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Northern Hake Stock dynamics

Ongoing Work

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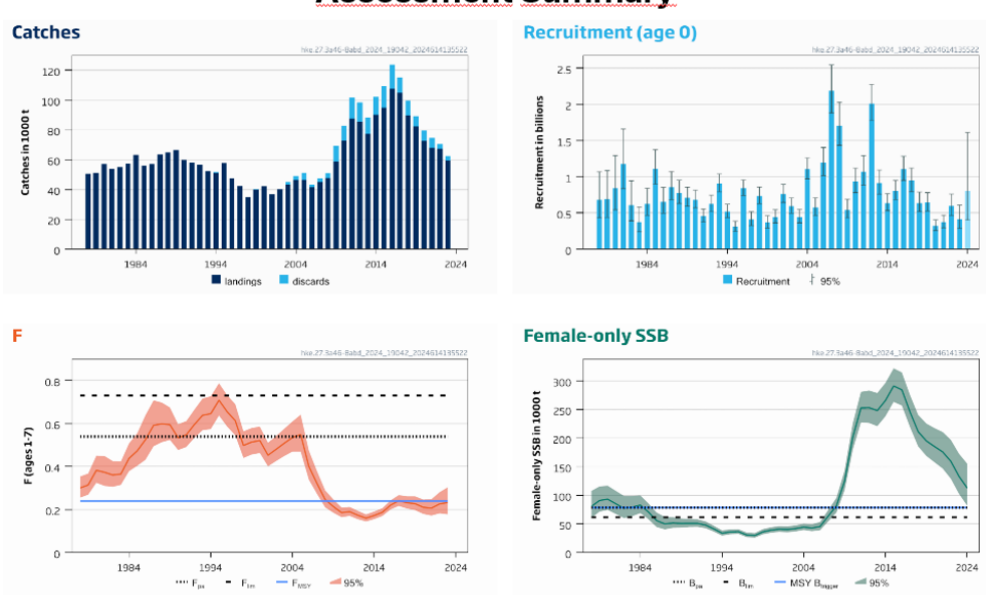
VarMer. FEMPA 2024-2026

VARMER Project

Variability in abundance and biological parameters of European hake

Objectives:

- Develop a spatial distribution model driven by environmental variables.
- Identify the density-dependent processes in the productivity of the stock.
- Identify the factors that explain the variability in recruitment.
- Identify the causes of variability in the abundance of the northern hake stock.
- Improve stock assessment and management.



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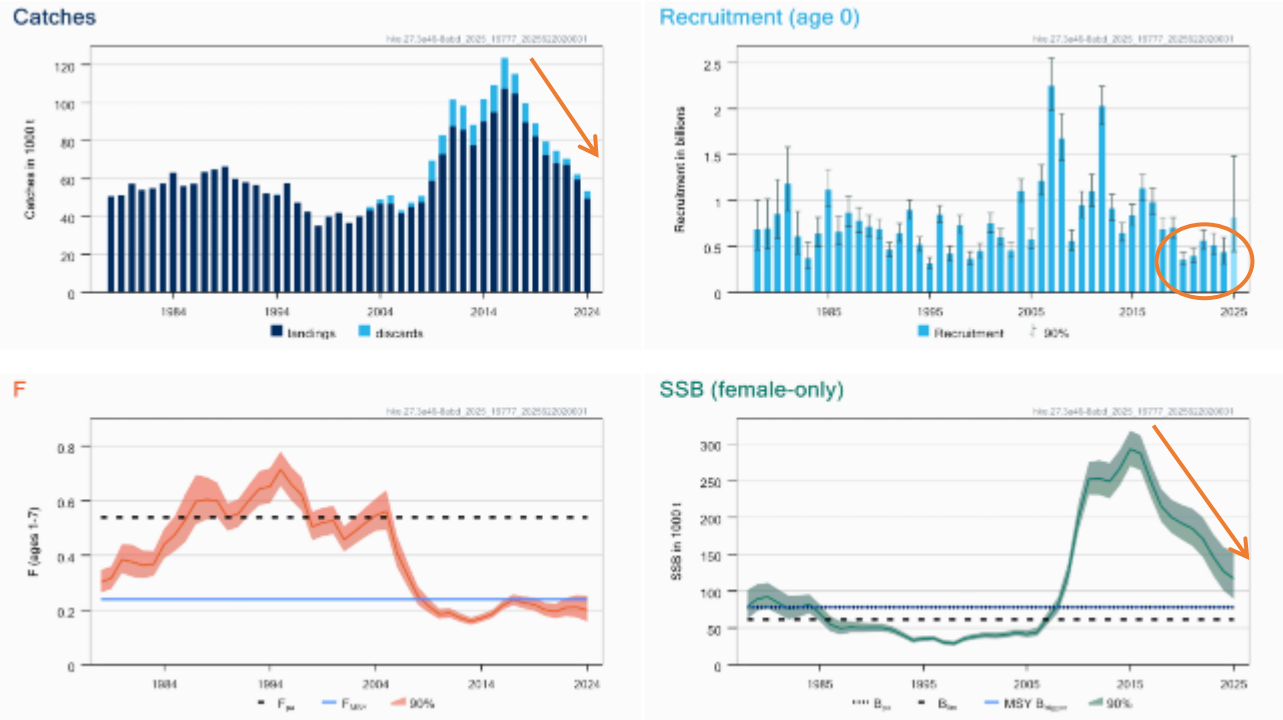
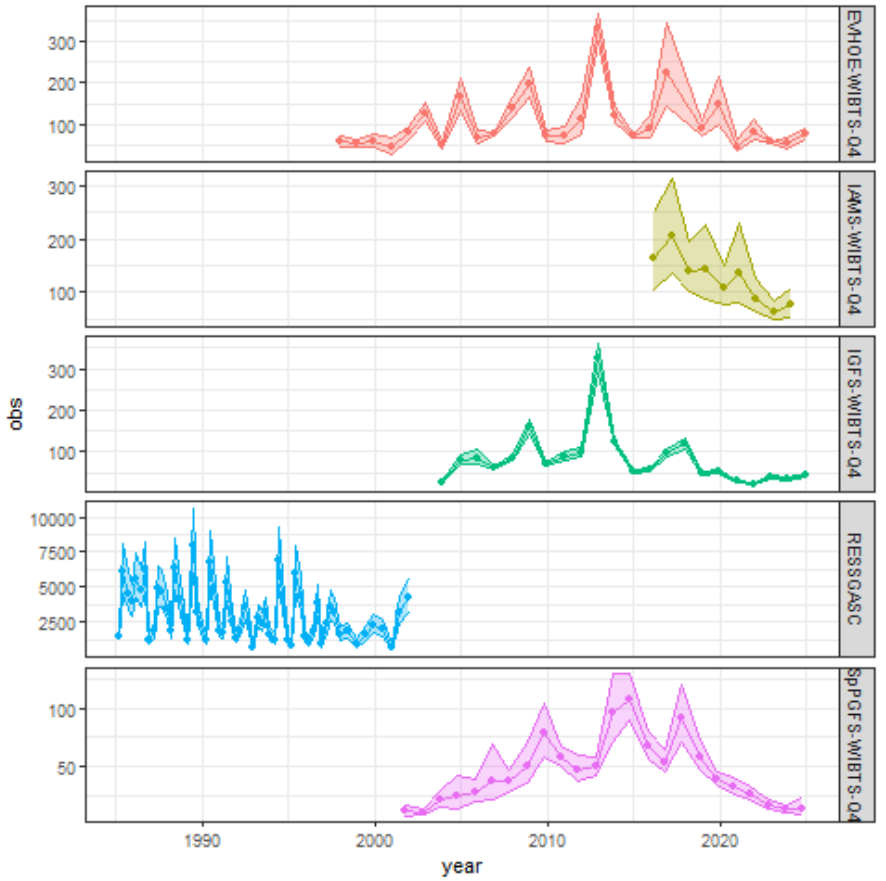
The assessment

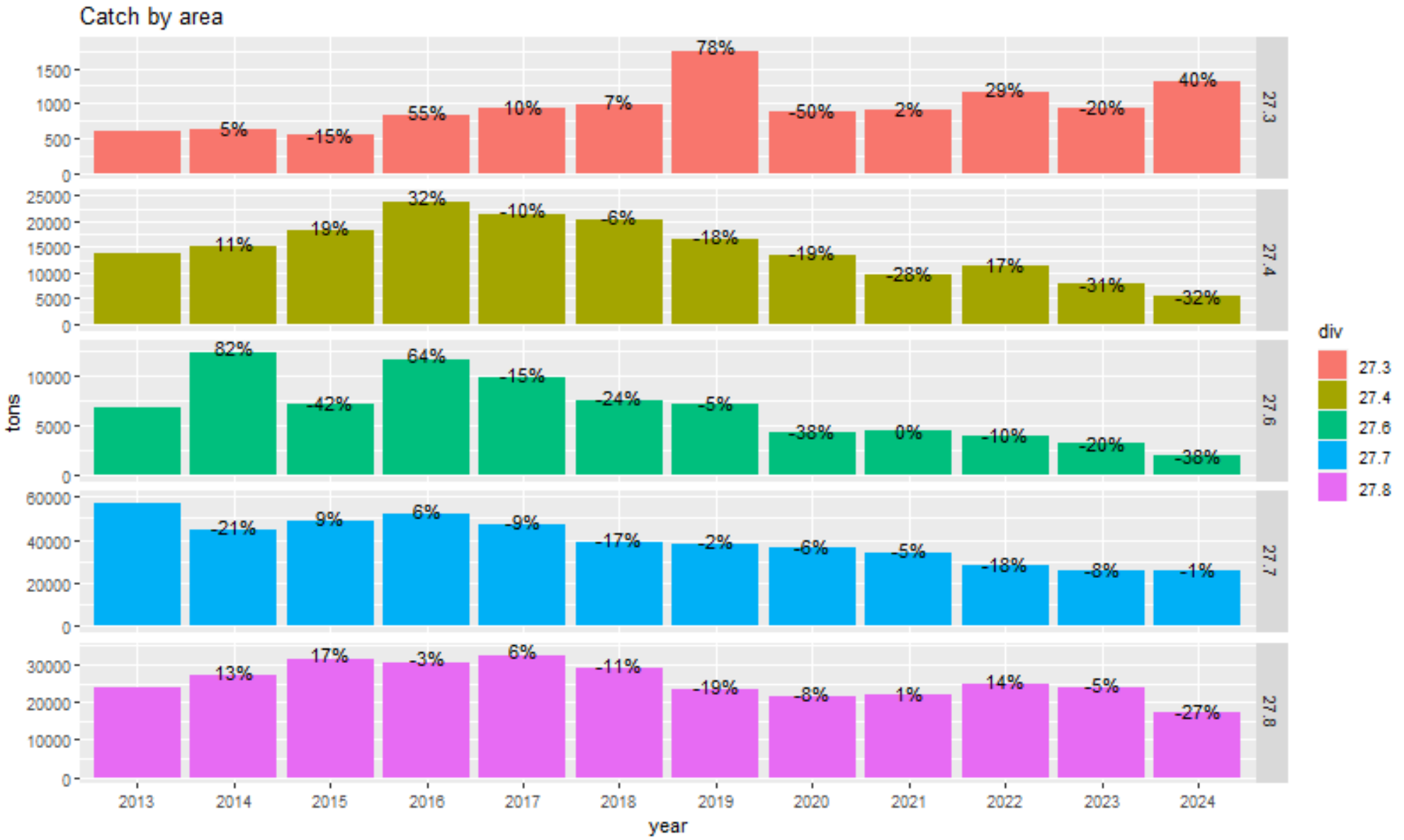


The Surveys



Both assessments and surveys show a big decrease in the biomass of the stock due to a lack of good recruitments

Spatial distribution of the catches



+ 116%

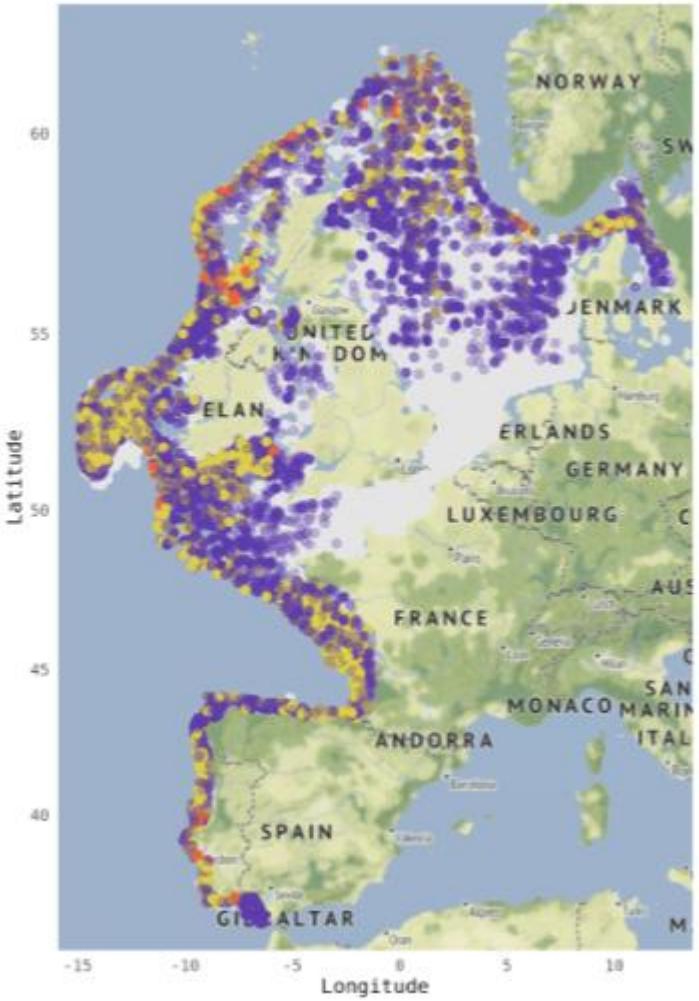
- 61%

- 71%

- 55%

+-28%

Spatial distribution model



Adults – Juveniles

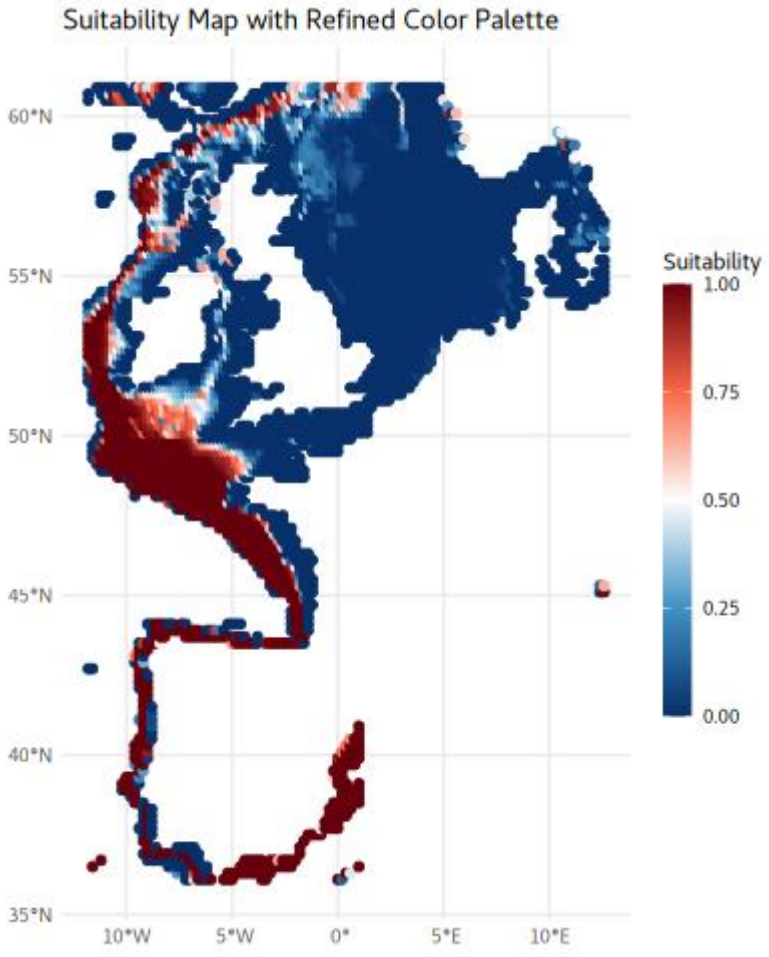
Presence – Abundance

Depth
Phytoplankton
SeaWater Potential Temperature
Oxygen
Salinity
Net Primary production
Slope
Chlorophyll
Sea surface height above geoid

Next Steps:

- Forecast the distribution under climate change scenarios
- Forecast the impact at fleet level (cathability)

Spatial distribution model



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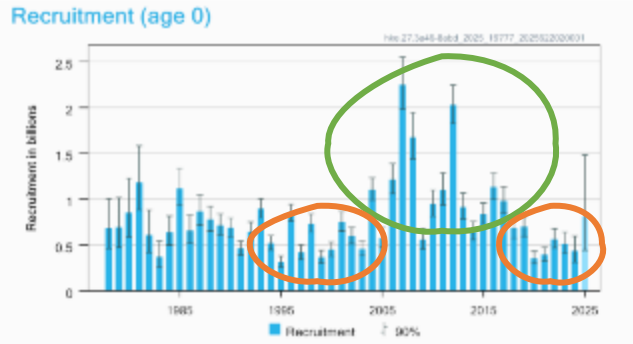
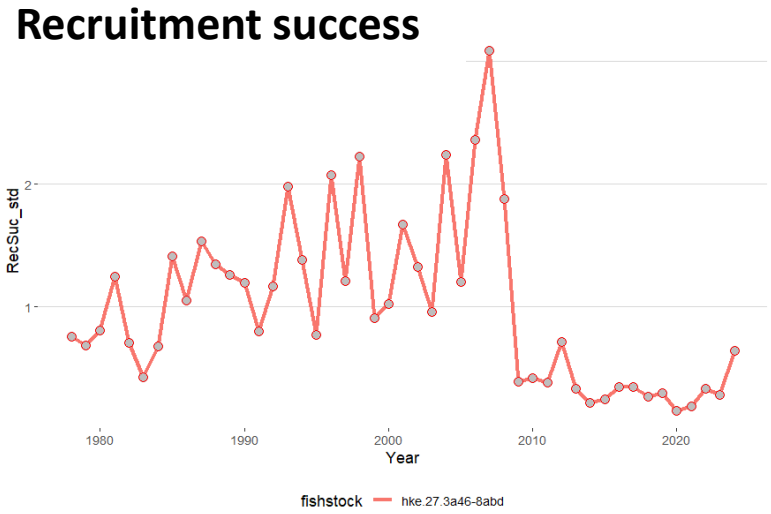
What are the factors that drive stock productivity (recruitment)?





Statistical model

Physical variables: Sea surface temperature, mixed layer thickness, salinity, eastward and northward wind components, and sea surface height.

Biogeochemical variables: Chlorophyll concentration, dissolved oxygen, nitrate, phosphate, silicate, iron, ammonium, net primary production, euphotic zone depth, phytoplankton carbon, and dissolved inorganic carbon.

Variables computed at different depths (if relevant) and different points in time

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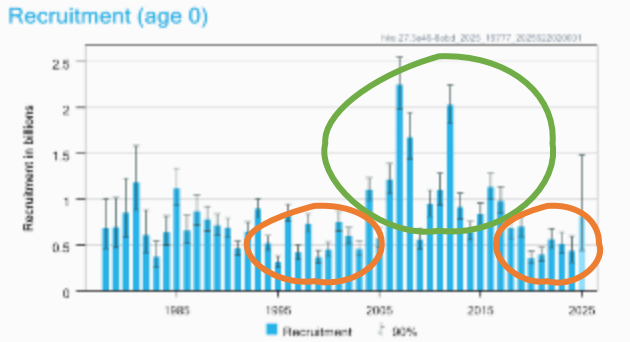
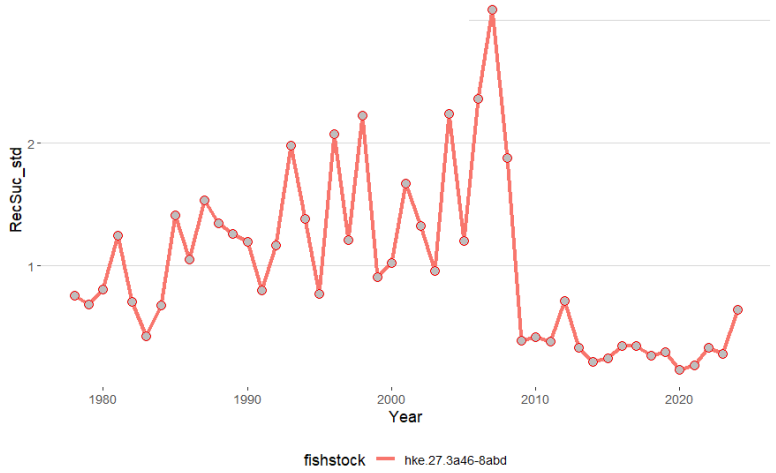
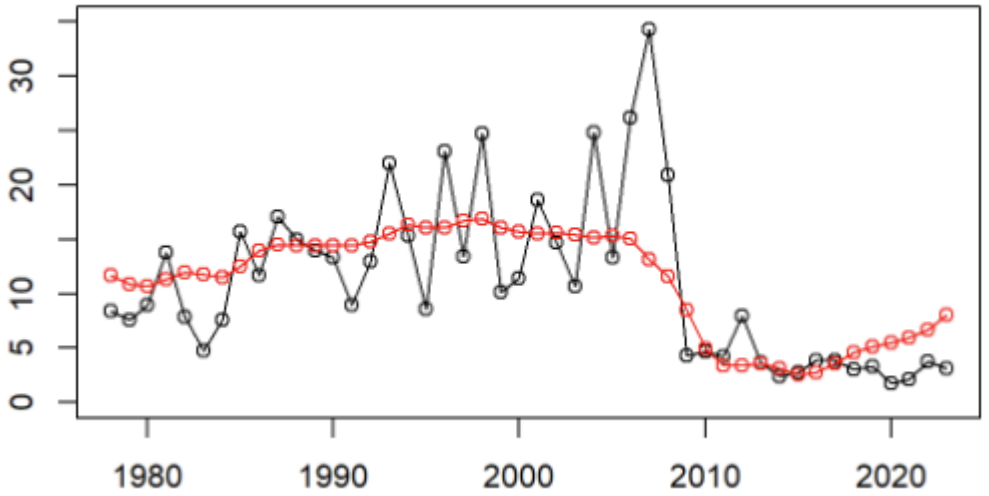


Variable	Mean
SSB	-0.683
East wind Jun-Aug in Area 8	26.551
East wind Mar-May Area 8	-31.703
North wind Apr-Jun Area 8	-34.380
East wind May-Jul Area 7	5.854

Recruitment success



Only SSB



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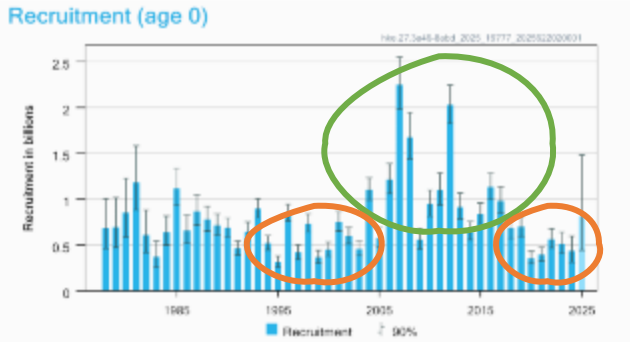

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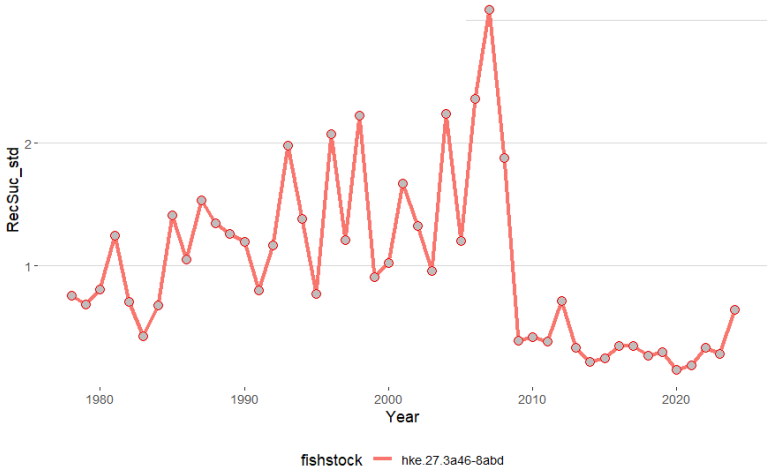
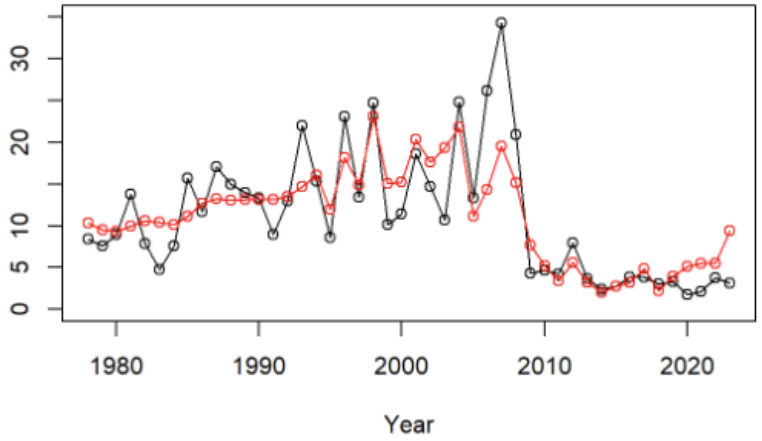


SSB + Environmental variables



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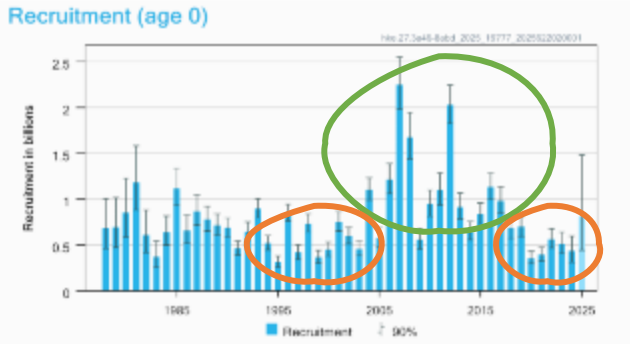

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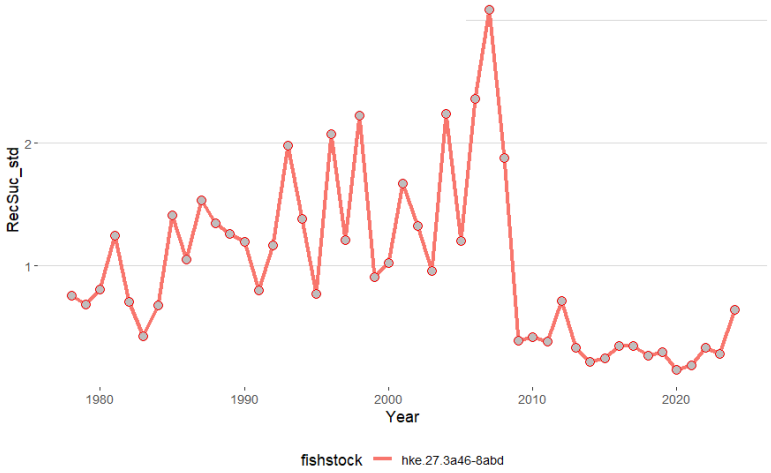


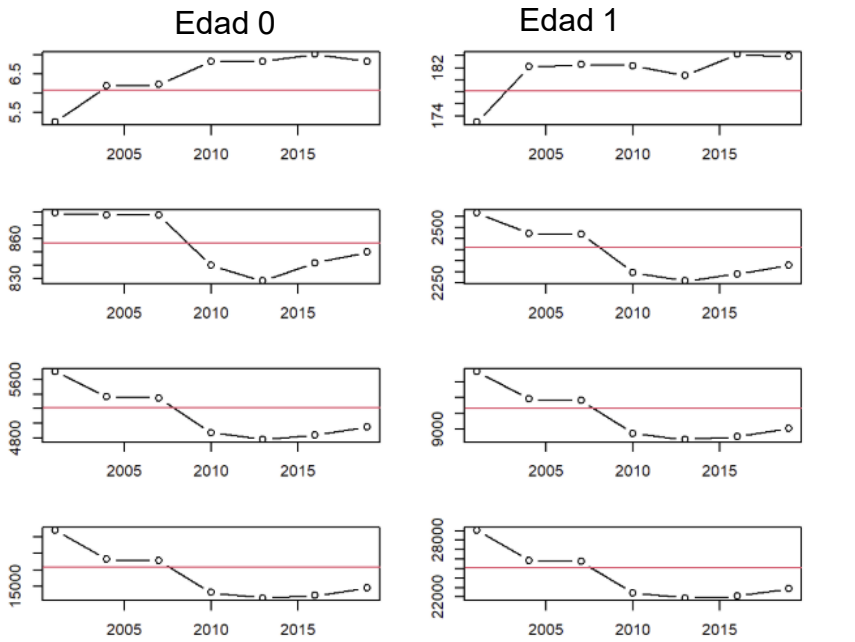
Next Steps:

- Modify stock assessment model to incorporate densodependence in recruitment (ricker)
- Modify intermediate year assumptions in the STF

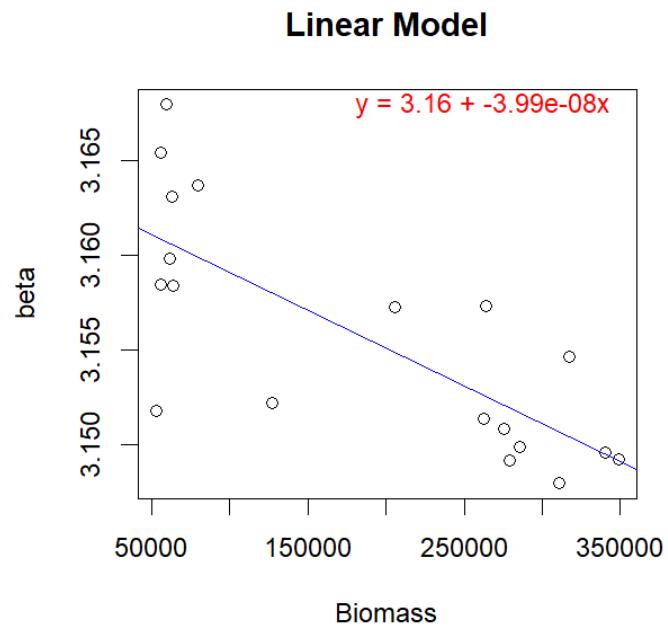
Densodependence

Maturity

Weights at age



Linear Model



Densodependence

Maturity

Weights at age

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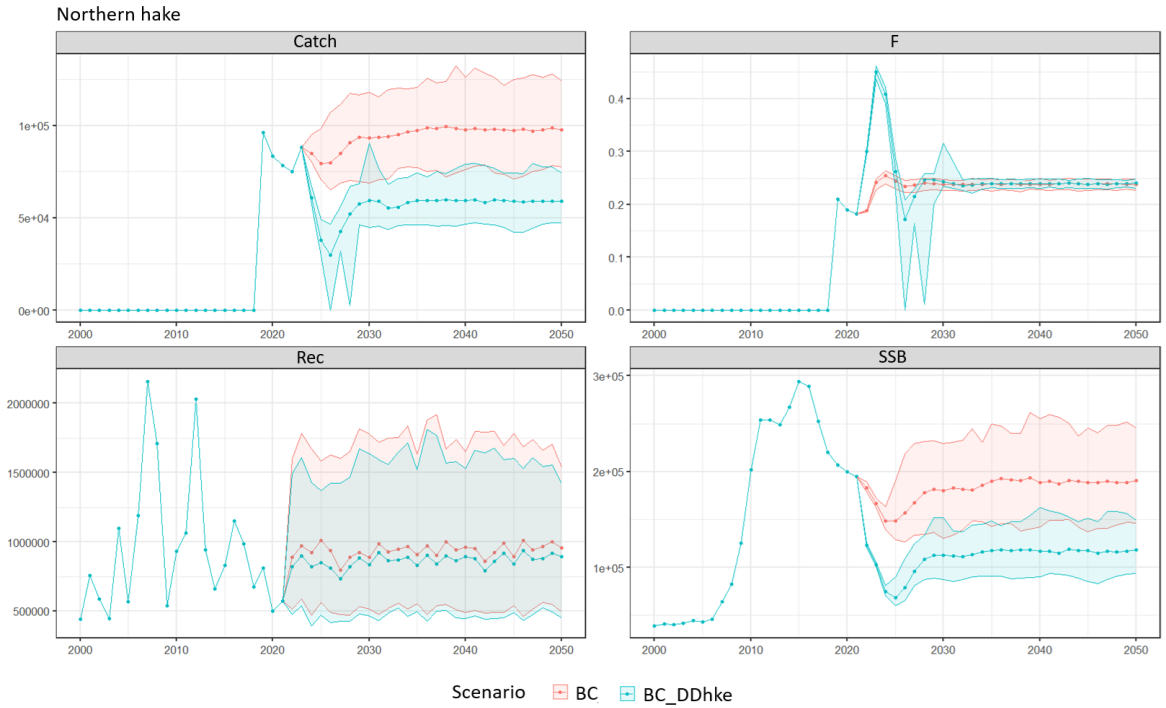

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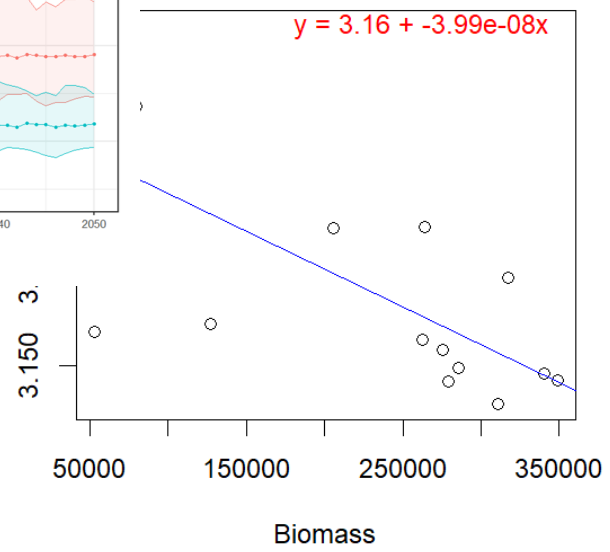

Densodependence

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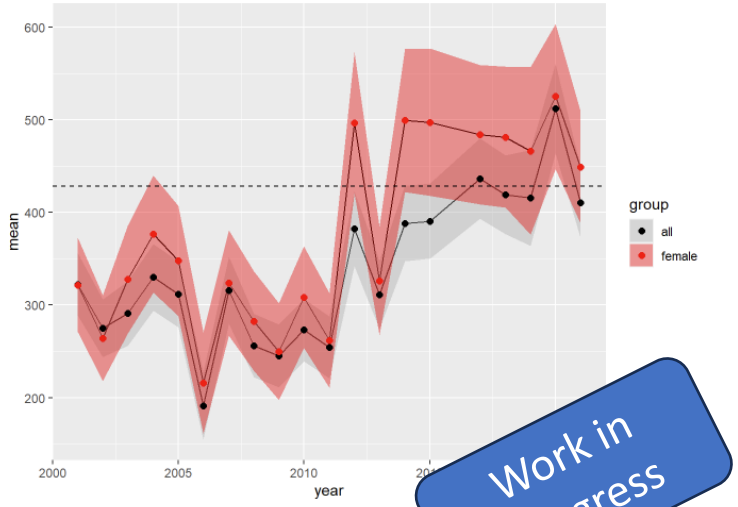
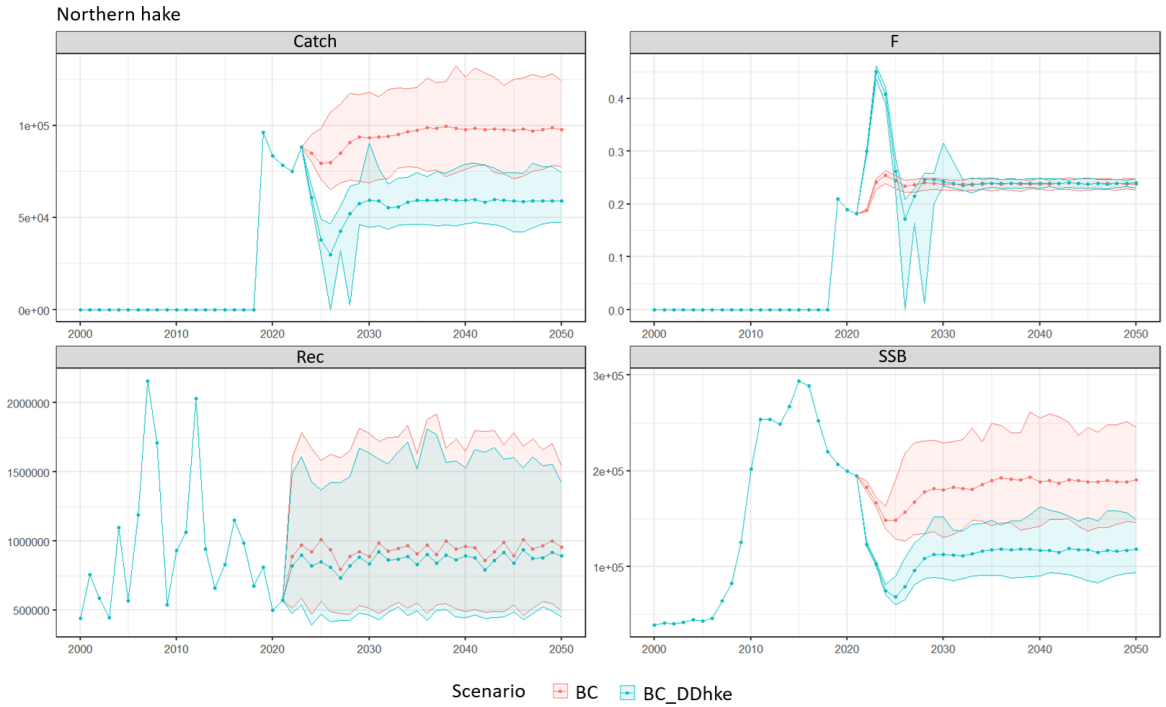
Maturity



Weights at age



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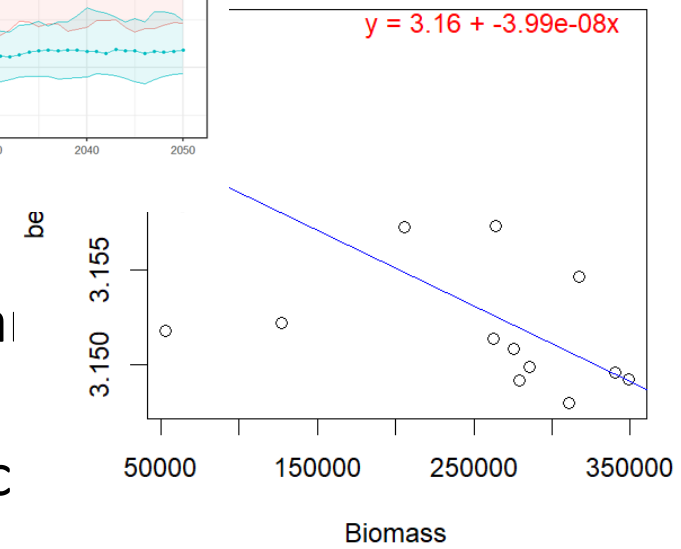
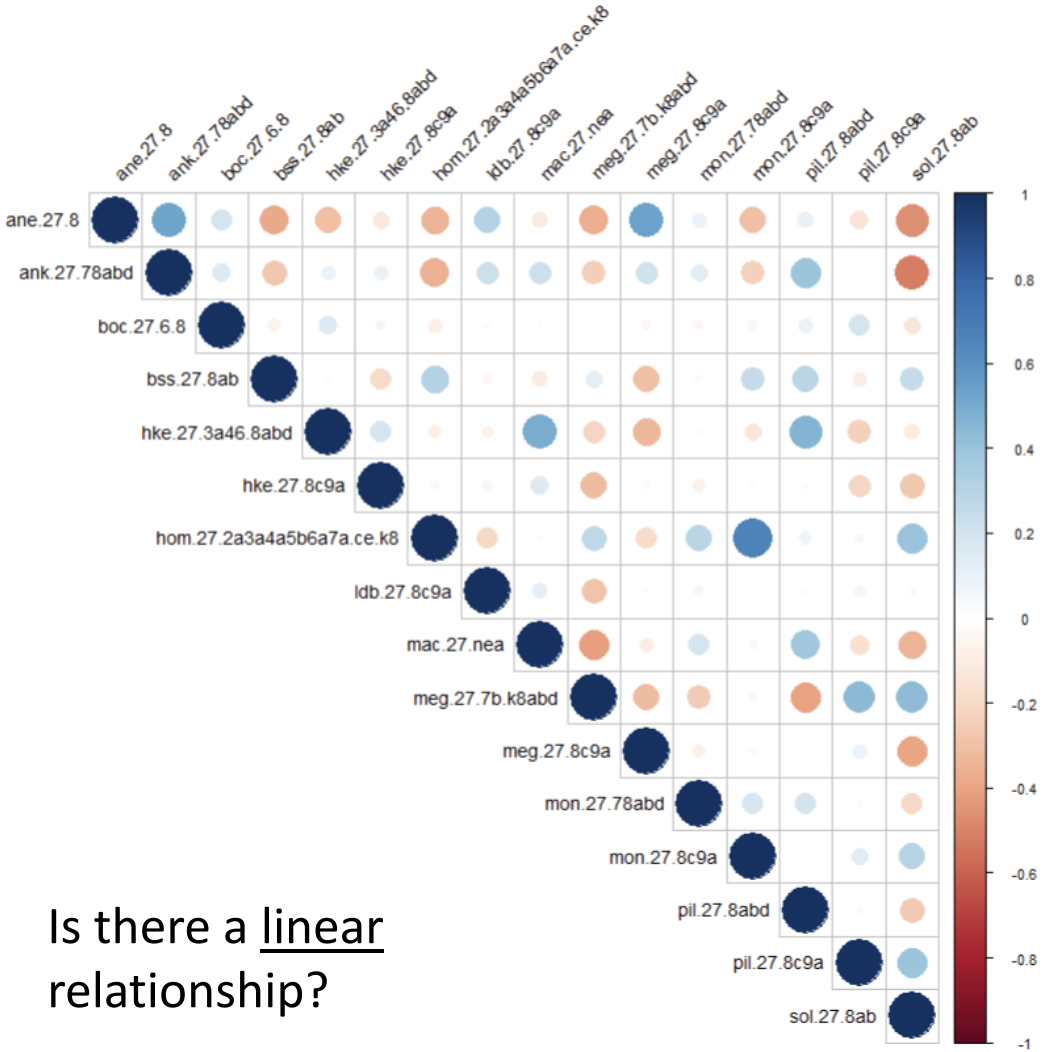


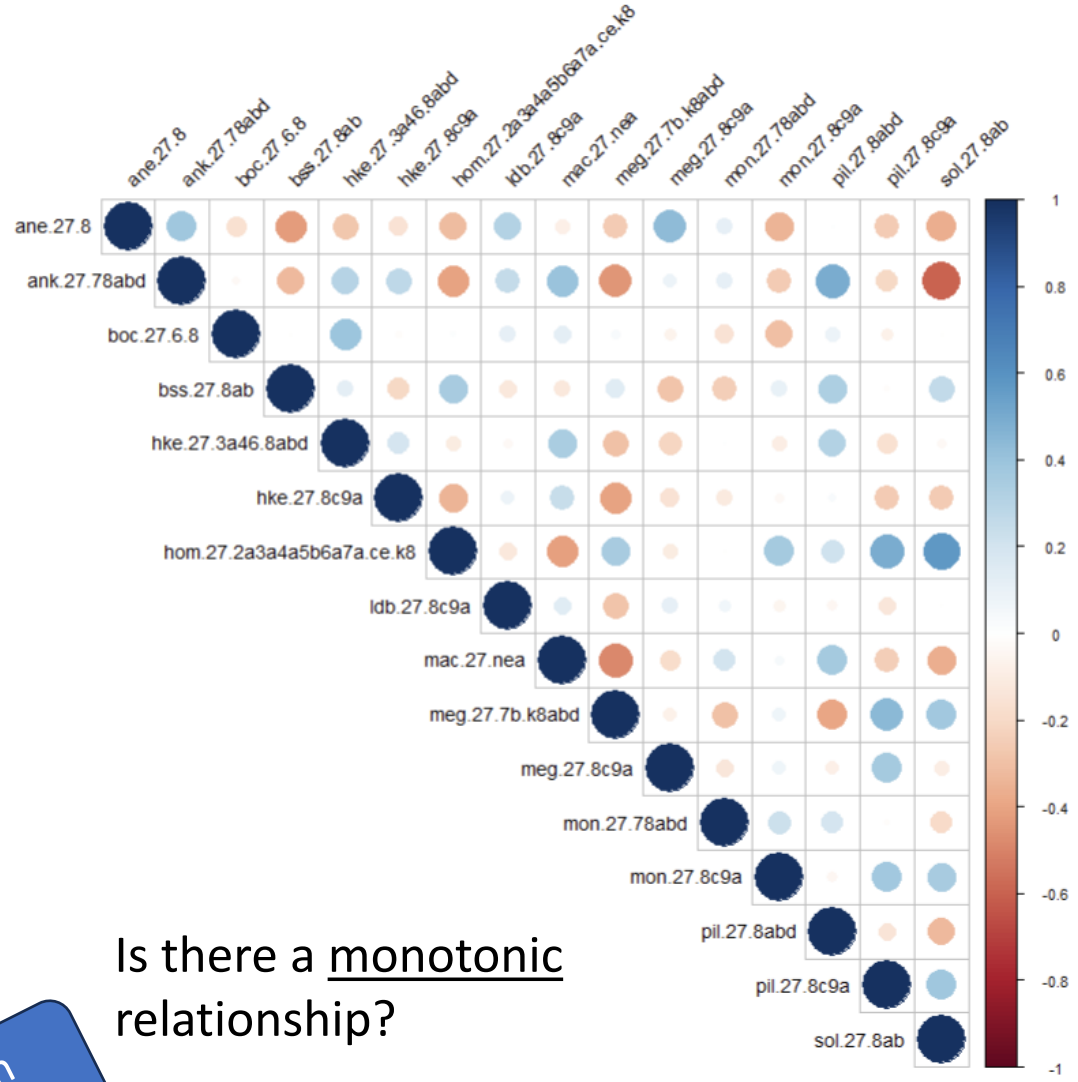
Next Steps:

- Maturity: Calculate northern hake specific time varying pa
- Weight: Include densodependence in the assessment
- Reference points: Account for densodependence in their c

Hake in an ecosystem context



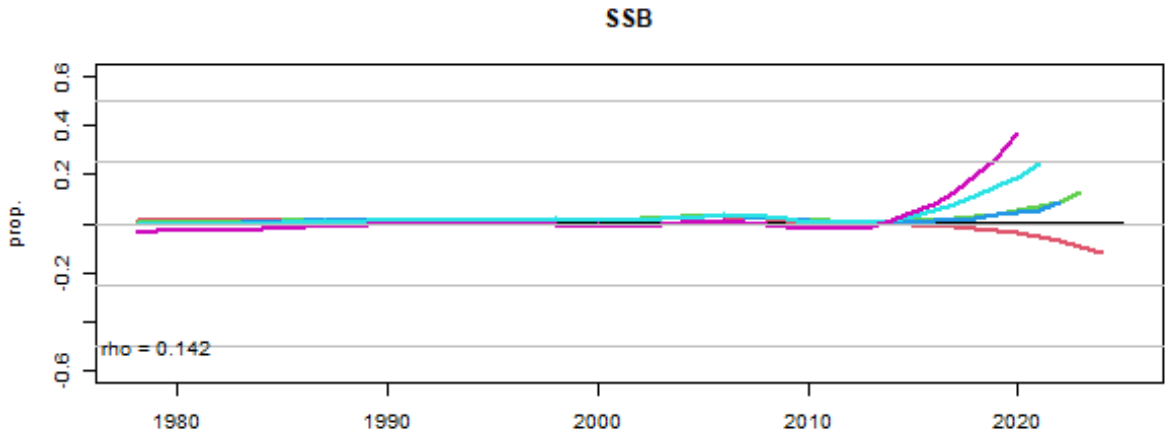
Is there a <u>linear</u> relationship?

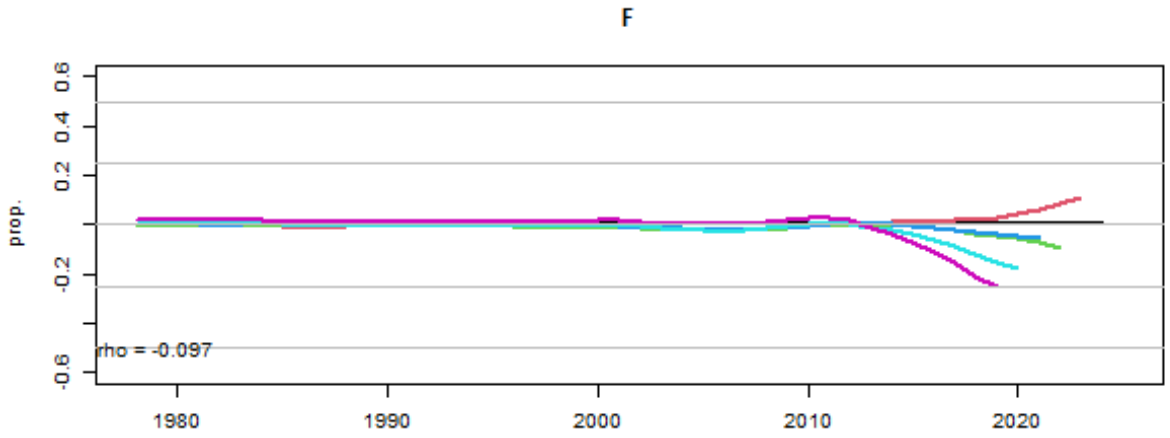


Is there a <u>monotonic</u> relationship?

Work in progress

The assessment





Solved!

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