

Fitting state-space models to scarce data for seal populations

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Abstract:

Aerial surveys of White Sea harp seal (*pagophilus groenlandicus*) pups during the period 1998-2010 indicate a sudden reduction in pup production after 2003 (ICES 2011). The lack of historical data on fecundity makes the current population model stiff, and unable to capture the dynamics of the pup production estimates. Fecundity rates have been shown to have rapid changes on an annual basis, resulting in significant impact on the population modelling (Sjare and Stenson 2010, Stenson and Wells 2010). A decline in the reproductive status of females may explain the sudden decrease in pup production observed for the White Sea harp seal population after 2003. An age-structured state space model with time dependent fecundity is implemented in AD Model Builder (Fournier et al. 2012). The model is fit to historical catch data and estimates of pup production in order to estimate the current total population size and associated measures of uncertainty.

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