


Comparison of Atlantic cod from the Faroe Bank and the Faroe Plateau by genetic analyses – initial studies

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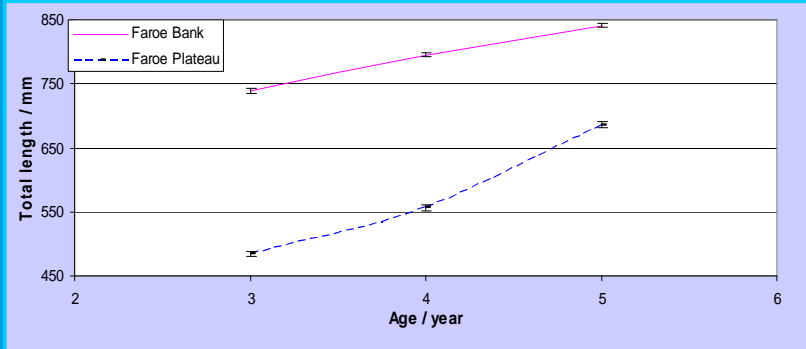
PhD project – started 1st of February 2008

Cod Farming in Nordic Countries, Reykjavík, 30th September – 1st October 2008



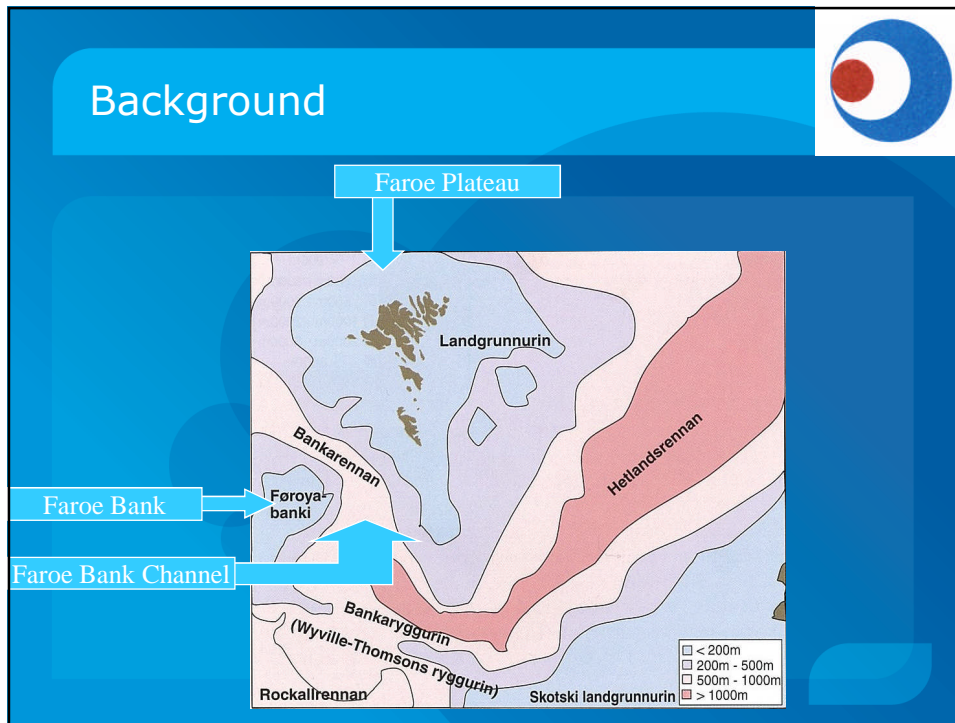
Background

- Growth trial in 1994: FB cod showed significantly faster growth than FP cod
- FB and FP cod managed separately since 1965



Age / year	Faroe Bank (mm)	Faroe Plateau (mm)
3	~740	~480
4	~780	~550
5	~840	~680

Mean total lengths of the three largest age groups sampled in 2008 (N ranges from 22 to 57). Bars represent the 95% confidence intervals.



Main goals of the project - 1

An in-depth population genetic analysis of the two Faroese cod stocks

Sampling of at least 100 individuals from both stocks

Biological data: length, weight, age, sex

Interannual variation?

Main goals of the project - 1



An in-depth population genetic analysis of the two Faroese cod stocks

- Microsatellites:
 - Gmo2
 - Gmo3
 - Gmo8
 - Gmo34
 - Gmo35
 - Gmo37
 - Gmo132
 - Tch11
- Haemoglobin
- Pantophysin
- Allozymes

Main goals of the project - 2



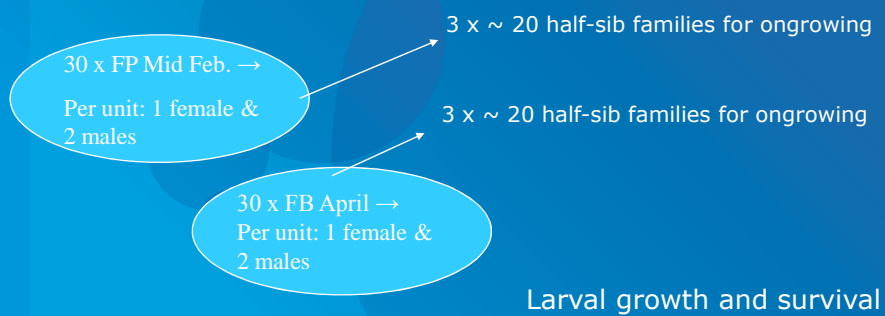
Evaluation of potential key aquacultural traits within and between the two Faroese cod stocks

- Collection of wild broodstock from both areas
- Broodstock identification: Tagging - morphometric measurements - genotyping
- Production of half-sib families

Main goals of the project - 2



Evaluation of differences between families within and between the two Faroese cod stocks

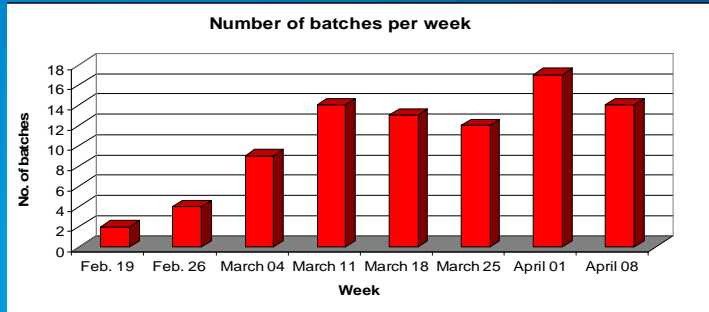


Achieved so far



- Collection of broodstock
- Pilot project (13 spawning pairs of Faroe Plateau cod)
- Testing of DNA profiling methodology for parental assignment
- First sampling of the natural populations
- Preliminary microsatellite results

Pilot project observations

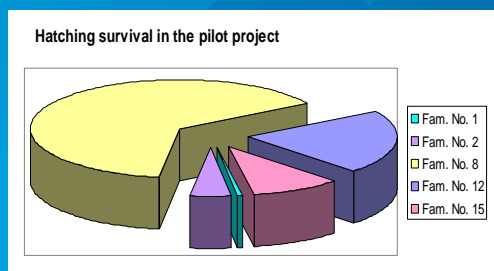


- Huge variation in egg fecundity, regularity and number of spawning events
- Fertilisation percent: Mean 97% (min 67% and max 100%)
- Egg diameter decreased throughout the breeding season

Parental assignment



Parental assignment achieved with 3 microsatellites

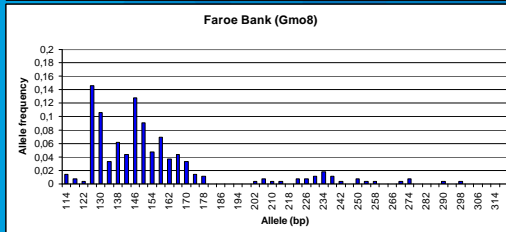
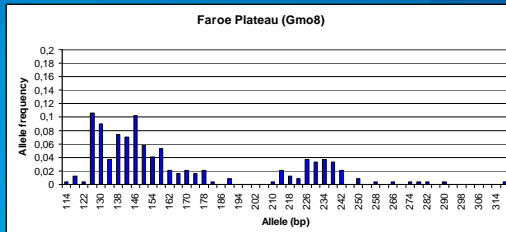


Family No.	No. Of larvae
1	1
2	8
8	119
12	39
15	18

N=185

Significant departure from homogeneity ($P < 0.001$)

Microsatellite preliminary results



Gmo8 most polymorphic marker



Microsatellite preliminary results



Single locus statistics

Locus	<i>n</i>	H_{exp} (FP)	H_e (FB)	HW exact test, $P=$ (FP)	HW exact test, $P=$ (FB)	F_{ST} (P)
Gmo2	15	0.80	0.82	0.0000	0.0025	-0.0028 (0.8764)
Gmo3	9	0.34	0.13	0.8774	0.1170	0.0564 (0.0000)
Gmo8	41	0.94	0.92	0.0011	0.0000	0.0012 (0.0776)
Gmo34	9	0.65	0.67	0.4144	0.1128	0.0041 (0.0345)
Gmo35	11	0.84	0.83	0.1818	0.0095	-0.0011 (0.8061)
Gmo37	15	0.84	0.85	0.5079	0.7303	-0.0009 (0.2183)
Gmo132	30	0.92	0.92	0.3744	0.9193	0.0050 (0.0001)
Tch11	23	0.93	0.93	0.4747	0.0001	-0.0015 (0.8709)
All				0.0000	0.0000	0.0028 (0.0000)

Microsatellite preliminary results



H_e 0.13 – 0.94 (mean 0.77)

H_e (FP) 0.782

H_e (FB) 0.758

Departure from Hardy-Weinberg equilibrium:

Gmo2, Gmo8 (FP + FB)

Gmo35, Tch11 (FB)

Microsatellite preliminary results



Genetic differentiation

Locus	F_{ST}	P
Gmo3	0.0564	0.00
Gmo34	0.0041	0.03
Gmo132	0.0050	0.00

Over all loci: $F_{ST}=0.0028$ ($P=0.00$)

Knowledge obtained



Differences between families within stocks

Confirmation of growth differences between the two Faroese cod stocks



Slight genetic differentiation

Conclusion



Genetic versus environmental influences?

Hypothesis:

Some of the observed differences between the Faroe Plateau cod and Faroe Bank cod are of genetic origin

