*Modeling Approach (Option A: “Data Driven”)*

The modeling workflow was designed to identify significant spatiotemporal break-points in the age-length relationship, and did not consider *a priori* hypotheses of spatial stratification. We employed a Generalized Additive Model (GAM) with smooth functions for location and year using the mgcv package (Wood, 2011) in R (R Development Core Team, 2011). The first derivatives of the GAM were evaluated to identify areas of significant change (i.e., break points) in in growth parameter estimates.

We first estimated the parameters of the VGBF using maximum likelihood in Template Model Builder (Kristensen et al., 2016). This was performed on the entire data set, separately for each sex.

The VBGF is parameterized by *L∞* (asymptotic length), *k* (the rate at which asymptotic length is approached) and *t0* (the estimated age at length zero). The prediction for length at age is subject to an error term ε that is assumed to be lognormally distributed with zero mean and variance σ. Our model estimates values for the three biological parameters at each of six strata for two sexes (fish of “unknown” sex were removed from the analysis beforehand); the error term is assumed universal across strata and sex.

Equation 4

The likelihood standard deviation is an allometric function of mean length, and the additive error term is assumed to be normally distributed with mean zero.

We executed a maximum of 1000 iterations. Initial parameters were t0 = 0, s0 = 0.1, s1 = 1, with L∞ = 70, K = 0.

To identify breakpoints in L∞ and K across the region, a bivariate normal distribution was used to generate 10 000 draws of each of these parameters based on the fits described above. We then fit a GAM with the vector of parameters as the response predicted by a smoother for year and location. selected amongst models that included various autoregressive errors. Selection via a generalized likelihood ratio test (i.e., an ANOVA) is appropriate because the various models are nested. Once the best-fit model was identified, we used the method of finite differences (as in Simpson, 2018) to locate periods and/or locations of statistically significant change in growth. The finite differences approach approximates the first derivative of the spline generated from the GAM function. We then identified years or regions where the confidence interval of the first derivative was outside the 95% quantile of the entire dataset, and designated these as “break points”.

Periods of significant change are those where the confidence interval of this value do not cross zero/where the