

Striped Bass Ageing Workshop

MA DMF Annisquam River Laboratory
Gloucester, MA

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Workshop Proceedings

Workshop Participants

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WORKSHOP RECOMMENDATIONS

General recommendations

- A concerted effort should be undertaken to collect scales and otoliths from coded wire tagged (CWT) fishes, the first of which were released in 1983. Agencies should consider steps to identify (wand) all fishes larger than 800 mm from tournaments, dealers, field sampling efforts, etc. These fishes would help to expand the known-age year class data by five years.

Participants noted that striped bass ages older than 10 years remain unverified and the best means to confirm ages from these older fish is to identify and collect as many CWT individuals as possible. An analysis of wild (uncoded) otolith and scale data revealed that the vast majority of these specimens would be over 800 mm at this age. The group noted that capture of the oldest fish corresponding to past hatchery releases (now 20 years old) would be improbable but should be attempted.

- Otoliths and scales should be collected from fishes greater than 800 mm TL (length at ages 10-12, based on backcalculations on the past five years of ODU otolith, and MD and NY scale data). The purpose of this sampling is to correctly identify the number of discreet older year classes in the assessment (presently a plus group of 15 yrs and older) and to continue to analyze the applicability of scales for ageing the older year classes.

Sampling should occur where and when the chances of capturing these large specimens are greatest and where fish are most relevant to the development of regional age-length keys (see bullet below). These venues include those states with trophy fisheries and could include recreational fishing groups (CCA, etc.), freezer collection of racks, taxidermist shops, commercial by-catch, charter fishermen, and tournament sampling. Purchase of larger fishes also is possible. Sacrificing larger fish should be considered as a last resort.

- Agencies should provide precision estimates with their age data, to give assessment scientists some idea of the confidence that readers put on a particular data set. These estimates also should be submitted in state compliance reports.
- The Striped Bass Stock Assessment Subcommittee should provide the numbers of samples required to accurately describe those additional year classes. Workshop participants discussed the possibility of developing regional age-length keys, which could influence the numbers of otoliths required and where fish should be sampled for otoliths.
- Agencies with ageing capabilities should begin to assess their potential for increased workload if age structures from the larger fishes are collected.
- The ability of age readers to accurately interpret age structures improves with experience. Long-term employment of scale and otolith readers should be encouraged.
- Readers should be provided with sample collection month to help interpret ageing structures. However, the structures should be read “blindly” (with regards to year of capture and fish length) to negate possible biases.
- To build growth and age profiles for individual animals while retaining the benefits of tagging, scientific personnel that recover tagged fish should remove several scales from the right (“opposite”)

side of the fish, record pertinent capture information, re-release the fish, and contact the agency that tagged the fish.

- July 1 should be adopted as the last date to see new annuli on scales. Fish caught in the spring are anticipated to deposit an annulus before that date (age assignment issue).
- As recommended by the past two ageing workshops, a reference collection of known age scale impressions and digital photos of known age otolith sections will be compiled. ASMFC staff will curate the collection, to be submitted by agencies that hold known age material (CBL, ODU, MD, NY, and NJ were identified) by March 2004. Agencies wishing to utilize specimens for training or other QA/QC protocols would contact the ASMFC office to obtain a subset of the collection.

Scales

Scale annuli were defined as concentric rings that are continuous around the entire anterior and lateral fields, to the baseline of the scale. Clear identification of "cutting across" should be noted throughout the anterior and lateral fields. The rings have been verified as annular marks by coded wire tag studies.

- Scales have been proven to provide unbiased estimates for fishes up to ages 10-12 and are recommended for ageing striped bass up to approximately 800 mm.
- Evidence suggests that scales underestimate ages for fishes over 800 mm. Scales should continue to be collected for specimens above 800 mm to analyze their applicability for use in older age classes (> age 10). This data should be examined in concert with CWT and otolith age data sets.
- Backcalculations should be accomplished on CWT scale data, to examine the range of fish lengths that show first annulus formation. This will provide a starting point for readers looking at scales to more consistently identify the first annulus and help alleviate the issue of "phantom" annuli.
- Striped bass scale preparation techniques should include pressing scales onto acetate sheets at adequate temperature and pressure to insure high-quality, permanent impressions of the scales, without melting the sheets or pressing an extra ring on the outside margin of the scale that could be interpreted as an annular mark. NYS DEC uses 170° at 20,000 lbs. for 5 minutes. Others use similar combinations of temperature, pressure, and time.

Otoliths

Otolith annuli are concentric rings within the structure, each comprised of a warmer month (transparent) growth band and a winter growth (opaque) band when viewed with transmitted light. Coded wire tagging studies have verified these rings as annular marks.

- Otoliths should be used to age striped bass older than age 10 (TL approximately 800 mm). While some readers are very competent ageing striper scales to age 14, past and recent test data with known age material indicate that scales are more likely to be mis-aged after age 10+.
- There is a known relationship between otolith weight and fish age. Agencies are encouraged to weigh whole otoliths before sectioning, to build regressions as a possible tool for readers.
- Workshop participants recommend that careful preparation of otolith sections is essential to obtain accurate ages from the species. General sectioning and polishing procedures noted in the ODU Laboratory Manual and in the Gulf States Marine Fisheries Ageing Manual should be adopted for

striped bass otolith preparation. Critical to these procedures is the use of a precision low-speed saw (Buehler Isomet or equivalent).

Quality Assurance/Quality Control Issues

- QA/QC protocols outlined by Campana et al. (1995) should be adopted to insure the precision of age readings (paired comparisons between reader ages and known ages and graphical representations of those readings).
- Samplers should obtain multiple scales from each individual for ageing purposes (a dozen if possible). This insures adequate scales to discard those regenerated and allows comparison between scales when ageing.
- Scales collected in the field should be placed in labeled envelopes, banded together tightly to decrease the chances of scales curling when drying. Paper-lined envelopes also could be used to decrease curling.
- Like-sized scales should be processed on the same acetate sheet (larger scales should be processed on a different sheet than smaller scales).
- Press platens should be level checked to ensure even pressure is applied across the entire area of the platen (hence, the acetate sheet).
- Samplers should be encouraged to collect both sagittal otoliths, which should be cleaned and stored dry in vials.

WORKSHOP DELIVERABLES

- **E. Zlokovitz (DONE), V. Vecchio (DONE), and S. Bobko - to provide all documentation generated for, or at the workshop, to staff.**
- **Participants with ageing capabilities are to discuss their potential for possible increased workload if the decision to collect animals > 800 mm is made. Staff will call for that information prior to the next Technical Committee meeting.**
- **J. Moran to send funding opportunities document (compiled for the NEAMAP Board) to D. Miko (DONE). CALL IF ANYONE ELSE WANTS A COPY.**
- **J. Moran will contact Florida personnel to obtain information on their otolith coring device.**
- **S. Bobko, E. Zlokovitz, V. Vecchio, T. Baum, D. Secor, and others with known age scale/otolith samples, are to send copies of annotated (annuli identified) otolith scans and copies of pressed scales to M. Gamble or J. Moran, for addition to the reference collection. To be done by March 2004.**
- **S. Bobko to plot length frequencies of 10/12-year old fish to examine where 800 mm falls, and send the information to staff.**

Meeting Summary

G. Nelson (MA) welcomed participants to the Annisquam River Laboratory at 9:15 AM. He briefed the group on results of the 1981 and 1991 striped bass ageing workshops as a prelude to this effort.

SCALE ISSUES

Prior to the workshop, a set of known-aged striped bass scales (CWT fish from by V. Vecchio) were aged by readers in MA, NJ, DE, VA, MD, and NC. NY personnel were not asked to read the scales, which had been provided by that state. G. Nelson compiled the results of the blind test, as follows:

- General overestimation of year 1 and 2 specimens by one year. Good agreement on scale readings from 3-7 years. Age 8 was underestimated by all readers (possibly a scale quality issue). Ages 9 through 12 (very low sample size was available from these ages) were interpreted reasonably accurately by experienced readers but were underestimated by all other readers.
- Workshop participants believe that age 1 and 2 issues could be mitigated with routine training and instruction using the known age scale set. Issues related to identification of the first annulus still must be identified. V. Vecchio will check issues related to the age 8 samples.

A general discussion of scale ageing issues ensued. V. Vecchio and others noted that their protocols called for examination of multiple scales from the same animal. It is their experience that details near the focus may be visible on one scale, but the detail near the edge may be better visible on another. Often, two or more scales are used to determine the age of a particular specimen. Also noted was that readers need to know the month of collection and length of the fish to use as a tool to help assign age to difficult specimens. However, scales should be read without the benefit of that information.

V. Vecchio presented a slideshow detailing his scale preparation techniques. These include making scale impressions on acetate sheets using a Carver Press (20,000 lbs. at 170°F for 5 min.). Other agencies use similar techniques and the group recommended that striped bass scales should be prepared using pressure, temp, and time values. No exact specifications were determined as several variations are used by different agencies. The only caveats were that scales should not be pressed at a temp that would cause melting of the acetate sheets, or pressed so that the technique left an extra ring outside of the true edge of the scale (could be interpreted as an annulus). Most agencies that age scales have Carver presses. D. Miko (PA) noted they use a roller press, which is adequate but not optimal.

In addition, the group recommended several other quality control protocols for scales, as follows:

- Scales should be stored in scale envelopes and banded together tightly to discourage curling as they dry.
- Like-sized scales should be pressed on the same acetate sheets, to insure good transfer of scale detail to the sheet. Large scales may cause little impression to be made from a smaller scale on the same sheet.
- Press platens should be leveled to insure equal pressure (hence, quality transfer of scale detail) over the length and width of the press.

First Annulus Assignment Issue

E. Zlokovitz displayed a scale from a 150 mm fish that showed exceptional scale growth and what appeared to be an annulus. The group hypothesized that these individuals may have been late-spawned, but the amount of growth on the scale before and after the mark was extraordinary. He noted that this

phenomenon is not uncommon in the Bay and J. Dilday also noted that he had seen similar cases in North Carolina.

Participants did not reach consensus on a method to solve this issue at this workshop. However, the group did note that examination of age-one specimens from the known-age scales would offer a means to determine an average range of growth on scales (and the length of the animals) that could be utilized to help with these problem cases. The group believed that most age-one annulus assignment issues could be remediated with training using known age material.

Scale Interpretation and Species Standards Issues

E. Zlokovitz noted that Maryland readers had scored the highest on the known age fish samples sent prior to the Workshop and that they are very confident in their ability to correctly interpret scales for fishes up to age 12. He noted that scale ageing allows the state to meet tagging obligations, rather than possibly having to sacrifice some larger animals to age via otoliths. He also noted some underestimation of otolith ages after age 12 by his readers. However, the group noted the obvious underestimation of scale ages after age 10 by the majority of agencies.

One issue could be longevity of age readers. All participants agreed that experienced readers were more accurate and faster, and recommended that agencies should take steps necessary to retain those individuals.

OTOLITH ISSUES

S. Bobko presented techniques used by the ODU Laboratory to section and prepare otoliths for reading. Specific nuances included a triple saw blade arrangement that cuts two 0.5mm sections simultaneously. Polishing sections as appropriate to remove saw blade marks also is an important step. Two readers examine each specimen once, with an additional 50 specimens selected at random for a second reading. Disagreement on particular samples is discussed between the two readers in order to reach a consensus age. Those otoliths still problematic are not included in analysis.

He noted several benefits of using otoliths to age striped bass, including that the rings have been verified as annular marks (up to age 15) and that otolith deposition occurs regardless of the physical condition of the fish. The first annulus can be clearly seen throughout the entire otolith section and it takes about ½ of the time to read an otolith section as it does to read a scale. Disagreements on age routinely are a result of annuli crowding on the edge as fish become older, but the rings on otoliths are clearly more visible and distinct than those on scales.

The group noted that obviously, fish must be sacrificed to obtain otoliths and the preparation time is a bit longer than that for scales. However, examination of data showed that readers routinely age otoliths accurately regardless of age and significantly more accurately than scales beyond age 10. S. Bobko had analyzed approximately 1200 wild-caught otolith ages to the lengths of those fishes, to determine at what size striped bass would need to be sampled to obtain a clearer picture of the age classes above age 10. Based on that analysis, greater than 85% of striped bass are age-10 or older at 800 mm. S. Bobko volunteered to plot length frequencies of 10/12-year old fish to examine where the 800 mm length falls, and will send the information to staff.

The group noted that otoliths are more precise between ages and between readers. However, if the stock assessment scientists can deal with bias in the assessment, then scales may be acceptable. The group did note that providing scale and otolith data for the same ages might be problematic, due to different precision parameters.

D. Secor noted the issue of determination of the longevity and associated mortality issues of the species. Technology exists to determine this age (radio bomb carbon), which could also be used to verify otolith ages. However, the technique has some limitations in estuarine fishes. No formal recommendation was made on this issue.

After substantive discussion the group consensus was that scales or otoliths are accurate up to age 10, dependent on the structure used at each agency. Otoliths were recommended as the structure of choice to age fish older than age 10 (or > than 800 mm, based on analysis of ODU and NYS DEC data at the workshop). Scales should continue to be collected from these larger animals, to continue examination of ageing larger fishes with scales.

The Workshop participants also recommended that otolith preparation techniques should follow those outlined in the ODU manual and the Gulf States Marine Fisheries Commission's Ageing Manual. Most crucial is the need to use a low speed saw (Buehler Isomet or equivalent) and to polish sections as appropriate to remove saw blade marks before reading.

Workshop participants were aware of sensitivities related to collection of otoliths and noted several possible no-cost venues to obtain larger specimens without having to sacrifice fish, including trophy fisheries, tournaments, commercial seafood dealers, commercial by-catch, freezers at selected marinas/boat ramps, charter fishermen, and taxidermists. Purchasing fish also was mentioned as a possibility and the group recommended that sacrificing large animals that would otherwise be released as a last resort. It was noted that Florida has developed some type of coring device to remove otoliths through the operculum. J. Moran will contact Florida personnel to obtain more information on this device.

D. Brame noted that several Coastal Conservation Association (CCA) members in each jurisdiction exclusively target these "trophy" fishes and suggested that protocols could be developed to secure these already captured fish from these anglers. The group believed this idea certainly would provide required samples, but some discussion ensued on possible increases in already strained workloads (to process additional samples of age structures). The group recommended that the Technical Committee should consider the CCA offer and the mechanism to physically obtain samples from these fishermen.

The group also noted possible workload issues should collection of larger animals supply hundreds of samples. D. Brame suggested that the individuals he was thinking of could generate a large volume of samples. The age laboratories that have the recommended equipment could possibly handle some additional workload but not being able to process the additional samples would not provide the benefit that is anticipated. Participants were to investigate the possibility of handling additional workload if the recommendation to collect larger animals and CWT fishes is approved. This information should be available for the next Technical Committee meeting.

STOCK ASSESSMENT ISSUES

Participants discussed the present assessment strategies and the amount of samples that may be required to extend the number of year classes included in the striped bass assessment. Presently there is a 15+ group, which could be delineated with the addition of ages of CWT and other larger fishes. A. Sharov noted that ageing bias is a key concern, but that precision is also important. It is possible that additional data from the older fishes may change the assessment picture for those older animals. He noted that MD and MA landings contribute significantly to the catch-at-age matrix. If ageing problems were significant in these two states, the effect on the assessment would be significant. Fortunately, personnel from these agencies are very accurate up to age 12, so the population age structure currently in the assessment for ages up to 12 likely is very good.

The group noted that assessment scientists should have some idea of the confidence that readers put on a particular data set and recommended that where possible, agencies should provide precision estimates with their age data.

As far as numbers of samples that would be required to assess the age structure, A. Sharov noted that 6-7 age groups are included in each inch interval over 800 mm (approx 31"). Numbers in each interval should be determined as a percentage of those intervals in the catch, a procedure similar to what the MRFSS uses to determine sample sizes. Some discussion ensued about the possibility of lumping these older classes to 2 or 3-year intervals, to decrease the number of samples required, but no consensus was reached.

If a coastwide key is appropriate (Jan-Jun and Aug-Dec periods), perhaps only a few hundred fishes would be required. A larger sample size would be required if geographic keys are necessary (North and South).

Quality Assurance/Quality Control Issues

Workshop participants noted that recommendations to establish a reference library of known age scales and otoliths had been made in 1981 and 1991, with no action taken to date. The collection would be invaluable for use in training and to examine possible "drift" in age determination over time (agers could review technique by ageing a sample of known age structures on an annual basis). Age structure exchange protocols also should be determined.

The group noted that scale impressions could be done and sent to the repository. It would be best also to have annotated images (annuli marked with dots or arrows) as well, for training purposes. Otolith sections, however, probably should not be sent, since if there were lost, the record for that specimen would be lost. Therefore, the group recommended that digital images (annotated) would be satisfactory for otoliths.

Updates to certain information would be required by all agencies on an annual basis, such as number of CWT or known age structures collected, number of paired structures collected (scale and oto from same specimen), and a contact person. G. Nelson agreed to compile this information and post it to the MA webpage.

Scale impressions and digital images of otoliths will be sent to Commission Staff to hold at the Commission office. The materials will be contributed by those agencies that have known age samples of scales and otoliths. Currently, this material is held by MD, NJ, ODU, VCU (M. King), NY, and CBL). The participants believed the images could be generated and remitted by March 2004. When requested, staff will pull a random sample of material and send to the requestor. Staff also will take charge of making sure materials are returned to the collection in a timely manner. Agencies will send updated material annually, to guard against readers memorizing particular scales or otoliths.

The group discussed routine QA/QC measures to insure the precision of age readings. Age data can be subjected to statistical tests, but these are not as robust as paired comparisons (between reader ages and known ages) and graphical representations of those readings. Workshop participants recommended that protocols outlined by Campana et al. (1995) should be adopted.

The agenda accomplished, the group thanked G. Nelson for his analysis of the known age scale information before the meeting, logistical items related to the meeting, and securing the Annisquam Laboratory for the meeting. With no additional business, the Workshop ended at 12:45 PM, 03/19/03.