
Reconciling stock-assessment with MCMC - Optimizing the new ICES WGNAS Atlantic Salmon stock-assessment model.

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Résumé

Atlantic Salmon stocks are widely depleted. Despite conservation measures, most of the population fail to recover. The widespread decline of marine survival rate in the recent decades is of major concern, and the underlying mechanisms are still unknown. A hierarchical bayesian life-cycle model has been developed to improve the workflow and the scientific basis of stock assessment in the ICES Working Group on North Atlantic Salmon. The new model captures the dynamics of 25 large complex of population across the Atlantic basin. It allows for analyzing synchronicity in marine survival and probability of maturation among the different stock units. The new framework makes uses of Bayesian MCMC methods, known to be highly flexible, but at the cost of being computationally intensive and time consuming. Making such a model workable in the context of a working group workflow then requires specific development to optimize computation time and to reach MCMC convergence in a reasonable time. Here we present generic methodological guidelines to achieve better computational efficiency and apply it to this new stock assessment model to achieve a reasonable computational time. Our approach requires several steps: i) spotting models bottlenecks regarding run time and algorithmic efficiency; ii) identifying the origins of MCMC inefficiencies around those nodes; iii) adapting model structure, parameterization and/or MCMC algorithms around those bottlenecks to optimize MCMC. We finally present a model configuration answering practical requirements as well as future model developments.

Mots-Clés: hierarchical Bayesian model, stage, based life cycle model, fisheries stock assessment, spatial synchrony

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