

Committee of Age Reading Experts

2024 Committee Report

Prepared for the Sixty-fourth Annual Meeting of the
Technical Subcommittee of the Canada-USA Groundfish Committee

April 2– 4, 2024



Prepared by
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2024 CARE Conference attendees on top of the Gladys Valley Marine Studies Building, Newport, OR. Photo by Camille Ayrea (ODFW).

A. CARE Overview

1. History

The Committee of Age Reading Experts (CARE) is a subcommittee of the Canada-USA Groundfish Committee's Technical Subcommittee (TSC) charged with the task to develop and apply standardized age determination criteria and techniques and operate within the Terms of Reference, approved by the TSC in 1986, and the CARE Charter, developed in 2000 and approved by the CARE in 2004.

2. Report Period

This report covers the work period of April 8, 2023 – April 5, 2024. To promote timely reporting of work and recommendations occurring during the recent CARE conference, an Executive Summary of the 23rd CARE conference held April 2-4, 2024 is included here as part of the TSC report. Current officers through June 30, 2024 are:

- Chair – Patrick McDonald (PSMFC/NWFSC-Newport)
- Vice-Chair – Mark Terwilliger (ODFW-Newport)
- Secretary – Nikki Paige (PSMFC/NWFSC-Newport)

The Secretary will prepare a draft of the minutes from the recent CARE meeting to be distributed to CARE members for review and subsequent approval prior to June 30, 2024 and posted on the CARE website. Due to the proximity of the TSC meeting following the CARE meeting, it is necessary for the Chair to prepare the report to TSC to include proceedings of the recent meeting as an executive summary.

3. CARE Conference - Executive Summary

CARE typically meets biennially for a conference that usually lasts three days. This meeting typically is evenly split between “business” and hands-on calibrations at microscopes to review and standardize age reading criteria. Occasionally extra time is scheduled for a specific focus group or workshop. These specific groups meet during the hands-on calibration portion of the meetings. During the April 2023 meeting, the CARE membership voted to move the meetings back to ‘even’ years to stagger our meeting with the Western Groundfish Conference. This staggering reduces the burden on agency travel budgets. The CARE membership also voted to have a meeting 1 year following the 2023 meeting rather than go 3 years to 2026.

a. Overview

The most recent biennial CARE Conference (with virtual option) was held in Newport, OR, April 2-4, 2024, at the Marilyn Potts Guin Library of Marine Science, Hatfield Marine Science Center (HMSC), and co-hosted by ODFW and NWFSC-PSMFC staff (Appendix I). The conference was attended in-person by 30 CARE members and nonmembers from seven agencies. An additional 17 CARE members and nonmembers attended virtually (Table 1). During the meeting there was a consensus to not hold calibration sessions for either quillback or China rockfish due to the lack of active participants.

As noted above, CARE had voted to move the biennial conference to occur on even years starting with this 2024 meeting (See section 6 subheading f, 2023 CARE to TSC report). With Western Groundfish Conference moving back to even years, the CARE membership voted to move the next meeting back to odd years. The next CARE meeting will be held in Nanaimo, B.C. in 2027. The specific dates will be finalized sometime after July 31st, 2026 (See CARE to TSC recommendations section 6, this report). The following officers were elected at the April 2024 meeting and will take office July 1, 2024:

- Chair – Mark Terwilliger (ODFW-Newport, OR)
- Vice-Chair – Chelsea Cooke (CDFO-Nanaimo, B.C.)
- Secretary – Nikki Paige (PSMFC/NWFSC-Newport, OR)

b. Agency Reports

AFSC (Derek Chamberlin), CDFO-Nanaimo (Audrey Ty), IPHC (Joan Forsberg), ADFG-Juneau ADU (Kevin McNeel), ADFG-Homer-Sport (Marian Ford), ADFG-Kodiak (Jessica Horn), NWFSC-PSMFC (Patrick McDonald/Emily Wallingford), WDFW (Andrew Claiborne), ODFW (Mark Terwilliger), Brittany Schwartzkopf (SWFSC-La Jolla) and Melissa Monk (SWFSC-Santa Cruz) provided reports summarizing and updating agency activities, staffing, organization, new species, and projects. Tracey Loewen (CDFO-Winnipeg) provided a brief overview of the work her lab does before her scientific presentation. There was no update given at CARE from ADFG-Homer-Commercial Fisheries or CDFO. Details from the

agency reports will be available in the finalized CARE minutes and posted to the CARE website by year's end.

c. Scientific Presentations

Seven oral presentations were presented in PowerPoint format during the CARE meeting.

- Kali Stone (AFSC) – Use of otoliths to gain insight into overwinter survival strategies of juvenile Arctic Cod (*Boreogadus saida*) in a warming arctic.
- Leif Rasmuson (ODFW) – Finding Oregon's old female rockfish.
- Tracey Loewen (CDFO-Winnipeg) – Age estimations of Greenland halibut: technique development and future directions [Remote Presentation]
- Will Patterson (UFL) – Eye lens-based age validation and epigenetic ageing of deepwater fishes [Remote Presentation]
- Evan Howard (UW CICOES) – Otoliths record hypoxia tolerance from individuals to global scales [Remote Presentation]
- Kevin McNeel (ADFG-Juneau) – Assessing species identification, age and life history information for shortraker rockfish (*Sebastes borealis*) in Prince William Sound, Alaska, using otolith analysis.
- Derek Chamberlin (AFSC) – Ageing error; where does uncertainty in model predicted ages propagate?

4. CARE Subcommittee (Working Group) Reports - Executive Summary

There were 6 active working groups that gave reports and updates at the 2024 CARE conference that summarized activities since the last in person meeting in 2023.

a. TSC Meeting 2023

Andrew Claiborne (WDFW) reported to the TSC in Nanaimo, BC on the 2023 CARE meeting and reviewed progress on the TSC recommendations to CARE. Andrew reported that a new chair Patrick McDonald (PSMFC/NWFSC) and vice-chair Mark Terwilliger (ODFW) of CARE were voted in at the 2023 meeting, which occurred in April 2023, immediately prior to the TSC meeting. Andrew informed TSC that the CARE meeting is now to be moved to even years, with the next meeting being in Newport in 2024. Andrew indicated that the 2023 CARE meeting included a concurrent workshop hosted by AFSC on FT-NIRS. CARE is composed of multiple working groups that provide reports to the TSC, and Andrew presented highlights of those reports to the TSC. For example, the manual working group is updating the CARE ageing manual including sections for sablefish and skates, with some updates to lingcod and other rockfish. At the 2023 CARE meeting the sablefish working group examined multiple images of young fish samples to compare classification of edge types among labs. A video tutorial of sablefish growth types was developed prior to CARE and shown. The lingcod working group met and is continuing to work towards using common criteria across regions and is exploring otoliths instead of fin-rays for aging lingcod, as fin rays are very time consuming to prepare. The black rockfish working group completed an exchange of otoliths between 4 regions (50 from each region, AK, WA, OR, CA) and TSC was updated on the results. TSC was also updated on the new age validation work with black rockfish completed by ODFW.

b. Structure Exchanges

There were 5 exchanges initiated in 2023 (Table 2). This is a large decrease from 14 exchanges initiated in 2022. The 2023 exchanges consisted of 5 rougheye/blackspotted exchanges. A new

exchange form was used for the first time after being voted on by CARE members during the 2023 meeting.

c. CARE Website and Forum

The website continues to be updated and refined by John Short (AFSC), Jamie Hale (PSMFC/NWFSC), Nikki Paige (PSMFC/NWFSC) and Andrew Chin (AFSC). There was one formal recommendation for the website committee to address (see section 6, subsection b) and several informal discussions regarding increasing user-friendliness of the website. Production numbers will be updated by June 30th, 2024. The exchange results as reported here will be available when all the structures have been aged by each participating agency. The CARE charter is also now available on the website.

d. CARE Manual

The CARE Manual group has been very active in the past year. The process going forward will be to adopt a section-by-section approach for reviewing and adding to the manual. The process will be streamlined and is meant to facilitate additions in a timelier manner. There are a total of 14 sections that need reviewing and adding with assigned personnel for most sections from the multiple agencies. Three sections are complete and include a Manual Cover update, QA/QC and Otolith Storage methods. It was noted that the CARE Manual is an invaluable tool for training new personnel and graduate students. Seven personnel are now active in this working group that represents 5 agencies (For full details see section 8, subsection a).

e. CARE Charter

The CARE Charter group did not have any updates. Elisa Russ (ADFG-Homer) was the lead, but she has since retired. Kevin McNeel (ADFG-Juneau) volunteered to be involved with Jamie Hale (PSMFC/NWFSC) from the website committee. There was discussion whether the Charter could be refreshed and edited for clarity. This led to the discussion being tabled to Thursday and ultimately a formal recommendation was made to direct further action.

f. Lingcod Working Group

Mark Terwilliger gave the membership a presentation of the work that has been done over the past year. Statistical measures comparing fin ray and otolith age estimates were made from NWFSC, ODFW and WDFW structures. Age estimates from ADFG and CDFO were not provided at the time of the meeting. The results indicated a low agreement between otoliths and fin rays with a range of 30-50% agreement overall. Generally, for fish over 8yrs old the fin rays yielded a younger age estimate.

5. TSC and CARE Recommendations

a. 2023 TSC to CARE Recommendations

1. The TSC requests that CARE consider methods to advance communication between CARE and the TSC, particularly mechanisms to be able to respond more quickly to emerging issues. The use of virtual platforms might be a potential mechanism, in addition to the forum on the CARE website. The TSC continues to recommend that a TSC representative attend the biennial CARE meeting.
 - i. The TSC suggests that the CARE and TSC leadership connect periodically (1-2 times per year, as appropriate) between meetings.
2. The TSC recognizes the significant progress made on these recommendations by

CARE (reference the 2022 TSC to CARE #1 and #2 recommendations). We thank CARE for their efforts and look forward to hearing about further results at future meetings.

- i. Note the lingcod comparison work at CARE demonstrates a collaboration across agencies, as well as a relationship between CARE and TSC.
- ii. The TSC recommends the formal publication of the results of the lingcod aging comparison.
- iii. The TSC appreciates the substantial progress of AFSC on the creation of the aging video library and recommends more participation from other CARE member agencies. The TSC encourages further exploration of publishing the videos on the CARE website.

b. Progress on 2023 TSC to CARE Recommendations

1. Lara Erikson and Ali Whitman met with both the Chair and Vice Chair of CARE via Google Meets on October 25th, 2023. The TSC Chair was formally invited to attend the 2024 CARE meeting, but an existing conflict precluded their attendance.
2. Work on the lingcod ageing structure comparison is ongoing; future work will involve structure exchanges and calibrations as well as obtaining grant funds to perform validation, simulation, and single-reader age estimates (For full details see section 6, subsection c).

The AFSC has completed several video tutorials including one for Pacific Ocean perch, rougheye/blackspotted rockfish, and a structure preparation for Pacific cod and walleye pollock. This adds to the AFSC list of previously reported tutorials, and they now have 9 documents. The NWFSC has created a tutorial on petrale sole. The NWFSC has also created in-house ageing documents for black and quillback rockfish. ODFW and NWFSC are independently working on a lingcod fin preparation video. These tutorials are in existence within their respective agencies, and they are not available online. The membership discussed how best to address publishing the tutorial content on the CARE website. A formal recommendation was made during this meeting (see section 6, subsection g).

6. CARE to CARE Recommendations 2024

a. CARE Manual Working Group

- CARE Manual Working Group will work to update the current edition of the manual and incorporate the completed sections and add changes to reviewed sections by the next CARE. The details will be in 2024 CARE to TSC working group report (approved unanimously). See Section 8, Subsection a, of this report.

b. CARE Website Working Group

- The website committee will post a protocol on the CARE website for members to submit agency updates and contact information (approved unanimously).

c. Lingcod Working Group

- The Lingcod Working Group will initiate a CARE exchange of easy and difficult unpaired structures for training purposes among participating ageing labs, followed by

N=50 paired structures in a subsequent exchange among participating agencies to determine ageing lab bias. Grant funds will need to be acquired for a graduate student to perform validation, simulation, and generate single reader ages for publication purposes (approved unanimously).

d. Sablefish Working Group

- The Sablefish Working Group will provide to the website committee a summary document to go into a working group tab that outlines the accomplishments of the sablefish working group efforts since its formation. This will include a summary of exchanges, known-age images and juvenile otolith measurement data. This will be a living document (approved unanimously).

e. CARE Charter Group

- CARE recommends the Charter Working Group review and submit to the Chair, modifications to the charter for distribution to the membership for approval by the next CARE meeting (approved unanimously).
- CARE meetings are to move to odd years again to alternate with the 2026 Western Groundfish Conference, with the next meeting to be held in 2027 (approved unanimously).

f. Otometrics Working Group

- The Otometrics Working Group recommends that CARE reports current practices for the collection and use of otolith measurements. Records should include equipment and the types of measurements, the time required to collect data, data storage, and its use in QA/QC procedures. A document describing these practices should be completed by the 2027 CARE meeting (approved unanimously).

g. General Recommendations

- CARE recommends the next meeting in 2027 be held in Nanaimo, B.C. (approved unanimously)
- CARE member agencies will submit a list of available age tutorials to the website committee to post on the CARE website. Agencies will continue explore putting the full tutorials online in the future (approved unanimously).

7. CARE to TSC Recommendation 2024

- a. CARE Recommends PSFMC fund some or all travel of age lab leads to the biennial CARE meetings (approved unanimously).
- b. CARE Recommends that lingcod age comparison and validation be added to federal research priorities to facilitate current and future age research (approve unanimously).

8. 2024 CARE Conference Hands on and Working Group Minutes - Executive Summary

There were 5 working groups who met during the CARE conference (manual, rougheye/blackspotted rockfish, sablefish, lingcod, otolith morphometrics). There were 2 species specific microscope/calibration sessions on Pacific cod and Pacific spiny dogfish. There was also an O¹⁸ breakout session/discussion. Below is an executive summary of each.

a. Manual Working Group

- **When:** Wednesday April 3, 2024
- **Attendees:** Kevin McNeel (ADFG), Barb Campbell (CDFO), Leif Rasmuson (ODFW), Jamie Hale (PSMFC/NWFSC), Andrew Claiborne (WDFW), Julie Pearce (AFSC)
- **Goals:** 6 goals agreed upon by the working group.
- Adopt a section-by-section approach for reviewing and adding to the manual.
- Revamp/clean-up of general ageing procedures and incorporate new sections.
- Update images
- Remove redundant processing notes
- Create a template using DFO sablefish section for new chapters for ageing methods for particular species.
- Include credit for authorship/date of sections
 - Sections that need reviewing/adding
 - Lingcod Otoliths -in review Andrew Claiborne
 - Sablefish – Complete, to review
 - Thin sectioning – current methods reviewed by Kali Stone
 - Break and bake – current methods reviewed by Kali Stone
 - Halibut – Complete, to review
 - Skate – Complete, to review
 - Ergonomics – In press – Julie Pearce?
 - Age Validation – existing chapter needs year reference
 - Walleye Pollock – in press, Kali Stone
 - Spiny Dogfish – Recover Document from Cindy Tribuzio – Prioritize Reviewed by Nikki Paige and Tyler Johnson
 - Black Rockfish – Liz Ortiz and Jamie Hale in press
 - Quillback Rockfish – Jamie Hale to be reviewed
 - Otolith Storage Method – done, to be added
 - History Synopsis – Leif Rasmuson

b. Rougheye/Blackspotted Rockfish Working Group

- **When:** Wednesday April 3, 2024 10:30am- 1:30pm
- **Attendees:** Emily Wallingford (PSMFC/NWFSC), Liz Ortiz (PSMFC/NWFSC), Tyler Johnson (PSMFC/NWFSC), Jessica Mai (CDFO), Chris Gburski (AFSC), Mark Terwilliger (ODFW), Mark Plumb (ADFG-Juneau), Josh Dore (ADFG-Juneau) - Virtual
- Summary
 - Subject Discussed: Otolith Storage
 - AFSC’s Glycerin-Thymol storage allows for clearing of the otolith which enables their lab to surface age specimens 10-years-old or younger without breaking and baking. Follow up questions included whether this storage method would affect chemical analysis later on. In regard to FT-NIRS, it was concluded that it would be fine as long as the storage method stayed consistent.
 - Subject Discussed: Pattern Interpretation

- Most of the labs seems to agree that following the light-dark margin on the cross section is a good strategy until about mid-twenties. At that point, following the more constricted growth somewhere in the middle region between the sulcus and wing tip seemed generally favored rather than continuing along that light-dark boundary. Tipping the otolith in a way that shows the annulus coming into the cross section from the distal surface also seemed to be a favorable technique for younger years, although not always possible depending on the sample. Differentiating between actual annuli and split annuli was also discussed – following the annulus from all the way to the sulcus and/or to the distal surface looking for convergence as well as looking for distinct and consistent light-dark banding seemed to be the agreed upon solution. One subject we talked about without coming to a definitive solution was the micro/macro patterns often seen in which several years will be darker with following several lighter years – this results in different interpretations depending on the magnification. Josh Dore inferred it could be from environmental factors, and Mark Plumb further suggested perhaps it correlates to El Nino/La Nina events.
- Subject Discussed: Methodology
 - Both edge type codes and readability codes were both touched on. AFSC’s lab and NWFSC’s lab use edge codes on a 0-5 scale, while ADFG’s lab ultimately does not quantify edge type, but rather incorporates that into their final age estimate. Readability codes on a scale 1-3 are used by ODFW, AFSC and NWFSC, while ADFG uses a scale of 1-5. Some people sand/polish samples when needed, but it was noted that this can introduce lines or “wash-out” the pattern. AFSC and NWFSC bakes their REYE/BLSP otoliths between 10 - 40 min depending on the person, while ADFG burns their otoliths. 10x or 16x eyepieces are used depending on personal preference. NWFSC seemed to be the only lab using an IsoMet low-speed saw to cut their otoliths while other labs broke theirs with nail clippers or large nippers.
- Subject Discussed: Morphometrics
 - The measurements of the first three years were discussed. It was agreed that the first year is highly variable, ranging from 1.0mm - 2.0mm, but more often closer to 1.0mm. Most participants thought the third year as more defined and easier to measure than the first and second. Although this third year more often than not is around 3.0mm, Josh Dore shared a beautifully clear image with the 4th annulus measuring at 3.0mm, reinforcing the idea that the measurement criteria of 1st year @ 1.0mm, 2nd year @ 2.0mm, and 3rd year @ 3.0mm is a soft guideline. It was also hypothesized that perhaps the first year’s annulus in this example was actually a strong nucleus check.

c. Sablefish Working Group

- **When:** Wednesday April 3, 2024 10:00am-noon; 1:30pm-3pm
- **Attendees:** John Brogan (AFSC), Patrick McDonald (PSMFC/NWFSC), Jamie Hale (PSMFC/NWFSC), Denise Parker (PSMFC/NWFSC), Audrey Ty (CDFO), Barb Campbell (CDFO), Julie Pearch (AFSC), Derek Chamberlin (AFSC), Andrew Chin (AFSC), Jessica Mai (CDFO), Chelsea Cooke (CDFO)

- **Summary**

Looked at many specimens projected on large monitor. Looked at known-age and annotated how each agency would identify juvenile years and checks. The participants referred to juvenile years as 'beaks' and how generally they have a large and checky pattern. The second year can often have a check or 'trailer' associated with it. We discussed as a group bringing a formal recommendation to the full membership to write up a document on the work of the Sablefish Working Group and have it as a document on the CARE website. Specimens examined are below along with some discussion for each;

- 1) Beaks ages 1 and 2 large take up more space, 2 doubling but might end up calling it 2, 3. Really strong trailer. Counting edge. Known 5 year old. And strong checks. Question on following top or bottom prominent band marking.
- 2) Known age ID Sable 3, specimen 2847. Catch date 6/2- count edge, edge type 5, or 4 plus. Annulus starting to form. Banding wide, comparing with $\frac{3}{4}$ view you can follow 1, 2 and 3, Even though 2 has wide banding pattern.
- 3) Sample 3090 - Surface 1, 2 wide, 3 start growing a bit slower, change at 6, can see trailer and check off of 2, Does 4 merge with 3, maybe merges, but looks distinct, 2 wide, 2 faint, 4 at lip?? or put 3 at lip. Follow groove to 3 - puts 3 on lip. Strong check and beak on 2. \$, 5, change at 6. So see that in the cross section. Which access looks the best, but usually after 4 will have moved away from the wing tip. Counted 18 together. John, Delsa counting "beak" as age 3. 18, 19 Delsa, 18, Barb. Julie 19. Expecting a lot of checks in the 1st 3 yrs, and very prominent, Barb - if follow check will go off surface for 1st 3 yrs. Known age is 19. Heel bubble starts to fan out, faint so it is difficult to count. Or count the "check/beak" as 3. Catch date. Didn't catch the date.
- 4) Sample 3113 - messy, looks young, strong false year, sulcus only shows 2 strong bands. Known age is 3. Catch date: Mar , Edge type 3, very small growth, Very checky.
- 5) Sample 3138 - Catch date: Nov, only 1 band on sulcus, edge checky, Might call it a 2 if you count check. Checky. Look at length sometimes to confirm age. Full year growth, annulus starting for form.
- 6) Known age, looking at 3133 - Everyone underaged -very tricky one, Change at 3. 10 plus on surface. One is wide, 2 is low. Looking at 12 or 13 in August. Known age is 12. They called it a 7, 10, 9, 11, Patrick may have gotten the 12. Surface indicated is larger than 7.
- 7) Known age - sample 3108; disagreement between readers. 3-4 tells you very little, Surface not helpful either. Surface looks like it could be 5 if you count, maybe 2, seeing a check, many counted as 3. March catch date. Growth is very large for 2, the beak is starting to form, check and annulus coming out of same spot. Patrick and Delsa called 2.

- 8) Not Known-Age: Another 2 yr old. Maybe not a 2 yr old. Make comment as using groove. Debating on morphology, 1 large with wide beak, so maybe 2 also have wide beak and bottom of beak forming. Size 43 cm, seeing check as strong, J state its a 2 based on groove, check determined as it is strong, but just fades as goes toward rostrum.
- 9) Not Known-Age: Another 2 year old, 1st year is very diffuse. Caught May 31, edge type 5. Check between 1 and 2. Old school type what your age, then one less plus to say you are counting edge. Discussing since 2nd annulus on this one not distinct and discussed how it would be notated on forms, depends on age reader.
- 10) Not Known-Age: Surface 10 - plus, pie pan shape, 3 at lip or just under, and then count down, so 10 or 11, Caught in Nov. Age 10 blends into carmel, so possibly 11. Patrick thinking it's like 11. John agrees with 11 on this. Original age was 10.
- 11) Not Know-Age: Caught Oct - Nov, SR 5, SR 4 or 5, But since Nov not counting edge, So probably 4 plus growth. Lots of growth between annuli, Annuli might be forming, so age consensus is 4 w/ 5 edge. But Growth is very wide. Patrick would have put 5 on the sheet.

General notes on the working group document; Barb Campbell brought up that our efforts as a Working Group go back to 2009 (or earlier) and maybe the products from the working group should be put on the website. Brogan and McDonald agree it should be on the website. A discussion ensued about how many images would exist, would they be known-age or not and that either way they could be used as references by all. The size of images was a concern and Andrew suggested that having a downloadable Zip file would work best. Then we could use the 'standard' 3 images per sample (1 surface, 1 ¾ angle tip, and then frontal break and burn cross section). Barb also mentioned the age 0 and 1's study done roughly 12 years ago that attempted to quantify the size of the otoliths from Alaska to California. The sample collection times was problematic for easy comparison, but it was agreed this information could be included in the overall report.

There was a discussion of when assessors bin and whether resolving from double reads needs to occur on specimens that are beyond the binning age.

NWFSC brought an estimated 88yr old specimen for other agencies to examine; the age ranges were from 83 to possibly 96.

d. Lingcod Working Group

- **When:** Wednesday April 3, 2024 8:30am- 12:00pm
- **Attendees:** Marian Ford (ADFG), Audrey Ty (CDFO), Denise Parker (PSMFC/NWFSC), Emily Wallingford (PSMFC/NWFSC), Jessica Mai (CDFO), Mark Plumb (ADFG-Juneau), Mason Emery (ADFG-Juneau), Jenny Topping (WDFW), Andrew Claiborne (WDFW), Merrie Schultz (WDFW), Leif Rasmuson (ODFW), Mark Terwilliger (ODFW), Kevin McNeel (ADFG-Juneau), Barb Campbell (CDFO), Sonya Elmejatti (ADFG-Kodiak), Jessica Horn (ADFG-Kodiak),

Chelsea Cooke (CDFO), Nikki Paige (PSMFC/NWFSC), Tyler Johnson (PSMFC/NWFSC)

- **Summary**

The group shared the reason why each lab was considering moving from fins to otoliths as the primary age structure, as well as the opposite. The pros and cons of each structure were discussed – fins are quick to collect and can be sampled in larger numbers but are extremely time consuming to prepare. Otoliths are much faster to prep and age and so a greater number of ages can be generated – providing those structures can supply a reliable age estimate and can be acquired in sufficient quantities in the first place. The group discussed methods of validating ages, and possibly a grant opportunity to get funding for a formal study on comparing samples and prep times. Various otolith samples were examined by the group and aged collectively.

A discussion was made to bring a formal recommendation to the membership on the final day of business (see section 6, subsection c).

For some validation ideas there was some talk of lead/radium and elemental mapping. Each lab discussed what size range limitations they have based on their source of age structures (recreational versus commercial versus survey).

Scope work occurred and the planning for the next steps of the working group.

- 1). Training Exchange
 - a. 25 pretty structures (AK)
 - b. 25 ugly structures (Laurel's or Andrew's)
 - c. 20 older/ 5 younger
- 2). Study Exchange
 - a. 50 paired structures from each lab
 - b. Figure out sampling from training exchange
- 3). SK Grant Proposal
 - a. Validation
 - b. Simulations
 - c. Single Reader

- e. **Otometrics Working Group**

- **When:** Thursday April 4, 2024 9:30am- 11:00am
- **Attendees:** Derek Chamberlin (AFSC), Jamie Hale (PSMFC/NWFSC), Leif Rasmuson (ODFW), Mark Terwilliger (ODFW), Kevin McNeel (ADFG-Juneau), Jon Short (AFSC), Audrey Ty (CDFO), Sonya Elmejatti (ADFG-Kodiak), Chris Gburski (AFSC), Jessica Horn (ADFG-Kodiak), Mark Plumb (ADFG-Juneau), Denise Parker (PSMFC/NWFSC), Marian Ford (ADFG-Homer)

- **Summary**

A discussion started from each lab talking about what otometrics data they collect and what they do with that data. There was variation in what gets collected and its use. For example, ADFG-Juneau tends to collect a lot of data and use it for their QA/QC by examining the new data to existing relationships. NWFSC creates relationships from the new data each time, but also uses it for QA/QC. It was agreed that we should document what gets collected and how the data are used across labs. The result of that can lead to some standardization.

There was a concern that some labs do not have the resources (in terms of equipment and personnel) to collect everything. Documenting the efficiency of collecting this data is important.

It was agreed that a formal recommendation be made to the membership (see Section 6, subsection f).

f. Calibration/Hands-on Stations

1. Pacific cod – ADFG-Kodiak brought Pacific cod otoliths harvested from the South Alaska Peninsula (SAP) and Kodiak areas. Generally, SAP samples are clearer and have stronger patterns than the Kodiak samples. Sonya Elmejjati and Jessica Horn from ADFG-Kodiak and Chris Gburski and Kali Stone from AFSC set up an Amscope camera to image the otoliths and mark annuli. Overall, the age readers agreed on half the samples looked at. On most otoliths, age readers agreed on the 1st and 2nd annuli. Otoliths that were aged differently were generally 1-2 years off and the differences seemed to be the 3rd and 4th annuli that was thought to be a checky by AFSC. Some differences could be attributed to different edge type decisions. It is important to note that some of the captured images were over-exposed with bad oil reflections and look slightly different than what was seen under the scope. On the second day of the workshop Kevin McNeel, Mark Plumb, Mason Emery, Andrew Pollak, John Brogan, Derek Chamberlin, Julie Pearce, and Jessica Horn joined the same group from Wednesday to image and annotate more SAP samples.
2. Pacific Spiny Dogfish - On Thursday April 4th, 2024 from 9-11:30 AM Andrew Claiborne, Merrie Schultz, and Emily Wallingford met and discussed the aging of spiny dogfish. Merrie outlined the technique used at WDFW to analyze the spine structures. The section of the spine that is ageable is between the white enamel gland ring at the base of the spine and the wear point at the top of the spine (wear point is the first point in which the enamel begins to wear at the top of the spine). Dark bands are counted between the two points, and each band must be slightly elevated/mounded to be counted. Generally these bands are more condensed towards the most recent years laid down at the base of the spine, and are more spaced and less consistent moving up towards the wear point. Measurements of the spine base diameter and wear point diameter are taken to extrapolate any missed bands that have worn off the spine tip. WDFW has exchanged spiny dogfish spines with the AFSC and did not have high agreement in band counts. During the session a few of these difficult structures were displayed with annotated counts from both labs to show the wide variation of age interpretation.

g. Oxygen-18 isotope breakout session/discussion

When: Thursday, Apr 4, 2024

Attendees: Kali Stone (AFSC), John Brogan (AFSC), Andrew Chin (AFSC), Julie Pearce (AFSC), Jessica Mai (CDFO), Josh Dore (ADFG-Juneau) (virtual), Sonya Elmejjati (ADFG-Kodiak), Mason Emery (ADFG-Juneau), Jessica Horn (ADFG-Kodiak), Kevin McNeel (ADFG-Juneau), Leif Rasmusson (ODFW), Mark Terwilliger (ODFW)

Kali Stone began the meeting by noting that the AFSC is expanding on Pacific cod age validation work started by Craig Kastle from the age 2-5 fish to 6-8 years old. On these older otoliths, Kali used secondary ion mass spectrometry (SIMS). On some

otoliths, transects from the core to the edge were obtained for both micromilling and SIMS to compare methods. Sonya asked which axis we mill on, and Kali explained she mills on the anti-sulcus. Kali explained that mounting otoliths is very time consuming, and most SIMS labs will do the prep for you for a little extra. If you plan on prepping in house, Kali can help develop a protocol, but she strongly recommended having the lab prep them. Kali had sent in 30 total otoliths and recently got the raw results from the first 5 otoliths. A discussion took place on what models were used and what has worked and what hasn't with GAMS. It was also discussed whether this data could be used to track hypoxia.

Specimens examined on the monitor:

On the first otolith (age 8) and comparing the O18 plot (each peak=growth zone), and in early years it seems easy but becomes variable further in age. Kali said she needed to double check the criteria for a "peak" based on Craig Kestelle's notes. End goal is to put an overlay over the otolith.

On the second otolith, there was a strong 1-2 check of a 6-7 aged fish. Comparing results, one part of it was cracked in the early years but the peaks seem to track a 6-year-old age.

For the third otolith - an age 6 fish - its wide 2 year spacing seems more reflected in the O18 graph. Again, there are more compressed growth zones in older fish so there are some variability and unclear patterns.

The fourth otolith was an age 8 fish, with tight growth patterns. O18 remains elevated in this older zone, and reflects the growth patterns.

On the last otolith, a checky age 8 fish, there is low variability around 0 but peaks tend to match the age.

ODFW displayed graphs from their publication on the black rockfish, copper rockfish and cabezon age validation and explained patterns in their data.

A discussion ensued about potential future research. Those included Kodiak cod, Greenland Turbot, scallops, lingcod. There is potential to expand this O18 work for age validation, and also study how OA is going to impact FT-NIRS and methylation aging methodologies.

9. Table 1. Attendance for CARE Conference 2024 (On-line attendees have starred last names)

Last name	First name	Agency	Country	Email
Ford	Marian	ADFG	USA	marian.ford@alaska.gov
Emery	Mason	ADFG	USA	mason.emery@alaska.gov
McNeel	Kevin	ADFG	USA	Kevin.McNeel@alaska.gov
Plumb	Mark	ADFG	USA	mark.plumb@alaska.gov
Elmejjati	Sonya	ADFG	USA	sonya.elmejjati@alaska.gov
Horn	Jessica	ADFG	USA	jessica.horn@alaska.gov

Brogan	John	AFSC	USA	john.brogan@noaa.gov
Chamberlin	Derek	AFSC	USA	derek.chamberlin@noaa.gov
Chin	Andrew	AFSC	USA	Andrew.Chin@noaa.gov
Gburski	Chris	AFSC	USA	Christopher.Gburski@noaa.gov
Pearce	Julie	AFSC	USA	julie.pearce@noaa.gov
Short	Jon	AFSC	USA	Jon.Short@noaa.gov
Stone	Kali	AFSC	USA	kali.stone@noaa.gov
Campbell	Barbara	CDFO	Canada	Barbara.Campbell@dfo-mpo.gc.ca
Cooke	Chelsea	CDFO	Canada	Chelsea.Cooke@dfo-mpo.gc.ca
Ty	Audrey	CDFO	Canada	Audrey.Ty@dfo-mpo.gc.ca
Mai	Jessica	CDFO	USA	jessica.mai@dfo-mpo.gc.ca
Hale	James	NWFSC	USA	jhale@psmfc.org
Johnson	Tyler	NWFSC	USA	tjohnson@psmfc.org
McDonald	Patrick	NWFSC	USA	pmcdonald@psmfc.org
Ortiz	Liz	NWFSC	USA	lortiz@psmfc.org
Paige	Nikki	NWFSC	USA	npaige@psmfc.org
Parker	Denise	NWFSC	USA	dparker@psmfc.org
Wallingford	Emily	NWFSC	USA	ewallingford@psmfc.org
Rasmuson	Leif	ODFW	USA	leif.k.rasmuson@odfw.oregon.gov
Terwilliger	Mark	ODFW	USA	mark.r.terwilliger@odfw.oregon.gov
Barnes	Cheryl	OSU	USA	cheryl.barnes@oregonstate.edu
Claiborne	Andrew	WDFW	USA	Andrew.Claiborne@dfw.wa.gov
Schultz	Merrie	WDFW	USA	Merrie.Schultz@dfw.wa.gov
Topping	Jennifer	WDFW	USA	Jennifer.Topping@dfw.wa.gov
Dore*	Josh	ADFG	USA	josh.dore@alaska.gov
Byerly*	Mike	ADFG	USA	
Jung*	Yeongha	CDFO	Canada	Yeongha.Jung@dfo-mpo.gc.ca
Varco*	Louisa	CDFO	Canada	Louisa.Varco@dfo-mpo.gc.ca
Wischniowski*	Stephen	CDFO	Canada	Stephen.Wischniowski@dfo-mpo.gc.ca
Loewen*	Tracey	CDFO	Canada	tracey.loewen@dfo-mpo.gc.ca
Forsberg*	Joan	IPHC	USA	Joan.forsberg@iphc.int
Johnston*	Chris	IPHC	USA	chris.johnston@iphc.int
Sawyer Van Vleck*	Kimberly	IPHC	USA	Kimberly.sawyer.vanvleck@iphc.int
Berger*	Aaron	NOAA	USA	Aaron.berger@noaa.gov
Ayrea*	Alycia	ODFW	USA	
Vargas*	Madison	OSU	USA	
Brooks*	Rachel	SWFSC	USA	rachel.brooks@noaa.gov
Monk*	Melissa	SWFSC	USA	melissa.monk@noaa.gov
Schwartzkopf*	Brittany	SWFSC	USA	
Patterson*	William	UFC	USA	
Caltabellotta*	Fabio	WDFW	USA	Fabio.PriorCaltabellotta@dfw.wa.gov

10. Table 2. CARE Exchanges

Exchange ID #	Exchange Year	Species	Sample Size (n)	Stock	Originating Agency	Participating Agency (Cooperators)
23-001	2023	Rougheye/Blackspotted RF	50	Alaska	ADFG	AFSC, WDFW, NWFSC
23-002	2023	Rougheye/Blackspotted RF	50	Washington	WDFW	AFSC, NWFSC, ADFG
23-003	2023	Rougheye/Blackspotted RF	50	US West Coast	NWFSC-PSMFC	ADFG, AFSC, WDFW
23-004	2023	Rougheye/Blackspotted RF	50	Alaska	AFSC	ADFG, WDFW, NWFSC
23-005	2023	Rougheye/Blackspotted RF	5	Alaska	ADFG	AFSC, NWFSC

11. Appendix 1. 2024 CARE Agenda



C.A.R.E. 2024 Agenda Twenty-third Biennial Meeting of the Committee of Age Reading Experts

**Working Group of the Canada – US Groundfish Committee TSC
Hatfield Marine Science Center
2030 SE OSU Drive, Newport, OR, USA
Guin Library Seminar Room
April 2–4, 2024**

Tuesday, April 2, 2024

- I. Call to Order** [8:30 am (Guin Library Hours 8:00am-5:00pm)] – CARE Chair (Patrick McDonald)
- II. Host Statement**
 1. Welcome statements & host info: safety/security orientation, refreshments, social. etc.
- III. Introductions**
 1. Round-table intro (name, agency, location)
 2. Attendance-address, phone, email (written list distributed)
- IV. Approval of 2024 Agenda**
- V. Working Group Reports** [9:00 – 9:40] Activity since CARE 2023 (~ 5 min each)
 1. TSC Meeting 2023 (Andrew Claiborne)

2. Age Structure exchanges (Mark Terwilliger)
3. Website (Jamie Hale)
4. CARE Forum (Nikki Atkins)
5. CARE Manual (Barb Campbell and Kevin McNeel)
6. Charter Committee
7. Lingcod Working Group (Mark Terwilliger/Leif Rasmuson)

VI. CARE & TSC Recommendations [9:40 – 10:15]

2. CARE to CARE 2023
3. CARE to TSC 2023
4. TSC to CARE 2023

Break 10:15 – 10:30

VII. Agency Reports [10:30 – 11:30] Activity since CARE 2023 (~ 5 min each)

1. CDFO – (Steve Wischniowski/Audrey Ty)
2. IPHC – (Joan Forsberg)
3. ADFG
 - a. Kodiak, Commercial (Sonya Elmejjati)
 - b. Juneau, ADU – (Kevin McNeel)
 - c. Homer, Commercial (Andrew Pollack)
 - d. Homer, Sportfish (Marian Ford)
4. NWFSC – (Patrick McDonald)
5. WDFW – (Andrew Claiborne)
6. SWFSC –
 - a. (Melissa Monk)
 - b. (Brittany Schwartzkopf)
7. ODFW – (Mark Terwilliger/Leif Rasmuson)
8. AFSC – (Derek Chamberlin)

VIII. Topics for Discussion/New Business [11:30 – 12:00] continued if needed [1:30-2:00]

1. FT-NIR updates – (get updates from labs using this technology)
2. Western Groundfish Conference move back to even years starting 2026/TSC Discussing April 17th-18th
3. Symposia/Conferences previous and upcoming
4. Age data hosted on the CARE website?
5. What would need to happen to begin posting TSC recommended age tutorial videos on CARE website
6. Agency handling and dissemination of double read data and informing end-users
7. Prioritization tool for US West Coast Assessments (URL Link)

Lunch 12:00 – 1:15

IX. Scientific PowerPoint Presentations [2:00 – 4:15] – 15-20 Minutes

1. Kali Stone – Use of otoliths to gain insight into overwinter survival strategies of juvenile Arctic Cod (*Boreogadus saida*) in a warming arctic.
2. Leif Rasmuson – Finding Oregon's Old Female Rockfish.

3. Tracey Loewen – Age estimations of Greenland halibut: technique development and future directions (Remote Presentation).
4. Will Patterson – Eye lens-based age validation and epigenetic ageing of deepwater fishes among U.S. ocean basins (Remote Presentation).

Break 3:10 – 3:25

5. Evan Howard - Otoliths Record Hypoxia Tolerance from Individual to Global Scales (Remote Presentation).
6. Kevin McNeel – Assessing Species Identification, Age, And Life History Information For Shortraker Rockfish (*Sebastes Borealis*) In Prince William Sound, Alaska, Using Otolith Analyses.
7. Derek Chamberlin – Ageing Error; Where does uncertainty in model predicted ages propagate?

X. Otolith Morphometrics [4:15 – 4:45]

1. Otometrics summary presentation
 - a. Discussion for actions/working group formation.

XI. Workshops, working groups, hands-on microscope work [4:45 – 5:30]

1. Otometrics Working Group Discussion/Formation (Guin Library Seminar Room)
3. Hands-on Reviewing of maximum age specimens
4. Hands-on Reviewing Previous Exchanges

Informal social at the Bier One, 255 SW 9th St, Newport, OR 97365 on Tuesday evening starting at 5:30PM

Wednesday, April 3, 2024

XII. Workshops, working groups, hands-on microscope work [8:30 – 5:00]

1. Hands-on Reviewing Continuation – Previous Exchanges, maximum age specimens
2. Lingcod Working Group (Barry Fisher Room, Guin Library; 8:30-12pm)
3. Sablefish Working Group (Lavern Weber Room, Guin Library; 10:00-12pm; 1:30-3pm)
4. Rougheye/Blackspotted (Guin Library Seminar Room; 2:00pm-5pm)
5. O18 break out session and discussion (Lavern Weber Room, Guin Library 3-5pm)
6. Stations – PCOD Calibrations

CARE Social Wednesday evening at Rogue Brewer's on the Bay, 2320 SE Marine Science Dr, Newport, OR 97365, 5:30pm

Thursday, April 4, 2024

XIII. Recommendations [8:30 – 9:00]

1. 2024 CARE to CARE
2. 2024 CARE to TSC

XIV. Working groups & Hands-on Workshop [9:00 –12:00];[1:00 – 3:15]

1. Working Groups – schedule future tasks, executive summary write-ups
2. Hands-on microscope calibrations continuation from Wednesday
3. Quillback Rockfish (9-12pm)
4. China Rockfish (1-3pm)
5. Spiny Dogfish (9-12pm)

XV. CARE Business [3:30-4:00pm]

1. Administration nominations
2. Schedule and location of next meeting

XVI. CARE Business Meeting Adjourns [4:00pm]