Identifying Nash equilibrium strategies for a multi-fleet multi-national fishery under uncertainty

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Abstract

Designing economic incentives to achieve a desired policy outcome from a fishery could be helped by exploring it within a game-theoretic context. We use Baltic salmon fishery to show how complex interactions between national fleets, offshore and coastal fishermen, and migratory stock dynamics can be analysed with a bio-economic model set up as a game of four asymmetric players. For Baltic salmon there is a stochastic and complex bio-economic model conditioned on a state-space Bayesian stock assessment which captures uncertainty in stock dynamics. We calculate Nash equilibrium under various cost and price scenarios for each combination of a salmon population model parameters, using an MCMC chain obtained from their joint posterior distribution so that the correlations between different life-history parameters are accounted for. We use results of many simulations to explore how natural variability and economic uncertainties affect Nash equilibrium strategies.