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Potential Collapse in Fisheries with Increasing Returns and Stock-dependent Costs

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Abstract *We develop a bioeconomic model to analyze a fishery with fixed costs as well as a within-season continuous cost function for the generalized Schaefer production function with increasing marginal returns to effort level. We analyze the consequences of the combined effects of increasing marginal returns and fixed costs. We find that regardless of the magnitude of the fixed costs, cyclical policies are optimal. We also demonstrate that the danger of potential collapse increases with increasing fixed costs. This result is quite counterintuitive, as higher costs are usually considered to have a conservative effect on resources.*

Key words Bioeconomic modeling, stock collapse, fixed costs, cyclical dynamics, increasing returns.

JEL Classification Codes Q20, Q22, Q57.

Introduction

Most of the literature on fisheries economics assumes that the net revenue function is concave in harvest (decreasing returns) and finds that the solution converges to optimal steady-state equilibrium. After such equilibrium has been established, harvest and stock levels remain constant forever. There are, however, various reasons why increasing marginal returns (non-concavities) may be relevant in fisheries models. Such reasons, for example, may be sharing of information, co-operation between vessels on the fishing grounds, economies of scale in technology, and other forms of coordinating effort (*e.g.*, Platteau and Seki 2001; Carpenter and Seki 2006). In the presence of non-concavities in the net revenue function, the optimal solution may no longer be steady-state equilibrium. Optimal solutions may consist of various types of cyclical policies or pulse fishing

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