Estimating cohort and time varying body mass at age in fisheries data

James Ianelli

Thomas Wilderbuer

Alaska Fisheries Science Center, NOAA

# Abstract

For many fisheries settings empirical estimates of mean body mass at age are quite precise due to sampling design and effort. For example, the uncertainty of estimated mean body mass for the eastern Bering Sea (EBS) walleye pollock (*Gadus chalcogrammus*) for the main fished ages typically has coefficients of variation below 5%.

# Introduction

Modern stock assessment methods that lead to scientific advice on sustainable fishing practices typically revolves around ensuring that fishing mortality rates are at or below values used as reference points. In most management settings, conservation measures are set based on catch biomass limits with some assumption about expected body mass-at-age (hereafter referred to as weight-at-age) to convert from modeled catch numbers (as specified based on the fishing mortality rates). Uncertainty estimates are typically concerned with the absolute values of the population numbers at age estimates and the stock productivity estimates leading to acceptable fishing mortality reference points. While uncertainty from these sources is obviously important for evaluating risks in management settings, the additional uncertainty due to unknown weight at age is typically ignored (Warshneski 2008)

# Methods

The model for predicting mean body weight at age in the fishery is modeled for two purposes, prediction of the current and future year values and their relative uncertainty.

### Model

The



Table .

|  |  |
| --- | --- |
| Symbol |  |
|  |  |
|  | Expected mean weight at age  in year |
| , | Index for year and age |
|  | Mean length age |
|  | Mean growth increment |
|  | Constant to scale lengths |
|  | Cohort and year effects |
| , , and | Parameters of the von Bertalanffy growth |
|  |  |
|  |  |

### Data

Fishery sampling for EBS pollock is extensive with large numbers of age, weight, and length measures sampled from the catch each year (Table )

The framework is set to estimate fishery weight at age

### Parameter estimation