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Are data-limited methods sustainable approaches? Management strategy evaluation of data-limited methods with a data-rich stock

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Abstract

Data-limited methods (DLMs) are useful tool to provide scientific advice for the management of fish stocks with limited information. Yet they have not been well evaluated for their effectiveness to achieve sustainable fisheries, since most data-limited stocks could not provide adequate data for comprehensive management strategy evaluation (MSE). In the present study, we developed an MSE framework for a data-rich stock, the Gulf of Maine cod (*Gadus morhua*). The framework and parameterization of the MSE were firstly calibrated and validated using hindcasting and forecasting simulations to mimic the historical trend of the stock. Then we implemented harvest control rules (HCRs) based on five biological reference points (BRPs) derived from data-rich stock assessment and thirty-one simple management procedures (MPs) derived from DLMs. The considered MPs were categorized into five tiers according to the amount of data required for these methods. The performance of DLM-based MPs varied greatly in comparison to BRPs when measured with spawning stock biomass. Generally, performances of MPs based on fishing mortality and survey biomass indices consistently exceeded those of other MPs being remarkably effective in avoiding overfishing. Surprisingly, MPs using more data did not necessarily outperform those using fewer data, indicating gathering more data might not thoroughly ensure sustainable exploitation with DLMs. We suggest that the implementation of DLMs should be carried with cautions when aiming for sustainability. The selection of candidate MPs should also align with the management objectives for different fish stocks.

Keywords:

Data-limited methods, Management Procedure, Management Strategy Evaluation, Sustainability

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