

Genetics in support of fisheries and aquaculture management

17-19 September
Faro, Portugal

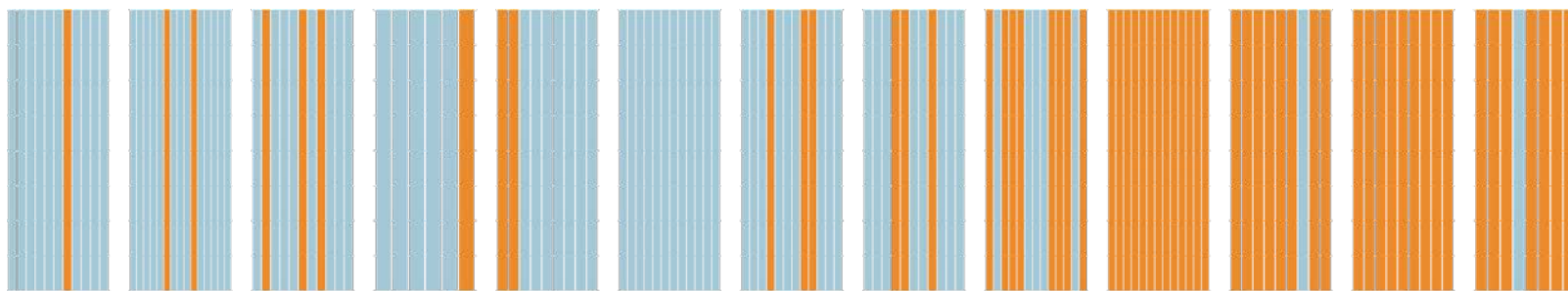


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Data Analysis case study – Cod in Greenland

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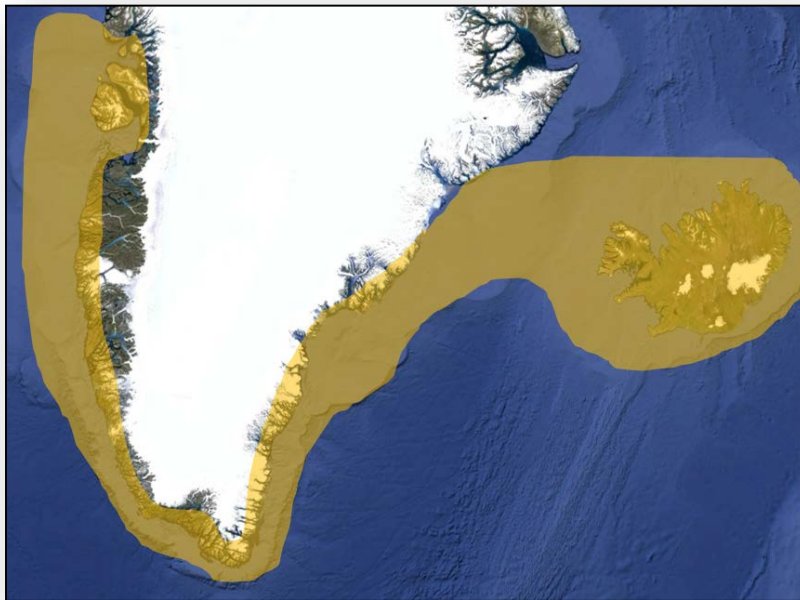
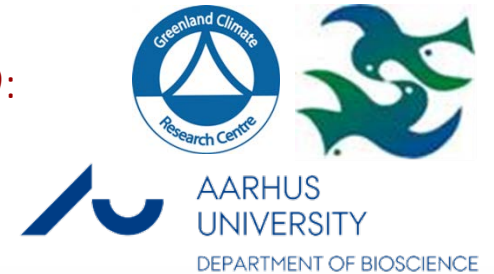
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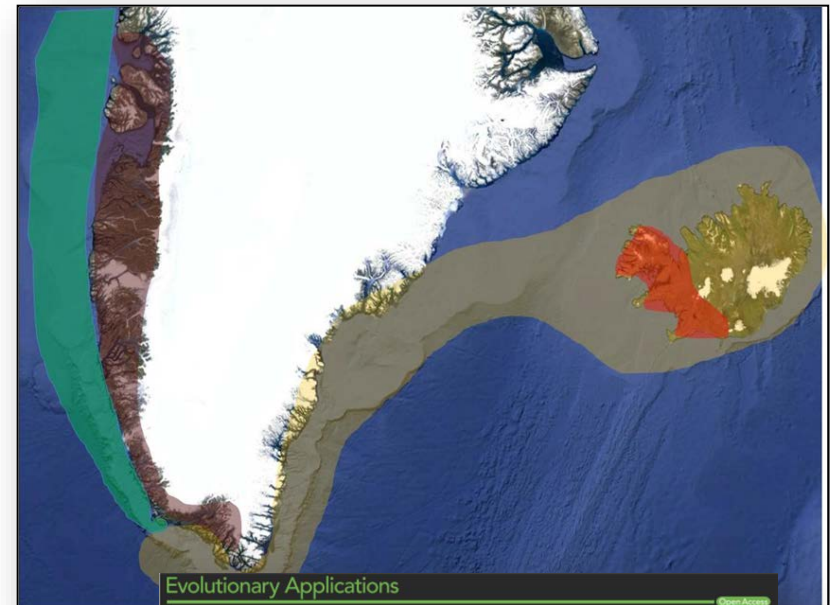
From Molecular Ecology to Management

Cod in Greenland (Greenland Climate Research Centre):

- Detection of spatiotemporal population structure using DNA from historical otoliths



Spawning populations before 2011



Evolutionary Applications
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 Evolutionary Applications ISSN 1752-4571

ORIGINAL ARTICLE
Spatiotemporal SNP analysis reveals pronounced biocomplexity at the northern range margin of Atlantic cod *Gadus morhua*
 Nina Overgaard Therkildsen,^{1,2} Jakob Hemmer-Hansen,^{1,2} Rasmus Berg Hedeholm,^{2,3}
 Mary S. Wisz,^{2,4} Christophe Pampouille,³ Dorte Meldrup,¹ Sara Bonanomi,^{1,2} Anja Retzel,³
 Steffen Malskær Olsen^{1,6} and Einar Eg Nielsen^{1,2}

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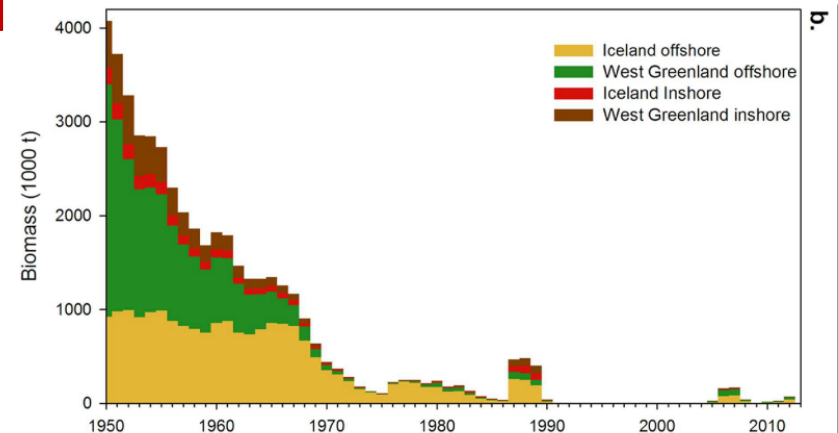
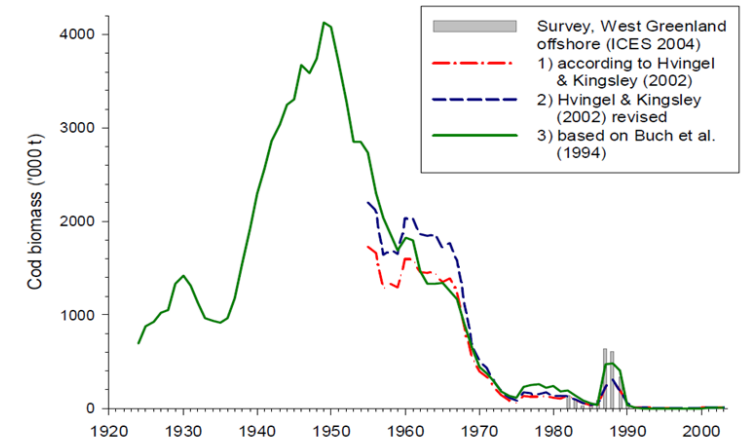
Cod in Greenland

(Greenland Climate Research Centre):

- Detection of spatiotemporal population structure using DNA from historical otoliths
- Investigation of causes of historical fisheries collapse

$F_{eq} = 0.14$ (West Greenland offshore)

$F_{eq} = 0.82$ (Iceland offshore)



SCIENTIFIC REPORTS

OPEN

Archived DNA reveals fisheries and climate induced collapse of a major fishery

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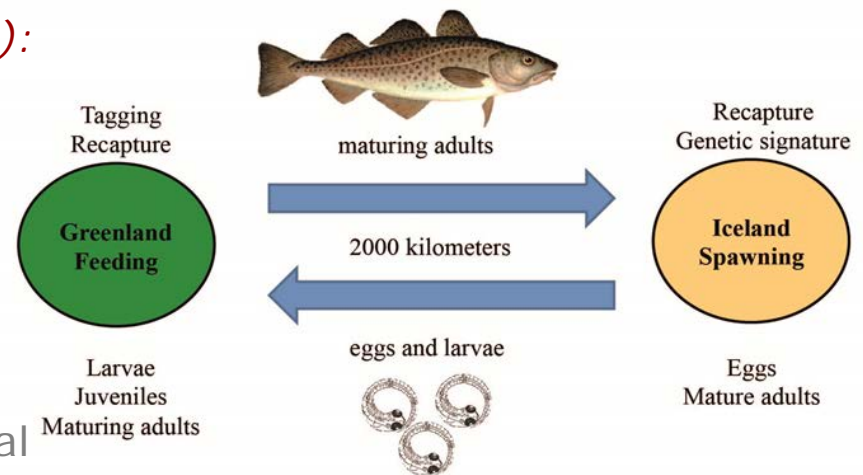
Sara Bonanomi^{1,2,3,*}, Loïc Pellissier^{1,4,5}, Nina Overgaard Therkildsen^{1,5}, Rasmus Berg Hedeholm^{1,6}, Anja Retzel^{1,6}, Dorte Meldrup¹, Steffen Malskær Olsen⁷, Anders Nielsen⁸, Christophe Pampoulie⁹, Jakob Hemmer-Hansen¹, Mary Susanne Wisz^{10,1}, Peter Grønkjær^{2,11,1} & Einar Eg Nielsen^{1,2,1}

From Molecular Ecology to Management

Cod in Greenland

(Greenland Climate Research Centre):

- Detection of spatiotemporal population structure using DNA from historical otoliths
- Investigation of causes of historical fisheries collapse
- Documentation of historical natal homing of Icelandic cod



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Cod in Greenland (Greenland Climate Research Centre):

- Detection of spatiotemporal population structure using DNA from historical otoliths
- Investigation of causes of historical fisheries collapse
- Documentation historical homing of Icelandic cod
- Change in ICES management recommendations



ICES Advice:

Before 2011, 1 stock: 0 t

2012-2014, 2 stocks:
8.000 t

2015-?, 3 stocks: 20.000 t
(200 mio DKK)

- TAC 50 000 t.

Bang for buck!

"The value of the cod and climate project for the Greenlandic society, far exceeds the prize for the Greenland Climate Centre as a whole (7 mill Euro)"

Klaus Nygaard, Director of the Greenland Institute for Natural Resources

Fisheries monitoring



Projekt PIFT (Proportioner i Indenskærs-Eiskeriet efter Torsk)



- 2-3 weekly collections over a year in Nuuk and Sisimiut
- Spatial and temporal information
- Different gear-types
- ~3000 cod (and counting).



Your job!

- Calculate basic population genetic indices from baseline data file (Fis, He, Ho, linkage)
- Estimate Fst among populations
- Assign fish in mixed samples back to population of origin