

Estimation of time-varying selectivity in fish stock assessments using state-space models

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Abstract: Time-varying selectivity is one of the main challenges in single species age-based assessment models. In classical deterministic VPA-type models the fishing mortality rates are unfiltered representations of the observed catches. As a consequence the selectivity becomes time-varying, but this representation is too fluctuating, because it includes the observation noise. In parametric statistical catch at age models a common assumption is that the selectivity is constant in all years, although time-varying selectivity can be introduced by splitting the data period in blocks with different selectivity, or by using smoothing splines and penalized time-deviances. However, these methods require subjective choices w.r.t. the degree of time-varying allowed. A simple state-space assessment model is presented as an alternative, which among other benefits offers an objective way of estimating time-varying selectivity pattern. The fishing mortality rates are considered (possibly correlated) stochastic processes, and the corresponding process variances are estimated within the model. The model is applied to North Sea cod and it is verified from simulations that time-varying selectivity can be estimated.