Genetic evaluation of female fertility traits in the Nordic countries

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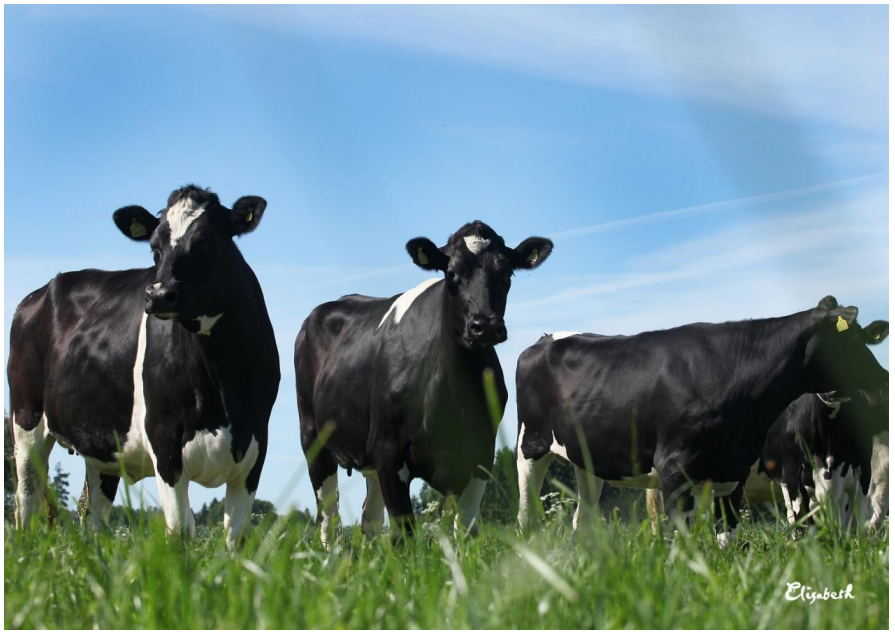
Our index for fertility describes the genetic ability of the bulls' daughters' to:

- ✓ start or resume cycling after calving
- ✓ to conceive at insemination
- ✓ to show oestrus

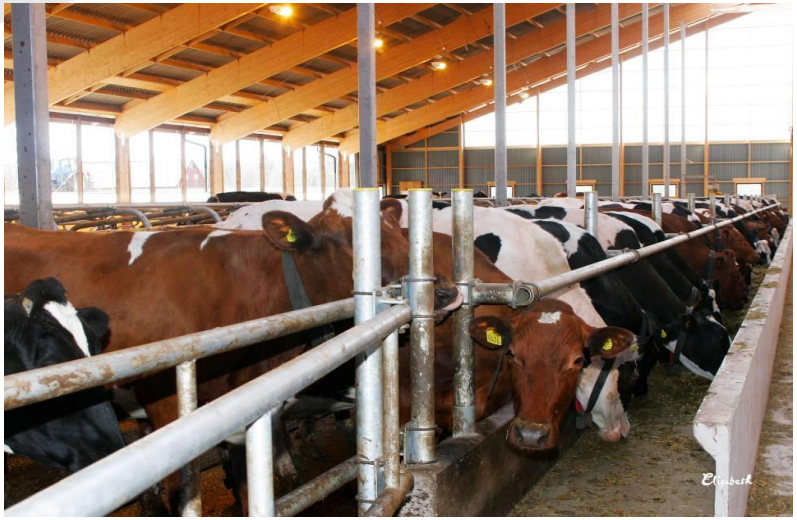
Dairy cattle - fertility

- Joint estimation of breeding values in Sweden, Denmark and Finland
- Routine run since June, 2005
- Based on raw data
  - Heifers and cows
  - Insemination dates
  - Calving dates
  - Heat intensity



	RDC		HOL		JER	
	Heifers	Cows	Heifers	Cows	Heifers	Cows
Sweden[1]	37 043	80 778	42 375	85 454	697	1 430
Denmark[2]	14 824	33 216	126 367	280 161	21 390	51 317
Finland[3]	49 151	117 887	27 647	66 311	-	-
Total	101 018	231 881	196 389	431 926	22 087	52 747

[1] Data since 1982 [2] Data since 1985 [3] Data since 1992



Traits

1. Non-return 56 days (NR56)
   First to last insemination (FLI)
   Calving to first insemination (CFI)
2. Number of inseminations (NINS)
   Heat strength (HS)
   Calving to first insemination (CFI)

- Editing rules at NAV's homepage
  - www.nordicebv.info - General description

- Correction for heterogeneous variance
  - country, year, parity

Model

Multi-trait, multi-parity (0 + 1-3), sire model

Month of first insemination*country (NR56, FLI, NINS, HST)	Fixed
Month of calving*country (CFI)	Fixed
Age at first insemination*parity*country	Fixed
Year (only Finland)	Fixed
Herd-period	Fixed
Breed	Regression
Heterosis	Regression
Genetic groups	Fixed
Herd-year (only Finland)	Random
Sire	Random

Genetic parameters – HOL (AYS/JER)

Trait	1.	2.	3.	4.	5.
1. NR56^{H}	0.008 (0.014)	-0.65 (-0.75)	0.40 (0.50)	0.10	-0.40
2. FLI^{H}		0.02 (0.015)	0.00 (-0.20)	0.35	0.40 (0.55)
3. NR56^{C}			0.02 (0.015)	0.45 (0.20)	-0.51
4. CFI^{C}				0.04	0.41
5. FLI^{C}					0.02 (0.03)

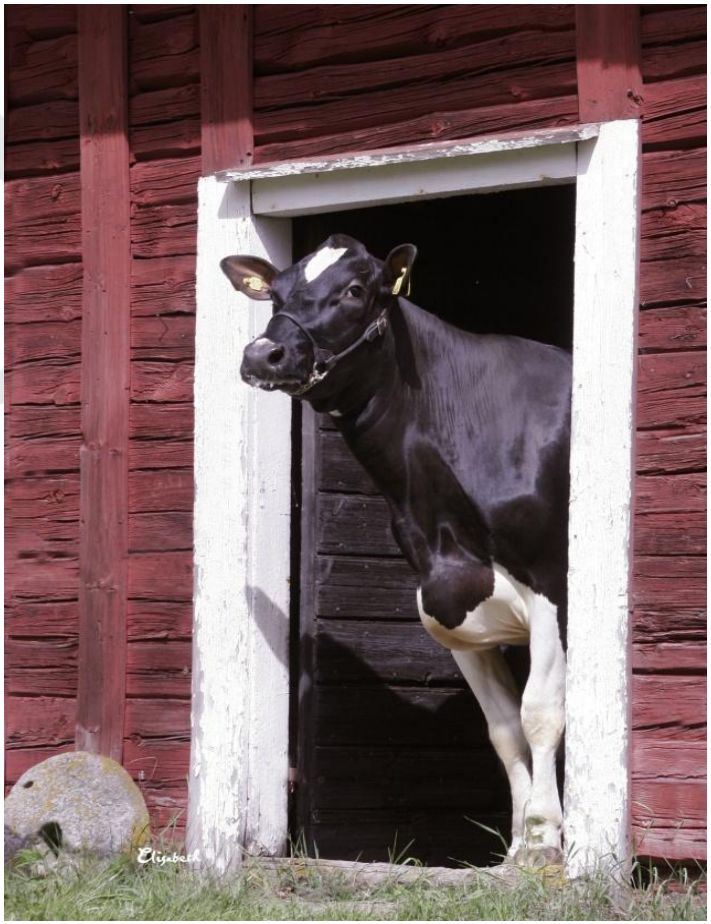
Genetic parameters – HOL (AYS/JER)

Trait	1.	2.	3.	4.	5.
1. $NINS^{H}$	0.025	0.15	0.40 (0.65)		
2. HST^{H}		0.02 (0.03)		0.65	
3. $NINS^{C}$			0.03	0.15	0.20
4. HST^{C}				0.025	0.35
5. CFI^{C}					0.04

Fertility index

- Economic value in NTM
  - euro (€) per unit
  - changes in calving interval
  - cost of AI and heat detection
  - related to yield

- Traits included
  - FLI for heifers and cows
  - NINS for heifers and cows
  - CFI for cows



Fertility index

HOL	$0.73 \times FLI^{H} + 0.62 \times CFI^{C} + 2.35 \times FLI^{C} + 10.17 \times NINS^{H} + 35.55 \times NINS^{C}$
RDC	$0.61 \times FLI^{H} + 0.56 \times CFI^{C} + 1.78 \times FLI^{C} + 10.14 \times NINS^{H} + 27.24 \times NINS^{C}$
JER	$0.93 \times FLI^{H} + 0.28 \times CFI^{C} + 1.61 \times FLI^{C} + 9.27 \times NINS^{H} + 27.14 \times NINS^{C}$

Correlations between fertility index and fertility traits

Trait	HOL	RDC	JER
FLI^{H}	0.75	0.75	0.80
FLI^{C}	0.97	0.97	0.96
CFI^{C}	0.65	0.60	0.63
$NINS^{H}$	0.54	0.68	0.78
$NINS^{C}$	0.85	0.91	0.87

Correlation between NTM and other traits for HOL

Yield	0.61
Growth	0.09
Fertility	0.44
Birth index	0.31
Calving index	0.35
Udder health	0.45
Other diseases	0.49
Body	-0.04
Feet and legs	0.15
Mammary system	0.34
Milkability	0.11
Temperament	0.00
Longevity	0.71

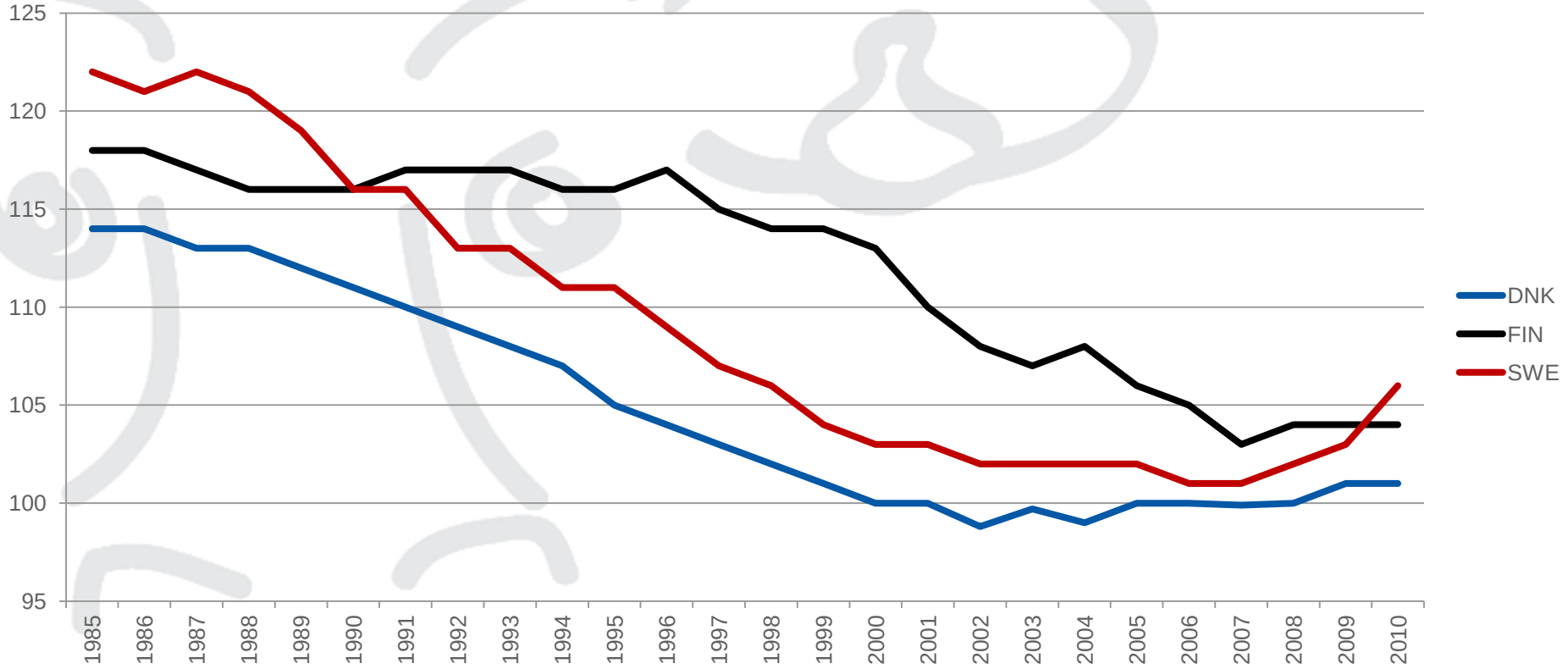
Correlation between NTM and other traits for RDC

Yield	0.68
Growth	0.06
Fertility	0.16
Birth index	0.20
Calving index	0.22
Udder health	0.30
Other diseases	0.24
Body	0.06
Feet and legs	0.17
Mammary system	0.32
Milkability	0.21
Temperament	0.20
Longevity	0.60

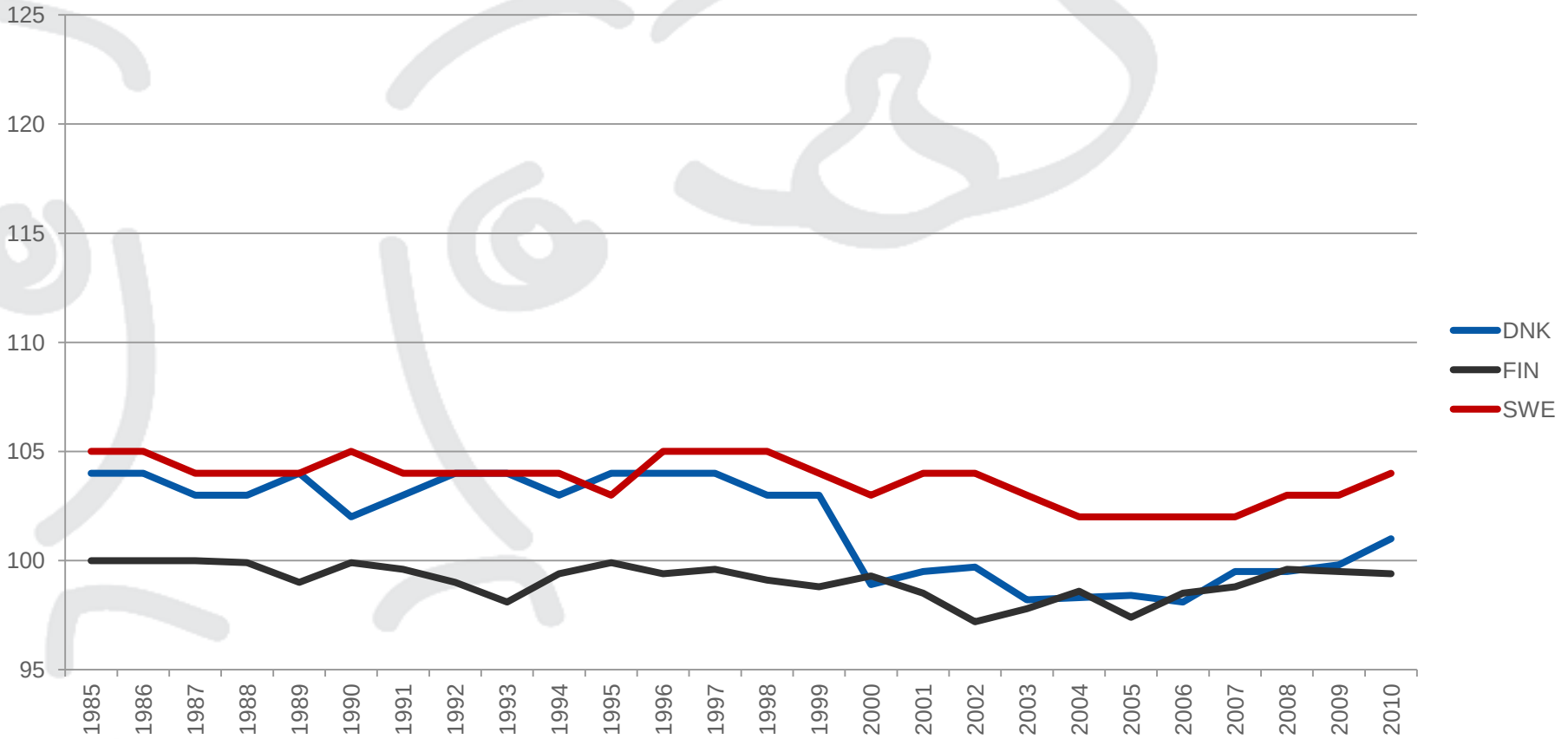
Correlation between NTM and other traits for Jersey

Yield	0.75
Growth	-0.05
Fertility	0.22
Birth index	-0.02
Calving index	0.08
Udder health	0.43
Other diseases	0.30
Body	0.03
Feet and legs	0.25
Mammary system	0.25
Milkability	0.10
Temperament	0.22
Longevity	0.60

Genetic trend - HOL



Genetic trend - RDC



Effect of +10 index units

Trait	HOL	RDC	JER
FLI^{C} (days)	-4.9	-5.9	-4.0
CFI^{C} (days)	-2.2	-1.7	-1.6
$NINS^{H}$	-0.03	-0.08	-0.06

New genomic index for fertility

NAV, May 2011

- Heifers and cows get GEBV for fertility
- Young bulls >20 months WITHOUT official NTM get GEBV
- Sires WITH official NTM get traditional EBV

Challenges

- Revision 2011/2012
- Harmonisation, new parameters
- Animal model
- Fewer traits – other traits?
- GEBV

Thank you for your attention!