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Bayesian modeling of the dynamics of complex of salmon populations in the North Atlantic

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Life cycle models are appropriate tools to evaluate multiple factors affecting wild animal populations at different life stages and at various spatial and temporal scales. They allow us to unravel the underlying mechanisms and predict the response of populations under plausible future scenarios.

Bayesian state-space modelling is appropriate for embedding complex demographic models within a statistical framework accommodating various sources of data, to derive inferences together with a fair appraisal of the uncertainty around estimates and predictions.

This multiscale approach was used to model Atlantic salmon population dynamics in the northern Atlantic. The model captures the complex meta-population structure stemming from homing behaviour for reproduction in freshwater. The different population components share some common environmental conditions and harvest pressure during their long migration in the sea.

The model was fitted to a 40 years data base of catches and homewater returns available for each country contributing to the population complex. The multiscale approach allows us to explore long term trends and climate influence on key population parameters shared by several population components, such as marine survival, together with time and spatial variability of region-specific life history traits characterizing the freshwater phase of the life cycle.