Genetic analysis of functional teats in the sow

Litter size is included in the breeding goal in most breeding programs. However, the selection for increased litter size is not beneficial if the number of functional teats, needed for high daily gain and uniform litters, is lower than litter size. Non functional teats *(e.g. inverted, blind, small or "extra")* are regarded to be of less value. The nursing and suckling behaviour of piglets follow a complex scheme and the milk ejection lasts for only 10-20 seconds. Thus the importance of having enough functional teats. Our purpose with this study was to analyse the genetic relationship between number of teats, age and backfat thickness at 100 kg. Our data included information on 24 600 purebred Yorkshire pigs from the Swedish breeding company Quality Genetics. We considered the records on males and females as different traits. The statistical model included the fixed effects of herd, year, birth parity number and random effects of animal, litter and pen during fattening period. Number of functional teats increased somewhat with parity number. Pigs born in small litters had somewhat less non functional teats than pigs born in larger litters. Significantly higher (+0.1) number of functional teats was found for pigs born in July-December compared with January-June. The heritability for number of functional teats was in the range 0.28-0.38 and for number of non functional teats in the range 0.04-0.22. The genetic correlation between number of functional teats for males and for females was high: +0.8. Number of functional teats had for male pigs, but not for females, a significant genetic correlation of 0.2 with age at 100 kg. There were no significant genetic correlations between number of functional teats and backfat thickness for any of the genders. Our result show that the number of functional teats can be improved by selection. Number of non functional teats is a complex trait and further studies including reproductive traits will be performed.

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Genetic analysis of functional teats in the sow

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Definitions (Nordic Genetics)

Functional teat: Teat judged to become functional for the piglets during lactation

Non functional teat: Teat judged to not be properly suckled or not able to give milk

- Inverted
- Small, extra
- Shortened, flat
- Missing, blind


Shortened/flat/small/extra teat


Inverted teat

Analyses are based on information from the Swedish breeding organisation Nordic Genetics:

- Yorkshire breed; 97706 males + females, born in the period Jan. 2004 to Apr. 2009, in 13 nucleus herds

- Since Nov. 2006 the number of functional/non functional teats on all pigs in the nucleus herds are recorded both at 3 wks of age AND at ultrasonic testing (approx. 100 kg live weight)

- Before that date only records at 100 kg live weight were kept
- 38938 pigs have records at 3 wks of age
- 70664 have records at 100 kg live weight
- 36720 pigs have records both at 3 wks and at 100 kg live weight
- ~80 % of the animals having records at 3 wks also have records at 100 kg live weight

Phenotypic analyses

Effects in the statistical model:

Sex

Sex ratio (=proportion of females in the litter)

Litter size

Herd-birth-year combination

2-monthperiod

Genetic analyses

Effects in the statistical model:

Sex (except when analyses where done for each sex)

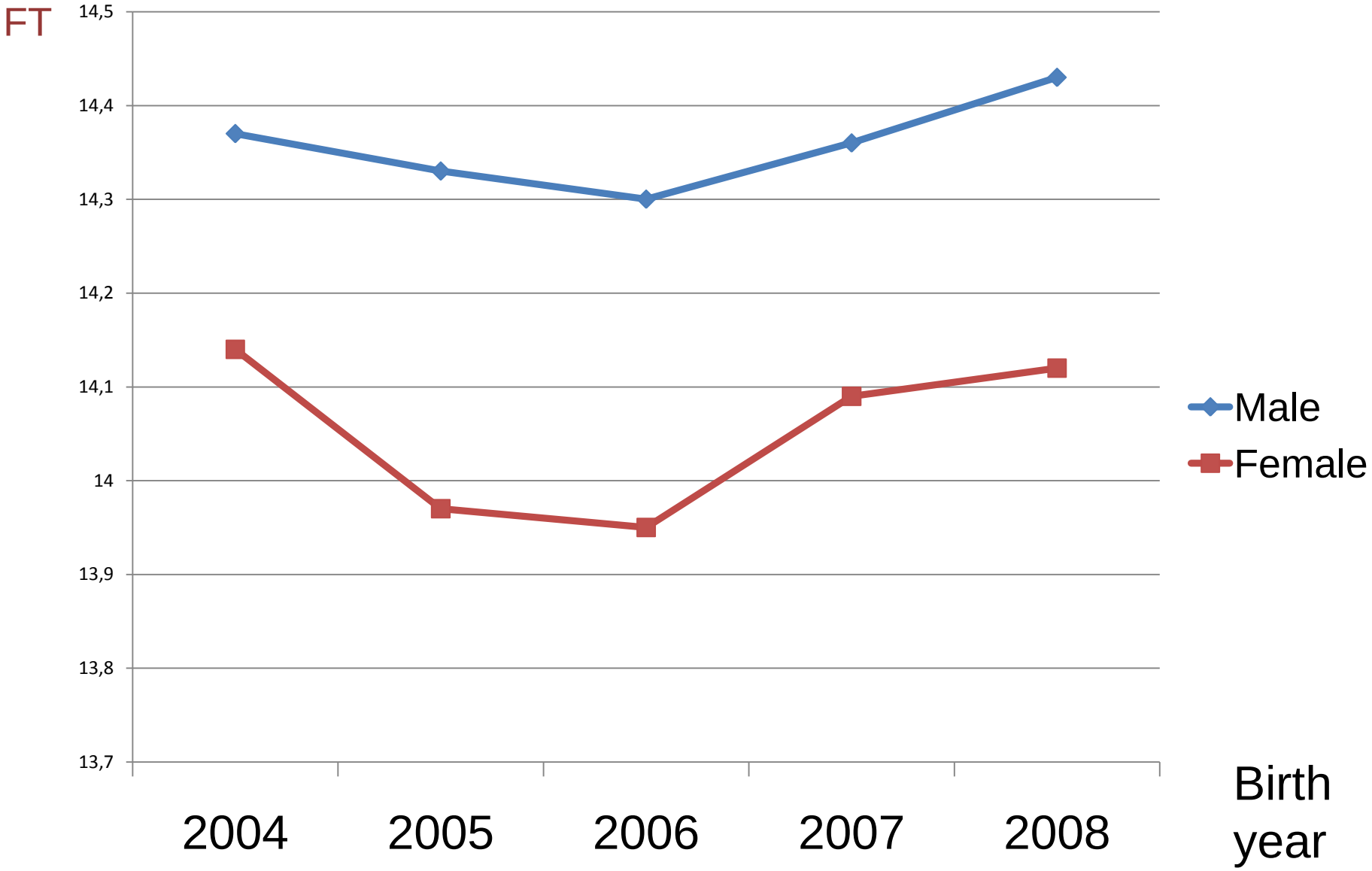
Herd-birth-year combination

Litter

Pen

Animal

Number of functional teats at 100 kg, for males and females

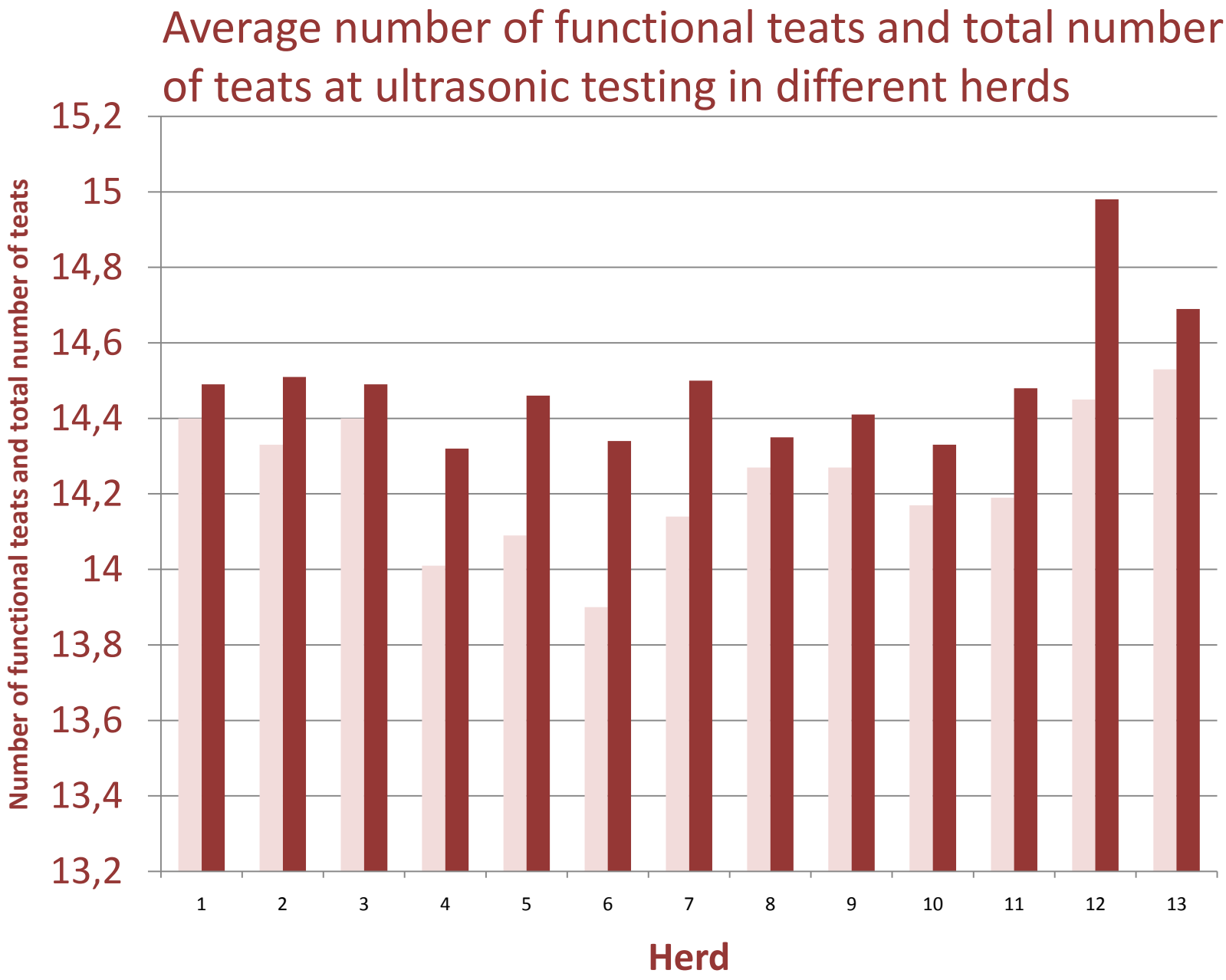


Average number of teats (LS means) for males and females

	Male	Female	Diff	Sign
No. func. teats 3 wk	14.45	14.39	0.06	***
No. func. teats 100 kg	14.40	14.08	**0.32**	***
No. non func. teats 3 wk	0.08	0.07	0.01	n.s
No. non func. teats 100 kg	0.09	0.35	**-0.26**	***
Tot. no. teats 3 wk	14.52	14.47	0.05	***
Tot. no. teats 100 kg	14.49	14.44	0.05	***

LS means

Sex ratio in the litter	FT 100 kg	NFT 100 kg	Sign FT	Sign NFT
More males	14.23	0.23	n.s;	n.s
Equal	14.25	0.23		
More females	14.24	0.23		
Parity number	**FT 100 kg**	**NFT 100 kg**	**Sign FT**	**Sign NFT**
1	14.21	0.22	***;	n.s
2	14.26	0.22		
3+	14.27	0.24		
Litter size	**FT 100 kg**	**NFT 100 kg**	**FT**	**NFT**
-10	14.24	0.07	n.s;	***
11	14.22	0.09		
12	14.24	0.07		
13	14.25	0.06		
14	14.26	0.07		
15+	14.23	0.06		


Average number of functional teats and total number of teats at ultrasonic testing in different herds
Number of functional teats and total number of teats
15,2
15
14,8
14,6
14,4
14,2
14
13,8
13,6
13,4
13,2
1
2
3
4
5
6
7
8
9
10
11
12
13
Herd

Estimated heritabilities by sex

	No. of functional teat			**No. of non functional teat**		
Time	M+F	M	F	M+F	M	F
3 week	**0.38**	0.39	0.40	**0.03**	0.04	0.05
100 kg	**0.28**	0.38	0.29	**0.22**	0.05	0.22

M=males F=females

Genetic correlations

	Days at 100 kg	Backfat thickness 100 kg
	Males	Females
No. of functional teats 100 kg (Males)	**+ 0.20**	+ 0.07
No. of functional teats 100 kg (Females)	+ 0.00	+ 0.04

Genetic correlations between gender

	Male-Female
No. func. teats, 3 wks	+ 1.0
No. func. teats, 100 kg	+ 0.8
No. non func. teats, 3 wks	+ 0.9
No. non func. teats, 100 kg	+ 0.6
Days at 100 kg	+ 1.0
Backfat thickness 100 kg	+ 0.9

Summary

- Differences between males and females
  - Biology or registration?

- Gen. corr. of +0.2 between number of functional teats for male pigs and age at 100 kg
  - Unfavourable genetic correlation between growth rate and no. of functional teats?

Summary

- Heritability for number of functional teats: 0.3-0.4
- Heritability for number of non functional teats: 0.04-0.22 is low, except for females at 100 kg
- Number of functional teats can be improved by selection

Thank you for your attention!

Swedish Farmers' Foundation for Agricultural Research