Re-ageing of archived otoliths from the 1920s to the 1990s

Joan E. Forsberg and Ian J. Stewart
International Pacific Halibut Commission, Seattle, WA

Background

The International Pacific Halibut Commission (IPHC) has collected otoliths for age determination since 1925, and its otolith collection contains samples from over 1.6 million halibut. Age determination techniques used for halibut have changed over time; prior to 1992, all otoliths were surface aged. Between1992 and 2001, otoliths that met certain criteria were also aged by break-and-burn or break-and-bake method in addition to surface aging. Beginning in 2002, all otoliths collected from setline surveys or the commercial catch have been aged by break-and-bake. Observed size-at-age (SAA) of Pacific halibut has changed over time and the reasons behind changes in halibut SAA are not well understood. Prior to this study, the potential contribution of changes in ageing methods to observed SAA was uncertain.

Microscope used by IPHC in the 1960s. New and historic surface ages were compared to see if there were differences that could be due to changes in equipment or protocol.

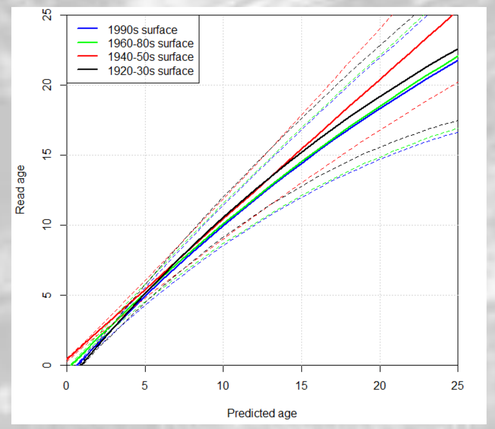
Stored otoliths were transferred from vials to trays with individual cells.

Study goals

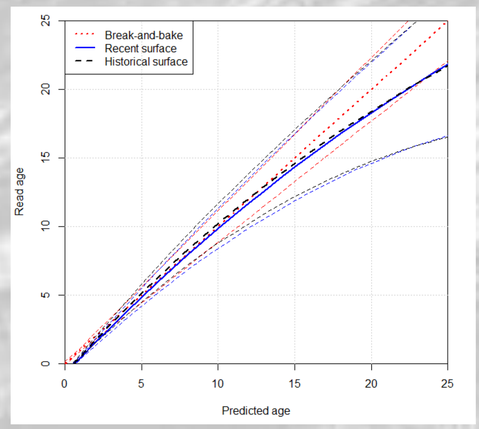
To provide information on the bias and imprecision of historical surface ages relative to age data from the 1990s onward, subsets of otoliths from each decade from the 1920s to the 1980s were re-aged by both the surface and break-and-bake technique, and these new ages were compared to the original surface ages. Additionally, subsamples of otoliths collected in 1992, 1993, and 1998 that were previously only surface-aged were re-aged by break-and-bake. Halibut otoliths have been cleared and stored in glycerin solution since the 1920s. This study also provided an opportunity to observe the condition of otoliths stored up to 88 years in glycerin solution.

Methods

Years for which otoliths had been collected and aged were identified. One or two years per decade were selected based on number of geographical regions (IPHC regulatory areas) and otoliths available. For each selected year within a decade, otoliths were retrieved from storage. Otoliths collected prior to 2002 were stored in groups of ~25 per vial. Otoliths were separated within the vial by numbered paper labels. For the re-ageing project, almost 28,000 otoliths were transferred from vials to containers that have individual cells. The transferred otoliths were further subsampled to 500 from each regulatory area for ageing. A total of 17,414 otoliths were re-aged by three experienced readers and 10% of these otoliths were aged twice for QA/QC.



Comparison of bias (solid lines) and imprecision (dashed lines) estimates for surface ages read during the 1990s, 1960s-1980s, 1940s-1950s, and 1920s-1930s.



Comparison of bias and imprecision for break-and-bake, recent (1998+) and pooled historical (1926-1993) surface ages.

Results

Results indicated that historical samples contained very few fish aged older than 15 years by either method. Based on simultaneous estimation of bias and imprecision for up to four unique ages per otolith, the properties of historical surface ageing methods were found to be very similar to current methods, becoming increasingly biased and imprecise beyond 15 years. Most of the otoliths examined were in good condition; some samples from the 1920s and 1930s had a chalky coating that obscured surface growth patterns, but were readable when broken and baked.

Full text in:
http://www.iphc.int/publications/rara/2014/rara2014_25reagearchive.pdf

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