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RISK ANALYSIS OF A FLATFISH STOCK COMPLEX

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RISK ANALYSIS OF A FLATFISH STOCK COMPLEX

A thesis presented in partial fulfilment of the requirements for the degree of Master of Science in Mathematics at Massey University

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The New Zealand Ministry of Fisheries relies on fishery assessments to determine suitable catch quotas for exploited fisheries. Currently, 628 fish stocks are managed in New Zealand using the Quote Management System, which includes the 8 commercial flatfish species caught within the Exclusive Economic Zone. These eight species of flatfish, which includes four species of flounder, two species of sole, brill and turbot, are currently managed using a combined catch quota. Since these eight species are managed using a common catch quota, there is concern that some of the individual species may be under or over-fished.

This thesis describes work involving the flatfish species caught in the FLA3 management area, around the south island of New Zealand. The FLA3 management area contains three key species: New Zealand sole, lemon sole, and sand flounder. Due to the nature and limitations of the data available, simple biomass dynamic models were applied to these species. The maximum likelihood and Bayesian goodness of fit techniques were used to estimate the model parameters. Three models were used: the Fox model, the Schaefer model and the Pella-Tomlinson model with $m = 3$. As a mathematical/statistical exercise, these models were used to conduct a risk analysis to analyse the advantages and disadvantages of six management options for setting a TACC. However, because of issues over the way that the parameter $K$ has been modelled (due to necessity caused by the lack of data), this should not be seen as an appropriate method for estimating the fish stock. Conclusions were drawn from the results regarding suitable future action for the assessment and management of flatfish stock in FLA3.
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