Supplementary Materials

Addressing the dichotomy of fishing and climate in fishery management with the FishClim model

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Supplementary Text 1. Climate projection data

CNRM-ESM2-1:
Seferian, Roland (2018). CNRM-CERFACS CNRM-ESM2-1 model output prepared for CMIP6 CMIP historical. Version 2018-07-14. Earth System Grid Federation. https://doi.org/10.22033/ESGF/CMIP6.4068

Voldoire, Aurore (2019). CNRM-CERFACS CNRM-ESM2-1 model output prepared for CMIP6 ScenarioMIP ssp245. Version 2018-10-26. Earth System Grid Federation. https://doi.org/10.22033/ESGF/CMIP6.4191

Voldoire, Aurore (2019). CNRM-CERFACS CNRM-ESM2-1 model output prepared for CMIP6 ScenarioMIP ssp585. Version 2019-09-24. Earth System Grid Federation. https://doi.org/10.22033/ESGF/CMIP6.4226

GFDL-ESM4:
Krasting, John P.; John, Jasmin G; Blanton, Chris; McHugh, Colleen; Nikonov, Serguei; Radhakrishnan, Aparna; Rand, Kristopher; Zadeh, Niki T.; Balaji, V; Durachta, Jeff; Dupuis, Christopher; Menzel, Raymond; Robinson, Thomas; Underwood, Seth; Vahlenkamp, Hans; Dunne, Krista A.; Gauthier, Paul PG; Ginoux, Paul; Griffies, Stephen M.; Hallberg, Robert; Harrison, Matthew; Hurlin, William; Malysh, Sergey; Naik, Vaishali; Paulot, Fabien; Paynter, David J; Ploshay, Jeffrey; Reichl, Brandon G; Schwarzkopf, Daniel M; Seman, Charles J; Silvers, Levi; Wyman, Bruce; Zeng, Yujin; Adcroft, Alistair; Dunne, John P.; Dussin, Raphael; Guo, Huan; He, Jian; Held, Isaac M; Horowitz, Larry W.; Lin, Pu; Milly, P.C.D; Shevliakova, Elena; Stock, Charles; Winton, Michael; Wittenberg, Andrew T.; Xie, Yuanyu; Zhao,
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**IPSL-CM6A-LR:**

Boucher, Olivier; Denvil, Sébastien; Levasseur, Guillaume; Cozic, Anne; Caubel, Arnaud; Foujols, Marie-Alice; Meurdesoif, Yann; Cadule, Patricia; Devilliers, Marion; Ghil, Josephine; Lebas, Nicolas; Lurton, Thibaut; Mellul, Lidia; Musat, Ionela; Mignot, Juliette; Cheruy, Frédérique (2018). *IPSL IPSL-CM6A-LR model output prepared for CMIP6 CMIP historical*. Version 2018-07-11. Earth System Grid Federation. [https://doi.org/10.22033/ESGF/CMIP6.5195](https://doi.org/10.22033/ESGF/CMIP6.5195)

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**UKESM1-0-LL:**

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Supplementary Figures

**Supplementary Figure 1.** Shape of the different types of niches used in our model to assess maximum standardised SSB (i.e. K). 

- **a.** Gaussian asymmetrical thermal niche.
- **b.** Trapezoidal asymmetrical bathymetric niche.
- **c.** Rectangular trophic niche with a threshold of chlorophyll higher or equal to 0.05 mg.m$^{-3}$. Then an average of the number of days above the threshold was calculated 15 days prior to the target day for each day of the period 1850-2100, or 1850-2300 in the case of the IPSL ESM for scenario SSP 585. The three niches were then combined together by multiplying them at a daily scale. Then an annual average was calculated by using the time period March to October, which is a key period for marine production in the North Sea.

**Supplementary Figure 2.** Histogram of the number of geographical cells with a cod occurrence as a function of sea surface temperature (blue bar) from Beaugrand and colleagues and the thermal response curve chosen in this study (red).

**Supplementary Figure 3.** Procedure used to determine the standardisation of ICES SSB. Standardisation of ICES Spawning Stock Biomass (SSB) should be at or below any point of the maximum dSSB (blue line). A number of standardisations was attempted (black thin curves) and we retained the one (red thick curve) that maximised correlation between fishing intensity $\alpha$ and ICES fishing effort $F$ (see Fig 1.e).
Supplementary Figure 1

(a) Thermal niche

(b) Bathymetric niche

(c) Trophic niche

- Blue line: [Chlorophyll] >= 0.05 mg/m³
- Red line: [Chlorophyll] < 0.05 mg/m³
Supplementary Figure 3