

Assessing the biological impacts of groundfish surveys: a metapopulation approach

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Abstract

Adequately monitoring the health of depleted fish stocks is crucial to the development and evaluation of rebuilding strategies, as well as to the prevention of additional stock collapses. It is also critical, however, for monitoring programs to be as minimally invasive to populations as possible so as to avoid compounding the problem of depletion. Unfortunately, the spatially structured and patchy distribution of some depleted stocks may pose challenges to reconciling these competing objectives in the design of broad-scale surveys. To appropriately balance information quality/quantity and biological impact requires a critical evaluation of alternative sampling strategies under a variety of scenarios of depletion and stock structure. I propose to create a series of simulated fish metapopulations using the systems dynamics modeling software STELLA, each characterized by a particular spatial structure, overall abundance, dispersal rate, and suite of demographic parameters. Metapopulations differing incrementally in each of these attributes will be subject to a range of simulated sampling regimes, assessing both the relative statistical performance and comparative biological impact of the alternatives. This work follows increasing awareness of the metapopulation nature of many fish stocks and of the consequent need for attention directed toward the individual subpopulations that comprise a stock. The results will help identify survey programs that have low biological impacts on fish populations, yet are effective for monitoring Gulf of Maine groundfish.

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