

APPENDIX IV

Alternative sampling schemes for life history parameters used in Bayesian stock assessments of bowhead whales.

Abstract presented in the American Fisheries Society 135th Annual Meeting
September 11-15, 2005, Anchorage, Alaska

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Bayesian estimation methods, employing the Sampling Importance Resampling algorithm, are currently used to perform stock assessments of the Bering-Chukchi-Beaufort stock of bowhead whales (*Balaena mysticetus*). The International Whaling Commission recommends catch quotas for a native Alaskan subsistence hunt based on the results of these methods. In recent assessments, age- and sex-structured population models have been fit to available data on abundance and stage-proportions. One assumption of this approach is that juvenile survival is less than adult survival. However, due to the functional relationship of life history parameters in the population dynamics model, placing an explicit prior on juvenile survival would be an instance of Borel's paradox (i.e., effectively placing two priors on one parameter). Instead, juvenile survival is solved for analytically given combinations from the joint prior distribution of the remaining six life history parameters in the model. However, these combinations can result in solutions for juvenile survival that are larger than adult survival. Therefore, new priors must be drawn from some or all of the life history parameters. This study investigates several alternative sampling schemes for obtaining feasible solutions for juvenile survival. The resulting posterior distributions of management related quantities are compared to those from the most recent assessment of this stock of bowhead whales.