

History of CARE

The "seed" for the formation of a Committee of Age Reading Experts (CARE) was "planted" at the June 1982 meeting of the Technical Subcommittee of the Canada/United States Groundfish Committee. Concerns were voiced regarding the standardization of ageing methodologies for species being aged by multiple agencies with management responsibilities for shared stocks, particularly in regard to the use of the break-and-burn technique. The Parent Committee formed a working group on January 10, 1983 in conjunction with the Second Western Groundfish Workshop in Monterey, CA. The working group met at the Hopkins Marine Station on January 12, 1983 and assigned Dr. Loh-Lee Low (Northwest & Alaska Fisheries Center, Seattle) and Dr. Dan Kimura (Washington Department of Fisheries, Seattle) the task of drafting a proposal for presentation to the TSC in March 1983. At the 1982 Annual Meeting, the TSC requested a review and position statement from each agency of the break-and-burn method of age determination to be presented at a special February or March 1983 meeting of the TSC.

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In February 1983, Dr. Loh-Lee Low and Dr. Dan Kimura drafted a memo to Dr. John P. Harville (Executive Director for the Pacific Marine Fisheries Commission) proposing two three-day workshops on ageing methodology. The focus of the proposed workshops was the standardization and documentation of methodology for ageing. They would include discussion of the appropriate age structures (otolith vs. scales etc.), preparation of samples (otolith surface vs. break-and-burn or thin-section, etc.), equipment required for sample preparation, and the reading procedure including discussion of the preferred reading axis and definition of the criteria used to identify annuli. In addition, development of procedures for inter-agency calibration, and methodology for age validation work were proposed as issues for discussion. Eight selected ageing experts were identified from Alaska, British Columbia, Washington, Oregon, and California. The proposal called for PMFC to organize and fund travel expenses for these people. The Northwest and Alaska Fisheries Center in Seattle offered to host the workshops. Funding for the workshops totaling \$5,500 was proposed to cover travel expenses, supplies, and publication costs.

A special meeting of the TSC was convened on March 7, 1983 to address this proposal. Position statements from each agency on the break-and-burn technique were presented. At this time, the first reference to "a committee of age reading experts" was noted. The following recommendations were made in regards to a late April 1983 workshop:

1. This group would convene to "document and standardize current methods used to age groundfish. This group may recommend the preferred method for each species but final action on the preferred method should be the responsibility of the TSC." The specific tasks related to age determination identified for documentation and standardization were as follows:

- a. the preparation of structures
- b. surface reading, break-and-burn, and sectioning procedures
- c. equipment and magnification used
- d. axis of reading and criteria used when counting rings
- e. "other necessary considerations."

In addition, the "products of the workshop" were detailed at this time. These products were to include: a manual of standard techniques; documentation of alternatives (where consensus is not achieved); recommendations for future research (including validation); estimates of the number of structures which can be aged by an experienced reader per day for each species and technique; and if possible, recommendations of the most accurate method for each species.

Target species were also defined at this time to include "rockfish of regional management concern." Pacific Ocean perch, yellowtail, canary, widow rockfish and bocaccio were listed. Chilipepper and black rockfish were suggested for inclusion as well, if time permitted. At this meeting, it was agreed that John Harville or Larry Six of PMFC would act as moderator to this workshop.

Concurrent with discussion of the standardization of ageing criteria between agencies was a "parallel effort" directed toward effects of ageing on assessment and management. In addition, the minutes from the March 7, 1983 meeting of the TSC indicate that a "centralized age reading unit" was under consideration at the time, but noted that one of the "objectives of a centralized unit" would be achieved through the reduction in ageing variation between agencies.

On March 8, 1983, Jack Tagart (WDF; representative of TSC) drafted a letter to Dr. John Harville proposing a "course of action" from the TSC to the Parent Committee. It was proposed that a workshop be convened in late April 1983 at the Northwest & Alaska Fisheries Center, Seattle. The participants were: Doris Chilton (Pacific Biological Station, Nanaimo), Julie Lyons (NWAFC, Seattle), Tina Echeverria (Southwest Fisheries Center, Tiburon), Ruth Mandapat (WDF, Seattle), Bill Barss (Oregon Department of Fish & Wildlife, Newport), Joan Organ (Alaska Dept. of Fish & Game, Kodiak), Frank Henry (Calif. Dept. of Fish & Game, Menlo Park), and George Boehlert (Oregon State University, Newport). The TSC requested that PMFC provide an "impartial moderator" to direct this workshop and that PMFC provide the necessary funds to support participation of the indicated age reading experts. This letter also anticipated that two three-day workshops would be required to produce an ageing manual documenting standardized rockfish ageing methodology.

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1ST CARE MEETING (APRIL 27-29, 1983):

The first CARE Meeting was convened on April 27-29, 1983 by Chairman Charles Woelke of the Pacific Council's Scientific & Statistical Committee at the Northwest & Alaska Fisheries Center, Seattle. Participants were: Jack Lalanne, Julie Lyons and Betty Goetz (NWAFC), Doris Chilton and Shayne MacLellan (PBS, Nanaimo), Frank Henry (CDFG), Bill Barss (ODFW), George Boehlert (OSU), Ruth Mandapat and Sandra Oxford (WDF), Tina Echeverria (SWFC, Tiburon), and Joan Organ (ADFG). An agenda outlined and suggested by the TSC was presented. Betty Goetz acted as Rapporteur.

Each participating agency detailed the techniques used to age yellowtail rockfish. Specific procedures used to prepare and age otolith surface, break-and-burn, and thin-section were described by each agency. Also detailed were otolith collection and storage procedures. The minutes for this workshop contained very detailed explanations of ageing procedures by agency, as well as assessment of the average daily productivity of experienced readers for each reading method.

Description of agency procedures was followed by compilation of a first draft of "Generalized Rockfish Ageing Procedures" which detailed sample collection recommendations, surface ageing techniques, break-and-burn methodology, and thin-sectioning options.

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TSC response to CARE workshop results (June 1983):

In June 1983 the TSC met and discussed the results of this first CARE workshop. Two primary recommendations were made; 1) "that each agency review applications of the break-and-burn technique and present a list of endorsed species at the next meeting of the parent committee", and 2) that a second workshop be convened to "resolve remaining issues". It was then recommended that a second workshop be held before the end of 1983 to address the following issues: 1. Resolve disagreements in very young and/or very old rockfish examined under controlled conditions. This would involve "hands-on" ageing of selected otoliths. 2. Work toward a goal of standardized methods for ageing sablefish. 3. Recommend procedures and a mechanism for monitoring age determination precision among and within agencies. These procedures should include a definition of an "acceptable" level of agreement.

Since the TSC supported the break-and-burn technique as the preferred method for ageing rockfish, the TSC suggested that this workshop provide the opportunity for participants to compare criteria and work to insure consistency in the application of this technique coastwide. A proposed agenda was drafted at this time.

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2ND CARE MEETING (AUGUST 3-5, 1983):

Prior to the second CARE meeting, a sample of 300 POP was circulated among selected participants. Surface and break-and-burn ages were assigned independently by 2 readers at AFSC (Julie Lyons & Betty Goetz). Neither reader was aware of the age assigned by the other reader or had access to the age estimated from the opposing structure. Surface and break-and-burn ages were also assigned by Canada and ODFG (Bill Barss). A surface age was assigned by WDF.

The second CARE meeting was held August 3-5, 1983 at the Northwest & Alaska Fisheries Center. This workshop was convened by Charles Woelke and attended by Bill Barss, Doris Chilton, Tina Echeverria, Betty Goetz, Frank Henry, Julie Lyons, Shayne MacLellan, Ruth Mandapat, Joan Organ, and Sandra Oxford. Additional participants were: Evan Haynes (NWAFS, Auke Bay), Han-Lin Lai (Univ. of Washington, Seattle), and Mary Yoklavich (OSU, Newport). Betty Goetz was elected Rapporteur.

Discussion of sample design, quality control procedures, criteria used in ageing young fish, readability coding, and acceptable levels of agreement occurred. Hands-on ageing of Pacific Ocean Perch (n = 5)(surface & BB), yellowtail rockfish (n = 10)(BB), sablefish (n = 5) involving all participants produced ages which were compared and discussed. The yellowtail rockfish burned sections were displayed on video screen which facilitated the resolution of discrepancies. Within-reader comparisons for 4 readers were computed after re-reading of 6 POP from the initial n = 300 sample. Sablefish ageing methodology was addressed but agreement on the interpretation of older ages was lacking. Flatfish ageing was also addressed briefly.

The "Generalized Rockfish Ageing Manual" was edited and a subcommittee consisting of Julie Lyons, Ruth Mandapat, Doris Chilton, Shayne MacLellan and chaired by Frank Henry was formed to draft insertions dealing with 1) standardization of recording methods for ageing, 2) an otolith exchange mechanism, and 3) recommended method of data analysis. Target date for outline draft addressing these points was end of 1983. A first draft of "suggested sablefish addendum to the proposed rockfish ageing manual" and "proposed inter-agency age calibration mechanism" were produced. At this meeting, C.A.R.E. agreed to substitute "burned section ageing" for "break-and-burn"

Topics for discussion at a subsequent C.A.R.E. meeting were outlined as follows:

- 1) Proceed with a sample exchange,
- 2) Refine sablefish methodology, and
- 3) Consider flatfish in more depth

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TSC recommendations to CARE (June 1984):

1. That the ageing manual be "published and distributed to all readers and researchers". PMFC volunteered to "publish and distribute the manual" and solicited a listing of readers and researchers from each State and Province.
2. That CARE hold annual meetings and amend/edit the manual at each meeting. Each agency should seek inter agency funds for travel to such a meeting on a continuing basis".
3. That CARE "draft its own terms of reference or operating procedures within the following framework:"The primary focus of CARE is the description and application of groundfish age reading methodology, and the development and implementation of age reading quality control procedures among agencies. CARE does not set age reading policy for the agencies."
4. That TSC approved the "concept of an otolith exchange", and assigned the coordination and execution of an otolith exchange to CARE.

An INPFC Ageing Workshop was held at Nanaimo from October 25-27, 1984, however, the chairperson requested that CARE business not be combined with this workshop. Hands-on examination of age structures occurred and CARE participants in attendance were Doris Chilton, Shayne MacLellan, Julie Lyons, Betty Goetz, Ruth Mandapat, Sandra Oxford, and Joan Organ.

A multi-species rockfish otolith pilot exchange was organized and otoliths circulated in 1984-85. Procedures outlined in the "proposed inter-agency age calibration mechanism" were followed. Species included Pacific Ocean perch, yellowtail RF, black RF, widow RF, canary RF, chilipepper RF and bocaccio. This exchange was organized to establish sample and size and identify logistical problems. The data was analyzed by both Nanaimo and NMFS staff and summarized in a report to Chuck Woelke. These results were circulated to the CARE participants.

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3RD CARE MEETING (JUNE 5-6, 1986):

The third CARE meeting was held June 5-6, 1986 at the Northwest & Alaska Fisheries Center, Seattle. This meeting was chaired by Chuck Woelke and attended by Bill Barss, Betty Goetz, Frank Henry, Julie Lyons, Ruth Mandapat, and Sandra Oxford. Other attendees were Vicki Betzenheimer (NWAFC), Lisa Edinger (WDF), Jim Greiner (NWAFC), and George Hirschhorn (NWAFC). Betty Goetz was elected Rapporteur.

Problems with the rockfish otolith exchange were discussed at length. Betty Goetz drafted a report to TSC describing results, problems, and recommendations.

Prior to this meeting, each agency was asked to prepare a summary of quality control measures used by each lab, including a discussion of the degree of precision achieved by species. This data was presented to the group and discussed at length. Average production volume per species and staffing levels were also discussed. This data was summarized in the first version of "Age Reading Methodology" which listed species, stock aged, structures used, method used, and validation work by agency.

Bill Barss presented a summary of the work done by Demory & Pikitch involving a comparison of Dover sole scale vs. break-and-burn ageing.

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Results of CARE meeting presented to TSC: 1.^ ^ ^ ^ There is a need to update the Ageing Manual (add photos for better description, improve sablefish section, add addresses and phone numbers of CARE members, add "summary of Age Reading Methods", and put a hold on inclusion of an "inter-agency age calibration mechanism" until revision is complete).2.^ ^ ^ ^ Present the Agency/Method summary

3.^ ^ ^ ^ Submit the report on the otolith exchange

4.^ ^ ^ ^ Discuss the support of future meetings and possible funding.

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TSC response to CARE meeting results (1986):

The TSC responded^ to these issues in June 1986. At this time a revision of the CARE Terms of Reference was drafted. Items suggested for discussion at the next CARE meeting were:

1)^ ^ ^ ^ implementation of the revised "terms of reference",

2)^ ^ ^ ^ revision of the Ageing Manual,

3)^ ^ ^ ^ review of quality control procedures, and

4)^ ^ ^ ^ initiation of another otolith exchange.

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4TH CARE MEETING (MAY 24-26, 1988):

The Washington Department of Fisheries hosted the fourth CARE meeting in the NWAFC/WDF facility, Seattle. Chuck Woelke chaired this meeting which was attended by Bill Barss, Betty Goetz, Julie Lyons, Shayne MacLellan, Ruth Mandapat, Sandra Oxford, and Joan Reid (Organ). Also attending were Jim Brennan (Moss Landing), Diego Busatto (CDFG), Darlene Dodds (PBS), Aaron King (Moss Landing), Anne McBride (SWFC, Tiburon), Christine Pattison (CDFG), Victoria Poage (NWAFC), Allison Reak (NWAFC), and Diana Watters (Moss Landing). Victoria Poage was selected as Rapporteur.

Extensive editing and revision of the Ageing Manual, including specific itemization of figures/photos needed to illustrate specific points occurred. Subcommittees to rewrite the "otolith exchange mechanism" (Lyons, Goetz, MacLellan,

McBride, Reid) and to revise the "sablefish addendum" were formed. Shayne MacLellan volunteered to coordinate photograph selection and duplication.

Each participating agency updated current activities including validation work, quality control procedures, flatfish aged, and image analyzer equipment. The Summary of Age Reading Methods was updated, and revised to include a "status" column, indicating whether a species was currently in production ageing, had been production aged in the past, or was slated for development in the future. Three hours of hands-on ageing followed.

Mark Wilkins (NWAFC) spoke to the group and described the role of TSC in directing the activities of CARE and fielded questions related to the proposed "terms of reference", relationship between the TSC and CARE, and election of CARE officers. Shayne MacLellan was voted CARE chairperson for the upcoming term. Joan Reid was voted vice-chair.

Interim activities: During the summer of 1988 a sablefish otolith exchange was organized between NWAFC, SWFC (Tiburon), and DFO (Nanaimo). A workshop was held from Feb. 14-17, 1989 in at NWAFC, Seattle to discuss results and calibrate criteria used by agencies.

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5TH CARE MEETING (MAY 16-18, 1990):

The fifth meeting of CARE was held from May 16-18, 1990 at NWAFC, Seattle. This was the first meeting chaired by a CARE member (Shayne MacLellan, DFO, Nanaimo), without a contract chair from PMFC. This meeting was co-hosted by AFSC and WDF. Bill Barss, Joan Brodie (Organ/Reid), Betty Goetz, Julie Lyons, Shayne MacLellan, Sandra Oxford, and Victoria Poage attended. Also in attendance were Calvin Blood (IPHC), Karen Charles (DFO, Nanaimo), Joan Forsberg (IPHC), Tracee Geernaert (IPHC), Craig Kestelle (AFSC), Dan Kimura (AFSC), Becky Ota (CDFG), and Larry Quirollo (CDFG). Victoria Poage was selected rapporteur.

Tom Jagielo (WDF), current TSC chair, spoke to the group about current concerns of the TSC. He described the recent recognition on the part of modelers of the difficulties involved in assigning ages, and the concurrent need to incorporate a measure of repeatability into population models. He emphasized the need to regularly collect repeatability information that could be pooled from various agencies. Thus, standardization of quality control protocols was needed.

Topics of discussion included structure storage procedures, updating of agency quality control procedures, documentation of edge type characteristics, age designation systems by agency, systems to foster continuity of career personnel, new reader training methods, systems of prioritizing age requests, update of the "Summary of Age Reading Methodology", and presentation of halibut validation research. CDFG presented a summary of their Dover sole ageing techniques. Also noted was interest on the part of age reading labs in Newfoundland and Woods Hole in the structure and purpose of CARE. Personnel at the SEFC (Miami) had also requested information on CARE.

Documents resulting from this meeting were: 1) Summary of Age Structure Storage Protocols, and 2) Summary of Precision Testing Protocols. Interagency calibration efforts were described for Dover sole agers.

A hands-on workshop was interrupted by a bomb threat. The CARE meeting was moved to the NMFS Montlake facility.

Revision/editing of the Ageing Manual involved selection of photographs for incorporation in the manual, and subcommittee meetings to discuss addenda 1) exchange mechanism, 2) sablefish ageing, and the Bill Barss method for permanent storage of otolith break-and-burns.

Officers for the next term were selected; Chair = Craig Kestelle (AFSC) and Vice-chair = Bill Barss (ODFG).

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Recommendations from CARE to TSC (presented June 5-7, 1990):

1. All agencies should institute a well documented and regular systematic precision testing program. Time to do this must be made available to the readers and should become a part of routine ageing procedure.

2. It is crucial that readers be given the time, instruction, encouragement and assessment necessary in order to provide confident age determinations. It is recommended that each agency institute a formal, documented training program which includes personal instruction with designated goals and precision testing.

3. Each agency should undertake to establish and document "expected" times of growth and non-growth for each stock and life history stage of species aged. This would provide fish agers with a time frame for edge growth deposition

that would enable them to more accurately assign age class.

4. It is recommended that a single age designation system be adopted to avoid confusion of future exchanges and cooperative work.

5. Validation work is required on Dover sole along with further development of criteria to help improve precision.

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TSC Recommendations to CARE (June 5-7, 1990):

1. TSC endorses the CARE report and recommends that an executive summary of the major recommendations be sent from the TSC to senior managers responsible for groundfish ageing within each agency.

2. In recognition of the need for Dover sole validation studies cited by CARE, the TSC recommends that a Dover sole working group be activated and prepare a validation study proposal over the next year. One member from each agency except Alaska would participate.

TSC Chair, Tom Jagielo (July 27, 1990) sent letters to the supervisors/heads of all West Coast Fish Ageing Units endorsing these recommendations, and encouraging the consideration of these issues in the interest of improving the accuracy of ages generated and in standardizing agency procedures.

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TSC Recommendations to CARE (June 4-6, 1991):

1. CARE members should participate in an otolith exchange prior to the May 1992 meeting. Species of concern were Dover sole, sablefish, and the thornyheads.

2. CARE should encourage new participants to attend. SWFC (La Jolla) was specifically mentioned.

3. CARE should attempt to establish a systematic program for investigation of otolith edge formation for all species, with initial emphasis on a few key species.

4. Validation efforts are encouraged, including OTC/tagging approach, investigation of independent age-related indicators (Pb-210, lipofuscin), and biostatistical methods for tracking strong year classes.

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6TH CARE MEETING (MAY 27-29, 1992):

The sixth meeting of CARE was held in Seattle (AFSC) from May 27-29, 1992. This meeting was chaired by Craig Kestelle and attended by Calvin Blood, Joan Forsberg, Tracee Geernaert, Shayne MacLellan, Larry Quirollo, Sandra Rosenfield (Oxford), Dan Kimura, Julie Lyons, Betty Goetz, and Delsa Anderl. Also in attendance were: Brenda Erwin (PSMFC/CDFG, Menlo Park), Pete Hagen (ADFG, Douglas), John Mello (CDFG, Sebastopol), Kristen Munk (ADFG, Douglas). Delsa Anderl was selected Rapporteur.

Studies related to marginal increment analysis were described, updates relating to agency precision testing procedures, age designation, radiochemical validation, thornyhead projects, and image analysis systems were discussed.

Shayne MacLellan was designated as the "editor-in-chief" for the Ageing Manual. She provided photos for consideration which illustrated the points outlined in previous CARE meetings.

The group discussed marginal increment analysis at length and commented that the lack of sufficient materials covering the entire growing season were the primary deterrent in achieving good information. Projects involving sablefish, English sole, and halibut were outlined. OTC use and application were demonstrated by Craig Kestelle (sablefish) and Cal Blood (halibut).

Presentations of work-in-progress and preliminary results:

1. John Mello, Validation of otolith annuli for use in age determination of chilipepper (*Sebastes goodei*). Marginal increment analysis from monthly collections.

2. Joan Forsberg, Estimating sex of Pacific halibut (*Hippoglossus stenolepis*) using Fourier shape analysis.
3. Craig Kestelle, Using Pb-210/Ra-226 disequilibrium for sablefish (*Anoplopoma fimbria*) age validation.
4. John Butler, Age determination of shortspine thornyhead, *Sebastolobus alascanus*, using otoliths sections and 210Pb:226Ra ratios.
5. Larry Quirollo, Report on CDFG/ODFW Dover sole ageing workshop April 14-16, 1992.

Other age validation and special projects were informally outlined. These included multi-structure study of shortspine thornyheads (AFSC), daily growth increment study of walleye Pollock to verify 0-1 year olds with vague otolith patterns (AFSC), marginal increment analysis of tagged juvenile sablefish (AFSC), radioisotope analysis for rockfish species (AFSC), rex sole ageing methods (AFSC), validation of the first annulus in atka mackerel (AFSC), correlation of environmental variables to strong pattern differences seen in yelloweye RF (*Sebastes ruberrimus*), and investigation of stock separation using these patterns (ADFG),

Hands-on workshop was held involving Dover sole, rougheye RF, sablefish, jack mackerel, shortspine and longspine thornyheads, chilipepper RF, lingcod, and Pollock. Discrepancies in a prior exchange of sablefish involving 4 agencies were resolved.

Chair for upcoming term = John Butler/ Vice-chair = Betty Goetz

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CARE recommendations to CARE (1992):

1. Alternatives for OTC should be investigated. Possibilities include calcine, alizarine compounds, and SrCl. This might reduce problems in receiving approval from the FDA.
2. Evaluation of different image analysis software and hardware systems which could result in the facilitation of interagency communication and reader comparisons is recommended.. A workshop is tentatively planned for spring 1993 to deal specifically with image analysis system evaluation.
3. CARE continues to recommend frequent exchanges of structures for interagency calibration. Of particular interest are shortspine thornyhead, sablefish, pollock, and other rockfish species.
4. CARE recommends that the Ageing Manual be completed and finalized as it currently exists, with additional species information added as addenda in the future. A working group was formed to accomplish this: Shayne MacLellan (editor), Betty Goetz, Kristen Munk, Larry Quirollo, Cal Blood, and John Butler.

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CARE recommendations to TSC (1992):

1. See Item 1 above.
2. CARE recommends that TSC support the establishment of a radiochemistry lab dedicated to age validation of marine organisms.
3. CARE recommends that the TSC solicit funds from PSFMC to publish the Ageing Manual including high quality photos, and quality reproduction of other graphics.

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TSC recommendations to CARE (1993):

1. The TSC endorses and encourages the investigation of alternative compounds for marking otoliths used in validation studies.
2. The TSC recognizes the value of radiochemical methods for age validation, but suggests that such work be accomplished in cooperation with established chemistry research facilities.
3. The TSC encourages and endorses the development and utilization of imaging technology.
4. The TSC supports the continued exchange of age structures to foster interagency calibration efforts. We further

recommend that an annual summary of such exchanges, including pertinent results, be included in the CARE report to TSC.

5. The TSC requests explanation of the objectives behind CARE's request to finalize and publish the CARE Ageing Manual, and suggests that CARE consider the use of multimedia technologies to enhance the effectiveness of the manual.

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TSC recommendations to CARE (1994):

1. In addition to the above, the TSC further recommends that CARE formalize and expand their minutes to facilitate better communication with the TSC. A section which addresses progress on recommendations from CARE to itself, and from TSC to CARE as well as a summary of recommendations from CARE to itself, and from CARE to TSC should be added.

2. The TSC recommends that CARE develop a comprehensive list of all groundfish species aged by agency. This listing should include a summary of structures aged, and any concerns associated with ageing each species. In addition, recommended species for exchange should be identified, and this list updated with CARE's annual report to the TSC.

3. The TSC endorses a revised set of guidelines as Terms of Reference for CARE as follows:

- a) control deviations from standard ageing procedures,
- b) review new ageing techniques and equipment, and
- c) resolve technical problems related to ageing.

The TSC further requests that CARE review the appropriateness of these Terms of Reference at each meeting.

4. The TSC requests that CARE prepare a document summarizing CARE's history and accomplishments since inception to be submitted to the TSC in 1995.

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7TH CARE MEETING (JUNE 14-16, 1994):

The seventh CARE meeting was chaired by John Butler at NMFS, Seattle, from June 14-16, 1994. In attendance were Cal Blood, John Butler, Brenda Erwin, Joan Forsberg, Tracee Geernaert, Pete Hagen, Shayne MacLellan, Kristen Munk, Sandra Rosenfield (Oxford), Betty Goetz, Craig Kestelle, Julie Lyons, and Delsa Anderl. Also attending were Sue Janz (DFO, Nanaimo), Scott Meyer (ADFG, Anchorage), Bob Mikus (ODFG, Newport), Rachael Miller (PSMFC/CDFG, Menlo Park), and Don Pearson (SWFSC, Tiburon). Sue Janz was selected Rapporteur.

The recent recommendations from TSC to CARE were discussed at length and summarized in a response to TSC from CARE.

Presentations involving current validation work :

1. Shayne MacLellan: hake natural tags and OTC validation of English sole
2. Delsa Anderl: atka mackerel first year validation and sablefish exchange
3. Kristen Munk: lingcod multi-structure comparisons
4. Craig Kestelle: radiometric age validation of rockfish
5. Don Pearson: age and otolith studies at the Tiburon laboratory (rockfish spp.)

A workshop comparing image analysis systems and otolith reading software on PC and MAC systems was held. Pete Hagen demonstrated the Optimas system for IBM PC compatibles and Don Pearson/John Butler demonstrated the NIH (National Institute of Health) and Bony parts programs for Power Macintosh systems. In addition, Leica had demo equipment available for examination.

A hands-on workshop involving examination of structures from juvenile anchovy, halibut, salmon, shortspine thornyhead, black rockfish, English sole, lingcod and sablefish was organized.

The CARE Ageing Manual was discussed at length. Shayne MacLellan (editor) submitted the final draft in hard copy and disk format. An AFSC Publications staff member provided technical and cost estimate information regarding image reproduction options. A subcommittee was formed to investigate further options in image reproduction.

In addition to the exchanges involving CARE participants, the group also listed exchanges or training exercises with outside groups (Appendix 7). A number of future exchanges were outlined at this time as well, including an interagency exchange of shortspine thornyhead otolith thin-sections and break-and-burns.

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