A quantitative genetic study of carcass quality traits in Atlantic salmon recorded both at a fixed age and fixed body weight.

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Important breeding objective traits

- Growth
  - Reduce number of days to target weight.
- Fat
  - Keep stable or reduce.
- Pigment
  - Increase colour level in the fillet.

Ref: Selective Breeding in Aquaculture: An Introduction, 2009, Trygve Gjedrem, Matthew Baranski, Springer Forlag

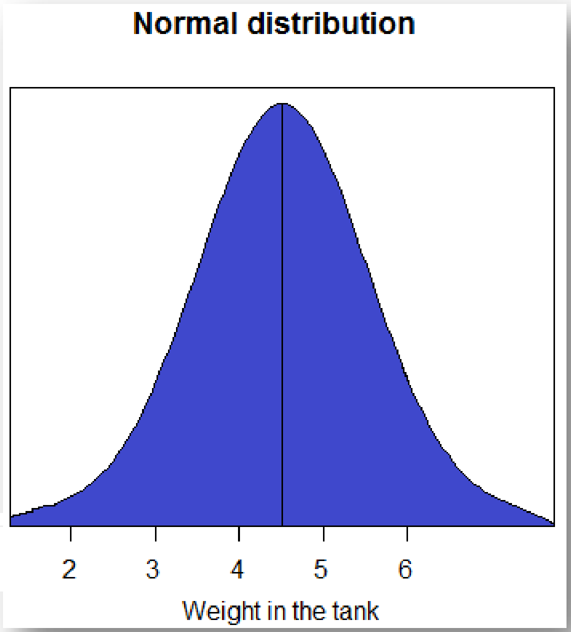
Genetic and phenotypic correlations recorded at same age

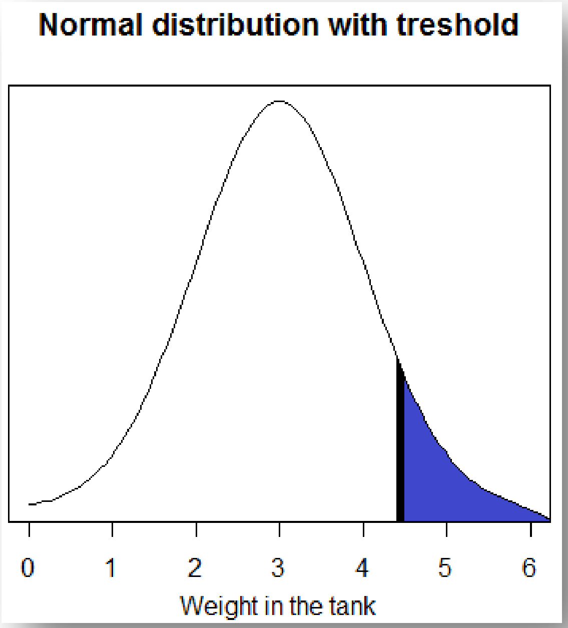
	Fat	Colour	Weight
Fat		0.03	0.48 to 0.63
Colour	-0.39		0.2
Weight	0.42 to 0.82	-0.21 to 0.31	

Ref: (Rye et al 1994, Rye and Gjerde et al. 1996, J. Powel et al. 2008)

Objective

- Obtain estimates of genetic parameters for growth, filet fat and filet colour when measured both at:
  - **<u>Same age(SA)</u>** **<u>Same weight(SW)</u>**





Material

- Two year classes.

- 206 families, offspring of 206 females and 103 males

  - 10-15 individuals per family in SA group

  - 13-15 individuals per family in SW group.

Methods

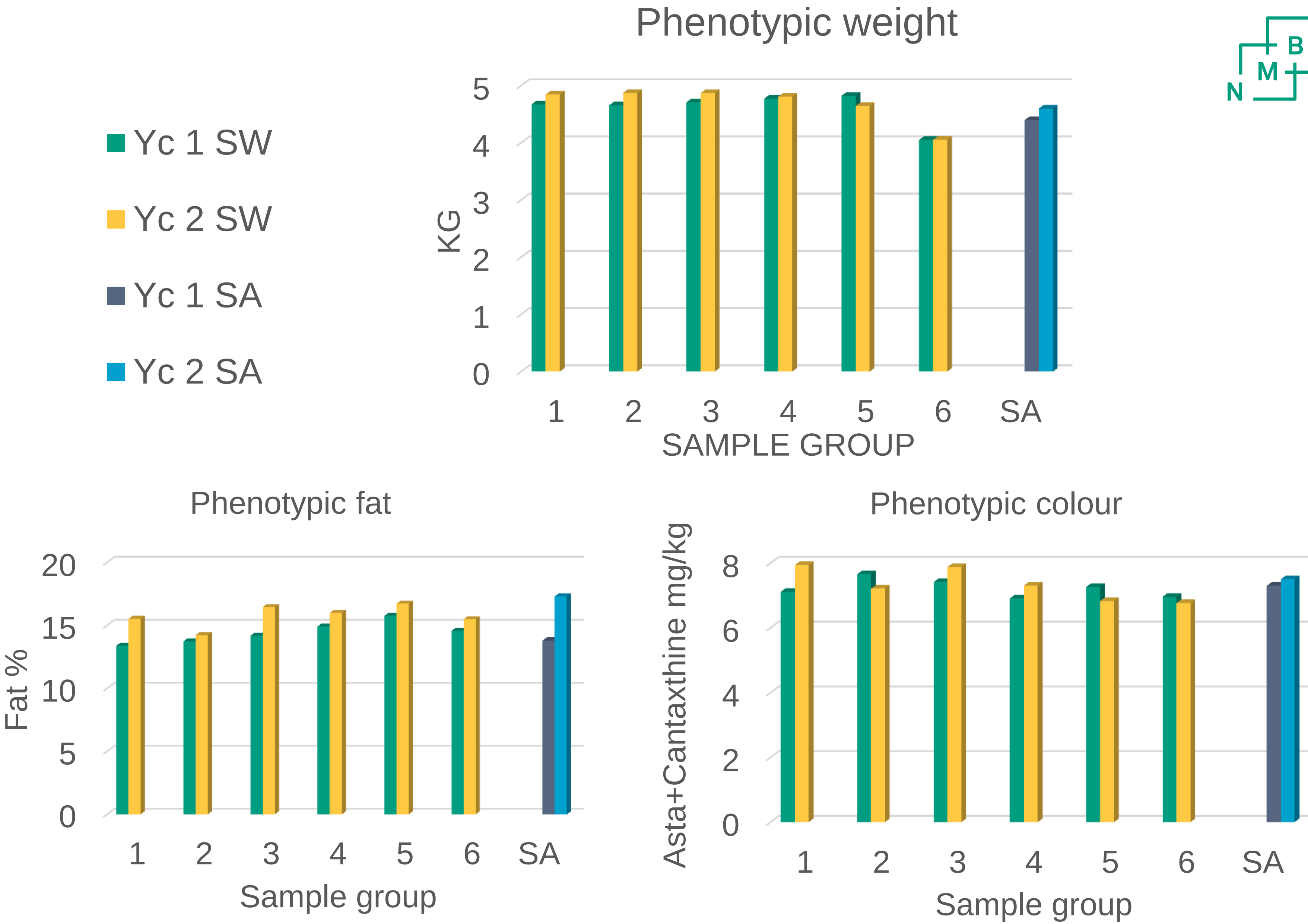
- SA group
  - Growth, fat and colour measured at average weight of 4.7 kg, in total 2437 measures.
- SW group
  - Growth measured at the start.
  - Growth measured on individuals around and above the target weight 4.4 kg ~ monthly.
  - Fat and colour measured at slaughter.
  - 7561 growth measures, 2693 fat and colour measures.


QVision

Multivariate censored animal model in DMU

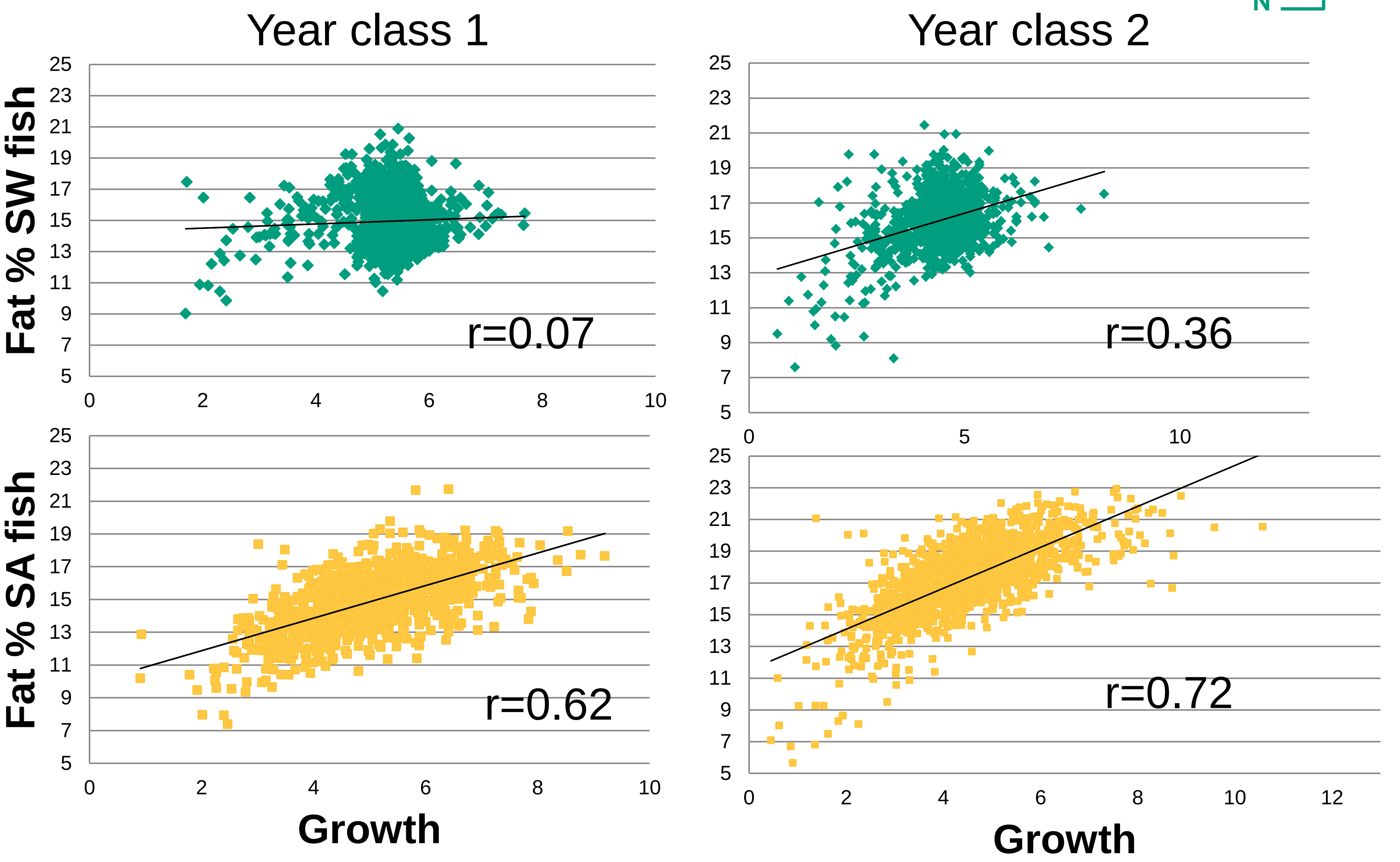
- Censoring data.
  - Start growth ~ when average weight was 2.7 kg.
  - Growth on individuals who reach threshold 4.4 kg.
    - Imputes growth values for remaining fish in tank using Gibbs sampler.
    - Total 13102 growth values used.
- The animal model for the 6 traits, growth, fat and colour SA and SW.
    - $y = X\beta + Zu + Mr + e$
  - Fixed effects: sex, year class, slaughter date
- Estimated using MCMC with 2.400.000 rounds.

Results



Phenotypic weight
Yc 1 SW
Yc 2 SW
Yc 1 SA
Yc 2 SA
KG
0
1
2
3
4
5
1
2
3
4
5
6
SA
SAMPLE GROUP
Phenotypic fat
Fat %
0
5
10
15
20
1
2
3
4
5
6
SA
Sample group
Phenotypic colour
Asta+Cantaxthine mg/kg
0
2
4
6
8
1
2
3
4
5
6
SA
Sample group

Phenotypic correlations



Heritabilities

	h^2 SA	h^2 SW
Fat	0.25±0.08	0.17±0.04
Colour	0.10±0.04	0.10±0.004
Growth	0.36±0.09	0.38±0.10

Genetic correlations between the same trait in SA and SW

	Genetic correlation
Fat	0.59±0.08
Colour	0.44±0.26
Growth	0.92±0.04

Genetic correlations between traits within SA and SW

	SA	SW
Fat and colour	-0.34±0.25	-0.26±0.26
Fat and growth	0.63±0.13	-0.21±0.23
Growth and colour	-0.36±0.24	0.25±0.32

Conclusions

- Magnitude of genetic correlations of growth with fat and colour depend on when the traits are measured.
- When measured at same weight instead of at same age genetic correlations change from being unfavourable to favourable.
- Possible to improve growth while at the same time reduce fat and increase colour as increased growth is utilized to perform earlier slaughter.

Thank you !

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