Supporting Information Appendix:

Evaluating drivers of spatiotemporal changes in fine scale individual condition of a bottom-associated marine fish

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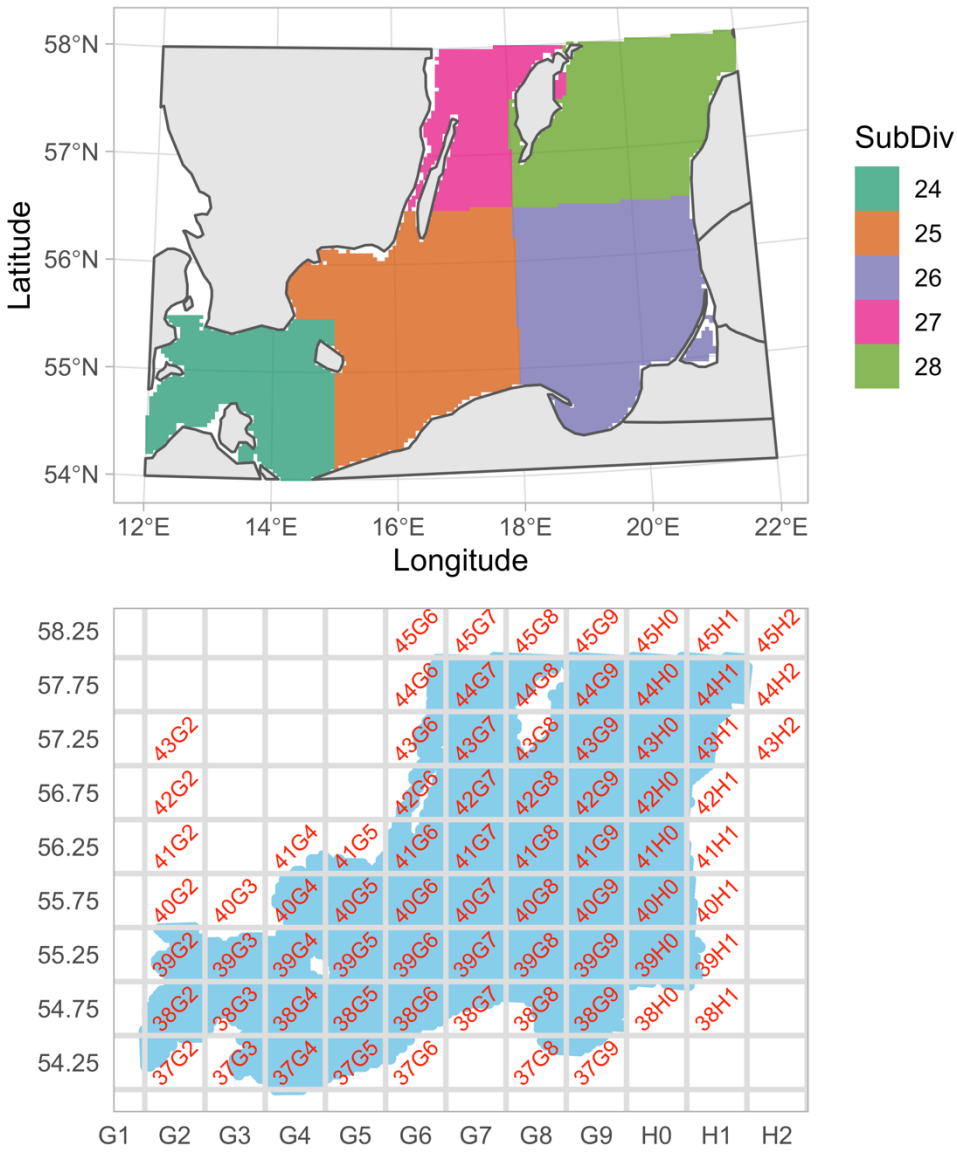

Fig. S1. Map of ICES subdivisions (top) and ICES rectangles (bottom).

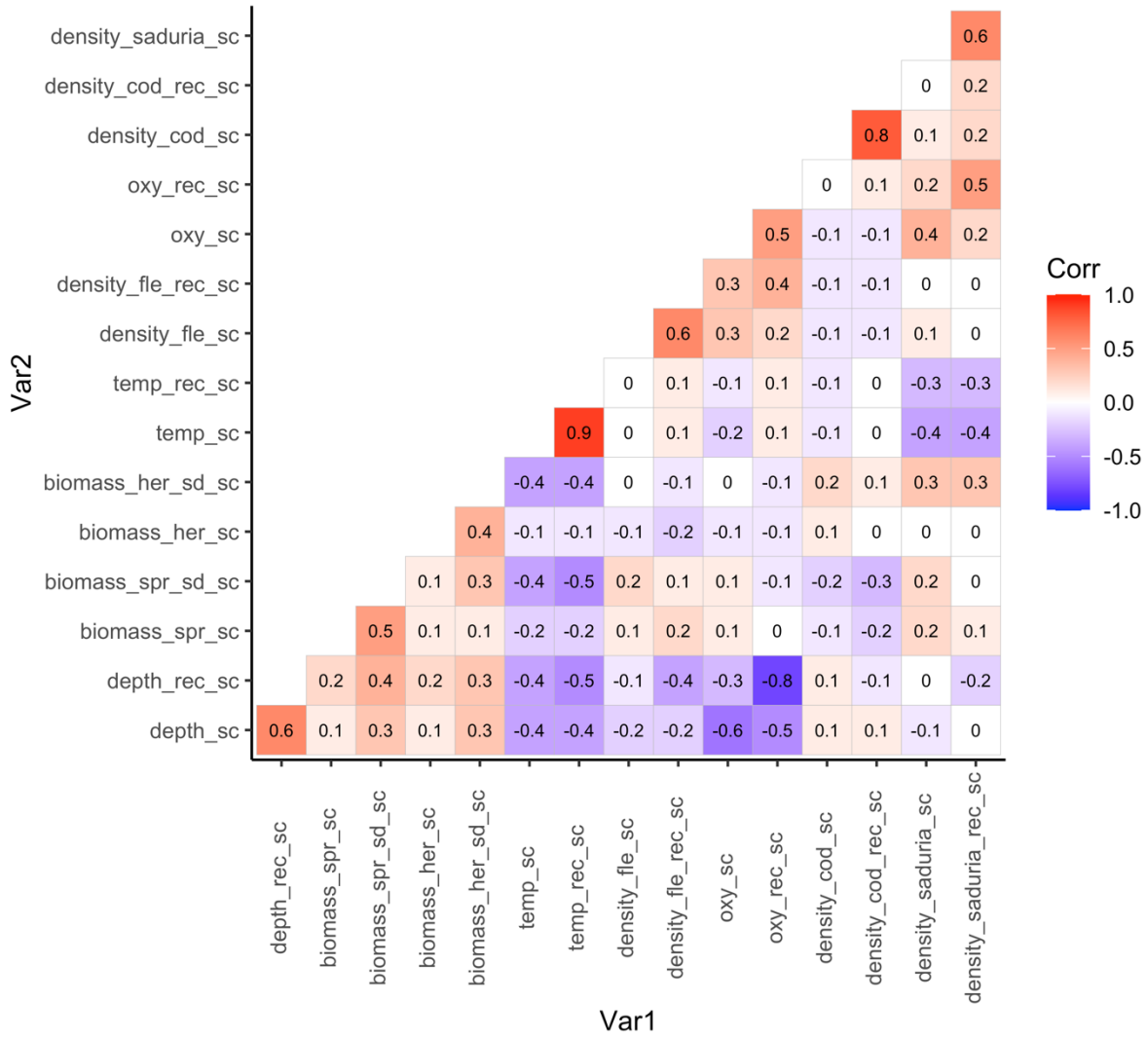

Fig. S2. Pearson correlations coefficients between all variables included in the condition model.

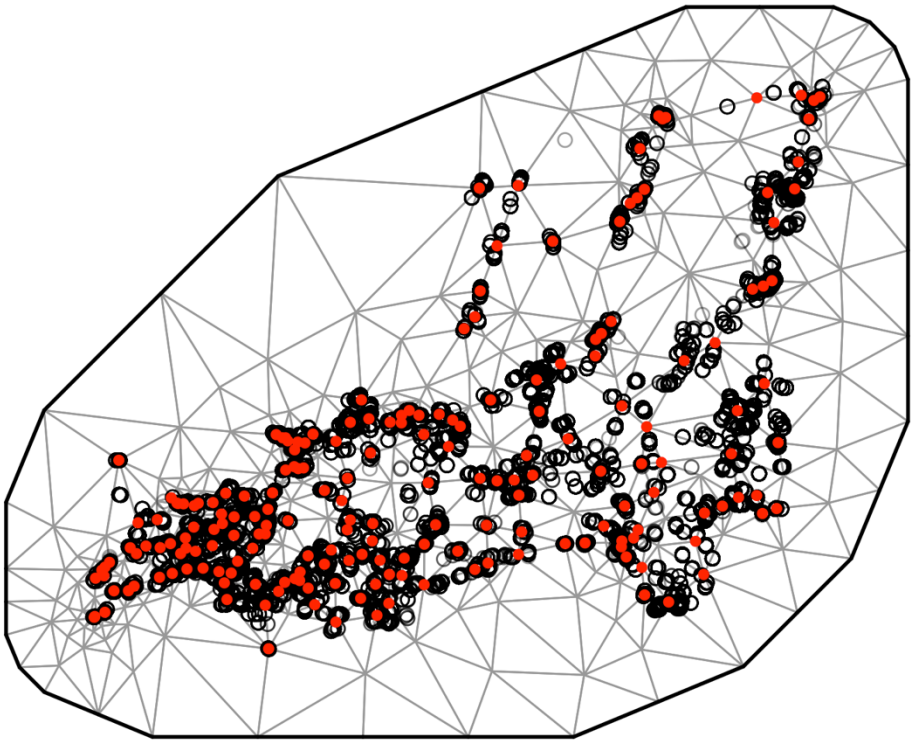

Fig. S3. SPDE mesh for condition model (200 knots).

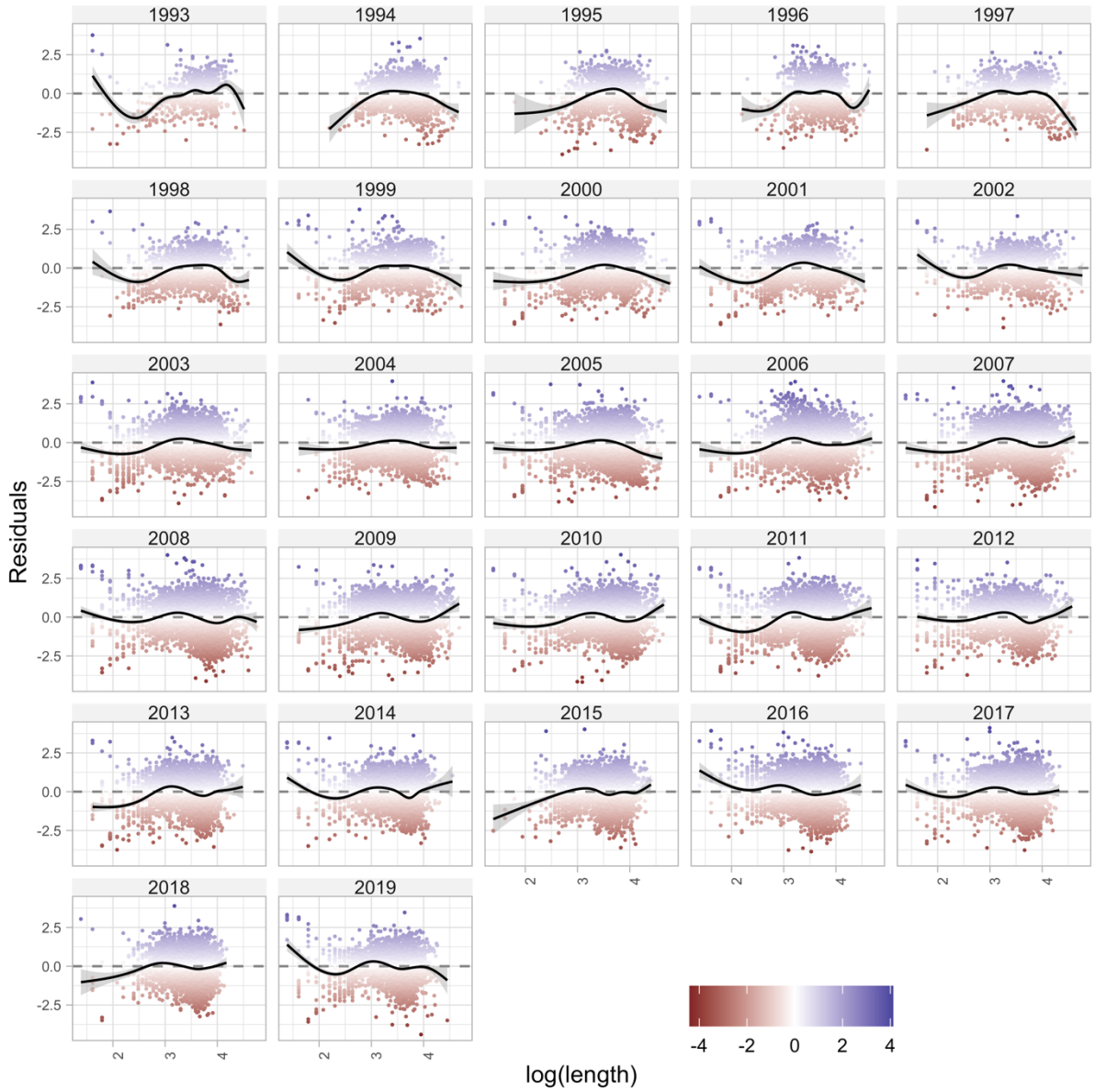

Fig. S4. Residuals from the condition model plotted against length for each year.

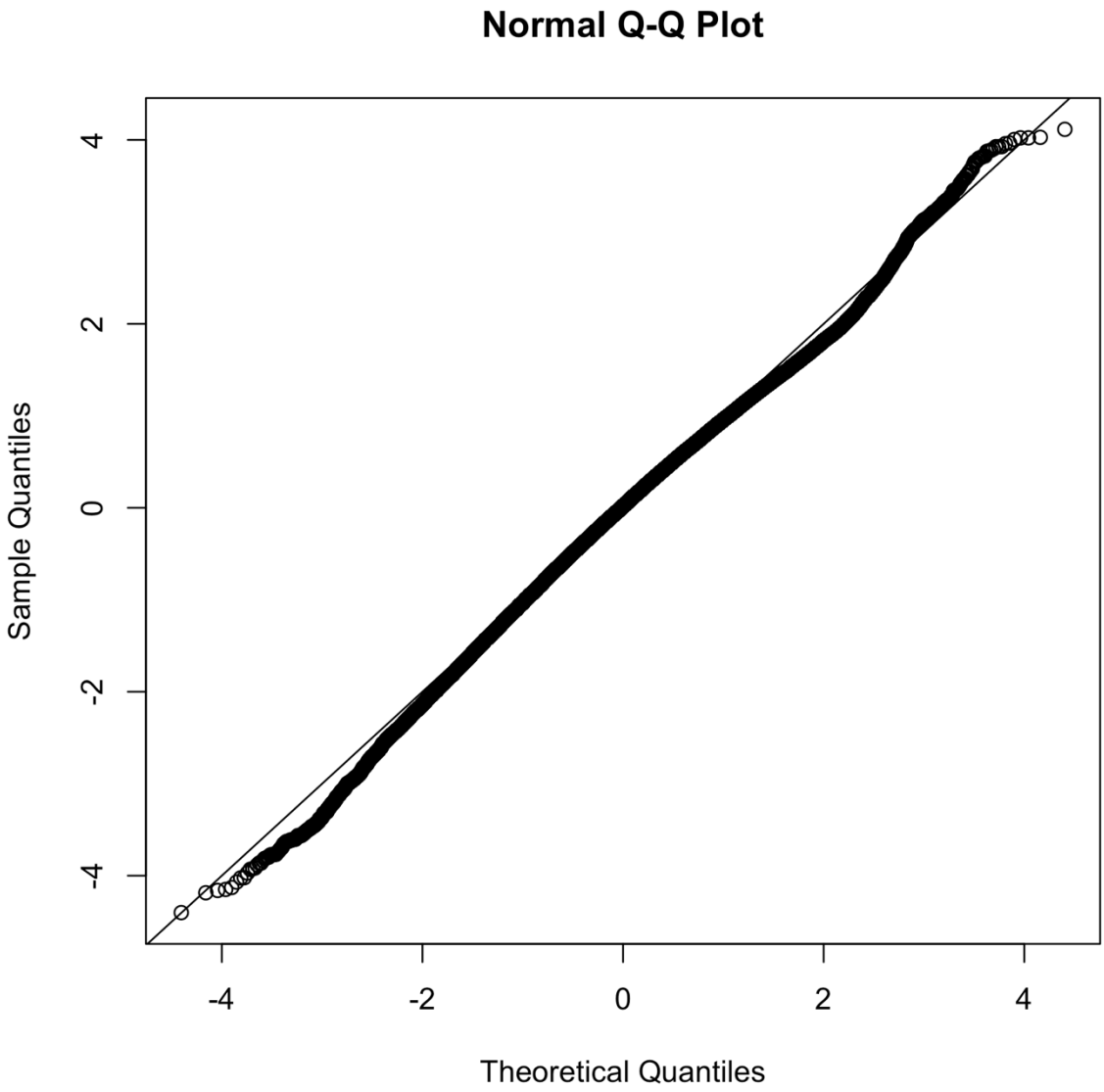

Fig. S5. QQ plot of condition model.

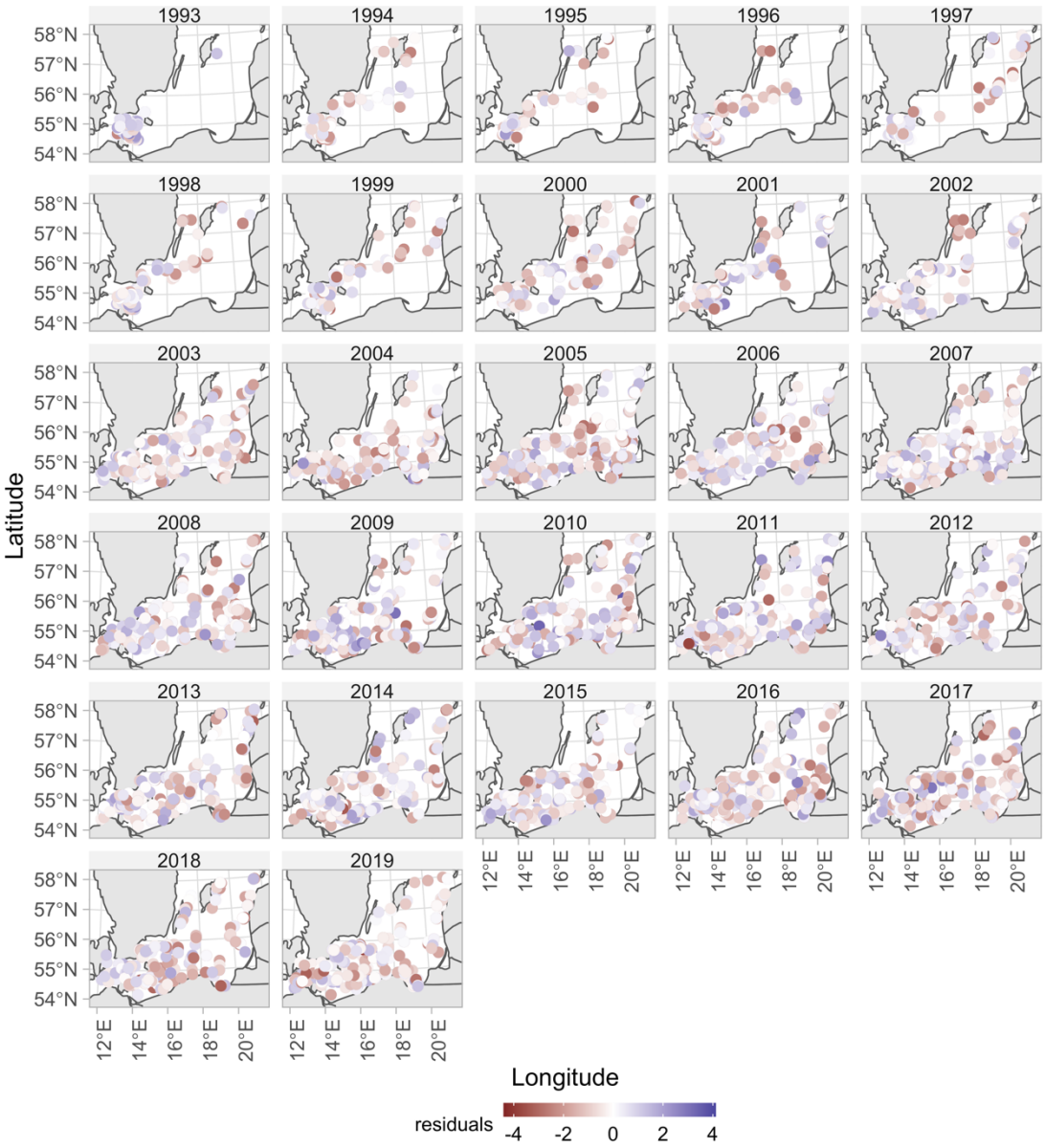

Fig. S6. Condition model residuals plotted in space.

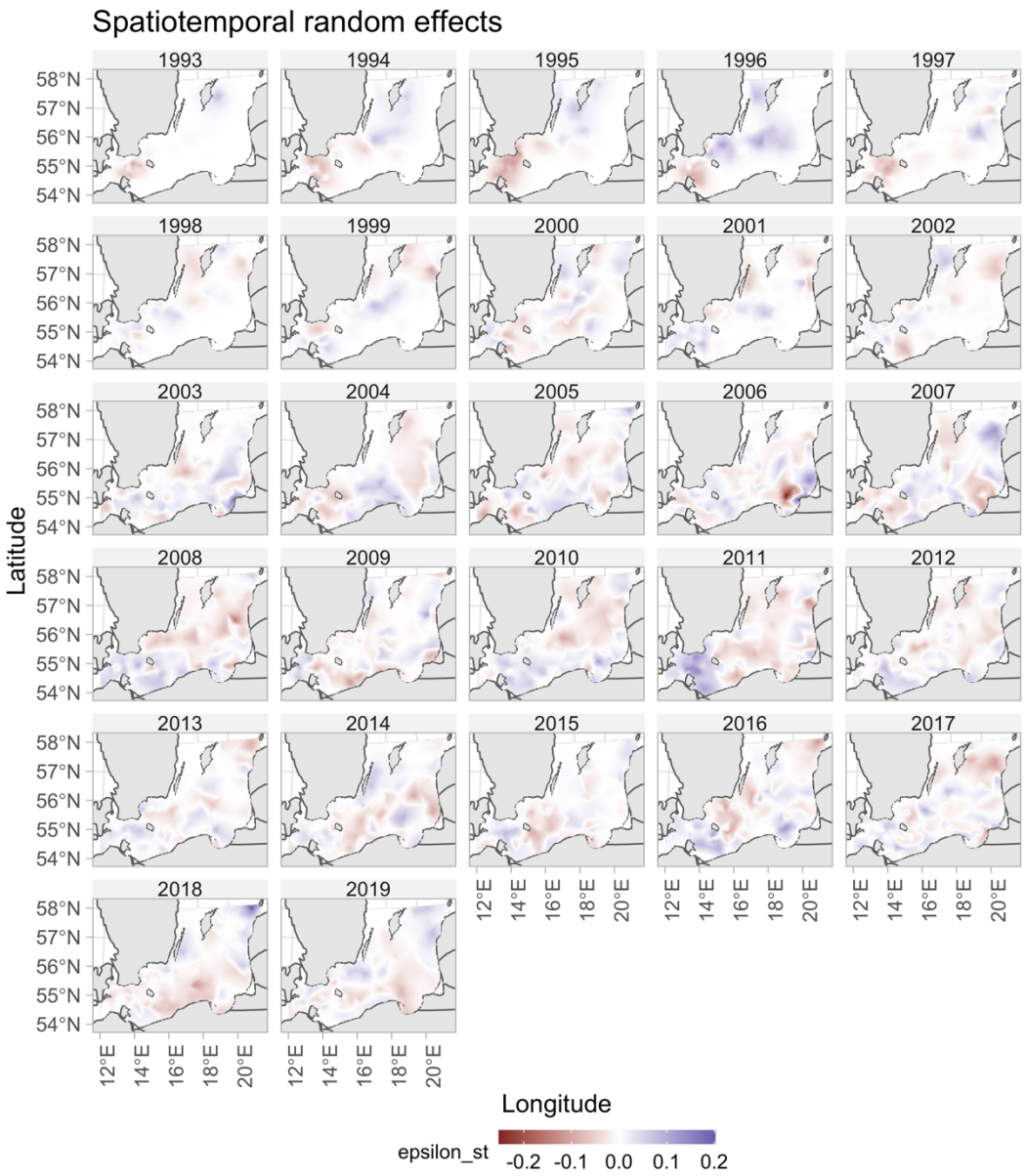

Fig. S7. Spatiotemporal random effects for the condition model.

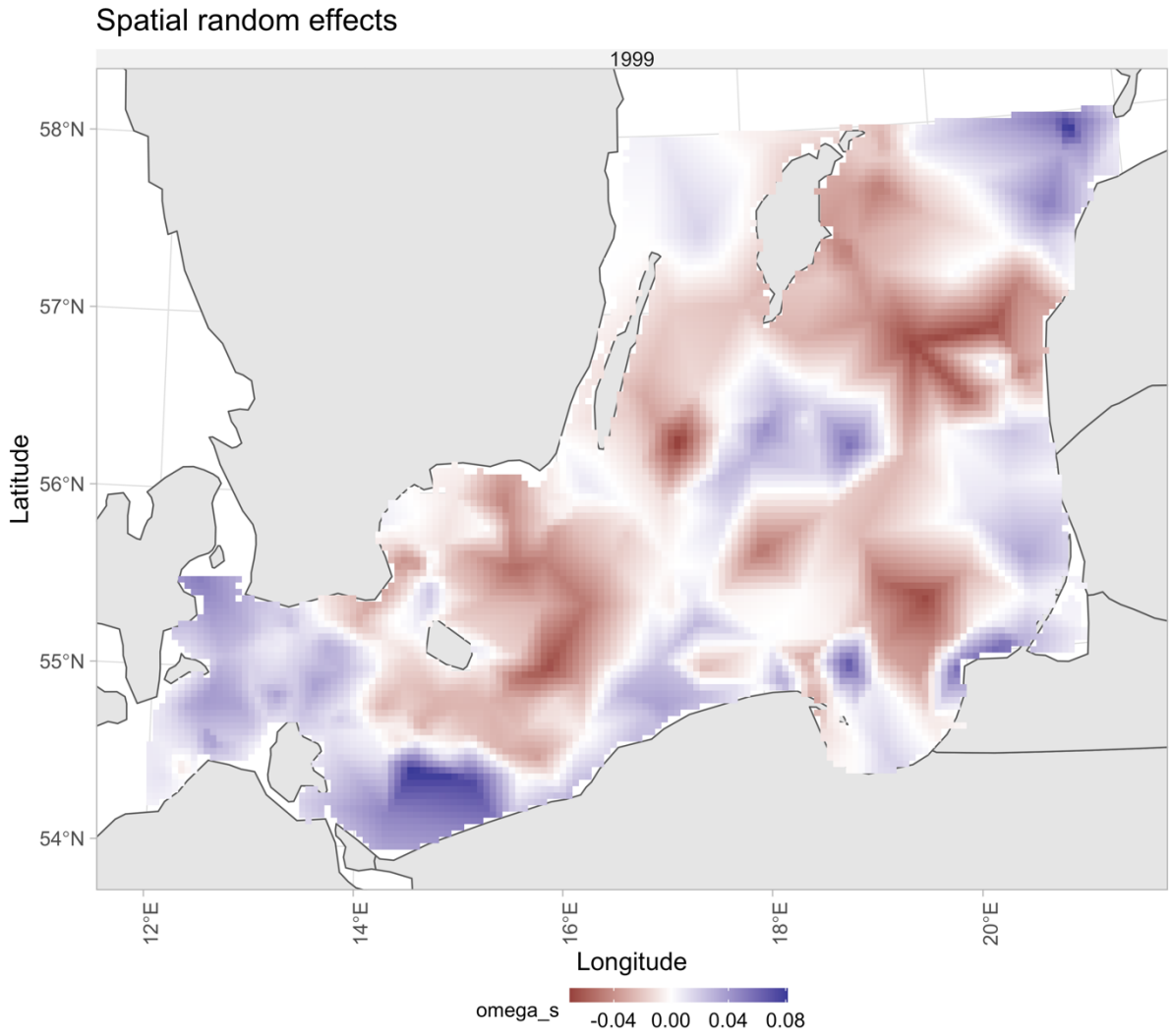

Fig. S8. Spatial random effects for the condition model.

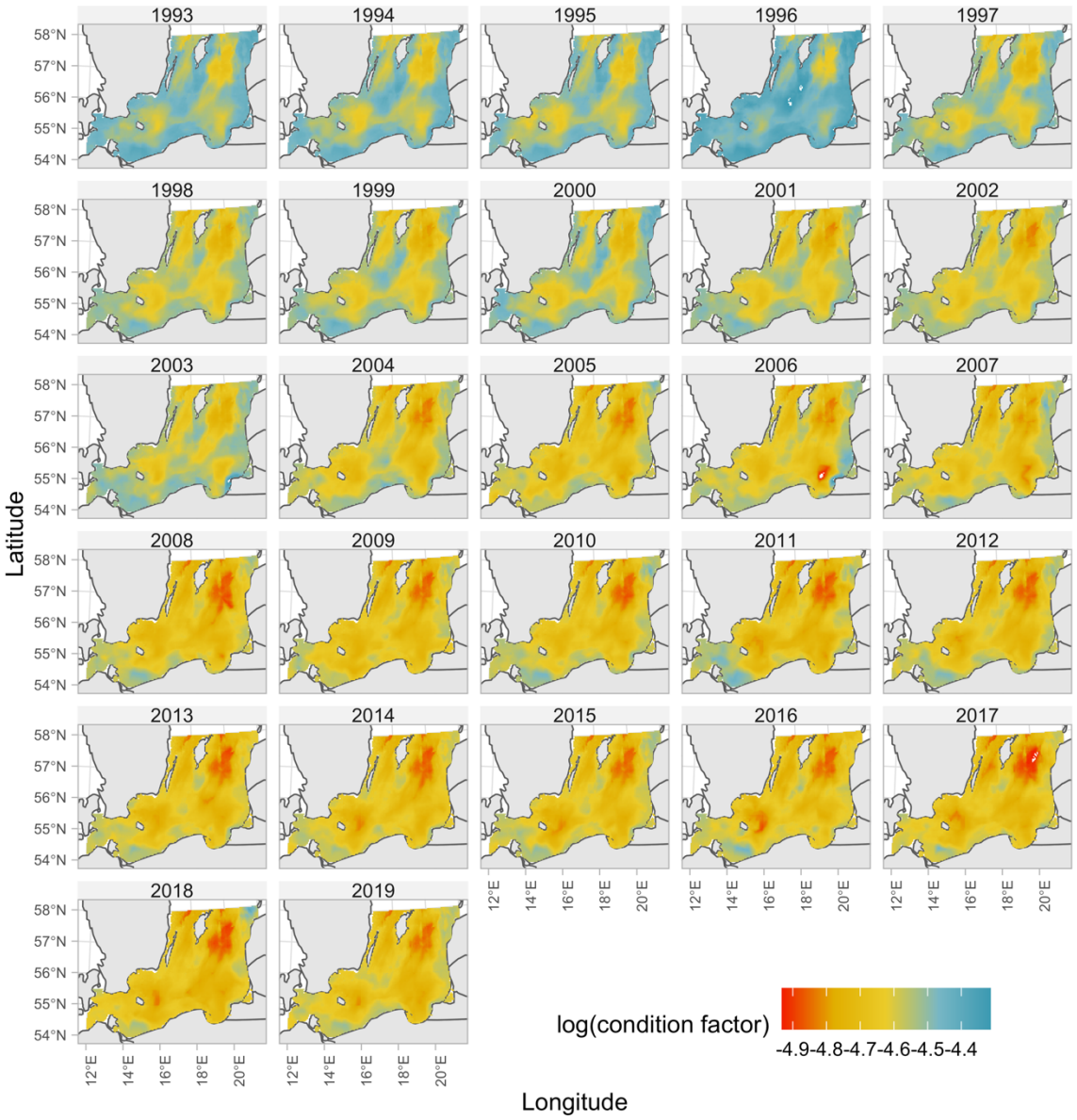

Fig. S9. Predicted log condition factor with spatially varying covariates set to their true values (ICES rectangles with missing pelagic data were given the subdivision mean, see *SI Appendix*, Fig. S24), such that the prediction corresponds to the depth, temperature, and oxygen-dependent log-condition factor for years 1994, 2001, 2008, 2018. For all years in the series, see *SI Appendix*, Fig. S8.

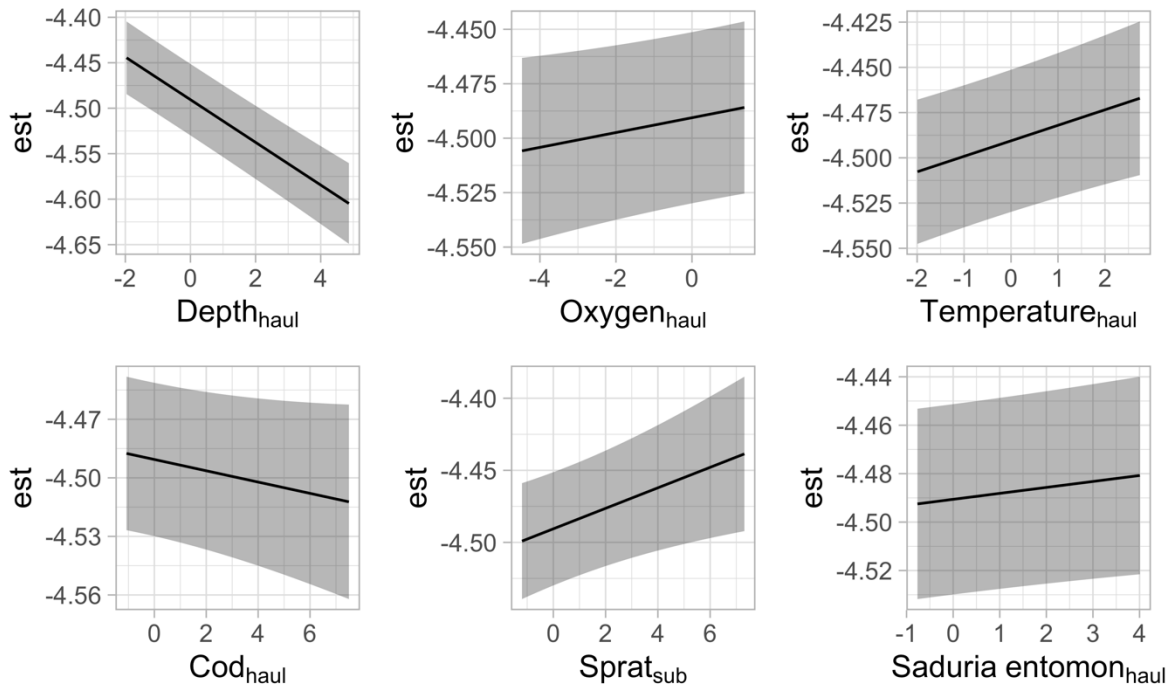

Fig. S10. Marginal effects from the condition model for selected covariates.

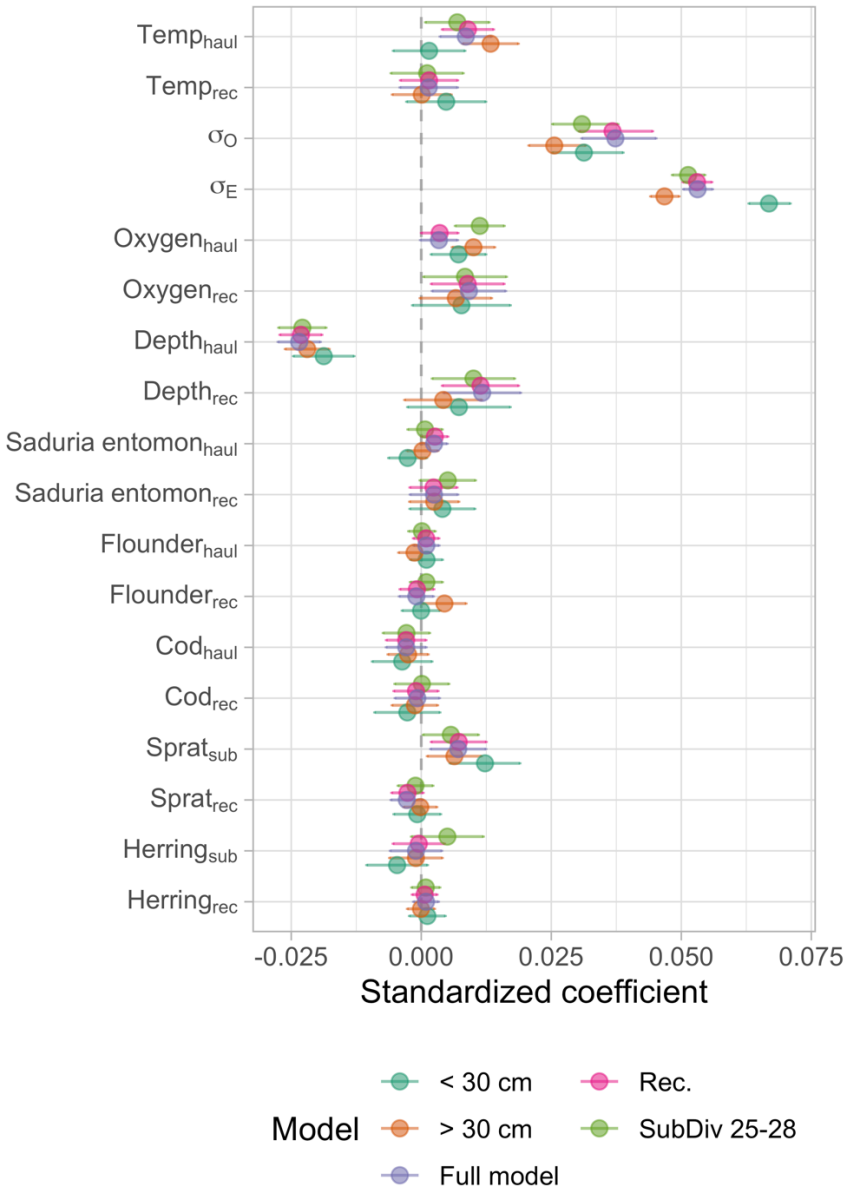

Fig. S11. Sensitivity analysis of the condition model. Each point corresponds to the covariate from a specific model, where the purple point is the model from the main text, teal is a model fitted only to cod below 30 cm, orange only above 30 cm (these models test if the coefficients are sensitive to the gradual ontogenetic diet shift cod exhibit). The green points stem from a model fitted to only subdivision 25-28, which corresponds to the core area of the eastern Baltic cod (subdivision 24 is a mixing zone between the distinct eastern and western Baltic cod). The pink points stem from a model where the rectangle-level medians of the covariates were calculated only using points on the grid with cod densities larger than the 5th percentile. Horizontal lines correspond to the 95% confidence interval).

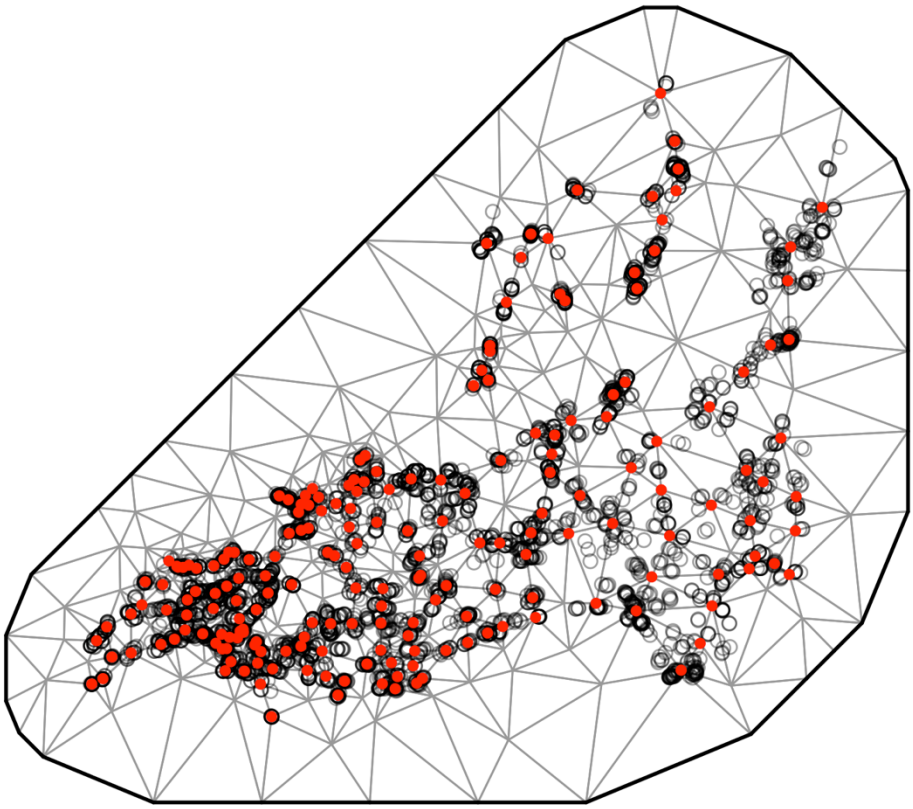

Fig. S12. SPDE mesh for the cod density model (200 knots).

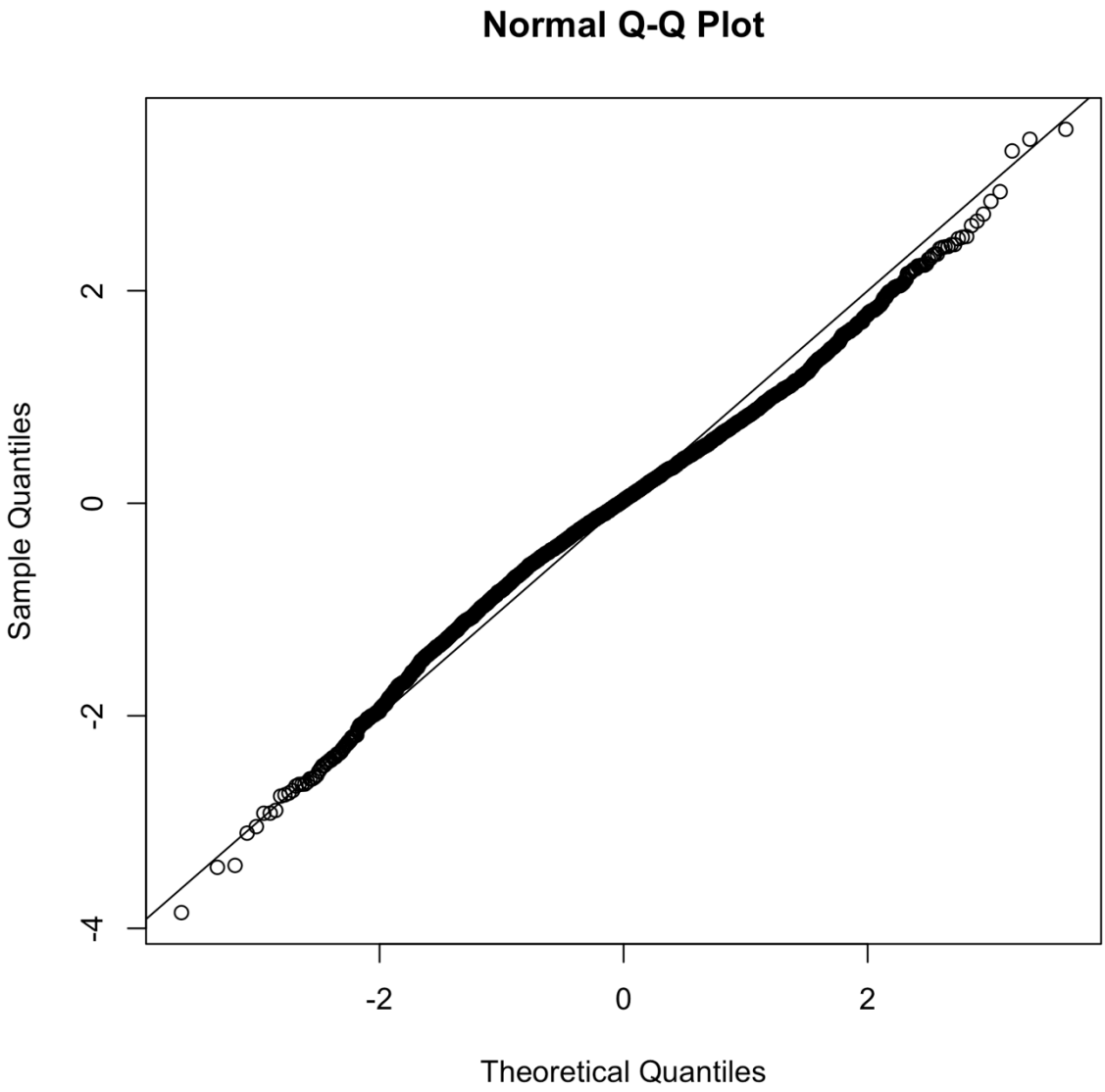

Fig. S13. QQ plot of the cod density model.

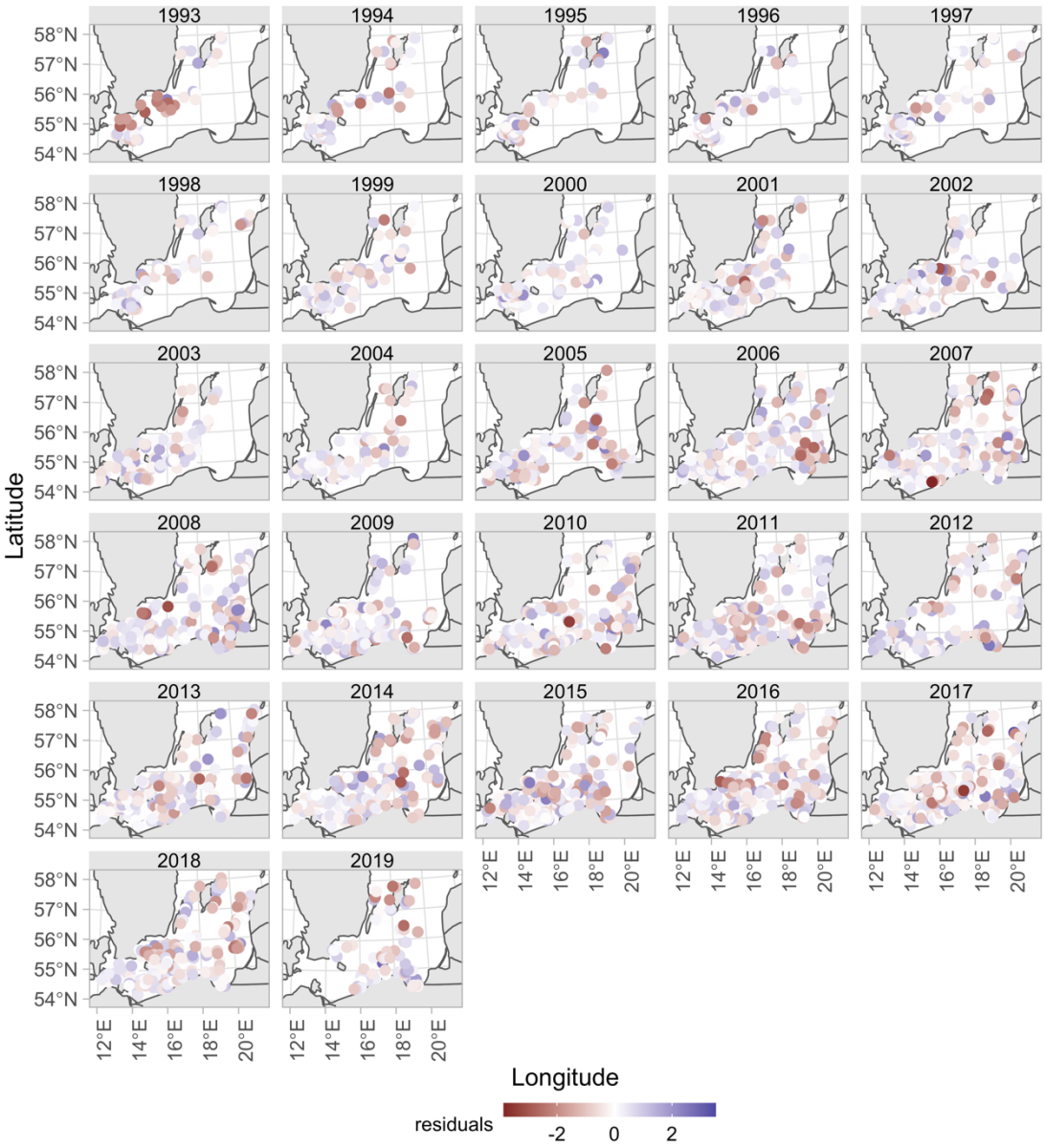

Fig. S14. Cod density model residuals plotted in space

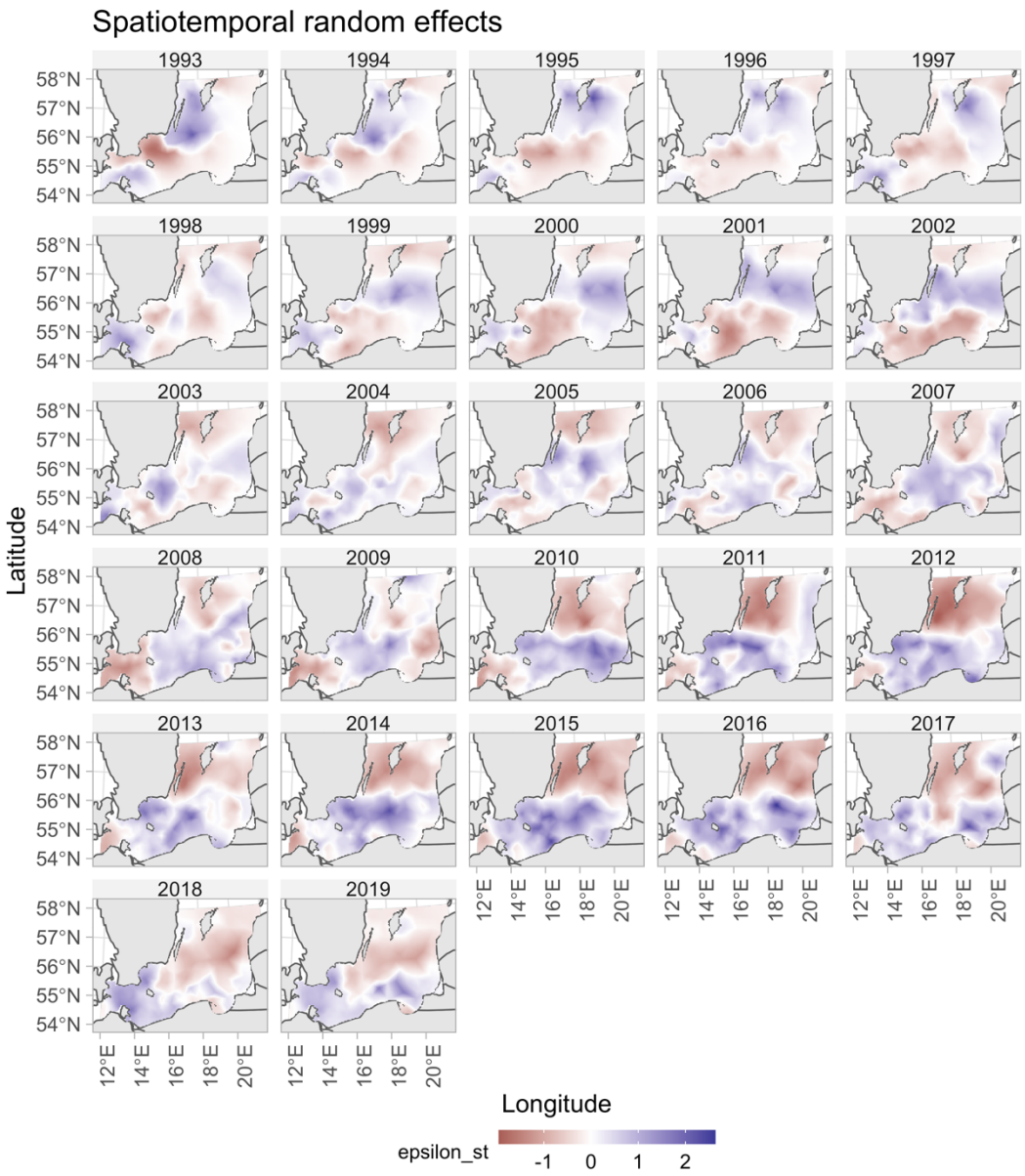

Fig. S15. Spatiotemporal random effects for the cod density model

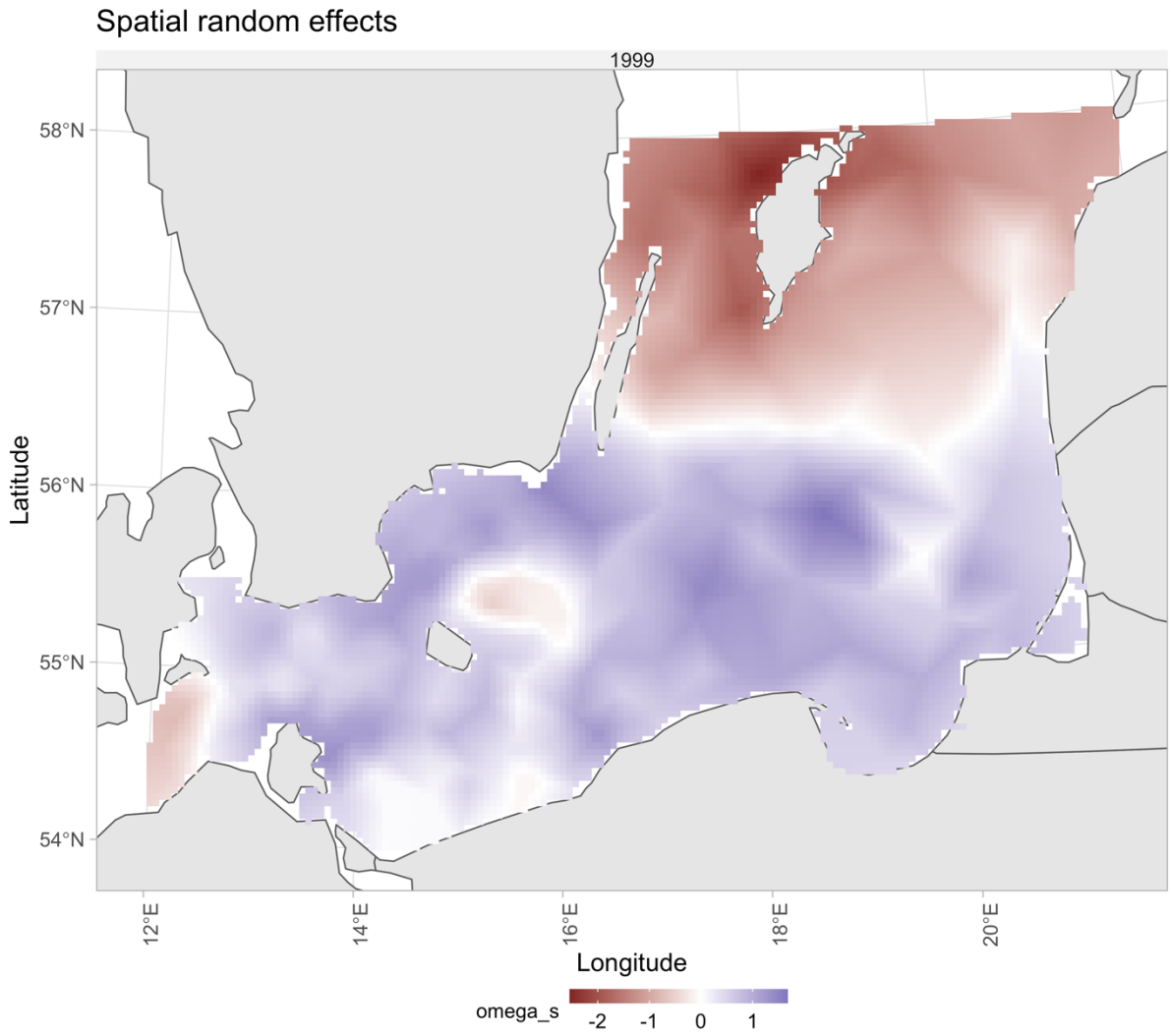

Fig. S16. Spatial random effects for the cod density model.

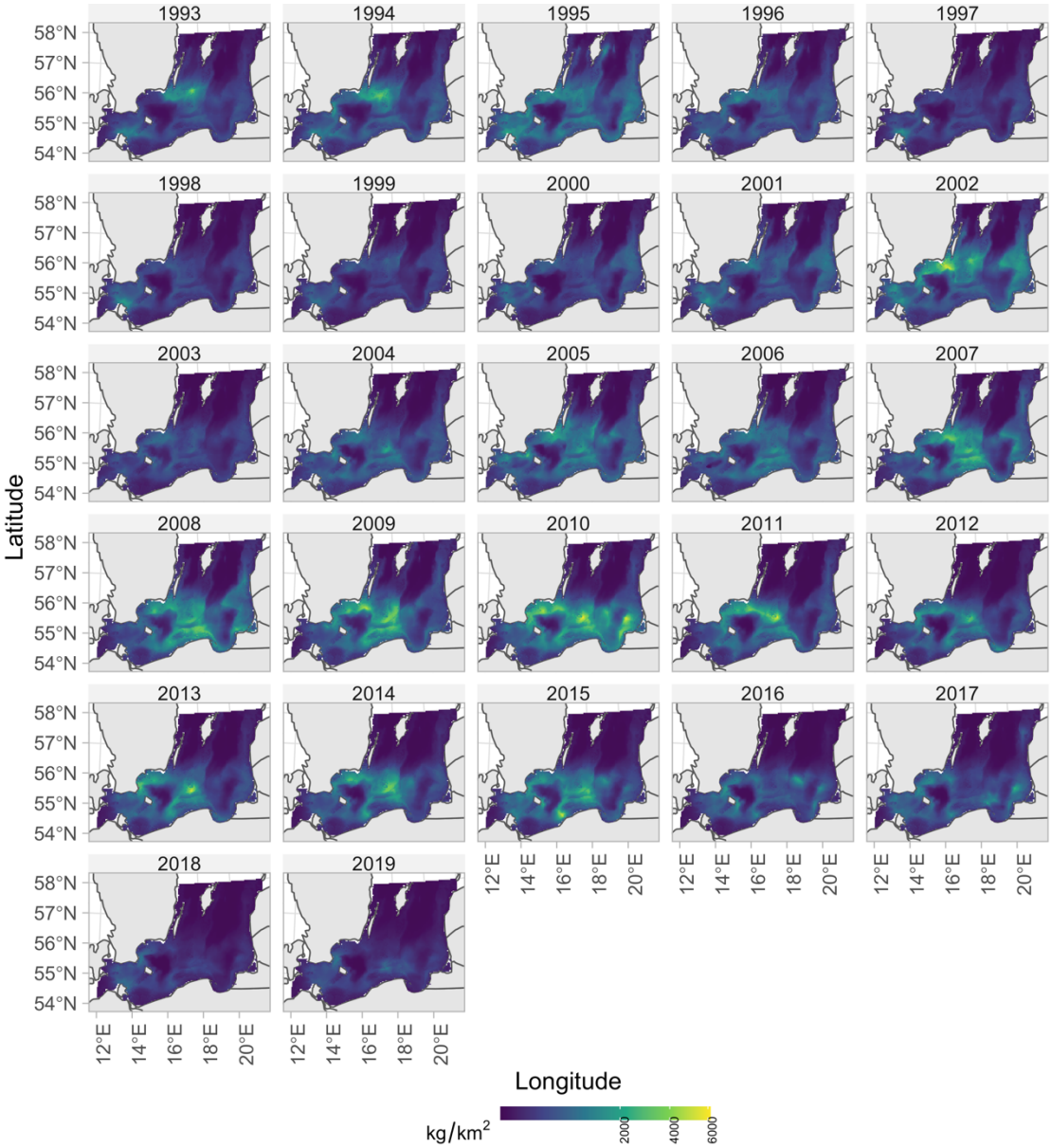

Fig. S17. Predicted cod density in space and time with covariates depth, oxygen and temperature.

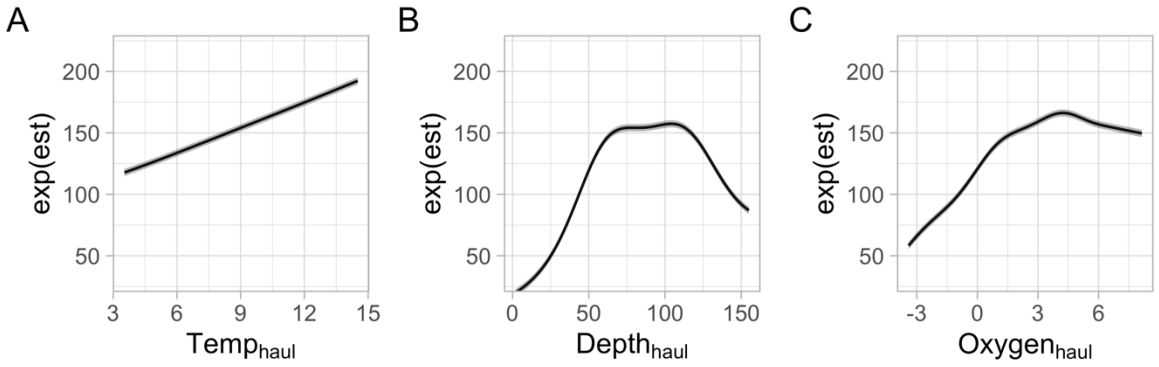

Fig. S18. Marginal effects from the cod density model

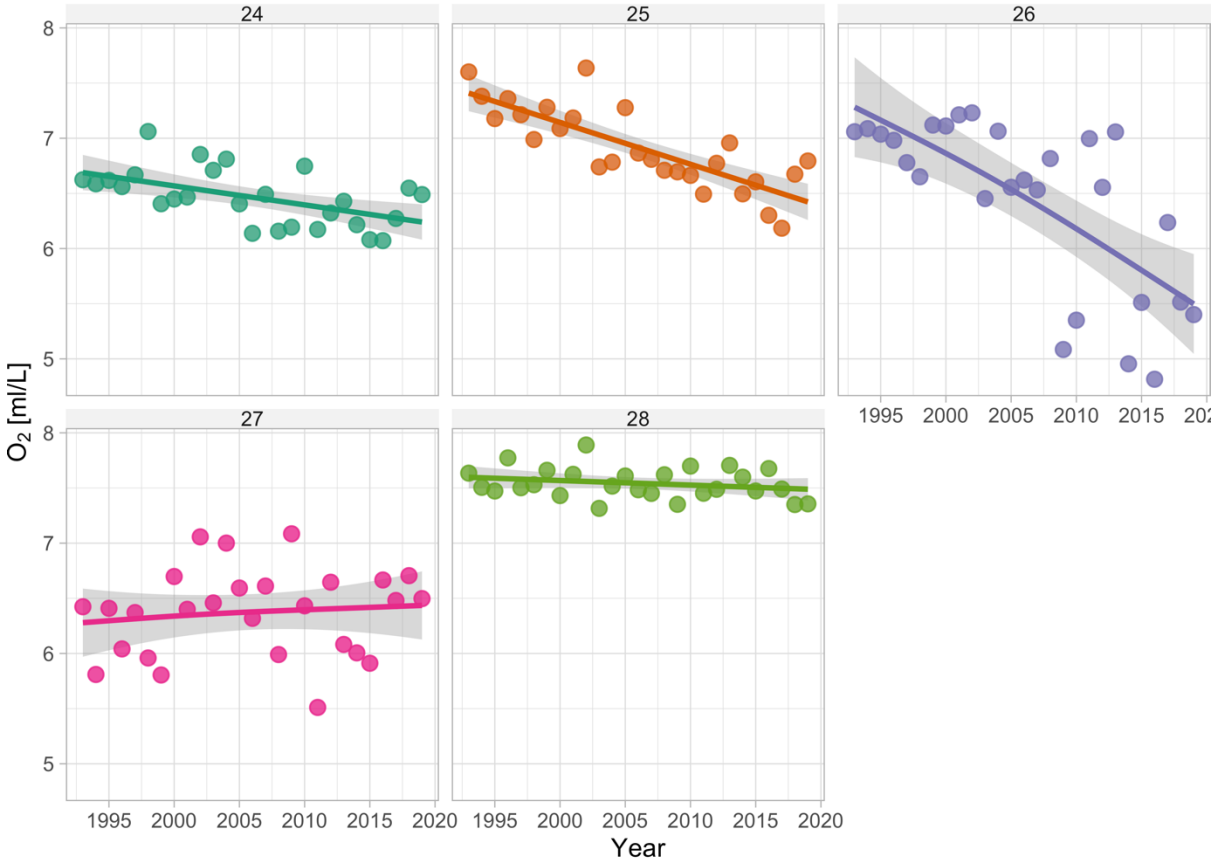

Fig. S19. Density-weighted sea bottom oxygen by sub-division. Lines depict GAM fits (k=4) fits and the shaded area depicts the 95% confidence intervals.

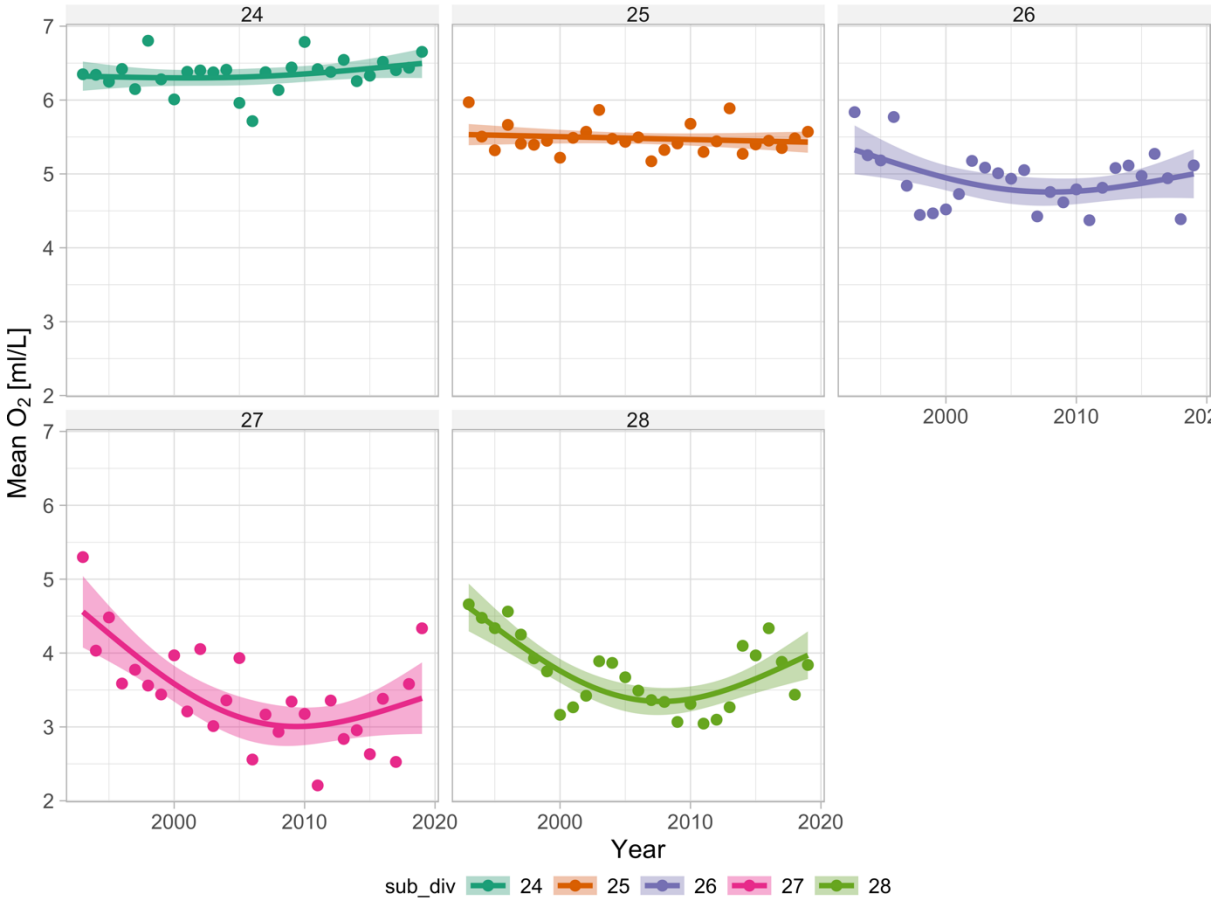

Fig. S20. Sea bottom oxygen concentration in the environment, by sub-division. Lines depict GAM fits (k=4) fits and the shaded area depicts the 95% confidence intervals.

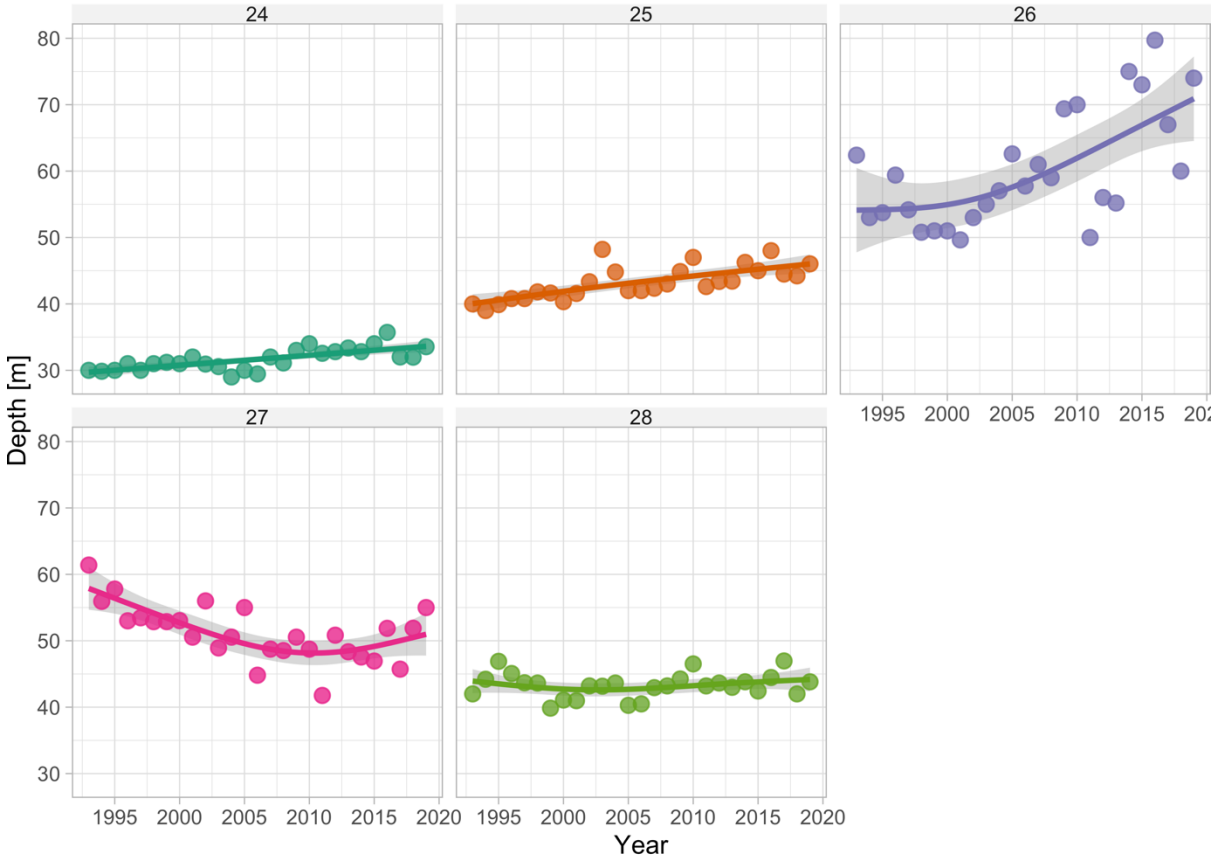

Fig. S21. Density-weighted depth by sub-division. Lines depict GAM fits (k=4) fits and the shaded area depicts the 95% confidence intervals.

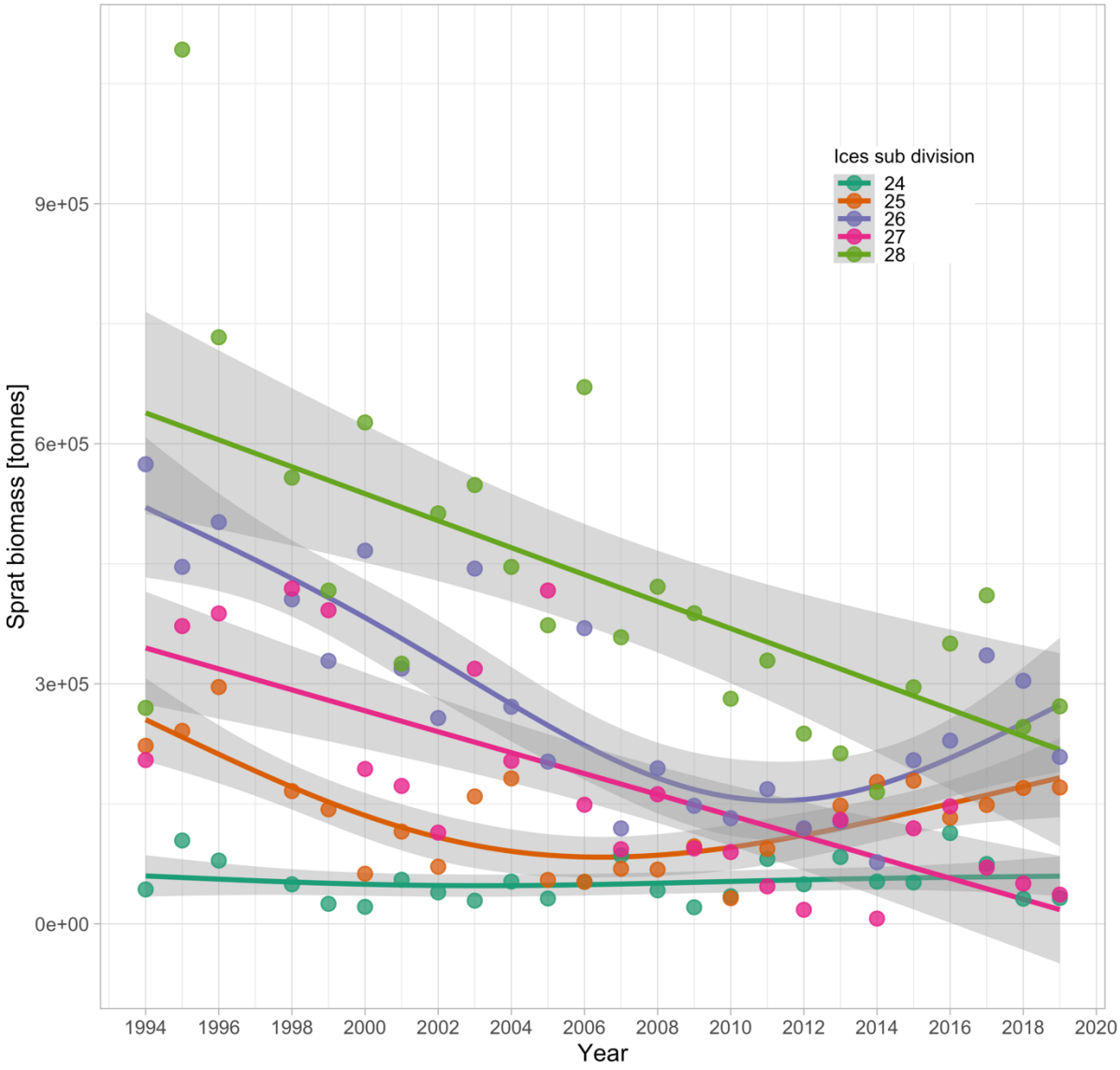

Fig. S22. Biomass of sprat over time by sub-division. Lines depict GAM fits (k=4) fits and the shaded area depicts the 95% confidence intervals.

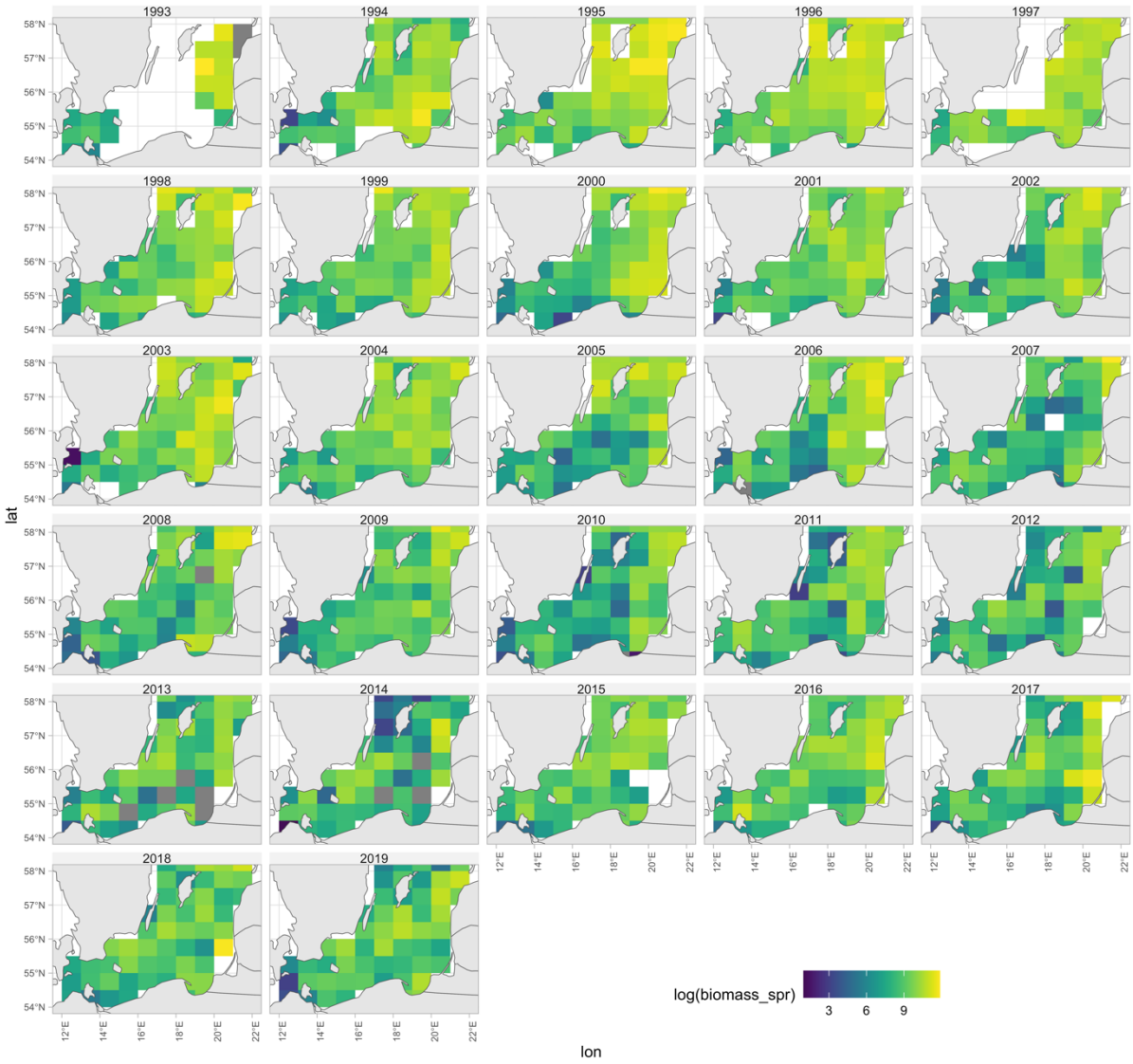

Fig. S23. Rectangle-level sprat log biomass indicating rectangles with missing values.

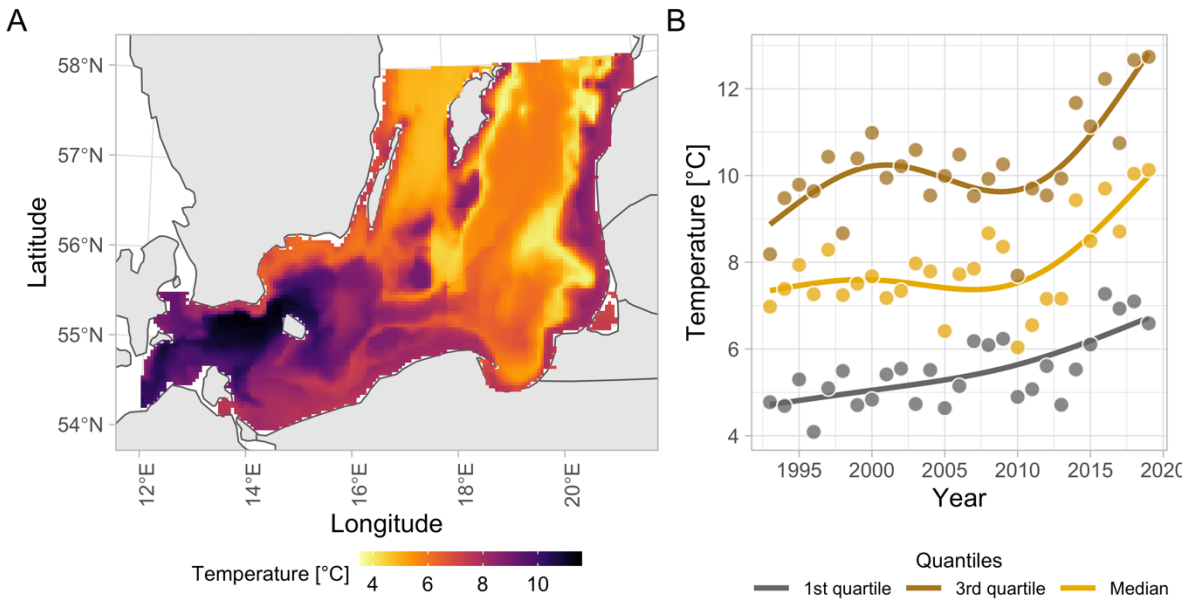

Fig. S24 Sea bottom temperature (exemplified using year 1999) in the study area. Panel (B) temperature weighted by predicted cod density. Colors indicate quantiles (1st quartile, median and 3rd quartile). Lines depict GAM fits (k=4).