Surplus Production Models of blue whiting

- and their relationship with recruitment and hydrographic conditions

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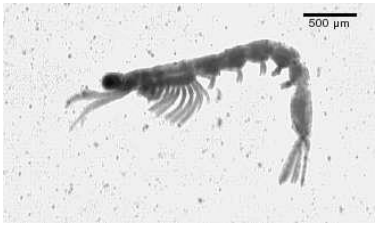
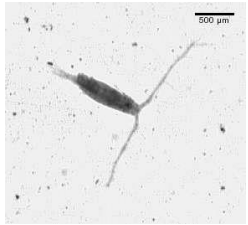
A bit of blue whiting ecology

- Spawning distribution between 250-600m
- Spawns mainly West of British Isles in Feb to mid-March
- Feeds in the Norwegian Sea in the summer

Sea mammals, cetaceans, some fishes

BW Adult





BW Larvae

Distribution of the spawning area

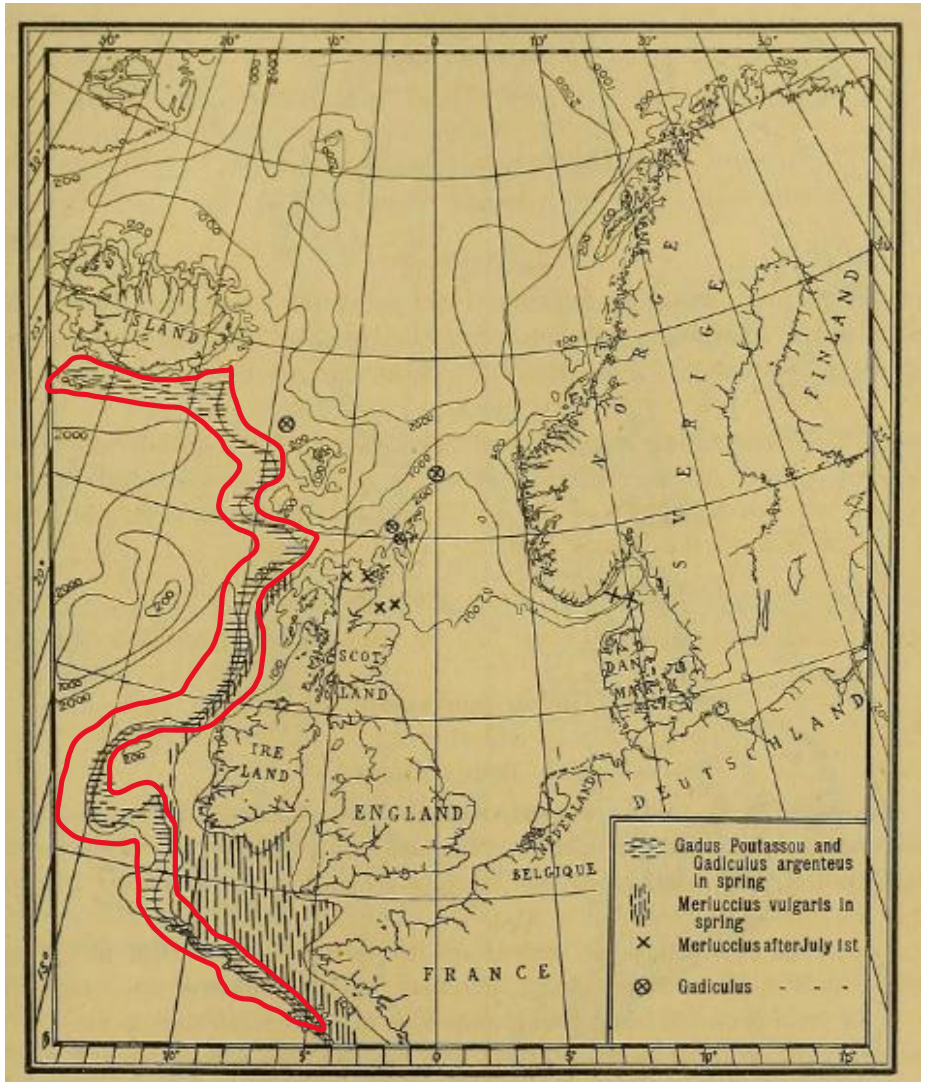
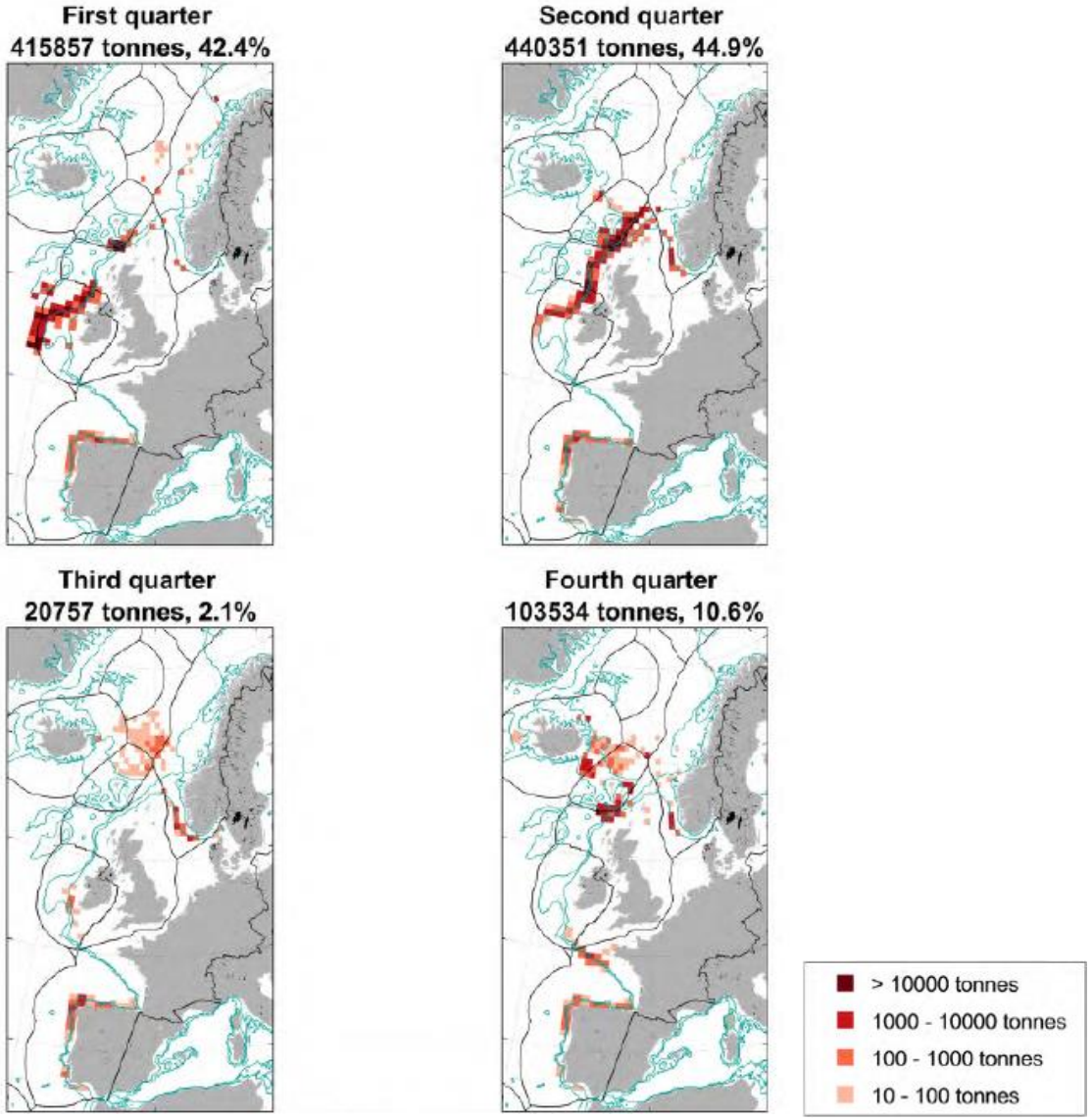


Fig. 17. Spawning region of *Gadus Poutassou*, *Gadiculus argenteus* and *Merluccius vulgaris*.

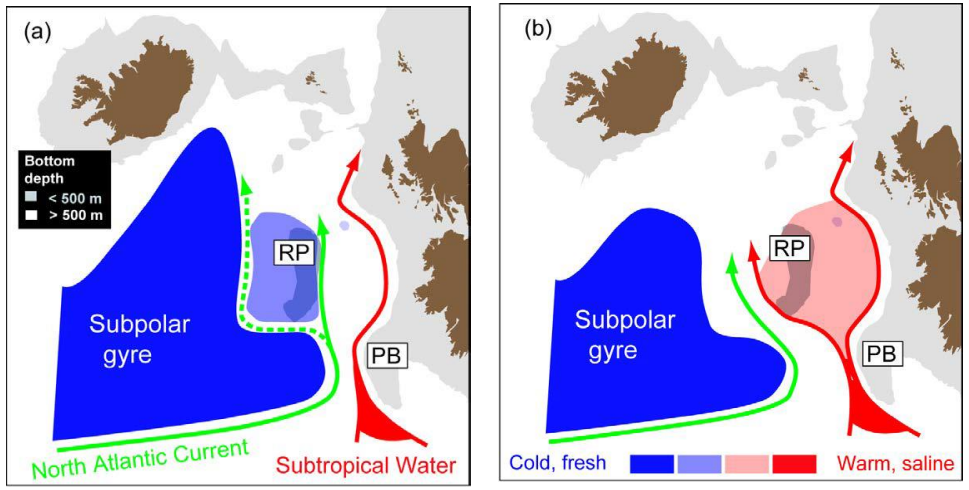
ICES (1909)



WGWIDE (2022)

The spawning area as a driver of surplus production?

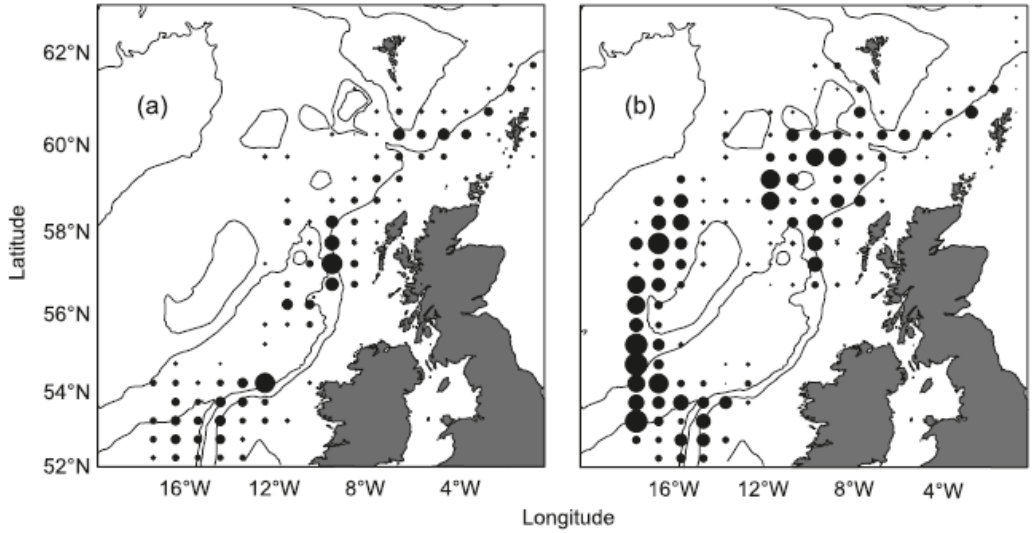
Payne et al. (2012)



low R (1989-1996)

high R (1997-2005)

Hàtùn et al. (2009)



Hydrographic conditions -> spawning stock distribution -> recruitment variability -> surplus production?

Population dynamics, carrying capacity, and ecosystem regime shifts of blue whiting

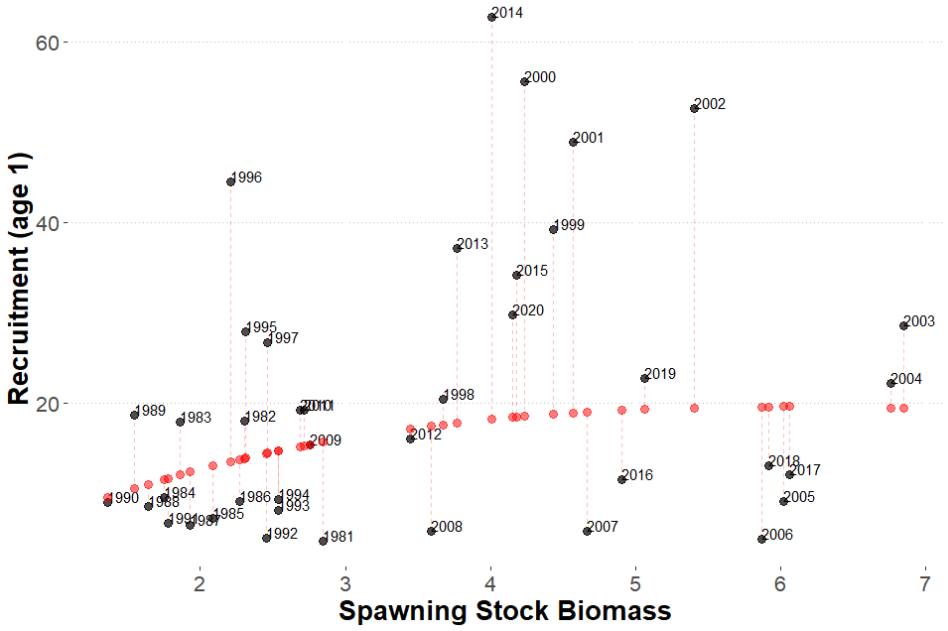
Can recruitment regimes be linked to the productivity regimes?

What does it mean in terms of carrying capacity and reference points?

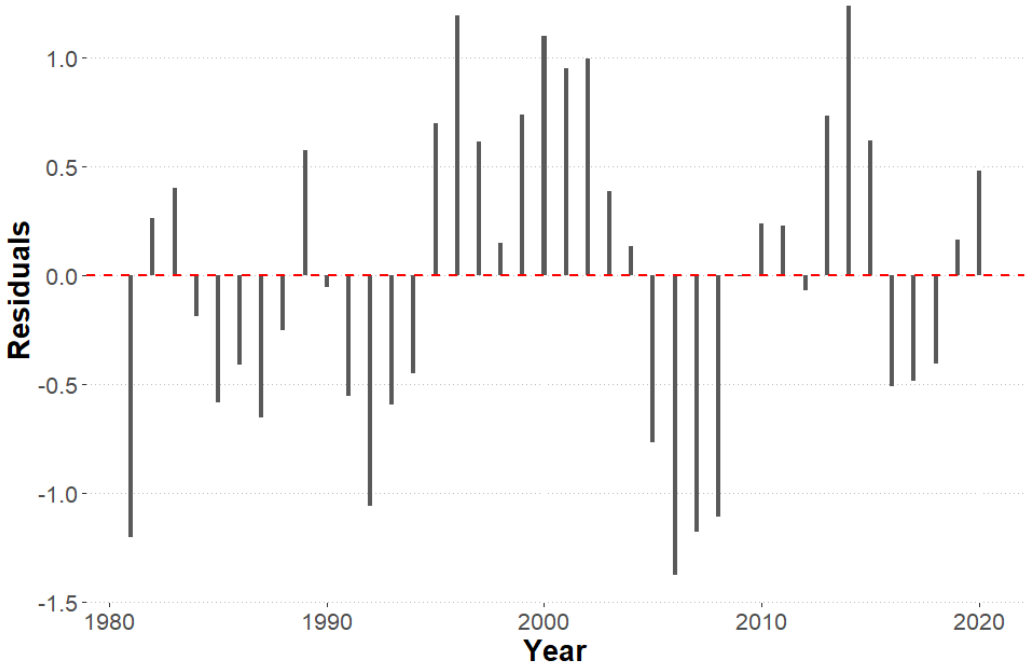
How much of this variability can be explained by climate-ocean variability?

Stock-recruitment relationship reveals differents periods of recruitment levels

S-R relationship

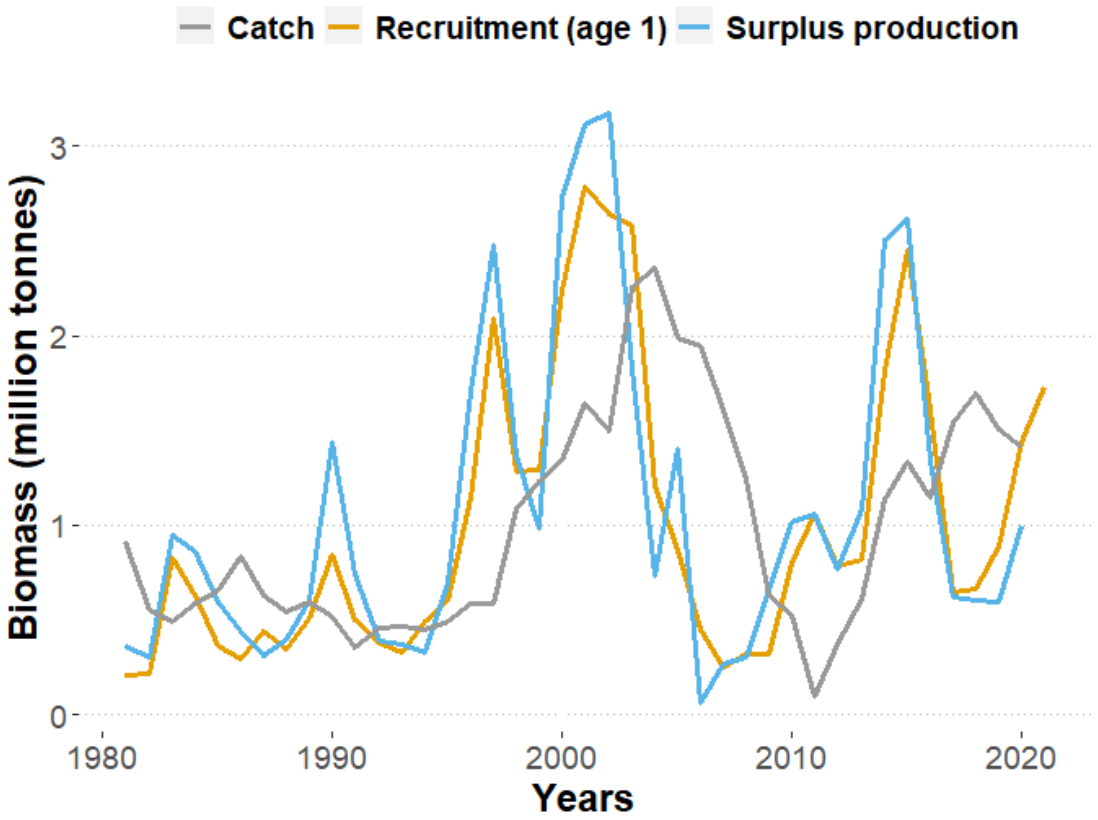


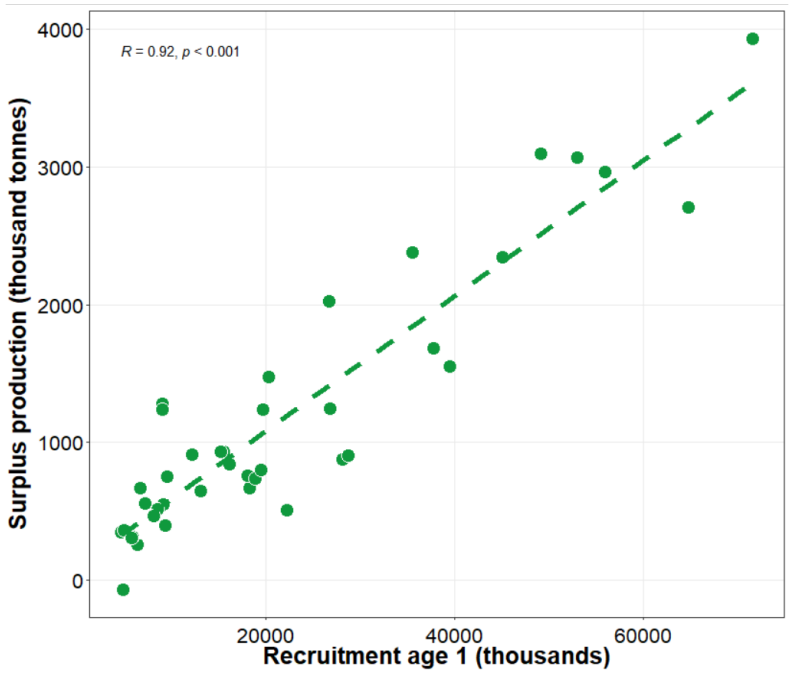
Time series of recruitment residuals



Juveniles contribution to changes in biomass

$$SP_{t\,obs} = B_{t+1} - B_t + C_t$$

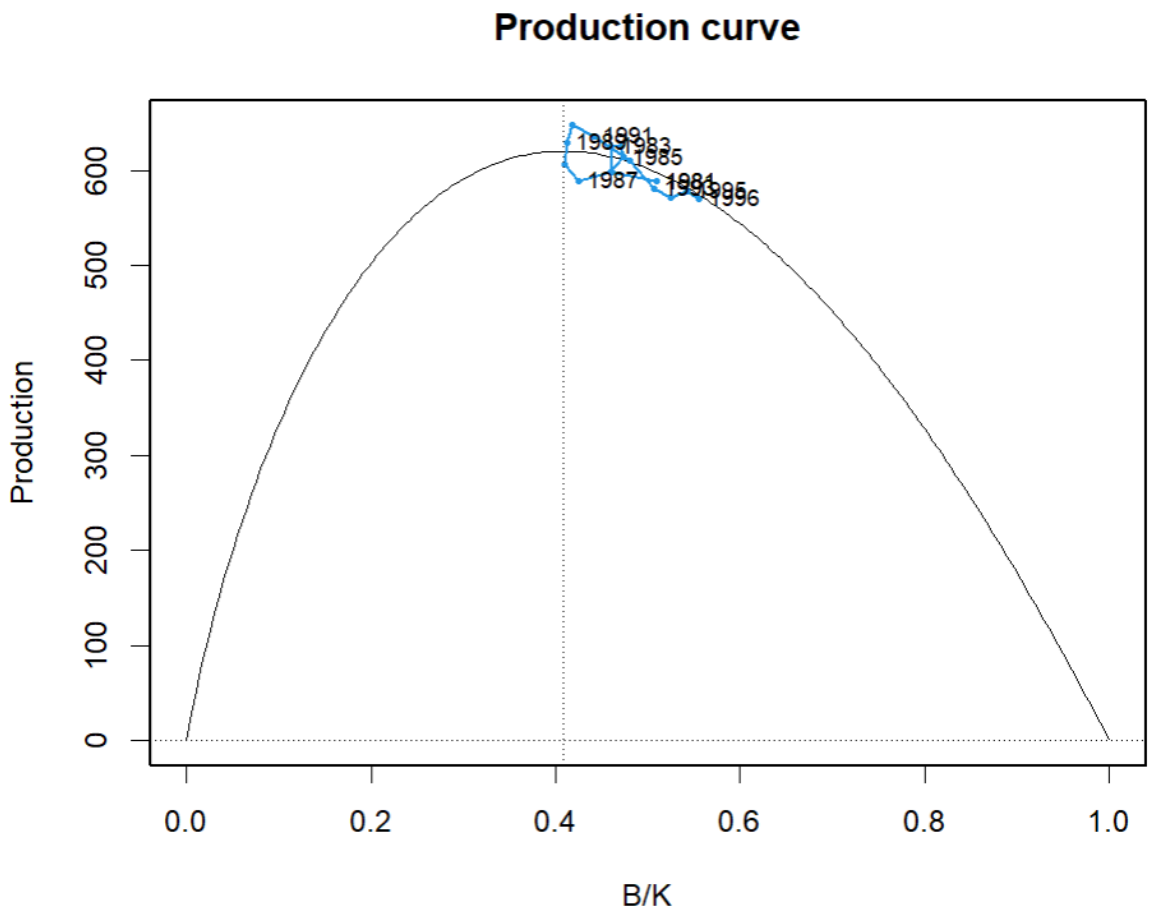




Strong relationship between surplus production and recruitment

SPiCT runs: 1981-1995

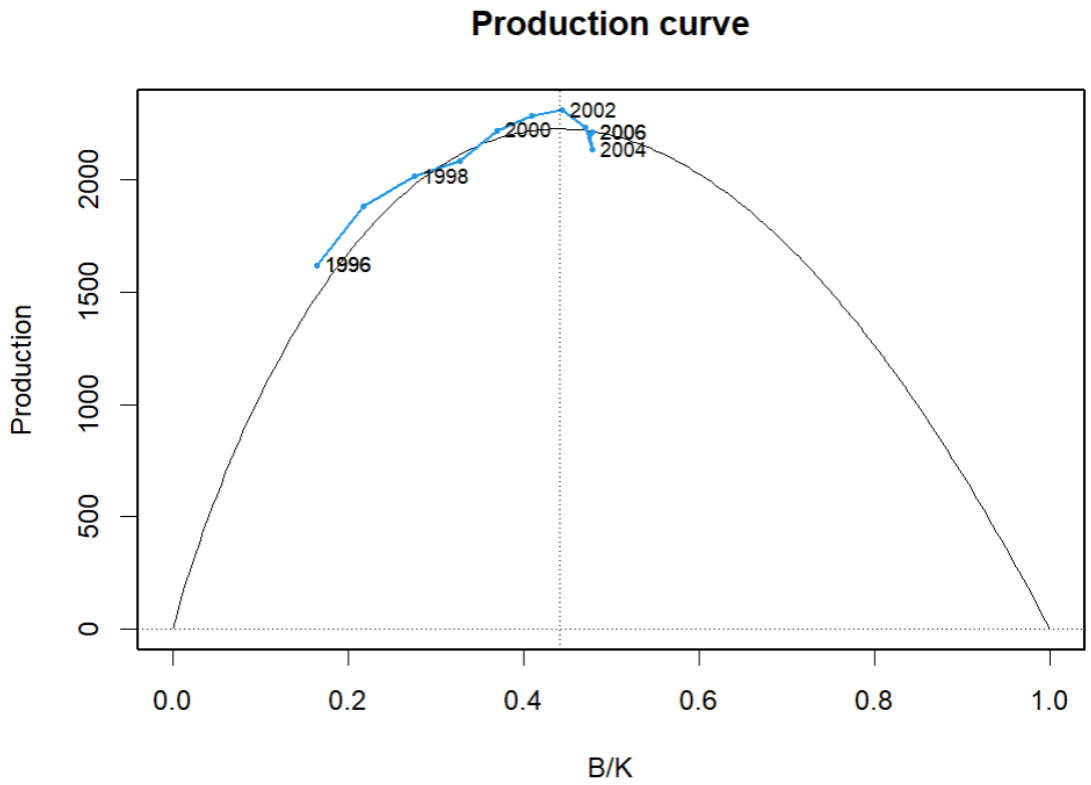
- B/K prior = log(0.6), 0.1^2
- N prior = log(1.478), 0.5^2



SPiCT runs: 1996-2005

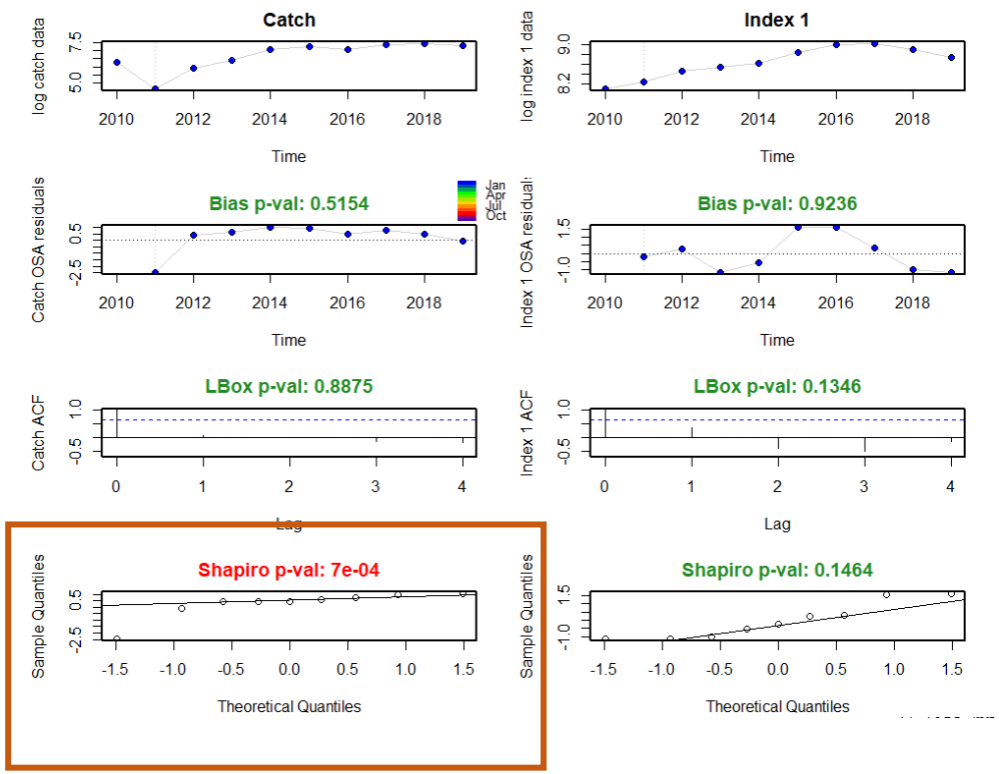
- N prior = log(1.478), 0.5^2

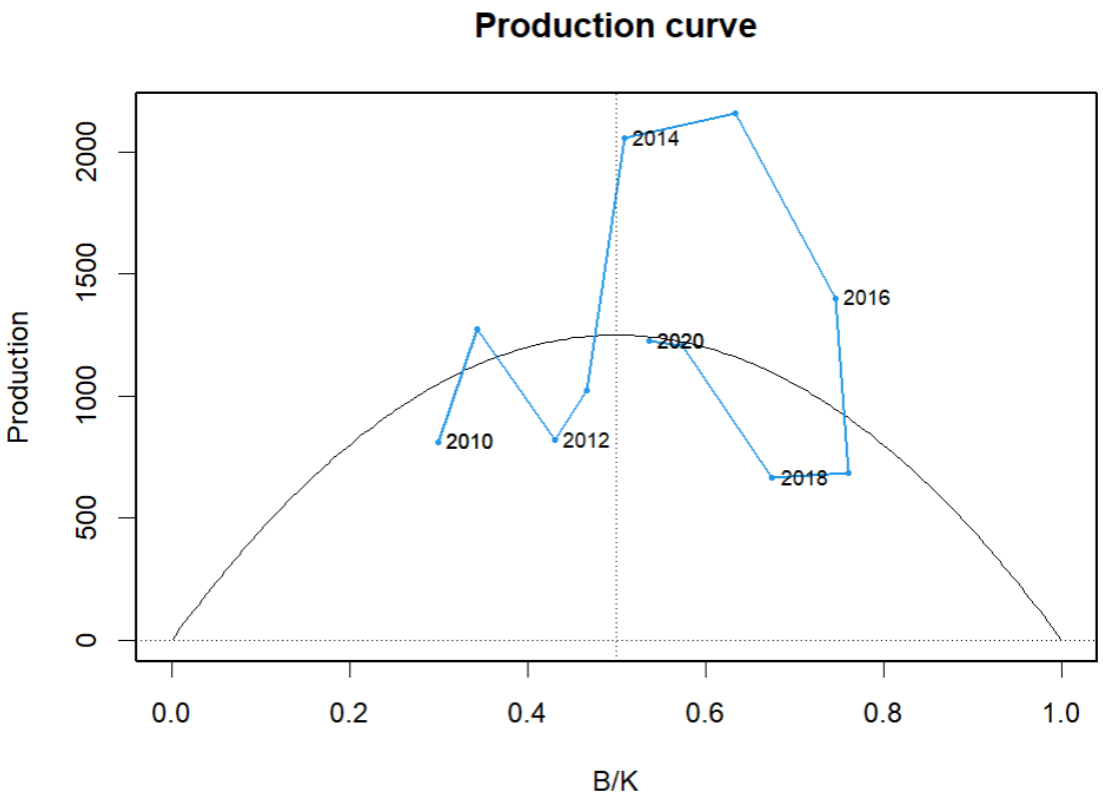
(Thorson et al., 2012) ”all taxa”



SPiCT runs: 2009-2020

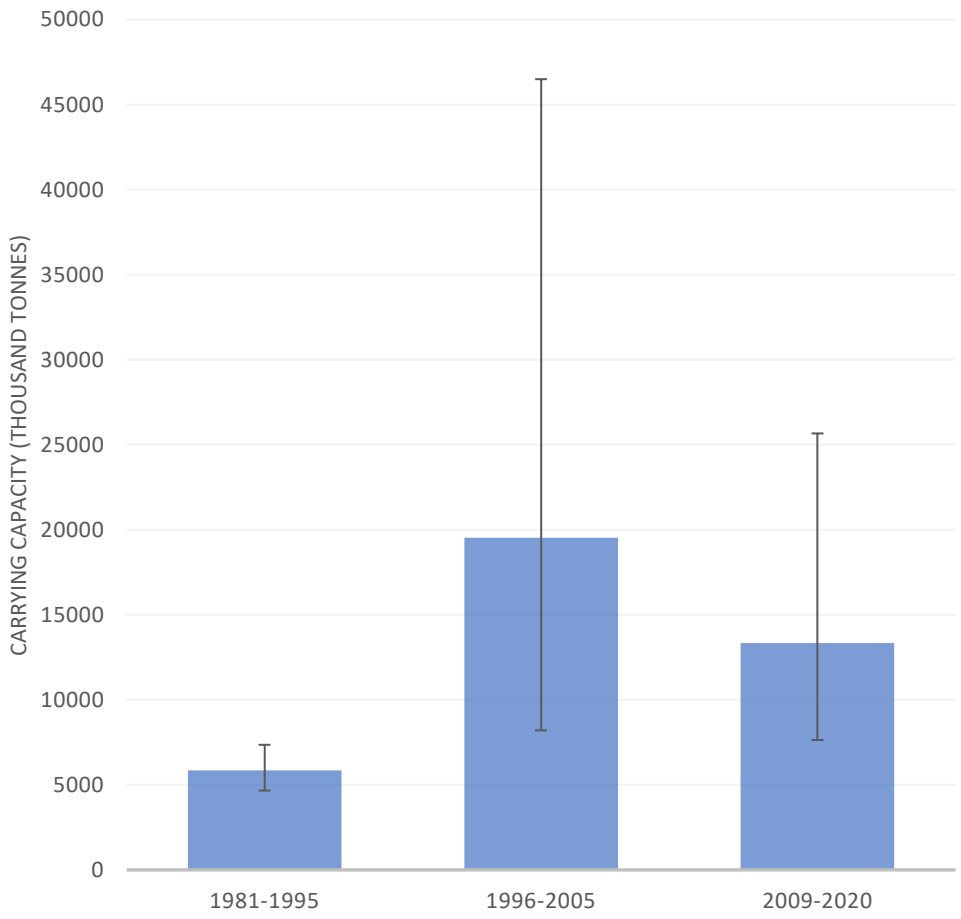
- B/K prior = log(0.3), 0.1^2
- N prior = log(2), 0.5^2 (Schaefer)



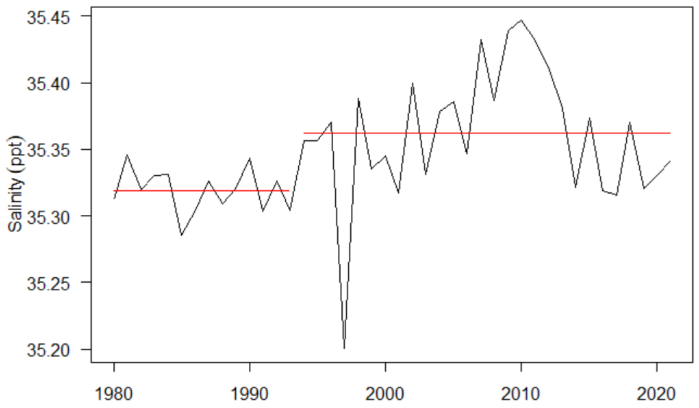
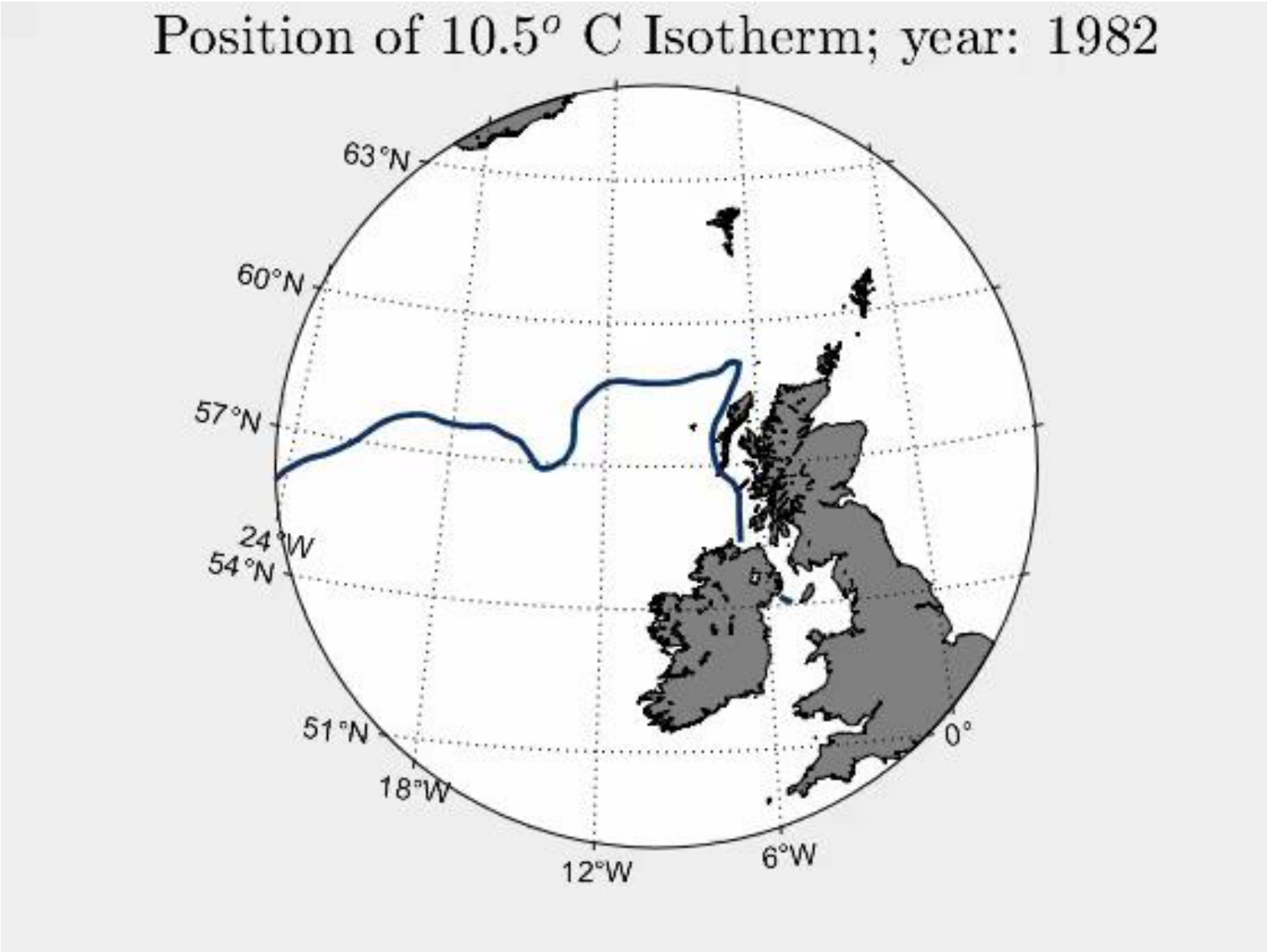


Significant carrying capacity per period of low and high productivity

	1981-1995	1996-2005	2009-2019
Bmsy	2.39	8.51	7.01
Fmsy	0.26	0.26	0.19
MSY	0.62	2.23	1.33
K	5.85	19.53	13.34



Integrated averaged salinity 250-600m during March-May: breaking point in 1995



- In the 80s, cold water at the Rockall plateau
- From the mid-90s, warmer water/more variability