Red Porgy Edge Analysis Memo

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SEDAR60-WP05

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Age estimates for stock assessments are generally provided as “increment count”, “calendar age”, or “fractional age”. Calendar age can be deduced using increment count, the width of the marginal increment (or “edge type”), time of increment formation, and month of capture. Calendar age differs from increment count in that it is generally increased by one (often referred to as “bumping”) in fish that have been alive for the first part of the year before opaque zone formation but have an otolith with a wide translucent margin. Calendar age is generally considered a more appropriate age estimate for use in stock assessments as it reduces uncertainty relative to increment age and assigns the fish into the correct year-class or cohort. Assessment scientists and members of the Assessment Panel well-versed in life history discussed which age to use on a conference call November 13, 2018 and recommended that if possible, calendar age should be used over increment count in the SEDAR 60 Red Porgy assessment.

Increment count has been the age type used for previous Red Porgy SEDAR stock assessments in the Atlantic waters off the Southeastern United States (SEDAR-1 2002; SEDAR-1 2006, SEDAR-1 2012). This was primarily due to lack of edge types for age estimates obtained from reading whole otoliths for fishery-independent collected samples. Due to limited time to age Red Porgy otoliths following a validation study prior to the SEDAR 60 assessment, the opportunity to re-examine (re-age) sectioned otoliths that were initially aged whole was impossible within the provided time-frame. As a result, ~14,000 otolith samples do not have an associated edge type, meaning that a calendar age could not be assigned directly. However, information from sectioned and aged otoliths with assigned edge types may be used to obtain a proxy for assigning edge type to otoliths that have none.

We explored the use of the information of the sectioned otoliths with known increment and edge type to create a proxy method that would allow us to “bump” otoliths with an increment count, but no edge type. Initially, we explored the month of opaque increment deposition in sectioned Red Porgy otoliths by examining the proportion of edge types by month, increment count, latitude, and year from sectioned otoliths. It was determined that the calendar age of fish collected from January – July with otolith edge types of 3 or 4 (indicating a wide margin) were equal to the increment count + 1 (aka bumped age). The calendar age of fish collected during this same period, but with edge types of 1 or 2 (indicating no or a narrow margin) were equal to the increment count. The calendar age of fish from August – December were equal to the increment count, regardless of the edge type.

Using these criteria for determining calendar age and applying them to 13,398 section-aged fish from 2008-2017 (which included edge type information), we analyzed proportions of fish with “bumped” age by factors such as month, increment count, latitude, or year. Multiple linear regression was run on these proportions of bumped ages from fish captured from January – July and it was determined that month and increment count were the only two variables that had a significant effect on that proportion. Fish aged historically with whole otoliths could then be assigned an edge type based on the proportion of fish from the sectioned otoliths with the same month of capture and increment count. Because these fish could be assigned edge types, it would then be possible to create a calendar age for all fish for further analyses. This method could be applied to a training set and cross-validated with a set of samples with known edge type that were not used in the training set to assess the method’s utility.

Given the preference to use calendar age, if available, those on the November 13th call recommend an evaluation of proxy calendar ages for fish with an otolith increment count but no edge type information. These calendar ages, as well as the increment counts for all fish, could be produced to be used in the SEDAR 60 Red Porgy stock assessment.