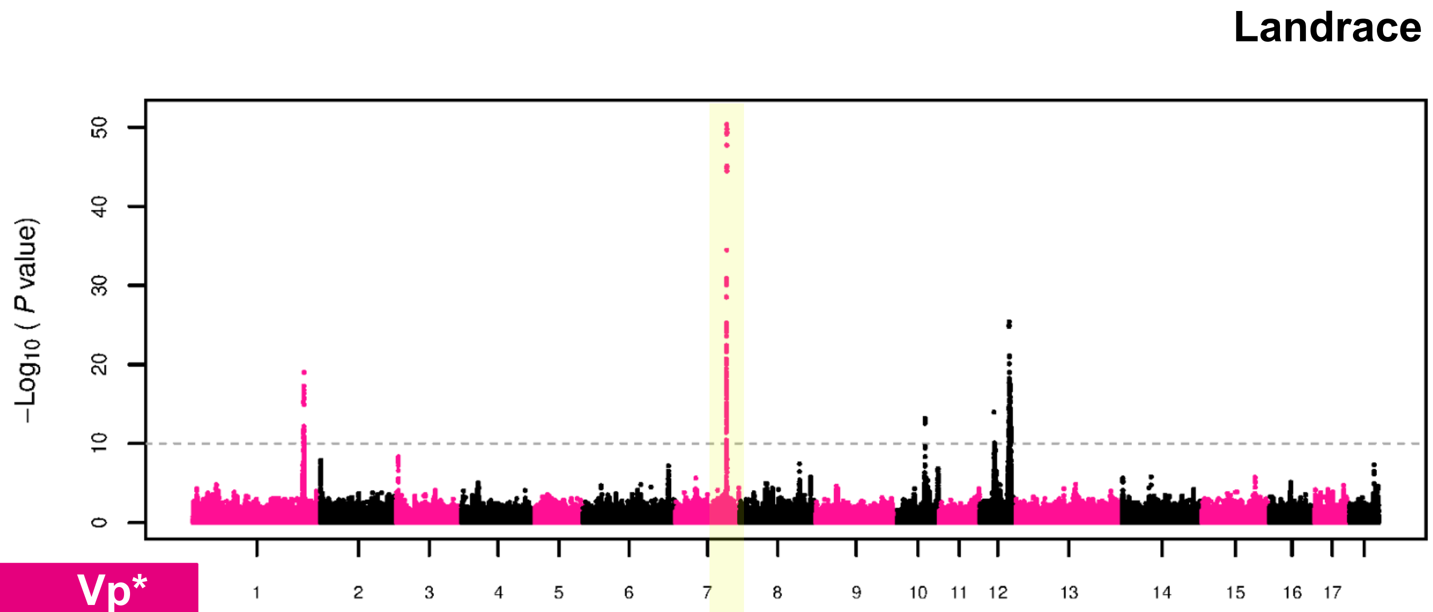
	Landrace	Large White
Phenotypic	1.46 (0.02)	1.06 (0.01)
Genetic	0.57 (0.02)	0.36 (0.01)
Heritability	0.39 (0.01)	0.34 (0.01)

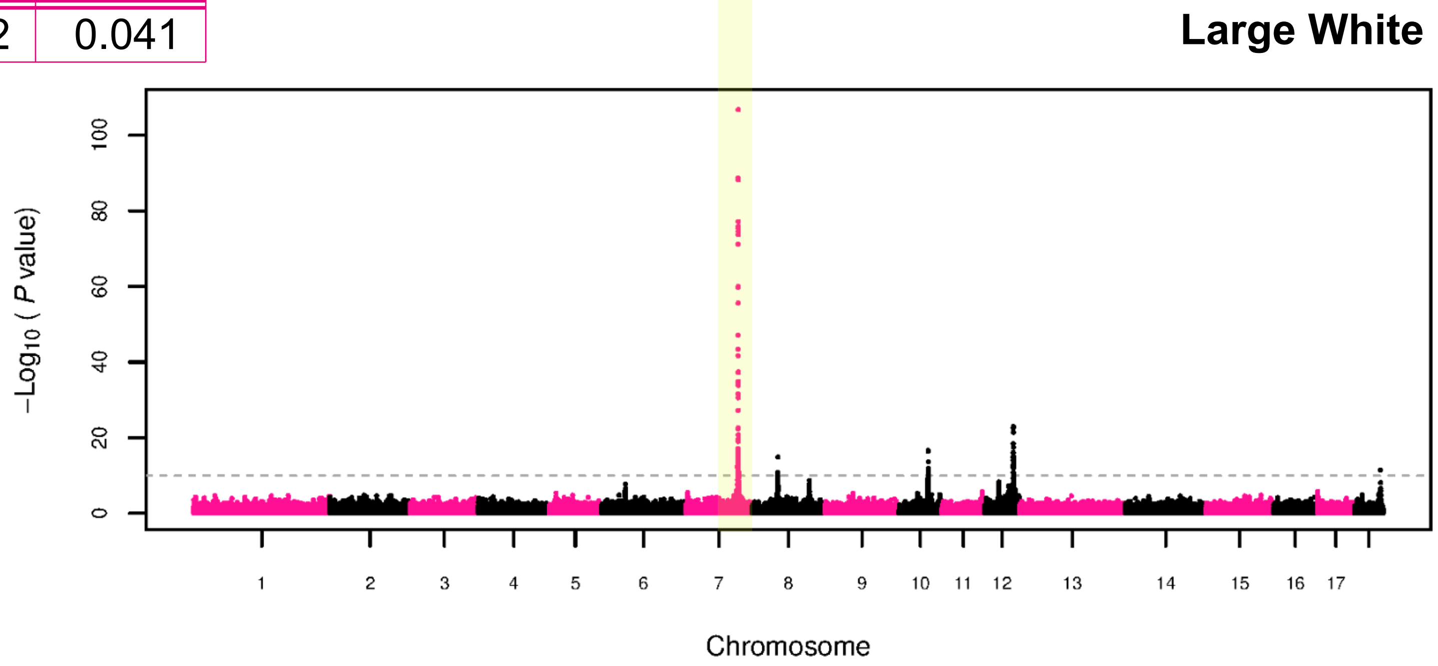
*Standard errors in parenthesis

VRTN

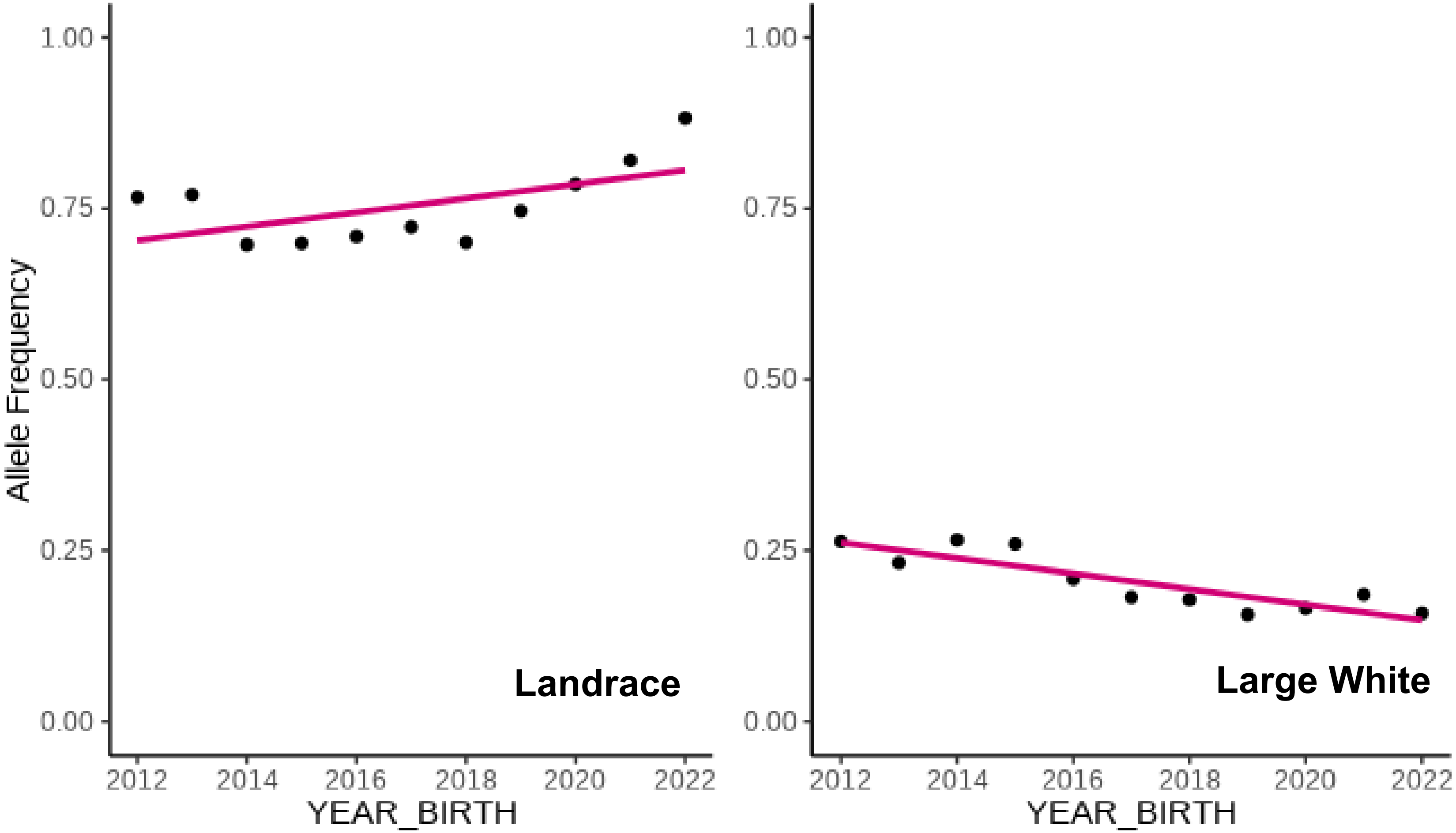
vertebrae development associated

Line	SSC	Mb	Freq.	Effect	Vg*	Vp*
L	7	98	0.78	0.41	0.096	0.037
LW	7	98	0.17	0.39	0.122	0.041

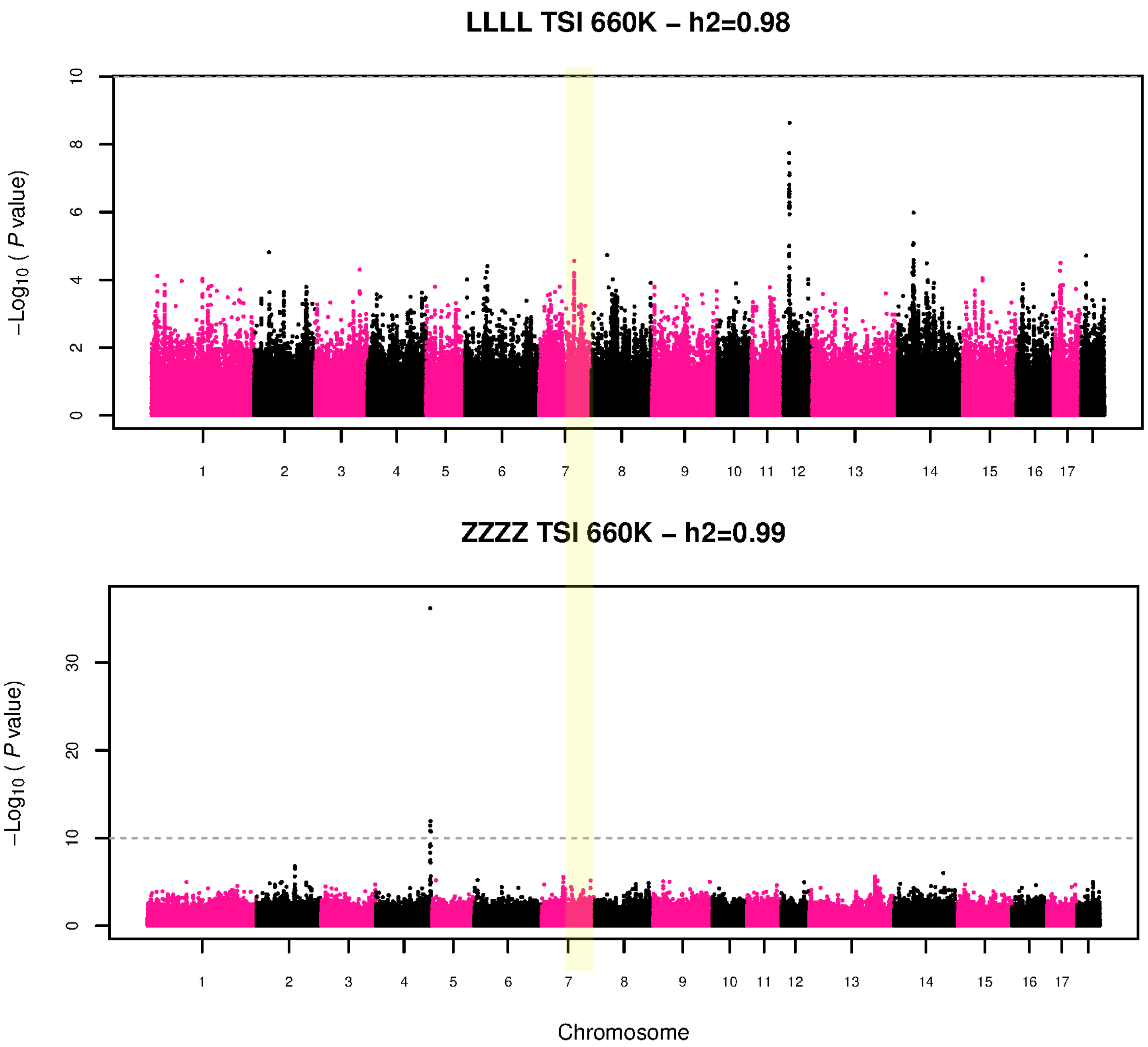




Opposite trend for VRTN allele increasing number of teats

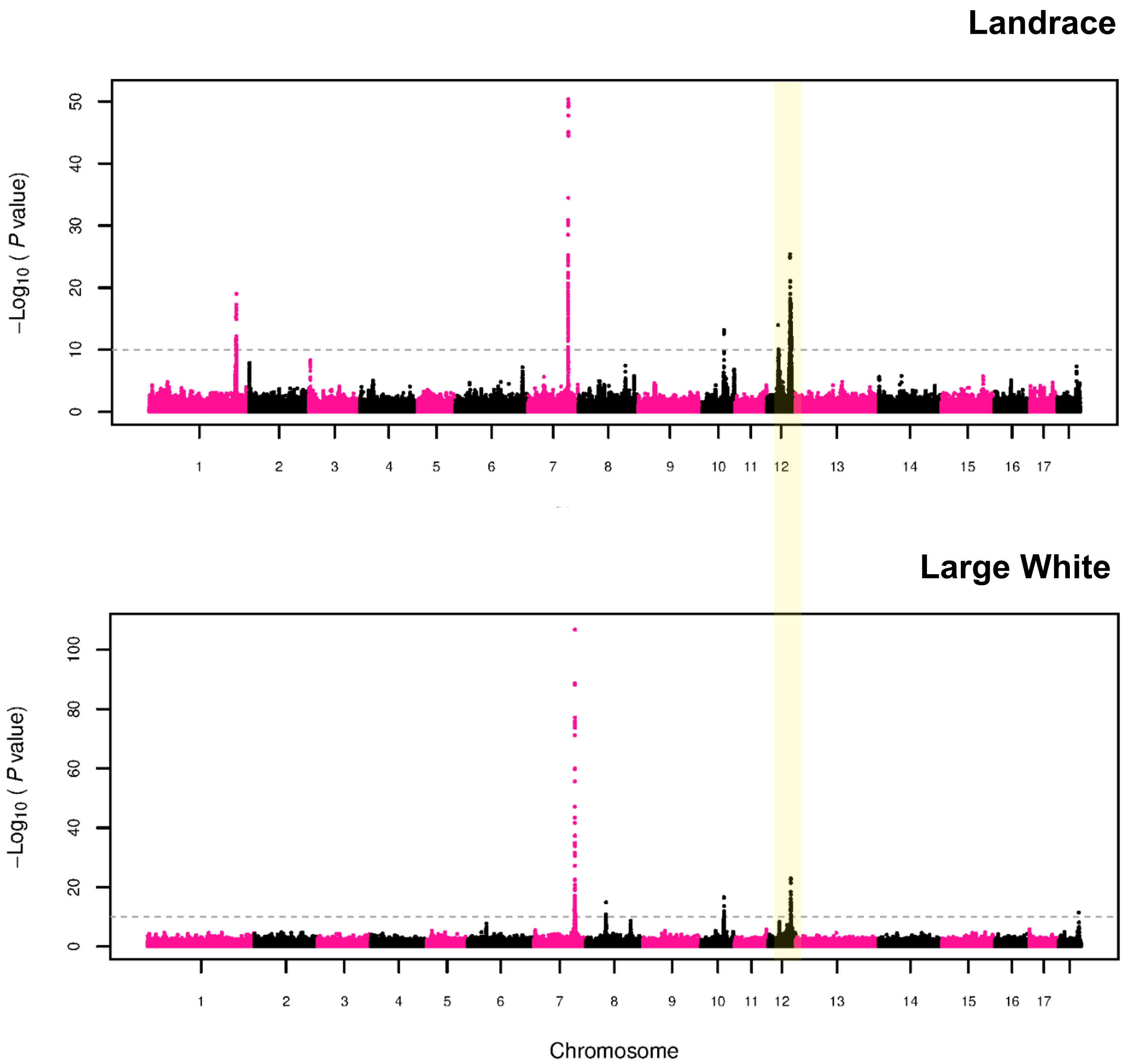


Unexpected correlations with other trait



2nd top QTL

associated with NTE



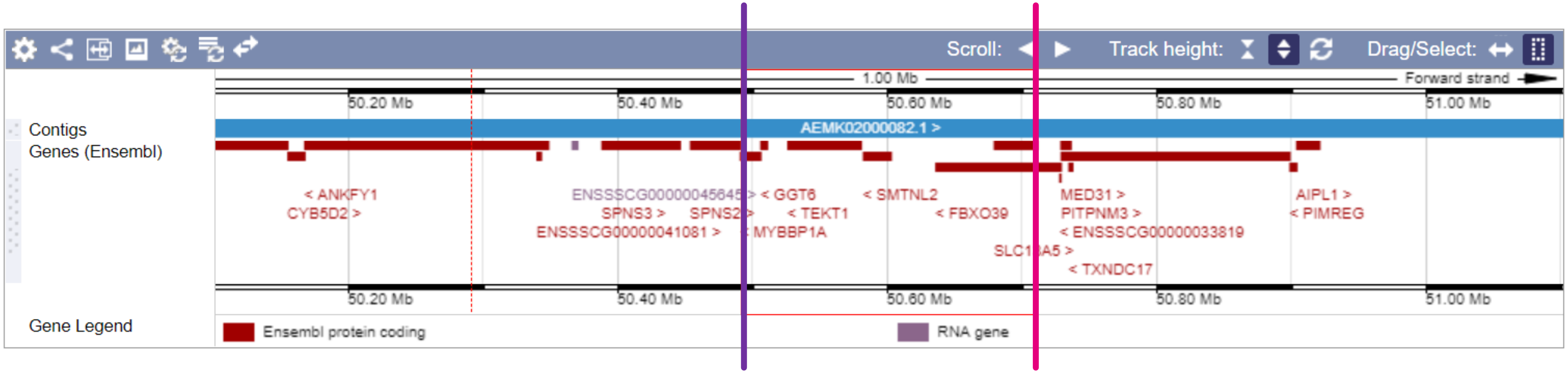
Landrace

Large White

Parameters for the SNPs in the 2 top QTL associated with NTE

Line	SSC	SNP	Position (Mb)	Freq.	Effect	Vg*	Vp*
L	12	AX-116444814	51	0.17	0.29	0.047	0.018
LW	12	AX-116758961	51	0.70	0.16	0.029	0.010

Region in detail



Discussion

- Less number of teats in Large White could be explained by less (genetic) variation.

- VRTN locus: the allele frequencies and their trend are the opposite in both lines.
  - Antagonist pleiotropy
  - Other QTLs contributes more to the overall genetic potential and selection space for NTE in Large White.

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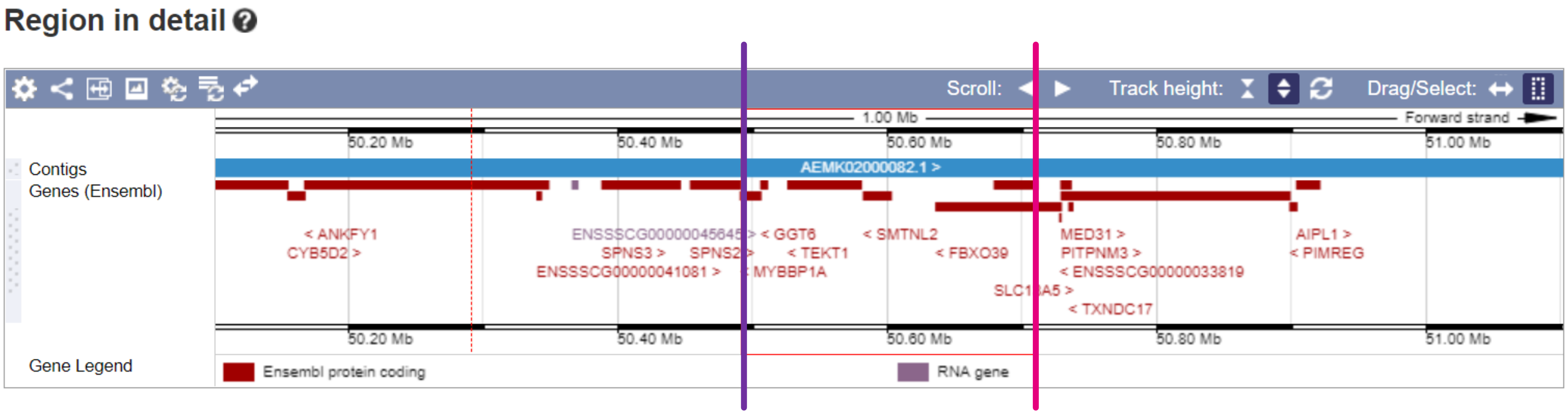
L	12	AX-116444814	51	0.17	0.29	0.047	0.018
LW	12	AX-116444814	51	0.01	NA	NA	NA
L	12	AX-116758961	51	0.23	0.13	0.011	0.004
LW	12	AX-116758961	51	0.70	0.16	0.029	0.010

*explained



Allele frequency trend