Management Strategy Evaluation for Data-limited Fisheries

Evaluación de las Estrategias de Gestión que Utilizan Datos Pesquera Limitada

Évaluation de la Stratégies de Gestion des Pêches de Données Limitée

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EXTENDED ABSTRACT

Limitations in data quantity and quality affect whether and how strategies for fisheries management are implemented. Challenges in integrating resource monitoring, stock assessment evaluations, and identifying robust management practices for data-limited fisheries have been the subject of two previous special workshops at the annual GCFI conference, culminating in a final workshop during the 2015 Panama City conference. Emerging from this final workshop are examples of the use of simulated management strategy evaluation (MSE) for guiding data-limited management practices. MSE involves comparing trade-offs among achievement of management objectives for different combinations of data collection schemes, and varying levels of scientific analysis and decision protocols. In the final workshop, participants focused extensively on the use of simulation in identifying management strategies that resulted in the best chance of achieving fishery objectives, even where data limitations abound.

Management strategy evaluation involves simulating an entire management *system* (Hertz and Thomas 1983, Butterworth and Punt 1999, Sainsbury et al. 2000). MSE consists of an operating model that describes stock dynamics and a management strategy that describes (i) information collection, (ii) scientific analysis, sometimes including stock assessment, and (iii) harvest control rules (Punt et al. 2014). Because stock dynamics and management strategies are simulated together, MSE emphasizes the collective performance of monitoring, analysis, and decision-making (Sainsbury et al. 2000, Punt et al. 2014). Performance is evaluated in terms of whether management objectives are likely to be achieved. For instance, preference could be given to management strategies that are robust to uncertainties that emerge from data limitations. Alternatively, through exposing where management strategies are not robust, MSE stimulates the necessary thinking to guide improvements to management strategies (Olsen et al. 1999, Walters and Martell 2004, Magnusson and Hilborn 2007, Harford 2014). In data-limited fishery systems, MSE is useful because the effects of data inputs, however imprecise or biased, are propagated through the entire fishery system. Thus, data-limited MSE enables understanding of whether and how management objectives can be achieved in circumstances where managers and stakeholders are expected to cope with data limitations. Conversely, legal or societal expectations about achievement of management objectives can drive exploration of whether current data collection is sufficient or whether additional monitoring and analysis may be required. Thus, MSE can guide data collection design in terms of trade-offs in information gained versus increases in data collection.

In the final special 2015 workshop, participants simulated fishery systems and used MSE to examine data-limited management strategy design. Several lessons were learned through this approach. In one case involving only reliable catch data being available to guide management decisions, breakdowns in management strategy performance occurred when the chosen assessment procedure provided inaccurate information about stock status. In this case, MSE revealed where a breakdown in the system was likely to occur, and guided thinking about whether alternative assessment procedures would be more appropriate or whether re-specification of a control rule was needed that was precautionary against stock status inaccuracy, or both. In a second case involving a spiny lobster fishery with hypothetical characteristics similar to those in the Bahamas, a scenario was examined regarding whether an additional data stream could improve stakeholder economic opportunities relative to the status quo. Upon engaging participants in the design of the management strategy, an issue emerged in that a proposed harvest control rule (and not the additional data stream) could inadvertently reduce fisher opportunities. This discussion exemplified the value of MSE in bringing transparency to policy development, revealing a harvest control rule that seemed appealing in concept but that did not achieve priority management objectives. In practice, instances such as this could serve as a platform for consensus building and could illustrate the importance of examining control rule performance prior to implementation. Finally, MSE was shown to be useful in examining whether management strategies are robust to environmental change, including climate-driven fluctuations in recruitment. In this case, a data stream that tracked recruitment variation was coupled with an in-season adjustment in total allowable catch. This approach produced a strategy that was robust against environmentally-driven recruitment reductions. Consequently, simulating

environmental signals within the operating model enabled determination of whether management strategies could perform sufficiently to achieve management objectives under the cumulative effects of fishing and environmental change. In conclusion, participants of the 2015 special data limited assessment workshop gained an understanding of how the MSE process can aid design of data-limited management strategies through evaluation of the combined effects of monitoring, assessment and decision-making.

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