A comparison study of age- and length-structured yield-per-recruit models

Yield-per-recruit models are often used to provide management guidance for the efficient use of a fish cohort and to estimate the biological reference points, such as F0.1 or FMAX. Although model parameters are usually age-specific, these parameters are thought to be more likely related to length than age. In this study, age- and length-structured models are compared in calculating yield per recruit, F0.1, and FMAX at which the yield per recruit is maximized. Using a Monte Carlo simulation approach, I also compare differences in effects of uncertainties of the model parameters on yield-per-recruit analysis and estimation of F0.1, and FMAX using age- and length-structured models. This study shows that differences are small in estimating yield per recruit, F0.1, and FMAX using two types of models when there are no error variances in the model parameters. However, such differences increase with the uncertainties of the model parameters. The yield-per recruit, F0.1, and FMAX estimated using the age-structured model tend to have smaller values and variations compared with those estimated using the length-structured model. This study indicates that although the length-structured model can better incorporate the information observed from fisheries, age-structured yield-per-recruit model can provide estimates of yield per recruit, F0.1, and FMAX, more precisely and more conservatively, and thus is preferred from the conservation viewpoint in fisheries management.

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Obtenir le document : EDP Sciences
Mots clés : Fishery management, yield, mathematical models, stock assessment, Pêches, rendement, modèles mathématiques, estimation de stocks
Date : 1997-09-15
Format : text/xml
Source : https://doi.org/10.1051/alr:1997030
Langue : Anglais
Télécharger les documents : https://www.alr-journal.org/10.1051/alr:1997030/pdf
Permalien : https://www.documentation.eauetbiodiversite.fr/notice/a-comparison-study-of-age-and-length-structured-yield-per-recruit-models0