

Committee of Age Reading Experts

Minutes for the 22nd Meeting

April 3– 7, 2023

Alaska Fisheries Science Center, Seattle, WA



Monday, April 3, 2023

I. Call to Order [8:30 am] – Acting CARE Chair (Andrew Claiborne)

II. Host Statement (Tom Helser)

1. Welcome statements & host info: safety/security orientation, refreshments, social. Notes about safety: Guests should be escorted into building every day by AFSC staff; FT-NIRS workshop concurrent in building 9 auditorium; social times and locations; COVID safety – masks & sanitizer available, go virtual and notify immediately if sick.

III. Introductions

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

IV. Approval of 2023 Agenda

Agenda approved (overwhelming)

V. Working Group Reports [9:00 – 9:45] Activity since CARE 2019 (~ 5 min each)

1. TSC Meeting 2019 (Andrew Claiborne)

- Updated TSC on exchanges, website update, and the first FT-NIRS conference which had 36 attendees from 7 agencies. Updated TSC on yelloweye rockfish exchanges and there was discussion about otolith storage & glycerin thymol issues.
2. Age Structure exchanges (Andrew Claiborne)
 - 14 exchanges in 2022, 2 in 2021, 10 in 2020. In 2022 there were 5 black rockfish exchanges, 2 rougheye, 2 canary, 2 petrale sole, 1 yelloweye rockfish, 1 sablefish, and 1 lingcod exchange.
 3. Website (Jon Short)
 - Jon Short, Jamie Hale & Andrew Chin (website working group) worked on the website converting to a WordPress backbone. The website working group transitioned the forum, species info, structure exchanges and updated many design elements. The website working group would like to turn off the old website but want to make sure that everything is ported over. All CARE minutes and reports are on the CARE website.
 4. CARE Forum (Nikki Paige)
 - Reminder that the forum exists and is a good way to keep in contact if other methods are unavailable. Basic overview of how to sign up and get in contact with Nikki to make sure you're signed in properly.
 5. CARE Manual (Elisa Russ)
 - New sablefish and lingcod otolith section nearly complete. Kevin McNeel was added to the manual committee now consisting of Elisa Russ (ADFG Homer), Barb Campbell (CDFO) and Kevin McNeel (ADFG Juneau). Longnose skate section has new info to include. Plan to re-visit next steps in detail on Friday in the 2023 CARE-to-CARE recommendations.
 6. Charter Committee (Elisa Russ)
 - Time between meetings (CARE & TSC) is short and is sometimes a crunch; talked about meeting times and switching from odd to even years. Will revisit on Friday during CARE business.
 7. Lingcod Working Group (Mark Terwilliger and Andrew Claiborne)
 - Lots of structures gathered but few samples have been processed at this point. Info has been collated for the number of structures and what the labs have done with them so far and is stored on a google drive that available to all members of the working group. When ageing of otoliths and fin rays is complete, Leif Rasmussen has volunteered to work up the statistics. Kevin McNeel has shared the ADFG lingcod otolith ageing protocol and this is also the basis for the new

section in the CARE manual. A comment made was that ODFW growth patterns do not look like Alaska patterns and the manual section should be inclusive of lingcod throughout their range. Objectives of the working group and structure examination will be completed this week and results working group reported below.

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

1. CARE to CARE 2019 (see pages 25-27 in 2019 CARE Meeting Minutes)
 - CARE manual working group finalize sections on lingcod otolith ageing procedures; update sablefish ageing procedures; update to thin sectioning procedures; general otolith ageing procedures adding baking (needs some more info from other agencies); ergonomic equipment section; spiny dogfish section; rockfish ageing section & thin sectioning; remove changes to the manual section & acknowledge section; send archived sections to the website for safekeeping
 - Many 2019 recommendations are nearly complete, and some are ongoing. See CARE to CARE recommendations for 2023 for review and finalization timeline.
 - Website Working Group add forum to website (complete). Discontinue publication list (have kept references list). Add info to species info page including reporting that methods listed are for most recent year (not complete). Edit species info for formatting (complete). Update agency production numbers (complete).
 - All 2019 Website Working Group recommendations are nearly complete.
 - Agencies should provide links to structure inventories (not complete).
 - Not complete. Limits and uncertainties on how each agency can put information out to the public. For agencies that can share structure inventories (e.g., AFSC) provide link to inventory via CARE website link. For agencies that cannot share, add contact agency lead for data requests.
 - Table of max age info for species and validation for such.
 - This 2019 recommendation is not complete and pushing forward to 2023. See Friday new business for next steps.
 - CARE otolith storage working group
 - This 2019 working group's work is complete and the working group is disbanded.
2. CARE to TSC 2019 (None)
3. TSC to CARE 2019
 - Consider ageing lingcod otoliths as primary ageing structure.
 - This recommendation is ongoing. CARE is actively exploring this through the lingcod working group.
 - Create record of ageing methods as a learning tool.

- This recommendation is ongoing. Agencies are actively making video training tools although there are agency barriers and concerns to putting these on YouTube or other public platforms. AFSC has made the most progress with several videos made. Will review and watch during working groups.

Break 10:15 – 10:30

VII. Agency Reports [10:30 – 11:15] Activity since CARE 2022 (~ 5 min each)

1. CDFO – (Audrey Ty)

Since CARE 2021 Aged:

Common Name	Scientific Name	Group	2021-	2022-23	Total
Dover sole	<i>Microstomus pacificus</i>	flatfish	67	0	67
		subtotal	67	0	67
Rougeye rockfish	<i>Sebastes aleutianus</i>	rockfish	164	0	164
Pacific Ocean perch	<i>Sebastes alutus</i>	rockfish	2910	6129	9039
Yellowtail rockfish	<i>Sebastes flavidus</i>	rockfish	829	0	829
Quillback rockfish	<i>Sebastes maliger</i>	rockfish	917	241	1158
Canary rockfish	<i>Sebastes pinniger</i>	rockfish	1398	413	1811
		subtotal	6218	6783	13001
Sablefish	<i>Anoplopoma fimbria</i>	roundfish	2681	1239	3920
Lingcod	<i>Ophiodon elongatus</i>	roundfish	1557	169	1726
Hake	<i>Merluccius productus</i>	roundfish	581	1170	1751
		subtotal	4819	2578	7397

Total Groundfish			11104	9361	20465
Herring	<i>Clupea harengus pallasii</i>	pelagics	15927	13804	29731
Total Pelagics					29731
Chum	<i>Oncorhynchus keta</i>	salmonids	4212	5118	9330
Coho	<i>Oncorhynchus kisutch</i>	salmonids	4265	7995	12260
Sockeye/Kokanee	<i>Oncorhynchus nerka</i>	salmonids	18487	20046	38533
Chinook	<i>Oncorhynchus tshawytscha</i>	salmonids	31734	29842	61576
Total Salmonids			58698	63001	121699
Geoduck	<i>Panopea abrupta</i>	shellfish	454	969	1423
Total Shellfish					1423
Total Ages Produced			86183	87135	173318
Number of Agers	(Full-time Equivalent)		6.6	6	

We returned to ageing in our lab in July 2020. All Covid restrictions were removed by Autumn of 2022.

SCL Direct Data Entry (SCLDDE) App trial began with Pacific hake in December 2021. There were some adjustments to workflow and to the rigidity of the database format but now the majority of the increase in time in processing a sample is due to the additional time it takes to weigh and image the otolith before ageing it.

We have procured a FT-NIR machine and have begun scanning Pacific Ocean perch otoliths as our proof-of-concept test. Since August 2022, Steve Wischniowski has been in a research role and Audrey Ty has been acting manager.

One experienced ager retired end of March 2022. One novice ager resigned August 2022 to go back to school. We hired a new ager in August 2022. Two intermediate agers came back from Maternity leave: one in June 2022 and one in November 2022. We hired a new ager in January 2023 who will be filling in for the maternity leave of one of our intermediate agers starting April 2023.

At present the Sclerochronology lab has a low ratio of experienced to novice agers. We've introduced a new training plan that outlines a path to learn our core species progressing through the easiest group of species to the most difficult group of species. We've created a new position to create training manuals and train trainers as well as agers. This will help us catch up on the training that should have been prioritized earlier and help us transition faster to an ageing group with broad experience among most of its members.

2. IPHC – (Joan Forsberg)

The number of IPHC age readers was reduced from four to three in 2021. Together, readers age an average of 25,000 to 30,000 otoliths per year. In 2021, a total of 27,209 otoliths were aged. In 2022, a total of 25923 were aged.

Most otoliths are stored in glycerin solution immediately after collection. Recreational otoliths and otoliths from recovered tagged fish are dry when received and are cleared in glycerin solution for 3-4 weeks prior to aging. Most Pacific halibut are aged by break and bake, but small fish from the trawl survey are aged by surface. The IPHC office gradually began opening to onsite work for fully-vaccinated staff in the summer of 2021, however, most of the age reading continued offsite until spring 2022, and all readers have been onsite as of early March 2023. 2 current IPHC staff members will be trained in age reading this summer in anticipation of retirements. We received the new Tray Biens last fall and noticed that the lids are harder to put on. We are spray painting the bottoms blue to make otoliths more noticeable against the white plastic.

3. AFSC – (John Brogan)

Now a 2-supervisor program with ageing and research components. Delsa retired and John Brogan is the acting supervisor for the ageing team until the position is filled and Tom Helser is the supervisor for the research team. Andrew Chin was hired as an age reader. Since CARE 2019 meeting, we have produced 101,511 traditional otolith ages. We have completed new reference collections for Alaska plaice, dover sole, Greenland turbot, northern rockfish, Pacific cod, Pacific Ocean perch, rex sole, and walleye pollock. We have produced training videos for dover sole, Greenland turbot, northern rockfish, Pacific cod, sablefish, and yellowfin sole.

Pandemic was disruptive for the application development of FT-NIRS, nationwide. AFSC scanned a total of 89,567 otoliths and is assessing the integration of FT-NIRS produced ages of pollock and Pacific cod into stock assessments. We are also expanding FT-NIRS into examination of soft tissues to look at energy density and fish condition and for maturity studies.

Moving towards deep machine learning for predictive models and using google cloud for the computing environment. Jon Short is looking at using the database user interface and architecture to ingest FT-NIRS products. Other research, includes using ^{18}O isotopes to expand Pacific cod age validation, and as a proxy indicator for preference in habitat use by arctic cod

4. ADFG Homer Sportfish – (Marian Ford)

The ADF&G-Homer sportfish aging lab is part of the Southcentral Alaska Halibut and Groundfish Harvest Assessment program. The port sampling program collects biological samples including age structures (otoliths and fin rays) from groundfish species harvested by the sport fishery in Cook Inlet and Prince William Sound management areas. Samples are collected by field technicians in the ports of Homer, Anchor Point, Ninilchik, Seward, Kodiak, Whittier, and Valdez. The lab also receives black rockfish otoliths to age from the Southeast Alaska port sampling program.

The majority of production age reading is done by program biologist Marian Ford, with additional sample preparation and aging done by one seasonal technician, Tim Blackmon. Our program is supervised by Clay McKean out of the Anchorage office.

In 2022, the Homer lab prioritized the aging of black and yelloweye rockfish in response to an ADF&G Statewide Rockfish Initiative, but also aged dark, dusky, quillback, and other rockfish species as time allowed. A total of 2,640 otoliths were aged this season. Lingcod fin rays are cross-sectioned and mounted on slides for aging. A total of 467 fin ray slides were aged for the 2022 season. All halibut otoliths collected by our project are sent to the IPHC for aging.

Each season agers do calibration testing for each species before moving on to production age reading. Precision testing is done on 20% of all samples. In the last couple years, the Homer lab participated in a lingcod otolith/fin ray exchange with the ADU lab and participated in an interagency black rockfish otolith exchange.

5. ADFG Juneau – (Kevin McNeel)

ADF&G Age Determination Unit (ADU) is the statewide groundfish and invertebrate age reading program based out of Juneau, AK. The ADU currently has two permanent staff, two seasonal staff, and interim personnel borrowed from adjacent ADF&G projects. The ADU has had turnover and had one biologist (Cathy Mattson) and two technical staff (Mollie Dwyer, Juliet Harrison) go through the program. Currently, Chris Hinds, who is also leaving the program, Josh Dore, Mark Plumb, and Kevin McNeel are the primary groundfish age readers for the lab.

During 2022, the ADU received 9,057 otolith sets from Central and Southeast Alaska commercial and survey sampling. These collections represented approximately 12 species and during the 2019 and 2023 period, the ADU focused on processed sablefish, lingcod, Pacific cod, yelloweye, black, shortraker, rougheyeye rockfish, and weathervane scallops and distributed at least 10,000 ages per year. Historically, the ADU questioned conventional age methods for

Pacific cod, but internal and AFSC based research supported conventional methods and ADU staff trained with AFSC staff.

During processing, personnel measure and weigh 100% of otoliths for quality control and age estimates are compared to growth model intervals in addition to random subsets of second reads. Growth models consist of estimated fish length and otolith weight at age ranges for lingcod, black rockfish, yelloweye rockfish, roughey rockfish, shortraker rockfish, shortspine thornyhead, sablefish, and scallops. Estimated size-at-age values were developed from Ludwig von Bertalanffy and exponential growth models, and reasonable error ranges per size were entered into a database table. Further, personnel develop Shiny apps to look at fishery data to flag and address outliers. To work on criteria, the ADU concluded a roughey rockfish exchange with the Alaska Fisheries Science Center in Seattle, WA (AFSC) and a lingcod exchange with AFSC and ADF&G Homer-Sport, respectively. Also, the ADU continued work on a black rockfish exchange that is presented later.

For age related research, ADU personnel participated in the following projects:

In collaboration with Baylor University, personnel finalized the North Pacific Research Board funded project 1803: Reconstructing reproductive histories of yelloweye rockfish through opercular hormone profiles. Project results were published in Charapata et al. (2022) in Canadian Journal. Work to extract and understand hormone fluctuations in bone are ongoing and include a collaboration with Alaska Fishery Science Center and Little Port Walter staff to support a long-term Pacific cod and walleye pollock rearing study, and rockfish and salmon samples with corresponding plasma, gonad, and isotope samples.

In collaboration with ADF&G Kodiak Otolith Lab, ADU staff established models and workflow to evaluate black rockfish species misidentification using fish length and otolith weight at age along with otolith morphology criteria to detect errors in contemporary and historical data. Results were presented at the Alaska American Fisheries Society meeting

In collaboration with the ADF&G Gulf of Alaska Bottomfish Program (GOAB), ADU staff performed and presented comparisons between fin spine and otolith age estimation methods using paired structures collected in Southcentral and Southeast Alaska and results were also presented at the Alaska American Fisheries Society meeting.

In collaboration with the AFSC, Auke Bay Laboratories, ADU staff aided an investigation of age-0 lapillar and sagittal otoliths to infer daily growth in juvenile sablefish in the Gulf of Alaska. This study used laboratory reared fish in temperature and feed treatments and the manuscript is in internal review.

Charapata, P., D. Oxman, K. McNeel, A. Keith, F. Mansouri, and S. Trumble. 2022. Lifetime hormone profiles for a long-lived teleost: Opercula reveal novel estimates of age-specific reproductive parameters and stress trends in yelloweye rockfish (*Sebastes ruberrimus*). Canadian Journal of Fisheries and Aquatic Sciences in Press.

6. ADFG Homer Commercial – (Elisa Russ)

In 2022 the Homer Alaska Department of Fish and Game (ADF&G) commercial groundfish age lab had four age readers: Elisa Russ (project leader), Andrew Pollak (primary production reader), Aaron Slater (black rockfish; hired in September 2021 and resigned August 2022), and Alissa Cole (walleye pollock; hired in November 2022). The port sampling program collects biological samples including age structures (primarily otoliths) from state managed groundfish and shellfish species harvested in Cook Inlet and Prince William Sound management areas (Central Region). All age readers also act as port samplers and sometimes as ADF&G observers. Sampling goals are 550 otolith pairs collected from each management area and from each primary groundfish species – Pacific cod, sablefish, lingcod, walleye pollock, and rockfish species. Groundfish sampling occurs in the ports of Homer, Seward, Whittier, Cordova, Kenai, and Kodiak.

Groundfish species aged in Homer include demersal shelf rockfish (primarily yelloweye and quillback), pelagic shelf rockfish (primarily black rockfish), and walleye pollock. The remainder of groundfish otoliths – lingcod, sablefish, and slope rockfish are sent to the ADF&G Age Determination Unit (Kevin McNeel – project leader).

In 2021, the Homer age lab continued to prioritize black and yelloweye rockfish age work in response to an ADF&G Statewide Rockfish Initiative (SRI) focusing on black and yelloweye rockfish assessment with those two rockfish as the keystone species. A total of 2,060 ages were produced in 2022. Age data is current through 2021 collections for black rockfish and yelloweye rockfish. In fall of 2022, staff began to tackle the backlog of walleye pollock specimens. Aaron Slater had become proficient in age reading black rockfish in his 1 year with the program and Alissa Cole trained on walleye pollock in late 2022; Andrew Pollak worked on yelloweye rockfish early in the year and then focused on pollock in the fall and training Alissa Cole.

The Homer ADF&G Division of Commercial Fisheries (DCF) age lab worked on a CARE exchange with other labs within ADF&G on yelloweye rockfish. The Homer DCF lab collaborated on a black rockfish maturity study involving age and growth with ADF&G SRI staff from other regions utilizing histology work on ovarian tissue. Homer DCF staff also collected genetics samples from black and yelloweye rockfish for another SRI study and also collected genetics samples from Pacific cod for NOAA staff.

Precision testing is done on 20% of all samples and on 100% of samples that are aged by new readers. All differences beyond 1 year are resolved, unless there is bias, and then all differences are resolved. Otoliths are stored dry, cut using an Isomet saw and baked; burning is used to refresh otoliths during precision testing. Morphometric measurements have been collected for all species (otolith length, width, and weight, excluding crystalized or broken

otoliths) since 2018. This information is analyzed to help identify outliers and errors in the age, species identification, or data entry.

5. NWFSC – (Patrick McDonald)

Staff/New Hires: We have 8 people in our lab including myself: Our two most recent hires are Meredith Emery Boeck and Liz Ortiz. Meredith was hired in August ahead of when we received our instrument from AFSC – she will update you on our FT-NIRS work for the Strategic Initiative. Liz Ortiz was hired in November of 2022 and will be helping ageing structures from California. We have staff doing a mix of working 100% on-site and others doing a mix of telework with on-site.

Groundfish Assessments

Supported: black rockfish, canary rockfish, copper rockfish, petrale sole, Pacific hake and rex sole (24, 240 otoliths aged, 5,400 DR; over 29,500 otoliths aged in past year).

CARE Exchanges

Participated: Sablefish round robin exchange. Black rockfish 4 agency round robin. Rougheye exchange with AFSC. Canary rockfish and petrale sole exchange with WDFW.

Projects

Lingcod paired structure project / lingcod working group – Nikki will be heading up our lab's work for this project.

Sablefish midcycle assessment; based on NWFSC combo the number of 'small' sablefish caught in 2022 is 2-3 times larger than anything that has been observed since 2003. Potential historic recruitment class.

NWFSC FT-NIRS – (Meredith Emery Boeck)

We are excited to implement the FT-NIRs ageing method at NOAA NWFSC in Newport, OR. We have had some issues since we've received the near infrared spectrometer this fall (November 2022) but hoping to resolve everything next week (April 2023) with the Bruker Technician.

Our plan is to focus on three species: Pacific hake, sablefish and rougheye rockfish. We are going to do a stabilization project both with hake and sablefish and create calibration models for all three species. One thing that we are really excited about is to have aged rougheye from two agencies outside of NOAA, which are Washington Department of Fish & Wildlife and

Oregon Department of Fish & Wildlife. This will allow us to have a rougheye calibration data set with ~2,300 aged fish. Thank you to both WDFW and ODFW for contributing to this research.

6. WDFW – (Andrew Claiborne)

Personnel Update: WDFW has one new age reader and one retirement since CARE last met, virtually. The lead groundfish age reader at WDFW, Sandra Rosenfield, retired after over 50 years of age reading. Sandra provided ages for species ranging from yelloweye rockfish to petrale sole. Sandra's tireless work ethic and attention to detail were instrumental in stock assessments, conserving groundfish populations, and collaborating on research projects. We were sad to lose such a vital part of our team but wish Sandra the best in retirement. Jenny Topping was promoted from our second groundfish age reader to the lead reader in 2022, after over 30 years with WDFW. In turn, Merrie Schultz was hired in August of 2022 and since then is quickly becoming proficient as a groundfish age reader. Our lab staff is Jenny Topping- Lead groundfish age reader, Merrie Schultz-groundfish age reader, Austin Anderson-salmon age reader, Christina Jump-freshwater age reader and database manager, Andrew Claiborne-team lead and salmon age reader.

Research Update: The WDFW Fish Ageing Lab has participated in several exchanges in 2022 including the round robin black rockfish, petrale sole, and canary rockfish exchanges. WDFW is collaborating on a study with Oregon State University looking at the potential of using petrale sole otolith chemistry as an indicator of ocean hypoxia and acidification pH. WDFW is working with the lingcod working group to compare age estimates from fin rays versus otoliths. The WDFW lab has also authored and co-authored nine manuscripts since the 2019 meeting, primarily related to ocean ecology and life history of anadromous species. Two relevant publications authored by the lab relating to age validation for anadromous species are provided below.

Anderson, A. J., Claiborne, A. M., & Smith, W. (2023). Validation of age estimates for Chum and Sockeye salmon derived from otolith and scale analysis. *Fisheries Research*, 259, 106556.

Claiborne, A. M., Losee, J. P., & Miller, J. A. (2020). Estimating migratory behavior and age for anadromous Coastal Cutthroat Trout in south Puget Sound: evaluation of approaches based on fish scales versus otoliths. *North American Journal of Fisheries Management*, 40(5), 1313-1323.

WDFW Production Age Reading Update: Numbers aged since 2019 CARE:

Common Name	Scientific Name	Year	N
Black Rockfish	<i>Sebastes melanops</i>	2020	4426
Black Rockfish	<i>Sebastes melanops</i>	2022	3216
Black Rockfish	<i>Sebastes melanops</i>	2023	1318
Canary Rockfish	<i>Sebastes pinniger</i>	2022	2
Canary Rockfish	<i>Sebastes pinniger</i>	2023	3624
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	2019	37403
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	2020	39342
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	2021	43742
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	2022	41804
Chum Salmon	<i>Oncorhynchus keta</i>	2019	722
Chum Salmon	<i>Oncorhynchus keta</i>	2020	15955
Chum Salmon	<i>Oncorhynchus keta</i>	2021	22174
Chum Salmon	<i>Oncorhynchus keta</i>	2022	31807
Coho Salmon	<i>Oncorhynchus kisutch</i>	2020	162
Coho Salmon	<i>Oncorhynchus kisutch</i>	2021	1217
Coho Salmon	<i>Oncorhynchus kisutch</i>	2022	229
Copper Rockfish	<i>Sebastes caurinus</i>	2020	1077
Eulachon	<i>Thaleichthys pacificus</i>	2019	500
Eulachon	<i>Thaleichthys pacificus</i>	2020	500
Eulachon	<i>Thaleichthys pacificus</i>	2021	500
Eulachon	<i>Thaleichthys pacificus</i>	2022	500
Lingcod	<i>Ophiodon elongatus</i>	2020	3396
Lingcod	<i>Ophiodon elongatus</i>	2021	4151
Northern Anchovy	<i>Engraulis mordax</i>	2019	1373
Northern Anchovy	<i>Engraulis mordax</i>	2020	1821
Northern Anchovy	<i>Engraulis mordax</i>	2021	202
Northern Anchovy	<i>Engraulis mordax</i>	2022	1088
Pacific Sardine	<i>Sardinops sagax</i>	2019	79
Pacific Sardine	<i>Sardinops sagax</i>	2020	59
Pacific Sardine	<i>Sardinops sagax</i>	2021	50
Petrale Sole	<i>Eopsetta jordani</i>	2019	2879
Petrale Sole	<i>Eopsetta jordani</i>	2022	1457
Quillback Rockfish	<i>Sebastes maliger</i>	2020	2411
Sockeye Salmon	<i>Oncorhynchus nerka</i>	2021	924
Sockeye Salmon	<i>Oncorhynchus nerka</i>	2022	1642
Stealhead	<i>Oncorhynchus mykiss</i>	2019	1013
Stealhead	<i>Oncorhynchus mykiss</i>	2020	1887
Stealhead	<i>Oncorhynchus mykiss</i>	2021	1666
Stealhead	<i>Oncorhynchus mykiss</i>	2022	2336
Vermilion Rockfish	<i>Sebastes miniatus</i>	2020	808
Yelloweye Rockfish	<i>Sebastes ruberrimus</i>	2019	819
Yelloweye Rockfish	<i>Sebastes ruberrimus</i>	2020	214
Yellowtail Rockfish	<i>Sebastes flavidus</i>	2019	7407
Yellowtail Rockfish	<i>Sebastes flavidus</i>	2021	3416

7. ODFW – (Leif Rasmussen/Mark Terwilliger)

Personnel: Leif Rasmuson, Program Manager

Mark Terwilliger, Age Reading Specialist

Production ageing: Production activity in 2022-2023 was heavily focused on ageing the considerable backlog of Black Rockfish otoliths for the upcoming 2023 assessment:

Year Captured	Commercial ages	Commercial 2 nd reads	Avg. % agreement (% APE)	Sport ages	Sport 2 nd reads	Avg. % agreement (% APE)
2019	894	180	66.67 (2.22)			
2020	961	193	56.99 (2.72)	1115	223	54.71 (3.02)
2021	908	181	60.77 (2.67)	1100	220	56.82 (3.20)
2022	901	180	63.33 (2.51)	1151	230	65.65 (2.18)

In total, I aged 7,030 Black Rockfish otoliths (1407 double-reads).

My plan was to age approximately 1000 samples per fleet per year. In some cases, (the recreational catches and 2020 commercial), the total number of structures approached 1000 and so no subsampling occurred; commercial 2019, 2021, and 2022 required subsampling. Subsampling was random and based on sex and length.

In years where subsampling occurs, I have also been heavily sampling the tails of the length distribution. These nonrandom samples are flagged as such in the data and are meant to better inform the length-at-age curves. These ages are **not** used to generate catchability curves for the stock assessment.

Exchanges: ODFW participated in the 2022 Black Rockfish exchange along with NWFSC, AFSC, and WDFW. With the ODFW ageing sample, precision among readers ranged from relatively high (Pat McDonald (NWFSC): APE=2.39%, 60% agreement, + bias) to very low (WDFW: APE=8.88%, 10% agreement, + bias).

ODFW intra-lab ageing: To develop ageing error vectors for interpreting conditional ages-at-length, the authors of the 2015 Black Rockfish Stock Assessment used a multiple-read study conducted in 2008 that included 150 original ages from three past age readers and double-reads of those ages by the current reader at the time. The resulting error increased exponentially with age, and further investigation into the inter-reader error and how to decrease it was listed as a

research need. Therefore, I re-read all 150 otoliths used in the 2008 study and generated precision estimates between myself and each original reader as well as between myself and the original double-reader. Precision estimates in all cases improved over original values. I also performed 150 double-reads on Black Rockfish otoliths originally aged by a different ODFW reader post-2015. To conclude, ODFW has provided to assessors Black Rockfish double-read data between the current age reader and the past 5 readers dating back to the late 1990s.

Oregon Statewide Black Rockfish Survey: In anticipation for the 2023 assessment, ODFW conducted a survey of Oregon's nearshore environment with the purpose of providing an abundance estimate for black rockfish. The survey incorporated acoustics, CTD casts, video camera drops, and hook-and-line drift sampling. All fish caught by hook-and-line were measured, sexed, and subsequently aged. Since the 2022 CARE meeting, age estimates were generated for 434 Deacon Rockfish (112 double-read), 53 Canary Rockfish (11 double-read), 50 Yellowtail Rockfish (10 double-read), and 48 assorted rockfishes (10 double-read). We also double-read 24 Black Rockfish otoliths that had been initially aged in 2021.

Black Rockfish ages for maturity study: Melissa Head, NOAA Research Fisheries Biologist with the FRAM division at NWFSC, has been conducting a maturity study on Black Rockfish that will be used to inform the 2023 assessment. I aged 117 Black Rockfish as part of this maturity study, representing fish captured between 2014 and 2021.

Lingcod aging structure comparison: We have concluded collection of paired structures for Lingcod. All fins have been dried, and I have just been sample processing and ageing. We have 368 pairs of structures between commercial and recreational fleets. Approximately 20% of our fins have been glued and 10% have been sectioned and aged. Thirty-five otoliths have been aged using a combination of break-and-burn and surface reads. Most of my focus will be finishing prep and ageing the remainder over the next few months.

Age Validation: Our paper on validating ages of Black Rockfish, Copper Rockfish, and Cabezon using SIMS was published in Winter 2023. The full citation is: Terwilliger MR, Rasmuson LK, Stern RA (2023) Age validation of Black Rockfish, Copper Rockfish, and Cabezon using secondary ion mass spectrometry (SIMS) to elucidate seasonal patterns in otolith stable oxygen isotopes. *Environmental Biology of Fishes* 106: 553-573.

Although visually derived otolith ages have been used in stock assessment models for decades, accuracy of the ageing method has not been determined for most groundfish species in the northeast Pacific. In this study, we validated otolith ages for Black Rockfish (*Sebastes melanops*), Copper Rockfish (*Sebastes caurinus*) and Cabezon (*Scorpaenichthys marmoratus*), three species with recreational and commercial importance to Oregon. Ages obtained by traditional break-and-burn methods were validated using secondary ion mass spectrometry (SIMS) to examine otolith stable oxygen isotope ratios ($\delta^{18}\text{O}$) over a fish's lifetime. This technique relies on the inverse relationship that exists between otolith $\delta^{18}\text{O}$ and ambient water

temperature, and independent counts of $\delta^{18}\text{O}$ maxima should be comparable to ages obtained by visual counts of otolith growth marks laid down during cold water periods. Locations of $\delta^{18}\text{O}$ maxima in otolith chronologies matched well with locations of visual growth marks in otoliths of all three species, maxima counts were strongly positively correlated with age, and variation in otolith $\delta^{18}\text{O}$ decreased with age. However, significant variability in the $\delta^{18}\text{O}$ chronologies caused by variability in intra-seasonal upwelling and resulting water temperature variations made maxima counts difficult in several samples. Correct interpretation of chronologies required knowledge of location of the first annulus, the compression of growth zones with age, and an assumption of the seasonal amplitude of the ambient water $\delta^{18}\text{O}$.

8. ADFG Kodiak Commercial – (Sonya El Mejjati)

The Kodiak port sampling program collects biological samples from State managed groundfish and shellfish species that are harvested in the Kodiak, Chignik, and South Alaska Peninsula areas. Sampling occurs in the ports of Kodiak, Sand Point, King Cove, and/or Akutan. The otoliths collected from all groundfish species are aged in the Kodiak Age lab and include Pacific cod (goal is 2,000 otolith samples for all management areas), black rockfish (1000 otoliths mainly Kodiak Area), dark rockfish (500 otoliths mainly Kodiak Area), lingcod (opportunistic sampling) and a few miscellaneous rockfish spp.

Kodiak age readers work seasonally, typically between January and April (4 months). In 2020 and 2021 we went from 4 to 2 age readers: Joan Brodie (39 seasons in 2020, retired that year), Mike Knutson (7 seasons in 2021, left ADFG in 2022), Jessica Horn (4 seasons), and Sonya El Mejjati (15 seasons). Precision testing is done on 20-40% 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 min at 400F using a standard toaster to prevent otoliths from bursting. The baking process is time consuming but saves time during age reading.

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 find a few outliers, errors in the age, mis-IDed species, and typos.

VIII. Topics for Discussion/New Business [11:15 – 12:00]

1. FT-NIRS with input from agencies applying this technology
 - Steve is testing on POP; John 90k scanned plus soft tissues; ODFW doesn't have a machine, they send theirs to PSMFC; IPHC no machine – going to hire postdoc for genetic ageing but funding fell through; southwest center shortbelly and possibly anchovy. Scan samples first so that they're whole before broken and burned. WDFW doesn't have machine.
2. Western Groundfish Conference including the Age Reading Workshop

- Back in the same year as CARE; workshop meant to help pull folks outside of CARE into the ageing fold, so it can be more universally understood. Do we try to get CARE back on alternate years?
- 3. Symposia/Conferences previous & upcoming
 - Nothing to report
- 4. Revising the CASE Invoice
 - Consolidated to 50 samples on one page; removed stats section because it wasn't filled out regularly; added exchange purpose; larger comment field; added exchange instructions so they're saved locally; exchange tracker so you know who to send it to next.
- 5. CARE Website (what else would you like to see on the website?)
 - Agency updates & verification of sp. info on CARE website. Leaving it meeting minutes is adequate.
- 6. Non-agenda items
 - Lingcod – SE AK having trouble getting head-on fish at ports for commercial, and managers asking 'can you move to spines' Want to know if structures are *comparable*, not saying one type is better than the other, so that as others move to otoliths they can still use fins.

Lunch 12:00 – 1:15

IX. Scientific PowerPoint Presentations [1:15 – 2:45]

1. Navigating through the new CARE Website (Jamie Hale)
2. How we produced age determination tutorial videos at AFSC (Julie Pearce)
3. Role of AFSC age readers with the new FT-NIRS technology (John Brogan)
4. Proposing a new way of reporting age data to data users at the AFSC (Beth Matta)
5. Results from a recent Black Rockfish exchange (Andrew Claiborne)

Break 2:45 – 3:00

X. Workshops, working groups, hands-on microscope work [3:00 – 5:30]

(Working group notes will be amended to the end of this document)

1. Longnose Skate scope work (Traynor room)
2. Working Groups (Traynor Room or Room 2079 available in morning)
3. Hands-on microscope work and calibration (Traynor Room)
4. Sablefish exchange group (Traynor Room or Room 2079 available in morning)
5. Black rockfish exchange group (Traynor Room or Room 2079 available in morning)

Informal social at the [Burke Gilman Brewing Co](#) on Monday evening starting at 5:00PM

Tuesday-Thursday, April 4 - 6, 2023

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

1. See working group reports below.

CARE/FT-NIR Social Wednesday evening at [Elliot Bay Brewing Co.](#)

Friday, April 7, 2023

XII. Recommendations [8:30 – 9:00]

1. 2023 CARE to CARE

- Care manual working group add the following sections-
Lingcod Otoliths, sablefish, thin sectioning, break and bake, ergonomics, rockfish sectioning, big skate, longnose skate - nearly complete or in progress. Draft CARE manual July 1, submitting by July 31.
- Care manual work will update age validation list in the manual.
- CARE manual working group will postpone/shelve sections previously discussed such as walleye pollack, spiny dogfish, black rockfish (discuss in 2024).
- CARE website working group will post old manuals to the website. Julie Pearce (AFSC) has scanned and can provide PDF.
- CARE will update production numbers biannually around meetings.
- Lingcod working group will adopt objectives one and two from the working group report before the next meeting in 2024
- Max age info - labs comment on ages provided by ADF&G if they have samples that go beyond the max supplied by them. Initiate exchanges for those samples
- CARE recommend moving care meetings to even years. (vote 15 to 2, many abstaining), Moving meeting to 2024 (2024 7 votes, 2026 4 votes)

3. 2023 CARE to TSC

- Recommend support across agencies for equipment for collection of morphological data (scales, calipers, FIT-NIRS, software, etc.).
- Recommend support across agencies for age validation testing and equipment.

XIII. Concluding CARE Business [9:00 –10:00]

1. Administration nominations

- Voted to move CARE to even years, starting with 2024. Votes are as follows: move CARE to even years, 15 to 2, many abstaining. Moving meeting to 2024, 7 to 4, many abstaining.
- Nikki Paige voted in as Secretary (overwhelming)
- Mark Twilliger voted in as Vice Chair (overwhelming)
- Patrick McDonald voted in as Chair (overwhelming)

2. Schedule and location of 2024 meeting

- Potential for meeting in Newport in 2024 (overwhelming vote for yes)

XIV. CARE Business Meeting Adjourned [10:15]

WORKING GROUP NOTES:

1. Black Rockfish Working Group

- When: Tuesday April 4, 2023 10:30am- 1:30pm
- Attendees: Kevin McNeel ADFG, James Hale NWFSC, Merrie Schultz WDFW, Liz Ortiz NWFSC, Marian Ford ADFG, Josh Dore ADFG, Sonya Elmejjati ADFG, Patrick McDonald- NWFSC, Andrew Claiborne- WDFW, Mark Terwilliger ODFW, Mark Plumb ADFG, Melissa Monk SWFSC, Jenny Topping WDFW (virtual).

Summary

Following the presentation by Andrew Claiborne (WDFW), the black rockfish working group met to review criteria and to look at otoliths from the exchange and from NWFSC California Assessment. The working group reviewed potential cryptic species, with black rockfish being misidentified as dark and dusky rockfish in Alaska. The group noted that those species may not be present in southern collections and are not problematic. Also, criteria for the size of the first year was reviewed: ADFG-Juneau uses an approximate 2mm diameter for the first year, ADFG-Kodiak uses 2-2.5mm, ADFG-Homer-SF uses 1.8-2.5mm. Most agencies used an approximate range for the diameter of the first year that were comparable. The working group discussed counting axes. All agencies agreed that both the dorsal and ventral half were used to estimate ages. Some age labs preferred to use the dorsal and specifically the light-dark boundary on the dorsal half to get a final estimate. Also, the group reviewed edge type and plus growth assignment. Some agencies recorded plus growth as percent growth and others recorded it based on capture date.

The working group noted current and historical age validation work. Currently, NWFSC is presenting a bomb radiocarbon analysis of California black rockfish, ODFW validated ages using oxygen isotope, and ADFG is working on publishing bomb radiocarbon validation. Historically, Vanessa Von Biela did an Alaska wide chronology of black rockfish growth. After age discrepancies were highlighted from the exchange, the working group reviewed young black rockfish. Participants identified annuli 2-5 as potential sources of error. Also, some specimens were difficult and had potential differences between age readers. After reviewing specimens, the group suggested that current agency methods be reformatted and published as a CARE Manual chapter. Furthermore, an additional exchange was suggested to evaluate improvements after the workshop.

2. Lingcod Working Group

- When: Wednesday April 5, 2023 9:00am- 12:30pm
- Attendees: Kevin McNeel ADFG, James Hale NWFSC, Merrie Schultz WDFW, Nikki Paige, NWFSC, Marian Ford ADFG, Josh Dore ADFG, Sonya Elmejjati ADFG, Patrick McDonald- NWFSC, Andrew Claiborne- WDFW, Mark Terwilliger ODFW, Mark Plumb ADFG, Audrey Ty CDFO, Chelsea Rothkop CDFO, Chelsea Cooke CDFO, Jenny Topping WDFW (virtual).

Summary

The lingcod working group proposed the following objectives: The first objective is to have each region/lab (ADFG, CDFO, WDFW, ODFW, NWFSC) age the otoliths and fin rays from their respective region using common age reading criteria. The second objective is to have a single expert otolith reader and a separate expert fin ray age reader produce age estimates for a subsample of structures from all regions to address inter-lab bias. The final objective is to validate age estimates derived from otoliths.

To accomplish objective one, the working group will need to collaborate with the manual working group to complete the lingcod otolith ageing section. ADFG's manual will be used as a starting point perhaps adding reference images from the other regions to help address any regional differences in growth patterns observed that may influence ageing criteria. To accomplish objective two and three the working group will need to identify two experts willing to age the structures from all regions and procure funding to support that effort. Objective three will require an academic partner and likely a graduate student to complete. Jessica Miller from Oregon State University has expressed interest and funding opportunities may be available via North Pacific Research Board.

Sample update: WDFW has completed ageing fish fin rays, but not otoliths. The range of fin ray ages is approximately 2-20 years. ADFG has completed ageing 2021 fin rays and otoliths, but 2022 samples are not complete. ADFG does not have young age fish because it is a commercial sample. NWFSC has paired samples, and fin rays are prepped, but otoliths are not aged yet. They have a wide range of ages down to age-1 fish. CDFO has completed ageing fin rays and their sample ranges from age 1 to 15. Otoliths are not complete. ODFW has recently started processing and ageing fin rays and otoliths. They have a good size range and work with the Observer Program to get undersized samples.

Working Group Discussion and Sample Examination: Alaska is walking through their SOP with a live otolith image. Discussing core measurement criteria-2 mm for 1st year. ADFG has mentioned they age on the ventral side only and burn the whole otolith so the distal surface can be examined. WDFW is using a yellow/green light filter for the fin rays. NWFSC is doing this as well because they were trained by WDFW. DFO, ADFG, and ODFW are not using filters. Jen from WDFW is going to track down the model number and see if the filter is a polarized.

3. Sablefish Working Group

- When: Wednesday April 5, 2023 1:30pm- 5:00pm
- Attendees: Kevin McNeel ADFG, Tyler Johnson NWFSC, Nikki Paige, NWFSC, Josh Dore ADFG, Audrey Ty CDFO, Chelsea Rothkop CDFO, Chelsea Cooke CDFO, Jenny John Brogan AFSC, Denise Parker NWFSC, Julie Pearce AFSC, Liz Ortiz NWFSC, Charlie Piston AFSC.

Summary

Point of exchange and working group is to determine how labs are calling edge types and the influence that has on ageing. Young fish were picked from various months of the year. Several images were examined as a group. A narration of each otolith used as an example is below.

Example 1: surface seemed to show 3, but on break and burn it looks much more like a 2 to most groups. Time of year was 6/21. Is the 2nd year bandy and still putting down material, not much edge? Or a really thin annuli, lots of growth and another annulus? General consensus came out to age 2, 5+ edge.

Example 2: Time of year mid-July. 1-3 generally clear, question comes on edge again. On surface there could be the ghost of a 4th year, but it could be part of 3? On break, the possible annuli seems like it's faint or nonexistent. Maybe 4 edge?

Example 3: August catch date. Ages from 4-5. Surface a bit messy but looks like a good example of an age 4. Sulcus count looks like 4, wingtip messier. 1 – edge

Example 4: November catch date. Ages from 2-4. On the surface it is really messy, and there are multiple checks on the break. But looks like a wider edge.

Example 5: October. Ages 3-5. Issue isn't edge, but where to break things out. Everything else was massively checky.

Example 6: June 21. Between 2 and 4. Grooves don't help so much.

Break to show Delsa's paper showing probability of edge types by month. Lowest probability of an annuli on edge is in August. But it's still not 0% for the months around then.

Went through slides showing various sablefish growth patterns and known age sablefish.