

Committee of Age Reading Experts

2020 Committee Report

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

April 23 – 24, 2020



Prepared by
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2019-2021 CARE Chair

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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 January 1 – December 31, 2019. This reporting period includes information from the 2019 Committee Report and Executive Summary prepared by outgoing CARE Chair Kevin McNeel. Current officers through June 30, 2019 (elected at April CARE 2017 Meeting) are:

- Chair – Kevin McNeel (ADF&G-Juneau)
- Vice-Chair – Barbara Campbell (CDFO)
- Secretary – Nikki Atkins (NWFSC)

The 2019 CARE Conference Minutes* have been approved by the CARE members and will be added to the CARE websites 'Previous Meetings' section. The Secretary prepared the first draft minutes for the 2019 CARE Conference and was reviewed by the exiting officers (Chair, Vice-Chair and Secretary) prior to distributing the final draft to members for review and approval.

*All tables and appendices refer to the 2019 CARE Conference Minutes (pp. 9 – 34).

3. CARE Conference

CARE meets biennially for a conference that usually lasts three days. Conferences typically consist of one and a half "business" days and one and a half days for a hands-on calibration workshop at microscopes to review and standardize age reading criteria with any extra time scheduled for a specific focus group or workshop.

a. Overview:

The most recent biennial CARE Conference was held in Seattle, WA, April 9-11, 2019 at the NOAA Western Regional Center at the Alaska Fisheries Science Center (AFSC), Sand Point facility, and hosted by the Age and Growth AFSC staff. The conference was attended by 34 CARE members (Table 1) from seven participating agencies: ADF&G (3), AFSC (15), CDFO (3), IPHC (3), NEFSC (1), NWFSC/PSMFC (4), ODFW (2), and WDFW (3). Following the CARE conference, AFSC hosted a two-day FT-NIRS workshop (Appendix II). The next CARE Conference in 2021 will be held prior to the TSC meeting in April in Newport, Oregon. The following officers were elected at the April 2019 meeting and will take office July 1, 2019:

- Chair – Delsa Anderl (AFSC)
- Vice-Chair – Andrew Claiborne (WDFW)
- Secretary – Nikki Atkins (NWFSC-PSMFC)

b. Business Session Highlights:

i. Scientific presentations:

An unofficial Call for Presentations and Posters for the 2019 CARE Conference was sent to members on November 2, 2018 (Appendix II). Submissions were requested to address current research and the 2018 TSC recommendations: yelloweye rockfish, differentiating cryptic species, and evaluating machine reading of otoliths.

Abstracts were due to the CARE Chair by March 8, 2019. There were two oral presentations submitted for the scientific presentation session. (Appendix III).

Two oral presentations in PowerPoint format were given during the CARE meeting:

1. Andrew Claiborne, Results of the yelloweye rockfish exchanges: comparison of age determinations from Alaska, British Columbia, and the coasts of Washington and Oregon
2. Chris Hinds, Importance of juvenile sablefish growth and methods of estimation

ii. Agency Reports:

AFSC (Thomas Helser), CDFO (Steve Wischniowski), IPHC (Joan Forsberg), ADF&G (Kevin McNeel), NWFSC-PSMFC (Patrick McDonald), WDFW (Andrew Claiborne), and ODFW (Lisa Kautzi) provided reports summarizing and updating agency activities, staffing, organization, new species and projects. There was no representative at CARE from SWFSC, CDFG, or ADF&G- Homer and Kodiak, but a written report was sent from Kodiak and presented at the meeting. Details from agency reports are available in the meeting minutes.

iii. Discussion of long-term storage of otoliths in glycerin-thymol:

This discussion was continued from the 2013, 2015, and 2017 CARE meetings and in response to ongoing TSC recommendations and the development of an ad-hoc working group. Stephen Wischniowski (DFO), Joan Forsberg (IPHC), and Delsa Anderl (AFSC) gave updates on their agency's progress on otolith storage. DFO is continuing to remove glycerin solutions from their historical otoliths and moving them to dry storage, but IPHC and AFSC is continuing to store otoliths in glycerin-thymol. Inconsistencies in climate-controlled storage and/or incorrect preparation of the glycerin solution likely caused degradation in the otoliths. IPHC is combating otolith degradation by controlling the mixing of glycerin solutions and AFSC sent samples of both degraded and intact otoliths to Seattle University to analyze and find potential reasons for degradation.

iv. Workshop on the Rapid Estimation of Fish Age Using Fourier Transform Near-Infrared Spectroscopy (FT-NIRS)

An international workshop was held at the Alaska Fisheries Science Center in Seattle, WA, April 11th - 12th, 2019, after the CARE meeting. The 2-day workshop was given to kick-off a NOAA strategic initiative by distributing information on near-infrared spectroscopy, multivariate predictive modeling, stock assessments, and fish age estimation. The workshop focused on the underlying technology, recent developments and case studies in estimation of age and animal physiology, and issues and research need to operationalizing FT-NIRS for age estimation. During the workshop, 63 individuals from the United States, Canada, Australia, and Korea participated in seminars, hands-on operation, and discussion panels. This workshop was the first part of a two-year initiative to evaluate FT-NIRS for age estimation and work is ongoing.

v. Hands-on Session Highlights and Demonstrations:

A total of 21 readers reviewed 7 species during the hands-on workshops and, mainly for the purpose of calibration between age readers and agencies. Members aged yelloweye

rockfish, Pacific cod, sablefish, longnose skate, and shortspine thornyhead. A demonstration for measuring rockfish otolith with image analysis was demonstrated by Charles Hutchinson (AFSC) and Kevin McNeel (ADF&G). See species aged, participating members, and agencies in Table 2.

B. CARE Subcommittee (Working Group) Reports:

1. CARE Website Subcommittee: Jon Short (AFSC) lead and webmaster, Nikki Atkins (NWFSC).

Subcommittee members addressed topics and recommendations drafted in 2017. Topics included summarizing the outdated state of the current website, the utility of old website, and the development of the new website as well as the updated forum. The new site is active at caredev.psmfc.org, but the subcommittee members needs help to develop the new site and maintaining the database supplying the table information. The CARE Forum is currently active and old topics have been moved to the new site.

2. CARE Manual/Charter Subcommittees: Elisa Russ (ADF&G-Homer), Betty Goetz (AFSC), Barb Campbell (DFO).

Most subcommittee members were not able to attend the 2019 CARE meeting, but the lead was able to provide input post-workshop. Final drafts of chapters will be finalized for review by the CARE membership and update prior to the 2021 meeting. Charter subcommittee members will review charter update recommendations and edit the charter for review at the 2021 CARE meeting. The subcommittees are seeking further membership to help with finalizing documents.

3. Yelloweye rockfish ad hoc working group:

Age readers from CDFO, WDFW, ADF&G-ADU, and PSMFC aged specimens from the radiocarbon sample using images. Specific features discussed were identification of the 1st, preferred aging axis, edge interpretation, splitting vs. banding of fine annuli in older specimens, and the importance of tracing annuli from the surface onto the reading surface to help interpret noise.

4. Rougheye/Blackspotted/Shortraker Rockfish ad hoc working group:

AFSC, DFO, and ADF&G worked together to provide updates, collect morphometric and shape data, and compare model results at CARE. Steve Wischniowski provided a sample of rougheye and blackspotted otolith images and Charles Hutchinson created otolith measurements using ImagePro Plus and compared measurements with otolith weight and age to the current AFSC model output. Kevin McNeel created shape estimates and otolith measurements using R and looked for statistical groups and identification error. Each agency is currently working to address specific concerns for identifying these species and a summary was provided to the group.

C. Age Structure Exchanges

Age structure exchanges occur periodically to assess calibration among CARE age-reading agencies. Depending on results, specimens of interest (e.g. demonstrated biases) are then reviewed and discussed.

Exchanges are tracked by the CARE Vice-Chair. Data from exchanges are available on the CARE website.

There were five age structure exchanges initiated in 2019 and none in 2020. A request was made to CARE members during the CARE meeting to document and finalize age structure exchanges started in 2018 and 2019. All 2018 exchanges and four of the five 2019 exchanges have been finalized and will be added to the CARE websites 'Structure Exchange table'. See 2018 and 2019 exchanges on p. 7 and 8.

D. CARE & TSC Recommendations

In 2019 recommendations were made by CARE to CARE and TSC to CARE. Some recommendations may take more than one cycle to complete. This list contains recommendations that are still pending or provide background for those made by CARE/TSC in response to prior recommendations.

1. 2019 CARE to CARE

- a. Recommends the CARE Manual working group (Elisa Russ, Betty Goetz, Jodi Neil) finalize and add the following sections before the 2021 CARE meeting:
 - i. Lingcod Otolith Ageing Procedures section (is written, needs to be added)
 - ii. Sablefish Ageing Procedures section (is written, needs to be added)
 - iii. Thin Sectioning Method section – add a section under the General Ageing Procedures (is written, needs to be added)
 - iv. Add section on baking otoliths under General Otolith Ageing Procedures; to be written and finalized
 - v. Ergonomics section including equipment checklist as appendix (is written, needs to be added)
- b. Recommends the Manual working group continue the revision and expansion of the CARE Manual on Generalized Age Determination with the following sections drafted or revised for review and addition of edits to the manual by the 2021 CARE meeting:
 - i. Walleye Pollock Ageing Procedures section (use AFSC manual as starting point); not written
 - ii. Spiny Dogfish Ageing Procedures section – summary of spiny dogfish age determination paper by Dr. Cindy Tribuzio; not reviewed
 - iii. Rockfish Ageing Procedures section; not reviewed
 1. Edit to avoid redundancy with Thin Sectioning section;
 2. Revise/move some information to General Otolith Ageing Procedures section where appropriate;
 - iv. Remove documentation sections regarding changes to CARE Manual
 1. See Recommendation C to post archived editions.
 2. Remove 2015 recommendation to add Acknowledgements section.
- c. Recommends the CARE Manual working group submit archived editions of the CARE Manual to the website working group for posting on the CARE website to preserve historical records. Most archived material may be lost, but Betty Goetz offered to retrieve old files.
- d. Recommends that the CARE Forum be updated and added to the new website.

- e. Recommends the CARE searchable publication database be discontinued and an updated version of the current endnote database be supported.
- f. Additional recommendations for the website to be completed prior to the 2019 TSC meeting are as follows:
 - i. Add information at the top of the Species Information page to “Check with specific agency about changes in historical techniques”; report that “Methods listed are for most recent reporting year,”
 - ii. Add table for agency contacts with e-mail address of agency leads and information on age readers and species; Add as google doc and have agencies update information by Friday April 12, 2019
 - iii. Update agency production numbers annually (finalize agency updates by April 19, 2019), and
 - iv. Update Species Information page to include new codes;
 - v. Edits such as consistent capitalization on the Species Information page; find updated species list by Care 2021
 - vi. Agencies should work to provide links to structure inventories to be assessable on the new website before CARE 2021
- g. Recommends that ongoing agency progress toward long term otolith storage issues be documented and distributed to the TSC before the 2020 meeting. Research from the IPHC, CDFO, and AFSC will be summarized and distributed.
- h. Recommend posting list of maximum ages on CARE website and developing quality control processes for new maximum ages including a CARE age structure exchange between appropriate agencies (age structure exchange may be done at CARE meeting to minimize transport and maximize efficiency).
- i. Recommend evaluating and updating the current CARE Age Structure Exchange invoice to potentially exclude quality control statistics and include better notation before CARE 2021.

2. 2019 CARE to TSC

- a. CARE currently has no recommendations for the TSC

5. TSC to CARE 2017/2018/2019

2017

- a. Recommends CARE to review yelloweye aging

2018

- a. CARE did not directly respond to storage recommendations and CARE will carry this recommendation on this year and develop a working group to standardize otolith storage.
- b. TSC Recommends carrying over yelloweye ageing review.
- c. TSC encourages the use of otolith morphometrics to separate out cryptic species and suggests expanding the current working group to expand to other species.

- d. TSC encourages CARE to evaluate the machine reading of otoliths as a valid method (near infrared), concern is that suitable criteria are met.
- 2019
- a. The TSC supports CARE’s next steps, including making video documentation on how to process and age samples in an effort to fight the brain drain of retirements.

Table 1. CARE age structure exchanges

CARE Age Structure Exchanges initiated in 2018				
Exchange ID No.	Species	Originating Agency	Coordinator	Participating Agency (Cooperators)
18-001	sablefish	NWFSC	Patrick McDonald	NWFSC, ADFG-Juneau, AFSC, CDFO
18-002	Pacific cod	ADFG-Juneau	Jodi Neil	AFSC
18-003	sablefish	AFSC	John Brogan	NWFSC, ADFG-Juneau, AFSC, CDFO
18-004	canary rockfish	WDFW	Jennifer Topping	NWFSC
18-005	canary rockfish	NWFSC	Patrick McDonald	WDFW
18-006	longnose skate	AFSC	Beth Matta/ Morgan Arrington	NWFSC
18-007	sablefish	ADF&G-Juneau	Kevin McNeel	NWFSC, ADFG-Juneau, AFSC, CDFO
18-008	sablefish	CDFO	Barb Campbell	NWFSC, ADFG-Juneau, AFSC, CDFO
18-009	yelloweye rockfish	ADF&G-Homer	Elisa Russ	ADFG-Juneau
18-010	big skate	NWFSC-PSMFC	Tyler Johnson	AFSC

CARE Age Structure Exchanges initiated in 2019				
Exchange ID No.	Species	Originating Agency	Coordinator	Participating Agency (Cooperators)
19-001	Pacific cod	ADFG-Juneau	Jodi Neil	AFSC
19-002	cabezon	ODFW	Lisa Kautzi	WDFW
19-003	cabezon	WDFW	Jennifer Topping	ODFW
19-004	black rockfish	ODFW	Lisa Kautzi	ADFG-Homer
19-005	widow rockfish	WDFW	Jennifer Topping	NWFSC



C.A.R.E. 2019 MEETING MINUTES 9–11 APRIL 2019

Twentieth Biennial Meeting of the Committee of Age Reading Experts

Working Group of the Canada – US Groundfish Committee TSC

AFSC Sand Point Facility, NOAA Western Regional Center

7600 Sand Point Way, NE, Seattle, WA, USA Bldg. #4, Jim Traynor Conference Room 2076

Tuesday, April 9, 2019

I. Call to Order

2019 CARE Chairperson Kevin McNeel (ADF&G-Juneau) called the meeting to order at 8:30 am.

II. Host Statement

Dr. Tom Helser (AFSC), Age and Growth Program Manager, welcomed the group to the 20th CARE conference. He disclosed which rooms were available during the meeting and covered security issues. He invited everyone to the social which would be held at the Elliot Bay Brewing Company's Cascade Hall. Tom also mentioned the donation box for the daily refreshments.

III. Introductions

CARE attendees introduced themselves—stating which agency they worked for and giving brief summaries of their history and/or directed work (Table 1, Fig. 1: 2019 CARE Attendee List).

IV. Approval of 2019 Agenda

Kevin McNeel (ADF&G-Juneau) asked for edits to the agenda. There was a correction such that the social would be located at the Elliot Bay Brewing Company where there would be pre-ordered platters of food. Chris Gburski (AFSC) would collect the \$20 fee and directions to the location would be distributed. The group photo was scheduled for Wednesday before lunch. With these changes and additions, the 2019 agenda was approved by CARE.

V. Working Group Reports

A. TSC Meeting 2018

Kevin McNeel (ADF&G-Juneau) had attended the TSC meeting in San Jose in 2018 where he gave an update on CARE activity and changes in CARE personnel. In the report he included the 13 age structure exchanges conducted in 2018. Kevin commented that CARE initiated 5 yelloweye rockfish exchanges, which addressed the 2017 TSC to CARE recommendation to review yelloweye rockfish age pattern criteria. TSC was interested in using near-infrared (NIR) spectroscopy to age otoliths and TSC suggested using tag-recapture, known-age sablefish. Kevin noted that the AFSC was already working on evaluating NIR spectroscopy for ageing walleye pollock, Pacific cod, sablefish, and sole. The AFSC was the only center that Kevin knew of on the west coast with an NIR spectrometer. Kevin then went over the 2017 CARE to TSC and TSC to CARE recommendations. The CARE to TSC recommendation recognized TSC to CARE concern about storage media and therefore CARE developed an Ad Hoc Working

Group to address the issue. The 2017 TSC to CARE recommendation was to investigate yelloweye rockfish age determination criteria; CARE had five age structure exchanges, including bomb-radiocarbon validated specimens, to compare criteria. TSC members proposed to add yelloweye rockfish criteria as a research priority to help make this species easier to study.

B. Age Structure Exchanges

Kevin McNeel (ADF&G-Juneau) thanked Barbara Campbell (CDFO) for coordinating the exchanges and preparing the 2019 CARE Structure Exchange Summary. Barbara was unable to attend the meeting. Kevin also thanked Joanne Groot (CDFO) for continuing to coordinate exchanges.

In 2017 there were 13 exchange samples/invoices:

- 5 yelloweye rockfish samples exchanged (resolved)
- 2 roughey rockfish samples exchanged (both outstanding)
- 2 lingcod samples exchanged (1 outstanding)
- 1 blue/deacon rockfish sample exchanged (resolved)
- 2 Pacific cod samples exchanged (1 training sample and 1 resolved)
- 1 petrale sole sample exchanged (resolved)

In 2018 there were 10 exchange samples/invoices (Table 3):

- 4 sablefish samples exchanged (1 outstanding)
- 1 Pacific cod sample exchanged (resolved)
- 2 canary rockfish samples exchanged (resolved)
- 1 longnose skate sample exchanged (resolved)
- 1 yelloweye rockfish sample exchanged (resolved)
- 1 big skate sample exchanged (resolved)

In 2019 there were 4 exchange samples/invoices at the time of meeting:

- 1 Pacific cod exchange started
- 2 cabezon exchanges
- 1 black rockfish exchange

CARE members also discussed the following:

- Statistical results on invoices: Kevin McNeel questioned whether it was necessary or beneficial to include statistics given the lack of consistency across invoices. People were not using forms with active equations. If people were interested in holding individuals to a set of standards, that should be addressed in the CARE to CARE recommendations.
- Resolving ages within a lab prior to inter-agency exchanges for a sample: Kevin McNeel noted that the CARE Charter states that agencies should submit only one age for invoices. Whether this should be continued could be brought up during recommendations.
- Whether an invoice number was necessary if ages were not intended for the website: Sandra Rosenfield (WDFW) suggested that the Vice Chair could assist with coordinating CARE training sample exchanges without initiating a formal exchange with an invoice. Kevin McNeel brought up whether multiple structure comparisons should be recorded as one invoice or multiple. Kevin suggested to keep data together. Andrew Claiborne (WDFW) suggested that the data be kept in the same invoice and that the comment

section of the invoice be used to identify ages of the different structures. It was suggested that these updates be added to the CARE Charter and that the invoice template be updated so that the notes section would replace the statistics section to enable the recording of additional useful information.

C. CARE Website

Jon Short (AFSC) summarized the utility of the website and noted that the management system running the site (Joomla) was out of date. Jon pointed out the species tables, manual, and link to the forum, but noted that the links and materials may no longer be supported. Jon went through the structure of the new WordPress site and what content was available. He mentioned that CARE needed a dedicated person to check the content of the new website and to do updates. The PSMFC has server space for the site and the updates should be done preferably by one agency.

Sandra Rosenfield (WDFW) asked Jon Short how long the old site was to continue working. Jon mentioned that the site was currently not functional. Sandra mentioned that the species table was one of the most important pieces of information on the site. The new site was active at <http://caredev.psmfc.org/>. It was expressed that Jon could use help maintaining the MS Access database and providing the code to display the data.

D. CARE Forum

Nikki Atkins (NWFSC/PSMFC) gave updates on the old and new forum. She noted that nothing had happened on the forum for quite some time. However, with the new host for the website, the forum appeared more user friendly. Posts from the old forum would be copied and moved into the new forum as “archived” posts so the content would not be lost. Nikki would contact all current users of the forum with the new address and reminders of their usernames so they could log in to the new version.

E. CARE Manual and CARE Charter

Elisa Russ (ADF&G-Homer) was the chair for both working groups and could not attend this meeting; and Betty Goetz (AFSC) did not have updates for either working group. Kevin McNeel (ADF&G-Juneau) suggested that they go over the points in the recommendations.

Morgan Arrington (AFSC/UW) mentioned that the group processing longnose skate were working on a CARE manual chapter.

Elisa Russ (ADF&G-Homer) provided input post-workshop that she had draft/final manual chapters that have been submitted. Elisa Russ will review and coordinate with authors and other working group members as needed to finalize the manual for review by the CARE membership and update prior to the 2021 meeting. Elisa Russ has reached out to other manual working group members Barbara Campbell (CDFO) and Jodi Neil (ADF&G-Juneau) to set up a meeting. Elisa Russ has reviewed the previous and current CARE to CARE recommendations and will follow up as needed and address these prior to the CARE meeting in 2021.

Regarding the CARE Charter, Elisa Russ and Betty Goetz did review it in 2015; however, no work was done to expand the Charter as previously recommended by CARE. This will remain an item to address at the next CARE meeting along with the current CARE recommendation.

Elisa Russ committed to review and provide an update in 2021. Betty Goetz will be retiring in 2020, so Elisa Russ will be seeking another CARE member to join this working group.

VI. CARE & TSC Recommendations [9:45–10:15]

A. CARE to CARE 2017 (see pages 23 & 24 in 2017 CARE Meeting Minutes): Kevin McNeel (ADF&G-Juneau) reviewed the CARE to CARE and the CARE to TSC recommendations.

1. CARE recommends that the CARE Manual Working Group finalize and add the following sections to the *CARE Manual on Generalized Age Determination* and distribute the updated version of the manual to the CARE membership by June 1, 2017 with the finalized version to be submitted to the CARE Website Working Group by June 30, 2017 for posting on the CARE website:
 - a. *Lingcod Otolith Ageing Procedures* section: Kevin McNeel stated that these were finalized at the 2017 meeting.
 - b. *Sablefish Ageing Procedures* section: Kevin McNeel stated that these were finalized by the 2017 meeting.
 - c. *Thin Sectioning Method* section—add a section under the *General Ageing Procedures*; Charles Hutchinson (AFSC) commented that this was written.
 - d. *Baking Otoliths*—add a section under *General Otolith Ageing Procedures*; not written.
 - e. *Ergonomics* section including equipment checklist as an appendix; Betty Goetz (AFSC) mentioned that this was written in 2017.

Kevin McNeel (ADF&G-Juneau) suggested following up with Elissa Russ (ADF&G-Homer) to see if these sections were added.

2. CARE recommends that the CARE Manual Working Group continue the revision and expansion of the *CARE Manual on Generalized Age Determination* with the following sections drafted or revised by May 1, 2018 for review; and the edited sections to be added to the manual by the 2019 CARE meeting:
 - a. *Walleye Pollock Ageing Procedures* section (use the AFSC manual as a starting point). This was noted to likely not be finished, but Elisa Russ may have updates.
 - b. *Spiny Dogfish Ageing Procedures* section—summary of the spiny dogfish age determination paper by Dr. Cindy Tribuzio.

It was noted that we do not know if this was incorporated into the manual.

- c. *Rockfish Ageing Procedures* section
 - i. Edit to avoid redundancy with the *Thin Sectioning* section.

- ii. Revise/move some information to the *General Otolith Ageing Procedures* section where appropriate.
- d. Remove documentation sections regarding changes to CARE manual
 - i. See recommendation C to post archived editions.
 - ii. Remove 2015 Recommendation to add *Acknowledgements* section.

It was noted that documentation from the 2015 and 2017 working group meetings may be missing. Betty Goetz (AFSC) mentioned that she might have time to get some of these documents together.

- 3. CARE recommends that the CARE Manual Working Group submit archived editions of the CARE manual to the CARE Website Working Group for posting on the CARE website to preserve historical records.

Kevin McNeel (ADF&G-Juneau) suggested that any archived additions of the manual be submitted to Jon Short (AFSC) to be added to the website.

- 4. CARE recommends that the CARE Forum be continued.

- 5. CARE recommends that the CARE Website Working Group continue to refine the searchable publication database to be housed at ADF&G-Juneau, so that relevant information is more accessible to the age reading community and stock assessors. Recommends that CARE members enter publications into the database using the online form. Recommends that the publications page includes the following, 1) a full list of publications, 2) a searchable feature at the top of the page, 3) a link to the publication entry form—the above to be completed before the 2019 CARE meeting. CARE members suggested that posters should verify what publication information or material could be added to the CARE website without violating online publication permissions, especially prior to adding a full publication or abstract.

Kevin McNeel (ADF&G-Juneau) brought up the CARE website literature database. Kevin mentioned that ADF&G did not want to support the database and that no one has added submissions. He suggested that CARE vote on removing the online database in favor of supporting the Endnote file at the end of the meeting.

- 6. Additional CARE recommendations for the website to be completed prior to the 2019 meeting are as follows:

- a. Add information at the top of the *Species Information* page to “Check with specific agency about changes in historical techniques”; report that “Methods listed are for most recent reporting year,” or adjust in conjunction with changes incorporated in recommendation G.

This change was not made and Kevin McNeel (ADF&G-Juneau) offered to send the quotes to Jon Short (AFSC).

- b. Add a table for agency contacts with e-mail addresses of agency leads and information on age readers and species (to be completed by April 30, 2017).

Kevin McNeel added the list as a Google Doc and recommended that agencies update

information by the end of Friday.

c. Update agency production numbers annually (update the website with current production numbers by April 30, 2017). Kevin McNeel added the production number template to a CARE-wide email. Ask that production numbers be submitted by the following Friday.

d. Include methods for current year and use appropriate codes (B&BN = break-and-burn, B&BK = break-and-bake):

Kevin sent the definitions to Jon Short. Agencies will have to retroactively assign methods to historical production numbers to qualify if they are bakes or burns.

e. Edits such as consistent capitalization on the *Species Information* page:

Kevin offered to find the updated species list and email that to Jon.

7. CARE recommends that the website subcommittee continue to research the possibility of converting the CARE website and CARE forum to a different technology (Joomla is out-of-date, and it requires a major undertaking to update to a new version). The Website Working Group will research software options and make a recommendation (e.g., WordPress, Drupal, or a new version of Joomla).

The Website Working Group updated the CARE website to WordPress and the transition to the new website is in process. The updated website is housed at <http://caredev.psmfc.org/>.

8. CARE recommends that an Otolith Storage Ad Hoc Working Group be created to address the issues of short and long-term storage of otoliths with a complete report reviewed by membership for the 2019 CARE meeting. This is in response to prior TSC to CARE recommendations and due to the issue of otolith storage becoming a 2017-2021 research priority for the North Pacific Fishery Management Council. It is imperative that the historical archive of age structures be preserved.

There was no working group developed yet. Stephen Wischniowski (CDFO) said that their agency was cleaning their historical otoliths of glycerin and moving them to dry storage. Stephen noted that a lack of climate-controlled storage and a lack of consistency with the glycerin solution caused issues with the otoliths. The CDFO was now storing all otoliths dry. There were inconsistencies in which otoliths were degraded.

Joan Forsberg (IPHC) noted that the IPHC were still storing otoliths in glycerin but acknowledged that incorrect preparation of the solution was an issue. The IPHC has climate-controlled storage and they mix their own glycerin solutions.

Delsa Anderl (AFSC) commented that the AFSC continued to store otoliths in glycerin. The AFSC sent samples with both degraded and intact otoliths to Seattle University for analysis with the goal of determining the reasons for the degradation.

10:19 (15-minute break)

9. CARE recommends that the Charter Working Group revise the Charter and submit it to CARE membership for approval by the 2019 meeting; changes to include information on timelines including the preparation of the TSC report following the same year CARE meeting:

Kevin McNeel noted that this was resolved by including an executive summary to TSC of the previous meeting. CARE could consider adding a due date of April 20th to the Charter for the executive summary.

- b. Submission of production numbers (species aged table); to include timelines above.

Kevin suggested adding to the Charter a deadline of the Friday after a CARE meeting for submitting production numbers.

- c. Chair coordination with host agency regarding meeting logistics.

CARE needed to follow up with the Charter Working Group to see if this was added and CARE should consider not including it.

10. CARE recommends that the Sablefish Ad Hoc Working Group produce a final report summarizing their work to be published on the CARE website by the 2019 meeting with possible publication as a formal report.
This report was not written.
11. CARE recommends that a Skate Ad Hoc Working Group be created for standardization of age determination methods; this project already has funding through NOAA Fisheries.
This working group was formed, and work was completed.
12. CARE recommends that a Rougheye/Blackspotted/Shortraker Rockfish Ad Hoc Working Group be created for addressing mixed sample issues involving these three, long-lived species and possibly other slope rockfish species.
Betty Goetz (AFSC) offered to write a report summarizing progress, and the working group planned to meet at the 2019 CARE meeting to discuss progress.
13. CARE recommends posting a list of maximum ages on the CARE website (or link to lists on AFSC and ADF&G/ADU-Juneau, websites). Recommends developing a process to update maximum ages including a CARE age structure exchange between appropriate agencies (age structure exchange may be done at CARE meetings to minimize transport and maximize efficiency).
Kevin McNeel (ADF&G-Juneau) offered to email a link to the ADF&G maximum age website and suggested that CARE members could send maximum ages data to update the site.

B. CARE to TSC 2017 (see page 25 in the 2017 CARE Meeting Minutes)

1. CARE recognizes that otolith storage was approved as a 2017–2021 research priority for the North Pacific Management Council. CARE appreciates that TSC recognizes that CARE members are experts in the field of otolith reading and otolith storage and are thus best

suitied to develop and use best practices. As requested by TSC, CARE has initiated this process to document structures and storage methods currently in use (by species and agency) with information on their benefits and deficits. This request has been addressed by creating an ad hoc working group to report on current procedures for short and long-term storage of otoliths by CARE agencies and produce a document to support this research priority.

CARE should document the agency progress noted above and present that to TSC.

C. TSC to CARE 2017/2018 (see pages 23 and 533 in 2018 TSC Meeting Minutes)

2017

1. Ask CARE to review yelloweye rockfish ageing again.

2018

1. Progress on 2017's Recommendations from TSC to CARE: CARE did not directly respond to storage recommendations and CARE will carry on with this recommendation this year and develop a working group to standardize otolith storage.
2. 2018 Recommendation: carryover the review of yelloweye ageing. Encourage the use of otolith morphometrics to separate out cryptic species and expand the current working group to extend to other species. Encourage CARE to evaluate the machine reading of otoliths as a valid method (i.e., NIR), with the concern that suitable criteria are met.

VII. Agency Reports [10:30–12:00] Representatives from each agency gave updates on activity since CARE 2017

A. AFSC – (Tom Helser)

Tom noted that two NPRB projects were underway:

1. Latitudinal variance of growth and reproduction of flatfish in the Bering Sea. This project was looking at far north areas not covered by surveys and asking the question, “is this new area changing the status of flatfish?” This project was wrapping up with publications coming soon.
2. NIR ageing of Bering Sea and Aleutian Island Pacific cod. This study was in progress with the University of Washington School of Fisheries, assessing the possible separation of Bering Sea and Aleutian Islands Pacific cod into separate stocks. The Aleutian Islands data was coming both from fisheries and from otoliths not historically aged. The study also was trying to gain efficiencies in generating rapid age assays. This study was underway and in its second year. Jordan Healy’s presentation was scheduled for Thursday. Initial results were good—not sure if NIR will supplant or supplement traditional methods. The method has promise, but there is no plan in place for changing the production model, which will need a 4- to 5-year plan to investigate.

Improve a stock assessment study—NOAA HQ approved this 2 years ago. Life history variation, NIR for longnose skates, bycatch is an issue. Not enough ages at the moment for a full assessment; NIR might assist with building a full stock assessment.

NOAA every 5 years funds new research and technology. This year operationalization of NIR was funded. This made available \$1.2 million between this and another project to develop and implement the technology to improve efficiencies in collection and data production. After the funding was received, NOAA formed a Strategic Initiative Development Team and hosted a workshop. The purpose of the initiative and workshop was to look across species and ecosystems to find where NIR technology could be applied. The team is concurrently working with CARE and is testing how predictive data will fare. Current progress is going to be presented on Friday.

Published a paper on ancient Pacific cod otoliths discovered in middens at two sites. The otoliths retrieved from archaeological digs retain their integrity and analyses were successful. From these collections, we are reconstructing Gulf of Alaska sea surface temps ~200 yrs (this includes the Little Ice Age) and work will be published in the Journal of Archaeological Science. We are now looking into another study that could reconstruct ~6000 years from layered middens. With laser ablation, they tracked warming periods using stable isotope studies which give sea surface temperatures over time.

Essential fish habitat work. Coastal Alaska sampling of Pacific cod cohorts bimonthly. Measure change in cohort strength through time and examine otoliths with oxygen isotopes. Look at change in growth over winter, thermal refuge areas.

The Age and Growth lab has roughly 15 employees on top of graduate students and a

prospective contractor to help with lab work and FT-NIR scanning. Dustin Nadjkovic is a new employee, Todd TenBrink was made full-time, Irina Benson was made a ZP3, and Kali Stone was made an FTE.

B. CDFO – (Steve Wischniowski)

2018

7 Full time agers

1 term

1 salmon data entry person

1 program manager

2019

7 Full time agers

0 term (potential term by April)

0 salmon data entry person

1 program manager

Darlene Gillespie and Shayne MacLellan alumnus status

1 extra position asked for

Retirement schedule

2019 Nora Crosby and Karen Charles

2021 Joanne Groot

2021 Mary-Jane Hudson

2023 Judy MacArthur

Species aged since last CARE meeting (2017):

<i>Sebastes aleutianus</i> (rougheye rockfish)	5,479
<i>Sebastes entomelas</i> (widow rockfish)	3,460
<i>Sebastes maliger</i> (quillback rockfish)	2,257
<i>Sebastes pinniger</i> (canary rockfish)	4,303
<i>Sebastes proriger</i> (redstripe rockfish)	667
<i>Sebastes ruberrimus</i> (yelloweye rockfish)	6,250
<i>Anoplopoma fimbria</i> (sablefish)	4,211
<i>Microstomus pacificus</i> (Dover sole)	1,346
<i>Ophiodon elongatus</i> (lingcod)	222
<i>Merluccius productus</i> (Pacific hake)	3,724
<i>Oncorhynchus tshawytscha</i> (Chinook salmon)	68,653
<i>Oncorhynchus keta</i> (chum salmon)	18,744
<i>Oncorhynchus kisutch</i> (coho salmon)	11,671
<i>Oncorhynchus nerka</i> (sockeye salmon)	38,905
<i>Clupea pallasii</i> (Pacific herring)	47,532
<i>Panopea generosa</i> (Pacific geoduck)	951
Total	218,375

Sclerochronology Lab (SCL) Otolith Washing Reference Collection

- SCL began to wash all otoliths in response to the deterioration issue

- ~14,000 of the 1.6 million have been washed so far—lots to go
- Reserved for term or casual employees

Validation Research

- eulachon—SIMS ¹⁸O validation was inconclusive, requires more statistical evaluation potential false negatives
- the initial concern of the utility of oxygen isotopes as a validation technique for a species documented as having a deep-water profile seem to be valid with the results of this study
- small otolith exchange with WDFW (Andrew Claiborne)
- Rocky Mountain ridged mussels—SIMS ¹⁸O validation completed and successful
- northern abalone, Olympia oysters, and spiny and smooth scallops to be SIM'ed
- Pacific cod-SIMS ¹⁸O validation—early life history
- shortspine/longspine thornyhead, roughey rockfish, shortraker rockfish
- isotopic oxygen to measure relative temperature difference
- isotopic carbon to measure change in metabolic rate
- isotopic nitrogen to measure trophic fractionation
- Potentially, these isotopes in harmony can identify a change in environmental condition and the influence it has on the on the growth and metabolic activity of the growth zones under scrutiny when compared to growth zones that reflect a “normal”* pattern that is typical for a specimen of this age at these depths
- Chinook salmon/coho salmon freshwater ageing issues
- Validation Technique: isotopic oxygen, elemental Ca:Sr and Ca:Br ratios

SCL Client Joint Research

- * Roughey/Blackspotted Rockfish—Species Discrimination by way of Otolith-Shape Analysis
- * Canceled—a lack of funding and the lack of structures from the central coast prevents the study from progressing.

C. IPHC – (Joan Forsberg)

Four halibut readers on site. Linda Gibbs retired. Primary ageing season June–October. Last year genetics lab added. Physiology study, reproductive study.

Genetics—fin clips taken with otoliths. Using these to ID sex to match to otolith ages.

Read 30k per year, most from commercial catch.

Storage—all in glycerin thymol. 9,400 clean pairs stored dry as a “clean” collection. Waiting for elemental analysis.

Using break and bake. Bake posterior ½. 4 years and under, use surface to age.

Two staff members went to IOS last year and presented. Those studies are being updated as well.

D. ADF&G – (Kevin McNeel)

There are four main groundfish age determination programs within the Alaska Department of Fish and Game: the Age Determination Unit or ADU (based in Juneau), the Kodiak ADF&G age lab, and the Homer commercial and sport age labs. Unfortunately, representatives from the other three labs were not able to attend. Kodiak was able to give a written update and Kevin McNeel presented that.

ADF&G-Kodiak

The Kodiak ADF&G age lab update was written by Sonya El Mejjati. The dockside program samples state managed groundfish and shellfish species that are harvested in Kodiak, Chignik, and South Alaska Peninsula areas. Groundfish species aged in Kodiak include Pacific cod (about 2,000 otolith samples for all management areas), black rockfish (1000 otoliths mainly from Kodiak), dark rockfish (500 otoliths mainly from the Kodiak), lingcod (opportunistic sampling) and a few miscellaneous rockfish species.

All age readers are generally employed within December and April (3–4 months season). In 2017, 2018, and 2019 there were three age readers: Joan Brodie (38 seasons), Mike Knutson (5 seasons), and El Mejjati (11 seasons).

Precision testing is done on 40% of all samples and on 100% of samples that are aged by new readers. All differences are resolved. The lab uses the break and burn method for rockfish. For Pacific cod, one otolith is broken, and the other is cut with an Isomet saw; halves of each otolith are baked rather than burned for 12 minutes at 400°F using a standard toaster to prevent otoliths from spitting material (a.k.a., bursting). The cutting and baking process is time consuming in general, but it ultimately saves time during age reading compared to burning individual otoliths.

Starting in 2017, morphometric measurements have been collected for all species (otolith length, width, and weight, excluding crystalized or broken otoliths). This information has helped identify outliers and errors in the age, species ID, or typos. At the 2018 CARE meeting, the Kodiak lab noted that Pacific cod otoliths are frequently difficult to age with incomplete and irregular material comprising the ageing surface of the otolith, and because of this contemplated switching to fin rays. After talking to other agencies that have used Pacific cod fin rays and attending a workshop on fin ray preparation at the 2018 CARE meeting, it was decided that logistically the fin ray method would take too much time given the limited seasonal work in the Kodiak lab. Additionally, after looking at a few fin ray slides and communicating with fin ray age readers, it appeared that there were as many uncertainties with the early years due to material reabsorption. The Kodiak lab will continue processing otoliths for Pacific cod.

ADF&G-Juneau

The ADF&G Age Determination Unit (ADU) is the statewide groundfish and invertebrate age reading program based in Juneau, Alaska. The ADU currently has two permanent staff, two seasonal staff, and interim personnel borrowed from adjacent ADF&G projects. Jodi Neil and Chris Hinds are the lab's dedicated age readers and Peter Fasolino is currently focused on weathervane scallop processing.

In 2017 and 2018, the ADU received approximately 10,000 otolith sets per year from Central and Southeast Gulf of Alaska commercial fisheries and survey samples. These collections represented approximately 15 species. During the 2017 and 2018 period, the ADU processed sablefish, lingcod, Pacific cod, yelloweye rockfish, black rockfish, shortraker rockfish, and rougheye rockfish and distributed approximately 8,200 ages per year.

For quality control, readers calibrate annually prior to processing samples. The samples are

tested with a 30% second read and outlying fish and otolith size-at-age checks. Currently, the ADU uses modeled fish length and otolith weight-at-age for lingcod, yelloweye rockfish, roughey rockfish, shortraker rockfish, shortspine thornyhead, and sablefish. During 2017 and 2018, the ADU participated in roughey rockfish exchanges with AFSC; yelloweye rockfish exchanges with WDFW, NWFSC, CDFO, and ADF&G-Homer; sablefish exchanges with the AFSC, NWFSC, and CDFO; a Pacific cod exchange with AFSC for training; and a lingcod exchange with WDFW.

For age related research, we completed the review of potential age structures for crustaceans (red king crab, snow crab, tanner crab, and spot shrimp). We found that band counts were near expected ages estimated based on size, and that a calcium binding dye (calcein) was retained in structures across molting. However, counts did not increase for crabs that no longer molted, the proportion of readable structures was low, and recent literature found that the entire structure was digested during molting in similar species. We are currently doing some histology work on the structures through molting, but further validation needs to be done. The ADU is continuing work on a Prince William Sound shortraker rockfish chronology and a shortraker/roughey rockfish otolith shape analysis. We worked with Bryan Black (University of Arizona) on cross-dating specimens and are waiting for time to collect more data. The ADU also initiated a North Pacific Research Board funded project on reconstructing reproductive histories of yelloweye rockfish through opercular hormone profiles in 2018. We sampled opercula and otoliths from female yelloweye rockfish collected during the NMFS Sablefish Longline Survey and are working with Baylor University to analyze increment progesterone, cortisol, and estradiol concentrations.

E. NWFSC – (Patrick McDonald)

Personnel

- Lance Sullivan left the ageing lab last fall (2018)
 - We have 4 full time age readers and one team lead (myself)
 - There are no plans at the moment to fill the last two age reader position that we lost
- Travel/Meetings/Workshops –
- We hosted WDFW to review yelloweye rockfish ageing (Sandra Rosenfield, Jennifer Topping, and Andrew Claiborne)
 - Tyler Johnson and I visited the AFSC to work with Beth Matta, Chris Gburski, and Morgan Arrington to learn how to age big skate.

Ageing species and numbers:

Species	Common Name	Year	N
<i>Atheresthes stomias</i>	arrowtooth flounder	2017	1,200
<i>Sebastes melanops</i>	black rockfish	2017	14
<i>Beringraja binoculata</i>	big skate	2018	636
<i>Sebastes pinniger</i>	canary rockfish	2017	4,534
<i>Sebastes crameri</i>	darkblotched rockfish	2017	863
<i>Ophiodon elongatus</i>	lingcod	2017	2,487
<i>Sebastes alutus</i>	Pacific Ocean perch	2017	2,861
<i>Eopsetta jordani</i>	petrale sole	2017	1,934
<i>Merluccius productus</i>	Pacific hake	2017	7,423
<i>Merluccius productus</i>	Pacific hake	2018	5,235

<i>Anoplopoma fimbria</i>	sablefish	2018	5,857
<i>Scorpaena guttata</i>	California scorpionfish	2017	95
<i>Sebastes ruberrimus</i>	yelloweye rockfish	2017	977
<i>Sebastes flavidus</i>	yellowtail rockfish	2017	761
Totals		2017/18	34,877

We double read over 11,000 structures in 2017 and 2018.

Projects:

- Tyler Johnson did some initial examinations looking at big skate caudal thorns (n=100) to determine the viability of their potential use for age determination. Due to the stock assessment cycle we spent a limited time on this project.
- We cored n=43 canary rockfish for ¹⁴C analysis.
- We collected ~300 paired otoliths/fin-ray structures to explore using only otoliths to age lingcod.

We were participants or initiators of several exchanges since the last CARE meeting (2017).

These include:

yelloweye rockfish—WDFW, ADF&G-Juneau, ADF&G-Homer, CDFO

canary rockfish—WDFW (18-005)

petrale sole—WDFW

sablefish—ADF&G-Juneau, AFSC, CDFO

big skate—AFSC

longnose skate—AFSC

F. WDFW – (Andrew Claiborne)

6 members on different species. John Sneva 1 day/week. Lucinda Morrow retired this year.

120k/year salmon, groundfish.

Exchanges, Pacific cod, petrale sole, yelloweye rockfish, lingcod, canary rockfish.

Taking on Cabezon and getting a bead on how to age and training on white sturgeon

New projects: population productivity, hatchery population forecast, data entry access to have data on hand.

1 temporary hire to enter historical ages.

WDFW's Fish Ageing Lab

Lance Campbell—Unit Lead

Andrew Claiborne—Age Lab Team Lead

Anna Hildebrandt—Age Lab and Otolith Lab

Sandra Rosenfield—Age Lab

Jenny Topping—Age Lab

John Sneva—Age Lab (part time)

Lucinda Morrow—Age Lab (retired July 2018)

Generally, business as usual. We are ageing approximately 120k samples per year and are primarily a production lab. Approximately 100k salmon and steelhead, and 20k groundfish. We received two new grants for 2019 including a project to investigate the relationship between marine growth, oceanographic factors, and productivity of Puget Sound chum salmon. Another grant is to explore early marine growth (from scales) as predictor of adult survival for Chinook

salmon. We also will be populating a salmon age database with historical ages. We are exploring ageing of cabezon and white sturgeon.

Exchanges: Pacific cod, petrale sole, yelloweye rockfish, lingcod, canary rockfish.

G. ODFW – (Lisa Kautzi)

Oregon Dept. Fish & Wildlife

- I'm the only age reader

2017—Focus on blue and deacon rockfish.

- An exchange of blue and deacon rockfish was made with the SWFSC
- We aged, imaged, and used shape analysis software to analyze deacon rockfish otoliths. The project compares otolith shape of near and offshore locations and will be combined with genetics analysis.

2018—Focus on cabezon

- I experimented with different preparation methods for cabezon to try and improve the readability of the otolith. I found it best to soak the otolith in 50% ethanol for at least a week and using break and burn to age them.
- A report draft was created comparing the ages of thin sections and break and burns, and the growth curve fits.

A total of 8,352 commercial, recreation, and special project fish were aged since the last CARE meeting. Species aged were:

- black rockfish: 3,132
- cabezon: 1,548
- blue/deacon rockfish: 3,672
- approximately 20% of samples are self-tested to check for consistency

Lunch 12:00–1:15

VIII. Scientific PowerPoint Presentations [2:00–2:30]

1. Andrew Claiborne—*Results of the Yelloweye Rockfish Exchanges: Comparison of Age Determinations From Alaska, British Columbia, and the Coasts of Washington and Oregon* (15 minutes)
2. Chris Hinds—*Importance of Juvenile Sablefish Growth and Methods of Estimation* (15 minutes)

IV. Topics for Discussion/New Business [1:15–2:00]

A. Symposia/Conferences since CARE 2017 meeting & upcoming

CARE members mentioned the meetings and symposia that they attended since the last meeting.

- Representatives from AFSC went to 2018 Western Groundfish
- Representatives from AFSC and IPHC went to 2018 International Otolith Symposium
- Representatives from Juneau Auke Bay Lab and ADF&G-Juneau went to 2018 Sablefish Summit
- Representatives from AFSC presented otolith growth research at the 2017 Wakefield

Symposium

Break 2:30–2:45

IX. Workshops, Working Groups, Hands-On Microscope Work [2:45–5:30]

A. Yelloweye Working Group

Tuesday, April 9, 2019, 2:45 pm to 5:30 pm
AFSC, Seattle, WA, Traynor Room

Participants:

Joanne Groot (CDFO)
Michele Mitchell (CDFO)
Chris Hinds (ADF&G-Juneau)
Jodi Neil (ADF&G-Juneau)
Sandy Rosenfield (WDFW)
Andrew Claiborne (WDFW)
Patrick McDonald (NWFSC)
Kevin McNeel (ADF&G-Juneau)

Age readers from CDFO, WDFW, ADF&G-ADU, and PSMFC aged specimens from the radiocarbon sample using images. Specific features discussed were identification of the 1st year, preferred aging axis, edge interpretation, splitting vs. banding of fine annuli in older specimens, and the importance of tracing annuli from the surface onto the cross-section to help identify checks and annuli.

B. Hands-On Microscope Work and Calibration (Traynor Room)

A total of 32 CARE attendees reviewed criteria for 5 different species across the three-day meeting. See Table 2 for a summary of the participants and targeted species.

Wednesday, April 10, 2019

X. Workshops, Working Groups, Hands-On Microscope Work [8:30–12:00]

A. Pacific Cod Working Group

Wednesday, April 9, 2019, 8:30 am to 10:30 am
AFSC, Seattle, WA, Room 2011

Participants:

Delsa Anderl (AFSC)
John Brogan (AFSC)
Charles Hutchinson (AFSC)
Beth Matta (AFSC)
Dustin Nadjkovic (AFSC)
Kali Stone (AFSC)
Chris Hinds (ADF&G-Juneau)
Jodi Neil (ADF&G-Juneau)
Kevin McNeel (ADF&G-Juneau)
Sandra Rosenfield (WDFW)

The Pacific Cod Working Group evaluated ages and images from the last exchange of ADF&G Pacific cod otoliths. Specifically, the group evaluated last annulus on/before the edge and whether spacing made sense compared to the spacing between the rest of the annuli. Participants also looked at different transects and the 1–2 check spacing.

B. Sablefish Working Group

Wednesday, April 9, 2019, 10:30 am to 12:00 pm
AFSC, Seattle, WA, Room 2011

Participants:

Delsa Anderl (AFSC)
John Brogan (AFSC)
Dustin Nadjkovic (AFSC)
Kali Stone (AFSC)
Nikki Atkins (NWFSC)
Jamie Hale (NWFSC)
Tyler Johnson (NWFSC)
Patrick McDonald (NWFSC)
Joanne Groot (CDFO)
Michele Mitchell (CDFO)
Chris Hinds (ADF&G-Juneau)
Kevin McNeel (ADF&G-Juneau)
Jodi Neil (ADF&G-Juneau)

The Sablefish Working Group reviewed images and ages of the resent sablefish exchanges between AFSC, CDFO, NWFSC, and ADF&G-Juneau. Also, the group came up with a plan to distribute the current collection of known-age sablefish otoliths in a larger exchange sample to prevent potential bias due to the specimens being known-age.

C. Big and Longnose Skate Working Group

Wednesday, April 10, 2019, 4:00 pm to 5:00 pm
AFSC, Seattle, WA, Imaging Room 1110

Participants:

Morgan Arrington (AFSC, UW)
Chris Gburski (AFSC)
Tyler Johnson (NWFSC)
Beth Matta (AFSC)
Patrick McDonald (NWFSC)

The Big and Longnose Skate Working Group began the skate ageing session viewing thin section images from vertebral centra on the imaging PC monitor which had been prepared by Morgan Arrington. The US west coast longnose skate (*Raja rhina*) specimen images were acquired with reflected light and image enhanced. We examined discrepancies between the AFSC and NWFSC from the CARE exchange conducted in winter 2018. Early growth years (0–1 year old) were viewed for consensus ageing. The intermedialia, corpus calcarea arms, edge,

birthmark increment, translucent versus opaque growth zones, and total length were used for age determination. For west coast collected longnose skate, it was surmised that the birthmark is closer in distance to the focus when compared to longnose skate collected from the Gulf of Alaska. To explain this difference, water temperature and timing for embryo development within the skate egg case may vary from these two regions with variances in life history events. Edge growth and seasonality (summer vs. fall collected) was discussed to estimate age and edge growth. One specimen was subsequently ranged due to the difficulty in age interpretation. Skate maturity stage (mature vs. immature) with respect to how it may affect appearance of growth zones was also discussed. Ontogenetic shift in diet may affect growth and maturity stage timing. Age 1–2 years old were also viewed. The ‘*Young Skate*’ section for ‘*Longnose Skate Ageing Procedures*’ from the CARE ageing manual was referenced to assist with ageing. Tyler showed west coast collected big skate (*Beringraja binoculata*) unstained vertebral thin sections (n=5) that we viewed with reflected light. Both age 1 or 2-year-old and age 3 or 4-year-old specimens were looked at for a consensus age. How to interpret growth patterns including splitting versus grouping, translucent growth zones, spacing, pre-annular checks, and thin section thickness were discussed. There were 5 participants from AFSC and NWFSC.

D. Hands-On Microscope Work and Calibration (Traynor Room)

See Table 2 for summary of attendees and focused species.

Lunch 12:00–1:15

XI. Recommendations [2:00–2:30]

A. 2019 CARE to CARE

1. Recommends that the CARE Manual Working Group (Elisa Russ, Betty Goetz, Jodi Neil, and Barb Campbell) finalize and add the following sections before the 2021 CARE meeting:
 - a. *Lingcod Otolith Ageing Procedures* section—written
 - b. *Sablefish Ageing Procedures* section—written
 - c. *Thin Sectioning Method* section under the *General Ageing Procedures*—written
 - d. Add *Baking Otoliths* section under *General Otolith Ageing Procedures*—not written
 - e. *Ergonomics* section including equipment checklist as appendix—written
2. Recommends that the CARE Manual Working Group continue the revision and expansion of the *CARE Manual on Generalized Age Determination* with the following sections drafted or revised for review and addition of edits to the manual by the 2021 CARE meeting:
 - a. *Walleye Pollock Ageing Procedures* section (use AFSC manual as starting point)
 - b. *Spiny Dogfish Ageing Procedures* section—summary of spiny dogfish age determination paper by Dr. Cindy Tribuzio, or a reference to the existing manual written by Dr. Tribuzio
 - c. *Rockfish Ageing Procedures* section
 - d. edit to avoid redundancy with *Thin Sectioning* section
 - e. revise/move information to *General Otolith Ageing Procedures* section where appropriate
3. Recommends that the CARE Manual Working Group remove current or recommended

documentation sections regarding changes to the CARE manual and remove the 2015 recommendation to add *Acknowledgements* section. Also, CARE members should submit archived editions of the CARE manual to the CARE Website Working Group for posting on the CARE website to preserve historical records.

4. Recommends that the CARE Website Working Group update and add the CARE Forum to the new website and discontinue the CARE searchable publication database (with continued support of the current endnote database). Additional recommendations for the website to be completed prior to the 2019 meeting are as follows:
 - a. Add information at the top of the *Species Information* page to “Check with specific agency about changes in historical techniques”; report that “Methods listed are for most recent reporting year,” or adjust in conjunction with changes incorporated in Recommendation G.
 - b. Add table for agency contacts with e-mail address of agency leads and information on age readers and species; Add as a Google Ddoc and have agencies update information by end of Friday.
 - c. Update agency production numbers annually (update website with current production numbers by April 30, 2019), and Update *Species Information* page to include new codes for baking and burning.
 - d. Edit *Species Information* pages to fix capitalization and formatting.
 - e. Agencies should provide links to structure inventories to be accessible on the new website before CARE 2021
 - f. Posting a list or link to current lists of maximum ages on CARE website and develop a quality control process for new maximum ages (e.g., a CARE age structure exchange between appropriate agencies, potentially done at a CARE meeting to maximize efficiency).
5. Recommends that the CARE Otolith Storage Working Group document and distribute ongoing agency progress toward long term otolith storage issues to TSC before the 2021 meeting.
6. Recommends the CARE Charter Working Group evaluate and update the current CARE Age Structure Exchange invoice to potentially exclude quality control statistics and include better notation before CARE 2021.

B. 2019 CARE to TSC

CARE currently has no recommendations for TSC

XII. CARE Administrative Business [2:30–3:30]

- A. CARE Officer nominations
Chair: Delsa Anderl
Vice Chair: Andrew Claiborne
Secretary: Nikki Atkins

B. Schedule and location of 2021 meeting—Newport, OR

XIII. Workshops, Working Groups, Hands-On Microscope Work [3:30—4:30]

A. Hands-on microscope work and calibration (Traynor Room). See Table 2 for a summary of the participants and targeted species.

XIV. CARE Business Meeting Adjourns [4:30]

Thursday, April 11, 2019

XV. Working Groups and Hands-On Workshop Continuation [8:30–12:00]

A. Workshop—Rapid Estimation of Fish Age Using Fourier Transform-Near Infrared Spectroscopy (see attached schedule)

B. Shortspine Thornyhead Working Group

Participants:

Jodi Neil (ADF&G-Juneau)

Charles Hutchinson (AFSC)

Todd TenBrink (AFSC)

Goal: Discuss the otolith structure exchange between AFSC and ADF&G-ADU (initiated by AFSC) using unburned thin-sectioned specimens.

Both agencies annotated the images and we discussed these annotations as well as looked at a few additional unburned thin-sectioned specimens, and aged and annotated them as a group. The results of the annotated structure exchange suggested a slightly older pattern interpretation by AFSC age readers in comparison to the ADU age readers. We discussed the best counting pathway.(axis) to use (e.g., sulcus vs edge) and how to interpret the early years. Shortspine thornyhead growth patterns are noisy and checky in the early years so all readers agreed that using the surface was better, and that focusing on the sulcus was the best way to interpret these patterns.

A concern brought up by the AFSC age readers was whether darker areas in older specimens were compressed zones or fast growth larger zones, and how best to interpret these zones. In unburned thin sections, these zones appear as translucent bands within which the individual annuli are difficult to distinguish. We discussed the possibility that, at least for these older specimens, the thin section was not thin enough to clear up these translucent compressed areas.

We discussed the possibility of conducting a larger paired-structure exchange that would include both a broken and burned half, and an unburned thin-sectioned half from the same specimens—both agencies would contribute otoliths for the exchange. At the end of the meeting, Charles Hutchinson proposed that AFSC staff compile a list of questions and goals that they would like to achieve in the next structure exchange.

Friday, April 12, 2019

C. Rougheye/Blackspotted/Shortraker Rockfish Working Group

Participants:

Charles Hutchinson (AFSC)

Steve Wischniowski (CDFO)

Kevin McNeel (ADF&G-Juneau)

Notes from 2017 CARE meeting: several agencies are dealing with this ‘mixed bag’ problem. Three in particular (AFSC, ADF&G and CDFO) are aware of the potential, and others (NWFSC, WDFW) may have the problem but are currently unaware of any specific problems with species identification in their collections as they are just starting to calibrate on this species group. We have some tools to develop (Kevin’s R-based approach of otolith shape discrimination and Harris/Hutchinson rougheye/blackspotted rockfish shape morphometric project) that may help with this problem. It was suggested that a Working Group could potentially address this question from a more formal perspective and perhaps gain funding/prioritization via TSC. We need to prioritize collection and analysis of more vouchered shortraker rockfish via DNA analysis. Rougheye/Blackspotted/Shortraker Rockfish Working Group = Charles Hutchinson (lead), Betty Goetz (AFSC), Irina Benson (AFSC), Tom Helser (AFSC). Other agencies: Kevin McNeel, Elisa Russ, Joanne Groot (CDFO), Stephen Wischniowski

AGENCY PROJECT STATUS REPORTS 2019

AFSC—Two projects are currently addressing this situation with Alaskan samples. Problem blackspotted/rougheye/shortraker rockfish mixed observer sample (Betty Goetz) - An observer collection of rougheye rockfish was submitted for ageing (B30713A) (n = 307) and initial testing suggested a potential problem with mixing. Some otoliths appear to have characteristics which suggested that they might be shortraker rockfish. We also knew that rougheye samples were typically mixes of blackspotted and rougheye rockfish. Although we already have a research plan to separate blackspotted rockfish from rougheye rockfish, this identification protocol requires ages and we do not yet have reliable ageing criteria for shortraker rockfish. The model developed would not assist in the separation of a third species. To address this problem, we have done the following: ImagePro morphometrics and otolith weights have been taken from all otoliths in the problem cruise. ImagePro morphometrics and otolith weights have been taken from DNA vouchered blackspotted and rougheye rockfish used in the blackspotted/rougheye rockfish separation model. A selection of smaller shortraker rockfish collected from surveys (not observer samples) have been accessed and are ready for morphometric measurement/otolith weight. Blackspotted/Rougheye Rockfish otolith separation model (Charles Hutchinson) -

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corrections using a small sample size of genetically verified species. The genetic results found a significant proportion of the rougheye rockfish were blackspotted rockfish and an automated shape analysis using R could significantly identify specimens within the genetic collection. However, use of the model for otoliths outside of the genetically verified specimens did not work, because of the small sample size. The ADU is seeking to continue this work and to verify results using results from the AFSC models and future work by CDFO to improve the current shape identification or species correction procedures done at the ADU.

CDFO—Looking at cost cutting measures to reduce DNA charges for the identification of the Blackspotted/Rougheye Rockfish complex. 704 blackspotted/rougheye rockfish otoliths were collected from all groundfish surveys in 2018, all structures were genetically identified by the Molecular Genetics Lab at Pacific Biological Station. All structures were aged, imaged, and weighed. A small subsample (~70) was tested during the 2019 CARE workshop in Seattle, WA. Both techniques were employed, i.e., Kevin McNeel’s R-based approach of otolith shape discrimination and the Jeremy Harris/Charles Hutchinson rougheye/blackspotted rockfish shape morphometric project. Unfortunately, time constraints worked against us and we were unable to determine the errors that were generated in the Harris/Hutchinson approach using ImagePro software. However, the R-based approach provided results that indicate that otolith shape is a viable means of determining species within this complex for fish caught off the west coast of Vancouver Island. The SCL is looking to incorporating both otolith weight and shape imagery during the age estimation process for all its species. This as a means increase the QA/QC before submitting age estimates to its clients.

CARE Social at the Elliot Bay Brewing Company (5:30–9:00)

Table 1. Attendees of the CARE Conference, April 9–11, 2019, Seattle, Washington, U.S.A.

Last Name	First Name	Agency	Location	Country	Contact
Anderl	Delsa	AFSC	Seattle	USA	delsa.anderl@noaa.gov
Arrington	Morgan	AFSC/UW	Seattle	USA	morgan.arrington@noaa.gov
Atkins	Nikki	NWFSC/PSMFC	Newport	USA	nikki.atkins@noaa.gov
Brogan	John	NOAA/AFSC	Seattle	USA	john.brogan@noaa.gov
Claiborne	Andrew	WDFW	Olympia	USA	andrew.claiborne@dfw.wa.gov
Forsberg	Joan	IPHC	Seattle	USA	joan.forsberg@iphc.int
Gburski	Chris	AFSC	Seattle	USA	christopher.gburski@noaa.gov
Goetz	Betty	AFSC	Seattle	USA	betty.goetz@noaa.gov
Groot	Joanne	CDFO	Nanaimo	Canada	joanne.groot@dfo-mpo.gc.ca
Hale	Jamie	NWFSC/PSMFC	Newport	USA	james.hale@noaa.gov
Helser	Thomas	NOAA/AFSC	Seattle	USA	thomas.helser@noaa.gov
Hildebrandt	Anna	WDFW	Olympia	USA	anna.hildebrandt@dfw.wa.gov
Hinds	Chris	ADF&G	Juneau	USA	chris.hinds@alaska.gov
Hutchinson	Charles	NOAA/AFSC	Seattle	USA	charles.hutchinson@noaa.gov
Johnson	Tyler	NWFSC/PSMFC	Newport	USA	tyler.johnson@noaa.gov
Johnston	Chris	IPHC	Seattle	USA	chris.johnston@iphc.int
Kastelle	Craig	NOAA/AFSC	Seattle	USA	craig.kastelle@noaa.gov
Kautzi	Lisa	ODFW	Newport	USA	lisa.a.kautzi@state.or.us
Matta	Beth	AFSC	Seattle	USA	beth.matta@noaa.gov
McBride	Richard	NOAA/NEFSC	Woods Hole	USA	richard.mcbride@noaa.gov
McDonald	Patrick	NWFSC/PSMFC	Newport	USA	pmcdonald@psmfc.org
McNeel	Kevin	ADF&G	Juneau	USA	kevin.mcneel@alaska.gov
Mitchell	Michele	CDFO	Nanaimo	Canada	michele.mitchell@dfo-mpo.gc.ca
Nadjkovic	Dustin	NOAA/AFSC	Seattle	USA	dustin.nadjkovic@noaa.gov
Neidetcher	Sandi	NOAA/AFSC	Seattle	USA	sandi.neidetcher@noaa.gov
Neil	Jodi	ADF&G	Juneau	USA	jodi.neil@alaska.gov
Pearce	Julie	AFSC	Seattle	USA	julie.pearce@noaa.gov
Piston	Charlie	AFSC	Seattle	USA	charlie.piston@noaa.gov
Rasmuson	Leif	ODFW	Newport	USA	leif.k.rasmuson@state.or.us
Rosenfield	Sandra	WDFW	Olympia	USA	sandrарosenfield@dfw.wa.gov
Rudy	Dana	IPHC	Seattle	USA	dana.rudy@iphc.int
Short	Jon	NOAA/AFSC	Seattle	USA	jon.short@noaa.gov
Stone	Kali	AFSC	Seattle	USA	kali.stone@noaa.gov
TenBrink	Todd	NOAA/AFSC	Seattle	USA	todd.tenbrink@noaa.gov
Wischniowski	Stephen	CDFO	Nanaimo	Canada	stephen.wischniowski@dfo-mpo.gc.ca

Table 2. 2019 CARE Hands-On Sessions – Species Aged, Participants, and Agency.

Species	Participants	Agency	Comments		
shortspine thornyhead	Charles Hutchinson	AFSC	calibration		
	Jodi Neil	ADF&G-Juneau			
	Todd TenBrink	AFSC			
longnose skate	Morgan Arrington	AFSC, UW	calibration		
	Chris Gburski	AFSC			
	Tyler Johnson	NWFSC-PSMFC			
	Beth Matta	AFSC			
	Patrick McDonald	NWFSC-PSMFC			
sablefish	Delsa Anderl	AFSC	calibration		
	Nikki Atkins	NWFSC-PSMFC			
	John Brogan	AFSC			
	Joanne Groot	CDFO			
	Jamie Hale	NWFSC-PSMFC			
	Chris Hinds	ADF&G			
	Tyler Johnson	NWFSC-PSMFC			
	Patrick McDonald	NWFSC-PSMFC			
	Kevin McNeel	ADF&G			
	Michele Mitchell	CDFO			
	Dustin Nadjkovic	AFSC			
	Jodi Neil	ADF&G			
	Kali Stone	AFSC			
	Pacific cod	Delsa Anderl		AFSC	calibration
		John Brogan		AFSC	
Chris Hinds		ADF&G			
Beth Matta		AFSC			
Kevin McNeel		ADF&G			
Dustin Nadjkovic		AFSC			
Jodi Neil		ADF&G			
Sandra Rosenfield		WDFW			
cabezon	Kali Stone	AFSC	calibration		
	Lisa Kautzi	ODFW			
	Sandra Rosenfield	WDFW			

Table 3. CARE age structure exchanges initiated in 2018.

Exchange ID	Species	Originating Agency	Coordinator	Participating Agency
18-010	big skate	NWFSC-PSMFC	Tyler Johnson	AFSC
18-004	canary rockfish	WDFW	Jennifer Topping	NWFSC
18-005	canary rockfish	NWFSC	Patrick McDonald	WDFW
18-006	longnose skate	AFSC	Beth Matta	NWFSC
18-002	Pacific cod	ADF&G-ADU	Jodi Neil	AFSC
18-001	sablefish	NWFSC	Patrick McDonald	NWFSC, ADF&G-ADU, AFSC, CDFO
18-003	sablefish	AFSC	John Brogan	NWFSC, ADF&G-ADU, AFSC, CDFO
18-007	sablefish	ADF&G-ADU	Jodi Neil	NWFSC, ADF&G-ADU, AFSC, CDFO
18-008	sablefish	CDFO	Barb Campbell	NWFSC, ADF&G-ADU, AFSC, CDFO
18-009	yelloweye rockfish	ADF&G-Homer	Elisa Russ	ADF&G-ADU

Figure 1: Attendees of the 2019 CARE Conference, April 9–11, 2019 Group Photo



APPENDIX-I: 2019 CARE Agenda



CARE 2019 Agenda Twentieth Biennial Meeting of the Committee of Age Reading Experts

Working Group of the Canada – US Groundfish
Committee TSC AFSC Sand Point Facility, NOAA
Western Regional Center
**7600 Sand Point Way, NE, Seattle, WA,
USA Bldg. #4, Jim Traynor Conference
Room 2076 April 9 – 11, 2019**

Tuesday, April 9, 2019

1. Call to Order [8:30 am] – CARE Chair (Kevin McNeel)

2. Host Statement

7. Welcome statements & host info: safety/security orientation, refreshments, social. etc.
(Tom Helsler-Age & Growth Program Director)

3. III. Introductions

1. Round-table intro (name, agency, location)
2. Attendance-address, phone, email (written list distributed)

V. Approval of 2019 Agenda

4. Working Group Reports [9:00 – 9:45] Activity since CARE 2015 (~ 5 min each)

- XVI. TSC Meeting 2018 (Kevin McNeel)
- XVII. Age Structure exchanges (Kevin McNeel)
- XVIII. Website (Jon Short)
- XIX. CARE Forum (Nikki Atkins)
- XX. CARE Manual (TBD)
- XXI. Charter Committee (TBD)

5. CARE & TSC Recommendations [9:45 – 10:15]

6. CARE to CARE 2017 (see pages 23 & 24 in 2017 CARE Meeting Minutes)
7. CARE to TSC 2017 (see page 25 in 2017 CARE Meeting Minutes)
8. TSC to CARE 2017/2018 (see pages 533 and 23 in 2018 TSC Meeting Minutes)

Break 10:15 – 10:30

9. Agency Reports [10:30 – 12:00] Activity since CARE 2017 (~ 5 min each)

1. CDFO – (Steve Wischniowski)
2. IPHC – (Joan Forsberg)
3. AFSC – (Tom Helser)
4. ADF&G – (Kevin McNeel)
5. NWFSC – (Patrick McDonald)
6. WDFW – (Andrew Claiborne)
7. ODFW – (Lisa Kautzi)
8. Additional Attending Agencies

Lunch 12:00 – 1:15

10. Topics for Discussion/New Business [1:15 – 2:00]

1. Symposia/Conferences since CARE 2017 meeting & upcoming
2. Agency updates & verification of sp. info on CARE website
3. Non-agenda items

11. Scientific PowerPoint Presentations [2:00 – 2:30]

1. Andrew Claiborne, *Results of the yelloweye rockfish exchanges: comparison of age determinations from Alaska, British Columbia, and the coasts of Washington and Oregon* (15 min)
2. Chris Hinds, *Importance of juvenile sablefish growth and methods of estimation* (15 min)

Break 2:30 – 2:45

12. Workshops, working groups, hands-on microscope work [2:45 – 5:30]

1. Yelloweye Working Group [2:45 – 5:30]
2. Working Groups (Traynor Room and Room 2079)
3. Hands-on microscope work and calibration (Traynor Room)

a. Wednesday, April 10, 2019

13. Workshops, working groups, hands-on microscope work [8:30 – 12:00]

1. Sablefish Working Group [10:30 – 12:00]
2. Working Groups (Traynor Room and Room 2079 available all day)
3. Hands-on microscope work and calibration (Traynor Room)
--- Posters available for viewing during breaks from other tasks all day---

Lunch 12:00 – 1:15

14. Recommendations [2:00 – 2:30]

3. 2019 CARE to CARE
4. 2019 CARE to TSC

15. CARE Administrative Business [2:30 –3:30]

1. Officer nominations
2. Schedule and location of 2019 meeting

16. Workshops, working groups, hands-on microscope work [3:30 – 5:30]

1. Working Groups (Traynor Room and Room 2079 available all day)
2. Hands-on microscope work and calibration (Traynor Room)
--- Posters available for viewing during breaks from other tasks all day---

17. CARE Business Meeting Adjourns [4:30]

a. Thursday, April 11, 2019

18. Working groups & Hands-on Workshop Continuation [8:30 – 12:00]

1. Workshop- Rapid Estimation of Fish Age Using Fourier Transform-near Infrared Spectroscopy (see attached schedule)
2. Working Groups – additional time available to meet and schedule tasks for 2019
3. Hands-on Workshop – dual microscopes available for calibration work until noon
4. Workshops – additional time if needed

CARE Social at the Elliot Bay Public House & Brewery -see sign-up sheet and directions (5:30-9:00)

APPENDIX-II



NOAA Fisheries, Alaska Fisheries Science Center, Western Regional Center, Building 4, Traynor Room 2076, 7600 Sand Point Way, NE, Seattle WA 981093, April 11th & 12th, 2019

Thursday, April 11, 2019

- 9:00 Welcome, introductions and workshop purpose (T. Helser – FT-NIR SIDT Chair)
- 9:30 *Introduction to NIR and FT-technology.* Jason Erickson, Applications Scientist, Bruker Optics.
- 10:00 *Data preprocessing for quantitative and qualitative models based on NIR spectroscopy.* Barry Wise, President, Eigenvector Research, Inc.
- 10:30 *Applications of near infrared spectroscopy to questions in animal physiology.* Carrie Vance, Professor, Mississippi State University.
- 11:00 coffee Break
- 11:20 *Near infrared reflectance spectroscopy detection of male northern dusky salamanders (*Desmognathus fuscus*) response to female pheromones.* Mariana Santos-Rivera, Mississippi State University.
- 11:40 *Predicting fish age at the speed of light.* Brett Wedding, Principle Scientist, Agri-Science Queensland Government, Australia.
- 12:00 Morning discussion and wrap up
- 12:30 Lunch and tour of the AFSC Spectroscopy Laboratory
- 14:00 *Age prediction of Gulf of Mexico red snapper using near infrared spectroscopy.* Beverly Barnett, Fishery Biologist, Southeast Fisheries Science Center, Panama City Laboratory.
- 14:20 *Using FT-NIR to predict daily ages in juvenile red snapper.* Michelle Passerotti, Ph.D. Candidate, University of South Carolina.
- 14:40 *Case study of FT-NIR spectroscopy for Bering Sea Pacific cod stocks.* Jordan Healy, M.S. Candidate, University of Washington.
- 15:00 *Application of near FT-NIR spectroscopy for Gulf of Alaska longnose skate vertebrae.* Morgan Arrington, M.S. Candidate, University of Washington.
- 15:20 *Anadromous chinook salmon otoliths ageing using near infrared spectroscopy.* Andrew Claiborne, Fishery Biologist, Washington Department of Fish and Game.
- 15:40 Coffee Break
- 16:00 *FT-NIR spectroscopy ageing of Bering Sea walleye pollock: Wavelengths to population parameters.* Irina Benson, Research Fishery Biologist, Alaska Fisheries Science Center, Age and Growth Laboratory.
- 16:20 Discussion and session wrap up.

Workshop Social: TBD

Friday, April 12, 2019

- 9:00 *Precision and accuracy metrics for ageing QA/QC: what is behind the numbers.* Richard McBride, Branch Chief, Population Biology, Northeast Fisheries Science Center, Woods Hole Laboratory.
- 9:30 *Ageing outputs in stock assessments in Queensland-focus on fisheries concerns moving the technology forward.* Julie Robins, Research Scientist, Department of Fisheries and Agriculture, Queensland, Australia.
- 10:00 *A new paradigm of FT-NIR age estimation and challenges in U.S. stock assessments.* TBD, Stock Assessment Scientist, Resource Ecology and Ecosystem Modeling, Alaska Fisheries Science Center.
- 10:30 *Operationalizing FT-NIR ageing enterprise in NOAA Fisheries: A conceptual pathway forward.* Thomas Helser, Supervisory Research Fishery Biologist, Alaska Fisheries Science Center, Age and Growth Laboratory.
- 11:00 *Report of the week's FT-NIRS multispecies analysis by the Strategic Initiative Development Team.* Discussion facilitated by T.E. Helser.
- 12:30 Lunch
- 14:00 Discussion of detailed strategic initiative work plan and report to NOAA Fisheries Science Board.
- 1) Group discussion – likelihood of success for implementing FT-NIRS ageing of fish from otoliths
 - 2) Impediments to success - Prioritization and execution of central scientific questions to be answered
 - 3) Unique requirements of NIR technology in fisheries science and its scalability
 - 4) Implementation time lines for strategic initiative work plan

APPENDIX-III



CARE Meeting 2019

April 9-11, 2019

NOAA, Western Regional
Center, Alaska Fisheries Science
Center, Sand Point, Seattle, WA

CALL FOR PRESENTATIONS & POSTERS

The Committee of Age Reading Experts is pleased to announce the Call for Presentations and Posters for the 2019 CARE Meeting.

While no specific theme has been designated, topic sessions can focus on current research and the 2018 TSC recommendations: yelloweye rockfish, differentiating cryptic species, and evaluating machine reading of otoliths.

Please submit abstracts by Friday, March 8, 2019 to Kevin McNeel, CARE Chair:

kevin.mcneel@alaska.gov

Submit abstract as a Word document (preferably) and include the following information:

- Type of presentation (oral or poster)
- Title
- First and Last Name of Author(s)
 - Include any preferred appellation (e.g. Dr. or Ph.D.)
 - Name of Presenter (if more than one author)
 - Include any affiliations (spell out agency), city, country, and e-mail
- Text of abstract in 250 words or less
- Amount of time needed for presentation (maximum of 20 minutes-including questions)

The CARE meeting includes presentations, age reader calibration, workshops and workgroup meetings, held April 9-11, 2019. Presentation titles and abstracts will be published online in CARE the minutes.

- Oral presentations-Tuesday (afternoon), April 9th
- Poster presentation- will be displayed throughout the meeting

CARE Website: <http://care.psmfc.org>

APPENDIX-IV



Nineteenth Biennial Meeting of the Committee of Age Reading Experts

Working Group of the Canada – US Groundfish Committee TSC

AFSC Sand Point Facility, NOAA Western Regional Center

April 4 – 6, 2017

Abstracts

Type of Presentation: Oral

Title: Results of the yelloweye rockfish exchanges: comparison of age determinations from Alaska, British Columbia, and the coasts of Washington and Oregon

Authors and affiliation:

Andrew Claiborne¹

¹Washington Department of Fish and Wildlife, 1111 Washington St SE Olympia WA, 98501

Abstract:

Yelloweye rockfish are an ecologically and commercially important species from Alaska to central California and one of the longer-living rockfish with a reported maximum age of 147. Several agencies and members of the Committee of Age Reading Experts (CARE) produce age estimates for yelloweye rockfish across their range, yet few CARE sample exchanges have occurred in the last two decades. Here we compare age estimates independently made between 5 laboratories with samples originating from Alaska to California. Overall, age estimates agreed between readers for yellow eye up to age-30. However, bias between labs was clear for ages ranging from 40 to 120. CARE exchange results are discussed in the context of the 2017 stock assessment of yellow eye in the federal and state waters of Washington, Oregon, and California, and recommendations to further validate ages of yelloweye rockfish.

Type of Presentation: Oral

Title: The importance of juvenile sablefish growth and methods of estimation

Authors and affiliation:

Wess Strasburger¹, Chris Hinds²

¹ Auke Bay Laboratories, Alaska Fisheries Science Center, National Oceanic and Atmospheric Administration, United States Department of Commerce, 17109 Point Lena Loop Road, Juneau, AK 99801

²Alaska Department of Fish & Game, Division of Commercial Fisheries, Mark, Tag and Age Laboratory, Juneau, AK 99811

Abstract:

Gulf of Alaska sablefish biomass has declined since 1988 with only a few strong year classes supporting the fishery. Studies suggest that juvenile sablefish growth may be a better indicator of recruitment than spawning stock biomass, but that has not been studied in Alaska. To compare juvenile growth with recruitment and environmental factors, we developed three objectives: (1) compare daily increment counts between the lapillus

and sagitta otoliths to ensure that results using either otolith are comparable; (2) compare objective fish and otolith measurements to highlight growth differences across conditions; and (3) model growth rates across environmental and ecological conditions using daily increment widths and relate that to recruitment events. To compare lapillus and sagitta otoliths, samples from the 2014, 2016, 2017 National Marine Fisheries Surface Trawl were mounted to petrographic slides and polished using sand paper and lapping film to image daily growth bands. Using image analysis software, we found no difference between lapillus and sagitta daily growth counts ($-0.75 + 7.2$ SD differences between structures) and estimated an average hatch date of April 12th. Our preliminary analysis supports that there is no difference between daily counts for each structure and we will focus on the lapillus for the remainder of the study. To preliminarily compare objective otolith measurements, we took images of unpolished otoliths from the trawl samples and measured lapillus and sagitta otolith length and height using image analysis. We found a positive relationship between lapillus and sagitta otolith diameters and fish length and will further investigate this relationship across controlled environmental factors (temperature and food ration) to look for objective differences in otolith growth using fish that were reared at Auke Bay Laboratories. To model growth rates, juvenile sablefish otoliths from 1997-2018 Middleton Island rhinoceros auklet bill loads will be processed to estimate juvenile growth spanning over 20 years and juveniles reared at Auke Bay Laboratories in a controlled temperature and feeding study will be used to interpret and validate results. Given preliminary results from objectives 1 and 2, we will focus on processing lapillus from bill load samples and will continue to collect daily increment counts, otolith length and height measurements, and otolith increment widths to improve evaluation of objectives 2 and 3.

APPENDIX-V

Rougheye/Blackspotted/Shortraker Rockfish Working Group Report 2019

Notes from 2017 CARE meeting: Several agencies are dealing with this ‘mixed bag’ problem. Three in particular (AFSC, ADF&G and CDFO) are aware of the potential, and others (NWFSC, WDFW) may have the problem but are currently unaware of any specific problems with species identification in their collections as they are just starting to calibrate on this species group. We have some tools to develop (Kevin’s R-based approach of otolith shape discrimination and Harris/Hutchinson rougheye-blackspotted shape morphometric project) that may help with this problem. It was suggested that a working group could potentially address this question from a more formal perspective and perhaps gain funding/prioritization via TSC. We need to prioritize collection and analysis of more vouchered shortraker via DNA analysis. RE/BS/SR RF Working Group = Charles Hutchinson (lead), Betty Goetz, Irina Benson, Tom Helser. Other agencies: Kevin McNeel, Elisa Russ, Joanne Groot, Stephen Wischniowski

AGENCY PROJECT STATUS REPORTS 2019

AFSC – Two projects are currently addressing this situation with Alaskan samples.

Problem Blackspotted/rougheye/shortraker mixed observer sample (Betty Goetz) - An observer collection of rougheye rockfish was submitted for ageing (B30713A) (n = 307) and initial testing suggested a potential problem with mixing. Some otoliths appear to have characteristics which suggested that they might be shortraker rockfish. We also knew that rougheye samples were typically mixes of blackspotted and rougheye rockfish. Although we already have a research plan to separate blackspotted rockfish from rougheye rockfish, this identification protocol requires ages and we do not yet have reliable ageing criteria for shortraker rockfish. The model developed would not assist in the separation of a third species. To address this problem, we have done the following:

- (1) ImagePro morphometrics and otolith weights have been taken from all otoliths in the problem cruise.
- (2) ImagePro morphometrics and otolith weights have been taken from DNA vouchered blackspotted and rougheye rockfish used in the Blackspotted/rougheye rockfish separation model.
- (3) A selection of smaller shortraker rockfish collected from surveys (not observer samples) have been accessed and are ready for morphometric measurement/otolith weight.

Blackspotted/Rougheye Rockfish otolith separation model (Charles Hutchinson) -

ADF&G – The Alaska Department of Fish & Game has a consistent collection of shortraker and mixed rougheye and blackspotted otoliths from Prince William Sound, Alaska. Historically, the Alaska Department of Fish & Game Age Determination Unit (ADU) submitted species corrections to regional samplers based on otolith morphology and growth patterns. The ADU was seeking to automate this procedure and look for significance of species corrections using a small sample size of genetically verified species. The genetic results found a significant proportion of the rougheye rockfish were blackspotted rockfish and an automated shape analysis using R could significantly identify specimens within the genetic collection. However, use of the model for otoliths outside of the genetically verified specimens did not work, because of the small sample size. The ADU is seeking to continue this work and to verify results using results from the AFSC models and future work by CDFO to improve the current shape identification or species correction procedures done at the ADU.

CDFO – Looking at cost cutting measures to reduce DNA charges to groundfish for the identification of the Blackspotted/Rougheye Rockfish complex. 704 Blackspotted/Rougheye otoliths were collected from all groundfish surveys in 2018, all structures were genetically identified by the Molecular Genetics Lab at PBS. All structures were aged, imaged and weighed. A small subsample (~70) was tested during the 2019 CARE workshop in Seattle, WA. Both techniques were employed, Kevin’s R-based approach of otolith shape discrimination and Harris/Hutchinson rougheye-blackspotted shape morphometric project.

Unfortunately, time constraints worked against us and we were unable to determine the errors that were generated in the Harris/Hutchinson approach using ImagePro software. However, the R-based approach provided results that indicate that otolith shape is a viable means of determining species within this complex for fish caught of West Coast Vancouver Island.

The SCL is looking at the incorporation of both otolith weight and shape imagery during the age estimation process for all its species. This as a means increase the QA/QC before submitting age estimates to its clients.