2025 CARE check-in Minutes/Lab updates

During the April 2023 CARE meeting, CARE membership voted to move the meetings to 'even' years to stagger our meeting with the Western Groundfish Conference, and agreed to meet in Newport, OR in 2024. Three weeks after the 2023 CARE meeting, Western Groundfish voted to move their conference back to even years (next meeting in 2026), so CARE followed suit at the 2024 meeting and voted to convene during odd years once again, with the next in-person meeting scheduled for Nanaimo, BC in 2027. Due to the long period between in-person meetings, a virtual CARE check-in was held on March 24, 2025 to update ageing activities and progress on CARE Working Groups, ageing structure exchanges, and recommendations from the 2024 CARE meeting. This update report covers the work period of April 6, 2024 – March 24, 2025. The CARE check-in was virtually attended by 32 CARE members and the U.S. Co-Chair of the Groundfish Technical Committee (Table 1).

The meeting started with agency reports from attendees (see below). After Agency reports were completed, CARE Chair Mark Terwilliger (ODFW) followed by showing an Excel table with completed and currently open CARE structure exchanges, urged participants to complete exchanges that they were involved in, and noted that some of the incomplete exchanges dated back to 2022.

Terwilliger then addressed any progress on CARE-to-CARE recommendations from the 2024 CARE meeting. Because everyone was busy ageing fish for the 2025 assessment cycle, it was acknowledged that little had been done to address the recommendations since adoption at CARE 2024.

For the CARE Manual Working Group, Kevin McNeel (ADFG-Juneau) reported that a TEAMS channel was created for collaboration with working group members and that there was a working draft of the manual on the channel. Barbara Campbell (CDFO) has been doing a lot of the updates. Kali Stone (AFSC) and John Brogan (AFSC) have been working on the Pacific cod chapter, and Beth Matta (AFSC) has been providing edits. In the next several weeks the working group should touch base to regain momentum.

For the CARE Website Working Group, James Hale (NWFSC) said that some updates have been made since the last CARE meeting, and all current agency contacts are current. Jon Short (AFSC) requested CARE production numbers for addition to the site and pointed out that the minutes from CARE 2024 had not been made available for posting. Pat McDonald (NWFSC) said he would make them available.

For the Lingcod Working Group, Mark Terwilliger reported a structure exchange with easy and difficult structures was initiated but the status of those samples is unknown. A preproposal was submitted to Saltonstall-Kennedy to fund a student to do the comparison, validation, and simulation work but SK did not suggest a full proposal. Alternate funding sources like Pacific

States or North Pacific Research Board were suggested as possible funding sources going forward.

No progress was made on the CARE Charter Working Group, Sablefish Working Group, or the Otometrics Working Group.

AGENCY REPORTS

ADF&G-Homer Sportfish update

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 collected from Elfin Cove, Ketchikan, and Sitka.

The majority of production age reading is done by program biologist Marian Ford, with additional sample preparation and aging done by one seasonal technician. This year Tim Blackmon, who has worked as our seasonal aging technician for the past four years, accepted a new position in the department. We have not filled this position yet, but we were able to borrow McKenzie Morey, a technician with the Southeast port sampling program, to assist us. McKenzie is now trained for production aging of black rockfish. Our program is supervised by Clay McKean out of the Anchorage office.

In 2024, 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 4,213 otoliths were aged this season. Lingcod fin rays are cross-sectioned and mounted on slides for aging. A total of 585 fin ray slides were prepared for the 2024 season and aging is in progress. 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 several years, the Homer lab participated in an interagency black rockfish otolith exchange and participated in a lingcod otolith/fin ray exchange with the ADU lab. This season, in addition to the black rockfish otoliths we receive from the Southeast port sampling program, we received and aged 1,312 sets of black rockfish otoliths from a student working on their PhD project in Southeast Alaska.

ADFG-Kodiak Commercial update

This season, we had the same 2 age readers working in the age lab. Our season lasted 4 months from January through April 2025. In the summer, Jessica works out of Chignik sampling sockeye

smolt for AWL, taking limnology data, and entering fish ticket data for the commercial sockeye fishery. Outside of the age lab, Sonya leads the Kodiak port sampling program in collecting biological samples from State managed groundfish and shellfish species that are harvested in the Kodiak, Chignik, and South Alaska Peninsula areas.

This season we processed 1500 Pacific cod, 844 black rockfish, and 256 dark rockfish that were sampled in 2024. Morphometric measurements were collected for all samples aged (otolith length, width, and weight, excluding crystalized or broken otoliths). We use this information to find outliers, age errors, mis-IDed species, and data entry errors. Precision testing is completed on 20-40% of all samples and all differences are resolved. Otoliths are stored dry. The lab uses the break and burn method for rockfish species. For Pacific cod, 1 otolith is cut and baked for 12 min at 400F using a standard toaster oven. The baking process is time consuming but saves time during age reading.

Additionally, we received and processed otolith samples collected by research teams. We measured and aged otoliths from 27 adult Pacific cod that had been tagged by NMFS and recaptured by the commercial fleet between 2012-14, 38 adult black rockfish tagged by the ADFG groundfish research crew and recaptured in 2024, 250 juvenile cod collected in 2001, and 160 juvenile rockfish species (mostly black and copper rockfish) collected in 2024. The juvenile cod and rockfish species were collected in beach seines and ranged in age between 0-3 years. Juvenile fish were fun to look at as we never see fish that young in commercial catches.

ADF&G-Juneau update

The ADF&G Age Determination Unit (ADU) is the statewide groundfish and invertebrate age-reading program based in Juneau, AK. The ADU has undergone some staffing changes, with Kevin McNeel serving as the lab supervisor, Josh Dore as the processing coordinator, Mark Plumb as the biologist, and Kaitlyn Johnson as the laboratory technician. Additionally, interim support has been provided by technical staff from other projects as needed. Currently, Josh Dore, Mark Plumb, Kaitlyn Johnson, and Kevin McNeel serve as the primary groundfish age readers.

In 2024, the ADU received 6,277 otolith sets from commercial and survey sampling in Central and Southeast Alaska. These collections represented approximately 10 species. Between 2019 and 2024, the ADU focused on processing sablefish, lingcod, Pacific cod, yelloweye rockfish, black rockfish, rougheye rockfish, greenspotted rockfish, geoduck, and weathervane scallops, distributing a total of 11,869 age estimates.

As part of the processing workflow, personnel measure and weigh 100% of otoliths for quality control. Age estimates are compared to growth model predictions and second reads. Growth models are based on estimated fish length and otolith weight-at-age for species including lingcod, black rockfish, yelloweye rockfish, rougheye rockfish, shortraker rockfish, shortspine thornyhead, sablefish, geoduck, and scallops. Estimated size-at-age values are derived from

Ludwig von Bertalanffy and exponential growth models, with reasonable error ranges incorporated into a database. Additionally, personnel develop Shiny applications to analyze fishery data, flagging and addressing outliers. To refine aging criteria, the ADU continued rougheye rockfish, Pacific cod, and lingcod otolith exchanges with CARE agencies.

ADU personnel participated in the following research projects:

- Hormone Expression Studies: In collaboration with Baylor University and Texas A&M University, personnel continued research on hormone expression in incrementally grown structures. Ongoing efforts focus on extracting and analyzing hormone fluctuations in bone, with additional collaborations involving the Alaska Fishery Science Center and Little Port Walter staff. This work supports a long-term Pacific cod and walleye pollock rearing study, along with rockfish, tarpon, and salmon samples that include corresponding plasma, gonad, and isotope data.
- Student Research Support: ADU staff provided research support to graduate and doctoral students from the University of Alaska, Baylor University, Humboldt University, Oregon State University, the University of Texas, and San José State University. This research included Pacific cod daily age studies, hormone reconstruction, quillback rockfish chronology, black rockfish life history research, coastwide demography analysis, and greenspotted rockfish age evaluation.
- Lingcod Otolith & Fin Ray Studies: In collaboration with CARE members and Jessica Miller, ADU staff pursued funding to support lingcod otolith and fin ray evaluations. Additionally, ADU staff worked with Laurel Lam to support the publication of studies integrating otolith, fin ray, DNA methylation, and FT-NIR methodologies for lingcod.
- Shortraker Rockfish: staff completed initial work on shortraker rockfish chronology, bomb radiocarbon evaluation, and cryptic species misidentification and published thesis work through the University of Alaska Fairbanks.

AFSC Update

Personnel Changes:

There have been no personnel changes at AFSC between the last CARE meeting in April 2024 and this meeting. However, Thomas Helser, the AFSC Age and Growth program manager, plans to retire at the end of March 2025. Currently, the program consists of the following staff: Program Manager Tom Helser, Production Ageing Supervisor Derek Chamberlin, the research team—Beth Matta, Brenna Hsieh, Esther Goldstein, Irina Benson, Jon Short, and Todd TenBrink — the production ageing team—John Brogan, Andrew Chin, Chris Gburski, Jason Conner, Julie Pearce, Kali Stone, and Sandi Neidetcher — and PacStates contractor Kathrin Bayer.

Production Ageing:

Since the last CARE meeting in April 2024, AFSC produced 31,108 traditional otolith ages from 21 species and produced double-read test ages on 7,996 of those samples. Additionally, we scanned a total of 15,145 samples using Fourier transform near-infrared spectroscopy (FT-NIR).

Research:

The AFSC Age and Growth program successfully completed a review, conducted by the Center for Independent Experts (CIE), of the use of FT-NIR to predict age. The reviews were overwhelmingly positive and supported FT-NIR being put into operational use for eastern Bering Sea pollock to produce ages for the 2025 assessment. Additionally, the program finalized a study examining the effect of ageing error on the performance of FT-NIR machine learning models and produced simulations of the optimal proportion of a collection that needs to be tested to quantify FT-NIR ageing error. Researchers also explored the use of otolith shape analysis to understand the spatial structure of dusky rockfish, documented the age, growth, and mortality of silvergray rockfish in the Gulf of Alaska, and studied the reproductive biology of shortspine thornyhead. Ongoing research into Pacific cod age validation is also incorporating trace element data into the analyses. Furthermore, the Age and Growth staff published a manuscript on the application of Raman spectroscopy to predict the reproductive status of walleye pollock, along with a review of the biology of the Pacific sleeper shark.

CDFO update

Steve Wischniowski has continued in a research role and Audrey Ty has continued as acting manager.

One Sclerochronology technician resigned June 1st to take a Biologist position. Michele Mitchell returned from leave in October as a Trainer. Tania Mohr joined us in December for a full-time year Term to learn how to determine fish and shellfish ages, and see if it is a career for her.

Common Name	Scientific Name	Year Aged	N	Agency
Sablefish	*Anoplopoma fimbria*	2024	1,440	CDFO-PBS
Lingcod - otoliths for paired CDFO fins	*Ophiodon elongatus*	2024	54	
Hake	*Merluccius productus*	2024	1,235	
Silvergray rockfish	*Sebastes brevispinis*	2024	1,866	
Yelloweye rockfish	*Sebastes ruberrimus*	2024	3,328	
Groundfish Aged			7,923	
Herring	*Clupea harengus pallasi*	2024	18,543	
Eulachon	*Thaleichthys pacificus*	2024	1,010	
Pelagics Aged			19,553	
Chum	*Oncorhynchus keta*	2024	3,586	

Coho	*Oncorhynchus kisutch*	2024	9,298
Sockeye/Kokanee	*Oncorhynchus nerka*	2024	21,127
Chinook	*Oncorhynchus tshawytscha*	2024	30,719
Salmon Aged			64,730
Geoduck	*Panopea abrupta*	2024	235
Shellfish Aged			235
Total Ages Produced			92,441
Number of Agers	Full-time Equivalent	(FTE)	5

CDFO-Freshwater Institute update

The Age Estimation Lab at the Freshwater Institute is presently in the process of converting to a production age lab where we expect to triple our age estimation capacities in the next several years as we continue to make changes to our processes. We are working on improving efficiencies in our workflow and are presently experiencing some staffing change. Presently we provide age estimations for up to 61 different freshwater and marine species (this list is growing). In 2024, our team provided 11862 age estimates to our clients. Our team consists of a lab manager, one seasonal technical staff member (6 months) and 3 full-time technical team members completing age estimation. We are presently staffing a lab manager position in our lab as Laura's term position is ending in the next few months. We are interested in age reading exchanges with other labs who may be providing age estimates for Greenland Halibut, Sebastes mentella, Greenland Cod, Arctic Cod, and Capelin as priority species.

2024 Production Age Estimates

AMPL	American Plaice	1
ARAL	Arctic Alligatorfish	5
ARCD	Arctic Cod	31
ARCH	Arctic Char	4207
ARCS	Arctic Cisco	68
ARFL	Arctic Flounder	39
ARGR	Arctic Grayling	1
ARSC	Arctic Sculpin	35
ARSH	Arctic Shanny	29
ARUN	Aurora Pout	1
ASLM	Atlantic Spiny Lumpsucker	2
ASSC	Arctic Staghorn Sculpin	44
ATPC	Atlantic Poacher	23
BNGN	Banded Gunnel	1
BRWH	Broad Whitefish	139
BRWL	Bering Wolffish	4
BURB	Burbot	2
CAPE	Capelin	44
CHUM	Chum Salmon	1
CNEL	Canadian Eelpout	3
DBSH	Daubed Shanny	27
DVCH	Dolly Varden Char	516
DVCH (Anad.)	Dolly Varden Char	225
FRSC	Fourhorn Sculpin	82

FRSN	Fourline Snakeblenny	5
GLSN	Gelatinous Snailfish	3
GRCD	Greenland Cod	119
GRHL	Greenland Halibut	4027
INCO	Inconnu	228
LKTR	Lake Trout	309
LKWH	Lake Whitefish	216
LTLM	Leatherfin Lumpsucker	2
LTSC	Little Sculpin	1
MSSC	Moustache Sculpin	30
PCHR	Pacific Herring	139
RBSC	Ribbed Sculpin	1
RNSM	Rainbow Smelt	9
RNWH	Round Whitefish	6
SETD	Sea Tadpole	2
SFCD	Saffron Cod	98
SHSC	Shorthorn Sculpin	78
SLEL	Slender Eelblenny	29
STEL	Stout Eelblenny	21
STFL	Starry Flounder	80
TWSC	Twohorn Sculpin	8
UCHAR	Unidentified Char	584
UCISC	Unidentified Cisco	8
UELBL	Unidentified Eelblenny	7
USCLP	Unidentified Sculpin	21

USHNN	Unidentified	1
USNLF	Unidentified	2
USNLN	Unidentified	4
USPCS	Unidentified	3
UWHTF	Unidentified Whitefish	3
WALL	Walleye	288
	TOTAL	11862

IPHC update

The IPHC currently has two full-time and two part-time age readers.

In 2024, a total of 18808 otoliths were collected, 12595 otoliths of which were aged for the stock assessment.

Age reading plan for 2024 included:

- Reading all current-year setline survey otoliths prior to assessment
- Reducing number aged from commercial samples by reading a 50% subsample of otoliths from certain areas
- Second reads on all otoliths from recent maturity and fecundity studies (n=2483)
- Re-aging subset of 2022, 2023, and 2024 setline survey otoliths in the winter/spring of 2024/2025 (n~3000)
- Reading the 2024 recreational and trawl survey otoliths in the winter/spring of 2024/2025

Age reading plan for 2025 involves:

- Reading all setline survey otoliths plus all commercial samples from WA/OR/CA and BS/AI but aging a 50% subsample of commercial samples from all other areas
- Reading the 2025 recreational and trawl survey otoliths in the winter/spring of 2025/2026.

Additional age reading tasks:

IPHC is also investigating the use of artificial intelligence (AI) for aging Pacific halibut from otolith images. The AI model uses deep learning through a convolutional neural network (CNN). Age group staff have been photographing otolith surfaces and broken-and-baked (B&B) otolith sections for input into the AI along with ages derived from baked sections. The AI code was adapted from the DeepOtolith open-source AI platform https://www.mdpi.com/2410-3888/7/3/121. AI doesn't eliminate the need for trained readers; the intent is for it to be used in a supplemental capacity.

- Initial training images: B&B otoliths from the 2019 setline survey collection (the most recent year of full coastwide survey)
- In 2024, photos of the whole otolith surface as well as baked section were taken for each survey otolith. Will use the paired images to compare AI age estimation accuracy for whole vs baked section images. (Would be more efficient if surface photos could be used)
- Using Amscope camera, TIFF format, same magnification for all images
- No annotation of image to mark rings; inputs to model for training currently include image and age. the model decomposes the image into so called convolutional layers and identifies itself the features that are informative for age determination. Other data such as date and area of catch, length, sex, etc. can also be added

Video showing Pacific halibut age reading techniques as requested by the TSC: postponed.

NWFSC-PSMFC update

Staff/New Hires

We have 7 people in our lab including myself; Patrick McDonald, Nikki Paige, Tyler Johnson, Jamie Hale, Denise Parker, Liz Ortiz and Emily Wallingford. This is the same staff profile we had when I reported for the 2024 CARE meeting.

We still have staff doing a mix of working 100% on-site and others doing a mix of telework with on-site.

Groundfish Assessments Supported

We provided age support for the following groundfish stock assessments in the past year (n=8).

-REYE/BSPR

-SABL

-CA QLBK

-WDOW

-CLPR

-YTRK

-PWHT

-YEYE (WDFW aged all NWFSC samples – Thank you!)

REYE/BSPR (n=4,290 total reads) – Tyler and Liz were the agers on this species. They have production aged a total of n=3,168 structures and double read n=1,122. Our double read rate for this species was 35%. Some of those samples that were production aged were maturity samples and we did 100% double read and resolving on those to get the best possible age estimate. Liz is leading an otolith shape analysis project on those maturity samples that have been genetically identified. The sources aged include; NWFSC At-Sea Hake Observer Program and NWFSC bottom trawl survey samples.

SABL (n=7,384 total reads) –Patrick, Nikki Paige and Denise Parker are co-ageing this sablefish. We production aged a total of 5,399 structures and double read n=1,1985. Our double read rate was also high for this species given that we had a new sablefish age reader enter the mix. The sources aged include; WA Comm, OR Comm, CA Comm and NWFSC bottom trawl survey samples.

CA QLBK (n=896 total reads) – Jamie took the lead on this species and Patrick double read. There were not a lot of CA QLBK to age, but we did do n=662 and double read n=234. These were all CA structures that were aged.

WDOW (n=3,808 total reads) – Jamie took the lead on this species and Patrick double read. We production aged n=3,179 and double read n=629. The sources aged were OR Comm and NWFSC bottom trawl survey samples.

CLPR (n=4,297 total reads)– Tyler took the lead on this species. We had never aged this species before and we trained on NWFSC bottom trawl survey samples that had been aged by the SWFSC. Patrick did double reads. We are still working on this species to meet ageing requests. As of today Tyler has aged n=3,247 and Patrick has double read n=648. Tyler did 2 cross-reads against Don Pearson's old reads to help evaluation ageing error between our two labs. Tyler cross read a total of n=395. The sources aged were OR Comm, CA Comm and NWFSC bottom trawl survey samples.

YTRK (n=4,857 total reads) – Emily took up the lead on this species for her first production ageing to support an assessment. She split her time between FT-NIRS and doing traditional ageing. Liz also helped with double reading and provided original age reading efforts. A total of n=4,031 original ages were produced and n=826 were double read. The sources aged NWFSC bottom trawl survey and NWFSC At-Sea Hake Observer Program samples.

PWHT (n=3,021 total reads) – Jamie is our lead hake age reader and Patrick did double reads. A total of n=2,544 original ages were produced and n=477 were double read. The sources aged were NWFSC At-Sea Hake Observer Program, OR Comm and WA Comm samples.

Our total reads were at 28,948 for the past year.

CARE Exchanges Participated

Widow Rockfish exchange with WDFW

REYE/BSPR Rockfish; Part of the round robin reported by other agencies here.

Yellowtail Rockfish exchange with WDFW

Special Projects

We did some minor age reading on some Pacific hake, sablefish and Dover sole samples from the Scripps Institute. This project is looking at DDT accumulation of fish caught off southern CA.

We also assisted a graduate student researching gopher rockfish and aged less than 100 fish for this project.

Jamie worked on creating a Shiny App for us to use for outlier checks on ages/otolith weights.

FT-NIRS

Since the last CARE meeting our lab has continued sablefish scanning efforts for the assessment this year. So far we have scanned the NWFSC COMBO Survey years 2015-2024. By the end of the assessment in April, we plan to have also scanned a total of 6 years of OR, WA, and CA Commercial sablefish (2018, 2020, 2021, 2022, 2023, 2024). In total, we have scanned about 18,600 sablefish since the last CARE meeting in April 2024.

We have also completed about 4,000 Pacific Hake production scans during the past year, including 2,000 that were part of a special net retention study. In the fall of 2024 we scanned just over 8,000 Rougheye rockfish, but the results for that species after analysis weren't promising in terms of use in the assessment, so we have since slowed down our efforts in scanning Rougheye and Blackspotted rockfish to prioritize other assessment species.

In December of 2024 we expanded our scanning efforts to include Chilipepper rockfish. The SWFSC helped us to adopt their scanning method for Chilipepper which involves using a Teflon disc to narrow the scanning window on the spectrometer, which leads to cleaner spectra. So far we have scanned 7 years of the NWFSC COMBO Survey (2014 and 2018-2024), as well as a few years of OR and CA commercial, totaling in about 6,300 Chilipepper production scans.

We also received a new TANGO spectrometer from the La Jolla lab in January of this year. We are waiting on a new computer in order to get the spectrometer set up and running, but we are excited to train more technicians to use the spectrometer and hopefully increase our scanning capacity and production rates this year.

Total Production Scans since CARE in April 2024

SABL	REYE	BSPR	PWHT	CLPR
18609	8158	29	4175	6301

Grand total: 37,272 production scans

ODFW update

Mark Terwilliger remains the lone age reader for the agency.

Production Ageing

ODFW has historically focused on production ageing of nearshore groundfish for inclusion in stock assessments, so we started off 2024 by ageing China Rockfish in anticipation of that species being assessed in 2025. We aged 493 commercially caught China Rockfish from catch years 2014-2022 and weighed 362 samples (222 commercial, 140 sport) in accordance with CARE (Committee of Age Reading Experts) protocols.

We soon learned that neither China Rockfish, nor any other nearshore species, were included in the Groundfish Management Team's list of species to be assessed in 2025. Therefore, we switched gears and estimated ages for Oregon's component of the Rougheye and Blackspotted Rockfish complex (a slope species) for inclusion in the 2025 assessment. In 2024, ODFW produced break-and-bake age estimates for 1765 fish from catch years 2017, 2021-2023, all from the commercial fishery. Weights were taken from 2612 otoliths and data provided to NWFSC for FT-NIRS (Fourier transform near infrared spectroscopy) age estimation.

ODFW routinely performs double-reads on 20% of all otoliths to generate an index of precision, defined as the reproducibility of repeated measurements on a given structure. Precision estimates lend insight on the ease of ageing a structure, assess the reproducibility of an individual's age determinations, or compare the skill level of one ager relative to that of others. ODFW employs a single reader to age commercially and recreationally important groundfish; therefore, double-reads are used to determine the precision of a single reader. Only catch years 2021-2023 were double-read during the 2024 calendar year, and average percent error (APE) for those collections was 5.66%. Given the long-lived nature of this species and the inherent difficulty in ageing it, our APE value is acceptable.

Other Ageing Activities

Prior to ageing China Rockfish, we imaged an additional 708 samples (in addition to 1215 images taken in 2023) for a study using otolith shape to potentially further separate the central stock (from the Oregon-Washington border south to 40°10' N) into a northern and southern component. This study is ongoing.

ODFW obtained 25 Black Rockfish otolith samples captured by DFO during their Gulf of Alaska surveys in 2019, 2020, and 2022. These samples were of particular interest because they came from relatively large fish and Oregon Black Rockfish aged for the 2023 assessment showed a lack of large, old females. We are still awaiting the sex data for these samples, but because the ages were relatively young (range 9-20 years), they lend credence to the hypothesis that large old females are absent from populations throughout their range.

ODFW typically sends Lingcod fin rays to WDFW for processing and ageing; however, in 2024 it was deemed cost prohibitive to continue that practice. In late 2024, port samplers from ODFW and PSMFC began preparing commercial (N = 1168) and sport (N = 1040) fin ray samples from years 2020-2023 for ageing. Fin ray preparation is a long, tedious process that includes gluing, sectioning, and mounting fin sections onto microscope slides.

ODFW and NWFSC co-hosted the biennial CARE meeting in Newport, which included representatives from state, federal, and international ageing labs on the west coast of North America. Working groups on otometrics and ageing protocols for Lingcod, Sablefish, and Rougheye/Blackspotted Rockfish were a few of the highlights.

SWFSC-La Jolla update

The Fisheries Resources Division at the Southwest Fisheries Science Center conducts research on coastal pelagic (i.e., sardine, anchovy, Pacific mackerel) and highly migratory species (i.e., Pacific Albacore tuna, Pacific Bluefin tuna).

Northern Anchovy

The primary reader at SWFSC for the central subpopulation of northern anchovy aged the required otoliths from the 2024 summer survey. They also continued to age otoliths sampled from northern subpopulation of northern anchovy otoliths as part of their ongoing research.

A new reader was certified to age northern anchovy. They have completed age assignments for otoliths sampled in 2021 and are currently ageing northern anchovy samples collected from 2021 through 2024.

A third reader completed the training and is in the process of completing the test for certification in order to begin providing age data for stock assessments by summer 2025.

The primary reader for northern anchovy at SWFSC began training new age readers at CDFW, since the two agencies work closely together to provide age data for stock assessments.

Pacific Sardine

An update stock assessment for the Pacific Fishery Management Council occurred for Pacific sardine in February 2025. The primary reader at SWFSC provided ages for all sampled otoliths from the 2024 summer survey that were assigned to the northern stock of Pacific sardine by the STAT team. The majority of otoliths from Pacific sardine sampled during the 2024 survey were not aged, because the sampled fish were assigned to the southern stock, which is not assessed or managed.

Two new readers were certified to age Pacific sardine. One reader has finished the backlog of samples collected from 2021-2024, and the other reader is currently working on these backlogged samples.

The primary reader for Pacific at SWFSC began training new age readers at CDFW, since the two agencies work closely together to provide age data for stock assessments.

Pacific Mackerel

Three readers at SWFSC are currently trained and certified to age Pacific mackerel for stock assessments.

No Pacific mackerel were aged in 2024, as time was taken to build a new training set and certification test for new age readers at both SWFSC and CDFW.

By the end of 2025, all three readers will age the small backlog of otolith samples of Pacific mackerel.

Pacific Albacore Tuna

We generated updated length-at-age data and modeled sex-specific growth for Pacific albacore tuna sampled from recreational and commercial fisheries in the eastern and central Pacific Ocean from 2013 through 2023. An updated growth curve (sexes combined) was generated and otoliths with known sex (sex determined from genetic analyses) were used to generate separate growth curves for males and females.

The updated age and growth data and our growth model results were presented to the International Scientific Committee North Pacific Albacore Working Group in March 2025. The updated age data will be combined with previous available age data and new age data from Japan. The working group will decide how to incorporate these age data in late 2025.

Pacific Bluefin Tuna

We continued the long-term collection of Pacific Bluefin Tuna otoliths from the southern California Bight in 2024, extending our time series, which now spans from 2008 to 2024.

Our international collaboration with researchers in Taiwan to develop an AI-based machine learning model for automated aging of PBF otoliths also continued in 2024. We provided 300 otolith samples that were sectioned, scanned, manually aged by readers at SWFSC and National Taiwan University, and aged by the AI-based model. In addition to serving as training data for the machine learning model, the age data derived from

these otoliths will be incorporated into age and growth models specific to PBF in the southern California Bight. The AI model is now publicly available through a user-friendly web-based platform (https://mltunaotolith.toolmenlab.bime.ntu.edu.tw).

FT-NIRS

After carefully weighing the scientific tradeoffs and benefits, the number of questions to still be answered, as well as the success of using FT-NIRS to predict ages of coastal pelagic species and highly migratory species, the SWFSC – La Jolla lab has decided to not continue its research efforts on FT-NIRS. The FT-NIRS machine (TANGO) at the SWFSC - La Jolla lab was sent to the NWFSC in January 2025 to increase their scanning capacity.

C.A.R.E. Otolith Exchange

We are currently participating in a C.A.R.E. otolith exchange with WDFW for northern anchovy and Pacific sardine for inter-agency validation. WDFW sent 50 otoliths of each species in March for the exchange. Once the SWFSC is done reading these otoliths, they will send them back and send an additional 50 otoliths of each species from the SWFSC collection for WDFW to read.

Ongoing Research

- Ageing methodology of managed and assessed coastal pelagic species off the northeastern Pacific Coast
- Evaluating the accuracy and precision of FT-NIRS ages estimated for two short-lived coastal pelagic species (CPS), Pacific sardine and Pacific mackerel
- Variability in age and growth of Pacific Sardine in US waters during the recent period of low population biomass, 2012-2021
- Exploration of variations in length-at-age to inform stock structure of Pacific sardine off the U.S. West Coast
- Relationships between somatic growth, recruitment, climate, and stocks using otolith biochronologies
- Spawning stock recovery of Pacific bluefin tuna (*Thunnus orientalis*): evidence from length, age and catch data of Taiwanese longline fishery in 2010-2023

Recent Publications

- Validation of periodicity of growth band formation in Pacific sardine (*Sardinops sagax)* from a captive growth experiment (James et al., 2024, Marine Biology, https://doi.org/10.1007/s00227-024-04425-2)
- Systematic review of somatic growth patterns in relation to population structure for Pacific sardine (*Sardinops sagax*) along the Pacific Coast of North America (Erisman et al. 2025, NOAA Tech Memo, https://doi.org/10.25923/0j1j-xv61)
- Update on the age and growth of North Pacific albacore tuna (*Thunnus alalunga*) from the central and eastern Pacific Ocean. (Snodgrass et al. 2025. ISC/25/ALBWG-01/05 Working Group Paper Submitted to the ISC Albacore Work https://isc.fra.go.jp/working_groups/albacore.html).
- Evaluating post-survey otolith subsampling strategies and age-length keys for Pacific sardine (*Sardinops sagax*) for inclusion in stock assessments (Schwartzkopf et al., manuscript in revision)

WDFW update

Personnel Update:

WDFW has the same team in the Fish Ageing Lab since CARE last met in 2024.

- Jenny Topping- Lead Groundfish Age Reader
- Merrie Schultz- Groundfish Age Reader
- Austin Anderson-Salmon Age Reader
- Christina Jump-Freshwater Age Reader and Database
- Andrew Claiborne-Team Lead and Salmon Age Reader

Activities Update:

2024 and 2025 have been a busy assessment cycle for the WDFW Fish Ageing Lab. We've contributed ages to the widow, yellowtail, rougheye, and yelloweye rockfish stock assessments. The most recent exchange we have been working on is the rougheye rockfish exchange with NWFSC, ADFG ADU, ODFW, and AFSC. We are collaborating on a study with Oregon State University looking at the potential of using petrale sole otolith chemistry as an indicator of ocean hypoxia. Growth estimates are made for these fish and chemistry data is forthcoming. We are currently finalizing a NOAA Tech Memo with the SWFSC that describes ageing methodology for coastal pelagic species (anchovy, Pacific sardine and Pacific mackerel). WDFW staff, Fabio Prior Caltabellotta

and Lisa Hillier, continue to research the use of spiny dogfish stained vertebrae for age estimation.

Production Age Reading Update since 2025 CARE:

Common Name	Scientific Name	Year
black rockfish	*Sebastes melanops*	2024
Pacific sardine	*Sardinops sagax*	2024
rougheye rockfish	*Sebastes aleutianus*	2010
rougheye rockfish	*Sebastes aleutianus*	2023
rougheye rockfish	*Sebastes aleutianus*	2024
widow rockfish	*Sebastes entomelas*	2019
widow rockfish	*Sebastes entomelas*	2020
widow rockfish	*Sebastes entomelas*	2021
widow rockfish	*Sebastes entomelas*	2022
widow rockfish	*Sebastes entomelas*	2023
widow rockfish	*Sebastes entomelas*	2024
yelloweye rockfish	*Sebastes ruberrimus*	2017
yelloweye rockfish	*Sebastes ruberrimus*	2018
yelloweye rockfish	*Sebastes ruberrimus*	2019
yelloweye rockfish	*Sebastes ruberrimus*	2020
yelloweye rockfish	*Sebastes ruberrimus*	2021
yelloweye rockfish	*Sebastes ruberrimus*	2022
yelloweye rockfish	*Sebastes ruberrimus*	2023
yelloweye	*Sebastes ruberrimus*	2024

rockfish		
yellowtail rockfish	*Sebastes flavidus*	2021
yellowtail rockfish	*Sebastes flavidus*	2022
yellowtail rockfish	*Sebastes flavidus*	2023
yellowtail rockfish	*Sebastes flavidus*	2024
steelhead	*Oncorhynchus mykiss*	2024
chum salmon	*Oncorhynchus keta*	2024
coho salmon	*Oncorhynchus kisutch*	2024
sockeye salmon	*Oncorhynchus nerka*	2024
Chinook salmon	*Oncorhynchus tshawytscha*	2024

Table 1. Attendees of the 2025 Virtual CARE check-in, March 24, 2025

Last name	First name	Agency	Location	Country	Email
Whitman	Ali	ODFW/ GTC	Newport	USA	alison.d.whitman@odfw.oregon.gov
Ford	Marian	ADFG	Homer-DSF	USA	marian.ford@alaska.gov
Dore	Josh	ADFG	Juneau	USA	josh.dore@alaska.gov
Johnson	Kait	ADFG	Juneau	USA	kaitlyn.johnson@alaska.gov
McNeel	Kevin	ADFG	Juneau	USA	kevin.mcneel@alaska.gov
Plumb	Mark	ADFG	Juneau	USA	mark.plumb@alaska.gov
Chamberlin	Derek	AFSC	Seattle	USA	derek.chamberlin@noaa.gov
Chin	Andrew	AFSC	Seattle	USA	Andrew.Chin@noaa.gov
Gburski	Chris	AFSC	Seattle	USA	Christopher.Gburski@noaa.gov
Helser	Tom	AFSC	Seattle	USA	Thomas.Helser@noaa.gov
Matta	Beth	AFSC	Seattle	USA	Beth.Matta@noaa.gov
Neidetcher	Sandi	AFSC	Seattle	USA	sandi.neidetcher@noaa.gov
Pearce	Julie	AFSC	Seattle	USA	julie.pearce@noaa.gov
Short	Jon	AFSC	Seattle	USA	jon.short@noaa.gov
Stone	Kali	AFSC	Seattle	USA	kali.stone@noaa.gov
Gravel	Sarah	CDFO	Nanaimo	Canada	sarah.gravel@dfo-mpo.gc.ca
Ty	Audrey	CDFO	Nanaimo	Canada	audrey.ty@dfo-mpo.gc.ca
Wischniowski	Stephen	CDFO	Nanaimo	Canada	stephen.wischniowski@dfo-mpo.gc.ca
Heuring	Laura	CDFO	Winnipeg	Canada	laura.heuring@dfo-mpo.gc.ca

Loewen	Tracey	CDFO	Winnipeg	Canada	tracey.loewen@dfo-mpo.gc.ca
Magrane	Kelsey	IPHC	Seattle	USA	kelsey.magrane@iphc.int
Hale	James	NWFSC	Newport	USA	jhale@psmfc.org
McDonald	Patrick	NWFSC	Newport	USA	pmcdonald@psmfc.org
Paige	Nikki	NWFSC	Newport	USA	npaige@psmfc.org
Ortiz	Liz	NWFSC	Newport	USA	lortiz@psmfc.org
Wallingford	Emily	NWFSC	Newport	USA	ewallingford@psmfc.org
Terwilliger	Mark	ODFW	Newport	USA	mark.r.terwilliger@odfw.oregon.gov
Monk	Melissa	SWFSC	Santa Cruz	USA	melissa.monk@noaa.gov
Erisman	Brad	SWFSC	La Jolla	USA	brad.erisman@noaa.gov
James	Kelsey	SWFSC	La Jolla	USA	kelsey.james@noaa.gov
Caltabellota	Fabio	WDFW	Montesano	USA	fabio.priorcaltabellotta@dfw.wa.gov
Claiborne	Andrew	WDFW	Olympia	USA	andrew.claiborne@dfw.wa.gov
Topping	Jennifer	WDFW	Olympia	USA	jennifer.topping@dfw.wa.gov