

# From genome assembly to fisheries assessment

## A case study of Atlantic herring

SPF Symposium 2022

7. November

Florian Berg

[florian.berg@hi.no](mailto:florian.berg@hi.no)



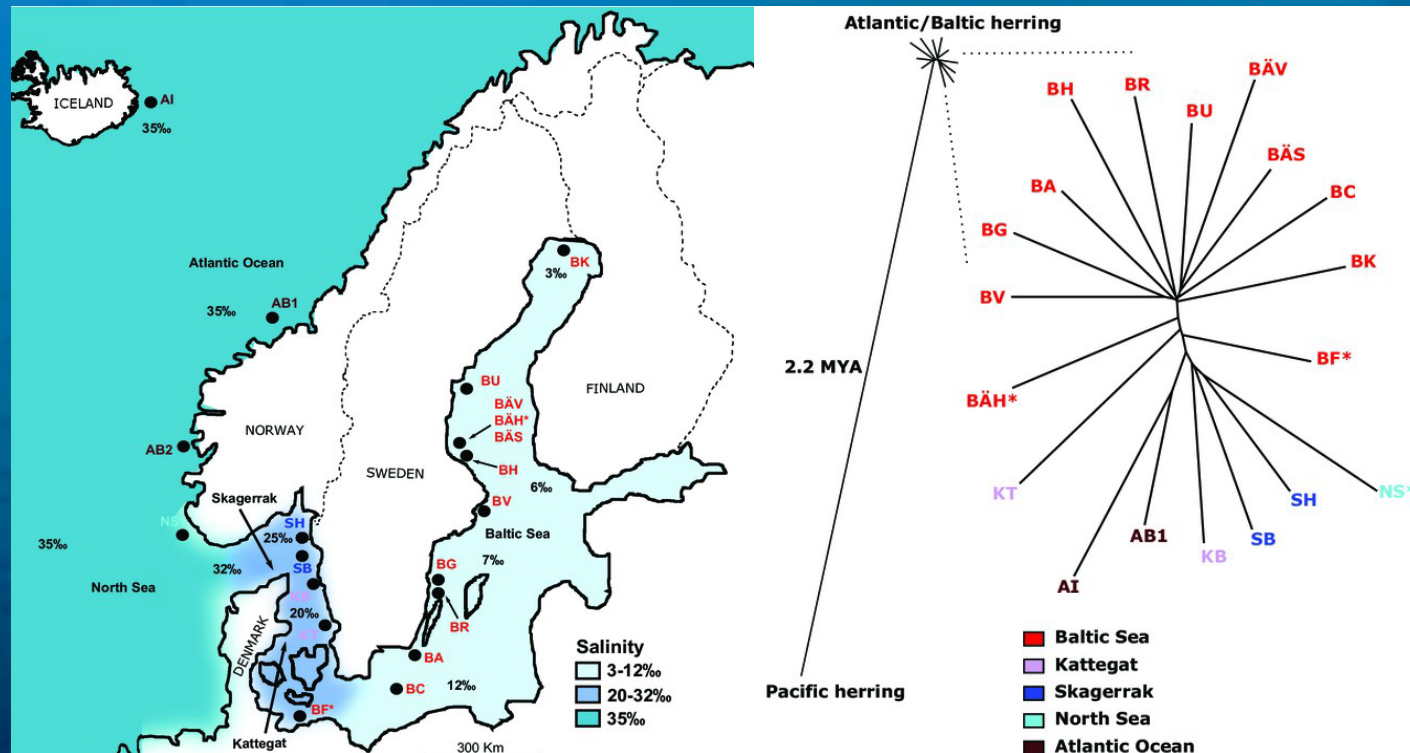
# Genetic framework

Genetic adaptations underlying population structure in herring, *Clupea harengus* (GENSINC)

## The genetic basis for ecological adaptation of the Atlantic herring revealed by genome sequencing



Martinez Barrio et al. eLife 2016;5:e12081. DOI: 10.7554/eLife.12081



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eLIFE  
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**GENOME RESEARCH**

Published in Advance October 24, 2019, doi: [10.1101/gr.253435.119](https://doi.org/10.1101/gr.253435.119)

*Genome Res.* 2019.

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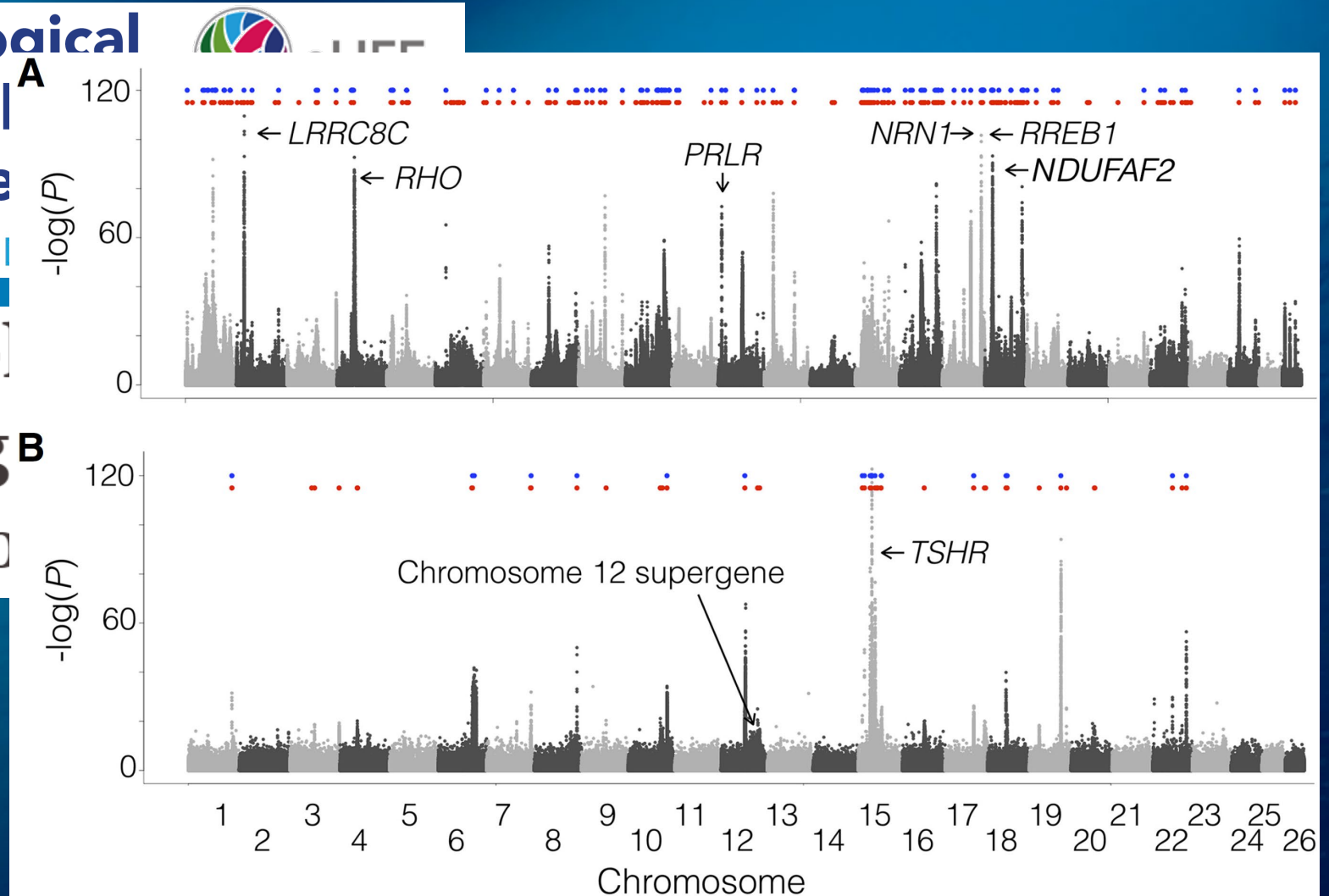
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**Ecological adaptation in Atlantic herring is associated with large shifts in allele frequencies at hundreds of loci**



Han *et al.* eLife 2020;9:e61076. DOI: <https://doi.org/10.7554/eLife.61076>



# Genetic framework

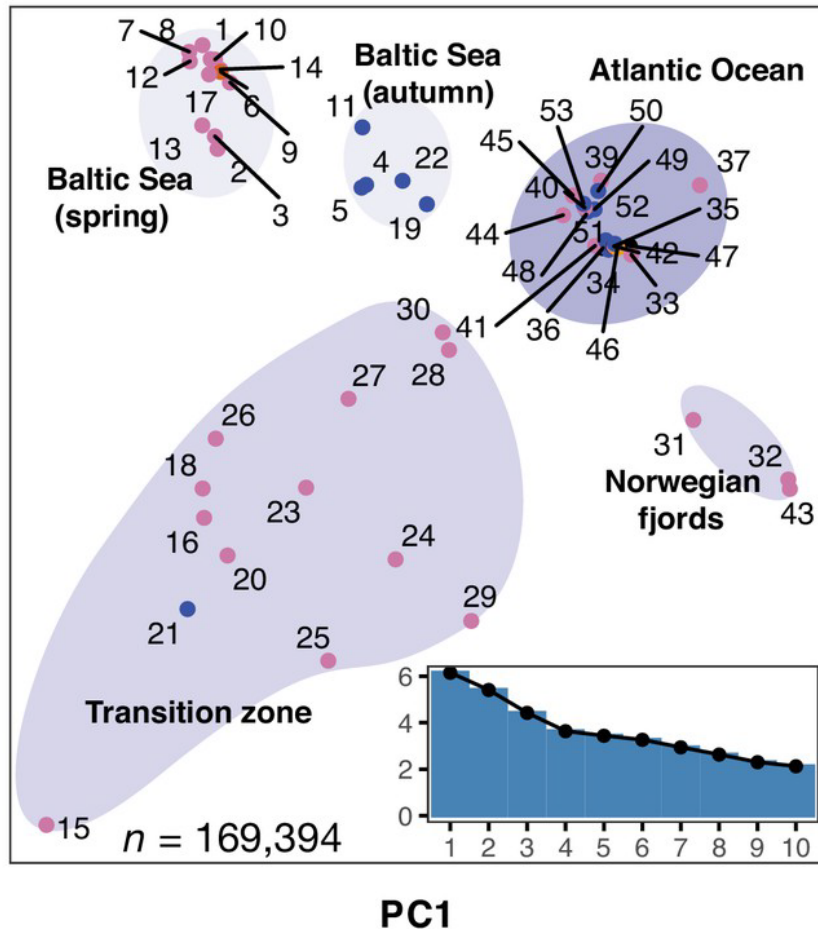
Genetic adaptations underlying population structure in herring, *Clupea harengus* (GENSINC)

The genetic basis for ecological

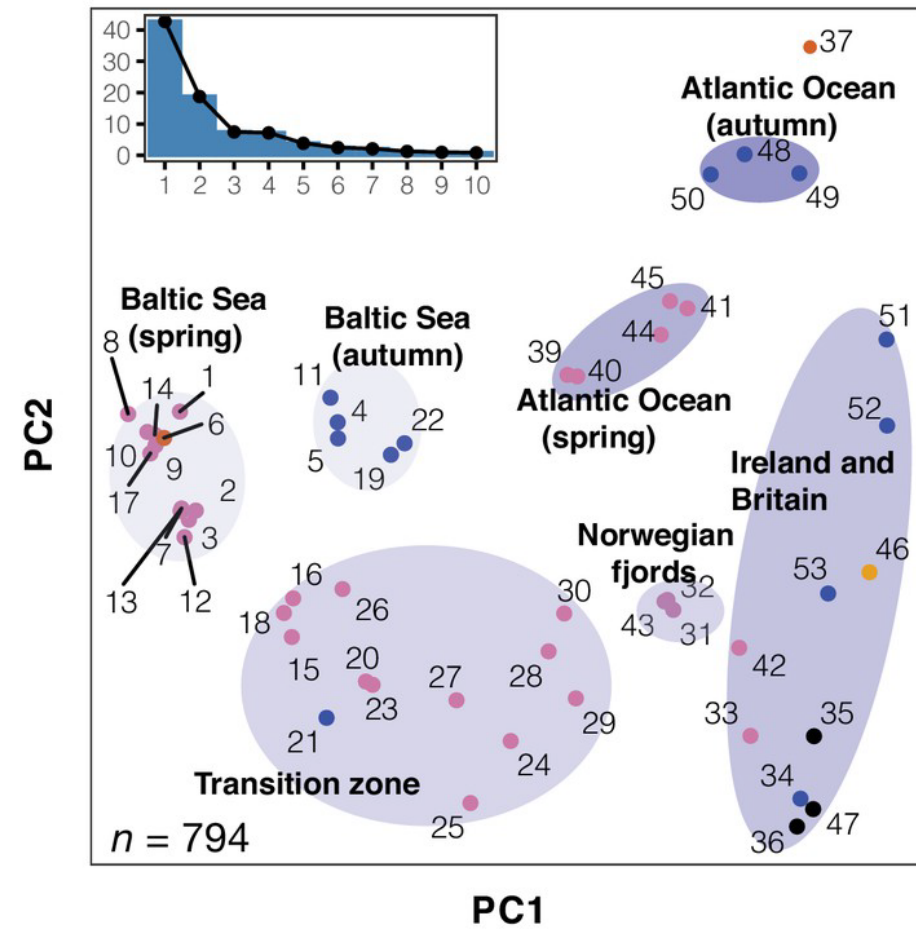
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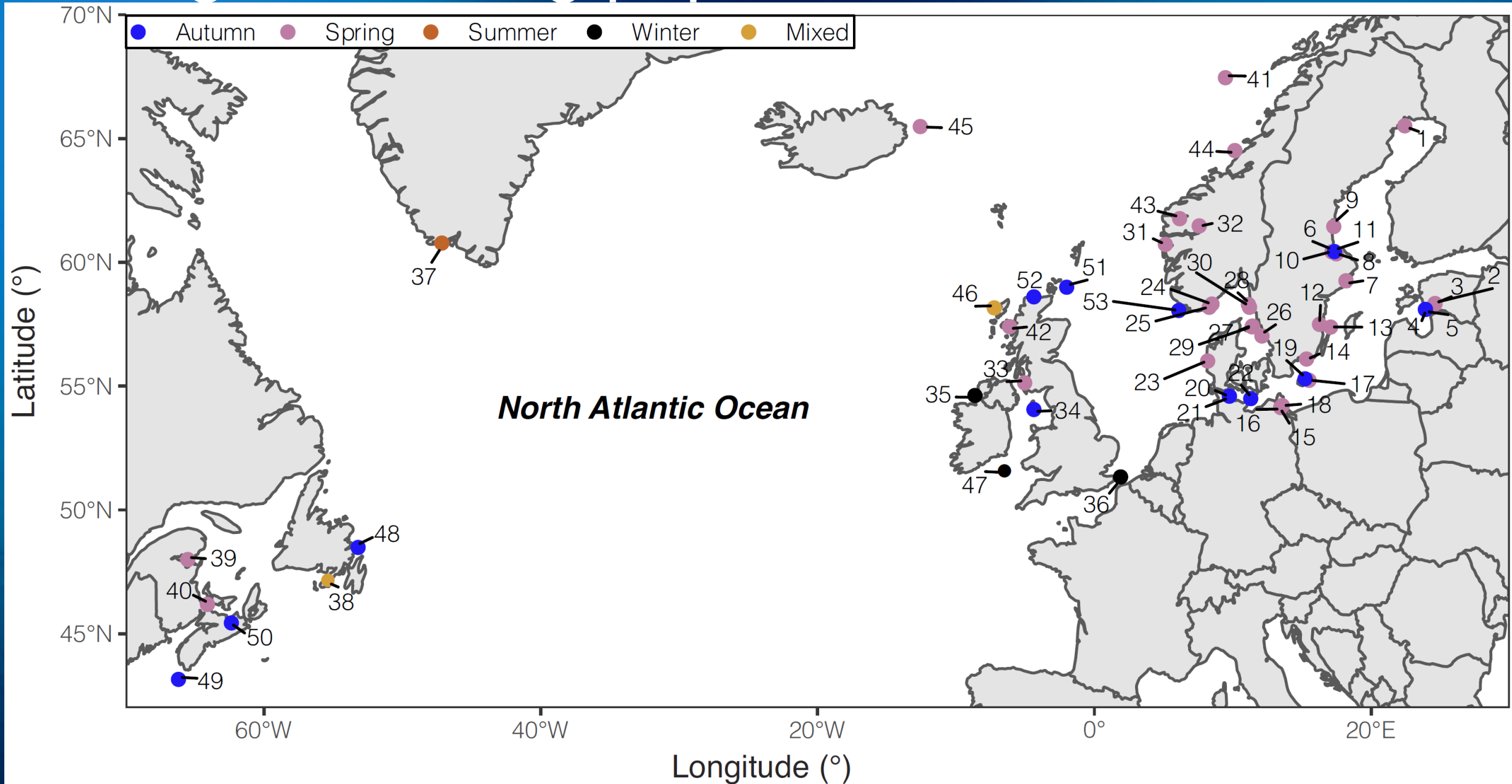
Herring is

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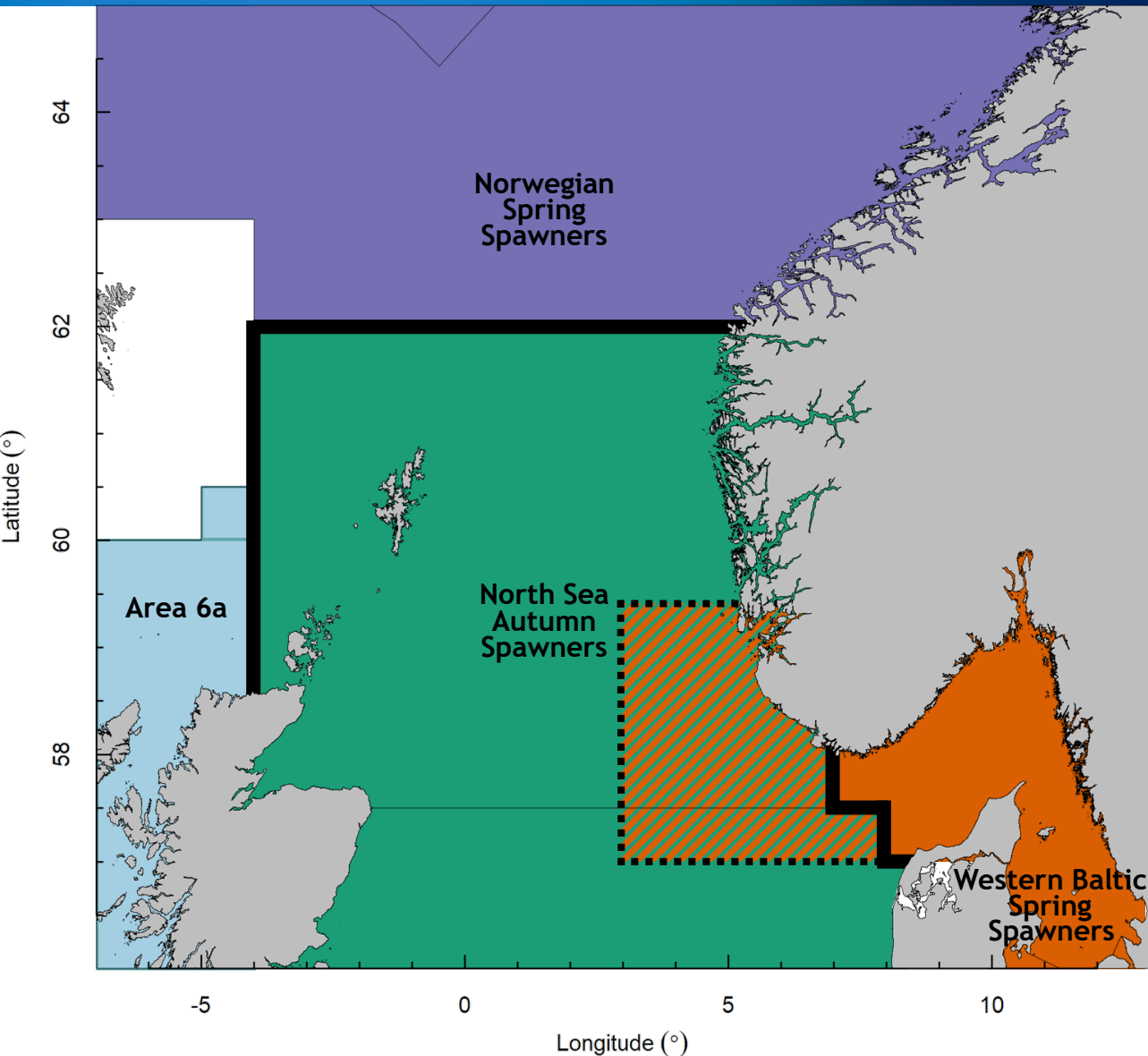
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# Original herring populations



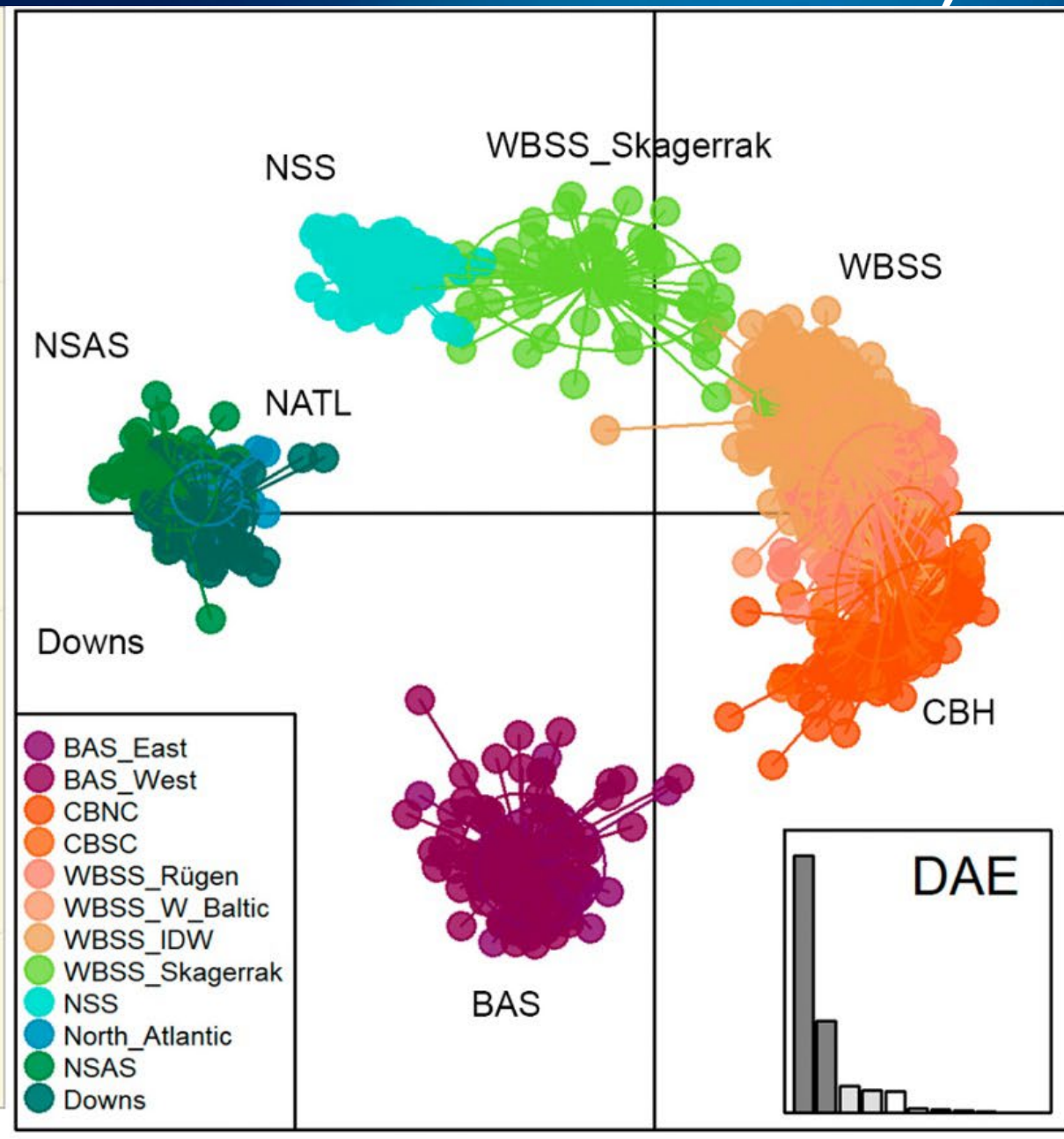
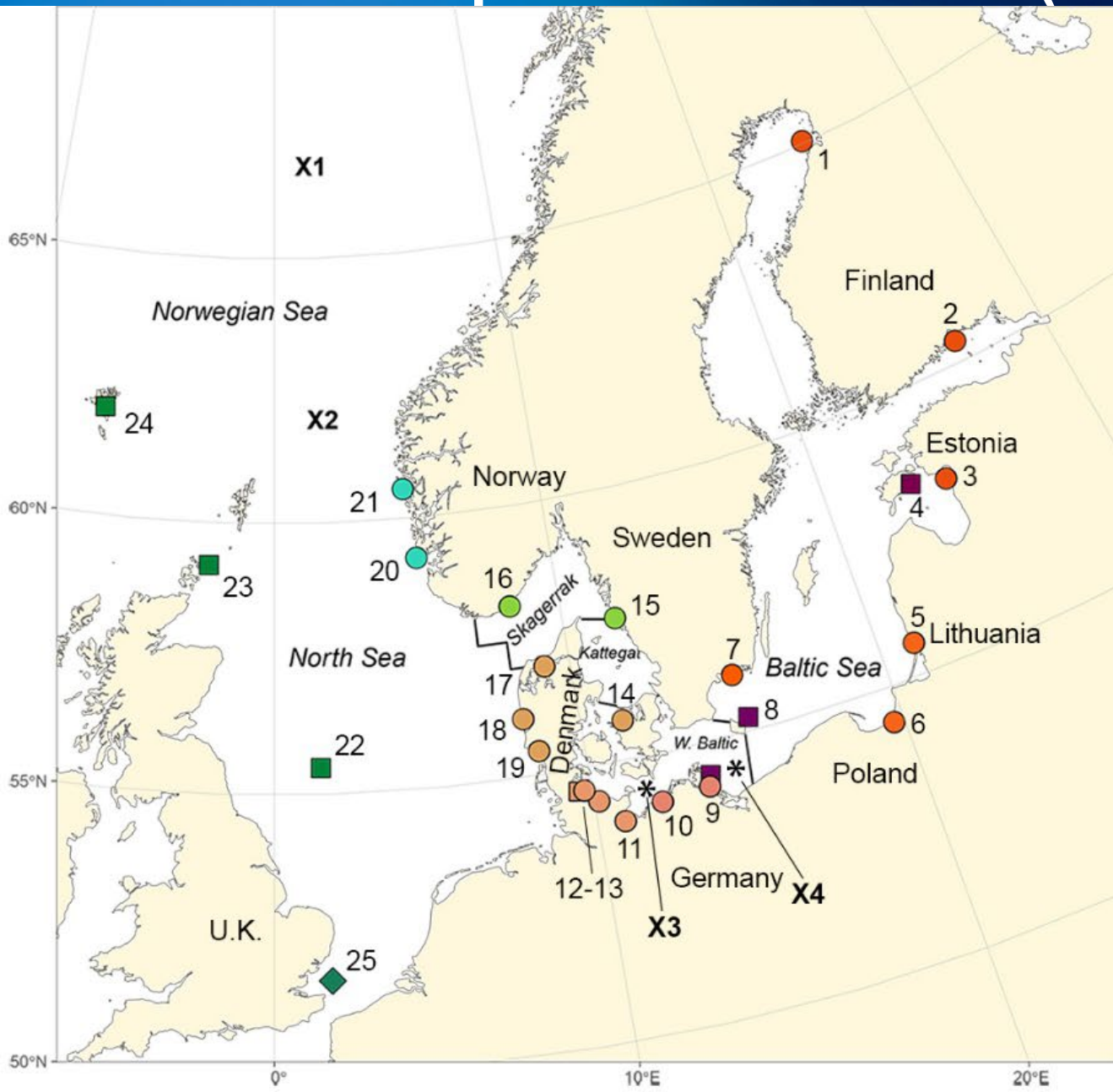
# Which stocks are involved?



- 62° N: NSAS vs. NSS
- 7° E: NSAS vs. WBSS
- Transfer area: NSAS vs. WBSS
- **Vertebral counts: NSAS vs. WBSS**
- **Otolith microstructure: autumn vs. spring**
- New methods: **Genetics**

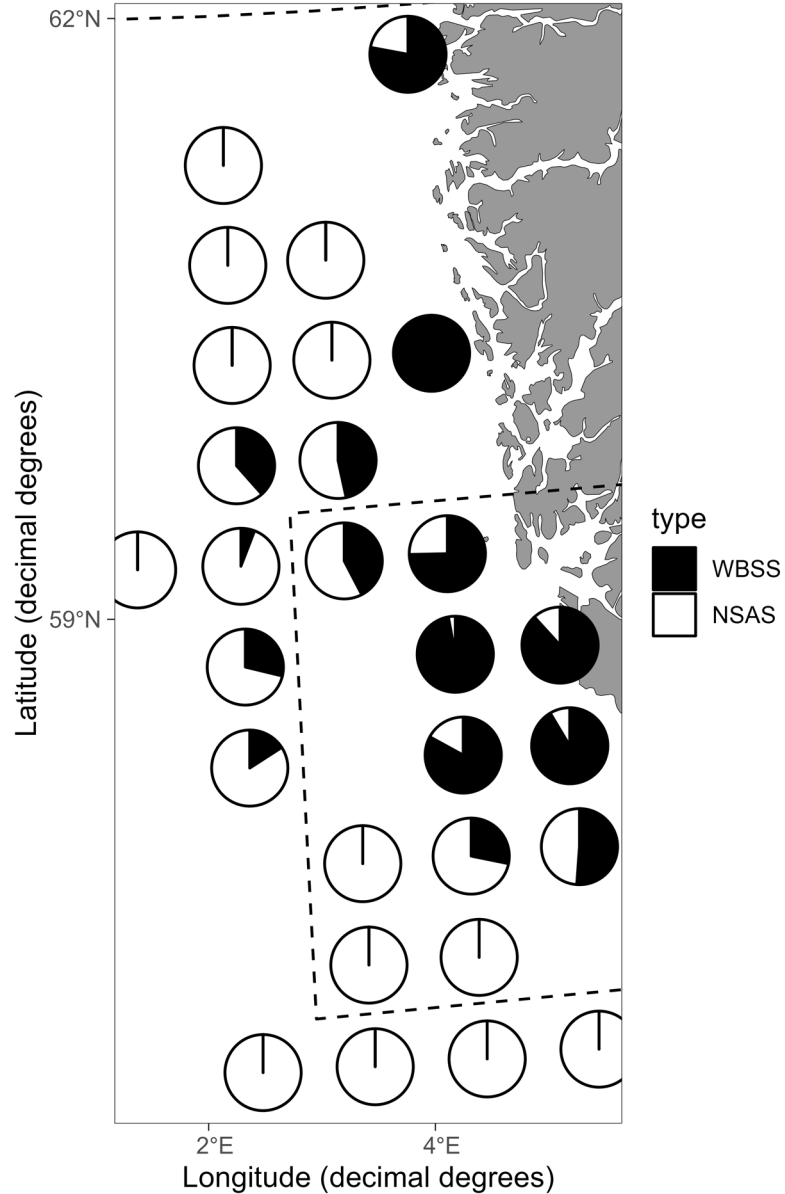


# Build up a baseline (Bekkevold et al. 2022)

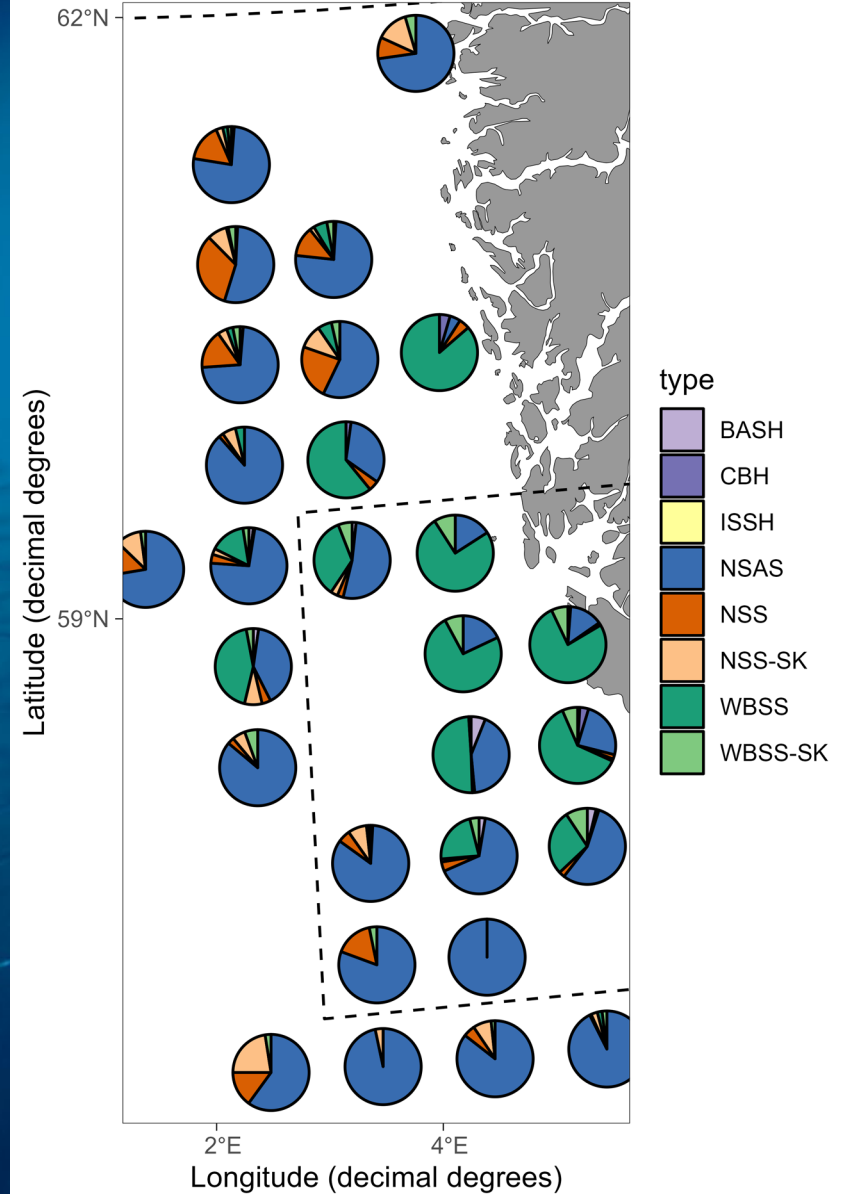


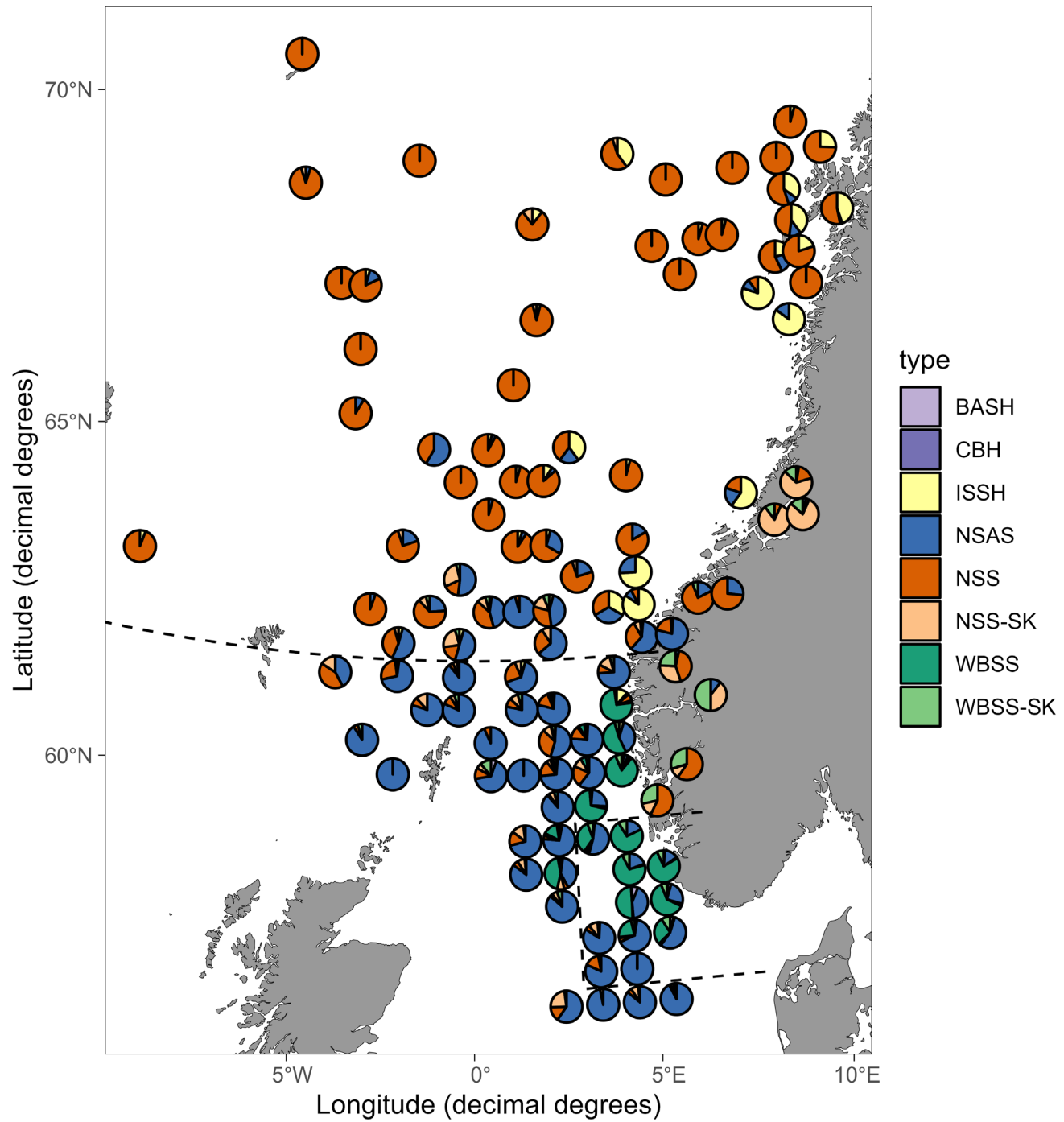
# Split of herring stocks

## Vertebral counts



## Genetics





# Assignments at population level

Algorithm 1	Algorithm 2
NSAS	NSAS
WBSS	WBSS
WBSS Skagerrak	WBSS Skagerrak
NSS	NSS



# Assignments at population level

Algorithm 1	Algorithm 2	Mean vertebrae counts
NSAS	NSAS	56.6 (n = 1887)
WBSS	WBSS	55.7 (n = 587)
WBSS Skagerrak	WBSS Skagerrak	56.6 (n = 107)
NSS	NSS	57.1 (n = 279)

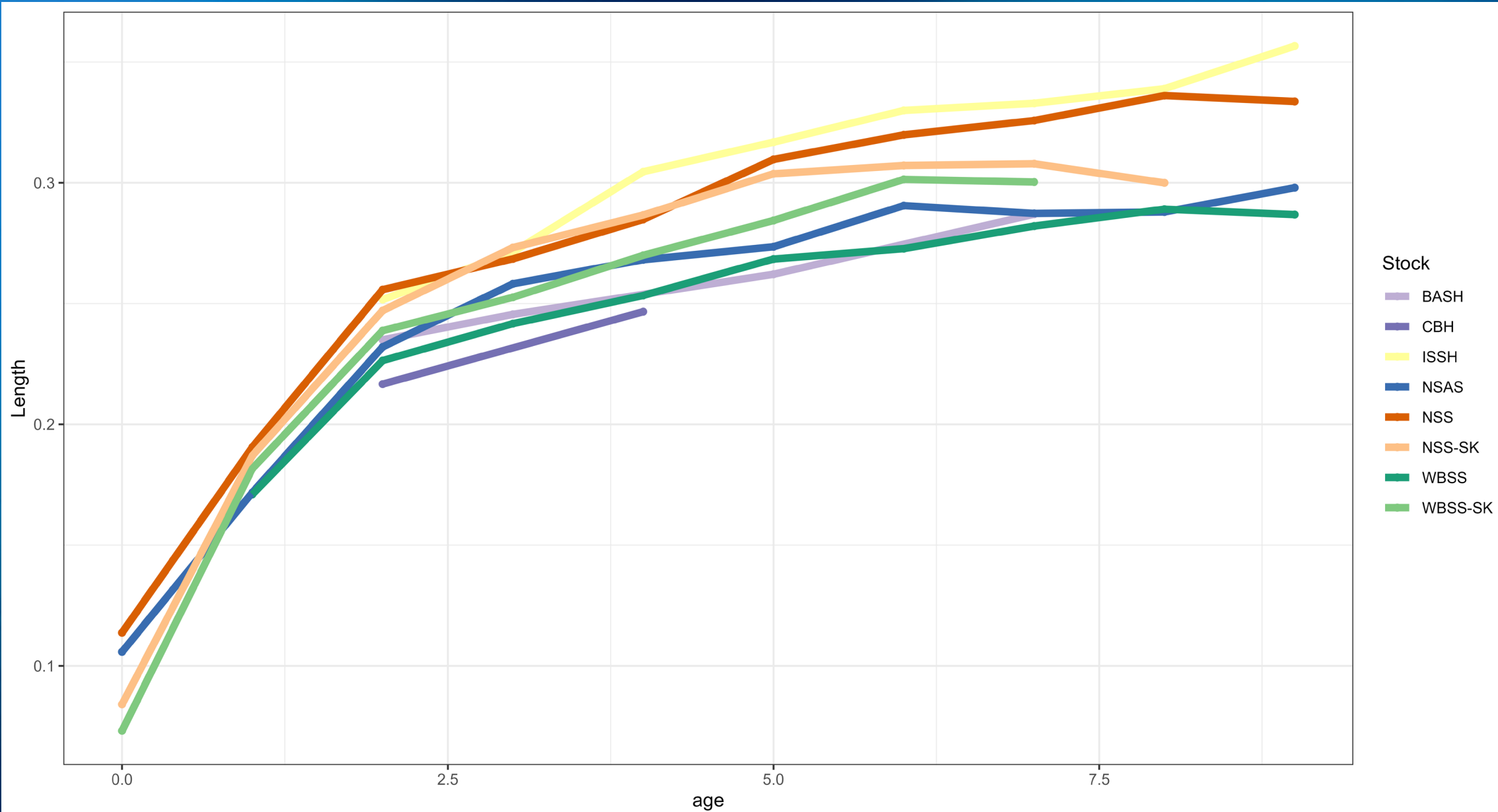


# Assignments at population level

Algorithm 1	Algorithm 2	Mean vertebrae counts
NSAS	NSAS	56.6 (n = 1887)
WBSS	WBSS	55.7 (n = 587)
WBSS Skagerrak	WBSS Skagerrak	56.6 (n = 107)
NSS	WBSS Skagerrak	56.9 (n = 135)
NSS	NSS	57.1 (n = 279)



# Linking genotype and phenotype



# Assessment of herring stocks

Genetics	Vertebral counts	Otolith microstructure
North Sea autumn spawners (NSAS)	NSAS	NSAS (autumn)
Downs	NSAS	NSAS (winter)
Western Baltic spring spawners (WBSS)	WBSS	WBSS (spring)





# Assessment of herring stocks

Genetics	Vertebral counts	Otolith microstructure
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Western Baltic spring spawners (WBSS)	WBSS	WBSS (spring)
Norwegian spring spawners (NSS)		
Baltic Autumn spawners (BAS)		
Central Baltic spring spawners		

# Assessment of herring stocks

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Central Baltic spring spawners	WBSS (overestimation)	WBSS (spring)

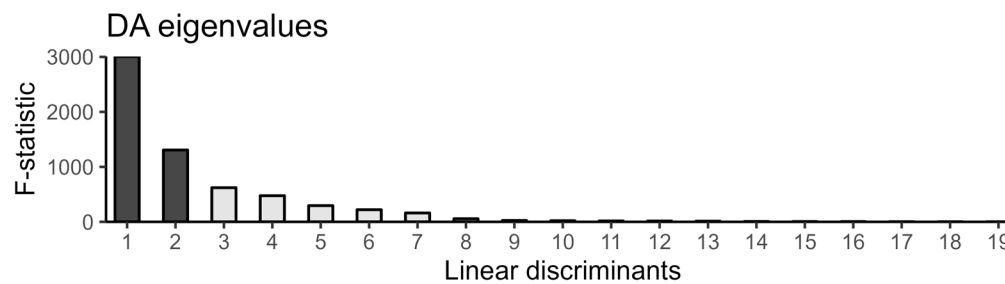
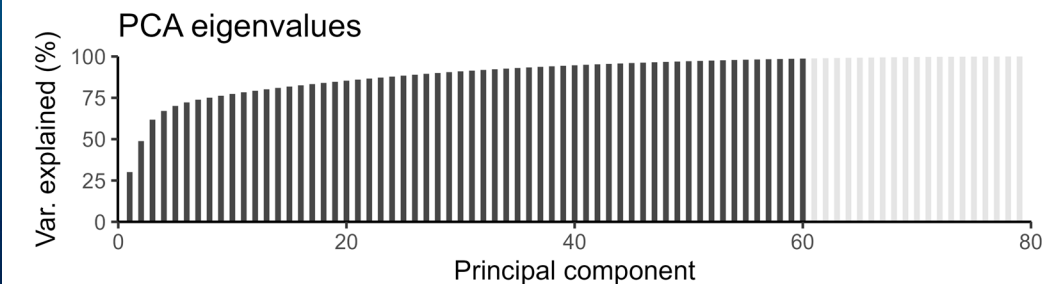
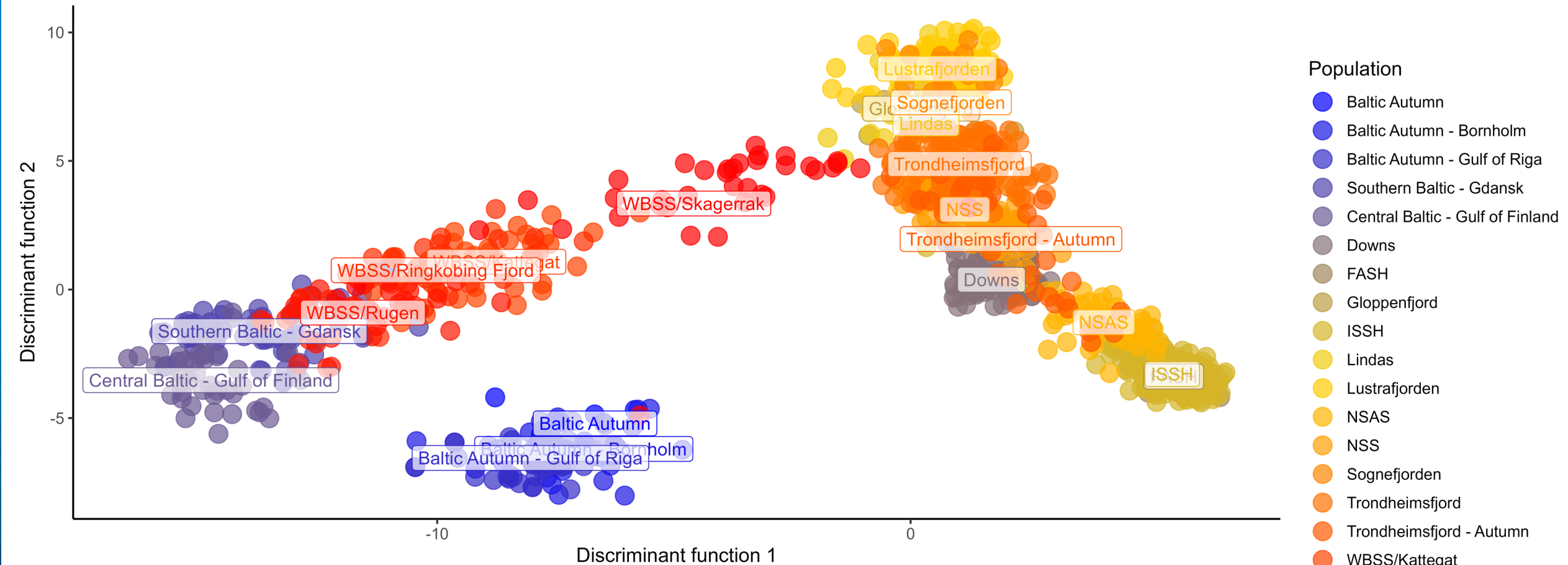


# Assessment of herring stocks

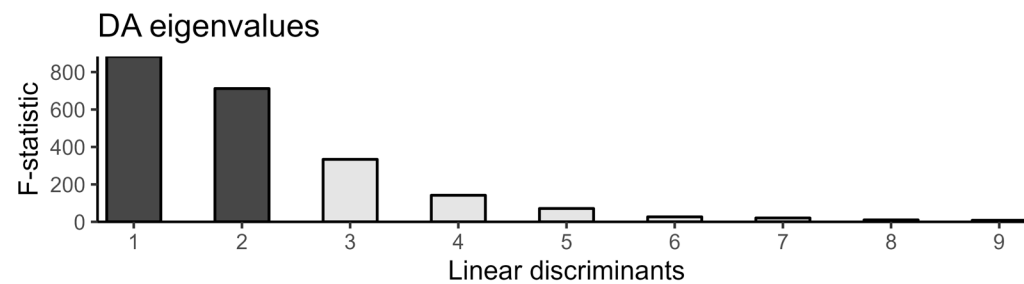
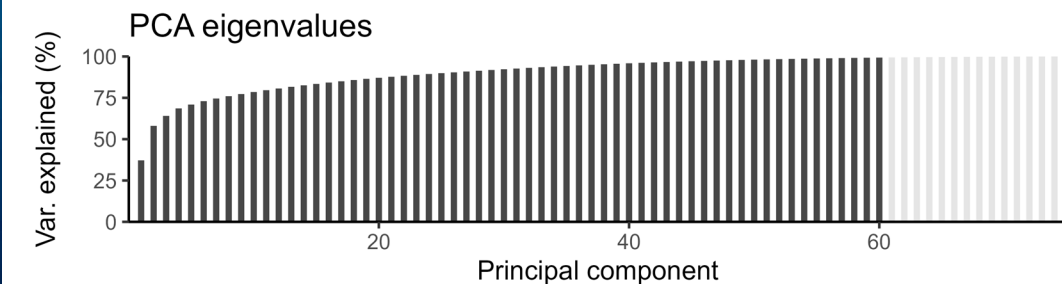
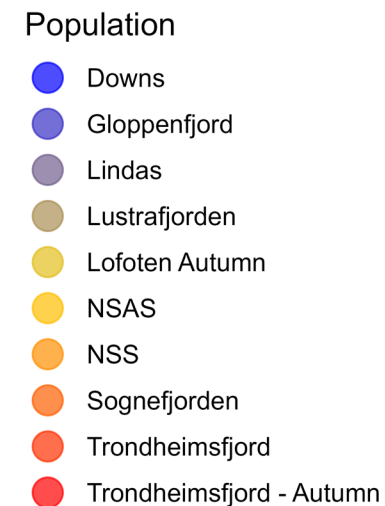
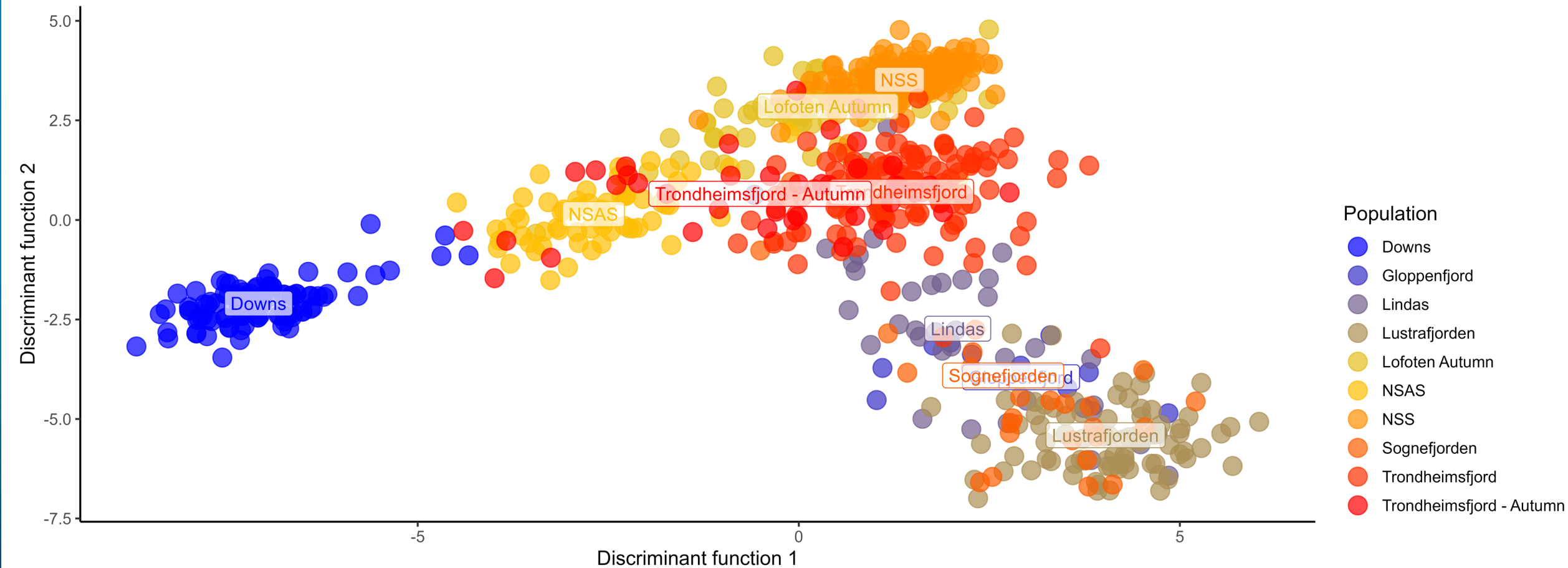
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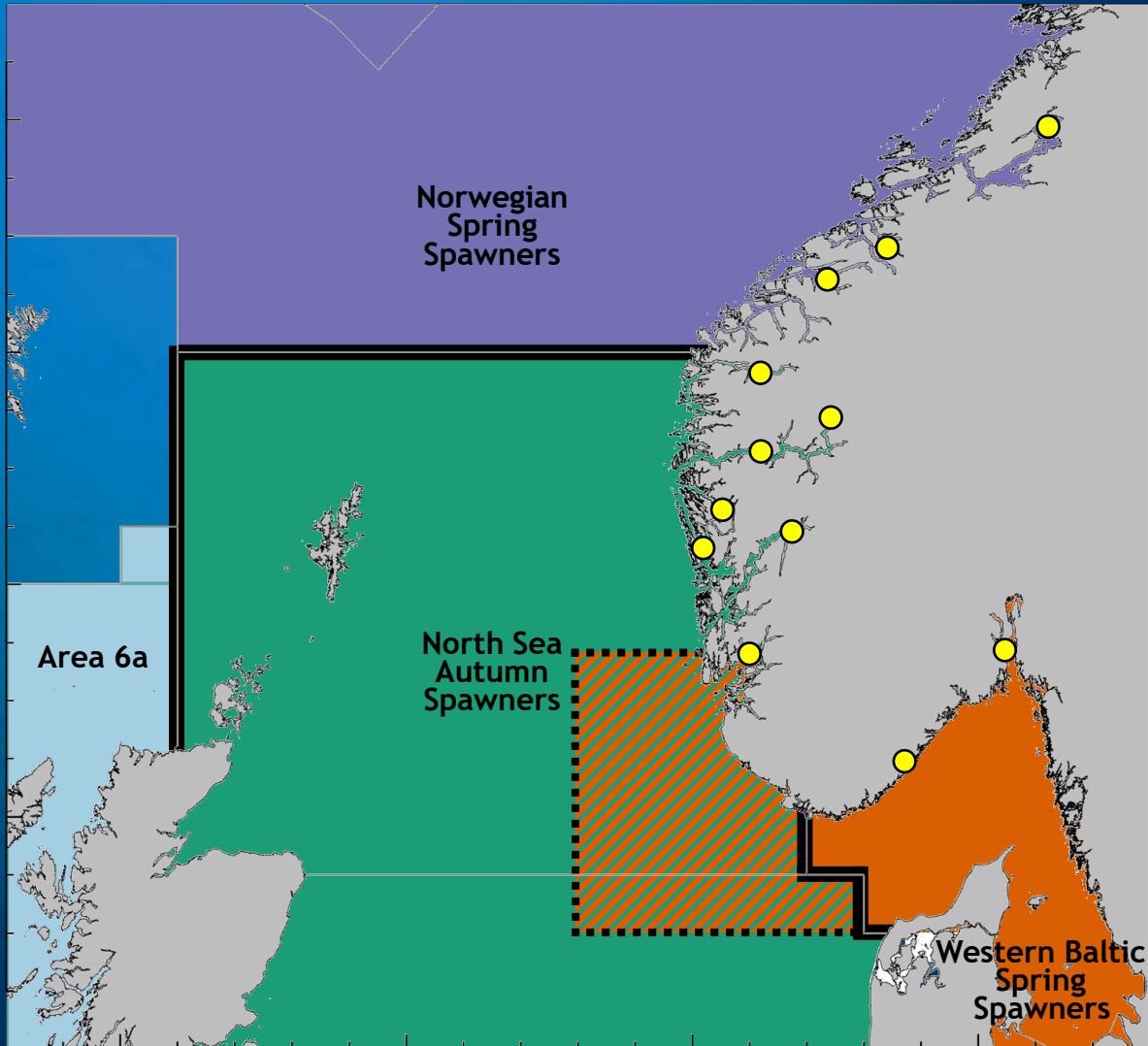
# Build up a baseline (Berg et al. 2022)



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# Can genetics help stock assessment?



**Not, yet!!!**

- Assessment relies on time series!
- How to allocate “none existing” stocks

**But,**

- much better biological knowledge
- redefine stock borders → dynamic?

**Can genetics become a  
GAME CHANGER?**



Please feel free to contact me:

[florian.berg@hi.no](mailto:florian.berg@hi.no)

Questions

