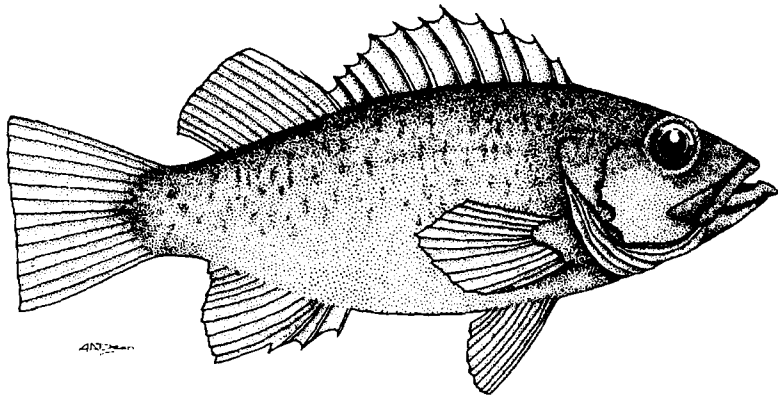
Report of the Technical Subcommittee of the Canada-United States Goundfish Committee



Appointed by the Second Conference on Coordination of Fisheries Regulations between Canada and the United States

Thirty-Sixth Annual Meeting, May 2-3, 1995

Prepared by
Tory O'Connell
Alaska Department of Fish and Game

October 1995

REPORT OF THE TECHNICAL SUBCOMMITTEE OF THE CANADA-UNITED STATES GROUNDFISH COMMITTEE

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Tory O'Connell
Alaska Department of Fish and Game
Sitka, Alaska

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[1] The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Commercial Fisheries Management and Development Division.

REPORT OF THE TECHNICAL SUBCOMMITTEE OF THE CANADA/U.S. GROUNDFISH COMMITTEE

1995

EXECUTIVE SUMMARY

The Technical Subcommittee of the Canada/U.S. Groundfish Committee (TSC) met May 2 and 3, 1995, in Seattle, WA. Representatives from the Canadian Department of Fisheries and Oceans, the National Marine Fisheries Service, Alaska Department of Fish and Game, Washington Department of Fisheries and Wildlife, Oregon Department of Fish and Wildlife, the Pacific Fishery Management Council, the North Pacific Fishery Management Council, the Pacific States Marine Fisheries Commission, and the International Pacific Halibut Commission attended. Barry Bracken, Alaska Department of Fish and Game served as chair and Tory O'Connell, also from Alaska Department of Fish and Game, was appointed Secretary.

During the 1995 meeting, the TSC exchanged information on research, stock assessment and management activities conducted during 1994 and work planned for 1995. The agency reports and TSC working groups reports have been collated in the accompanying document. The report contains additional information that scientists and managers may find useful including agency publication and staff lists.

Background

The Canada/U.S. Groundfish Committee (Parent Committee) was established in 1959 by the Second Conference on Coordination of Fisheries Regulations Between Canada and the United States and is sanctioned as an advisory group by the State Departments of both nations. The TSC was established at the first Parent Committee meeting as a technical advisory group to the Parent Committee. It is the only coast-wide forum for official exchange of information on the status of groundfish stocks and groundfish research among U.S. federal and state agencies and the Canadian Department of Fisheries and Oceans. The terms of reference for the TSC, which are reviewed and approved at each annual meeting, are as follows:

1. Exchange information on the status of groundfish stocks of mutual concern and to coordinate, whenever possible, desirable programs of research.

2. Recommend the continuance and further development of research programs having potential value as scientific basis for future management of the groundfish fishery.

3. Review the scientific and technical impacts of existing or proposed management strategies and their component regulations relevant to conservation of stock or other scientific aspects of groundfish conservation and management of mutual interest.

4. Transmit approved recommendations and appropriate documentation to appropriate sectors of Canadian and U.S. governments to encourage implementation of these recommendations.

The TSC discusses issues of concern regarding west coast groundfish with emphasis on transboundary stocks. Although the TSC is has no regulatory authority, the group makes recommendations both to itself and to the Parent Committee. The Parent Committee has one member from each country who has the authority to contact appropriate officials in his/her country urging them to act on recommendations made by the Parent Committee and/or the TSC.

Working Groups

Once the TSC identifies an issue, a working group is formed to further research the issue and, if possible, recommend a solution. Three such groups are currently active. The Committee of Age Reading Experts (C.A.R.E.) is an on-going working group which meets biennially to discuss groundfish age reading issues. Their primary objective is to promote coast-wide consistency and precision in groundfish age reading. The other two are stock assessment working groups formed to address transboundary stock issues regarding Pacific whiting and yellowtail rockfish.

Although the sablefish working group is not currently active, the TSC received a report from former working group members on the current status of the proceedings of the 1993 Sablefish Symposium. The Sablefish Symposium was initially recommended and ultimately sponsored by the TSC.

Working group reports are appended to the 1995 meeting minutes.

Other Topics For Discussion

The agency overview, stock status, and agency research and management discussions were abbreviated this year in accordance with the recommendations made during the 1994 meeting. The agency reports are appended to the minutes in the form in which they were submitted to the secretary. Much of the meeting was spent discussing "Other Topics for Discussion" as follows:

1. The TSC received a verbal report on the near-shore rockfish management meeting in 1994 which was recommended by TSC and sponsored by PSMFC. The need for a follow-up meeting was discussed.

2. Halibut and groundfish fisheries in the disputed zone in Dixon Entrance were discussed. See recommendations to the Parent Committee.

3. The impacts and spin-off implications of the halibut and sablefish IFQ and ITQ fisheries were discussed. No formal recommendations were made.

4. The TSC discussed the need to form a lingcod working group. It was agreed that a formal working group is not required at this time, but that a joint stock assessment review meeting should be held.

5. This is the first year since 1979 that the TSC meeting has not rotated between the member states and Canada. Alaska was eliminated as a site because of travel costs. It was agreed to continue to rotate among member states and Canada as long as there is sufficient travel funding, but that meetings would be held in Portland or Seattle if the travel costs in the normal rotation are prohibitive.

6. A brief discussion on use of Internet and computer software protocol ensued. It was agreed to use WP-51 as the word processing standard, at least for the time being. A list of E-mail addresses will be compiled and circulated by the secretary.

7. It was agreed that formal membership will continue to be comprised of one member from each coastal state agency, NMFS, and DFO. The chairmanship will rotate among the formal members or member agencies for a two-year term.

8. A brief discussion on observer programs brought the group up to date on the current on-going observer programs.

9. There was considerable interest in recent research with underwater video systems. It was suggested that a special session be considered in conjunction with the 1996 Western Groundfish Conference.

Progress on 1994 Recommendations

The TSC recommendations to itself were primarily to streamline the reporting process, minimize the time spent on agency overviews, and to spend more time discussing other issues of concern. These objectives were met during the 1995 meeting.

The TSC also wished to obtain an updated list of TSC accomplishments; that list has been recently completed and is appended to the meeting minutes.

Recommendations from TSC for both 1993 and 1994 were reviewed. All recommendations were accomplished by CARE at their 1994 meeting.

1995 Recommendations

1. TSC to itself - TSC recommends that a TSC member attend all CARE meetings to foster better communication between the groups. TSC also recommends that a list of user-pay and cost recovery programs currently in use be provided by each agency and compiled for the 1996 report.

2. TSC to the Parent Committee - It was decided that all of the objectives of the 1994 Nearshore Rockfish Workshop were not met. A follow-up meeting with specific goals was recommended and is tentatively scheduled for late winter or early spring of 1996.

Regarding the Dixon Entrance District, it was agreed that since the fisheries are not escalating and the stocks do not appear to be put in jeopardy, no formal action needs to be recommended at this time. Managers from both nations agreed to continue to share information on fisheries in that zone.

3. 1995 CARE to TSC - A number of recommendations were received from CARE. These included publication of an up-dated age reading manual, TSC participation in CARE meetings, and more agency support for CARE from TSC members. CARE is also concerned with precision testing. TSC members strongly endorse age structure exchanges and more emphasis on precision testing. There will be a conference call in February 1996 with TSC members and the CARE Chairperson to discuss the 1996 CARE meeting agenda.

1996 Meeting

The 1996 TSC meeting will be May 7-8, in Newport, OR. Ms. O'Connell will replace Mr. Bracken, who retired June 30, 1995, as chair.

If you wish further information regarding the TSC call Tory O'Connell (ADFG 1996 TSC Chair) at 907-747-6688) or other TSC members listed in the attached minutes.

MINUTES OF THE TECHNICAL SUBCOMMITTEE
OF THE
CANADA-UNITED STATES GROUNDFISH COMMITTEE
Thirty-Sixth Annual Meeting
May 2 and 3, 1995
Seattle, WA

I. CALL TO ORDER

Chairperson, Mr. Barry Bracken called to order the 36th annual meeting of the Technical Subcommittee (TSC) at 0845 on May 2, 1995 in Seattle, WA.

II. APPOINTMENT OF SECRETARY

Ms. V.M. O'Connell, Alaska Department of Fish and Game, Sitka, AK was appointed to serve as secretary.

III. INTRODUCTIONS

Members and participants introduced themselves. Participants are listed by agency, with members indicated by asterisks. A complete list of names, telephone numbers, and e-mail addresses is included in Attachment A.

Canada Department of Fisheries and Oceans (DFO)

Pacific Biological Station
Mr. Sandy McFarlane
*Mr. Mark Saunders

Offshore Division
Ms. Devona Adams

United States

National Marine Fisheries Service

Alaska Fisheries Science Center (AFSC)
*Mr. Mark Wilkins
Mr. Tom Wilderbuer
Mr. Martin Dorn

Northwest Fisheries Science Center (NWFSC)
Dr. Richard Methot

Auke Bay Laboratory
Mr. Dave Clausen

Southwest Fisheries Science Center (SWFSC)
Dr. John Hunter
Dr. Peter Adams

Washington Department of Fish and Wildlife (WDFW)
*Mr. Tom Jagielo

Oregon Department of Fish and Wildlife (ODFW)
*Mr. Bill Barss

Alaska Department of Fish and Game (ADFG)
*Mr. Barry Bracken
Ms. Tory O'Connell

California Department of Fish and Game
Not represented

Pacific Fishery Management Council (PFMC)
Mr. Jim Glock

North Pacific Fishery Management Council (NPFMC)
Ms. Jane DiCosimo

International Pacific Halibut Commission (IHPC)
Dr. Calvin Blood

Pacific States Marine Fishery Commission (PSMFC)
Mr. Dave Hanson
Mr. Steve Phillips

IV. APPROVAL OF THE 1994 REPORT AND THE 1994 AGENDA

Several changes were made to the 1994 report and the report approved. It was noted that the 1993 report is still not complete. Mr. Saunders said that Mr. Thomas was still working on the final version. The 1995 agenda was approved.

V. TERMS OF REFERENCE

Dr. Methot pointed out a mistake in the 4th Term of Reference in the 1994 TSC report and recommended that the word "regulations" be changed to recommendations. The correct Terms of Reference of the Technical Subcommittee are as follows:

1. Exchange information on the status of groundfish stocks of mutual concern and to coordinate, whenever possible, desirable programs of research.

2. Recommend the continuance and further development of research programs having potential value as scientific basis for future management of the groundfish fishery.

3. Review the scientific and technical aspects of existing or proposed management strategies and their component regulations relevant to conservation of stocks or other scientific aspects of groundfish conservation and management of mutual interest.

4. Transmit approved recommendations and appropriate documentation to appropriate sectors of Canadian and US Governments and encourage implementation of these recommendations.

VI. WORKING GROUP REPORTS

A. CARE (Committee of Age Reading Experts)

Ms. Betty Goetz, Chair of CARE, presented the TSC with the 1995 CARE report and submitted meeting minutes from the June 1994 meeting as well as a report on the history of CARE (Attachment B). Ms. Goetz informed TSC that CARE had added, as requested, a summary of exchanges of structures between agencies during the past year. Ms. Goetz remarked that the shortspine thornyhead exchange was very interesting and that there are also ongoing exchanges for shortraker rockfish and sablefish.

Ms. Goetz explained that although the TSC had recommended against implementation of on-site radiochemistry laboratory, Mr. Kastelle had already set up a lab for this purpose.

The CARE manual was discussed, with the CARE group requesting at least 25 copies, 2 per laboratory, be reproduced in loose leaf format and they requested TSC support in obtaining funding to reproduce the 13 figures necessary to accomplish this task.

CARE made 5 recommendations to TSC. These were discussed and clarifications made as needed.

B. STOCK ASSESSMENT

1. Pacific Whiting

The Pacific whiting/hake working group was active during 1994 conducting a joint assessment of the coastal population and providing scientific advice to the Canadian and U.S. negotiating teams. The assessment of the current status of the stock has changed little during 1994 and 1995 largely due to the fact that the assessment is driven by the most recent triennial survey, which was 1992. The next survey is scheduled for July/August 1995 and the working group met to plan the survey.

An acoustic survey of selected transects from northern California to Canada was conducted using the DFO research vessel W.E. RICKER to verify the presence of hake offshore. The 1992 triennial survey found roughly double the expected amount of hake; and this was attributed to fish found seaward of the previous surveys. The sign was confirmed as hake. In addition the northern US and Canadian transects contained young-of-the year hake which were encountered for the first time.

Dr. Methot gave an update on the latest round of negotiations with the U.S. as the host country. He noted that no formal report was ready from the fall 1994 meeting. Two annual indices of hake abundance in the two zones were developed based on the correlation of environmental conditions with biomass distribution during survey years. These reports, contained in the 1994 TSC report, were primary new scientific inputs tabled for discussion but there was still not complete agreement on allocation. Canada offered a draft MOU outlining a structure for future agreements but no formal action has been taken on the document. The working group has not been tasked with any further work relating to the allocation issue.

There was then a discussion of the implications of the 1992 biomass estimate and whether the 1995 survey data would be incorporated into the 1996 season quota recommendations. Currently a lower exploitation rate is used given the uncertainty with the biomass estimate.

The lack of agreement between countries causes overages in the harvest but total removals have not reached "moderate" rate of exploitation. Dr. Methot said that there may be an opportunity to use preliminary results from 1995 cruise (i.e. hydroacoustic estimate) in 1996. If the new survey confirms previous results, PFMC is willing to consider a moderate exploitation rate. The PFMC has the option of setting a range of exploitation rates at their October meeting with the final rate determined when survey results are resolved. The big question is what would be reaction if the 1995 survey shows a lower biomass estimate. Ms. Adams said that the Canadians can change the recommended quota up to the end of March.

2. Yellowtail Rockfish

A working group report was submitted by Dr. Tagart and Mr. Stanley (Attachment C). Other than publication of a paper on stock delineation (Tagart et. al.), no directed work is planned for yellowtail rockfish by either WDFW or DFO. It was noted by TSC that there was not a statement regarding overharvest in transboundary zone and that a summary table was not provided and should be requested.

C. Other

1. Sablefish Symposium Proceedings Update

Mr. Wilkins reported that all but 4 papers have been accepted and that a total of 27 papers are expected once the final 4 are revised. It is expected that galley page proofs will be ready by the end of July, prior to the departure of R. Hardy as editor. Once the galley proofs are finished, publication is expected within four months.

VII. REVIEW OF AGENCY GROUNDFISH RESEARCH, ASSESSMENTS, AND MANAGEMENT

This year oral presentations were limited to new information not included in the 1994 reports. The 1994 agency reports are appended to the minutes (Attachment D).

It was duly noted that California was not present and did not send a written report. TSC began with an agency by agency report but it was suggested by Mr. Saunders that we revert to the old format and discuss each species collectively. This was agreed upon but first each agency had the opportunity to discuss organizational changes:

WDFW has completed a Fisheries/Wildlife merger. Marine fish are managed within the Marine Resources Division of the fish program.

DFO underwent a large reorganization which is detailed in their written report. They are considering implementing a management body called a Conservation Council which would roughly mirror the US council system.

ADFG: Barry Bracken announced that he was retiring this summer and expected that Tory O'Connell would replace him as project leader.

NMFS

SWFSC: Dr. Hunter announced that there will be a Hake Symposium in late October 1996 at Asilomar, sponsored by CALCOFI. The proceedings will be published as a CALCOFI report within one year of the meeting. They are trying to facilitate international participation in the

meeting, including European participation. Mr. Glock and Dr. Methot requested that the conference not conflict with the PFMC meeting.

NWFSC: Dr. Methot is now director of a new Division within the Northwest Fishery Science Center: Fisheries Analysis and Monitoring Division. He will be located in Seattle but the laboratory will be at the Hatfield Marine Science Center. The final makeup of the lab is still under development now but Dr. Methot reported that there will be 6 staff whose task is to improve groundfish stock assessments. He also anticipates work on age reading of sablefish and associated species.

AFSC: Mr. Wilkins related that the implementation of the new division and the change in position of Dr. Methot will effect both the RACE and REFM divisions.
Auke Bay Lab: Mr. Clausen reported that Mike Dahlberg is the new laboratory director at Auke Bay.

PFMC: Mr. Glock submitted two written reports, one for 1994 and one relating 1995 information.

NPFMC: Ms. DiCosimo introduced herself as the new GOA biologist for the NPFMC. She will provide TSC with a written report. The implementation of the IFQ fisheries is the biggest change for the NPFMC. The vessel moratorium has been re-submitted, and groundfish license limitation and the Alaska Research Plan are both being worked on.

MULTI-SPECIES MANAGEMENT STUDIES

DFO: Hecate Strait Project is continuing. The LaPerouse fisheries oceanography program off SW Vancouver Island is winding down in its current form; however, DFO plans to apply the general approach to the entire upwelling domain off the west coast of Vancouver Island. Research modeling the links between tropho-dynamic models and oceanographic models will be continued.

NMFS: Dr. Methot reported that NMFS is reviewing the multi-species groupings of rockfish and that Dr. Jean Rogers will be working at the Newport Lab, heading up a look at the shelf/slope split of rockfish based on observer data, survey data and logbook records.

Mr. Wilkins said details of the FOCI work are in the written report. Bob Laugh worked with Waldo Wakefield (Rutgers) to build and use a camera sled system to compare trawl and video transect replicates of the deep water slope complex, primarily thornyhead and sablefish. The survey was much more successful that most expectations and 12 replicates were made. The camera had superior resolution and the data is now being reviewed using a data reduction system. Preliminary results indicate that the rates of detection for thornyheads and sablefish are similar between the two gears. Dr. Adams reported that it has been his experience that cat shark numbers are lower in the trawls than video. Mr. Jagielo reported that Wayne Paulson from WDFW has been working on a video/acoustic technique for assessing shallow water rockfish and lingcod in Puget Sound. Craig Rose's work on mounting cameras in trawls was briefly discussed. Mr. Saunders recommended that a more detailed discussion of underwater video/sonar systems be added to the agenda

SHELF ROCKFISH

WDFW: Mr. Jagielo reported that WDFW is working on a black rockfish project to define stock boundaries using genetics (allozyme variation). A stock synthesis analysis of black rockfish was completed in 1994.

DFO: Ms. Adams reported that DFO is using an aggregate species management for nearshore rockfish in an attempt to reduce discarding and the pressure on yelloweye rockfish. They have now implemented 100% dockside monitoring program and have provided 3 harvesting options to the 177 license holders in outside waters.

1. live fish market: fixed quota of quillback and coppers with a 20% bycatch of yelloweye, 1 month licenses.
2. yelloweye supplement with incentives for taking canary and silvergrey.
3. "cutter" rockfish: non-traditional species such as canary, silvergrey, rougheye, shortraker, and redbanded with a 10% yelloweye bycatch.

Quotas are not allocated by gear sectors.

CDFG: Mr. Adams said that he has major concerns about the sampling design of a three-year sampling program that CDFG has undertaken. The nearshore species are very difficult to track, as much as 40% of the shore side landings are not reported and the live landings are very difficult to sample.

ADFG. Ms. O'Connell described a cooperative study between ADF&G and Moss Landing Marine Laboratories to validate yelloweye rockfish ages using radiochemistry of cores. She also gave a brief overview of their upcoming submersible survey to conduct line transects in the eastern Gulf of Alaska.

PFMC: Mr. Glock said that the council matched the recreational bag limits for rockfish in federal waters (10 fish for the whole Washington coast, 15 fish for the Oregon coast of which no more than 10 may be black rockfish). There is no ABC for black rockfish. Dr. Methot spoke for the Groundfish Management Team: shelf rockfish are problematic, they have monthly limits which result in discard problems. PFMC is interested in allowing fishing period overages and wondered how DFO manages this. Ms. Adams said that DFO has license limits and holders can exceed up to 20% and carry over this overage (deducted from monthly limit). Fishers are encouraged to bring in total excess with the product relinquished to the Groundfish Research Group.

NPFMC: GOA Plan Team would like to remove black rockfish from the Pelagic Shelf Group but currently does not have the information to recommended ABC or TAC.

SLOPE AND THORNYHEADS

NMFS: The Auke Bay Lab is conducting a cruise this summer to collect size, age, and maturity data for Pacific ocean perch to verify mortality and growth data currently used in the stock assessment. Also Auke Bay has an on-going study to look at shortraker mitochondrial DNA and Dr. Tony Gharret is looking at a worldwide survey of *Sebastes* using this technique. A graduate student is working on density estimate of thornyheads using video tapes from Krieger's submersible projects.

AFSC: Frank Shaw is working on maturity and fecundity of four species: sharpchin, rosethorn, greenstriped, and red striped. Craig Kastelle is working on shortspine thornyhead age validation. Russell Vetter of the SWFSC is also looking at rockfish genetics. Jim Ianelli tagged 300 shortspine thornyheads last September on the domestic longline survey and has gotten 3 tag recoveries already.

PFMC: In 1995 there is a separate harvest guideline for the two species of thornyheads, with different trip limits and fishers are required to sort to species.

There was a general discussion of the exploitation rate for Pacific ocean perch in the GOA assessment and the need to look at biological objectives.

SABLEFISH

DFO: During 1994, 1500 sablefish were tagged in four central coast inlets . The majority of the fish caught were immature, aged 2-6 years and of exploitable size (55-65 cm). As a result of finding mainly immature fish, the inlets were closed to commercial sablefish fishing. Tagging was also conducted at eight offshore indexing sites. Analysis of 1990-93 offshore releases is underway to estimate abundance.

ADFG: The Chatham Strait sablefish population will be estimated using an ASA.

NMFS: The longline survey has been extended off Oregon and Washington. The sablefish and slope survey and assessments are being highly scrutinized. A mid-summer external review is scheduled for the sablefish assessment. Future assessment should more fully characterize uncertainty. Dr. Methot said that the shortspine thornyhead is the weak link in the deep water management with the same issues for the survey and assessment as sablefish.

The Japan-U.S. cooperative longline survey has been discontinued after 17 years. The domestic survey has been conducted for 8 years but there is no annual longline survey of the Bering Sea or Aleutian areas. There is also a new problem this year in that the IFQ fishery will be prosecuted during the longline survey, obviously affecting results. Mike Sigler has developed an ASA for GOA sablefish; his alternative biomass estimate is 220,000 mt.

Dr. Adams said that SWFSC has been working on spatial patterns of species assemblage in deep water using an ROV.

PFMC: West Coast sablefish management is different than GOA in that 50% of the catch is trawl catch. Northwest Indian treaty tribes are allocated 10% off-the-top, and about 94% of remainder allocated to limited entry. There has been an interest by PFMC to review the stock assessment model and NAS will conduct a broad review of these models (separate review from NMFS external review). IFQ program has been put on hold until congressional decision on MFCMA. The industry is highly divided, with some pushing trip limits, and others pursuing IFQs.

A discussion followed on the problems associated with changes in fishery management affecting stock assessment work.

FLATFISH

ODFW: Sanddabs are coming under increasing demand in developing markets.

WDFW: Martha Rickey published maturity information on arrowtooth flounder (reprints available).

ADFG: Alaska Sea Grant has published a flatfish guide, co-authored by Bill Barss and Barry Bracken, among others.

Copies of the 1994 IPHC annual report were distributed.

LINGCOD

WDFW: Mr. Jagielo reported on a tagging study and the stock synthesis assessment submitted to PFMC. WDFW is also working on a coastwide genetic study - initial results appear to show a genetically homogenous distribution and an adult tagging study confirms a fair amount of

movement. WDFW is monitoring year class strength via an annual nearshore survey at Cape Flattery. Results of an 8 year nearshore tagging study at Cape Flattery were published (reprints available).

DFO: Discussed the resolution of aging problem involving 1st and 2nd annuli - 80% of samples have now been re-aged. Their OTC work is progressing with 1500 tag returns, 500 from 2-5 years. A manuscript is now in press detailing these results.

ADFG: Ms. O'Connell said that ADFG is using lingcod otoliths and using a new otolith clearing technique. Mr. McFarlane added that otoliths have a lot of checks for the first ages, but otoliths are as good as fin rays when cleared.

OTHER RELATED STUDIES

DFO: DFO conducted a six-gill shark tagging project in inlets off the west coast of Vancouver Island to delineate stocks. The project was funded jointly by industry, the province of B.C. and DFO. Biological samples were also collected and a promising technique for aging six-gills using stained sections of the vertebral arch was developed.

WDFW: Puget Sound Ambient Monitoring Project - mercury and PCB testing.

ADFG: Sidescan project- habitat mapping a priority, ADFG hopes to work with NMFS and USGS to continue GOA coastal mapping project.

IPHC: Sport charter tagging project. To date have set 4,500 tags with two sizes of tags for medium and large fish. Sport fisher receives a pin and a certificate, charter operator pays for tags ($0.60/tag).

NPFMC has had a request from the commercial industry to cap the guided-sport catch of halibut.

VIII. OTHER TOPICS FOR DISCUSSION

A. Follow-up on Nearshore Rockfish Workshop

Stephen Phillips discussed the workshop and suggested a follow-up workshop could be organized if there was interest. There was discussion that the workshop should focus on designing management strategies in the absence of biological or assessment information. It was agreed that a summary paper detailing current approaches to management should be written and circulated prior to the meeting to maximize productivity and effectiveness.

B. Dixon Entrance

Mr. Bracken gave an overview of the history of the disputed zone as it related to TSC. At the time extended jurisdictions were declared by Canada and the U.S. (1977), both countries agreed to flag state enforcement and that neither country would escalate its fisheries in the disputed zone beyond historic levels. The terms of this agreement, however, were not agreed to. Canada's position was that only traditional fisheries with significant catches during the 1970-77 period would be subject to flag state enforcement. The U.S. felt that state enforcement applied to all fishing operations regardless of past catches in the zone. Neither country agreed to what fisheries were considered traditional in the disputed zone. Canada recognized fisheries for halibut and a by-catch fishery for sablefish while the U.S. recognized directed fisheries for both. The issue was not resolved.

The disputed zone was first discussed at TSC in 1988 and in 1989 the agencies reported on fisheries in the zone. It was concluded that sablefish fisheries were stable in the area and rockfish fisheries were declining. The subject was reviewed in 1990 and it was decided to agree to an informal data exchange. This proved adequate until 1994 when the Canadian government informed Alaska that the disputed area sablefish fishery should not proceed as there was no formal agreement to allow fishing in the area. The fishery was not cancelled because vessels were already in the area.

It was felt that the recent increase in catch in the zone was still within the spirit of the original agreement. Both U.S. and Canadian agencies agreed to continue monitoring catches in the disputed zone and report annually throught the TSC. Canada agreed to provide recent catch statistics to the U.S. and will work with Alaska representatives to clarify data sources.

C. Impacts of Quota Share Programs on Other Fisheries

NPFMC: Ms. DiCosimo gave an overview of the GOA sablefish and halibut IFQ programs and said that she will comprise a list of "new problems" at the end of the first year.

A general discussion followed with DFO detailing their new source tagging of IFQ halibut landings and the problems imported Alaskan fish landed in BC bring to this program. ADF&G has had to change the directed rockfish fishery to accommodate IFQ management of halibut, including canceling the seasonal allocation and withholding some quota to ensure enough TAC remains for bycatch.

Implementation of IFQ programs can have numerous negative as well as positive implications for stock assessment work including:

1) dramatic redirection of effort among areas from open access fisheries.
2) CPUE index changes: need to evaluate the resolution in data to determine if spatial changes, targeting on bycatch, etc. are discernible and taken into account in assessment.
3) increased high-grading of fish obviously effects sampling regime.
4) hardest to document, but very important, is the change in fishing patterns and practices that often occurs in anticipation of IFQS (e.g. BC fishers bait-loaded traps, highly biasing the CPUE data).
5) decreased efficiency with less experienced crews.
6) increased complexity of sampling.
7) larger time frame for cheating.
8) interference with traditional survey timing.

On the positive side there is generally better management and increasing fleet cooperation that can lead to cost recovery programs and increased research.

It was acknowledged that there were spin-offs in other areas. PFMC is anticipating increased effort in their fisheries because of GOA IFQ program.

Meeting adjourned for the evening at 5:05 PM
Meeting re-convened at 8:30 AM, Wednesday May 3.

D. Need for Lingcod Working Group

Mr. Jagielo suggested a number of transboundary issues regarding lingcod for discussion. The 1994 stock assessment resulted in a reduction of the ABC in the PFMC management zone. Both WDFW and DFO agreed that there has been successful calibration on the inter-agency age

calibration project. Stock delineation is an issue that has not yet been resolved. Mr. Jagielo believes he has new information that needs review and DFO responded that they are currently reviewing the 1994 PFMC stock assessment document. Mr. Glock reflected PFMC concerns about the need for cooperative bi-national assessment and management in the boundary area. Dr. Adams recommended that there should be a review of non-trawl and recreational data coast-wide as well, as these sectors of the fishery are poorly documented, especially in the south. It was agreed that at this point a working group was not necessary and a resolution would be drafted requesting a joint US/Canada stock assessment review meeting occur. The Alaskan members would like to participate in any meetings between the Washington and Canadians members regarding this topic.

E. Future Meeting Location

This was the first year that TSC met out of the normal area rotation. The meeting had been scheduled for Petersburg, Alaska, but Oregon and California members did not have adequate travel funds to attend. It was generally agreed that it is preferable to continue with rotation as this allows technical staff to participate in the process; however, PSMFC does not have a travel grant anymore so can not be relied upon to help fund travel. The burden appears to be heaviest in years when travel is to Alaska. It was determined that TSC would continue to rotate meeting location to the extent travel costs could be justified, otherwise the meetings would occur in Seattle or Portland.

F. Internet and Software Protocol

Some discussion revolved around the use of the Internet for document exchange. The secretary will compile a list of e-mail addresses and distribute to all the TSC members (Appendix A).

G. TSC Membership

Ms. DiCosimo had requested a discussion of TSC membership. It was decided that there should be no change to the current membership, and the Chairmanship should continue to rotate between the state agencies, DFO, and NMFS.

H. Cost/Recovery and User/Pay Programs

There was a general interest in the use of cost/recovery and user/pay programs for fisheries research.

ODFW: trawl catch tax assessment by Oregon Trawl Commission (OTC) of 0.5 cents on each dollar of member vessel landed catch value. The assessment goes to OTC for research with funds distributed to ODFW as per agreement for research, project coordination, data entry, and analysis.

NMFS: longline surveys are funded by the catch.

ADFG: test fish programs, sales of catch pays for surveys. Also new program for urchins where industry funds initial stock assessment work (including salaries) to determine if an open access fishery will occur.

DFO: a percentage assessment tax on sablefish funds all aspects of management and research. Trawl fleet pays 80% of port validation program, directly billed to fleet. The Groundfish Research and Conservation Society has received $1 million so far. The protocol in Canada is to completely fund all programs through cost recovery and they are trying to earmark funds to

remain within a region. They now have to meet more with industry but have more research dollars and a stronger core program.

A discussion followed on what the ramifications of fishery closures and decreased price/pound would be on research programs and how that might effect management decisions. There is still a need for general fund moneys to ensure continuity of time series in marginal fisheries. It was decided that an appendix on cost recovery program be included in the 1996 TSC report.

I. Observer Program

ODFW: A cooperative program between ODFW and OTC is scheduled to begin in 1995.

NPFMC: may have to postpone research plan until 1997.

PFMC: Newport Lab will have observer data and will help ODFW with statistical design of observer program.

J. Underwater Video Systems

There was a general discussion of the on-going work with video and other in-situ systems. It was suggested that a special session or brain-storming meeting be held at the Western Groundfish Conference on this topic. Ms. O'Connell agreed to send Mr. Saunders a list of researchers currently using this technology.

IX. PROGRESS ON 1994 RECOMMENDATIONS

A. From TSC to Itself

1. Member agencies submit written reports to the chairman of TSC at least 4 weeks in advance of the annual meeting and that the reports be formatted so that the report and a summary of discussion be available for distribution within 2 months after the annual meeting.

2. Information exchange should concentrate on highlights and new information not contained in the written reports and that a Current Issues section should be added to the agenda. Suggested topics should be submitted to the chair in adequate time to be circulated with the draft agenda.

3. The TSC recommends that the two previous (1984 and 1992) reports detailing the accomplishments of the TSC be combined, updated to the present, and submitted to the TSC. (Appendix E)

The chairman apologized for not meeting the time line for distribution of the agenda and reports but believes TSC is on the right track towards streamlining of the process. It was agreed that the agency oral reports were more substantive and important and less time wasted detailing the written reports. It was agreed that the annual report should be available for distribution by the end of July and that agency reports would be appended as submitted. It was agreed that future reports should detail the previous year's fisheries and include a section on current year activities to date. Publication lists should separate previous calendar year publications from current year publication and "in press" citations. The current year publication and "in press" citations should be included in the following year's annual report under the previous year.

It was agreed that it was not necessary to append the catch tables to the annual report as PACFIN and other data sources are available for obtaining this information. Mr. Wilkins agreed to provide a crib sheet on how to access catch data.

B. From TSC to CARE (1993)

1. The TSC still endorses the investigation of alternatives to OTC for age validation studies but understands why CARE is reticent to proceed with alternatives given the limited resources for precision testing etc.

2. Radiochemical Laboratory: When TSC recommended last year against establishment of a dedicated laboratory for radiochemistry they were unaware that some laboratory facilities already existed at AFSC. The AFSC radiochemistry lab has been further supported by the Marine Mammal Lab, which has other uses for low level radiochemistry.

3. The CARE group is still working on using imaging technology.

4. CARE provided TSC with a summary of the age structure exchanges as requested.

5. CARE is requesting specific support for quality reproductions of CARE manual so that each lab be provided with two copies. A letter with the original figures was received from John Butler. CD imagery is not an option as resolution is not good enough and not all labs have this technology. Photographs are requested as a cost-effective method of publication.

C. From TSC to CARE (1994)

See Appendix B for 1994 TSC recommendations to CARE.

1. Accomplished, CARE has requested a minimum of 2 copies per laboratory.

2. Accomplished, CARE meeting minutes expanded to accommodate recommendation.

3. Accomplished, although TSC would like CARE to provide an updated list of exchanges for the annual TSC meeting and have summary include more detail including date initiated, number of samples, and the reason for the exchange.

4. The CARE terms of reference stand unchanged.

5. Accomplished, Ms. Goetz submitted a draft document detailing CARE's history and accomplishments.

X. 1995 TSC RECOMMENDATIONS

A. TSC to Itself

1. TSC recommends that a local TSC member attend all CARE meetings in order to improve communication between the two groups and to provide clarification of issues put forth to CARE from TSC.

2. TSC has noted an increase in cost/recovery and user/pay programs in commercial fisheries. To document new opportunities and problems associated with these programs the TSC recommends that each participating agency provide a brief summary of cost/recovery or user/pay programs utilized by their agency. This summary should be appended to the 1995 agency reports to the TSC in 1996.

B. TSC to Parent Committee

1. Recommendation regarding Nearshore Rockfishes Management Workshop

TSC reviewed the report of the nearshore rockfishes workshop held in Portland Oregon March 1-2, 1994. TSC notes that considerable progress was made towards the workshop goals, in particular in the areas of nearshore rockfish biology and assessment. However, in the time allotted, the workshop fell short of achieving the major objective of identifying possible management strategies. Given the general lack of stock assessment information and the difficulty of acquiring these data for these types of fisheries, innovative alternative management strategies must be developed as quickly as possible.

TSC recommends that the Parent Committee assign individuals to ensure that this objective is addressed through the following process:
1. Detail historic and current management strategies for nearshore rockfishes by agency including species lists and current management concerns.
2. Identify biological features such as longevity, low rates of mixing, habitat specificity, etc. which need to be considered in these management strategies.
3. Collate above items in a summary document and distribute to agency staff for comments.
4. Convene a meeting of agency staff and an outside expert to explore and develop recommended strategies for the management of nearshore rockfishes.
5. Results of these meetings should be reported to the TSC at the 1996 annual meeting.

2. The TSC reviewed records of recent harvest of groundfish by US vessels in the disputed zone known as the Dixon Entrance District. They also reviewed past TSC discussions and actions on this issue. After the review, it appears that the U.S. harvest has not escalated substantially beyond the historic average harvest. The TSC agreed that, at present, there does not appear to be a resource conservation problem at current harvest levels. TSC recommends that catch levels continue to be monitored to ensure that any escalation is promptly detected. Canadian and Alaska TSC members are requested to continue to exchange information on groundfish management and harvests from the area.

3. The 1994 U.S. assessment of lingcod in the transboundary area (PSMFC areas 3A, 3B, and 3C) raised concerns about the possibility of the bi-national harvest exceeding the ABC for this area. The TSC recommends that Canadian and U.S. scientists consult on the assessment of lingcod in this area to 1) evaluate information supporting research on the transboundary nature of the stock to help clarify the operational stock unit, 2) exchange data to facilitate future assessments, and 3) review modeling procedures.

C. 1995 CARE Recommendations to TSC (see Attachment B for full recommendations)

1. It was agreed that each agency will have 2 hard copies of the CARE aging manual and that a minimum of 25 copies be produced.

2. TSC will participate in CARE meetings when invited to improve communications between the two groups and to provide clarification of issues. A local member of TSC will attend and report back to TSC on pressing issues.

3. The TSC Chairman will write a letter to the appropriate person at each agency emphasizing the importance of CARE and emphasizing validation needs.

4. This recommendation, to encourage agencies to support CAR members in exploring the Internet and in imaging technology, will be incorporated into the letter pertaining to item 3.

5. Although the TSC shares CARE member concerns that sample sizes, subsampling, and precision testing systems are important to the utility of age data this is not an issue TSC can respond to directly.

A discussion followed regarding precision issue and how resolved ages are used and evaluated. TSC members strongly endorse cross-reading exchanges and the importance of precision testing.

It was agreed that there should be a February conference call to discuss agenda items for the 1996 CARE meeting.

XI. SCHEDULE AND LOCATION OF FUTURE MEETINGS

The 1996 annual meeting will be held on May 7 and 8 in Newport, Oregon. The chairman, Mr. Bracken, asked what the protocol will be for next year's chairman given that he is retiring. It was agreed that Ms. O'Connell will replace Mr. Bracken as the chair for the 1996 meeting, thereby keeping the rotation between agencies in order.

XII. ADJOURNMENT

It was requested that the minutes reflect an appreciation of Mr. Bracken's contribution and many years of service to the TSC. It was also noted that the change in focus of the meeting to emphasize new research and management has been effective and that the discussion has been much more meaningful.

The meeting was adjourned at 14:00.

Attachment A

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Attachment B

CARE REPORT TO TSC
ANNUAL REPORT ON THE ACTIVITIES OF CARE HISTORY OF THE COMMITTEE OF AGE READING EXPERTS (CARE)

To: Technical Subcommittee of the Canada/United States Groundfish Committee

From: Betty Goetz (chair), Committee of Age Reading Experts

Date: April 12, 1995

Subject: Annual report on the activities of CARE

This report summarizes progress related to the recommendations from CARE to itself (1994), TSC to CARE (1993/amended 1994), and from CARE to TSC(1994) since our June 1994 meeting. Scheduling for the next CARE meeting is not complete, however, we would attempt to hold this meeting prior to the 1996 TSC meeting.

A. PROGRESS ON RECOMMENDATIONS FROM CARE TO ITSELF (1994 MEETING):

1. In the interests of improving communications and raising CARE's profile, it will be the chairperson's responsibility to write an annual "newsletter" to CARE members in order to keep them informed as to interactions with TSC and updated as to age exchanges, workshops, species ages by agency, progress on validation studies and publications. This information will also be submitted to TSC. It will be the responsibility of members agencies to keep their chairperson informed.

Progress: All participants or lead personnel in each Aging Laboratory have been contacted and responses are summarized in this report. A preliminary draft has been circulated to each participant and a full report to CARE participants including TSC response to this information will be drafted following this meeting.

2. CARE will set up a regular schedule of age exchanges each year.

Progress: Appendix 1 summarizes the exchanges which have been completed since the last CARE meeting in June 1994. Brief reports are included for the shortspine thornyhead exchange, halibut exchange, and dover sole workshop. In addition, an exchange of shortraker rockfish thin-sections has been outlined between AFSC and ADFG(Juneau).

3. Ms. Goetz will provide a document on the history and achievements of CARE to TSC in 1995.

Progress: This document will be presented to the TSC at the May 1995 meeting.

4. Validation work should be maintained as a high priority for CARE members. CARE should identify problem species and provide baseline information to TSC on species that need to be validated.

Progress: Validation research continues to be a priority for CARE members, but often suffers due to high volume of production ages requested by participant aging facilities. Radiometric validation work is proceeding at AFSC for a number of Sebastes spp. as well as Sebastolobus spp. In addition, SWFSC(Tiburon) and PSMFC/CDFG(Menlo Park) have done preliminary validation work for bocaccio which validates the first year through daily growth increment counts, and the first three annuli by following a dominant year class.

Species of particular concern continue to be dover sole, shortspine thornyhead, and short-raker rockfish.

5. The manual "image committee" will assess the methods of reproducing the manual figures for the hard copy format, keeping in mind quality and cost and will make a recommendation to TSC.

Progress: The manual "image committee" recommends that funds be sought to have the figures reproduced by a printer. Electronic reproductions of the figures have been provided to the TSC Chair (September 1994), but are judged by the "image committee" to be inadequate. CARE will seek the advice of the TSC regarding figure reproduction and whether funds are available to pursue printing of manual hard-copies.

6. CARE will continue to explore the potential of Internet and image analysis systems with reference to its mandate.

Progress: A number of agencies have recently purchased image analysis equipment. The potential use of this equipment for image transmittal will continue to be encouraged.

B. SUMMARY OF RECOMMENDATIONS FROM TSC TO CARE (1993/AMENDED 1994):

1. "The TSC endorses and encourages the thorough investigation of and search for alternative compounds to OTC for marking otoliths for age validation studies. If suitable alternatives can be found, they would facilitate badly needed validation research".

Progress: This was deferred to the TSC in 1994. However, discussion of this topic during the 1994 CARE meeting is summarized in Appendix 4 of the meeting minutes. Pete Hagen (ADFG) indicates that logistics of approval by FDA have been simplified and a contact person has been designated by the FDA to aid fishery biologists with the permitting process.

2. "Although the TSC recognizes the value of radiochemical methods of age validation, we suggest that, due to the complex and sensitive chemical procedures involved, such studies would be most effectively carried out in cooperation with established chemistry research facilities. Instead of establishing a radiochemistry lab, the TSC recommends that radiochemical validation studies continue to be pursued as they have been, through studies in cooperation with academic institutions.

Progress: A radiochemistry lab has been established at AFSC. A report is appended (Appendix 2).

3. The TSC encourages and endorses the development and full utilization of imaging technology and commends the CARE for their efforts in extending the technology as widely as possible.

Progress: See A6 above.

4. The TSC supports the continued frequent exchange of age structures for interagency calibration. We recommend that the CARE compile an annual summary of these exchanges, including pertinent results, and that this summary be included in the CARE report to the TSC for the TSC annual meetings.

Progress: See A2 above.

5. Based on discussions with CARE participants at the 35th annual meeting, TSC understands that the CARE Aging Manual is to be a "living document" and will be a loosely bound manual amenable to continued additions. The TSC recommends that at the biennial meeting in June 1994, CARE participants discuss avenues for ensuring that the quality of figures are maintained in a cost effective manner and identify the number, version and residency of the manuals (i.e. one per established age reading laboratory).

Progress: See A5 above. We recommend a minimum of 2 hard copies per agency for a minimum total of 25 copies. We also recommend that an electronic copy be made available on INTERNET or NMFS Bulletin Board or other electronic medium. A copy is currently available via anonymous FTP from POOH.UCSD.EDU in the directory /PUB/CARE. All copies will be amended as needed.

6. The TSC recommends that CARE formalize and expand their meeting minutes to facilitate better communication between CARE and the TSC. A section should be added to their report as follows:
Progress on recommendations A. From CARE to itself
B. From TSC to CARE
Recommendations A. From CARE to itself
B. From CARE to the TSC.

Progress: This report addresses this point.

7. To facilitate future age reading exchanges, the TSC recommends that CARE develop a comprehensive list of all Groundfish species aged by each agency. This inventory should include a summary of structures aged and any concerns associated with the aging of each species. Recommended species for exchange should be identified and the list updated with CARE's annual report to the TSC.

Progress: CARE has been updating a comprehensive list of species aged by each agency for many years. This list includes species, agency, stock aged, structure/methods used, whether work is current, past or proposed, and whether validation work had been done. If validation work has been done, methodology is detailed.

8. The following guidelines for CARE were reported in the minutes of the 1983 meeting of the TSC:
A. Control deviations from standard aging procedures.
B. Review new aging techniques and equipment.
C. Resolve technical problems related to aging.

The TSC endorses these guidelines as Terms of Reference for CARE and asks that CARE review the appropriateness of these Terms of Reference at each meeting.

Progress: These Terms of Reference were reviewed at the June 1994 meeting. CARE participants endorse these guidelines as Terms of Reference.

9. In order to ensure continued support for CARE, agencies need to be better informed of its function and importance. To this end the TSC recommends that CARE prepare a document to be submitted to the TSC in 1995, summarizing CARE's history and accomplishments since its inception in 1983.

Progress: See A above.

C. SUMMARY OF RECOMMENDATIONS FROM CARE TO TSC (1994 MEETING):

1. CARE recommends that each agency should have 2 hard copies of the CARE Aging Manual. Depending on cost (to be determined according to choice of figure reproduction) a minimum of 25 hard copies need to be produced. It is also recommended that an electronic version of the manual be made available through INTERNET and the NMFS Bulletin Board.

2. CARE recommends that a member of TSC be invited to CARE meetings in order to improve communications between the two groups and to provide clarification of issues put forth to CARE from TSC.

3. CARE asks for continued support in fish aging and validation studies, especially in the case of "new" priority or difficult to age species. Dover sole is of current concern to a number of CARE members.

4. CARE asks that TSC provide encouragement to its member agencies to support CARE members in exploring Internet and imaging technology to facilitate exchange.

5. Time spent at different fish aging tasks is at a premium. CARE members request help from the TSC in addressing and assessing such issues as sample size, subsampling and precision testing systems.

D. SUMMARY OF RECENT CARE EXCHANGES:

Black rockfish (Sebastes melanops)	DFO(Nanaimo),ADFG(Juneau) WDFW(Olympia), ODFG
Bocaccio (Sebastes paucispinis)	SWFSC(Tiburon), PSMFC/CDFG(Menlo Park) PSMFC/CDFG, ADFG(Juneau)
Brown rockfish (Sebastes auriculatus)	WDFW(Olympia), ODFG
Puget Sound rockfish (Sebastes emphaeus)	AFSC(Seattle), Univ. Wa graduate student
Yelloweye rockfish (Sebastes ruberrimus)	ADFG(Juneau), Moss Landing graduate student
Shortspine thornyhead DFO(Nanaimo)	AFSC(Seattle), SWFSC(La Jolla), ODFG(Newport), (Sebastolobus alascanus)
Haddock(Atlantic)	DFO(Nanaimo), + other countries(Dr. Campana study)
Pollock (Theragra chalcogramma)	AFSC(Seattle), Sea Fisheries Institute(Poland)
Sablefish (Anoplopoma fimbria)	DFO(Nanaimo), ADFG(Juneau)
Pacific sardine (Sardinops sagax caeruleus)	SWFSC(La Jolla), CDFG, INP Mexico
Dover sole (Microstomus pacificus)	ODFG(Newport),CFG(Eureka),PSMFC/CDFG(Menlo Park)
English sole(juveniles) (Parophrys vetulus)	ODFG(Newport), OSU graduate student

Planned Exchanges:

shortraker rockfish(Sebastes borealis): AFSC(Seattle), ADFG(Juneau)

E. SUMMARY OF SHORT-SPINE THORNYHEAD EXCHANGE

Betty Goetz 4/17/95

A small sample (n = 30) of short-spine thornyhead otoliths was exchanged between AFSC, SWFSC, ODFW and PBS in 1994. Thin-sections from Miller Freeman 88-09 (n = 15) were prepared by SWFSC, and break-and-burn + thin sections from Miller Freeman 90-8 (n = 15) were prepared by AFSC. This is not a species which has achieved production aging status at any of the agencies involved. The ages assigned were considered preliminary age estimates by most readers.

The initial agencies involved were AFSC and SWFSC. Ages were generated by these agencies, and the sample was subsequently forwarded to ODFW and PBS. The thin-sections prepared by AFSC were reworked (polished and remounted) by SWFC. Some of these reworked sections were detached from the glass slide upon receipt at ODFW and were reattached by the reader at this agency. The condition of these thin sections presents a variable to be considered in examining the ages assigned.

All readers commented on their lack of confidence in aging SSTH, and the difficulty of the otoliths included in this sample. In many cases, an age range was assigned. Most readers were more familiar with the interpretation of break-and-burn ages, and expressed their lack of familiarity with thin-section aging. The format for assigning ages varied from agency to agency. All samples were collected from July - December, and younger fish showed edge growth which may not have been characterized consistently from agency to agency. This could account for +/-1 for younger fish. In subsequent exchanges, age recording format can be standardized.

In some cases, multiple readings were performed by a reader. In the case of ODFW, a resolved age was assigned and used in this table. In the case of AFSC, one reader performed two independent readings of the break-and-burns, but no attempt was made to reconcile the two ages. An age range was assigned. PBS ages were generated by two readers. These readers assigned a resolved age for some otoliths, but the raw ages estimated by both readers are reported in this table.

Although all readers emphasized their lack of confidence in their ages, it is interesting to note that old fish are consistently aged old by all readers. We do note a few exceptions, but this is not unreasonable with such difficult otoliths, and lack of specific calibration between readers using this species. With calibration and experience, the ages assigned to younger fish would probably be easily reconciled. The techniques involved in thin-section preparation need to be improved or standardized.

Key:

BG = Betty Goetz (Alaska Fisheries Science Center)
SRJ = Shelly Jay (AFSC)
JB = John Butler (Southwest Fisheries Science Center)
SM = Shayne MacLellan (Pacific Biological Station)
SJ = Sue Janz (PBS)
BM = Bob Mikus (Oregon Department of Fish & Wildlife)

TS = thin section
BB = break-and-burn

Data from shortspine thornyhead exchange:

MF 88-09 thin-section collection date: 11/28-12/12/88

spec #	fish length	BG(TS)	JB(TS)	SM(TS)	BM(TS)	SJ(TS)
88	46	42-46	38	43+/-10	34	38+/-10
96	43	89-92	41	100+/-10	106	90+/-10
113	63	60-62	52	64+/-5	71	58+/-5
156	37	22-32	31	25+/-2	31	24+/-3
217	48	93-105	53+/-5	80+/-5	97	75+/-10
295	67	71-79	72	112+/-20	139	125+/-30
299	74	133-154	55	128+/-30	116	130+/-20
300	70	52-69	68+/-5	96+/-20	116	80+/-10
436	57	44-45	63	118+/-30		105+/-20
486	27	21-23	21	26+/-5	51	25
519	38	49-70	36	55+/-10	58	48
740	39	23-27	27	70??	74	75+?
751	15	34-36	7	7(8-9)	27	9
781	33	20-29	16	60+/-20	81	59
868	41	39-49	21	33+/-5	34	36+/-2

MF 90-8 break-and-burn collection date: 7-19-90

spec #	fish length	BG(BB)	JB(BB)	SM(BB)	BM(BB)	SJ(BB)	SRJ(BB)
1	71	86	58	87+/-3	71	74+/-3	70-71
6	30	35-37	21	35-36	32	35	34-36
19	21	7-8	8	9	7	7(8)	8-9
22	28	15-18	14	13-14	14	14+/-1	16-17
23	24	12-13	12	13	11	13(14)	12-13
29	18	6	7	7+	7	7(6+)	7
30	17	3-4	7	4+	4	4(5?)	4
36	10	2	2	2-3	2	2+	2
37	42	61-63	45-56	65+/-3	58	63+/-3	60-63
38	32	28-29	27-29	28+/-2	26	26+/-2	20-30
40	35	29	21	30+/-5	31	25+/-2	21-33
55	21	7	10	9+/-1	10	9+/-2	9
67	16	6	7	6+	6	6+	6
76	13	4	5	4-5	4	4+	4
79	8	2	4	2+	2	2+	2

MF 90-8 thin-section collection date 7-19-90

spec #	fish length	BG(TS)	NB(TS)	SM(TS)	BM(TS)	SJ(TS)	SRJ(TS)
1	71	90	40-60	90+/-5	75	74+/-3	89
6	30	33	14+/-2	33+/-2	34	32+/-2	31
19	21	9	8+/-1	9+/-1	7	8+/-1	
22	28	16	11+/-1	20+/-2	16	6	
23	24	17	12	12-13	14	13	
29	18	6+	7	5+/-1	13	5-6	
30	17	8+	5	7+(8)	8	8	
36	10	2	3	2(3)	2	2	
37	42	57-63	40+/-5	75+/-5	56	65+/-5	
38	32	24-27	26+/-5	30+/-4	37	26+/-2	
40	35	28-33	17+/-3	33+/-3	35	21-24	
55	21	8	11+/-2	10+/-3	12	10	
67	16	7+	7	7	7	6+	
76	13	5+	6	5+	5	4+	
79	8	2+	3	3(2)	2	2+	

IPHC and ADF&G Pacific Halibut Otolith Exchange
Calvin Blood 4/13/95

For the past five years the IPHC and the sport fish division of the ADF&G Southcentral Region have exchanged about 100 otoliths collected in ADF&G sport halibut sampling. IPHC age readers provided the initial training for ADF&G personnel and the 100 otolith sample is used to monitor reader drift between the two agencies.

Very few differences were detected during the first four exchanges. However, in the 1994 exchange, IPHC ages were definitely positively biased when compared to the ADF&G ages. An independent check between two ADF&G readers showed little bias. Although the estimated age distributions were not statistically different, they appeared to be biologically different. The two agencies agreed to review the ages once more.

A second comparison reduced the positive bias considerably. The reasons for the bias are not apparent. The IPHC reader was relatively inactive in age reading for 1994 and this probably contributed to the differences. The moral of this age-reading story is that for those of us don't read otoliths on a production basis need to re-fresh our skills from time to time. We have taken steps at IPHC to maintain our proficiency by reading small samples of otoliths on a weekly to monthly schedule.

Appendix 2.

Status of radiometric aging laboratory at NMFS, AFSC
Craig Kastelle 4/13/95

The development of a radiometric aging laboratory at the AFSC is proceeding. Partial operation has been established recently and full operation is expected in spring of 1995.

Staff at the AFSC recognizes the concerns expressed by the TSC in the "1993 Recommendation to CARE", item # 2, where it was suggested that radiometric aging be done in association with existing radiochemical labs. Staff at the AFSC believe that the spirit of the concerns are being implemented. Close association is being maintained with other researchers, and careful calibration of procedures and equipment is a standard practice.

Recent research completed in labs both at the University of Washington and the AFSC was focused on four species of rockfish (Sebastes and Sebastolobus): Pacific Ocean perch, rougheye, shortspine thornyhead, and shortraker. The results were promising, but due to sample size considerations only provided an indication of the method's feasibility in each species or a partial validation. More research is planned to eventually complete age validation studies on the above four species plus northern and dusky rockfish. Other current studies are focused on radiometric aging of marine mammals and preliminary results look favorable.

Appendix 3.

MEMORANDUM

OREGON DEPARTMENT OF FISH AND WILDLIFE

INTRA-DEPARTMENT

DATE: 04-14-95
TO: Betty Goetz
FROM: Bob Mikus
SUBJECT: ODFW/CDFG Dover sole aging workshop

The 1995 Dover sole aging workshop took place at the Eureka, CA. offices of the CDFG from 04-03-95 through 04-05-95. Participating for CDFG were Larry Quirollo, Brenda Erwin and Mike Fukushima. Participating for ODFW were Bob Mikus and Bill Barss. Two samples were looked at, one from CDFG (32 otoliths), and one from WDFW (20 otoliths).

Of the five age readers one does not regularly age Dover sole, and another is relatively new. Some of our precision difficulties can be attributed to this. The rest, of course, is simply due to the everyday orneriness of Dover sole bones. The procedure was to have each person age all the otoliths independently, then compare ages. Due to the large number of readers and their differing levels of experience we decided that for fish where all 5 ages were within +/- two years we would not go through a resolution process. If one reader was three years different than one or more of the others, all would re-age the fish and try to come to an agreement. In all the graphs included, those differences of more than two years indicate an inability to resolve a disagreement.

Our previous workshops found edge determination and the "lumping vs. splitting" syndrome to be the major difficulties in achieving agreement. This time, the biggest headache was determination of the first annulus (in addition to the other two problems). In short, the whole structure was a pain.

The first day and a half were spent on the CDFG sample. As with last year, the whole sample consisted of very difficult to age structures. Table 1 shows our initial and resolved ages on the CDFG sample. The second column of numbers shows the resolved ages, the third column shows our disagreement with our own initial ages. The highest age in this sample was 29 years, the average was 19.22 years, and the low was 9 years. Figure 1 shows four groups of ages graphed against the fifth. In the sake of brevity and paper conservation I have decided not to plot all the variations; they are much the same anyway. Within the ten possible combinations of age readers, agreement on the CDFG sample ran as follows: the highest agreement within +/- 2 years

Appendix 3, continued.

was 96.89%, the average agreement within +/- 2 years was 85.63%, the lowest agreement within +/- 2 years was 78.13%.

Table 2 shows our initial and resolved ages on the WDFW sample. The highest age in this sample was 45 years, the average age was 12.16 years, the lowest age was 6.6 years. Figure 2 shows four groups of ages graphed against the fifth. Again, I opted to save paper and time by only plotting a representative sample. Within the ten possible combinations of age readers, agreement on the WDFW sample ran as follows: the highest agreement within +/- 2 years was 100% (yea!), the average agreement within +/- 2 years was 83%, the lowest agreement within +/- 2 years was 70%.

Figures 3 and 4 show a graphic representation of the highest and lowest agreement, respectively, in the California and Washington samples.

Compared to some of the head banging that has gone on at previous workshops, this one was pleasingly agreeable. Firstly, despite the samples (once again bones from hell), we had suprisingly high agreement within our +/- 2 year acceptability level on the initial reading - despite having five age readers. Secondly, where there were differences, anticipated rows gave way to mild mannered discussion (with one exception...but that's another story and doesn't involve any of the structures used for this report). It is apparent that age readers that routinely work/train together (Larry - Mike, Bob - Bill) tend to have the same pattern in their aging. Also apparent is the higher agreement between those agers that have aged for a long time (pardon all age-ing puns) or have worked extensively/exclusively with Dover sole. Agreement was reached (where it **was** reached) by using the scope equipped with a teaching head (two sets of eyepieces) or by verbal description (hand motion, etc...). A short discussion was held on the potential for a prism attachment for one of the scopes that could project an enlarged view of the bone under the lens on a screen - like an overhead projector (if such an attachment exists).

The increase in percent agreement within +/- 2 years between 5 age readers from the 1994 workshop to the 1995 workshop is encouraging (1994: Low = 20.4%, High = 42.8% ; 1995: Low = 70%, High = 100%), and shows the value of having these workshops.

Appendix 4. Report of sablefish exchange by Kris Munk. {This report was filed as an Excel workbook and is being sent as a separate file named carekris.xls.}

n=	24		
n AGREE=	5	**AVG SD =**	1.761864543
%AGREE=	21%	**CV =**	14.30%
AVG %ERR=	10.00%	**D =**	9.65%

SPECIME	KM	SM	BIAS	MEAN	AVG.ERR	VAR.	STDEV	CV	D
94-03-289	3	4	1	3.5	0.1429	0.5	0.707106781	0.202030509	0.14286
94-03-290	15	12	3	13.5	0.1111	4.5	2.121320344	0.15713484	0.11111
94-03-291	7	7	0	7	0	0	0	0	0
94-03-292	6	7	1	6.5	0.0769	0.5	0.707106781	0.108785659	0.07692
94-03-293	9	10	1	9.5	0.0526	0.5	0.707106781	0.074432293	0.05263
94-03-294	10	11	1	10.5	0.0476	0.5	0.707106781	0.067343503	0.04762
94-03-295	2	3	1	2.5	0.2	0.5	0.707106781	0.282842712	0.2
94-03-296	12	14	2	13	0.0769	2	1.414213562	0.108785659	0.07692
94-03-297	15	19	4	17	0.1176	8	2.828427125	0.166378066	0.11765
94-03-298	6	4	2	5	0.2	2	1.414213562	0.282842712	0.2
94-03-299	8	6	2	7	0.1429	2	1.414213562	0.202030509	0.14286
94-03-300	13	13	0	13	0	0	0	0	0
94-03-301	15	15	0	15	0	0	0	0	0
94-03-302	31	25	6	28	0.1071	18	4.242640687	0.151522882	0.10714
94-03-303	4	4	0	4	0	0	0	0	0
94-03-304	16	13	3	14.5	0.1034	4.5	2.121320344	0.146297955	0.10345
94-03-305	9	5	4	7	0.2857	8	2.828427125	0.404061018	0.28571
94-03-306	9	6	3	7.5	0.2	4.5	2.121320344	0.282842712	0.2
94-03-307	10	10	0	10	0	0	0	0	0
94-03-308	8	6	2	7	0.1429	2	1.414213562	0.202030509	0.14286
94-03-309	10	12	2	11	0.0909	2	1.414213	0.1285648	0.09091

							562	69	
94-03-310	10	13	3	11.5	0.1304	4.5	2.121320344	0.184462639	0.13043
94-03-311	21	19	2	20	0.05	2	1.414213562	0.070710678	0.05
94-03-312	55	51	4	53	0.0377	8	2.828427	0.0533665	0.03774
MAX	55	51	6		0.2857	18	4.242640687	0.404061018	0.28571
MIN	2	3	0		0	0	0	0	0
MEAN	12.67	12.04	1.96	12.35	0.1	3.104166667		0.136519428	0.0965337 5
APE					10.00%				
AVG VAR						3.10416666			
AVG SD							1.761864543		
AVG CV								0.143	

HISTORY OF THE COMMITTEE OF AGE READING EXPERTS (CARE):

Activities leading up to the first CARE meeting:

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 involving the standardization of aging methodologies for species being aged by multiple agencies were voiced, particularly in regard to the use of the break-and-burn technique. A working group was formed by the Parent Committee 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.

In February 1983, a memo was drafted to Dr. John P. Harville (Executive Director for the Pacific Marine Fisheries Commission by Dr. Loh-Lee Low and Dr. Dan Kimura proposing two three-day workshops on aging methodology. The focus of the proposed workshops was the standardization and documentation of methodology for aging which 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 aging 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 aging criteria between agencies was a "parallel effort" directed toward effects of aging 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 aging 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 consisting of the following participants: 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 aging manual documenting standardized rockfish aging methodology.

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 aging 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 Aging Procedures" which detailed sample collection recommendations, surface aging techniques, break-and-burn methodology, and thin-sectioning options.

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" aging of selected otoliths.
2. "Work toward a goal of standardized methods for aging 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 aging 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.

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 aging young fish, readability coding, and acceptable levels of agreement occurred. Hands-on aging 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 aging methodology was addressed but agreement on the interpretation of older ages was lacking. Flatfish aging was also addressed briefly.

The "Generalized Rockfish Aging 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 aging, 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 aging manual "and "proposed inter-agency age calibration mechanism" were produced. At this meeting, CARE agreed to substitute "burned section aging" for "break-and-burn"

Topics for discussion at a subsequent CARE meeting were outlined as follows:

1) proceed with a sample exchange, 2) refine sablefish methodology, and 3) consider flatfish in more depth

TSC recommendations to CARE (June 1984):

1. That the aging 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 internal 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 Aging Workshop was held at Nanaimo from October 25-27, 1984, however, the conveners 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.

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. A report to TSC describing results, problems, and recommendations was drafted by Betty Goetz.

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.

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

Results of CARE meeting presented to TSC:

1. There is a need to update the Aging 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.

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 (Attachment ##). Items suggested for discussion at the next CARE meeting were 1) implementation of the revised "terms of reference", 2) revision of the Aging Manual, 3) review of quality control procedures, and 4) initiation of another otolith exchange.

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

The fourth CARE meeting was hosted by the Washington Department of Fisheries 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 Aging 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 aging, had been production aged in the past, or was slated for development in the future. Three hours of hands-on aging 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.

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 Kastelle (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 which 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 aging 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 Aging Manual involved selection of photographs for incorporation in the manual, and subcommittee meetings to discuss addenda 1) exchange mechanism, 2) sablefish aging, and the Bill Barss method for permanent storage of otolith break-and-burns.

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

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 aging 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 s 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.

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 aging 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 Aging 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.

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.

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 Kastelle 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 Aging 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 Kastelle (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 Kastelle, 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 aging workshop April 14-16, 1992.

Other age validation and special projects were informally outlined. These included multistructure 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 aging 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

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 Aging 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.

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 Aging Manual including high quality photos, and quality reproduction of other graphics.

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 Aging Manual, and suggests that CARE consider the use of multimedia technologies to enhance the effectiveness of the manual.

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 aging 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 aging procedures, b) review new aging techniques and equipment, and c) resolve technical problems related to aging.

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.

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 Kastelle, 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 Kastelle: 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 Aging 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 a interagency exchange of shortspine thornyhead otolith thin-sections and break-and-burns.

CARE recommendations to CARE; CARE recommendations to TSC:

See report submitted at May 1995 TSC meeting.

Attachment C

YELLOWTAIL ROCKFISH WORKING GROUP REPORT

Working Group Report on the Yellowtail Rockfish Fisheries

Submitted to the Technical Subcommittee of the Canada/United States Groundfish Committee

by R. D. Stanley and J. V. Tagart

May 1995

This document summarizes progress made from June 1994 to June 1995 and outlines the objectives through June 1996.

At the 1988 Annual Meeting of the Canada/US. Groundfish Committee, the Technical Subcommittee recommended to the Parent Committee that a yellowtail rockfish working group be appointed. They stated that this working group should:

1. Review the status of the yellowtail rockfish stocks;
2. Study management strategies for yellowtail rockfish;
3. Review the implications of the various management strategies on the yellowtail rockfish stock;
4. Report to the TSC and Parent Committee on their progress.

1. Stock Assessments

1.1 Canada

A interim assessment for yellowtail rockfish was conducted in 1994 for the 1995 fishing year (Stanley, in press). An interim assessment for the "coastal yellowtail rockfish stock (PMFC Areas 3D-5E) will be produced for July 1995. A full assessment of the "boundary" stock (Area 3B-3C) will be conducted for 1996.

1.2 U.S.

The 1995-96 U.S. recommendations for acceptable biological catch (ABC) are based on a previous analysis of stock biomass (Tagart, 1993). The stock abundance of yellowtail rockfish in U.S. waters will be reassessed in 1996.

While Canadian and U.S. assessments will be conducted separately, there will be continued consultation over procedures and recommendations.

2. Management options

The TSC asked that the working group examine various management strategies related to the transboundary-boundary allocation of yellowtail rockfish harvest. Available evidence suggests that the population in the transboundary-boundary area mixes freely in the vicinity of the boundary, thus there is no biological basis for an allocation. Consequently, recommendations for allocation of the harvestable resource must rely on social, political, and economic factors which the current group is unprepared to address without explicit guidance from the managers of both countries.

The working group recommends that any bilateral discussion on the transboundary-boundary nature of these fisheries treat PMFC areas 3C and 3B as an operational stock (the southern Vancouver stock) and exclude from consideration the fisheries to the north and south. We acknowledge that the stock affiliation with the fishery of central Vancouver Island remains unclear.

Managers are reminded that the offshore hake fishery results in a significant harvest from the southern Vancouver stock. They are also advised that the working group does not perceive any differences in the harvest selectivities between the two domestic fleets. The impact of harvesting a fixed amount will be equal regardless of which nation does the harvesting.

3. Additional research

Other than publication of a paper on stock delineation (Tagart et al, in prep), no additional directed work is planned for yellowtail rockfish by either WDF or DFO.

4. Literature Cited

Stanley, R. D. (in press). Shelf Rockfish In: M. Stocker {ed.} Groundfish stock assessments for the west coast of Canada in 1994 and recommended yield options for 1995. Can. Tech. Rep. Fish. Aquat. Sci. xxxx.

Tagart, J. V. 1993. Status of the yellowtail rockfish resource in 1993. in Appendices to the status of the Pacific coast groundfish fishery through 1993 and recommend acceptable biological catches for 1994. Pacific Fishery Management Council, 2000 SW First Avenue, Suite 420, Portland, OR, 97201.

Tagart, J. V., S. R. Phelps and R. D. Stanley. (in prep). Genetic evidence of multiple yellowtail rockfish (Sebastes flavidus) stocks along the Pacific coast of North America.

Attachment D

REVIEW OF AGENCY GROUNDFISH RESEARCH, ASSESSMENTS, AND MANAGEMENT: AGENCY REPORTS

1. OREGON

A. AGENCY OVERVIEW

Bill Barss is filling the Butler position effective March 1995, as the new Field Operations Project Leader. Barss will continue duties as Whiting Coordinator until that position is filled in 1995. Claire Wood transferred to the Shellfish Program, and her old position with the Technical Services Project was filled by Mark Freeman. See APPENDIX A for Marine Finfish Program personnel.

B. MULTI SPECIES STUDIES

1. Staff participated in RecFIN committee work and planning. Sampling was conducted in 1994 and continues in 1995.

2. Coastwide species composition sampling continues on recreational catches.

3. Species composition sampling of rockfish and thornyheads continues on commercial trawl landings. Species composition samples have been taken from commercial fixed gear landings.

4. Monthly cumulative trip limits were used in 1994. They seemed to be favored over bi-weekly limits by both fishermen and enforcement agents.

5. Oregon landing tax is now collected on the ex-vessel value of a particular species or species group rather than on the poundage. This change along with a variety of rockfish species which are sorted because of differential prices paid to the fishermen, has created the potential to obtain rockfish species composition information for ports, areas, gears, or months during which samples were available to collect species composition samples. To achieve this we began working on a technique to substitute species composition information collected from fish tickets for periods during which adequate samples were not collected. For more information contact Mark Saelens (503) 867-4741

6. Our shrimp project staff continued their research on finfish excluders. In late 1994, in cooperation with Craig Rose of NMFS/ RACE, an underwater video system was used to examine three types of finfish excluders in action. The results suggested some minor modification in the construction of two of the three. This Saltonstal-Kennedy funded project will continue in 1995, with extensive field trials of the three devices to determine fish exclusion efficiency by size and species and the degree of shrimp loss for each. For more information contact Bob Hannah at (503) 867-4741

7. The Pacific whiting observation program continued in 1994. We coordinated the sampling of by-catch and data analysis from shoreside landings of Pacific whiting. For more information contact Bill Barss (503) 867-4741

8. We began development of a general trawl fishery observation and enhanced data collection project during the last half of the year. The Oregon Trawl Commission (OTC) increased their 0.5% tax by 0.5% to fund data gathering projects. Beginning with September 1994, all Oregon groundfish and shrimp deliveries were charged this 0.1% tax, including the additional 0.5% tax for data collection work. During June through October we worked on a draft proposal to OTC to coordinate this project which will focus on management induced discard. The project also includes goals to determine prohibited species bycatch rates, bycatch of additional species of groundfish which may not be target species, survival work with halibut and sablefish, and collection of biological information.

In October OTC accepted our draft proposal, and we jointly presented a request to the Pacific Fishery Management Council) to approve experimental fishing permits. The Council approved the request with the understanding that we would return in April with additional detail on the project. As of this writing the concept of issuing the permits was approved by the Council at their April meeting. We are currently working on permit language with the National Marine Fisheries Service, and hope to have observers aboard 10 vessels beginning July 1, 1995. For more information contact Mark Saelens (503) 867-4741

9. CORE studies:

a. The Cooperative Reef Ecosystem study (CORE) continued work on subtidal rocky bottom habitats off the Oregon coast near Depoe Bay and Cape Foulweather. This was a dive survey to characterize sea urchins and habitat.

b. The Shellfish/Habitat Program plans to survey kelp bed fish, invertebrates, algae, and habitat characteristics in 1994 were postponed and are planned for 1995. The survey will continue for several years and will be performed in conjunction with experimental kelp harvest to begin determining potential kelp harvest impacts.
For more information contact Dave Fox or Jim Golden (503) 867-4741.

C. BY SPECIES:

1. Pacific cod: no work was conducted on Pacific cod and few fish were found in the trawl landings.

2. Shelf rockfish:

a. Black Rockfish -

1) The recreational bag limit was reduced from 15 to 10 fish, effective 1/1/94.

2) Commercial fishery restrictions for all gears except trawl are in effect on August 1, in state waters. Trip limits of 65 fish or 200 pounds, whichever is greater are in effect for four areas off Oregon which are: Tillamook Head (45°56'45" N. latitude) to Cape Lookout(45°20'15" N. latitude); Cascade Head (45°03'50" N. latitude) to Cape Perpetua (44°18' N. latitude); 43°30' N. latitude to 43°10' N. latitude; and Mack Arch (42°13'40" N. latitude) to the Oregon-California Border (42°00' N. latitude).

3) PFMC approved commercial fishery restrictions in (2) at its March 1994 meeting. A document to be submitted to NMFS/Washington, D.C. Is in preparation.

4) Coastwide sampling continues on recreational catches of black rockfish. Sampling includes biological sampling for age, length, sex and maturity. Age determination is done by ODFW. Contact Elaine Stewart for more information(503) 867-4741.

b. Widow rockfish - fish from the Cobb Seamount continue to be sampled for age, length and sex. Age determination from otoliths was done by NMFS, Tiburon. Contact Dave Douglas for more information (503) 325-2462.

c. Canary rockfish - Canary landings fell about 35% to 935 mt. A stock assessment was completed and included in PFMC's 1994 status of stocks report. The assessment was co-authored with David Sampson of OSU. For more information contact Elaine Stewart (503) 867-4741.

d. Yellowtail and widow rockfish - Primarily due to changes in regulations (trip limits), yellowtail rockfish landings rose sharply to 4,212 mt. ODFW continues to collect routine age samples on these species. Yellowtail rockfish age determination is done by WDFW, and Widow rockfish age determination is done by NMFS, Tiburon. For more information contact Bob Mikus (503) 867-4741.

3. Slope rockfish: Most sampling is limited to species composition sampling.

4. Thornyheads: Sampling included species composition sampling, age sampling and length frequency sampling. Age determination from otoliths is done by NMFS. High value for thornyheads has resulted in some sorting and discard problems with the DTS complex. There was about a 9% drop in the thornyhead landings to 4,044 mt due to reductions in trip limits.

5. Sablefish: Routine age samples were obtained on sablefish. Otoliths were sent to NMFS for age determination.

6. Flatfish:

a. Age sampling continued on Dover sole, English sole, arrowtooth flounder and petrale sole. We began taking age samples of Pacific sanddab in the port of Charleston. Ages were determined at ODFW for Dover, and English sole. Petrale sole, Pacific sanddab and arrowtooth are not being aged at this time. ODFW also provides for age determination for some Dover sole samples taken by CDFG and some English sole and Dover sole samples taken by WDF. ODFW is also helping train an OSU graduate student to age English sole.

It is important to note that while Dover sole is one of the largest components of Oregon's bottom trawl fishery, landings were down 40% from 1993 primarily due to trip limit reductions in the DTS complex and a softer market for Dover sole. The Pacific sanddab markets improved and while landings remain at a modest level, they almost doubled compared to 1993 landings rising to 516 mt. Contact Bob Mikus for additional information on aging(503) 867-4741

b. Halibut-

1) ODFW participated in the weekly catch monitoring of recreational catches in light of the catch quota.

2) About 1/2 of the recreational catch was sampled for average weight and enforcement purposes. For additional information on halibut issues contact Jerry Butler (503) 867-4741.

7. Pacific whiting:

a. ODFW with cooperation from PSMFC, NMFS, PFMC, CDFG, WDFW and the fishing industry, continued to conduct an observation program to sample the by-catch of landings made to shoreside processors and provide data on by-catch discard at sea.
Oregon sampling sites were Astoria, Newport and Charleston. Sampling was also conducted in Ilwaco, WA through WDFW and Crescent City and Eureka, California through CDFG. A sampling rate of 20% for at-sea observations and 30% for shoreside observations was selected. Sampling was conducted form April until the season's end in November.

One Washington, three California and seven Oregon processors, and their vessels participated in the observation program. Experimental Fishing Permits (EFP) were issued by NMFS through ODFW and CDFG to participating vessels so they could land unsorted catches containing prohibited species (salmon and halibut) and trip limit overages. Any prohibited species and the exvessel value of trip limit overages were given to the state of landing (ODFW in Oregon, WDFW in Washington and CDFG in California).

Thirty-three mid-water trawlers targeted on Pacific whiting and most participated in the observation program. Twenty-nine of these vessels landed fish in Oregon ports. About 72,000 mt of whiting was delivered to shoreside processors (65,008 mt landed into Oregon). Overall 18% of the trips targeting whiting were observed at sea (including the offload); the Oregon rate was 19%. An additional 24% (26% in Oregon) of the whiting landings were observed shoreside. Overall salmon catch rate was 0.008 salmon per mt of Pacific whiting. There were 243 salmon (230 in Oregon ports) seen in the 715 observed trips (662 trips in Oregon). The highest observed bycatchs were for jack and Pacific mackerel (531,699 lb), yellowtail rockfish (319,231 lb) and widow rockfish (231,877 lb).

Oregon midwater trawl landings of Pacific whiting were up some 82% over 1993 to 65,110 mt. This was primarily due to the allocation agreement where 40% of the U.S. Quota was reserved for shoreside processors. Shoreside processing capability also improved over 1993. For more information contact Bill Barss (503) 867-4741

b. ODFW collected whiting biological samples for NMFS, Seattle (otoliths, length, sex and weight) at Astoria. Newport and Charleston.

8. Dogfish: No work was conducted on dogfish.

9. Lingcod: Age samples were collected and sent to NMFS, Tiburon for age determination.

10. Other:

a. Surfperch- Extensive biological sampling continued along the southern Oregon coast. Special emphasis was again on redtail surfperch. Age determination was done by ODFW. For more information contact Darrell Pruden (503) 888-5515.

b. Pacific herring- The roe herring fishery in Yaquina Bay produced almost no landings. Fish were present in the estuary for only a short time and were in an area not accessible to the fleet. Only 4 tons were caught out of a quota of 90 tons.

c. Hagfish: Only one landing of hagfish for 5,370 pounds was delivered. The low catch was entirely due to poor market demand for hagfish. A paper on black and Pacific hagfish and the Oregon Hagfishery was published in the Fish. Bulletin. For more information contact Bill Barss (503) 867-4741.

D. MARINE FINFISH PROGRAM

Jerry Butler, Program Leader	Newport
Bill Barss, Project Leader, Field Operations	Newport
Dave Douglas, Port Biologist	Astoria
Gary Hettman, Port Biologist	Newport
Mike Hosie, Port Biologist	Charleston
Tom Preston, Port Sampling EBA	Astoria
Rhonda Haynes, Port Sampling EBA & Pelagic Fish	Newport
Lisa Johnson, Port Sampling EBA	Charleston
Carol Madden, Data Management Technician	Newport
Darrell Pruden, Sportfish Biologist	Charleston
Mark Saelens, Project Leader, Tech.Services	Newport
Vacant, Biologist, Whiting & OTC Project Coordinator	Newport
Mark Freeman, Data Coordinator Biologist	Newport
Kathy Raymond, Data Entry EBA	Newport
Bob Mikus, Age-rading specialist	Newport
Elaine Stewart, Finfish Assessment Biologist	Newport
David Sampson, Consultant, OSU	Newport
Clayton Creech, Consultant, OSU	Newport

2. WASHINGTON

A. AGENCY OVERVIEW

In 1994, the Washington Department of Fisheries merged with the Washington Department of Wildlife to become the Washington Department of Fish and Wildlife. The new agency has one Fish Management Program which encompasses salmon and steelhead as well as marine fish and shellfish. Marine fish are managed under the Marine Resources Division of the new Fish Management Program.

1. Coastal Marine Fish Management

Coastal Marine Fish Management occurs within the Coastal section of the Marine Resources Division, which is responsible for management and research of groundfish in all coastal waters and in the outer Strait of Juan de Fuca. The coastal section also handles all issues requiring interstate, regional, federal or international cooperation. Responsibilities include membership on the Groundfish Management Team (GMT) of the Pacific Fishery Management Council (PFMC), membership on the groundfish plan team of the North Pacific Fishery Management Council, membership on the Science and Statistical Sub-Committee (SSC) of the Pacific and North Pacific Fishery Management Councils, multi-jurisdictional management and stock assessment of groundfish stocks in state waters (0-3 miles) and in the Fisheries Conservation Zone (3-200 miles) adjacent to Washington, and joint research with other agencies or institutions on questions of mutual interest.

Management of the coastal groundfish stocks is primarily accomplished through membership on the GMT which develops annual estimates of "Acceptable Biological Catch" for major species/species groups and proposes management strategies to the PFMC. Division personnel implement Council decisions by drafting state regulations and coordinating state enforcement regarding groundfish management. Division personnel are stationed in major ports of landing to collect catch and biological data and other fishery related information.

2. Puget Sound Marine Fish Management.

The Puget Sound MF/SF section defines Puget Sound as those waters east of the Sekiu River including the Strait of Juan de Fuca. Marine Fish management occurs in three units of this division: the Baitfish Unit, the Marine Fish Assessment Unit, the Marine Fish Monitoring and Operations Unit, the Hydroacoustics Unit, and the Data Management Unit.

The Baitfish Unit is responsible for all research and management of the baitfish resource; chiefly Pacific herring and smelt. The goal of this unit is to maintain sustainable yields of baitfish harvested by commercial and recreational fishermen. To achieve this goal the unit conducts field sampling programs to determine annual spawning escapement, biological characteristics such as age, size and maturity of the fish, and biomass estimates of the commercial catch. From analysis of the data collected, a management plan is formulated and regulations are implemented to allow for an efficient harvest and conservation of the species while minimizing conflict between user groups. In addition this unit is responsible for the definition and resolution of environmental issues affecting the spawning habitats of baitfishes.

The Marine Fish Assessment Unit is partially supported by a Wallop-Breaux Project. The goal of this unit is to evaluate specific groundfish stocks in order to manage at the stock level. This unit performs analysis of fishery and biological data from regional field surveys and historical data bases to evaluate stock trends, and resource conservation problems. With consideration of these trends a management plan is developed, implemented and evaluated.

The goal of the Marine Fish Monitoring and Operations Unit is to maintain sustainable yields of groundfish species to the various user groups while providing for the conservation of harvested fishes and minimize conflict between user groups. The unit is subdivided in regional management units which are responsible for the management and operations in their region. These Units perform field sampling and analysis of fishery and biological characteristics in order to insure orderly harvest. This section is responsible for the development and evaluation of management strategies, usually gear and time/area restrictions.

The Hydroacoustics Unit conducts biomass surveys for marine fish stock assessment from our 37-foot boat, M/V Pasquale, with on-board hydroacoustic equipment. Species and areas surveyed on an ongoing basis include: herring in Bellingham Bay, Hood Canal, Gulf of Georgia, and South Puget Sound; whiting in Port Susan; and sockeye salmon presmolts in Lake Washington.

The Data Management Unit provides a variety of data processing services to the Marine Fish Program including: operating and maintaining our shared computer resources; user training and support; maintaining the WDF Fish Ticket, Otter Trawl Logbook, and Biological Sample Databases; and designing and implementing new computer applications.

B. BY SPECIES, BY AGENCY

Black rockfish. Research is currently directed at identifying stock boundaries for coastal black rockfish. Washington tagging data suggest that Cape Flattery and Cape Falcon may represent area bounds for a coastal Washington-northern Oregon black rockfish stock. In 1994, a three year study was initiated to determine the genetic separation of coastal black rockfish populations using electrophoretic allozyme analysis. Last year we collected black rockfish tissue samples from Alaska, Washington and California. If allele frequency differences can be found between the three geographically disparate sample areas, the study will be expanded to include other coastal areas this summer and next year.

A stock assessment using the Stock Synthesis model was completed in 1994. An age structured model was applied to catch, size, and age data collected from the trawl, jig, and sport fisheries. Auxiliary data used as indicators of trends in abundance included tagging survey catch per unit effort, tagging survey size data, and sport effort.

Contact: Farron Wallace (360) 249-4628

Arrowtooth flounder. Maturity work was published in a Fishery Bulletin article. Arrowtooth flounder are batch spawners and spawn at depths of at least 366 m (200 fm). Spawning begins in September, extends through December, and is complete by March. The length at which 50% of fish are mature is 28.0 cm for males and 36.8 cm for females determined from fall survey data.

Contact: Martha Rickey (360) 902-2850

Lingcod. Results from an 8-year nearshore tagging study at Neah Bay were published in the Transactions of the American Fishery Society. Another tagging study designed to estimate nearshore and offshore fishery interactions entered the model refinement and testing phase. An age-structured stock assessment of lingcod north of Cape Falcon in areas 3A/3B/3C was completed in 1994. A coastwide (Alaska to California) Genetic Stock Identification study was completed and the results were submitted for publication. An ongoing study designed to monitor yearclass strength in the nearshore waters of Cape Flattery entered its second year.

Contact: Tom Jagielo (360) 902-2837

C. OTHER RELATED STUDIES

1. Puget Sound Ambient Monitoring Project.

This project is part of a multi-agency effort to characterize the health of Puget Sound, monitor environmental trends and investigate potential human health issues. Survey work was conducted by WDF during 1994 at 12 sites distributed throughout Puget Sound to examine English sole for liver disease due to contaminated sediment exposure. Muscle and liver tissue specimens were analyzed for chemical contaminants of PCB's, pesticides, heavy metals and various organic compounds. An overview paper summarizing findings is in preparation. A report on mercury and PCB contamination in rockfish is currently available.

Contact: Sandie O'Neill (360) 902-2843 or Jim West (360) 902-2842

2. Puget Sound Recreational Species Assessment.

Primary work included special studies on assessing and managing lingcod and rockfish populations in Puget Sound. In 1993, a Video-Acoustic Technique (VAT) was used to survey fish populations living in the shallow waters (to 39 m) of the San Juan Archipelago. The VAT uses a black-and-white television camera to quantitatively estimate the densities of fishes living within 2 m of the bottom. Standard scientific echosounding techniques estimate the pelagic fishes living above the reef, and these results are added to the video survey results. Approximately 300,000 lingcod (*Ophiodon elongatus*), 723,000 quillback rockfish (*Sebastes maliger*), and 2.1 million copper rockfish (*S. caurinus*) were estimated from 1993 survey results. In 1994, the VAT survey was repeated in the San Juan Archipelago finding similar populations of lingcod but about twice the abundance of quillback and copper rockfishes. The survey was also expanded during the second survey year to the Strait of Juan de Fuca. Estimates are not yet available, but populations of reef fishes were extremely low.

Other activities included estimating the harvest and effort in the lingcod fishery at Tacoma Narrows. This spring time fishery harvests several hundred lingcod during approximately a thousand fishing trips. Catch rate estimates resulting from the creel survey have been stable during the last seven years indicating lingcod populations are stable in the southern region of Puget Sound.

Annual harvest and effort estimates were made 1993 and integrated into a comprehensive database of recreational and commercial catch statistics which includes fishery data to 1970. These data and the results from various assessment work are now being integrated into a Status of Stocks document for marine fish in Puget Sound.

Contact: Wayne Palsson, (360) 902-2845, palsswap@dfw.wa.gov

D. RECENT PUBLICATIONS AND REPORTS

Jagielo, T.H. 1994. Assessment of lingcod (*Ophiodon elongatus*) in the area north of 45° 46' N. (Cape Falcon) and south of 49° 00' N. in 1994. Appendix I, In: Pacific Fishery Management Council, 1994. "Status of the Pacific coast groundfish fishery through 1994 and recommended acceptable biological catches for 1995." (Document prepared for the council and it's advisory entities.) Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, Oregon 97201.

Jagielo, T.H. 1995. Abundance and survival of lingcod at Cape Flattery, Washington. Transactions of the American Fisheries Society. 124:36-73.

Rickey, Martha H. 1995. Maturity, spawning, and seasonal movement of arrowtooth flounder, *Atheresthes stomias*, off Washington. Fishery Bulletin 93:127-138.

Wallace, F.R. and J.V. Tagart. 1994. Status of the coastal black rockfish stocks in Washington and northern Oregon in 1994. Appendix F, In: Pacific Fisheries management council, 1994. "Status of the Pacific coast groundfish fishery through 1994 and recommended acceptable biological catches for 1995." (document prepared for the council and it's advisory entities.) Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, Oregon 97201.

West, J. E. and S. M. O'Neill. 1995. Accumulation of mercury and polychlorinated biphenyls in quillback rockfish (*Sebastes maliger*) from Puget Sound, Washington. Presented at Puget Sound Research '95 Conference, submitted to conference Proceedings.

3. ALASKA

A. AGENCY OVERVIEW

1. Description of the State of Alaska groundfish program:

The Alaska Department of Fish and Game (ADF&G) has jurisdiction over all groundfish fisheries within the internal waters of the state and to three miles offshore along the outer coast. A provision in federal Gulf of Alaska Groundfish Fishery Management Plan gives the State of Alaska limited management authority for demersal shelf rockfish in the federal waters east of 140° W. longitude. The state also manages the lingcod resource in both state and federal waters of Alaska. Other groundfish fisheries in Alaskan waters are managed by the federal government or in conjunction with the federal management of the adjacent Exclusive Economic Zone (EEZ). The information related in this report is from the state-managed groundfish fisheries only.

The State of Alaska is divided into three maritime regions for marine fisheries management. The Southeast Region extends from the Exclusive Economic Zone (Equi-distant line) boundary in Dixon Entrance north and westward to 147° W. Longitude. The Central Region includes the internal waters of Prince William Sound, Cook Inlet, and Bristol Bay and the Outer District off Kenai Peninsula. The Westward Region includes all territorial waters of the Gulf of Alaska west of Cape Douglas, Kodiak Island, the Aleutian Islands, and the Bering Sea.

a. Southeast Region

During 1994 the Southeast Region Commercial Fisheries Groundfish Project was staffed with a project leader in Petersburg, an assistant project leader in Sitka and a resource assessment coordinator in Sitka. Seasonal port samplers were employed in Petersburg, Ketchikan, and Craig. The project also received biometrics assistance from the regional office in Douglas.

The Southeast Region's groundfish project has responsibility for research and management of all commercial groundfish resources in the territorial waters of the Eastern Gulf of Alaska. The project also cooperates with the federal government for management of the waters of the adjacent EEZ and the project leader participates as a member of the North Pacific Fisheries Management Council's Gulf of Alaska Groundfish Plan Team.

Project activities center around fisheries monitoring, resource assessment, and in-season management of the groundfish resources. In-season management decisions are based on data collected from the fisheries and from the resource assessment surveys. Primary tasks include fish ticket collection, editing, and data entry for both state and federal-managed fisheries; dockside sampling of lingcod, Pacific cod, and rockfish landings; skipper interview and logbook collection and data entry; and biological studies of important commercial species. Five resource assessment surveys were completed during 1994. Regulation development and review and information dissemination also require considerable staff time.

b. Central Region

During 1994 the Central Region was staffed by a biologist located in Homer. He was assisted by a data entry technician who had primary responsibility for entering fish tickets from shore based processors in the Central Region. Rockfish and lingcod management plans, which were adopted by the state Board of Fisheries during 1992, were fully implemented by 1994. Those FMPs establish an extensive closure to protect lingcod during their spawning period, a size limit for lingcod, and weekly trip limits for rockfish. Groundfish staff were also responsible for in-season management of the Prince William Sound sablefish fishery and participated on a comprehensive shellfish/groundfish trawl survey of Katchimak Bay and lower Cook Inlet.

c. Westward Region

In the Westward Region a Shellfish/Groundfish Coordinator was responsible for supervising fish ticket data entry and analysis of groundfish data from shellfish stock assessment surveys. The Kodiak staff continued monitoring the near-shore black rockfish fishery off Kodiak Island. Toward the end of 1994 a separate TAC was established for black rockfish in the Aleutian Island Regulatory District, but no active fishing was reported.

d. Headquarters

ADF&G personnel continued to enter fish tickets from all shore-based groundfish landings from Alaskan waters during 1994 under a renewed cooperative agreement with the National Marine Fisheries Service (NMFS). Fish tickets from all shore-based groundfish fisheries were collected, edited, and entered on microcomputers in five coastal communities. A programmer analyst working in Juneau was responsible for setting up and maintaining the master state-wide groundfish fish ticket database and for providing summary groundfish catch information to NMFS, ADF&G, and PacFIN.

e. Sport Fish Division

In recent years the Sport Fish Division has been taking a more active role in groundfish monitoring and management. Only one staff biologist, Douglas Vincent-Lang in Anchorage, is assigned to groundfish full-time. Other regions incorporate groundfish activities into their general marine research and management programs. Groundfish harvest records come from regional creel census programs and from an annual state-wide angler survey. Halibut is still the most sought after non-salmonid marine species in Alaska and much of the groundfish is taken as bycatch in the recreational fisheries for halibut. Lingcod and rockfish have also been growing in popularity and seasons and bag limits for those species are among the most restrictive on the west coast.

Names, titles, and addresses of full-time state groundfish personnel are shown in Appendix 1.

B. BY SPECIES

1. Pacific Cod

a. Research

Catch rate and biological information is gathered from fish ticket records, port sampling programs, and during stock assessment surveys for other species. A voluntary logbook program was initiated for state waters of SE Alaska in 1992 to provide a relative index of CPUE. An analysis of cod bycatch data from the Northern Southeast Inside Subdistrict of SE Alaska red king crab survey was begun in 1994 but not completed. Work is in progress.

b. Management

Regulations adopted by the Alaska Board of Fisheries during November 1993 established guideline harvest range (GHR) of 340 to 570 mt for Pacific cod in the internal waters of SE Alaska. The department will manage the fishery within that range with the pre-season harvest objective set according to the best available information. The GHR was based on average historic harvest levels rather than on a biomass-based ABC estimate.

Cod along the outer coast are managed in conjunction with the Total Allowable Catch (TAC) levels set by the federal government for the adjacent EEZ. However, there are gear restriction in state waters in lower Cook Inlet and around Kodiak Island to reduce crab bycatch.

c. Fisheries

Most of the Pacific cod harvested in Southeast Alaska, Prince William Sound, and the North Coast District is taken by longline gear. In Cook Inlet pots comprise the dominant gear. Prior to 1993 much of the cod taken in Southeast was utilized as bait in fisheries for other species. Cod harvested in 1993 and 1994 were evenly divided between bait use and human consumption. In other areas of the state, Pacific cod are harvested in both state and federal waters and utilized primarily as food fish. Harvests of Pacific cod totaled 2,722 mt in state-managed fisheries during 1994.

2. Shelf Rockfish

a. Research

ADF&G Port sampling, skipper interview, and logbook programs for demersal shelf rockfish fisheries continued in Southeast Alaska through 1994.

The logbook and interview programs are designed to furnish detailed catch and effort information, to estimate at-sea discards, and to obtain more detailed information regarding specific harvest location. The port sampling program provides species composition from the landed catch and an opportunity to collect biological samples. Otoliths were obtained from principal demersal shelf rockfish species and sent to the age-reading laboratory in Juneau for age determination. Data from these programs is entered on a microcomputer in Sitka. (Contact Victoria O'Connell, ADF&G, 304 Lake St. Room 103, Sitka, AK 99835)

b. Stock Assessment

Three rockfish surveys were conducted during 1994. The *F/V Ida June* was contracted to conduct a fishing down experiment in the CSEO Section of the Southeast Outside Subdistrict. The purpose was to determine if it is possible to harvest enough fish from an isolated area to estimate abundance by analyzing declining catch trends. The submersible, Delta, was operated under contract to conduct stock assessment transects in the CSEO and SSEO sections of the Southeast Outside Subdistrict. Preliminary results of this work were compiled and used to recommend harvest levels for demersal shelf rockfish (DSR) in the Southeast Outside Subdistrict for 1995. The third survey was also conducted under contract with NURC funds. The purpose of this survey was to test the feasibility of using side-scan SONAR as a habitat mapping tool. The goal is to be able to expand the DSR per unit habitat relationships determined by the submersible observations to additional areas. (Contact Victoria O'Connell, ADF&G, 304 Lake St. Room 103, Sitka, AK 99835)

c. Management

The DSR assemblage is the only component of the rockfish complex actively managed by the state in Southeast Alaska at this time. Rockfish management for this group is based upon a combination of seasons, guideline harvest ranges, gear restrictions, and trip limits. The state has management authority for demersal shelf rockfish in both state and federal waters of Southeast Alaska. Directed harvest of demersal shelf rockfish is restricted to hook-and-line gear.

Separate harvest ranges have been established for each of six Southeast Alaska management areas based upon the best available information on the condition of rockfish stocks in each area. New regulations adopted in 1994 include reduced GHRs in internal waters, reduced weekly trip limits from 7.500 pounds per vessel to 6,000 pounds per vessel, and added a requirement that logbook pages must be submitted weekly with fish tickets from each fishing trip. (Contact Barry Bracken, ADF&G, P.O. Box 667, Petersburg, AK 99833)

Rockfish management plans adopted and implemented for the Prince William Sound and the North Gulf Coast Districts during 1993 were fully implemented in 1994. The provisions of the plan place a trip limit on all landings and a provision which reverts the fishery from directed to bycatch status when an annual harvest limit has been reached. (Contact William Bechtol, ADF&G, 3298 Douglas St., Homer, AK 99603)

d. Fisheries

Harvest of rockfish from state-managed commercial fisheries totaled 1,298 mt in 1994. Nearly 90% of the harvest was taken in Southeast Alaska; with most of the remainder reported from Prince William Sound and the North Gulf Coast. Virtually all rockfish harvested in state-managed fisheries is taken by hook-and-line gear either in directed fisheries or incidental to fisheries for other species.

3. Slope Rockfish

a. Management

In Southeast Alaska slope rockfish are managed as part of the "other rockfish" complex under an area-wide annual harvest limit of 500 mt. In the Central Region slope rockfish and shelf rockfish are managed as a single complex. Slope rockfish are included in the trip limits and annual harvest objectives under the Central Region's Rockfish Management Plan.

b. Fisheries

In all state waters of Alaska slope rockfish harvest occurs primarily as bycatch in fisheries for other species, most notably the hook-and-line fisheries for halibut and sablefish.

4. Sablefish

a. Research

An intensive skipper interview program is conducted during the Southeast Alaska area's two internal water fisheries. The objective is to obtain detailed catch and effort information from the participants. This program also provides an opportunity to collect tags recovered during the fisheries.

b. Stock Assessment

Sablefish stock assessment surveys were conducted in each of the two Southeast Alaska inside management areas for the seventh consecutive year during 1994. The surveys use snap-on longline gear set at stations which were randomly selected during the first year of the project. The gear is allowed to soak for a standardized fishing period of one hour. The results are utilized to determine inter-annual changes in relative abundance. These surveys are also designed to provide biological samples from the sablefish populations within each area. Every tenth fish captured is sampled for AWL, sex, and maturity. Otoliths taken during these surveys are sent to the ADF&G age reading laboratory in Juneau for age determination.

Preliminary results of the surveys show that there has not been a significant linear trend in abundance in either area over the duration of the surveys. Between year differences in numbers of fish were noted in both areas, but differences in kg per hook were insignificant.

The cost of these surveys is offset by the sale of the fish caught. The fish are dressed and iced according to industry standards and the state receives all revenues from the sale of the fish. (Contact Barry Bracken, ADF&G, P.O. Box 667, Petersburg, AK 99833)

c. Management

There are three separate internal water areas in Alaska which are managed exclusively by the state. The Northern Southeast Inside Subdistrict, the Southern Southeast Inside Subdistrict, and the Prince William Sound District each have separate seasons and guideline harvest ranges.

An annual harvest objective is selected within the guideline harvest range for each area based upon the best available information on current stock condition. In the Southeast areas the season length is set prior to the opening according to the estimated time required by the existing fleet to reach the harvest objective.

Since 1985 both Southeast Inside Subdistrict sablefish fisheries have been managed under a license limitation program. Because of increased vessel efficiency the season for the NSEI Subdistrict has been reduced to a 24-hour per year "derby" style fishery since 1987. Even in that short season, the pre-season harvest objectives set by ADF&G have been consistently exceeded. Beginning in 1994 a new harvest strategy was adopted for the NSEI Subdistrict sablefish fishery. In response to a concern for potential over-exploitation, the Board of Fisheries adopted regulations which restrict the harvest to no more than 3,000,000 dressed weight for the 1994, 1995, and 1995 seasons. To assure that the newly adopted quota is not exceeded the annual harvest objective is equally divided among the eligible permit holders. The season was extended from 24 hours to 30 days provide for a more rational and manageable fishery. For the 1994 season each of 122 eligible permit holders was allocated 24,500 pounds dressed weight. The season started noon September 22 and continued until noon October 22. Although, there was an initial outburst of complaints and concern, the comments received from the industry after the first year have been generally quite favorable.

The season framework in both of the Southeast Inside management areas allows for some flexibility in the starting dates to avoid conflicts with other fisheries and with periods of large tides. This is done because large tides tend to concentrate the effort and result in more lost gear.

The Prince William Sound fishery was opened in conjunction with the offshore waters of the Gulf of Alaska and continues until the annual harvest objective is reached. (Contact Barry Bracken, ADF&G, P.O. Box 667, Petersburg, AK 99833)

d. Fisheries

In the Northern Southeast Inside Subdistrict 121 vessels harvested approximately 2,170 mt round weight during a 30-day season. In the Southern Southeast Inside area 30 vessels harvested approximately 415 mt round weight in a 57-hour fishery.

Although both of the Southeast Alaska inside area fisheries are under limited entry, the number of vessels participating in each area greatly exceeds the target number established by the program. This factor is compounded because there are currently no regulations controlling vessel size or the amount of gear each vessel can use. As a result, the individual fishing power of the vessels has increased dramatically in recent years. Much of this problem was alleviated by the permit harvest limits implemented in the NSEI area, but still remains a problem in the SSEI area.

The Prince William Sound fishery first opened on May 23 and closed on June 7. A total of 55 vessels harvested 127 mt round weight during four 24-hour open fishing periods.

The offshore sablefish fisheries (0-3 miles) are managed in conjunction with the federal-managed fishery in the EEZ. The state opens and closes the fishery consistent with field orders issued by NMFS. The 1994 season in the GOA lasted 10 days from noon May 18 to May 28. The quota was not taken during the initial opening and the season reopened for 48 hours at noon September 12 in conjunction with the fall halibut opening.

5. Flatfish

a. Research

No research was conducted on flatfish species by the State of Alaska during 1994. A mandatory logbook program in effect for this fishery provides information on CPUE of target species and an estimate of at-sea discards.

b. Management

Trawl fisheries for flatfish are allowed in the internal waters of Southeast Alaska only under a special permit issued by the department. The permits are generally issued for no more than a month at a time and specify the area fished and may restrict the type of gear used. Mandatory logbooks are required and some areas cannot be fished unless there is an ADF&G observer on board. This restrictive management is necessary because of reduced flatfish stocks and because of a history of very high prohibited species bycatch rates, particularly crab and halibut, in flatfish trawl fisheries conducted in the internal waters of the state.

New regulations adopted in November 1993 implement a 20,000-pound maximum weekly trip limit in the trawl fishery. The new regulation went into effect in 1994.

c. Fishery

The Southeast Alaska inside area flatfish trawl fishery was restricted to three small areas during the 1993-94 season with a harvest objective set for each area. Approximately 9 mt of harvest was reported from Southeast Alaska and less than 1 mt from Prince William Sound during 1994. Most of the Southeast harvest is starry flounder while the Prince William Sound harvest is a mixture of shallow-water species.

6. Dogfish

a. Research

The relative catch rate of dogfish is monitored in the Southern Southeast Inside area in conjunction with the annual sablefish survey in that area.

b. Management

There are no seasons, gear restrictions, or harvest limits for dogfish in the territorial waters of the state at this time. Directed fisheries for dogfish were very limited in state waters during 1994.

7. Lingcod

a. Research

One lingcod research survey was conducted during two days in June 1994. It concentrated on collecting age structures and determining inter-annual comparative catch rates in an off-shore waters near Sitka using "dinglebar" troll gear. (Contact Dave Gordon, ADF&G, 304 Lake St. Room 103, Sitka, AK 99835)

The ADF&G age reading laboratory experiments to compare age reading from fin rays with age readings from cleared otoliths continued in 1994. (Contact Kris Munk, ADF&G, P.O. Box 240020, Douglas, AK 99824)

b. Management

New regulations adopted for the Central Region in 1993 included: 1.) a complete area closure from January 1 through June 30, 2.) a minimum size limit of 35 inches (89 cm) overall or 28 inches (71 cm) from the front of the dorsal fin to the tip of the tail. These regulatory changes reduced the 1994 harvest and effort rather dramatically from previous levels the Central Region.

A lingcod management plan was adopted for the Southeast Alaska Region during 1993 went into effect until April 1994. The main elements of the plan include: 1.) extension of the winter closure outward from the surf line to three miles from shore, 2.) modification of the winter spawning closure period by one month to December 1 through April 30, 3.) establishment of guideline harvest ranges for all six of the Southeast Region management areas based on 1/4 to 1/2 mt per nautical mile of productive lingcod habitat within each area, 4.) apportionment of the fishery seasonally and among user groups in the two management areas where the fishery is fully utilized. The 27-inch (69 cm) minimum size limit remains in effect in the Southeast District.

c. Fishery

Lingcod are landed incidental to hook-and-line fisheries for other species and, in recent years, have been the target of an expanding "dinglebar" troll fishery in Southeast Alaska. Dinglebar troll gear is salmon power troll gear modified to fish for groundfish.

A total of approximately 380 mt round weight of lingcod was harvested by all gear types in state-managed fisheries during 1994. Over 96% of this was taken from Southeast Alaska. Harvest from the Central Region (12.5 mt) was much reduced from previous levels, presumably because of the more restrictive regulations which were adopted for that area.

8. Other species

There were no state regulations in effect for other species of groundfish in state-managed fisheries during 1994. Most of the harvest in state waters is taken as bycatch in fisheries for other more valuable groundfish and halibut. Reported landings during 1994 were approximately 17 mt. An "emerging fisheries" policy is being developed for new fisheries which will reduce the possibility that a fishery can escalate beyond management control before regulations can be developed.

C. OTHER RELATED STUDIES

1. Groundfish Management (General)

a. Management Authority

State groundfish fisheries are managed by the Department of Fish and Game under regulations set triennially by the Board of Fisheries. The department announces the open and closed fishing periods consistent with the established regulations, and has authority to close fisheries at any time for justifiable conservation reasons. The department also cooperates with NMFS in regulating fisheries in the offshore waters.

b. Catch Reporting

By regulation, fish tickets are required for all shore-based landings in Alaskan ports and for all landings from state-managed fisheries. The catch data from the fish tickets is used as the primary means of tracking the in-season harvest levels. Groundfish fish tickets are collected from as many as thirty or more processors within the state. The fish tickets are edited for accuracy and the data is entered on microcomputers in Petersburg, Sitka, Ketchikan, Homer, Kodiak, and Dutch Harbor. Because of the intensity of many of the groundfish fisheries, a "soft data" accounting system using processor contacts is also utilized, when necessary, to track landings during a fishery.

2. Groundfish Research (General)

Groundfish research is currently being conducted by ADF&G only in Southeast Alaska. Groundfish research is divided into three major components: port sampling/ skipper interviews, resource assessment, and biological sampling.

A total of six groundfish resource assessment and/or biological sampling surveys were conducted by ADF&G in Southeast Alaska during 1994. These surveys are addressed in by target species in section B of this report.

3. Age Reading Laboratory

The age-reading laboratory is responsible for both groundfish age reading and thermal marked salmonid otolith reading. Groundfish age reading emphasis is on sablefish and near-shore rockfish. Age reading positions were maintained in both Juneau and Kodiak during 1994. A major portion of the Kodiak reader's time was spent conducting otolith exchanges and on precision testing.

4. Port Sampling and Skipper Interviews

During 1994 port sampling and skipper interview programs were conducted in Sitka, Ketchikan, Petersburg, and Craig. Port sampling provides biological information from the landed catch. In recent years this activity has been limited to sampling landings of rockfish, Pacific cod, and lingcod. This component provides information on species composition and AWL data from important commercial species by management area. It also provides an opportunity to collect data on sex ratio and reproductive status from round deliveries of rockfish.

Skipper interviews are conducted for landings of the key groundfish species. Interview effort concentrated on the state-managed sablefish, rockfish, and lingcod fisheries during 1994. This program is designed to provide detailed location and effort information which, when coupled with the fish ticket data, provides an estimate of CPUE for the landed catch by management area.

5. Miscellaneous Stock Assessment

Catches of groundfish species are also observed routinely during stock assessment surveys for other species. That information provides an indication of population trends for some commercially important groundfish species which are not assessed directly. Two surveys in particular, the Kodiak/Alaska Peninsula crab trawl assessment survey and the Southeast area crab pot indexing survey provide information on the relative abundance and length frequency of commercial groundfish species such as Pacific cod, pollock, juvenile sablefish, and some shallow water species of flatfish.

D. REPORTS COMPLETED DURING 1994

1. Alaska Department of Fish and Game, Workshop Proceedings, applications of side-scan Sonar and Lazer-line systems in fisheries research. V.M. O'Connell Workshop Coordinator. Special Publication No. 9. Alaska Dept. of Fish and Game, Commercial Fisheries Management and Development Division, Juneau, AK, 99801.

2. Kramer, D. E., W.H. Barss, B.C. Paust, and B.E. Bracken. In Press. Guide to Northeast Pacific Flatfishes, families Bothidae, Cynoglooidae, and Pleuronectidae. Alaska Sea Grant College Program, University of Alaska Fairbanks, Fairbanks, AK 99775.

3. O'Connell, V.M., D.W. Carlile, and B.E. Bracken. 1993. Demersal shelf rockfish. IN 1995 Stock Assessment and Fishery Evaluation Report For the Gulf of Alaska. North Pacific Fishery Management Council, Anchorage AK.

E. ALASKA DEPARTMENT OF FISH AND GAME PERMANENT FULL-TIME GROUNDFISH STAFF DURING 1994

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4. CANADA

A. AGENCY OVERVIEW

During 1994 the Canadian federal government conducted a national program review to ensure programs were focussed on the departmental mandates. Results of that review are being used to facilitate a major downsizing of the civil service announced with the federal budget in February 1995. Details of the cuts and the impact on Groundfish assessment and research programs are still not known.

A major re-organization of DFO science programs will be implemented in April 1995. Research Divisions will be structured 1by function and site directors have been eliminated. The science divisions in the Pacific region which include the Pacific Biological Station, the Institute of Ocean Sciences (Sidney, B.C.) and the West Vancouver Lab. include;

Stock assessment Division	Dr. M. Henderson
Marine Environment and Habitat Sci	Dr. R. Wilson
Ocean Science and Productivity	Dr. J. Garrett

Each of these division heads reports to Dr. John Davis, the Regional Director of Science (RDS). The head of the Pacific Stock Assessment Review Committee (PSARC), Dr. J. Rice also reports to the RDS.

Groundfish research will be conducted primarily through the stock assessment division. Within the Stock Assessment Division two sections will divide up groundfish responsibilities;

Fish Population Dynamics	Sandy McFarlane
Assessment Methods	Laura Richards

The Assessment Methods section includes Fish Ageing Lab. staff.

The management of marine fish falls under the Fisheries Branch of the Department of Fisheries and Oceans. Mr. Bruce Turris has recently replaced Mr. Ed. Zyblut as the Offshore Division groundfish manager. Managers receive scientific advice from the Stock assessment division through PSARC.

B. MULTISPECIES STUDIES

1. Hecate Strait Project

Hecate Strait is an area of variable topography with a variety of bottom habitats, which supports an important mixed-species groundfish fishery. To date, six research surveys have been conducted, from 1984-1993, to obtain species abundance estimates and information on assemblages. Previous analyses have identified three characteristic assemblages of groundfish species. Recently, relationships between the dominant species of these assemblages and environmental conditions in early summer 1989 and 1991 have been identified. The environmental factors examined were bottom type and depth (invariant conditions), and temperature (a variable condition). Three categories of species were identified: (i) those consistently associated with particular depths and temperatures between years; (ii) those with variable depth and temperature associations; and (iii) those with no apparent relationships to depth, temperature or sediment type. Category (i) was dominated by flatfishes, and could be further separated into groups associated with deep and cool, shallow and warm, and intermediate depth and temperature conditions. Category (ii) included roundfishes plus Pacific halibut, and were widely distributed. At least one species (Pacific cod) tended to maintain a particular temperature range while changing its depth range between years. Identification of significant associations between fish species and habitat conditions is the first step towards incorporating environmental information into survey abundance indices and reducing by-catch problems.

2. La Perouse Program

This program was continued in 1994.

This project is a multi-disciplinary, multi-species investigation conducted by the Pacific Biological Station and the Institute of Ocean Sciences in support of long-term management of the major fish stocks off the west coast of Vancouver Island. Initiated in 1985 following the large 1982/83 El Niño event in the Pacific Ocean, the primary focus of the La Perouse/MASS program has been directed toward describing and understanding the causes of annual and interannual variability of the fish and zooplankton stocks over La Perouse Bank on the southwest portion of the shelf. Located within the coastal upwelling production zone that extends from northern Vancouver Island to Baja California, La Perouse Bank is an extremely productive fishing area.

Considerable progress has now been made toward identification of the dominant physical processes affecting the circulation and water property structure, to quantifying the statistical variability of the seasonal and interannual cycles and toward direct estimation of the impact of interannual fluctuations on the planktonic food web.

C. BY SPECIES

1. Pacific cod

a. Research programs

The age validation program for Pacific cod continued in 1994. A second series of monthly stratified samples of Pacific cod dorsal fin rays and otoliths from Hecate Strait were collected to track seasonal growth patterns and to determine the timing of annulus formation. The first series of dorsal fin rays, collected in 1993, have been examined and were found to be highly variable. The 1994 series have yet to be examined. Monthly sampling will be continued in 1995 to allow the examination of annuli formation from a single cohort over several years. As a further step to validate Pacific cod ages approximately 3500 juvenile Pacific cod were tagged, injected with oxytetracyline and released off the west coast of Vancouver Island in September, 1994.

b. Stock assessments

Pacific cod stock assessments were presented for four areas on the British Columbia coast. No new analysis were conducted for the Strait of Georgia or Queen Charlotte Sound stocks where fisheries are small and of low management priority. New catch-at-age analysis were conducted for the west coast of Vancouver Island and Hecate Strait stocks. Yield recommendations were based on a one year projection from a Bayesian procedure. Results indicate that fishing mortality rates and fishing effort continue to be at above average levels and stock abundance is below average for both the west coast of Vancouver Island and Hecate Strait. Biological sampling from 1994 and early 1995 does not indicate a strong incoming year-class. The clearest indication that Pacific cod stocks are depressed is the fact that the 1994 quotas were undersubscibed.

Current research is directed to the development of a catch-at-length model for Pacific Cod assessments. The model, an extension of MULTIFAN analysis, will be used for the 1995 stock assessments.

c. Management

Annual 1995 quotas of 1870 t and 1300 t are imposed for Hecate Strait and the west coast of Vancouver Island, respectively. A coastwide trip limit of either 30,000 lb, 15,000 lb or 3,750 lb, depending on which landing option (number of trips/month) the license holder opts for, is in effect for the first quarter. Trip limits for the remaining fishing periods will be determined at a later date through consultation with the Groundfish Trawl Advisory Committee.

2. Rockfish - offshore

a. Research Programs

The long-term study of the early life history of Pacific ocean perch (*Sebastes alutus*) in Queen Charlotte Sound was deferred by ship conflicts 1994. A presentation on the alternative recruitment hypothesis for this species was made to the 1994 Western Groundfish Conference. Recruitment is thought to be associated with the spring-summer transition, wherein larvae from offshore deepwater are advected with upwelled water into the gullies of Queen Charlotte Sound during the transition. This mechanism provides evidence for the persistence of apparent coherence of different stock characteristics in these gullies over long periods. This finding has also directed attention to alternative oceanographic indices and periods from the early spring features examined previously.

Investigations of the effects of school and diel behaviour of *S. flavidus* on the application of acoustic techniques also continued in 1994. A manuscript which partitions the survey-based and behaviourally-based components of variation in biomass estimation was completed and is in revision following review (Stanley et al. MS). The study demonstrated that among transect variance was a substantially greater influence on precision of acoustic biomass estimation than either within transect or diel variance.

A two-vessel trawl and hydroacoustic survey of rockfish stocks in Goose Island Gully was conducted in early summer, 1994. The survey was designed to update the time series of biomass estimates of Pacific ocean perch from standard trawl surveys, to investigate the potential for hydroacoustic techniques to measure rockfish abundance, and to collect oceanographic information to explore the relationship between rockfish and their environment. The trawl survey (chartered fishing vessel) followed the stratified-systematic approach of previous surveys and produced a Pacific ocean perch relative biomass estimate of 16,100 t. The previous two-vessel survey in 1984 had produced Pacific ocean perch relative biomass estimates of 13,700 t and 7,600 t. Because different vessels participated in these surveys, a vessel effect and/or a true abundance increase could account for the higher measured abundance in 1994. Another survey is planned for 1995.

Echograms compiled during the 1994 hydroacoustic survey were composed of distinctive structures which could be interpreted as species categories. However, Pacific ocean perch could not be reliably identified. The acoustic biomass estimate of all fish from depths where rockfish dominate (180 to 300 m) was 15,600 t, based on a target strength of -35 dB/kg. Acoustic detection was limited, however, to approximately 14 m above the bottom. Therefore, an unknown quantity of near and on-bottom fish were undetected.

b. Stock assessments

An interim stock assessment of shelf rockfish stocks (*Sebastes brevispinis*, *S. entomelas*, *S. flavidus*, and *S. pinniger*) was presented for the 1994 Pacific stock assessment review committee (PSARC) cycle. Recommendations were unchanged from the previous year.

An interim assessment of slope rockfish (Pacific ocean perch, redstripe rockfish, yellowmouth rockfish, and rougheye rockfish) was conducted in 1994. There were no changes to recommended yields and no assessment was conducted for Area 5E-N, pending a review of the experimental closure. Yield recommendations for all stocks were based primarily on catch histories. Coastwide catches of Pacific ocean perch and rougheye rockfish increased 11% and 10% in 1993, respectively, while catches of redstripe rockfish and yellowmouth rockfish decreased 38% and 25%, respectively. The larger Pacific ocean perch catch could be attributed to Area 3C, where the catch jumped from 391 to 965 tonnes between 1992-93 after the area was included in coastwide management. Overall, the number of rockfish trips grew by 30% in 1993 and rockfish trawl hours increased 15-22%. By contrast, slope rockfish CPUE declined 21%. The reduction in CPUE was probably related to changing fishing patterns rather than decreasing stock abundance.

The most recent major assessment was completed in 1993, including catch-age analyses of Pacific ocean perch in Goose Island Gully from 1963-92 and in Moresby Gully from 1978-92. These analyses identified large uncertainties in the estimates of current biomass and potential yield. New age data from 1993 provided evidence for a strong 1984 year-class entering the fishery, in addition to strong 1976 and 1980 year-classes. However, these data did not alter previous conclusions in updated model runs. With "base" model settings, estimates of 1993 exploitable biomass for Goose Island Gully ranged from 7,400-57,400 tonnes. A joint hydroacoustic-trawl survey was conducted for Goose Island Gully in 1994 to address the uncertainty. Survey results will be incorporated into the 1995 assessment.

c. Management and regulations

Major changes were incorporated into the 1994 trawl management plan including coastwide species aggregate quotas for rockfish (determined from the sum of species-area quotas) and port monitoring of most landings. The 1995 plan is similar to the 1994 plan, but the species composition of aggregates has changed. The 1995 aggregates are as follows:

Aggregate 1:	Canary rockfish, silvergray rockfish, yellowtail rockfish, widow rockfish, and rougheye rockfish.
Aggregate 2:	Pacific ocean perch, yellowmouth rockfish, and redstripe rockfish.
Aggregate 3:	Shortraker rockfish and shortspine/longspine thornyheads.
Aggregate 4:	All other rockfish species.

Only aggregates 1 and 2 are managed by quota. However, all rockfish landings are restricted by trip limits and the number of landings in a 30-day period.

3. Rockfish - inshore

a. Research programs

Onboard monitoring of the live hook and line fishery in 1994 continued in the Strait of Georgia. Biological sampling continued for the major fishing areas coastwide.

b. Stock assessment

Coastwide commercial hook and line rockfish catch increased between 1992 and 1993 from 1690 t to 1905 t, largely due to increases in catch from the west coast of Vancouver Island and the Queen Charlotte Islands. In general, stock condition is poor in the Strait of Georgia and unknown in other areas. Yield levels for each statistical area are determined by relating an estimate of productivity (sustainable [?] catch per area) to the amount of rockfish habitat in a statistical area.

c. Management and regulations

The hook and line rockfish fishery is managed by limited entry area licensing. A number of changes were introduced into the 1995 management plan. All landings are now monitored through a user pay dockside program. Similar to the trawl management plan, vessels are required to choose among landing options that differ in the number of landings allowed in a fishing period (30 days) and in the magnitude of trip limits on six different species aggregates. Species aggregate quotas are defined for five areas with staggered fishery openings.

The recreational fishery is managed by a daily limit of five rockfish per day in the Strait of Georgia and eight per day outside of the Strait of Georgia.

4. Sablefish

a. Research

A species interaction trawl survey was continued in August to assess the impact of sablefish on hake and herring stocks in the La Perouse region of the Vancouver Area. It is anticipated that this survey will be conducted in 1995.

Trap surveys of the south coast and the north coast were conducted during Oct/Nov by the Western Viking and the LaPorche. The goal of the surveys is to monitor the age composition of the population. Sets are made at discrete depths (100fm intervals between 150 and 650 fm) at pre-selected stations. Each vessel occupied five stations offshore and two inlet stations on the central coast. Preliminary analysis indicates that the inlets are predominantly immature fish, less than 7 years of age. A total of 3700 fish were tagged in the north and 3300 fish in the south. Results of the survey will be incorporated into the 1995 assessment. This survey will be conducted again in October 1995.

Since 1983, Canadian fishers have been participating in offshore seamount fisheries under an experimental permit program. A report summarizing the seamount fishery was completed and will be published in early 1995.

Neuston surveys of larval sablefish off the west coast of Vancouver Island were conducted annually between 1984 and 1989 and during 1992. The objective of the surveys was to examine the factors influencing the distribution and abundance of larvae and to examine the ability of the surveys to index the strength of recruiting year-classes. Processing of the 1992 samples had been outstanding and this was completed during 1994. A report summarizing the seven cruises is presently being completed and will be available in 1995. The survey indices of year-class strengths will be assessed over the next several years.

b. Stock assessment

A major assessment of sablefish in Canadian waters was conducted during 1994. Separate analyses were conducted for northern and southern areas of the B.C. coast due to observed differences in age and length compositions, growth and evidence from juvenile tagging that recruitment to the areas are drawn from different origins. A separable catch-at-age model (Synthesis) was used to estimate the current status of each stock. Biomass in the north and south were estimated to be 29,000 t and 32,000 t, respectively. Overall, both stocks are estimated to be in decline, a result of low recruitment during the late 1980's and early 1990's. Yields ranging from 1325 to 2650 t were presented as low to high risk yield options for the south stock and from 1400 to 2900 t in the north. Coastwide low to high-risk yield options were 2725-5550t. A major assessment is also planned for 1995.

c. Management and regulations

Sablefish are managed by quota with a 4500 t coastwide quota in effect for 1995. The quota is split between trawl (8.75%) and longline/trap (91.25%) vessels. Both trawl and longline licenses are limited entry.

In 1995 longline/trap licence holders are again entitled to an individual vessel quota. Fishers are entitled to a proportion of the quota rather than a permanent tonnage. The allocation of quota is based on a combination of vessel size criteria and landings prior to the inception of IQ's. Quota is transferable for the current fishing year only and reverts back to the original licence holder for the following year. In 1995 a cost recovery program initiated in 1994, remains in effect with revenue from the fishery used to fund research, enforcement, management and verification of landings.

5. Flatfish

a. Research programs

Flatfish research continued to focus on recruitment mechanisms. A model was developed for Hecate Strait English sole. The multiplicative model incorporates the effect of temperature and Ekman transport at the egg and larval stage and spawning biomass. Shepard's (1982) formulation of stock-recruitment offered the best fit to the data and spawning biomass accounted for 17% of the variation in recruitment. The nature of the stock-recruitment relationship was asymptotic. The relationship between recruitment and Ekman transport at the egg and larval stage was also significant accounting for 20% of recruitment variation. Temperature accounted for an additional 14%. The spawning period for this species was extremely protracted which may account the rather large amount of recruitment variation unexplained by the model.

A study of halibut bycatch in the B.C. trawl fishery was continued in 1994. Observers made 8 trips and monitored 221 tows in the B.C. trawl fishery in 1993. The study focused primarily on the west coast of Vancouver Island. Halibut catch-rates off the west coast of Vancouver Island were highest for flatfish species and lingcod and lowest for rockfish species. The mean halibut CPUE for the summer fishery in this area. A manuscript was published on factors influencing the bycatch mortality of trawl-caught. The size of halibut caught and the amount of time spent on deck before release were the most important factors associated with overall fish condition. Other significant factors were depth fished, total catch and tow length.

b. Stock assessment

Detailed stock assessments were produced in 1994 for Hecate Strait rock sole and English sole. Catch-age analysis of data collected from 1945-93 was the basis for estimation of current abundance and sustainable yield for these stocks. $F_{0.1}$ and $F_{35\%}$ were used as the basis for the low-risk and high-risk sustainable yield, respectively. Biomass of rock sole in Hecate Strait in 1993 was the highest since monitoring began in the mid 1940s. Biomass of English sole in Hecate Strait has remained stable over the last 20 years at about 30-35% of the pristine level. Flatfish landings in 1994 continued to be among the highest on record. The high landings are mainly the result of strong recruitment for stocks of rock sole and English sole and an increase in the intensity in the fishery for Dover sole off the west coast of Vancouver Island (PMFC Area 3CD). This deepwater fishery began in 1989 and takes place mainly in deepwater (600-900m) during the first quarter of the year. Landings for the northern (PMFC Area 5C-E) Dover sole stock in 1994 were near MSY. Landings for petrale sole remain low and recruitment in 1994 remained at a low level for more than a decade.

c. Management

Flatfish in British Columbia are managed using a combination of area specific quotas and/or trip limits. Rock sole and petrale sole are managed by trip limits while Area 5C-E Dover sole and English sole are managed using area quotas. Dover sole in Area 3CD are managed using a combination of quota and trip limits. The 1994 trip limit level for rock sole, Dover sole and petrale sole was set according to a vessel-specific landing schedule (number of trips allowed per month) chosen by the captains at the beginning of the season. A minimum mesh size regulation (5.5 inches- stretched) was in effect for the 1994 fishery in Hecate Strait. This measure is directed specifically at the target fishery for rock sole, English sole and Pacific cod. This measure was invoked to try to increase yield in the longterm for this region by reducing the harvest of the younger age groups of fish.

6. Pacific hake

a. Research programs

The monitoring of catch, estimation of species composition, and biological sampling in the Vancouver Area fishery was continued through an extensive offshore observer program.

Trawl and hydroacoustic studies examining the relative abundance and distribution of Pacific Hake in the Vancouver Area, including northern Vancouver Island, were continued. Hake were found along the 200 m contour extending into Queen Charlotte Sound. Assuming a target strength value of -35.0 dB/kg, the biomass of hake in the surveyed portion of the Canadian zone was 224,907mt which is down considerably from the 638,906 mt surveyed in 1993. An anomalously large biomass of hake was present in Queen Charlotte Sound and there were anecdotal reports of hake in Hecate Strait from domestic trawl captains. Therefore as in 1993 a substantial biomass of hake was likely north of the survey limit. A hydroacoustic assessment of hake in the Canadian zone is planned for August 1995 in conjunction with the U.S. triennial hydroacoustic survey.

The 9th annual species interaction trawl survey was conducted in August to assess the impact of Pacific hake and other predators on herring survival and recruitment.

A hydroacoustic survey of hake in U.S. waters was conducted from July 18-31. The purpose of the cruise was as follows: During 1992 the most recent coastwide triennial hydroacoustic assessment survey of Pacific hake was conducted. The biomass of hake found was considerably higher than expected, largely due to a substantial biomass found in a deep scattering layer seaward of previous survey boundaries. Limited fishing indicated that the layer contained hake. These findings resulted in a substantial increase in the coastwide ABC for 1994. Canadian and U.S. scientists agreed that it was important to conduct further fishing to confirm that hake is a major component of the layer and to determine whether the 1992 offshore distribution was an anomaly. Specific goals were: 1) To examine the distribution of offshore Pacific hake on selected triennial survey transects from Cape Blanco to the Can./U.S. border using hydroacoustics with particular attention to be paid to locating deep offshore scattering. 2) To determine the species composition of the deep, offshore scattering layer using midwater sampling gears.

Adult hake were found at and beyond the previous offshore extent of transects from 43 to 45 degrees north. In this area there were no additional targets in Tucker or fish trawls deployed within the scatter. From 45 degrees to 48.5 degrees north a strong offshore scatter of young-of-the-year(YOY) hake was present which occasionally contained adult hake. To our knowledge YOY seen previously were only found in waters off southern and central California therefore it is unlikely that YOY would have been undetected in trawls conducted during the 1992 survey. Overall the results supported the 1992 survey. Further laboratory work will be conducted during 1995 on the implications of the presence of YOY hake in this area, to our present understanding of hake life history.

b. Stock assessment

Strait of Georgia

The fishery in the Strait of Georgia declined in 1993 to 4368 t from 8485 t in 1992. The decline in catches is related to a drop in availability of adult hake during the summer and fall of 1993. The cause of the shift is presumed to be environmental as catches and size compositions indicate that the adult fish have rebounded in 1994. The stock is estimated to be in good condition based on results of a hydroacoustic survey conducted during March 1993 that found a total of 245 Kt throughout the Strait of Georgia. These estimates are higher than previous surveys conducted during 1981 and 1988, although we caution that sources of error with the estimate, including species identification and incorrect target strengths for juvenile fish, could lead to an overestimation of stock size. The survey had a strong showing of 1 and 2 year-olds suggesting that recruitment to this stock may be good over the next several years. The yield options for the Strait of Georgia remain unchanged from the previous assessment conducted using Virtual Population Analysis (VPA) and a forward simulation model that indicated that yields up to 14,000 t may be sustainable.

Offshore

Since 1968, more Pacific hake have been landed from the offshore stock than from any other species in the groundfish fishery on Canada's west coast. Coastwide catches of Pacific hake decreased from 295 Kt in 1992 to 200 Kt in 1993 a result of declining available yield. The all-nation-catch in the Canadian zone was 58,783 t in 1993, down from 86,370 t in 1992. In the absence of an allocation procedure, the combined Canadian and U.S. harvests in 1990, 1991, 1992 and 1993 have exceeded recommended yield levels.

Canadian and U.S. scientists conduct the assessment of offshore hake jointly. The approach taken in the 1994 assessment is similar to that of the previous one, using catch-at-age analysis tuned to independent Canadian and U.S survey estimates to assess the current status of the stock, and using an age-structured forward simulation model to examine long term (equilibrium) production and short term (look ahead) yield options. Overall abundance as indicated by stock synthesis runs, is declining as the strong 1980 and 1984 year-classes move through the fishery. Yield options for three possible fishing strategies and three risk levels were presented with available yields for 1995 ranging from 185 Kt to 382 Kt which are lower than 1994 a result of declining abundance. Managers were urged to use caution in adopting yield options given concerns over the 1992 survey results discussed above.

c. Management and regulations

Hake off the west coast of Vancouver Island are managed by annual quota. A proportion of the quota is retained for domestic fisheries and in 1994 as in previous years, the remainder was allocated to a joint-venture fishery. Each country participating in the joint-venture fishery negotiates for an allocation. The 1994 quota was 111 thousand mt. It is anticipated that joint venture fishery during 1995 will represent less than 35% of the hake landed as domestic demand continues to increase.

In the Strait of Georgia the 1995 quota is 11,000 mt.

7. Dogfish

a. Research programs

Processing and analysis of dogfish tag recoveries was continued. The purpose of this experiment is to assess long-term movements, in particular the rate of exchange between the Strait of Georgia and offshore stocks.

b. Stock assessment

The age-structured deterministic model developed by Wood et al. (1979) continues to be used to evaluate the condition of the spiny dogfish stocks in the Strait of Georgia and offshore. As current harvests levels are below the optimal yield in both areas, stock size is predicted to increase.

c. Management and regulations

Dogfish are managed by annual quota with separate quotas in place for the Strait of Georgia (3000 mt) and for the remainder of the coast (15,000 mt).

8. Lingcod

a. Research programs

The discrepancy in age estimation for lingcod which appeared between 1987 and 1992 was resolved and candidate samples for re-ageing identified.

b. Stock assessment

Offshore lingcod stocks remain relatively stable (McFarlane and Leaman 1994). However, there has been a shift in the distribution of catch off the west coast of Vancouver Island. A larger proportion of the catch now originates in longline fishing in Area 3D than seen in the historical time series. CPUE trends are also different between areas 3C and 3D.

c. Management and regulations

The commercial lingcod fishery closure in the Strait of Georgia, initiated in 1990, will continue through 1995. The recreational fishery remains open between June 1 and September 30, with a minimum size limit of 65 cm, bag limit of 1 per day, possession limit of 2, and an annual limit of 10 which must be recorded on the angler's licence.

Lingcod are managed by annual quota for southwest and northwest coast of Vancouver Island, Area 3C and 3D respectively; and Queen Charlotte Sound (Area 5A-B). Annual quotas were 2700t and 1650t, respectively. Fishery effort in Hecate Strait (Area 5C-D) has recently undergone a dramatic increase in effort, but there is little biological information available to guide yield recommendations. A recommended yield level of 1000 t is provided out of concern for the sensitivity of the species to exploitation and the rapid expansion of the fishery.

9. Walleye pollock

a. Research programs

Monitoring of catches and collection of biological samples were conducted during 1994 for pollock stocks in northern Hecate Strait/Dixon Entrance, Queen Charlotte Strait, the southwest coast Vancouver Island and the Strait of Georgia.

b. Stock assessment

The coastwide catch of walleye pollock increased substantially from 5121 t in 1992 to 8807 t in 1993 mainly due to increased landings in Hecate Strait/Dixon Entrance. The 1992 incidental catch in the joint-venture hake fishery decreased to 552 t from 1437 t in 1992. The range of sustainable yield options based on Gullands (1983) MSY model is 630 to 2350 t for the Strait of Georgia and 440 to 1760 t for Dixon Entrance/Hecate Strait. A precautionary quota of 2400 t or less is recommended to cap the yield in Queen Charlotte Strait (Minor area 12) until a detailed assessment can be conducted. Yield options are not proposed for stocks off the west coast of Vancouver Island. Given the expansion of Dixon Entrance/Hecate Strait and Queen Charlotte Strait fisheries detailed surveys and assessments of these stocks are warranted.

c. Management and regulations

Pollock are managed by annual quota in the Strait of Georgia (2260mt), Queen Charlotte Strait (1750mt), and Hecate Strait/Dixon Entrance 2900mt). Yield is not restricted off the west coast of Vancouver Island where the majority of catch is incidental to the hake fishery.

10. Other - Six-gill Shark

a. Research programs

A cooperative study of six-gill sharks was initiated by DFO, the Province of BC and industry representatives interested in developing a six-gill fishery. DFO was not prepared to support a fishery until enough information on the life history was known to support rational yield options. During 1994 tagging was conducted and biological samples collected from four inlets off the west coast of Vancouver Island. Preliminary indications are that only immature sharks are available to the fishery. Progress was made on a technique for ageing six-gill vertebrae.

b. Other related studies

1. Statistics and Sampling

The principal activities in 1994 included maintenance of the trawl and trap catch and effort database, and biological sampling of commercial landings. Modifications were made to the CATCH database to allow the storage of start and end latitude/longitude coordinates for individual sets. An additional change was the use of port validation information for the majority of trawl landings, in place of sales slip information. Over 240 samples were collected from commercial landings as well as recovering over 600 sablefish tags. Catch and effort statistics were summarized for the 1993 fishery (Rutherford, in prep). A ORACLE-based relational database system was designed and implemented. This system will archive groundfish biological data. Backfilling of 4 million records will be conducted over the next two years.

Staff participated in Regional database initiatives including formation of a Groundfish Data Working group.

D. REVIEW OF CANADIAN GROUNDFISH FISHERIES

1. Commercial Fisheries

Canadian domestic trawl landings of groundfish (excluding halibut) in 1994 were 77,067 t, an increase of 4% above the 1993 catch. The major species in the trawl landings were Pacific hake (41%), Pacific ocean perch (7%), pollock (5%), turbot (5%), dover sole (5%) and Pacific cod (5%). Principal areas of trawl production were 3C (29%), 4B (25%), 5B (11%), 3D (10%) and 5A (9%).

At this time, Canadian landings of groundfish caught by gear other than trawl in 1994 are not available.

2. Recreational fisheries

Each year, Fisheries Branch (DFO) conducts creel surveys of the recreational angling fishery in the Strait of Georgia. Principal target species are chinook and coho salmon. In 1994 these surveys covered only the months of January to October. Provisional estimates of 1994 catches for this 10-month period were 6,885 fish for lingcod, 162,431 fish for all rockfish species and 1,244 fish for dogfish. There was also an estimate of 35,840 fish for other fin fish which includes greenlings and sculpins, as well as other species such as herring.

3. Joint-venture fisheries

In 1994, seventy Canadian catcher vessels delivered Pacific hake and incidental species to fourteen processing vessels in cooperative fishing arrangements. These fisheries take place off the southwest coast of Vancouver Island (Area 3C). A total of 84,154 t of Pacific hake was processed by 7 Polish vessels, 5 Chinese vessels and 2 Russian vessels. The quotas and catches are outlined below:

Nation	Species	Quota (t)	Catch (t)
Poland	Hake	48,500	47,715
China	Hake	23,500	22,456
Russia	Hake	14,000	13,983
Total	Hake	86,000	84,154

4. Foreign fisheries

There were no national or supplemental fisheries for Pacific hake off southwest Vancouver Island (Area 3C) in 1994.

E. REPORTS PUBLISHED BY THE MARINE FISH DIVISION DURING THE PERIOD MAY 1, 1994 TO APRIL 30, 1995 ARE LISTED BELOW:

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Robinson, C. L. K., and D. M. Ware. 1994. Modelling pelagic fish and plankton trophodynamics off southwestern Vancouver Island, British Columbia. Can. J. Fish. Aquat. Sci. 51: 1737-1751.

Rutherford, K. L. 1994. Catch and effort statistics of the Canadian groundfish fishery on the Pacific Coast in 1992. Can. Tech. Rep. Aquat. Sci. 2010: 95p.

Saunders, M. W., G. A. McFarlane, M. Stocker, and B. M. Leaman. 1994. Sablefish. pp. 121-153 *In* Stocker, M. [ed.]. Groundfish stock assessments for the west coast of Canada in 1993 and recommended yield options for 1994. Can. Tech. Rep. Fish. Aquat. Sci. 1975: 352p.

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F. MARINE FISH DIVISION STAFF IN 1994

P. Aubry	Stock assessment computer programs
W. Andrews	Sablefish, hake, dogfish and pollock
K. Cooke	Population hydroacoustics estimation
J. Fargo	Stock assessment and biology
C. Fort	Herring assessment
G. Gillespie	Offshore rockfish
V. Haist	Marine fish stock assessment
L. Hamer	Herring data base management
C. Hand	Pacific cod stock assessment
S. Hardy	Statistics/sampling
T. Johansson	Statistics/sampling
R. Kieser	Population hydroacoustics estimation
B. Leaman	Stock assessment and recruitment biology
J. Leaman	Statistics/sampling
G. A. McFarlane	Marine Fish stock assessment, population dynamics and biology, fish/ocean interaction
W. Mitton	Sablefish, hake, dogfish and pollock
I. Perry	Fisheries oceanography
J. C. Rice	Head, Marine Fish Division
L. Richards	Multispecies stock assessment, mathematical analysis
K. Rutherford	Statistics/sampling
M. Saunders	Groundfish stock assessment and biology
J. Schweigert	Herring stock assessment and stock identification
M. Smith	Sablefish, hake, dogfish and pollock
R. Stanley	Shelf rockfish stock assessment biology, sampling studies
M. Stocker	Multispecies stock assessment
R. Tanasichuk	Hake/herring/euphausiid interactions
N. Venables	Statistics/sampling
D. Ware	Fisheries oceanography
G. Workman	Technical support
L. Yamanaka	Rockfish stock assessment and biology

5. NMFS - SOUTHWEST FISHERIES SCIENCE CENTER

A. AGENCY OVERVIEW

1. National Marine Fisheries Service-SWFSC

Groundfish-related research and management support is conducted by three major components of the NMFS Southwest Fisheries Science Center (SWFSC): the Coastal Division (La Jolla), directed by Dr. John Hunter; the Pacific Fisheries Environmental Group (Monterey), directed by Dr. George Boehlert; and the Tiburon Laboratory (Tiburon), directed by Dr. Alec MacCall.

a. Coastal Division (La Jolla)

The Coastal Fisheries Resources Division is involved in a large number of research studies that support management of groundfish by the Pacific Fishery Management Council. These studies address short and long term problems in biology and economics that affect management of groundfish. Work in the Coastal Division is focused primarily on Pacific whiting and the deep water complex (sablefish, Dover sole and thornyheads), but work on rockfish (Sebastes spp.) in shallow water is also ongoing.

Recent publications by Coastal Division scientists include a definitive study of the reproductive biology of sablefish and a new approach to estimating their abundance using ichthyoplankton data. A study describing the development of Dover sole during their prolonged (more than two years in some cases) larval planktonic stage is in press. A description of relationships between depth and length of Dover sole off Oregon and California was recently published and a similar paper for short- and longspine thornyhead has been submitted for publication.

Investigations of the physiological ecology of the groundfish complex are proceeding based on extensive shipboard studies in Monterey Bay and through laboratory experiments. The most important observation to date is that the center of the groundfish distribution, between 600 and 1,000 m, is also the center of the oxygen minimum zone. Oxygen concentrations in the minimum zone throughout the year are 96-98% less than oxygen concentrations at the surface. These exceptionally low oxygen conditions probably place limits on the metabolism, scope for activity and ultimate productivity of the fish community. A paper on metabolic adaptations of Dover sole to depth and low oxygen concentrations was recently published as well as a paper describing general adaptations in the white muscle of deep living fish. These studies help define limits on productivity of deep water fisheries and help predict the effects of exploitation on groundfish adapted to life in the deep water community.

2. Pacific Fisheries Environmental Group (Monterey)

Pacific Fisheries Environmental Group (PFEG) develops methods to address the linkages between natural environmental variability and fish populations dynamics. Data series developed within the PFEG research program are made available to scientific collaborators. Co-location with the U.S. Navy's Fleet Numerical Meteorology and Oceanography Center provides access to ocean and atmospheric data on a global scale. Major categories of scientific activity at PFEG include: (1) Development of environmental index time series, (2) ocean anomaly diagnostic studies, (3) identification of environmental-biological causal linkages through interregional comparative studies, exploratory data analysis, empirical modeling etc., (4) development of appropriate environment-dependent fishery modeling methodologies, (5) development of biological time series for calibration, verification and parameter estimation. A study of potential effects of climate change on marine ecosystems and resources is a major focus of PFEG research activity at the present time. In addition, PFEG personnel are increasingly involved in inter-institutional collaborative field studies of the coastal groundfish habitat off the U.S. west coast.

3. Tiburon Laboratory (Tiburon)

Field and laboratory research on groundfish is cooperatively conducted at the Tiburon Laboratory by three interrelated investigations: Groundfish Analysis, Groundfish Communities, and Groundfish Physiological Ecology.

The Groundfish Analysis Investigation develops methods to predict rockfish recruitment, estimate spawning biomass, sample groundfish landings and age groundfish; staff members also study rockfish life histories, develop new management models and conduct stock assessments. In addition, staff participates on the Pacific Fishery Management Council's Groundfish Management Team, principally in stock assessments and exploring management alternatives.

Recent publications include a paper on the utility of different types of auxiliary data, a paper on groundfish assemblages, a paper on the effects of oceanic factors on juvenile rockfish recruitment, a paper on distribution of juvenile rockfish, a note on the Cobb Seamount fishery, and a note on estimating weight-length relationships from group measurements. Papers on early growth of rockfish and Pacific whiting, and a paper relating the distribution of juvenile sanddabs to oceanic features are in press. Papers on El Niño effects off Central California, SEM and light microscopy determinations of shortbelly rockfish larvae ages, identification of chilipepper and stripetail rockfish larvae, comparison of mid-water trawl and diver count estimates of rockfish yearclass strength, and analysis of a MIK net survey off Central California were submitted for publication.

Rockfish landings have been sampled since 1977 in a cooperative program with the California Department of Fish and Game. Since 1986 staff members coordinated an expanded coastwide port sampling of sablefish landings, but because of staff reductions this program was reduced at the end of 1991. The data from the port samples are compiled with software developed by project members and routinely used in stock assessments. The staff recently improved the software and is collaborating with the California Department of Fish and Game to improve expansion of port samples to total landings.

The Physiological Ecology Investigation (PEI) conducts research to determine factors most affecting physiological condition and reproduction of groundfishes. The focus remains on ecologically and commercially important rockfish species (genus Sebastes). Research findings contribute to the assessment of stocks and the understanding of how and why recruitment varies. Emphasis is on factors that influence the ability of populations to grow, reproduce, and persist. Both field and laboratory studies are designed to provide comparison of temporal and spatial patterns. Laboratory experimentation tests hypotheses that are derived from field observations. Information is integrated and research activities are coordinated with those of other research investigations and university and other governmental agencies.

Research continues on long-term monitoring of the annual reproductive effort and larval and juvenile recruitment of yellowtail rockfish and shortbelly rockfish. A paper was published which described the significant interannual and geographic variation in fecundities of yellowtail rockfish from northern California and Washington. The ninth consecutive annual assessment of adult physiological condition and fecundity was completed for the 1994/1995 season with positive prospects for high larval production. Also during the last year a paper was published that analyzed the nutritional dynamics of major tissues in relation to female reproduction. The apportionment of lipids and proteins, primarily in mesenteries and muscle, and their utilization for adult metabolism and ovarian development, was reported for the first time in a viviparous marine teleost. Surveys were conducted for the fourth consecutive year on shortbelly rockfish to estimate stock abundance by the larval production method. Fecundities of adult shortbelly have been invariant over the last four years. Also the factors that influence larval and juvenile recruitment were studied through assessment of physiological condition. Preliminary results indicate that significant differences appear in total lipid content and lipid class composition through early life stage development and between locations.

The major objective of the Groundfish Communities Investigation is to determine how changes in the environment affect the distribution, abundance and the relative success of recruitment in groundfish species. Changes considered include regular seasonal transformations of the habitat, as well as changes associated with irregular environmental events like El Niños. Emphasis is on how these changes affect interspecific relationships, particularly those between predator and prey. Because prey populations fluctuate widely in response to habitat transformations, the ability of specific predators to accept alternate prey in the absence of preferred prey is a major topic of study. Information from these studies should help managers anticipate not only the effects of environmental change on the relative availability of prey, but also the impact of fisheries for such important prey as shortbelly rockfish and anchovies. In addition, recruitment strength is thought to correlate with certain elements of environmental change, and so is another topic of study.

The investigation coordinates sampling of commercial and recreational lingcod landings in California and Oregon and contributes to assessments of the lingcod stock for the Groundfish Management Team of the Pacific Fisheries Management Council, and conducts research based on comments made in response to the stock assessment document. Present studies include age validation, examination of the fishery and modeling the basis of what may be a disturbed sex ratio.

B. MULTISPECIES STUDIES

1. National Marine Fisheries Service - SWFSC

An ongoing program to describe the distribution and abundance of groundfish eggs and larvae is being conducted in connection with the CalCOFI program and groundfish research cruises. Two CalCOFI atlases were published recently that describe seasonal, spatial and temporal patterns in the occurrence of fish eggs and larvae. An identification guide for fish eggs and larvae in the California Current, including groundfish, is nearing completion.

Coastal Division scientists, in cooperation with the Southwest Fisheries Science Center Tiburon Laboratory, NOAA's National Undersea Research Program, and the Monterey Bay Aquarium Research Institute continue to develop technology and procedures for estimating abundance of fish stocks using remotely operated underwater vehicles (ROV's). A paper comparing ROV estimates of fish abundance and traditional swept area estimates from bottom trawl surveys is in press. It appears that traditional swept-area methods may underestimate fish abundance and are more variable than ROV surveys in many cases.

A molecular genetic approach, based on the sequencing of the cytochrome b gene, is being used to resolve uncertainties about species determination for rockfish larvae. Identification of early life stages is a recurrent problem in rockfish because of the large number of species (>70) and their morphologic similarity. Phase one is to sequence genes from adults of each species to obtain species-specific genetic signatures. Larvae from samples will then be positively identified and examined for distinctive morphological characteristics. This approach could never be applied to large numbers of samples but will help taxonomists identify useful physical characteristics useful for species identification. Phase two is to examine the DNA sequences for species-specific restriction sites that will be, in effect, a "bar code" for each species. This method could potentially be automated to identify larger numbers of larvae in plankton samples.

C. BY SPECIES, BY AGENCY

1. Shelf Rockfish

a. National Marine Fisheries Service - SWFSC

New genetic studies of rockfish (Sebastes) are being initiated by the Coastal Division in three areas: 1) determination of phylogenetic relationships among species, 2) development of genetic techniques for identification of eggs and early stage larvae, not identifiable by other means (by amplification and sequencing of larval DNA followed by comparison to adult sequences from phylogenetic studies), and 3) analysis of rockfish population structure based on microsatellite DNA allele frequencies.

PFEG is conducting research on rockfish communities to identify the impacts of fishing activity on community structure and to assess species-habitat relationships using submersibles. Additionally, analyses of CFG data on time series changes in the recreational rockfish fisheries of the Monterey Bay area are under examination.

Tiburon Laboratory's recruitment work, which aims to detect differences in relative strength of rockfish year-classes prior to their entry into the fishery, continues. Annual surveys using midwater trawls determine the relative abundance and distribution of first-year juvenile rockfishes off the coast of central California. Recently these surveys were expanded to include abundance and growth during an earlier larval stage. During March 1995 intensive sampling at a single location was conducted off Central California with bongo nets. The study was aimed at determining temporal effects on abundance of larval rockfish. Factors that influence year-class strength are another area of study. In this work, staff members are evaluating interannual variation in oceanographic conditions, plankton abundance, juvenile rockfish diet, time of spawning, and growth rate. Oceanographic data are collected with a CTD and an acoustic Doppler current profiler. Staff members collaborate with staff of the SWFSC-PFEG in analyses of the oceanographic data that are published in Technical Memoranda. Staff members also collaborate with scientists of UC Davis to study the nearshore recruitment process.

Long-term studies by the staff of the SWFSC's Tiburon Laboratory on yellowtail rockfish from Cordell Bank, California, continued for the ninth consecutive year. Reproducing adults for the 1993/1994 season were younger at mean age, and smaller in size than the long-term averages. Nonetheless, the age-specific and size-specific fecundities were not significantly different than those found during the previous eight years. Energetic conditions of adult spawners prior to the reproductive season, measured by mesenteric fat deposits, indicated that spawning would be normal. This pattern also continued in the pre-season measurements for the 1994/1995 season. Analyses of the fecundity samples have yet to be done. These analyses should indicate whether late season El Niño conditions induced stressful conditions thereby negatively influencing reproductive effort.

2. Slope Rockfish

a. National Marine Fisheries Service - SWFSC

SWFSC's PFEG is conducting research on the role of environmental variability on recruitment variability in three species (chilipepper, widow, and yellowtail rockfish).

The SWFSC Tiburon Laboratory conducted assessments on the bank and splitnose rockfish fisheries. The assessments were published in the PFMC Status of Stocks document.

A pilot larval production survey by the Tiburon Laboratory was aimed specifically for shortbelly rockfish because this species is very abundant and larvae can be identified. Preliminary results indicate that the most serious problem may be in obtaining representative samples of the adult population. We found considerable differences in the size and age compositions of catches made during two surveys for adults. This result suggests that only a portion of the stock is available at a given time and that the available portion may not be representative of the entire population. Preliminary examination of results from the larval survey indicate that, while station distribution should be modified, the amount of sampling effort (6 days) was sufficient to estimate larval production for the 100 mile stretch of coast. A comparison of Kriging with the Sette-Ahlstrom method for estimating total larval abundance showed that the Sette-Ahlstrom method gave the best results. A preliminary report on the study was prepared and is being revised for publication.

Field studies continued on adult reproductive effort, nutritional dynamics associated with gestation, and larval physiological conditions of shortbelly rockfish. Tissue and organ samples were collected in a series of research cruises at three submarine canyon sites off central California, known to be areas of abundance for shortbelly rockfish stocks. Results indicated that females continued to have temporally consistent high reproductive effort. Differences in locations are the result of different size and age compositions. Laboratory analyses showed that initial egg energy contents varied and that, most notably, protein and triglycerides in embryos declined linearly during gestation. Field-caught larvae were found to differ in their physiological conditions between locations, suggesting that differing environmental factors may effect development and survival in larvae at different sites. These studies continued during the 1994/1995 season providing the opportunity for interannual comparisons and the determination of the effects of the intense El Niño conditions.

3. Thornyheads

a. National Marine Fisheries Service - SWFSC

Two projects designed to improve management of thornyhead (Sebastolobus spp.) stocks are underway or have been completed. The first project is a joint effort involving scientists at Scripps Institution of Oceanography, Moss Landing Marine Laboratory and the University of Hawaii that involves use of radioisotope ratios to validate criteria used to age shortspine and longspine thornyhead. The second project, which is a collaborative effort with scientists at the Alaska Fisheries Science Center, is an assessment of fisheries for shortspine and longspine thornyheads on the west coast.

The Coastal Division is conducting a molecular genetics project that focuses primarily on the population structure of longspine and shortspine thornyheads but is also concerned with Dover sole and sablefish. Mitochondrial DNA sequences from samples of thornyhead from Alaska, Oregon and five sites in California have now been sequenced. The data show a high degree of site specific variation that indicate less mixing of individuals between sites than originally anticipated. These results indicate that thornyheads are retained in their natal regions even though both species have planktonic larval and juvenile stages longer then one year in duration. The influence of various current patterns on larval retention is being investigated.

4. Sablefish

a. National Marine Fisheries Service - SWFSC

The SWFSC Tiburon Laboratory is collaborating with the AFSC on an OTC-based study of sablefish age determination, with the intent of developing criteria that will improve reader agreement which has been poor for sablefish captured off California, Oregon and Washington. About 2500 fish were released in 1991. About 325 fish have been recovered, and otoliths from those fish are being examined by Tiburon and AFSC scientists.

The SWFSC Tiburon Laboratory assisted scientists from the Alaska Fisheries Science Center on an assessment of the sablefish fishery that was published in the PFMC Status of Stocks document.

The Coastal Division recently published a definitive study of the reproductive biology of sablefish. A manuscript dealing with sablefish biomass estimates using egg and larval survey data is in preparation.

5. Flatfish

a. National Marine Fisheries Service - SWFSC

The Coastal Division recently published a definitive study of the reproductive biology of Dover sole. This information will aid future attempts to measure species abundance by egg and larvae surveys. A new approach to measuring Dover sole biomass using egg and larval survey data was published in 1993. A manuscript describing the prolonged (two years) life history of pelagic larval Dover sole has been submitted for publication. The Division also published a description of relationships between depth and length of Dover sole off Oregon and California.

The results from the Coastal Division's study of the genetic structure of Dover sole were presented at the 1993 CalCOFI meeting, and manuscripts are in preparation. Results indicate that Dover sole mix from Alaska down to San Diego with no evidence of genetic structure.

6. Pacific whiting

a. National Marine Fisheries Service - SWFSC

During 1995, the Coastal Division initiated a new research program dealing with the reproductive biology and early life history of Pacific whiting. This work is part of a broad and comprehensive research effort jointly planned by the Southwest, Alaska and Northwest Fisheries Science Centers that will be proposed for funding under NOAA's Coastal Oceans Program. In 1995, cruises were carried out during March and April-May with two vessels, one used for biological sampling and the other to map physical structure and circulation by ADCP and CTD casts. Objectives were to: 1) evaluate an adaptive sampling strategy for whiting eggs and larvae, 2) measure larval growth rates for comparison with fish that will survive and eventually recruit to the fishery, 3) compare the distribution of larvae to the distribution of their food, 4) describe the physical structure of larval habitat and effects of ocean circulation on larval distribution, and 5) measure the size of larvae patches in the ocean. Adaptive sampling strategies are being developed to effectively sample eggs and larvae, which are extremely patchy in the ocean. Zooplankton used as forage by whiting larvae were measured by an optical plankton counter attached to the MOCNESS net used to sample larvae. This novel approach made it possible to collect information about zooplankton forage at the same depth and location where larvae were found. Calibration studies using plankton samples analyzed aboard ship were also conducted. A cruise is planned for January 1996 that will focus on direct measurement of reproductive parameters (batch fecundity, spawning frequency, etc.) in spawners. Spawning aggregations will be detected by sonar and real time identification of whiting eggs in plankton samples.

7. Lingcod

a. National Marine Fisheries Service - SWFSC

Research on lingcod at the Tiburon Laboratory is conducted in three areas: age validation, sampling of commercial and recreational landings and modeling the basis of what may be a disturbed sex ratio. A report that examined the first year of sampling in California and Oregon was produced for the PMFC Status of Stocks document in 1994.

Age Validation

The importance of population age-structure in fisheries management places great importance on the validity of aging techniques. Thus age validation has been a major issue in lingcod management because the method currently used to age this species--examination of rings in dorsal fin rays--remains inadequately tested. To resolve this problem Tiburon researchers have undertaken a program of age validation where fish are caught and then simultaneously tagged and injected with oxytetracycline (OTC) before being released. The OTC produces a mark in the dorsal fin rays that can be seen under UV light. When the fish is recaptured it can be determined whether the number of rings beyond the mark does in fact match the length of time the fish is known to have been at liberty. As of March 1995, 288 lingcod have been tagged, and there have been 18 returns. The two that were at liberty longer than four weeks show growth outside the OTC mark, thus demonstrating promise for success in this project. The goal is 50 returns of fish that have been at liberty for at least a year, and 20 for at least two years.

More recent work has focused on validating the first year annulus of lingcod. The annuli of known-age lingcod were measured. These lingcod were known to be one and two year-old fish by either length and time of year, or by captive growth. Those measurements were found to agree with first and second year annuli of older lingcod. This validates the marks as the first and second year annuli.

Sampling of Commercial and Recreational Lingcod Landings

Port sampling of Oregon and California commercial landings of lingcod fin rays for aging was initiated in January 1992. Sampling is conducted by Oregon Dept. of Fish and Wildlife and California Dept. of Fish and Game, but is coordinated through Tiburon. Aging of the lingcod fin rays also occurs at Tiburon. The target is to sample two trips per month per gear category. The eventual goal is to obtain enough years for an age structured analysis. Sampling of the California recreational catch also began in 1992 with length-sex sampling in all ports and fin ray sampling for age analysis in the San Francisco-Princeton ports. In 1993, this program was expanded to age sampling statewide. Age structure sampling of Oregon's recreationally-caught lingcod began in 1994, and included state of maturity.

Possibility of a Disturbed Sex Ratio

Certain problems inherent in lingcod management come from the species' reproductive habits. Lingcod are segregated by sex, with males predominating in shallow water and females in deeper water. To at least some extent this distribution is related to the fact that during reproduction males guard the masses of fertilized eggs that are attached in nests to shallow-water rocks. Because the two major fisheries for lingcod--the shallow-water recreational fishery and the deeper-water trawl fishery--inflict differing mortalities, there is potential in this situation for a disturbed sex ratio. Whether or not the sex ratio has been disturbed is an important consideration for management. Although the system is complex, it is amenable to modeling. Nevertheless, to develop such a model there is need to define more precisely the extent to which the sexes are segregated.

8. Other species

D. OTHER RELATED STUDIES

1. National Marine Fisheries Service - SWFSC

The SWFSC Coastal Division's biological research is supplemented by economic data collection and investigations. Recreational data collections include a 1991 survey of U.S. recreational anglers who fish in Mexican waters; a paper was published in 1992 which describes survey results in terms of angler participation, angler characteristics, fishing expenditures, and fishing effort and catch of groundfish as well as other species. Economic data on the commercial groundfish fishery, including vessel cost and earnings data and vessel productivity indices, are collected and periodically updated.

Coastal Division economists regularly develop and analyze information regarding the commercial and recreational groundfish fisheries off the Pacific Coast, emphasizing the California region. Regular data collection activities include the periodic updating of cost and earnings data for groundfish trawlers, fuel prices, and economic indices of trawl fishery productivity. Research is currently focused on economic effects of individual transferable quota and other limited entry approaches, optimal harvest policies for Pacific whiting, benefit-cost analysis for allocating harvest in the U.S. whiting fishery, and a description of the U.S. fishery for rockfish. Coastal Division economists published seven papers in the last two years dealing with groundfish fisheries.

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6. NMFS - ALASKA FISHERIES SCIENCE CENTER

A. AGENCY OVERVIEW

Essentially all groundfish research at the Alaska Fisheries Science Center (AFSC) is conducted within the Resource Assessment and Conservation Engineering (RACE) Division, the Resource Ecology and Fisheries Management (REFM) Division, and the Auke Bay Laboratory (ABL), which is responsible for groundfish assessment in the Gulf of Alaska east of Cape St. Elias. The RACE and REFM Divisions are divided along regional or disciplinary lines into a number of tasks and subtasks. A review of pertinent work by these tasks during the past year is presented below. Recent publications and reports produced by RACE, REFM, and ABL scientists are presented as Appendix I.

1. RACE Division

In 1994 the primary activity of the RACE Division continued to be fishery-independent stock assessments of important groundfish species of the northeast Pacific Ocean and Bering Sea. Groundfish trawl surveys were conducted by the Bering Sea, Gulf of Alaska, and West Coast subtasks. There were two bottom trawl surveys and three longline surveys in 1994. The Midwater Assessment and Conservation Engineering Task conducted a major survey of the eastern Bering Sea Shelf during the summer of 1994 and has conducted four acoustic surveys of pollock abundance in the Gulf of Alaska and Bering Sea in early 1995. Major emphasis in 1994 was in the eastern Bering Sea and Aleutian Islands, in keeping with the triennial rotation of comprehensive surveys among three major geographic areas. The focus will be in the West Coast region (Washington-Oregon-California) in 1995. The Conservation Engineering group has also been refining methods used to stabilize research survey trawls, monitor the fishing configurations of sampling trawls, and explore possible methods of reducing bycatch. Underwater video and scanning sonar are being used to study the behavior of fish encountering trawl gear with the purpose of detecting behavior differences among species and size classes which might be exploited to reduce bycatch. The Recruitment Processes task conducted four Fisheries-Oceanography Coordinated Investigations (FOCI) cruises in the spring of 1994, investigating the interaction between the environment and the spawning products of Gulf of Alaska and eastern Bering Sea pollock. An additional FOCI study near the Pribilof Islands in late summer 1994 looked at young-of-the-year pollock. Doyne (Red) Kessler retired after 37 years of Government service on March 31st. He was replaced by Jay Orr who, besides pursuing his own research projects, will assume many of Red's duties providing support for identification and maintenance of specimens collected during AFSC surveys.

For more information on overall RACE Division programs, contact Division Director Dr. Gary Stauffer at (206)526-4170.

2. REFM Division

The research and activities of the Resource Ecology and Fisheries Management Division (REFM) are designed to respond to the needs of the National Marine Fisheries Service regarding the conservation and management of fishery resources within the U.S. 200-mile Exclusive Economic Zone (EEZ) of the northeast Pacific Ocean and Bering Sea. Specifically, REFM's activities are organized under the Observer Program and the following tasks: Age and Growth Studies, Socioeconomic Assessments, Resource Ecology and Ecosystems Modeling, and Status of Stocks and Multispecies Assessments. Scientists at AFSC assist in preparation of stock assessment documents for groundfish in the three management regions (Bering Sea/Aleutian Islands, Gulf of Alaska, and Washington-Oregon-California), conduct research to improve the precision of these assessments, and provide management support through membership in regional groundfish management teams. Dr. Richard Methot formerly served as the task leader for the Status of Stocks and Multispecies Assessment task of the REFM Division. Dr. Methot has taken a new position with the Northwest Fisheries Science Center and will serve as Director of the Fishery Analysis and Monitoring Division. This new program will be responsible for groundfish assessments and advice to management on the status of West Coast groundfish species.

For more information on overall REFM Division programs, contact Division Director Dr. Richard Marasco at (206)526-4172.

3. NMFS - AFSC - Auke Bay Laboratory

The Auke Bay Laboratory (ABL), located near Juneau, Alaska, is a major division of the NMFS Alaska Fisheries Science Center (AFSC). ABL's groundfish task (part of the laboratory's marine fisheries assessment program) since 1982 has mostly been involved with research and assessment of sablefish and rockfish in the Gulf of Alaska. Presently, the groundfish task is staffed by 10 permanent biologists.

One major personnel change at ABL in 1994 was the retirement of longtime Laboratory Director Dr. George Snyder. His successor is Dr. Michael Dahlberg, who has been task leader of the marine fisheries assessment program at ABL.

In 1994 field research, ABL's groundfish task participated in two sablefish longline surveys in the Gulf of Alaska: the annual Japan-U.S. cooperative longline survey, and the annual domestic longline survey. Other field studies by ABL, all in southeastern Alaska, were also conducted: 1) a submersible/longline experiment to improve abundance estimates of shortraker and rougheye rockfish; 2) sample collections for other rockfish research, including a study of Pacific ocean perch diel food habits and an investigation of rockfish genetics; and 3) a continuation of juvenile sablefish studies at a bay near Sitka.

Several analytic activities were conducted by groundfish task members on sablefish and rockfish in 1994-95. One staff member applied an age-structured model to assess condition of sablefish in Alaska. Analysis continued on Pacific ocean perch rebuilding policies in the Gulf of Alaska. Ongoing research activities involved management of ABL's sablefish tag database and preparation of three annual status of stocks documents for Gulf of Alaska groundfish: sablefish, slope rockfish, and pelagic shelf rockfish.

For more information on overall Auke Bay Laboratory programs, contact Laboratory Director Dr. Michael Dahlberg at (907) 789-6001.

B. MULTISPECIES STUDIES

1. Research

a. Aleutian Islands triennial bottom trawl survey

The fifth triennial bottom trawl survey of the Aleutian Islands region was completed during the summer of 1994 by the RACE Division of the AFSC. The triennial groundfish surveys are designed to describe and monitor the distribution, abundance, and biological condition of the important groundfish stocks in the Aleutian Islands area. Previous surveys in this series were conducted in 1980, 1983, 1986 and 1991.

The Aleutian archipelago consists of 47 major islands extending westward in a nearly 1,500 km arc from the Alaska Peninsula to Attu Island. Located among the westernmost islands are several prominent banks and reefs including Petrel Bank located north of the island chain at approximately long. 180°W, Buldir Reef and adjacent Tahoma Reef (long. 176°E), and Stalemate Bank, west of Attu Island (long. 171°E). The bathymetry in the Aleutian region reflects the volcanic origin of the islands and is characterized by an irregular bottom, narrow continental shelf, and abrupt continental slope. The Aleutian Trench, approximately 120 km south of the chain, with 4-7 thousand m depths defines the southern limit of the continental shelf and slope. The northern continental shelf and slope varies from 30 to 75 km in width and is bounded by Bowers Basin in the west and the Aleutian Basin in the east. Historically, the Aleutian Islands have been important fishing grounds for a variety of groundfish species including Pacific ocean perch, Atka mackerel, walleye pollock, Pacific cod, Pacific halibut, sablefish, rockfishes and several invertebrate groups including crabs and squid.

The 1994 survey was conducted in three 23-day legs aboard two chartered commercial trawlers, the *Pacific Knight* and the *Vesteraalen* from June 1 to September 9. The *Pacific Knight* is 165 ft. The *Vesteraalen* is 127 ft. Both vessels used standard RACE Division Poly-Nor'eastern high opening bottom trawls rigged with roller gear. Steel V-doors (1.83 x 2.74 m) weighing approximately 800 kg each were used.

The stratified random survey design used for the 1983, 1986 and 1991 triennial surveys was employed during 1994 to make the most efficient use of limited vessel time and to provide consistency with earlier surveys. Within each stratum, stations were selected randomly from a pool of previously sampled stations and arbitrarily divided between the two survey vessels to minimize temporal and spatial separation of sampling effort. Standard trawl hauls were 30 minutes in duration. Efforts were made to maintain each tow at a constant depth. In cases where depths increased or decreased during a tow, the length of the trawl warps were adjusted accordingly. Catches were sorted to species, weighed and enumerated according to standard RACE Division protocol. A variety of biological data (age, length, sex, weight, and maturity of individual specimens) were taken. Special requests were also fulfilled for stomach contents, tissue, and whole fish samples.

The survey area covered a portion of the southern Bering Sea, from long. 165°W to long. 170°W and throughout the Aleutian Islands from long. 170°W to Stalemate Bank, long. 170°30'E. Sampling proceeded from east to west at pre-selected stations at depths ranging from 16-476 m. Successful trawls were achieved at 387 of the 436 sites attempted, at depths ranging from 16-476 m, an increase of 14% over the 340 successful stations completed during the 1991 survey.

In the Aleutian Islands (west of long. 170°W), Atka mackerel, Pacific ocean perch, Pacific cod, walleye pollock, northern rockfish, and sponge dominated the catches in most areas. As in 1991, the highest fish densities encountered during the survey were generally in the western Aleutian Islands (west of long. 177°E) where catches were composed primarily of Atka mackerel, Pacific ocean perch and northern rockfish. The most abundant species in the central Aleutian region including Petrel Bank (long. 177°W- 177°E) were Pacific ocean perch, Atka mackerel, Pacific cod and walleye pollock, while catches in the eastern Aleutian Islands (long. 170°W- 177°W) were represented mainly by Atka mackerel, Pacific ocean perch, Pacific cod and walleye pollock. Important components of catches from the southern Bering Sea portion of the survey area (long. 165°W- 170°W), north of the Aleutian chain) were Atka mackerel, walleye pollock, and Pacific cod.

Atka mackerel had, by far, the highest abundance of any species, 688 thousand t, up slightly (+4%) from the 1991 triennial survey. Pacific ocean perch with 448 thousand t was second in overall abundance, up nearly 10% from 1991. Other important species exhibiting positive biomass trends were Pacific cod, 194 thousand t (+6%), shortraker rockfish, 29 thousand t (+7%), rougheye rockfish, 14 thousand t (+9%) and shortspine thornyheads, 7 thousand t (+15%). Major species exhibiting apparent decreases in abundance from 1991 were northern rockfish, 82 thousand t, down 55%, and walleye pollock, 151 thousand t, down 43%.

For further information, contact Eric Brown, (206) 526-4157.

b. Bering Sea Crab/Groundfish Bottom Trawl Survey

The 1994 eastern Bering Sea crab-groundfish bottom trawl survey was conducted from May 31 to August 4, continuing the annual series of eastern Bering Sea resource assessment surveys which began in 1971. The primary purpose of the survey was to assess the abundance, distribution, and biological condition of the major demersal fish and crab resources on the eastern Bering Sea shelf. Further research included: collection of stomachs from various groundfish for use in trophic interaction studies; additional sampling in areas of high king crab and Tanner crab abundance to reduce variability of population estimates; retrieval and redeployment of bottom temperature sensors in Bristol Bay which record seawater temperatures for a 12 month period; an evaluation of subsampling methods for large bottom trawl catches using a trouser trawl split codend; and an experiment on the effect of varied trawl bridle configurations to assess herding behavior of fish into the net.

The survey encompassed an area approximately 465,000 km^2 which included continental shelf waters from inner Bristol Bay west to the 200 meter depth contour and from Alaska peninsula north to St. Matthew Island. The survey was conducted aboard two chartered fishing vessels. A total of 396 bottom trawls were completed during the survey using the standard 83-112 eastern bottom trawl. These included 381 successfully completed trawls and 13 unsuccessful hauls at scheduled sampling sites, 2 opportunistic hauls to collect additional information on king and Tanner crab. An additional 20 hauls were completed during the trouser trawl study and 53 trawls were completed during the herding experiment. Seawater temperature profiles and tow bottom depths were collected at most sampling sites using micro-bathythermographs (MBT) attached to the headrope of the net.

For further information, contact Gary Walters, (206) 526-4143.

c. Age and Growth Task - REFM

The Age and Growth Task of the REFM Division serves as the Alaska Fisheries Science Center's aging unit for groundfish species. The task consists of a biometrician, age validation researcher, data manager/technician, and 9 age readers. Ages are usually determined from otoliths, but scales and/or finrays are sometimes used.

Data provided by the task are used in stock assessment work which contributes to the estimation of the allowable catch of many commercially important groundfish species. These species include walleye pollock, Pacific whiting, Pacific cod, sablefish, Pacific Ocean perch, northern and dusky rockfishes, Atka mackerel, yellowfin sole, rock sole, rex sole, and misc. sole and rockfish species.

The Age Unit has completed establishing a radiometric lab for aging and age validation work on fishes. We believe this to be the first lab of its type established by the National Marine Fisheries Service. Current radiometric investigations are focusing on the aging of several rockfish species: Pacific Ocean perch, shortspine thornyheads, shortrakers, rougheye, northern and dusky. Preliminary studies are underway with the NMML for the possible use of this methodology on baleen whales. Research concerning otolith growth assumptions required for radiometric age validation has been completed and is currently under review.

The unit has been rather slow in applying the video imaging system with Optimus software. We have two applications underway at this time: aging of Greenland turbot otoliths, and the exchange of otolith images with Poland, as part of method of reconciling walleye pollock ages. We realize that this equipment has important long term potential in the study of aging methodology. These include the taking of quantitative measurements in otolith growth studies, and eventually, the possibility of video assisted aging. Ongoing research includes Delsa Anderl's work with Dr. Akira Nishimura of Japan's National Research Institute of Far Seas Fisheries on the first year growth in the otoliths of Atka mackerel. Delsa Anderl is also working with Jon Heifetz on a study based on known age sablefish.

Craig Kastelle is working with Don Pearson, SWFSC/Tiburon Lab, on studies of OTC marked sablefish otoliths, and with John Butler, SWFSC/La Jolla, on shortspine thornyhead radiometric age validation.

For further information contact Dr. Daniel K. Kimura (206) 526-4200.

d. Trophic Interactions Program - REFM

The Trophic Interactions Program continued regular collection of food habits information on key fish predators in the North Pacific. Program personnel and fishery observers collected fish stomachs. About 11,478 and 4445 stomachs were collected from the Bering Sea and Aleutian Islands, respectively. Bering Sea species sampled were walleye pollock, Pacific cod, yellowfin sole, Alaska plaice, rock sole, flathead sole, skates, arrowtooth flounder, Greenland turbot and Pacific halibut. Aleutian Island species sampled included walleye pollock, arrowtooth flounder, Pacific cod, Pacific halibut, sablefish, Atka mackerel, flathead sole, rock sole, great sculpin, Greenland turbot, Alaska skate, Pacific ocean perch, and miscellaneous rockfish species. Shipboard scans of fish stomach contents were performed on 494 fish (primarily walleye pollock) in the eastern Bering Sea. Laboratory analysis of stomach contents by regions totaled 13,967, 1705, and 124 stomachs for the Bering Sea, Aleutian Islands, and West coast regions, respectively.

A population model of walleye pollock in the Gulf of Alaska was modified to include predation. Predators entered into the model were: arrowtooth flounder, Steller sea lion, and Pacific halibut. Trophic levels of groundfish prey in the Gulf of Alaska, Aleutian Islands, and Bering Sea have been estimated and used to calculate trophic levels of groundfish in each area based on prey proportions in the diet calculated from the food habits data base. These data were then used to reconstruct historical trends in the trophic level of groundfish catch (including Pacific halibut and Pacific herring) in each area.

Annual energy consumption rates of predators on benthic infauna in the eastern Bering Sea have been estimated. These rates have been calculated for: yellowfin sole, rock sole, Alaska plaice, snow crab, Tanner crab, red king crab, and blue king crab. Estimated annual food consumption by these predators based on 1991 population levels totals 22.1 million metric tons.

Research comparing the food habits of arrowtooth flounder and Pacific halibut in the Gulf of Alaska has been completed. The diet of arrowtooth flounder consisted primarily of pelagic prey such as capelin, herring, and walleye pollock. Pacific halibut had more benthic feeding habits; several types of crabs, including hermit and Tanner crabs, were the primary prey by weight for smaller halibut while walleye pollock was important for larger halibut. High diet overlaps between the two predators were primarily due to their consumption of walleye pollock.

A report that includes the food habits and cannibalism of Pacific hake is being prepared. In previous studies on the food habits of Pacific hake the impact of its predation on other commercially important species was found to be extensive. In this study, the stomach contents of Pacific hake from the summer of 1989 and the autumns of 1991 and 1992 were collected and analyzed.

The diet of the Pacific hake sampled in 1989 varied considerably with latitude, although euphausiids (mostly Euphausia pacifica and Thysanoessa spinifera) were consistently an important part of the diet. In the southern areas, shortbelly and stripetail rockfishes were found, but in the Monterey INPFC area and northward, Pacific herring and northern anchovy generally dominated the biomass of fishes eaten. In the Eureka INPFC area, the commercially important pink shrimp was an important component of the diet. Although differences in the diet of Pacific hake with depth were seen, especially in the Columbia and Monterey INPFC areas, the only consistent difference was the presence of lanternfishes (included in the "Other fish" category) in the diet of the Pacific hake caught in deeper water (100-199 fm).

The diet of the Pacific hake in autumn 1992 appeared to be different from that of summer 1989 in the Vancouver and Columbia INPFC areas. In the 100-199 fm depth zone, pink shrimp and Pacific saury (included in the "Other fish" category) were very important in the Vancouver area, and in the Columbia area sergestid shrimp comprised nearly all of the "Other prey" category. In the 200-499 fm depth zone in the Columbia INPFC area, gonostomatids and myctophids accounted for most of the "Other fish" category.

In 1991, Pacific hake were sampled in the Monterey INPFC area in autumn. Pacific hake from a broad size range co-occur in this area, and a high level of cannibalism was found. The diet of Pacific hake in autumn 1991 was very different from the diet in summer of 1989 in the Monterey INPFC area, although an incidence of cannibalism was found in the summer in the 30-99 fm depth zone. Cannibalism was only committed by larger (44-60 cm fork length) Pacific hake. Many of the sampled Pacific hake were small, with modes at 18-19 and 23-29 cm fork length, and of similar length to those Pacific hake that were cannibalized.

The cannibalized hake were probably young of the year and small age-1 individuals. The importance of cannibalism in shaping observed recruitment patterns for this species is unknown. Despite several previous investigations into the food habits of Pacific hake, cannibalism was not documented. This study was the first to look at the diet of large Pacific hake in autumn and south of the Eureka INPFC area. More sampling in this area is needed to determine the degree of interannual variation in the levels of cannibalism that occur.

A laboratory manual entitled "Guide to the common eastern Bering Sea polychaetes" was completed for in-house use. The manual will serve to improve identification of polychaetes to the family level, an important step in understanding flatfish utilization of the benthos.

The Trophic Interactions Program groundfish food habits data base has now been completely transferred to the ORACLE server on the REFM Sparcstation. The data base (under FOODLAB.) includes tables for data on hauls, stomach contents, prey lengths, and intestine contents.

An analysis of the diet of Atka mackerel at a diel station in the Aleutian Islands during summer was completed. Diet of male and female Atka mackerel were similar. The diet (by weight) of males consisted of 44% calanoid copepods, 25% chaetognaths, and 15% euphausiids. Female diet included 44% calanoid copepods, 26% chaetognaths, 7% euphausiids, and 8% Atka mackerel eggs. Stomach content weight as a percent of body weight was approximately 1.1% for both males and females. Although there were not enough samples to do a detailed analysis of diel variation in stomach content weight, highest stomach content weights for both male and female Atka mackerel were observed in the evening, 1600-2000 hours Alaska daylight time.

Canonical correspondence analysis (CCA) of the diets of yellowfin sole rock sole and Alaska plaice was performed. The first ordination axis (horizontal) of the CCA biplot separates the three predators while the second axis (vertical) represents a diet gradient associated with geographic area. The northwest section (strata 20 and 40) of the eastern Bering Sea is on one end of the geographic gradient and the southeast section (strata 10 and 30) is at the other end of the gradient on the second axis. Polychaete and clam prey were associated most with the first axis while marine worm, decapod, and gammarid prey were associated with the second. This analysis showed that Alaska plaice and rock sole of each size group had very similar diets while the diet of yellowfin sole was less similar. The relative proximity of both rock sole and Alaska plaice to polychaete prey in the CCA biplot indicates the dominance of this prey type in their diet. The association of clam and miscellaneous prey with the left side of the first axis indicates that they were most important in the diet of large yellowfin sole.

A paper summarizing eastern Bering Sea ecosystem trends was completed and presented at the Large Marine Ecosystems of the Pacific conference in Qingdao, China. Results of this analysis were also incorporated into an Ecosystem Considerations section of the Stock Assessment and Fishery Evaluation report of the North Pacific Fishery Management Council.

For more information please contact Pat Livingston at (206)526-4242.

2. Stock Assessment

a. Status of Stocks and Multispecies Assessment Task

The Status of Stocks and Multispecies Assessment Task is responsible for groundfish assessments and management advice for Bering Sea, Gulf of Alaska and West Coast groundfish species. In addition, Task members conduct research to improve the precision of these assessments, and provide technical support for the evaluation of potential impacts of proposed fishery management measures.

Dr. Richard Methot, the former task leader of the Status of Stocks and Multispecies Assessment Task, has taken a new position with the Northwest Fisheries Science Center and will serve as Director of the Fishery Analysis and Monitoring Division. This new program will be responsible for groundfish assessments and advice to management on the status of West Coast groundfish species.

During the past year, stock assessment documents were prepared by the REFM Status of Stocks and Multispecies Assessment Task for the Gulf of Alaska and Bering Sea/Aleutian Islands plan development teams of the North Pacific Fishery Management Council and for the groundfish management team of the Pacific Fishery Management Council.

Assessment scientists also provided analytic assistance on many current fisheries management issues. These included: 1) analysis for the section 7 (Endangered Species Act) biological opinion concerning the interaction between the Gulf of Alaska commercial pollock fishery and the threatened Steller sea lion population; 2) identification and prioritization of research activities that may lead to improved groundfish stock assessments; 3) modeling of pollock stock structure in the Bering Sea; and 4) biological assessment of hake allocation between the U.S. and Canada and between shoreside and at-sea processors in the U.S.

Research activities spanned a broad range of topics. Field studies initiated by staff members included pilot trawl surveys in collaboration with the fishing industry, and maturation studies for slope rockfish, Pacific hake, and Pacific cod. Significant research contributions on sablefish growth, bycatch analysis, pollock cannibalism, and bioeconomic modeling of pollock stock dynamics were presented at various symposia. In addition, staff members participated on nationwide NMFS committees for age-structure modeling, risk assessment in stock assessment analyses, and review of overfishing definitions. Staff members also served on national and international steering committees of GLOBEC and PICES.

For further information, contact Dr. Richard Marasco (206) 526-4172 or Dr. Richard Methot (206)860-3365.

3. Management

a. Observer Program - REFM

The Fisheries Observer Program is responsible for placement of observers on vessels fishing for groundfish species in the EEZ of the northeastern Pacific Ocean and Bering Sea. Observers collect data which provide the basis for in-season management of the groundfish fisheries by NMFS, provide a means for evaluating and developing management strategies by regional management councils and NMFS, and are used in the stock assessment process. Observers play important roles in providing information that is critical to the continuation of the U.S. fishing industry.

During 1994, no foreign vessels were allowed to catch or process fish in the U.S. EEZ along the west coast and Alaska. All of the allotted groundfish were given to U.S. vessels and processing plants, both for catching and processing. The Observer Program trained and deployed 493 observers to vessels fishing off Alaska, and 29 observers to vessels fishing off the Washington-Oregon-California coast. The Program was responsible for defining the sampling duties and data collection methods used by observers, training of the observers prior to deployment, debriefing of observers upon their return, and editing and managing the resulting data. The catch data were provided to the Alaska and Northwest Regional Offices to assist in management decisions regarding the catches of groundfish and prohibited species. These data were also used in the implementation of the Vessel Incentive Program in Alaska, where vessels were prohibited from exceeding certain prohibited species catch standards. Valuable data were also collected regarding the operations of the groundfish fishery.

For further information, contact Dr. William Karp, (206) 526-4194.

b. Socioeconomic Assessment Task

During 1994, the Socioeconomic Assessment Task was actively involved in providing economic information used in the evaluation of management measures being considered by the Pacific and North Pacific Fishery Management Councils. Task members served on the BSAI, GOA, and West Coast groundfish plan teams and on both NPFMC and PFMC technical work groups and contributed significantly to, and in several cases had the lead for, the analyses and review of the following fishery management actions: (1) NPFMC comprehensive rationalization program for the groundfish and crab fisheries off Alaska, (2) North Pacific Fisheries Research Plan (i.e., the observer program and user fees to support it) (3) NPFMC amendments to control bycatch in the GOA and BSAI groundfish fisheries, (4) NPFMC halibut and sablefish ITQ programs, (5) NPFMC increased retention and increased utilization of groundfish catch, (6) NPFMC harvest priority in the groundfish fishery (i.e., reserve part of a TAC or season for vessels that meet specific bycatch and discard standards), (7) NPFMC total weight measurement (i.e., the use of scales or marked bins to provide better estimates of total catch for at-sea and on-shore processing), (8) vessel moratorium for the Alaska groundfish and crab fisheries, (9) PFMC groundfish License Limitation Amendment, (10) PFMC sablefish management (ITQs and transferable trip limits), and (11) PFMC pilot observer program. Also in support of the NPFMC, Task members prepared the following: the economic appendix for the Stock Assessment and Fishery Evaluation for BSAI and GOA Groundfish, an annual report on Oregon, Washington, and Alaska exports of edible fishery products, and a socio-cultural impact assessment plan for the Alaska Region and Alaska Fisheries Science Center.

Task members provided economic advice and technical review and support for: (1) Saltonstall-Kennedy and Sea Grant research proposals, (2) the redefined PacFIN system, (3) the data base for the Alaska halibut and sablefish IFQ program, (4) university research proposals, (5) a NMFS Central Office analysis of recent bankruptcies in the North Pacific groundfish fishery, (6) the NOAA Oil Pollution Act of 1990 (OPA) Workshop, (7) a NOAA sponsored workshop on "Economic Valuation in Natural Resource Management", (8) a U.S. Forest Service and NMFS workshop for Federal and State resources agency managers, (9) an evaluation of the NOAA fleet replacement and modernization plan development process, (10) the OECD study of the economic aspects of the management of living marine resources, (11) the annual cooperative NMFS and ADF&G survey of Alaska groundfish processors, (12) the economic counterpart to "Our Living Oceans" for the Pacific States and Alaska, and (13) an Alaska Fisheries Science Center study that integrates population dynamics and stock assessment information with market demand data in an effort to understand the implications of exploitation rate changes for rock sole in the U.S. eastern Bering Sea.

For further information contact Dr. Joe Terry (206) 526-4253, jterry@afsc.noaa.gov.

C. BY SPECIES, BY AGENCY

1. Pacific cod

a. Stock Assessment

BERING SEA/ALEUTIANS

Pacific cod in the EBS and Aleutian Islands is managed as a unit, although nearly all of the assessment research focuses on the EBS portion of the stock. Annual trawl surveys indicate that the biomass of Pacific cod in the EBS remained high and stable throughout the 1980s. After a decline in estimated survey biomass in the early 1990s, the past three surveys have indicated a considerable increase in stock size. The 1994 estimate is nearly twice that of 1993 and the 1989, 1990 and 1991 year-classes are now estimated to be well above average. The incoming 1992 year-class may be exceptionally large.

The length-based stock synthesis model used in last years' stock assessment was retuned for the current assessment incorporating additional length frequency information, revised catch estimates and the 1994 trawl survey estimate of current stock size. The model estimates the 1995 exploitable biomass at 1,620,000 t. Using an $F_{35\%}$ (=0.42) harvest strategy, the new assessment model projects a 1995 ABC of 285,000 t for the EBS portion of the stock and 328,000 t for the EBS and Aleutian Islands combined. Because reliable estimates of F_{MSY} and B_{MSY} are not available for Pacific cod, overfishing for this stock would occur at the fishing mortality rate that reduces the level of spawning biomass per recruit to 30% of its pristine value. This fishing mortality rate ($F_{30\%}$) is 0.51 (full selection value), which corresponds to a 1995 catch of 390,000 t for the EBS and Aleutians combined.

GULF OF ALASKA

A length-based stock synthesis model forms the basis for the 1995 assessment, replacing the stock reduction analysis used in previous assessments. The projected biomass (ages three and above) for 1995 is 573,000 t, up considerably from the 1994 projection of 296,000 t from the last assessment. Reasons for these changes include the estimation of a dome-shaped selectivity pattern by the model which results in a higher projected biomass, an increase in the trawl survey biomass estimate from 1990 to 1993, and a change in the natural mortality rate to the value used in the Bering Sea assessment (0.37). ABC was calculated for 1995 using the $F_{0.35\%}$ fishing strategy (=0.40) to give an ABC of 108,000 t. The fishing mortality rate that would constitute overfishing is 0.48 ($F_{0.30}$), or 126,000 t.

For further information, contact Dr. Grant Thompson at (206) 526-4232.

2. Shelf rockfish

a. Stock Assessment

GULF OF ALASKA

Pelagic Shelf Rockfish

The pelagic shelf rockfish assemblage is comprised of five species that inhabit waters of the continental shelf of the Gulf of Alaska and that are thought to exhibit midwater, schooling behavior. At certain times, however, some of these fish are caught in bottom trawls. Dusky rockfish appears to be the most abundant species in the group, and has been the target of a bottom trawl fishery in recent years. A jig fishery for black rockfish has also developed in the central Gulf of Alaska since 1991. Current exploitable biomass for the pelagic shelf assemblage is based on the average of the biomasses estimated in the 1987, 1990, and 1993 triennial trawl surveys: 57,644 mt. Results of these surveys, however, are highly uncertain for rockfish, especially when applied to species that may be somewhat pelagic in distribution. Pelagic shelf rockfish are presently managed using an F=M strategy, in which the annual exploitation rate is set equal to the estimated rate of natural mortality for dusky rockfish (0.09). Applying this exploitation rate to the current exploitable biomass yields a Gulfwide ABC of 5,190 mt for 1995.

The Gulf of Alaska Groundfish Plan Team recommended that black rockfish in the central Gulf be separated from the pelagic shelf group and assigned a separate ABC in 1995. A similar proposal was offered in 1993. These proposals stemmed from a concern that under the present management regime, black rockfish may be selectively over-harvested in localized areas. Neither proposal was enacted at the Council level, however, because virtually no assessment data exists for this species to determine an ABC.

For more information, contact David Clausen at (907) 789-6049 or Jon Heifetz at (907) 789-6054.

3. Slope rockfish

a. Research

GULF OF ALASKA

Observations of Rockfish on Longline Gear from a Manned Submersible

A study to improve abundance estimates of rougheye and shortraker rockfish from longline catch data was successfully conducted from 24 May to 6 June 1994 in offshore waters near Sitka, Alaska. Longline gear was deployed by the NOAA RV John N. Cobb and observed from the submersible Delta which was launched and recovered by the tender vessel Cavalier. Specific goals were to estimate the catchability coefficient of the longline survey gear for rougheye and shortraker rockfish, to quantify the effect of bait competitors, and to quantify the effect of local fish depletion on catch rates. Thirty longline sets and twenty-two submersible dives were completed. Depths sampled usually were 300 to 350 meters. Principal fish species observed from the submersible and caught by the longline gear were rougheye, shortraker, and redbanded rockfish, sablefish, halibut, shortspine thornyhead, and Pacific cod. Pacific ocean perch or other morphologically similar species also were observed from the submersible, but were not caught on the longline gear. Principal investigators were Dan Ito of the REFM Division and Ken Krieger and Mike Sigler of ABL. Results of this project are presently being analyzed.

For further information, contact Michael Sigler, ABL, (907) 789-6037.

Genetic Studies of Slope Rockfish

ABL's genetics task has completed an initial look at shortraker and rougheye rockfish from the eastern Gulf of Alaska region, ranging from Dixon Entrance to Yakutat. Approximately 30 enzymes were screened electrophoretically from 200 adults of each species. Several loci showed fixed differences for the common allele mobility between species, providing a useful tool for species identification. In addition, it appears there may some geographically based allelic frequency differences, but the data are still preliminary. Genetic samples from the Aleutian Islands region were collected in 1993 and will be compared to the eastern Gulf of Alaska samples for possible stock differences.

In cooperation with Dr. Anthony Gharrett and Andy Gray at the University of Alaska, a study on the use of polymerase chain reaction (PCR) amplification of mitochondrial DNA (mtDNA) to study rockfish genetics was initiated. This study will continue in 1995. Results will be used to examine phylogenetic relationships among rockfish species, determine if separate genetic stocks exist for various species of slope rockfish, and verify species identification of larval and post-larval rockfish.

For more information, contact Jon Heifetz at (907) 789-6054.

Diel Feeding of Pacific Ocean Perch

The NOAA RV John N. Cobb was used in July 1994 to collect stomach samples of Pacific ocean perch for a diel feeding study. Over a period of several days, stomachs were preserved from trawl-caught Pacific ocean perch during both day and night hours. Plankton tows were also made concurrent with each trawl haul so that stomach contents could be compared with available prey items. The results will be used to investigate the daily vertical migration of Pacific ocean perch and how this movement, if any, may relate to changes in plankton distribution.

For more information, contact Dave Clausen at (907) 789-6049 or Nancy Maloney at (907) 789-6060.

b. Stock Assessment

BERING SEA

Pacific Ocean Perch

The POP complex consists of true POP and four other red *Sebastes* species (northern rockfish, rougheye rockfish, sharpchin rockfish, and shortraker rockfish). Prior to 1991, the complex was managed as a unit in each of the two management areas. In 1991, the North Pacific Fishery Management Council enacted new regulations that changed the species composition of the POP complex. For the eastern Bering Sea slope region, the POP complex was divided into two subgroups: 1) Pacific ocean perch, and 2) shortraker, rougheye, sharpchin, and northern rockfishes combined. For the Aleutian Islands region, the POP complex was divided into three subgroups: 1) Pacific ocean perch, 2) shortraker, rougheye rockfishes, and 3) sharpchin and northern rockfish. These subgroups were established to protect Pacific ocean perch, shortraker, rougheye, and northern rockfishes from possible overfishing. Each subgroup is now assigned an individual total allowable catch (TAC).

The stock assessment for this complex is based mainly on *S. alutus*, which has the most data and is the most abundant species in the complex. The stock synthesis approach was used as the primary analytic tool for the current assessment. As with the stock reduction analysis used in previous assessments, stock synthesis results indicate that the *S. alutus* stocks in both areas underwent declines in abundance during the 1960s and early 1970s, and remained low in abundance through the early 1980s. For several years, the Council set TAC well below (normally at 50% of) ABC to promote rebuilding of the stocks. Through a combination of these management actions and improved recruitment, the stocks have been recovering slowly, although the most recent survey from the EBS region indicates some downturn in that portion of the stock.

For *S. alutus*, ABC had previously been set on the basis of an F_{MSY} harvest strategy. Results of the current assessment, however, have led the chapter authors and the Plan Team to conclude that previous F_{MSY} and B_{MSY} estimates are no longer reliable. Therefore, the recommended 1995 ABC is based on a harvest strategy that reduces the equilibrium level of spawning biomass per recruit to 44% of the pristine level ($F_{44\%}$). This strategy results in a fishing mortality rate of 0.058 for the eastern Bering Sea region and 0.068 for the Aleutian Islands region, resulting in ABC estimates of 1,854 t and 10,519 t, respectively. The 1995 overfishing limit for *S. alutus* is based on a harvest strategy that reduces the equilibrium level of spawning biomass per recruit to 30% of the pristine level ($F_{30\%}$). Given current estimates of exploitable biomass and estimates of full-selection F for the two areas as 0.093 (eastern Bering Sea) and 0.104 (Aleutian Islands), the corresponding overfishing levels are 2,907 t and 15,890 t for the eastern Bering Sea and Aleutian Islands, respectively.

For the other subcomplexes ("others" in the EBS and northern/sharpchin and shortraker/rougheye in the AI), ABC was calculated as the product of the natural mortality rate (0.06 for northern and sharpchin, 0.025 for rougheye, and 0.03 for shortraker) and exploitable biomass. Since estimates of other biological parameters are unavailable, harvesting at the $F=M$ strategy also corresponds to the Council's overfishing limit.

The "other rockfish" complex includes both of the thornyhead (*Sebastolobus*) species and all *Sebastes* species not included in the Pacific ocean perch complex. U.S. observers have identified 15 confirmed species within this complex, and another 14 species have been tentatively identified. The complex is managed as two separate stocks, one in the EBS and one in the Aleutian Islands. Little is known about the species in this complex. Commercial catch and effort data are of little use in examining abundance trends for these species since most of the catch is probably incidental. The natural mortality rate for species in this complex has been estimated at 0.05, which was used as the target fishing mortality rate in calculating ABC. Lacking estimates of other biological parameters, the resulting ABC values also correspond to the limit specified by the Council's overfishing definition. A reliable estimate of F_{MSY} does not exist for this complex.

For further information, contact Daniel Ito at (206) 526-4231.

GULF OF ALASKA

Slope rockfish are defined as those species of Sebastes that, as adults, inhabit waters of the continental slope, generally in depths greater than 150-200 m. Twenty-one species of rockfish are classified into the slope assemblage, the most abundant of which are Pacific ocean perch, and northern, rougheye, redstripe, sharpchin, shortraker, silvergray, and harlequin rockfish. The stock abundance of slope rockfish is considered to be depressed compared to its former abundance in the early 1960's. The "stock synthesis" model is applied to Pacific ocean perch. This model incorporates age composition, in addition to using other parameters such as fishery CPUE and estimated biomass from the triennial trawl surveys. Based on this model, our best estimate of exploitable biomass for Pacific ocean perch in the Gulf of Alaska is now 142,470 mt. Exploitable biomass for the other species in the assemblage is estimated from the average values in the 1987, 1990 and 1993 trawl surveys, and totals 272,470 mt.

Pacific ocean perch age samples indicate the presence of a strong 1986 year class, especially in the central and western Gulf of Alaska. This age class was first noted in samples from the 1990 triennial survey and verified in the 1993 survey. Past age samples have also identified a strong 1976 year class.

To prevent possible over-exploitation of the more desirable species, the slope rockfish assemblage is divided into four subgroups: Pacific ocean perch, shortraker/rougheye rockfish, northern rockfish, and other slope rockfish. Separate ABC's are assigned to each subgroup. Pacific ocean perch are presently managed using an adjusted $F_{45\%}$ strategy, where the ABC is adjusted downward in proportion to the ratio of current biomass to a target biomass. Target biomass is set at 150,000 mt of female spawning biomass. The other subgroups are managed under an F=M strategy, in which the annual exploitation rate is set equal to the rate of natural mortality. The 1995 ABC's are as follows: Pacific ocean perch, 6,530 mt; shortraker/rougheye rockfish, 1,910 mt; northern rockfish, 5,270 mt, and other slope rockfish, 7,100 mt.

Recently, a rebuilding plan has been initiated for Pacific ocean perch. Under this plan, an $F_{55\%}$ rate adjusted downward by ratio of current biomass to target biomass is used to compute a Total Allowable Catch (TAC) of 5,630 mt for Pacific ocean perch.

For more information, contact Jonathan Heifetz at (907) 789-6054, David Clausen at (907) 789-6049, or James Ianelli at (206) 526-6510.

WEST COAST

Pacific Ocean Perch

A rebuilding program was established for Pacific ocean perch in 1981 following depletion of this stock during the 1960s and early 1970s. Based on an analysis performed in 1992, the stock has not shown any significant increase. A strong 1985 year-class is evident from the 1989 triennial survey and estimates from the stock synthesis model suggest that it is similar in magnitude to the 1970 year class. In the short term, the mature biomass level is likely to increase if the 1985 year class remains as high as it currently appears. A more accurate indication of this year-class strength should be available after the 1992 triennial survey data are analyzed. Varying the absolute level of discards do not affect conclusions that were drawn about the condition of the Pacific ocean perch stock off the west coast of the continental U.S. However, the overall contribution of discards to fishing intensity may compromise rebuilding plans. Discards should be monitored so that more accurate age (or size) specific fishing mortality can be estimated. Simulation analyses suggest that under any harvest strategy, the average stock rebuilding rate is slow. Currently, the 1992 assessment is being updated. In the new assessment, the survey completed in 1992 will be included and should give a clearer picture of the strength of the 1985 yearclass. Also, data from slope surveys will be examined.

For further information, contact Dr. James Ianelli at (206) 526-6510.

4. Thornyheads

b. Stock Assessment

GULF OF ALASKA

As for the west coast, in 1994 a comprehensive stock assessment of shortspine thornyheads (longspine thornyheads are generally rare in Alaskan waters) was completed. The fundamental changes included: using revised NMFS triennial trawl survey biomass estimates (the fishing power correction estimates have been updated for all years); all available NMFS observer size frequency records since 1978 by longline and trawl fisheries were compiled and used; historical catch data were updated and discards were estimated using blended values from NMFS Regional Office and the NMFS observer program and various observer reports; finally, a size-based age-structured model was constructed to evaluate the current and historical status of the thornyhead resource. Past stock assessments of shortspine thornyheads in the GOA have relied primarily on the point estimates from the NMFS triennial trawl surveys.

The 1995 ABC recommendation for shortspine thornyheads in the GOA was 1,899 t. The overfishing level corresponded to removals in excess of 2,660 t. Unlike the west coast situation, both trawl and hook-and-line fisheries harvest substantial proportions of the shortspine thornyheads quota (the west coast fisheries use primarily trawl gear). This feature adds to the complexity of predicting future size-specific selectivity rates.

WEST COAST

In 1994 a comprehensive stock assessment of shortspine and longspine thornyheads was completed. A large part of this effort involved re-stratifying the survey areas to provide better coverage for deep-water species such as thornyheads. Trends in this biomass index were investigated and indicated a slight decline for both longspine and shortspine thornyheads. Logbook data from California and Oregon were investigated in detail and were used to help approximate discard rates prior to the market development which occurred in the late 1980s. ODF&W biologists collected extensive size-at-maturity data which was analyzed and used in this assessment.

The preferred habitat of longspine thornyheads is in deeper water than for shortspine thornyheads. Longspine thornyheads appear to be more abundant than shortspine thornyheads although their individual size is smaller. Shortspine thornyheads appear to move into deeper water as they grow, whereas the size distribution of longspine thornyheads is relatively uniform with depth.

For shortspine thornyheads, a large amount of ambiguity remains over the interpretation of the relationship between age and increments counted on their otoliths. Recent analyses using radiometric methods suggest that previous age determinations may have been over-estimated. However, more study in this area of research is needed to support or refute this proposition. In the recent analyses, assumptions about the average maximum size of shortspine thornyheads and their size at an early age were made in an attempt to determine their growth rate independently. Results indicated that the growth rate was highly dependent on assumptions of natural mortality rate. However, given the available data, the likelihood of natural mortality having values less than 0.05 for shortspine thornyheads was low. A similar analysis for longspine thornyheads indicated that a natural mortality of about 0.1 was appropriate, given current information about their age and growth.

Based on the recent assessment, the projected coastwide $F_{35\%}$ yield for 1995 is about 980 tons for shortspine thornyheads and 7,780 tons for longspine thornyheads. The overfishing rates ($F_{20\%}$) corresponds to yields of 1,760 and 15,920 tons, respectively. To the extent possible, fishing in deeper water would be beneficial because a) the more abundant longspine thornyheads can be targeted and b) the shortspine thornyheads are generally larger, and hence would have had more spawning opportunities.

For further information contact Dr. James Ianelli (206) 526-6510.

5. Sablefish

a. Research

GULF OF ALASKA

Japan-U.S. Cooperative Longline Survey

For the seventeenth consecutive year, a cooperative longline survey for sablefish was conducted in the Gulf of Alaska by Japan and the United States in summer 1994. The survey used the Anyo Maru No. 22, a commercial Japanese longline vessel provided by the North Pacific Cooperative Fisheries of Japan. A scientist from the AFSC's ABL participated in the cruise in the western Gulf of Alaska, and one from the RACE Division in the eastern Gulf of Alaska. As in previous years, 47 stations were fished along the upper continental slope of the Gulf from the eastern Aleutian Islands to Dixon Entrance. At each station, one longline 16 km long containing 7,200 hooks was set and retrieved. Survey results showed that overall sablefish relative population number (RPN) decreased 13.6% for the upper continental slope of the Gulf of Alaska from 1993 to 1994. On a geographic basis, the rate of decline was progressively greater from west to east, with the Southeastern area showing the largest decrease, 23.8%.

The overall results for sablefish in the 1994 cooperative survey were similar to those found in a duplicate longline survey of the Gulf of Alaska, the 1994 NMFS domestic longline survey. The latter survey between 1993 and 1994 showed a Gulfwide decrease in sablefish RPN of 17.8% for the upper continental slope. In contrast to the cooperative survey, however, the domestic survey found that rates of decline were much the same in all regions of the Gulf.

The time series of data from the cooperative survey will end with 1994, as there are no future plans to continue this survey.

For more information, contact David Clausen at (907) 789-6049.

Domestic Longline Survey

The AFSC has conducted an annual longline survey of sablefish and other groundfish in the Gulf of Alaska from 1987-94. The survey is a joint effort involving two divisions of the AFSC: ABL and RACE. It replicates as closely as practical the Gulf of Alaska portion of the Japan-U.S. cooperative longline survey conducted from 1978-94 and also samples gullies not sampled during the cooperative longline survey. Sixteen kilometers of groundline are set each day, containing 7,200 hooks baited with squid. In 1994, 77 stations were sampled from 5 July to 25 September. The survey vessel was the chartered fishing vessel Alaskan Leader. Sablefish relative population numbers for the upper continental slope and gullies (combined) decreased 23.0% from 1993-94. This decrease was statistically significant ($p < 0.001$).

For more information, contact Michael Sigler at (907) 789-6037.

Hook competition model

A stochastic model was developed relating longline catch rate to estimated fish abundance. The model directly accounts for hook competition; some information regarding local depletion and bait wear also can be inferred from the model. The model parameters are estimated from interarrival time data collected using hook timers. A second hook timer experiment was conducted in Chatham Strait, southeastern Alaska using the R/V John N. Cobb from 24 May to 4 June 1993 (the first experiment was conducted during 1992). The results of the two hook timer experiments imply that gear saturation has little effect on the capture of sablefish over the range of catch rates tested.

For more information, contact Michael Sigler at (907) 789-6037.

b. Sablefish Tag Recovery Programs

ABL

Processing new tags and editing of the ABL tag database continued during 1994. Tag releases now total 107,000 and recoveries nearly 6,400. The database was transferred from the Burroughs to the IT95 UNIX computer at the end of the year, and programs are being created by ABL staff for routine tag processing and administration of the tag reward program using Oracle.

Preparations are being made to assume responsibility from RACE in Seattle for all NMFS and Japanese tags released in Alaska waters during past cooperative longline surveys. Addition of these records to the present ABL database will result in a consolidated Alaska sablefish tag database.

Sablefish tagged at ages 0-2 during 1984-91 and recovered during 1988-93 were used to examine aging methods for sablefish. Otoliths from 52 of these known-age fish have been aged by the REFM Age and Growth Unit. Results of this study are currently being written by ABL and REFM.

RACE

RACE continued to respond to recovered sablefish tags, sending out hat and cash rewards and adding information to the recovery data base. In 1994 we rewarded 614 recoveries, of which 36 were fish injected with OTC in 1991 in a joint age validation study with SWFSC/Tiburon. This brings the total OTC recoveries to date from that study to 343. The RACE tag data base includes over 284,000 releases and 18,659 recoveries. As mentioned above, responsibility for tags released in Alaska is being transferred to ABL. This will include approximately 223,000 of the release records and their corresponding recovery records. We are not planning to release any additional tagged sablefish off Washington, Oregon, or California in the foreseeable future.

For more information, contact Nancy Maloney at (907) 789-6060 or Frank Shaw at (206) 526-4120.

Juvenile Sablefish Studies in Southeastern Alaska

Juvenile sablefish tagging studies in southeastern Alaska have been conducted annually by ABL since 1984. In May 1994, about 1,200 juvenile sablefish (mean length 26.0 cm) were tagged and released in St. John Baptist Bay, a small bay 10 km north of Sitka. This is the tenth consecutive year that relatively large numbers of age 1+ fish have found at this locality. As the tagged fish grow and are recovered in the longline fishery, the recovery data are being used to estimate the age of recruitment for sablefish to the fishery in the Gulf of Alaska.

For more information, contact Thomas Rutecki at (907) 789-6051.

WEST COAST

West Coast Extension of Domestic Longline Survey

The domestic longline survey of sablefish and other groundfish that the AFSC has conducted annually in the Gulf of Alaska from 1987-94 was experimentally extended to the coasts of Washington and Oregon in 1994. The chartered fishing vessel Alaskan Leader sampled 14 stations between September 29 and October 12 using the standardized longline gear developed for the AFSC Gulf of Alaska survey. This gear consists of two 80-skate groundlines set end-to-end from about 200 to 1,250 m bottom depth. Each skate of gear is 100 m long and has 45 Mustad 13/0 circle hooks on 38-cm gangions spaced 2 m apart. Additional skates were added at some stations where the slope was particularly broad to cover the depth range more completely. The following table summarizes the station locations and catches of principal slope groundfish species at each station.

Table 1.--Catches (number) of principal groundfish species off Washington and Oregon during the 1994 West Coast longline survey.

Station	Latitude	Arrowtooth flounder	Dover sole	Sablefish	Giant grenadier	Pacific grenadier	Shortspine thornyhead	Longspine thornyhead	Rockfish
1	48°15'	10	6	2,235	52	148	123	6	14
2	47°53'	24	0	1,007	54	8	85	23	6
3	47°35'	45	4	1,818	30	385	61	0	25
4	47°16'	8	5	1,986	56	170	37	2	49
5	46°40'	10	0	1,548	22	171	27	1	30
6	46°18'	6	2	2,483	30	84	51	0	24
7	45°58'	4	3	2,257	14	190	15	2	9
8	45°43'	6	1	2,069	51	442	7	1	15
9	45°19'	0	3	1,713	6	6	33	2	8
10	45°04'	0	2	1,950	77	290	24	1	22
11	44°22'	0	0	1,776	40	230	7	0	0
12	43°55'	0	0	2,288	276	961	4	0	1
13	43°27'	0	0	761	10	87	5	3	0
14	42°51'	1	0	744	46	475	13	2	1
TOTAL		114	26	24,635	764	3,647	492	43	204

The main objective of the Washington-Oregon section of the survey was to estimate the relative abundance and size composition of continental slope groundfish species. We hope to be able to relate the results of this survey to previous slope groundfish research in the area, primarily the 1979-1991 pot index surveys and the 1984-1993 slope trawl surveys.

For more information, contact Mark Wilkins at (206) 526-4104.

b. Stock Assessment

BERING SEA and GULF OF ALASKA

The sablefish population in Alaska's waters is still at a relatively healthy level, but with no strong recruitment evident in recent years, the population has slowly decreased since the mid 1980's. However, most of the decrease has been concentrated at the outer range of sablefish in the Bering Sea and Aleutian Islands, while the abundance in the Gulf of Alaska has been more stable. There has been some concern that large decreases in abundance observed in the Japan-U.S. cooperative longline survey in the eastern Bering Sea in recent years are due to interference with the survey by killer whales. An analysis investigating the effect of killer whale presence on survey catch rates during 1989-93 revealed there is a negative impact. This impact, however, was not found to be statistically significant, and the overall abundance trend remains the same with or without the effect of killer whales. Exploitable biomass for the beginning of 1995 for outside waters, as estimated from NMFS trawl and longline surveys and including projected recruitment, is 225,400 mt combined for the Gulf of Alaska, eastern Bering Sea, and Aleutian Islands, compared to the 1994 combined value of 246,100 mt.

Yield estimates are determined from a stock reduction analysis modified to explicitly track estimates of exploitable biomass and provide an estimate of recruitment. The Gulf of Alaska, Bering Sea, and Aleutian Islands regions have been combined and analyzed as one stock since 1989. The recommended yield is then apportioned by management area according to estimates of current biomass using an exponential weighted average of past apportionment estimates. The ABC's for 1990-92 were computed by multiplying the $F_{0.1}$ exploitation rate (0.116) by the estimate of exploitable biomass at the beginning of the fishing year. Beginning in 1993, an adjustable fishing rate strategy was adopted for sablefish, whereby the $F_{35\%}$ fishing rate (that rate which would reduce the spawning biomass per recruit ratio to 35% of the unfished level) is adjusted in proportion to the ratio of current biomass to a target biomass level that is 35% of the unfished level ($B_{35\%}$). The estimates of $F_{35\%}$ and $B_{35\%}$ are 0.137 and 247,000 mt, respectively. Thus, the adjusted fishing rate is 225,400/247,000 x 0.137 = 0.125, resulting in a combined ABC of 25,220 mt (21,500 mt for Gulf of Alaska, 1,600 mt for the eastern Bering Sea, and 2,200 mt for the Aleutian Islands).

NMFS has conducted two longline surveys to track abundance trends in the Gulf of Alaska: the Japan-U.S. Cooperative Survey and the domestic survey. The cooperative survey has also covered the eastern Bering Sea and Aleutian Islands. At times the results of the two Gulf surveys diverge significantly from each other, while at other times the difference between the two surveys decreases. Studies are now in progress by the AFSC's RACE Division to determine the reason for the difference in results. In computing the ABC's, an average of the two surveys was used to project the exploitable biomass estimate. There are no plans to continue the cooperative survey, and in 1995, the domestic survey will survey only the Gulf of Alaska. Survey of the eastern Bering Sea and Aleutian Islands may be feasible on a triennial basis with multi-year domestic survey contracts, beginning no sooner than 1996.

For more information, contact Sandra Lowe at (206) 526-4230, or Jeff Fujioka at (907) 789-6026.

WEST COAST

An updated assessment for west coast sablefish was conducted in 1994. New information for this assessment included results from the 1992 triennial trawl survey on the continental shelf, results from the 1990-1993 trawl surveys on the continental slope, and fishery monitoring information through 1993. The shelf survey monitors the abundance of young sablefish and recorded its highest level in 1992. These abundant young sablefish were predominantly from the 1989- 90 year classes. The slope surveys were conducted in different regions of the coast and, together, cover the area from San Francisco to the US-Canadian border. The combined biomass estimate from these slope surveys was less than expected from the previous sablefish stock assessment. In addition, an industry participant on the survey questioned whether the gear performance was sufficiently consistent to allow interpretation of the results as an estimate of absolute biomass. However, a low biomass is more consistent with the downtrend observed in the 1979-1991 pot survey.

The size/age and age/area versions of the Synthesis model were used to explore the implications of the various sorts of information described above. The age/area model indicates that movement of older sablefish to waters deeper than 500 fathoms is consistent with the currently observed predominance of old sablefish in deep water, with the proportion of biomass in deep water as observed in the slope trawl surveys, and with the decline in the pot survey which was conducted in the shallow depth zone where most of the fishing has occurred. This age/area model also indicated that the total biomass is about twice that calculated by swept-area methods applied to the slope trawl survey. The age/size model was then tuned to this total biomass level and used to project biomass and potential yield. The results indicate that the biomass had declined to below its long-term target level during recent years, but rebuilding is occurring as the strong 1989-90 yearclass moves into the spawning and fishable stock.

For further information contact Dr. Richard Methot, NWFSC, Seattle, at (206) 860-3365.

6. Flatfish

b. Stock Assessment

BERING SEA

The abundance of most of the species of flatfish in the eastern Bering Sea have shown substantial increases during the 1980s and are currently at high and stable levels of abundance.

Yellowfin sole

Yellowfin sole, which suffered a severe decline in abundance from overfishing in the early 1960s, is currently the second most abundant species in this region after walleye pollock. Three abundance estimators (trawl survey, virtual population analysis, and stock synthesis) indicate that the yellowfin sole resource increased slowly during the 1970s and early 1980s to a peak during the mid 1980s and that the resource has remained abundant and stable until the present. This trend is indicative of a slow-growing species that is known to have been lightly exploited while experiencing average to strong recruitment during the past 15 years. Exceptional recruitment from the 1981 and 1983 year-classes and additional good recruitment from the 1987, 1988 and 1990 year-classes is expected to maintain the abundance of yellowfin sole at a high level in the near future.

The recommended ABC for 1995 was calculated by applying the $F_{35\%}$ fishing mortality rate from the stock synthesis model (0.12) to the 1995 projection of exploitable biomass (2.7 million t). The $F_{35\%}$ rate is appropriate because it makes use of the available information regarding age-specific fishing selectivities and maturity. As with most North Pacific flatfish species, sexual maturity in yellowfin sole occurs well after the age of entry into the fishery. Yellowfin sole are fully selected to the fishery by age 11 but only about 50% of the females are mature by this age. The 1995 ABC is 277,000 t. This catch is below the level of 319,000 t corresponding to the Council's overfishing definition, computed under an $F_{30\%}$ value of 0.15. A reliable estimate of F_{MSY} does not exist for this stock.

Rock sole

Rock sole catches from the eastern Bering Sea in 1994 was over 60,000 t (including discards), primarily from a valuable roe fishery conducted northward of the Alaska Peninsula during the winter spawning period. Harvest levels remained well below the 1994 ABC of 313,000 t. Because of sustained good recruitment (1980-88 year-classes) rock sole biomass increased steadily throughout the 1980s and early 1990s to its present high level. Biomass estimates from stock synthesis and the trawl survey indicate that the present stock size is at least 1.9 million t.

The $F_{35\%}$ exploitation rate was used in the assessment which makes use of the available information regarding age-specific fishing selectivities and maturity. Rock sole attain sexual maturity well after the age of entry into the fishery (83% of the females are selected by the commercial gear by age 8, but only 33% are mature). The $F_{35\%}$ fishing mortality rate (0.18) gives a 1995 ABC of 347,300 t. This ABC is below the level corresponding to the Council's overfishing definition (388,000 t using $F_{30\%} = 0.20$).

Other Flatfish

Results of the 1994 Bering Sea trawl survey estimate the "other flatfish" species to be at a high level of abundance. The flathead sole estimate of 725,100 t is the highest yet observed from the trawl survey time-series and the Alaska plaice estimate of 623,000 t is at a high and stable level. These estimates, combined with the miscellaneous flatfish species estimate of 54,100 t, provide the highest estimate of "other flatfish" abundance observed by the EBS trawl survey.

This assessment uses exploitation rates derived from the fishing mortality values that would reduce flathead sole and Alaska plaice exploitable biomass per recruit to 35% (ABC) and 30% (overfishing) of their unfished levels. The 1995 ABC for this complex is set at 255,000 t with overfishing equal to 304,000 t. This resource remains lightly exploited.

Greenland Turbot and Arrowtooth Flounder

The conditions of the two principal species of large flatfish in the eastern Bering Sea, arrowtooth flounder and Greenland turbot differ. Based on survey estimates, the exploitable abundance of arrowtooth flounder has increased from less than 100,000 t in 1982 to 625,000 t projected for the beginning of 1995. Over this same period, recruitment of Greenland turbot has been very low and the presence of juvenile fish reported from the Bering Sea shelf and slope has been notably reduced. Assessments of the adult population, which occupy continental slope waters, is limited to triennial surveys such as in 1991, but these surveys incompletely sample this portion of the population. Because of the poor recruitment that has been observed since the early 1980s, exploitation of the adult population has been restricted and the TAC has been set at 7,000 t. Arrowtooth flounder remain lightly exploited with the 1994 catch of 8,000 t taken primarily in the pursuit of other species. For 1995 the ABC and TAC of arrowtooth flounder is set at 113,000 t and 10,227 t, respectively.

GULF OF ALASKA

Management of the Gulf of Alaska flatfish resource has been divided into five categories by the North Pacific Fishery Management Council for 1994. These categories include: "shallow water flatfish", "deep water flatfish", arrowtooth flounder, flathead sole, and rex sole. This reclassification was made because of the significant difference in halibut bycatch rates in directed fisheries targeting on shallow and deep water flatfish species and also because of the dominant biomass of arrowtooth flounder which could cause the other flatfish species to be overfished if it was not separated from the group and managed under a separate TAC. Flathead sole are also managed under a separate TAC because they overlap the distributions of the shallow and deep water categories and rex sole were given a separate TAC because of a problem with POP bycatch in the directed rex sole fishery in 1993.

Due to halibut bycatch in commercial trawl fisheries, the total catch of Gulf of Alaska flatfish species was nearly 28,000 t in 1993, well below the combined TAC of 75,980 t. Biomass estimates from the 1993 Gulf of Alaska trawl survey indicate that the total flatfish resource remains stable with no significant changes estimated for any species between survey years. Trawl survey size compositions indicate the continued presence of juvenile fish recruiting to the stock for most species. For 1995, the flatfish species are managed using the $F_{35\%}$ approach, resulting in a combined ABC of 305,000 t and a TAC of 84,400 t.

For further information, contact Thomas Wilderbuer (206) 526-4224.

WEST COAST

Dover Sole

Size and age composition data from the INPFC Eureka and Columbia areas were analyzed by the length-based version of stock synthesis, a separable catch-at-age model. For both areas, separate fishery selectivities were estimated for several time periods to fit the changes in size, age and fraction female. In both areas the model was run at various levels of virgin recruitment to generate a range of fits to slope survey abundance estimates. Runs with the slope survey ratio (Q which equals the observed slope survey biomass divided by the population biomass after survey selectivities are applied) between 0.5 and 1.0 were taken as a plausible range of biomass levels. In the Eureka area, recent landed catches have declined to 3,062 mt in 1993. MSY, estimated under an assumed level of density-dependent recruitment is 3,176 to 5,779 mt for the low and high biomass scenarios respectively. The 1994 female spawning biomass is estimated to be below the F20% level for the low biomass scenario and just above the F20% level for the high biomass scenario. The recommended yield for 1995 is calculated by applying F35% (fishing mortality that reduces female spawning biomass per recruit to 35% of its unfished level) to the exploitable biomass. This results in a yield of 1,067 mt (landed catch 952 mt and discard 114 mt) to 3,797 mt (landed catch 3,475 mt and discard 322 mt) for 1995. The current quota in the Eureka area is 3,500 mt. In the Columbia area, MSY, estimated under an assumed level of density-dependent recruitment, is 2,948 mt and 3,894 mt for the low and high biomass runs respectively. The 1994 female spawning biomass is estimated to be at the target level (F35%) for the high biomass scenario and at the F20% level for the low biomass scenario. The low and high biomass range produce 1995 yields (applying F35%) of 1,670 mt (landed catch 1,561 mt and discard 109 mt) and 3,726 mt (landed catch 3,503 mt and discard 223 mt) respectively. The current quota for the Columbia area is 4,000 mt with a harvest guideline that steps down from 6,000 mt in 1993 to 4,000 mt in 1995. The lower recommended yields in the Columbia area for this assessment compared to the last assessment (Turnock and Methot, 1992) are mostly due to a lower estimate of biomass for the 1992-93 slope surveys that covered the entire Columbia area from previous surveys in 1988 and 1989. Previous surveys covered only the central Columbia area and were extrapolated to the entire area.

For further information, contact Jack Turnock at (206) 526-6549.

7. Pacific hake

b. Stock Assessment

AFSC scientists conducted an assessment of the coastal Pacific whiting (Merluccius productus) resource in 1994. The assessment reviewed recent developments in the Pacific whiting fishery, tabulated and analyzed the 1993 catch statistics, described a stock synthesis model application using catch and survey data from 1977-93, and presented yield options for 1995-97.

The U.S. and Canadian harvest of Pacific whiting in 1993 was 199,994 metric tons (t). In 1994, the yield will be close to 371,000 t. Assessment surveys conducted during summer of 1992 by National Marine Fisheries Service and the Department of Fisheries and Oceans resulted in estimates of population abundance considerably in excess of forecasts based on earlier surveys and models.

A geographic version of the stock synthesis model that divided the population into U.S. and Canadian components was used to assess the Pacific whiting population. Population biomass peaked 1987 and has been declining steadily since that time. The biomass of age 3 and older fish in 1993 was estimated to be 2.871 million t. The age-2 recruitment abundance of the 1990 and 1991 year classes were estimated at 2.336 and 0.198 billion fish respectively, indicating that the 1990 year class is moderately strong (greater than the mean 1977-93 recruitment of 2.041 billion) and that the 1991 year class is a weak year class.

A deterministic age-structured population model for Pacific whiting was used to forecast yields for 1995-97. Several harvesting strategies are presented: a constant F strategy, a variable F strategy (where fishing mortality for a particular year is proportional to the level of female spawning biomass), and a hybrid strategy that combines features of the other two policies. Three harvest rates are presented for each harvest strategy. These harvest rates are based on the probability that female spawning biomass will fall below a cautionary level of 623,000 t in long-term simulations of the Pacific whiting population.

When a hybrid fishing strategy is applied to the projected numbers at age in 1995, the potential total yield is calculated to be 223,000 t at low harvest rate, 309,000 t at a moderate harvest rate, and 382,000 t at a high harvest rate. If recruitment remains near the 1960-93 median recruitment of 0.954 billion fish, the outlook for the immediate future is for a fairly rapid decline in annual yield in 1996 and 1997. The recruitment of a strong year class to the population would substantially increase the projected yields.

For further information, contact Martin Dorn at (206) 526-6548.

10. Other - Walleye pollock

a. Research

Acoustic Surveys - Midwater Assessment and Conservation Engineering (MACE) Task

BERING SEA

Bering Sea Shelf (June 27 - September 14, 1994)

An acoustic/trawl survey of walleye pollock was conducted on the eastern and western Bering Sea shelves as part of a Bering Sea-wide cooperative effort involving research vessels from the United States, Japan and South Korea. Abundance of walleye pollock echo sign varied markedly across the shelves. Aggregations of highest density were encountered on the eastern shelf between St. Paul Island (172^{0}W long.) and Cape Navarin (179^{0} E long.) Very little echo sign was encountered along the Russian coast on the western shelf. Walleye pollock captured in trawls ranged in length from 0.9 cm to 78 cm. Fish caught east of the Pribilof Islands were generally larger than fish caught west of the Islands. East of the Islands, lengths were bimodal with the dominant peak at 46 cm and a smaller peak at 31 cm. Fish with lengths between 6 and 26 cm were absent; a few fish smaller than 6 cm were caught. From the Pribilofs west to Cape Navarin, fish 5 -25 cm were common, and three length modes were observed at 22, 37 and 15 cm (in decreasing order of dominance). On the western Bering Sea shelf, the length composition was unimodal, with a peak at 25 cm. Lengths generally ranged from 18 to 25 cm, except for a few pollock captured that were larger than 29 cm.

Bogoslof Island Area (February 24 - March 9, 1995)

An acoustic/trawl survey of spawning walleye pollock was conducted in the southeastern Aleutian Basin near Bogoslof Island. Pollock echo sign was observed throughout most of the survey area, with higher concentrations located along the shelf edge between Akutan and Unalaska Islands, over deep water northwest of Bogoslof Island, and along the north side of Umnak Island from 168° W long. to 169° 30 ' W long. The largest pollock aggregations, centered north and west of Umnak Island, were somewhat west of where they had been observed in previous years. Preliminary results indicate a population length composition with peaks at 54, 44, and 48 cm, in order of decreasing importance. Among captured female pollock with lengths greater than 35 cm, 80% were in a pre-spawning (mature) reproductive condition. Only 8% were actively spawning, and 7% were post-spawning (spent).

Eastern Bering Sea Shelf (March 31 - April 14, 1995)

Spawning walleye pollock on the eastern Bering Sea shelf are currently under investigation. Objectives of an ongoing acoustic/trawl survey of the shelf area between Unimak Island and the Pribilof Islands are to identify potential spawning aggregations and provide estimates of biomass by sex and age for this area.

GULF OF ALASKA

Shumagin Islands Area (February 14 - 20, 1995)

A comprehensive acoustic/trawl survey of spawning walleye pollock (Theragra chalcogramma) was conducted in the vicinity of the Shumagin Islands. This effort was needed to better describe the spawning biomass of pollock which was first identified in this area during a brief, exploratory acoustic survey during March, 1994. During the 1995 survey, quantities of mature, pre-spawning pollock were detected throughout the study area although most fish were concentrated immediately to the northeast of the Islands near Renshaw Point and Stepovak Bay. Significant quantities of mature fish were also detected within the Shumagin Gully. Most pollock echo sign occurred over bottom depths in excess of 100 m. The size distributions of pollock from a total of 14 hauls throughout the area were remarkably similar; mean lengths among hauls ranged between 47-49 cm and distributions were strongly unimodal, except on three occasions where age-1 fish also produced a significant mode. The age-1 fish, which ranged in length (FL) between 8-13 cm, were only captured in the Shumagin Gully. About 80% of the fish greater than 33 cm FL were in a mature stage of gonadal development, and would have been expected to spawn within the next few weeks.

Shelikof Strait Area (March 17 - 27, 1995)

An acoustic/trawl survey of spawning walleye pollock was conducted in the Shelikof Strait area between Chirikof Island and Cape Chiniak. As in previous years, most spawning pollock were distributed along the western side of the Strait with greatest densities near Capes Kekurnoi and Kuliak. Fish were most abundant within 50-150 m of the bottom. The size distributions of pollock from hauls within the Strait generally exhibited dominant modes around either 10-12 cm or 48-50 cm length (FL), although weaker modes centered around 23 cm and 36 cm were sometimes present. The mode representing the age 1 fish (10-12 cm), though often numerically dominant, was likely under-represented since the survey was designed primarily to assess the characteristics of the spawning population. Random samples of the females greater than 33 cm FL suggested that about half were in either a spawning or post-spawning stage of reproductive development. Pollock from the 1994 year class formed a strong, well-defined acoustic layer in midwater (150-175 m depth) which was broadly distributed between Uyak Bay and the southern limits of the surveyed area near Chirikof Island. The areal extent and strength of this layer may be indicative of a relatively strong year-class.

For more information contact Dr. Jimmie Traynor at (206) 526-4163.

Recruitment Processes (FOCI)

Fisheries-Oceanography Coordinated Investigations (FOCI), a NOAA cooperative research program between the Recruitment Processes Task of the RACE Division and the Pacific Marine Environmental Laboratory (PMEL) is designed to investigate the causes of recruitment variations in commercially important fish and shellfish. The program's focus is the well-defined spawning population of walleye pollock in Shelikof Strait, and walleye pollock stock structure and recruitment in the eastern Bering Sea. Bering Sea FOCI is part of the NOAA Coastal Ocean Program. Areas of research include field studies of eggs and larvae in relation to primary and secondary production and the physical environment, biochemical methods for assessing larval starvation and predation and stock structure, and pollock behavior. FOCI conducted four cruises aboard the NOAA ship Miller Freeman during the spring of 1994, three in the Shelikof Strait region of the Gulf of Alaska, and one in the Eastern Bering Sea to study the effects of the environment on the eggs and larvae of walleye pollock. We also conducted a two-ship study of young-of-the-year juvenile pollock in the Bering Sea near the Pribilof Islands aboard the NOAA ships Miller Freeman and Surveyor in late summer. Laboratory studies on reared pollock larvae were conducted to (1) calibrate biochemical indices; (2) estimate feeding, digestion, and gastric evacuation rates; (3) calibrate histopathological condition indices; and (4) determine larval shrinkage caused by handling and preservation. Eggs were spawned from fish trawled in the Shelikof Strait and Bogoslof Island area, maintained in refrigerators aboard ship, and then transported in thermos jugs to the culture center at Sand Point in Seattle and to the Hatfield Marine Center of Oregon State University, where the behavioral studies were conducted.

For more information contact Dr. Art Kendall at (206) 526-4108.

b. Stock Assessment

BERING SEA and ALEUTIAN ISLANDS

The current assessment includes several separate estimators of pollock abundance, including the EBS bottom trawl survey, two tunings of the standard cohort analysis (subjective and least squares), CAGEAN, and Synthesis. All methods indicate a total biomass (age 3+) of over 7 million t for the EBS portion of the stock, above the biomass level which produces MSY. Cohort analysis, used for computing exploitable biomass, ABC and overfishing, projects the 1995 Eastern Bering Sea biomass at 8,080,000 t.

All models indicate a strong increase in biomass from 1979 to the mid 1980s that resulted from a very strong 1978 and relatively strong 1982 and 1984 year-classes recruiting to the fishable population. From 1985 to 1991 the fishable stock declined as these above average year-classes decreased in abundance with age and were replaced by weaker year-classes. In 1992 an upturn in abundance began with the recruitment of the strong 1989 year-class. Estimates of recruitment from the annual groundfish surveys and catch-at-age models indicate that exploitable pollock abundance will stabilize and increase as the 1992 year-class enters the fishable population.

The Aleutian Islands portion of the stock, small relative to the Bering Sea shelf, is estimated at 189,000 t of biomass with an 1995 ABC of 56,600 t.

An estimate of the 1995 pollock abundance in the Bogoslof region is 442,000 t. A 1995 Bogoslof ABC of 115,000 t is computed by multiplying estimated biomass by the $F_{35\%}$ exploitation rate of 0.26. Out of concern over recent declines in the Bogoslof population of Steller sea lions, the Bogoslof pollock fishery is managed on a bycatch only basis.

For further information contact Dr. Vidar Wespestad, (206) 526- 4249.

GULF OF ALASKA

The estimated 1995 biomass of pollock in the Western and Central Gulf of Alaska is 553,000 t from stock synthesis modeling results. Relative to last years' assessment, the following new sources of information are available: a) revised 1991 and 1992 egg production estimates of spawner biomass in Shelikof Strait, b) the 1993 bottom trawl survey biomass estimate; c) revised egg production estimates of spawning biomass for 1991 and 1992; c) the 1994 Shelikof Strait hydroacoustic biomass estimate; d) length-frequency data from the 1990-94 hydroacoustic surveys; e) age composition data from the 1992 and 1993 fisheries and the 1993 bottom trawl; f) ADF&G coastal crab survey data; g) FOCI predictions of upcoming year class strengths; and h) updated estimates of discard and catch.

The 1994 hydroacoustic survey utilized the same equipment as in 1993 with improved detectability of pollock in low density situations, and improved measurements from the near-bottom region. The 1994 Shelikof Strait biomass estimate based on the new system is 467,300 t. A value of 366,800 would have been estimated had the old system been utilized in 1994, and is the value which is comparable to past hydroacoustic estimates.

Length-frequency data from the 1994 hydroacoustic survey shows the progression of the strong 1988 year class through the population. A bimodal distribution of population numbers suggests that the 1993 year class may be an important contributor to the future pollock fishery.

The biomass estimate for the Western/Central area from the 1993 bottom trawl survey is 753,165 t, similar in magnitude to previous survey biomass levels. The age compositions from the 1993 bottom trawl survey revealed strong 1988 and 1989 year classes. The presence of the strong 1989 year-class found in the Shumagin, Chirikof and Kodiak areas suggest that there may be widespread mixing of pollock stocks between the Bering Sea and the Gulf of Alaska. The 1993 age composition also showed a large number of 1-year old fish in the Yakutat and Southeast areas. As these areas have not been well sampled in previous surveys, it is uncertain that this is indicative of a strong 1992 year-class.

The 1994 FOCI recruitment prediction was based on two quantitative and four qualitative sources of information. The two quantitative estimates of recruitment were a time-series model and an estimate of age 1 abundance of pollock in the hydroacoustic surveys. The four qualitative sources of information were: rainfall, wind mixing, advection and larval abundance. The predictions from the various sources of information were weighted and a combined prediction was calculated. The combined prediction for 1994 is: the 1991 and 1992 year-classes are weak and the 1993 and 1994 year-classes are average.

Estimates of fishing mortality rates based on biological reference points were determined from a dynamic pool model and an age-structured model. The resulting estimated values are $F_{35\%} = 0.43$ and $F_{30\%} = 0.51$. Additionally, the long term productive potential of the pollock stock was explored with a stochastic age structured simulation with different recruitment scenarios. The risk associated with a given fishing strategy was measured by monitoring the frequency that the spawner biomass fell below the threshold level in the simulation. The threshold level was defined as 20% of the unfished spawner biomass level and was estimated at 370,000 t.

To reflect recent recruitment conditions in the simulations, the probability of a strong year class was set at 0.2 which is lower than the estimated probability if all of the recruitment data was used (0.4). One interpretation of the differences in pollock recruitment patterns between the 1970s and 1980s indicated by model results is that the Gulf of Alaska ecosystem is undergoing changes which influence the carrying capacity for pollock. However, as in past years, the threshold spawner biomass level was estimated assuming a higher probability of a strong year class (0.4), calculated by using all of the recruitment data. An optimal fishing mortality rate was determined from the tradeoffs between increased yield and the risk of stock biomass falling below the threshold, or $F_{opt} = 0.3$ (full selection value). The fishing mortality value used to set ABC ($F_{ABC} = 0.2$) came from additional simulations and represents the value where the stock biomass fell below the threshold during 5% of the simulations.

Stock assessment authors recommended a 91,000 t ABC in the Western and Central Gulf and a 4,870 t ABC in the Eastern Gulf. The Plan Team selected a more conservative ABC of 62,000 t for the Western and Central Gulf and 3,360 t for the Eastern Gulf of Alaska.

For more information contact Dr. Anne Hollowed 526-4223.

D. OTHER RELATED STUDIES

1. Trawl Herding Experiments

David Somerton and Peter Munro (RACE Groundfish Assessment Task) completed two experiments to collect data on the effect of herding by trawl doors and bridles on the magnitude of the catch and on the size distribution of fish in research trawl catches. One experiment took place in the Bering Sea during the last two weeks of July. The other experiment took place off the coast of Washington during the first two weeks of September. The experiments were extensions of a similar effort conducted in September of 1993 off of Kodiak Island. The experiments were conducted by varying the length of the bridles in three increments and recording the numbers and sizes of fish captured with each gear configuration. Analysis of the data has not proceeded enough to permit more than a tentative statement of results. Herding effects on magnitude of catches appear to be discernable; larger catches tend to be associated with longer bridle lengths for a number of species, indicating that the effective area swept by the gear system is greater than that swept by the trawl itself. Effects on the size distribution of fish are not readily discernable. Analyses continue toward estimation of the fraction of fish in the catch that were herded from outside the path of the trawl.

a. West Coast Slope Groundfish Survey Trawl Gear Research

Scientists from the RACE Division's West Coast Groundfish Subtask conducted assessment survey gear research off the coast of Oregon (lat 44°40' N to lat 45°35' N) between 16 October and 13 November 1994 aboard the NOAA ship Miller Freeman. The cruise period was divided equally between two studies, each providing a distinct and independent approach to addressing concerns about gear performance. The first half of the cruise compared our standard bottom trawl (swept-area) survey technique with a video sled line transect survey technique. The second leg of the cruise investigated bottom trawl gear performance using different net configurations and towing protocols.

The impetus for conducting this research has been concern voiced by the fishing industry that the slope survey fishing operations are flawed and have led to commercial catch restrictions on Dover sole , thornyheads, and sablefish recently imposed by the Pacific Fishery Management Council in response to 1994 stock assessments. They contend that data from our trawl surveys are inaccurate because of the inconsistent gear performance. Our objectives for this study were to: 1) understand more fully how the standard survey net behaves when trawling over the soft mud bottom of the continental slope and 2) determine whether the slope survey trawl performs consistently as a standardized sampling tool and provides a reasonably accurate estimate of fish density.

b. Video Sled/Trawl Comparison Experiment:

One method for assessing how well the trawl survey estimates fish density is to compare it to an alternative survey technique. A video sled offers one independent method of estimating fish density. It offers the added advantage of being able to see details of this habitat's physical and biological characteristics.

Prior to the cruise, new trawl warps on the ship's trawl winches were marked every 50 m so that we had an accurate account of how much wire was paid out during trawling operations. During the first two days of the cruise we used the marked warps to develop a new scope table for 2.0 knots towing speed. We accomplished this by "flying" the trawl over deep water using various warp lengths and measuring the depth at which the trawl settled. Results from this experiment showed that significantly less wire was needed to tow at 2.0 knots than had been used during prior surveys. The new scope table was used for all trawls during the video sled/trawl comparison experiment and as one of three treatments during the gear performance experiment.

We used the standard West Coast Slope Survey Noreastern trawl for the trawling portion of this experiment. The video sled used during the experiment was designed and built specifically for this cruise by Dr. Waldo Wakefield, the Science Director at the National Undersea Research Center (NURC) and a Research Professor at the Institute of Marine and Coastal Science at Rutgers University. We thank him for his gracious help in accomplishing the video sled/trawl comparison experiment and for sharing his technical expertise as a voluntary participant on the first leg of the cruise. The video camera system included a Hi 8 format Sony camcorder with time lapse controller and wide angle, water-corrected zoom optics, contained within a single pressure housing which was rated to 6,000 m. The system included two sets of 24 volt/38 amp hour batteries and two 150 watt SeaLites. Standard recording time was 3 hours. The whole system was mounted on a sled (360 cm long by 224 cm wide by 147 cm high, total weight approx. 500 kg), which was towed between 0.75 and 1.0 m/s (1.5 and 2.0 knots) for three hours.

We successfully completed 13 camera sled tows and 19 trawl tows during this experiment. These included 12 pairs of camera sled and trawl tows done at depths of 450, 750, and 1,150 m (4 pairs at each depth). The bottom was flat or gently sloping, free from obstructions, and composed of soft mud.

2. Trawl Gear Performance Experiment:

Trawl gear performance was investigated by making changes to the gear or towing protocol and observing the resultant changes in net performance and catch. Our goals were to experiment with changes to the trawl system that would improve gear performance, have minimal affect on net selectivity so that we could maintain continuity with our slope survey data time series, and avoid reducing the maximum depth limit (1,300 m) of our present slope survey.

Suggestions for modifying the trawl net or towing protocol were solicited and received from a variety of individuals within the fishing industry (harvesters as well as trawl manufacturers) and the scientific community. After careful consideration, three modifications were chosen: 1) shorter scope (ratio of trawl warp length to depth); 2) a four point bridle attachment to the V-door; and 3) lighter ground gear. Combining these three modifications resulted in the following eight trawl configurations or treatments:

Treatment	*Four Point Bridle*	*Light Ground Gear*	*Short scope*
1	-	-	-
2	+	-	-
3	-	-	+
4	+	-	+
5	-	+	-
6	+	+	-
7	-	+	+
8	+	+	+

Shorter scope was chosen as a treatment because results from the scope experiment indicated that more scope was being used than was necessary. The weight of extra wire may cause the doors to fall over. The four point bridle on the V-doors may prevent the doors from falling over by forcing them to maintain a consistent angle of attack, thereby stabilizing the net's fishing dimensions. This arrangement is used successfully by most deep water commercial fishermen in Eureka, California, to tow at speeds ranging from 1.5 to 2.0 knots (Liem Massey, Pacific Trawl Nets and Gary Loverich, Research Nets, personal communications). Another explanation for the questionable gear performance may be that the standard mudsweep ground gear is too heavy, causing it to dig hard into the soft mud bottom, resulting in large catches of mud and benthic invertebrates and causing erratic net behavior. We eliminated about 700 pounds from our standard mudsweep ground gear for this experiment. We also considered increasing towing speed but chose not to test this because we felt confident would improve net performance. Towing faster, however, might severely alter the net's selectivity and would necessitate starting a new slope survey time series. It would also reduce the maximum depth limit of our survey by 100-200 m.

All combinations of the trawl configurations listed above were tested using a randomized block design. Within each block, treatments were done in random order. Twelve replicates of each block of treatments were completed for a total of 96 tows. All sampling was done between 460 and 480 m in the area between lat. 45°05' N and lat. 45°35' N, carefully avoiding crossing over the path of any previous tow.

The trawl was deployed with SCANMAR net mensuration gear attached to the headrope, wings, and doors; wireless FURUNO netsonde attached to the outside of the headrope; and a bathythermograph on the headrope. Newly developed tilt sensors were used to measure the bottom contact of the footrope and the pitch and roll angles of the V-doors. We collected pitch and roll data sets for both doors from virtually every tow and bottom contact data from 76 tows.

Preliminary analyses of the physical behavior of the trawl show that the original configuration was unstable; the distance between the doors and the distance between the wingtips fluctuated significantly. The two treatments that appeared to stabilize the trawl the most were the lighter footrope and the 4-point bridle attachments. When we compared catch rates for different configurations, we found that the lighter footrope caught significantly fewer fish, especially Dover sole and small longspine thornyheads.

For more information, please contact Bob Lauth (206)526-4102.

E. Recent Publications and Reports Pertaining to Groundfish and Marine Habitats by Authors at the Alaska Fisheries Science Center

These reports are primarily products of the RACE Division, REFM Division, and the Auke Bay Laboratory.

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7. PACIFIC FISHERY MANAGEMENT COUNCIL

A. OVERVIEW

Major changes in groundfish management were initiated in 1994 as the PFMC responded to increased fishing effort and declining resource abundance. The biggest change was implementation of the license limitation program. As of January 1, 1994, limited entry permits for groundfish are required aboard all vessels fishing groundfish trawl, longline and fishpot (trap) gear under the limited entry quota and regulations (limited entry gears). Longline and fishpot vessels without permits, along with all other gears except trawl, are allowed to continue fishing in an open access fishery. Trip limits and other management measures are used in the open access fishery to keep harvest within the historic levels of that segment of the fleet not receiving permits. The implementation process, including applications for limited entry permits, has been handled by the limited entry office of NMFS in Seattle, Washington.

Limited entry permits are size specific. The limited entry program includes a point schedule that enables larger vessels to combine permits for smaller vessels in order to gain entry into the groundfish fishery. Nine factory trawlers used that provision to obtain permits in 1994. They limited their activities to the Pacific whiting fishery.

As authorized by the groundfish fishery management plan (FMP), the PFMC again established harvest guidelines for species in need of individual management attention, providing flexibility to allow landing of incidental amounts in case an annual harvest target was reached prematurely. For the third year, all managed species were managed under harvest guidelines instead of quotas. Little fishing for shortbelly rockfish and jack mackerel occurred, but the entire whiting harvest was taken and processed by U.S. operations. The whiting resource was again allocated between competing user groups by federal regulation.

The policy of using cumulative 2- and 4-week catch limits for individual vessels in 1992 and 1993 was revised to calendar month periods. The levels of these limits were intended to provide for a year-round fishery while keeping total catch within the harvest guidelines for each species or species group. In several cases, the previous 4-week catch limits were carried over as monthly limits with the idea of reducing landings by about 10 percent.

In 1994, the PFMC continued consideration of an individual quota (IQ) program for fixed gear sablefish. Opponents to the IQ concept and to specific aspects of the IQ proposals became more politically active and convinced the PFMC to consider trip limit alternatives. The PFMC rejected the concept of using trip limits to manage the fishery, and then later postponed further consideration of IQs until the issues could be addressed on a national level. For 1995, a delayed season opening date (August 6) was proposed, followed by a "mop-up" fishery to take any remaining part of the harvest guideline. Managers will attempt to set a season length that leaves a reserve of 30 percent for the mop-up fishery. The season is currently expected to be no longer than 10 days.

The PFMC still favors development of a fishery observer program, but still lacks authority to collect fees to cover program costs. This issue has been moved up and down the PFMC's list of management priorities, and remains a high priority. The Oregon Department of Fish and Wildlife and Oregon Trawl Commission are currently developing a data collection program that will include observers on Oregon trawl vessels. The Council has commented on early drafts of this proposal and will watch its development closely.

B. ROCKFISH MANAGEMENT

Since 1992, the PFMC has moved away from per-trip limits and towards cumulative catch limits for specific periods. This allows vessels to make any number of landings within the specified period, but the total amount landed must not exceed the specified limits for any species. The specified periods in 1994 were calendar months. For the Sebastes complex, the coastwide cumulative monthly limit was 80,000 pounds of which not more than 14,000 pounds could be yellowtail rockfish north of Cape Lookout, Oregon (45 20'15"N latitude); not more than 30,000 pounds of yellowtail rockfish south of Cape Lookout; and not more than 30,000 pounds of bocaccio south of Cape Mendocino, California. On September 1 the cumulative monthly limit for Sebastes complex south of Cape Mendocino was increased to 100,000 pounds.

The 1994 widow rockfish fishery operated under a cumulative monthly limit of 30,000 pounds through December 1, then was then was reduced to an incidental catch. In 1994 Pacific ocean perch was the only rockfish species still managed under per-trip limits, with the trip limit remaining at 3,000 pounds.

Pacific ocean perch continues to be managed as an incidentally caught species. In 1994, the ABC was kept at zero, and the harvest guideline was set at 1,300 mt for the Vancouver plus Columbia areas to allow for incidental catch under a trip limit of 3,000 lbs.

C. THORNYHEADS MANAGEMENT

As in 1993, in 1994 the two thornyhead species were managed with a single harvest guideline although separate ABCs were adopted. Thornyheads are managed under a cumulative trip limit for the Dover sole/thornyhead/trawl-caught sablefish (DTS) complex (formerly called the "deepwater complex") and also a separate sublimit for the 2 thornyheads combined. Increased fishing effort for thornyheads in 1994 resulted in more restrictive measures. The DTS fishery opened with a cumulative monthly limit trip limit of 30,000 pounds of thornyheads, which was reduced sharply on July 1 to 8,000 pounds. Record high prices and dwindling trawl alternatives fueled the increased effort.

D. SABLEFISH MANAGEMENT

The 1994 sablefish ABC and harvest guideline were again set at 7,000 mt north of the Conception area. (The Conception area is managed without a harvest guideline.) Beginning in 1994, sablefish was allocated not just among trawl, Treaty Indians and nontrawl fisheries, but a portion was also allocated to the open access fisheries. This effectively reduced the trawl sablefish allocation by nearly 350 mt, from 3,886 mt in 1993 to 3,540 mt in 1994. Likewise, the limited entry nontrawl (longline and pot) allocation was reduced from 2,814 mt to about 2,560 mt. The trawl allocation was roughly 1,000 mt below the amount taken by trawlers in 1993.

1. Trawl

Trawl sablefish landings are managed as part of the deepwater trawl DTS complex, which includes Dover sole and the two thornyhead species. A single trawl trip limit covered the complex, with sublimits for sablefish and thornyheads. Due to reduced harvest guidelines for Dover sole in the Columbia area and the thornyheads, the PFMC proposed more restrictive landing limits on the DTS complex. The cumulative limit for the complex was 50,000 pounds per month, of which no more than 12,000 pounds could be trawl-caught sablefish and no more than 30,000 pounds could be thornyheads. High thornyhead prices attracted much greater effort than anticipated, and on July 1 the DTS limit was reduced to 30,000 pounds, of which no more than 6,000 pounds could be trawl-caught sablefish and 8,000 pounds could be thornyheads. Landings of sablefish and thornyheads continued at higher rates, and on December 1 the fishery north of 36 N was effectively closed by (1) prohibiting all sablefish landings, (2) restricting thornyheads to 1,500 pounds per month, and restricting Dover sole to 6,000 pounds per month.

2. Nontrawl

As in past years, a small trip limit was established for non-trawl gears prior to the opening of the regular (unrestricted) season. In 1994, only vessels with limited entry pot and longline permits could participate in that regular season; all others were limited to the small trip limits all year. The trip limits for all pot and line gears were 350 pounds in the Conception area and 250 pounds north of there.

In 1992 and 1993, the nontrawl unrestricted sablefish season opened on May 12 and lasted 15 and 21 days respectively. With the implementation of groundfish limited entry, many vessel owners hoped for a longer season (perhaps an additional week). However, it appears that some vessels employed additional gear, especially increasing the number of pots fished off Oregon. The pot fleet substantially increased its proportion of the harvest and contributed to a larger portion of the total nontrawl harvest occurring off Oregon. The 20-day season opened May 15 closed June with the allocation exceeded by nearly 800 mt. The open access fishery did not take its entire allocation in 1994.

E. DOVER SOLE MANAGEMENT

In 1993, the coastwide Dover sole ABC was 15,900 mt and the harvest guideline was 17,900 mt which included a harvest guideline of 6,000 mt for the Columbia area. In 1994, the coastwide ABC remained at 15,900 mt but the harvest guideline was reduced to 16,900 mt, including a 5,000 mt harvest guideline for the Columbia area. The year started with the cumulative monthly trip limit for the DTS complex at 50,000 pounds with sublimits on the amounts of thornyheads and sablefish. Trawlers taking the full thornyhead and sablefish limits would land no more than 8,000 pounds of Dover sole per month, which likely resulted in substantial discard. Although the rates of thornyheads and sablefish landings were high, Dover sole landings were sluggish. When the DTS limit was reduced to 30,000 pounds on July 1, the intent was not to restrict Dover landings. Trawlers taking the full thornyhead and sablefish limits could take 16,000 pounds of Dover sole.

F. PACIFIC WHITING MANAGEMENT

The PFMC established a 1994 harvest guideline of 260,000 mt (80 percent of the coastwide whiting ABC) as the U.S. allocation. A multi-year framework to allocate the harvest guideline between at-sea and onshore interests was recommended by the PFMC and implemented by NMFS. Under this plan, each year 40 percent of the harvest guideline is reserved for shore-based activities and the other 60 percent is available for an "Olympic" fishery that begins April 15 (except that shore-based activities in California between 40 30' and 42 00' N latitude begin March 1). The first 60 percent (156,000 mt) was projected to be reached on May 13, at which time further processing at sea was prohibited. The catch was higher than projected, about 166,000 mt for both the at-sea and shore-based sectors combined. The remaining 94,000 mt was reserved for shore-based processing. Shore-based landings reached only about 59,300 mt through September 25, and 38,000 mt of the remaining harvest guideline was released for at-sea processing on October 1. Total shore-based landings for the year were about 73,500 mt and at-sea landings were about 179,000 mt.

By-catch regulations for the whiting fishery continued in effect for 1994. Those regulations prohibited at-sea processing south of 42 N latitude, whiting fishing in the morning between midnight and one-half hour after official sunrise south of 42 N, and whiting fishing inside conservation zones around the mouths of the Klamath and Columbia Rivers. Trip limit management continued inside 100 fathoms in the Eureka area to protect chinook salmon that might be in that area.

G. PFMC MANAGEMENT ACTIVITIES, JANUARY 1 - APRIL 30, 1995

1. Acceptable Biological Catches, Harvest Guidelines and other specifications for 1995

Final acceptable biological catches (ABC) and harvest guidelines for 1995 include substantial reductions from 1994 levels for Pacific whiting, canary rockfish, lingcod, thornyheads and Dover sole in the Columbia management area. The 1995 ABCs and harvest guidelines are presented in the attached table at the end of this summary.

The sablefish ABC was increased slightly to 8,700 mt, which includes all sources of fishery-induced mortality. In setting the harvest guideline at 7,800 mt, the Council deducted 900 mt to account for anticipated discards. The Council endorsed an allocation of 780 mt for tribal fisheries in 1995. All tribal harvest inside and outside the tribes' usual and accustomed fishing area north of Point Chehalis will apply to this allocation.

The Pacific whiting population is currently declining because of an aging population, a lack of strong recruitment for several years, and recent harvests exceeding the ABC due to continued lack of international agreement over sharing the resource. The 1995 ABC, which includes the portion of the coastal stock harvested in Canada, is 223,000 mt, a 31 percent reduction from 1994. The harvest guideline for U.S. waters is 80 percent of the coastwide total or 178,400 mt (down from 260,000 mt in 1994). The Council advised the National Marine Fisheries Service Northwest Region director to adjust this figure as needed if an agreement is reached with Canada before the end of the year.

The canary rockfish ABC in the Columbia and U.S. Vancouver areas has been reduced from 2,300 mt in 1994 to 1,000 mt and a restrictive harvest guideline of 850 mt has been imposed for the first time. The harvest guideline is 65 percent below recent harvest levels in the area covered by the stock assessment. The lingcod ABC was also substantially reduced and a restrictive harvest guideline imposed. The 1995 ABC is 2,400 mt coastwide, compared to 7,000 mt previously. The stock assessment primarily addresses the status of the stock from Cape Falcon, Oregon, to Vancouver Island, British Columbia, and recommends a limit of 1,800 mt in this region. The ABC for the U.S. portion is 900 mt. However, the Council was informed that Canada may set its harvest limit near 2,000 mt, and recent combined harvests by the two countries have exceeded 2,700 mt annually, approaching the U.S. estimated overfishing level. The Council recommends that U.S. and Canadian scientists meet as soon as possible to discuss this situation. Restrictive measures for both commercial and sport fisheries are discussed below.

The Council began a harvest reduction plan for Dover sole in the Columbia area in 1993, with the intention of reducing the harvest guideline from 5,000 mt in 1994 to 4,000 mt in 1995. However, based on the new assessment, the 1995 ABC was reduced to 3,000 mt, with the harvest guideline at 2,850 mt (a 5 percent reduction to account for fish discarded at sea). The Eureka area ABC was also reduced by 600 mt. Consequently, the coastwide harvest guideline was reduced from 15,900 mt in 1994 to 13,600 mt in 1995.

The two thornyhead species are managed under separate ABCs and harvest guidelines in 1995, where previously a single harvest guideline covered both species. The shortspine thornyhead ABC was reduced to 1,000 mt coastwide north of Point Conception (the previous ABC of 1,900 mt excluded the Vancouver area and the entire Conception area). The longspine ABC is 7,000 mt, compared to 10,100 mt in 1994, and again this applies north of Point Conception. Harvest guidelines of 1,500 and 6,000 mt were set for the two species, respectively. The shortspine harvest guideline is above its ABC but below the overfishing level in order to allow greater harvest of longspine thornyheads (both species are usually caught together, but in varying proportions), while the longspine harvest guideline is set below its ABC to prevent overharvest of shortspines. Separate trip limits, which require fishers to sort the two species before landing, are discussed below.

2. Limited Entry Trip Limits for 1995

Beginning January 1, 1995, there are different cumulative monthly limits for the Dover sole, thornyhead and trawl-caught sablefish (DTS) complex for different parts of the Washington, Oregon, and California coast. North of Cape Mendocino, California, the DTS limit is 35,000 pounds. Prior to May 1, not more than 6,000 pounds of this could be sablefish, but at that time the limit was increased to 7,000 pounds per month. This increase occurred because the harvest guideline was increased by 700 mt to correct a computational error. Prior to April 1, not more than 20,000 pounds could be thornyheads, and of this not more than 4,000 pounds could be shortspine thornyheads. This was reduced April 1 to 15,000 pounds of the two species combined with not more than 3,000 pounds shortspines. This action was taken in response to higher than anticipated thornyhead landings early in the year. Fishers are required to sort and separate all four DTS species, including the two thornyhead species, prior to landing. The sablefish per trip limit is 1,000 pounds or 25 percent of the DTS complex on board, whichever is greater (the same as 33.33 percent of the Dover sole plus thornyheads on board), and not more than 500 pounds of sablefish in any landing may be smaller than 22 inches. This is a change from the 5,000 pounds of small sablefish in previous years. South of Cape Mendocino, the cumulative limit for the DTS complex is 50,000 pounds to allow for greater harvest of Dover sole, but the sub-limits for thornyheads and sablefish are the same as in the north. Any vessel crossing the Cape Mendocino boundary during the month is restricted to the smaller DTS limit. Fishers were notified of the need to distinguish the two thornyhead species to avoid citation and to reduce the likelihood of trip limit reductions later in the year. The smaller bodied longspine thornyheads can be targeted in water deeper than 500 fathoms.

Lingcod have been added to the list of species with trip and size limits in 1995 in order to keep landings from exceeding the harvest guideline. The coastwide monthly cumulative limit for lingcod is 20,000 pounds with a minimum size limit of 22 inches total length.

Widow rockfish are again managed under a monthly cumulative limit of 30,000 pounds, the same as for most of 1994. Pacific ocean perch also is also managed under a cumulative monthly limit, which is a change from previous years. The monthly limit for this species is 6,000 pounds.

Sebastes complex trip limits are different in each of three regions of the coast. North of Cape Lookout, Oregon, from January 1 till the end of April, the cumulative monthly limit was 35,000 pounds, not more than 14,000 pounds of which could be yellowtail rockfish and not more than 6,000 pounds of which could be canary rockfish. This is the first time separate canary rockfish limits will be in effect. On May 1, the yellowtail rockfish limit was increased to 18,000 pounds per month. Between Cape Lookout and Cape Mendocino, the Sebastes complex limit is 50,000 pounds, of which not more than 30,000 pounds may be yellowtail rockfish and not more than 6,000 pounds may be canary rockfish. South of Cape Mendocino, the Sebastes complex limit is 100,000 pounds, of which not more than 30,000 pounds may be bocaccio. Any vessel crossing the Cape Lookout boundary during a month is restricted to the northern limit for that entire month unless the vessel complies with Oregon and Washington state declaration procedures, and any vessel crossing the Cape Mendocino boundary during a month must comply with the more restrictive limits for both areas.

Prior to and after the Pacific whiting season, vessels have a trip limit of 10,000 pounds of whiting coastwide. In addition, vessels operating within 100 fathoms in the Eureka area (an area closed to large-scale directed whiting fishing) also have a trip limit of 10,000 pounds all year.

The 1995 limited entry fixed gear sablefish season will be delayed to August 6 and will undoubtedly be much shorter than previous seasons. Under the Council's proposal, the Groundfish Management Team will calculate the season length prior to the opening date so fishers will know how many days they will have to fish. The harvest guideline for the "derby" fishery will be 70 percent (approximately 1,700 mt) of the total limited entry fixed gear harvest guideline, with the remaining 30 percent expected to be taken in a month-long trip limit fishery beginning about three weeks later. For three days prior to the season, all groundfish pot and longline gear must be out of the water and no fixed gear sablefish landings will be allowed, with the exception that pot gear may be baited and set 24 hours before the official opening. This provision also applies to open access pot and longline gear. There will be no federal hold inspection, but the Council anticipates that Washington and Oregon will continue to require inspections during the 24 hours before the season to make sure vessels do not stockpile fish on board prior to the opening. The season will end at noon on the last day, with all vessels required to be in port and beginning to offload their catch by that time as currently required. Any limited entry landings beginning after noon will be limited to the 300-pound daily trip limit (350 pounds in the Conception area) that takes effect immediately. There will no longer be a three-day closure after the season, which is a change from the past few years. The groundfish team will tally the landings data from the fishery and determine how much of the limited entry fixed gear allocation remains for a "mop-up" fishery, and the National Marine Fisheries Service Northwest Region director will announce the vessel limit for the "mop-up" fishery. During the "mop-up" fishery, each limited entry vessel will have an equal cumulative limit that may be taken in a single trip or in several trips. After the "mop-up" fishery, the daily trip limit will again go into effect. During the regular ("derby") and "mop-up" fisheries, there will be the same trip limit on sablefish smaller than 22 inches as in 1994, i.e., 1,500 pounds or 3 percent of all legal sablefish on board, whichever is greater.

Pot and longline vessels have a daily trip limit of 350 pounds of sablefish in the Conception management area (south of 36°00 N latitude) and 300 pounds per day north of the Conception area before and after the "derby" season and the "mop-up" fishery. In the northern area, this is a 50-pound per day increase over the 1994 daily trip limit.

3. Open Access Trip Limits

Most of the open access fishery trip limits in effect in 1994 continue in 1995.

Rockfish. For all open access gears except setnets and non-groundfish trawls, there is a trip limit of 10,000 pounds of all rockfish coastwide. There is also a monthly cumulative limit of rockfish, which applies to setnets as well. North of Cape Lookout, Oregon, the monthly cumulative limit is 35,000 pounds (down from 40,000 pounds in 1994), and south of Cape Lookout, Oregon, the monthly cumulative limit is 40,000 pounds. The canary rockfish, yellowtail rockfish, bocaccio, Pacific ocean perch and widow rockfish sub-limits for the limited entry fishery also apply within the open access overall cumulative limit.

Sablefish. The trip limits are the same as for the limited entry fixed gear fishery, i.e., 350 pounds per day in the Conception area and 300 pounds per day north of that area. These limits will be in effect the entire year with the exception of the 72 hours prior to the limited entry "derby" fishery. During this period, no sablefish landings will be allowed, and no longline gear may be in the water. In addition, no pot gear may be in the water for the first 48 hours of the closed period.

For non-groundfish trawls (and other gears taking pink shrimp and spot and ridgeback prawns):
Pink Shrimp. The cumulative trip limit is 1,500 pounds (multiplied by the number of days of the trip) of groundfish species for any vessel engaged in fishing for pink shrimp.

Spot and Ridgeback Prawns. The limit is 1,000 pounds of groundfish species per trip for any vessel engaged in fishing for spot and ridgeback prawns.

California Halibut and Sea Cucumber. The limit is 500 pounds of groundfish species per trip for vessels engaged in fishing for California halibut or sea cucumbers south of Point Arena, California (38°N57 30"N latitude). All fishing during the trip must occur south of Point Arena. Landings must contain California halibut or sea cucumbers taken in accordance with California fishing and permit restrictions.

4. Three Experimental Fishing Permit Programs Proposed for 1995 Shoreside Fisheries

In October 1994, the Council endorsed three experimental fishing permit (EFP) applications for 1995. The first permit is continue the program to monitor the shoreside whiting fishery for the fourth year. However, the 1995 fishery will not be monitored at sea, but rather on shore when fishers land their catches. The results of the previous three years indicate that salmon bycatch is very low in this fishery, and the rates observed on vessels without observers were very similar to those for vessels with onboard observers. Under the EFP, vessels are again allowed to land unsorted catches of whiting, including any salmon and groundfish that may be caught inadvertently. At least 10 percent of all whiting fishing trips will be monitored upon delivery.

The second EFP will apparently not be issued. The intent of this program was similar to the first, but would have focused on shore-based whiting operations inside 100 fathoms in the Eureka management area. Large-scale whiting operations in the Eureka area are prohibited in waters shallower than 100 fathoms, as required by a National Marine Fisheries Service biological opinion for endangered salmon stocks. This EFP was intended to collect data on the relative incidental catch rates of salmon inside and outside 100 fathoms. Vessels would have been allowed to fish for whiting in excess of the nearshore trip limit if an observer was aboard at all times, even if that vessel operated outside the area. It now appears that no vessels were willing to comply with the terms of the EFP so the program has been canceled.

The third EFP will allow landing of unsorted catches taken in accordance with the proposed Oregon Trawl Commission data collection program that is planned to begin about June 1, 1995. That program is being designed similar to the whiting observer program, with the focus on discard estimation, biological sampling and an enhanced logbook. The Oregon Department of Fish and Wildlife is working with the trawl commission on this proposal.

5. Recreational Fishery: Lingcod Size Limit Coastwide; Washington Rockfish Bag Limit Reduced

For the first time, a 22-inch minimum size limit for recreational-caught lingcod went into effect January 1. The size limit, which previously applied only in California, is now extended along the entire coast in order to help keep the total harvest from exceeding the lingcod harvest guideline. On May 1, regulations adopted by the Washington Department of Fish and Wildlife (WDFW) reduced the recreational bag limit in state waters to 10 rockfish along the entire Washington coast. The reduced bag limit reflects WDFW s continuing concern for the coastal black rockfish population that supports the local recreational fishing industry. WDFW asked the Council to adopt a consistent bag limit in federal waters off Washington, and the Council agreed. Therefore, the bag limit in all Washington coastal waters will now be 10 rockfish. This change took effect in federal waters off Washington on May 1.

8. NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

A. AGENCY OVERVIEW

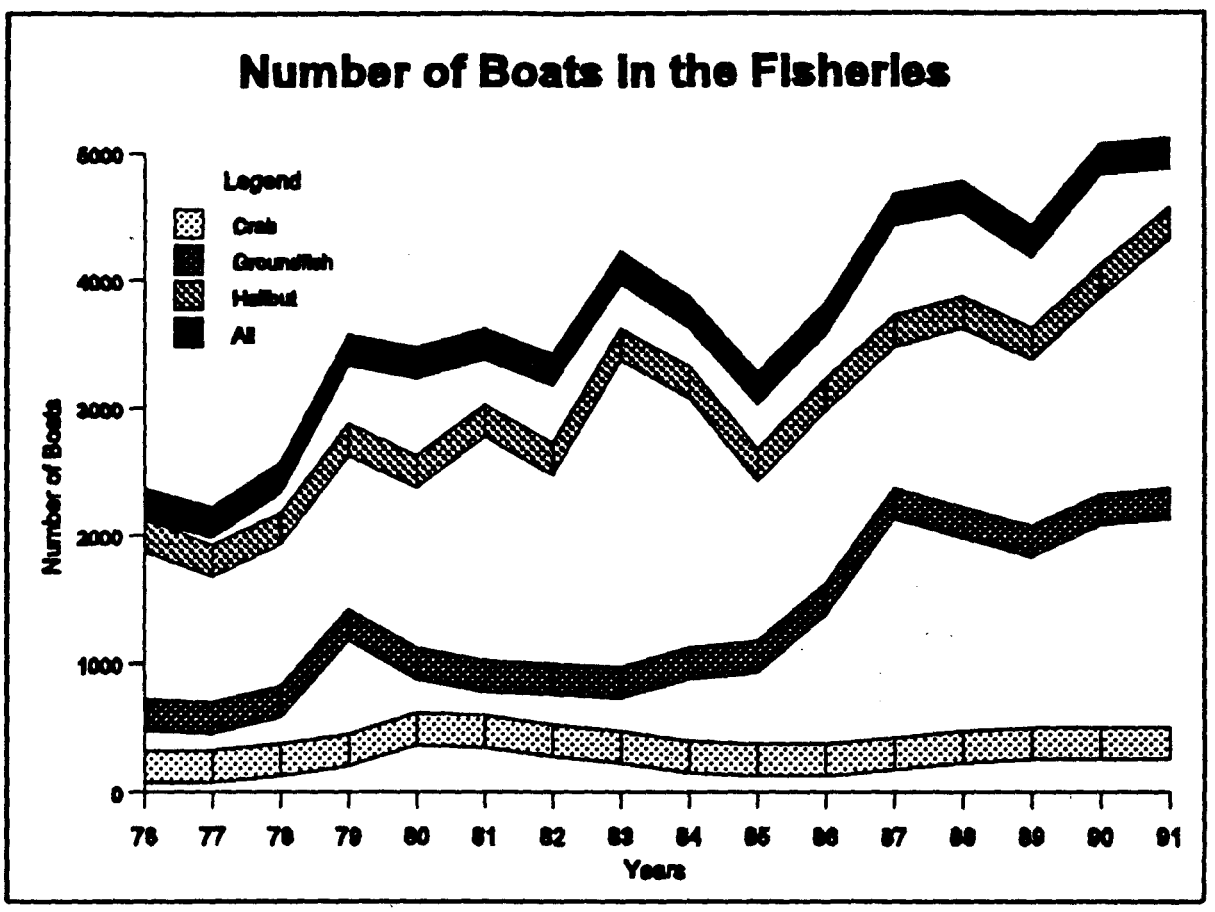
Since the North Pacific Fishery Management Council approved a sablefish and halibut limited entry program for the fixed gear fleet in December 1991, it has taken the past two years for the rule to be approved and the administrative machinery established. The centerpiece of the program is the individual fishing quota (IFQ) wherein each fisherman receives a quota based on his past history. The system includes a community development quota program wherein catch quota is set aside for disadvantaged communities in the Bering Sea/Aleutians area, much like with pollock CDQs. A new division called the Restricted Access Management (RAM) Division was created within the NMFS Alaska Regional Office in Juneau. RAM has processed 5,900 applications for halibut shares, and 1,700 applications for sablefish shares. The fishery, under the new system, is scheduled to begin March 15, 1995. It has survived one court challenge in U.S. District Court. That finding is being appealed.

Alaska's groundfish fisheries have one of the most ambitious observer programs in the United States as a result of a crisis in observer coverage in the mid- to late 1980s when foreign fisheries, extensively observed, gave way to Americanized fisheries that had little coverage. The Council took action in 1989 to require 100% observer coverage on vessels over 125 ft long, and 30% coverage on vessels between 60 and 125 ft long, and on certain shore-based processing plants. The Council required each vessel and processor needing an observer to pay through an independent contractor for that observer. This program will be replaced partially in 1995 and fully in 1996 by an observer fee program.

Congress authorized the Council to charge fees to the fishermen and processors to cover the cost of observers, rather than having only the groundfish fishermen bear the entire cost of the programming 1990. By 1993, the Council had developed and approved a fee program to collect up to 2% of the ex-vessel value of the groundfish, crab and halibut fisheries to support observers. The new system will maintain the same levels of coverage under the earlier industry direct-pay program, and will overlap with that program in 1995. It will be fully operational in 1996.

The North Pacific Council has been examining approaches to limited entry ever since the early 1980s when it proposed a moratorium for the halibut hook and line fishery, only to have it disapproved by OMB. Through the 1980s, the pace of the halibut and groundfish fisheries quickened, seasons shortened, and many in industry called for limited access. Growth in the harvesting sector developed more rapidly than anyone anticipated, particularly for groundfish. The Council is taking steps toward comprehensive rationalization or limited access in North Pacific fisheries. Step one is the individual fishing quota system beginning 1995 for the sablefish and halibut fixed gear fisher. Step two is to implement a moratorium on new entrants to the groundfish and crab fisheries. The Council first decided this issue in June 1992, but revisited it in late 1994. The Council's proposal will be forwarded to the Secretary of Commerce in February 1995 and could be in place for 1996, thus helping to stabilize growth of industry capacity.

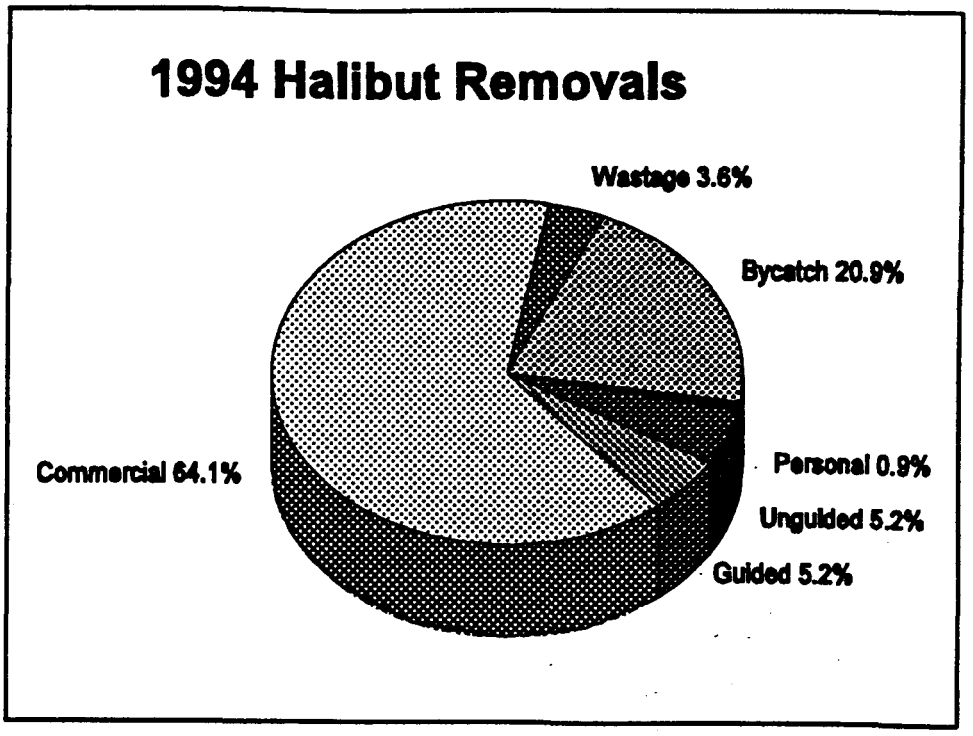
Step three would be a rollover of the inshore-offshore allocations for pollock in the BSAI and GOA, and for Pacific cod in the GOA, first implemented in late 1992. The original program will expire at the end of 1995, so the Council will consider its extension for another three years in 1995. Such a rollover could address problems with instability caused by unbuffered movements of catching capacity between areas in the Gulf of Alaska and Bering Sea and Aleutians, that have the potential to close seasons early for both the offshore and inshore fleet sectors. Inshore processors have voiced concern that when more local quotas are reached, they have no opportunity to go elsewhere to fish, and thus are put at an unfair disadvantage by the offshore


Number of Boats in the Fisheries
Legend
Crab
Groundfish
Halibut
All
Number of Boats
6000
4000
2000
1000
0
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
Years

processing fleet. The Council rollover of the inshore-offshore program likely would include the successful community development program that reserves 7.5% of the pollock harvest for six community complexes on the Bering Sea coast. That program is having immense positive economic consequences for those areas. A final decision on inshore-offshore will be rendered by the Council in June 1995, and if approved, implemented in January 1996. The program would lend stability to the major fishing sectors while longer term comprehensive rationalization approaches are developed.

Step four toward comprehensive rationalization is a proposed license limitation system now being considered by the Council for the groundfish fisheries of the Bering Sea and Aleutians and Gulf of Alaska, and the BSAI crab fisheries. It has taken the Council, working with industry, two years to develop a wide ranging suite of alternatives. The alternatives and associated analysis will go out for public review in March and the Council will be in a position to make a final decision in April or June 1995. If a license system is approved, it will likely take until 1997 at the earliest to implement.

Step five to comprehensive rationalization of North Pacific fisheries may be individual fishing and processing quotas for groundfish and crab. These may be fashioned after the halibut and sablefish IFQ system, though the overall groundfish system would be much more complex considering all the species and gear groups. Such a system may be designed over the next year, and the Council may choose to address just one or two of the more important species to start with, and then expand the program later. A final Council decision could not be made until April or June 1996 at the earliest, and could not be implemented until 1998.



Halibut Charter Issue

In May 1993, the Council received a proposal to limit the catch of halibut by the guided sport industry. It said action was needed because the recreational fishery was catching increasing amounts of halibut, thus reducing the amount available to the commercial fishery. The Council first addressed this issue in September 1993 and announced a control date of September 23, 1993 for a potential moratorium cut-off date for the guided sport fishery.

The Council also established a work group to identify potential alternatives for managing this fishery. It met in 1993 and 1994 and presented its report in January 1995. The Council then developed a problem statement and initiated analysis of alternatives which include making explicit allocations of the halibut quota between commercial and recreational fisheries, a moratorium on charter vessels, and individual transferable quotas. The Council may set a recreational cap of 105 to 140% of the 1994 charterboat catch as a cap for the charter industry, and the percentage could vary by area.

Regulatory Discards

The Council has paid greatest attention to controlling bycatches of prohibited species which provide profitable fisheries to other industry sectors. Halibut, for example, has long provided a highly profitable hook and line fishery for residents from many coastal communities in Alaska and Washington. Foreign bycatch depressed halibut stocks in the mid-1970s, and the Council incorporated closed areas and a prohibition on retention in its early groundfish management plans. The Council subsequently applied bycatch caps (prohibited species caps or PSCs) to the foreign fisheries, and most of those restrictions were carried over to domestic groundfish fisheries. When attained, the PSC for a particular gear group closes that group's groundfish fishery. This keeps one segment of the fleet from impacting another through bycatch. Bycatch caps now are taken for granted as a management tool, but they did not come easy. The Council had to show that there was a net benefit to the nation from the caps. The Council insisted that there had to be protection for the traditional fisheries and their target species, and in the end prevailed when its proposed regulations were adopted by the Secretary in the mid-1980s.

Today, PSC limits still control the fisheries and close down lucrative groundfish fisheries prematurely each year, leaving millions of dollars of groundfish unharvested. Various provisions have been added to improve handling of prohibited species while on deck to improve survival, and to give fishermen incentive to fish cleanly. The next big step in controlling PSC bycatch may take the form of bycatch quotas for individual fishermen. Then each fisherman could fish as he desired without closing down the rest of the fleet. Such a system could be very effective, but it also would be very expensive and complex to monitor and manage.

The prohibition on retention of halibut (or other prohibited species) in the groundfish fishery often is decried as a waste of valuable resource. It must be viewed, however, as a less-than-perfect compromise that protects the traditional fisheries while allowing harvest of the vast groundfish resources. The directed halibut fishery will be managed under an individual fishing quota system beginning in 1995. Quotas and the halibut fisheries will take on even greater value, so it is doubtful that the Council will change its present system for controlling bycatch in the near future. It should be noted that there appears to be no biological problem with halibut because of bycatch. Bycatch mortality is deducted before setting the annual halibut harvest quota. Halibut has been well managed by IPHC, sustaining harvests at about 50 million pounds or more annually since 1985.

One thing to watch is the novel experiment with salmon bycatch underway in the BSAI where groundfish harvesters and processors are working voluntarily on a program that funnels salmon bycatch, after examination by an observer, to food banks for the needy. In the last half of 1994, 47 companies participated and 68,780 pounds of salmon were processed, packaged and delivered to an estimated 200,000 needy individuals through a network of welfare organizations. Industry also is paying a voluntary $20 assessment per chinook salmon into a fund to support research on stream of origin of the salmon and bycatch avoidance techniques.

Economic Discards

Economic discards and profligate waste, rather than regulatory discards, that has most elevated the bycatch issue to national and international prominence. Economic discards, as noted earlier, result from fishermen not having a market for a particular species, or insufficient equipment, time or inclination to process that species. Total groundfish discards for both Bering Sea/Aleutian Islands and Gulf of Alaska for 1993 were 335,759 mt or 16% of a total groundfish catch of 2,099,035 mt. Fifteen percent of the total harvest in the Bering Sea and Aleutians was discarded, 94% accountable to trawl, and 6% to fixed gear fisheries. In the Gulf of Alaska, 19% of the total harvest was discarded, 87% accountable to trawl, and 13% to fixed gear.

To place this discard in perspective, it should be noted that worldwide commercial fisheries discards are about 27 mmt, or 26% of total catch. Shrimp fishery-related discards are particularly flagrant, accounting for 35% of the discards. The Bering Sea sablefish pot, Bering Sea rock sole trawl, and Gulf of Alaska flatfish trawl are on the top twenty list. Conversely, among the ten lowest discard rate fisheries (expressed as a discard rate by weight) is the Bering Sea pelagic pollock trawl, Bering Sea cod pot, and Gulf of Alaska midwater pollock trawl fisheries. Though most Alaska groundfish fisheries have intermediate or low bycatch rates relative to other world fisheries, the very high volume of the fisheries yields very impressive discard weights.

Each fishery has a different reason for discards. For example, the BSAI rocksole fishery has about a 69% discard rate, one of the highest in the North Pacific. The market in the orient is best for the roe in the females, so the males and other species are discarded. For arrowtooth flounder, which is almost all discarded, the flesh turns to mush upon cooking because of enzymatic degradation. The species is very abundant off Alaska, and also is a voracious predator on other species, and yet it will not be utilized until inhibitors are developed to counteract the enzymes. Experiments are now underway to resolve this problem.

One last example is the BSAI pollock fishery. The midwater trawl fishery for pollock is a very clean fishery that has little bycatch of other groundfish or halibut or crab. The discard rate for pollock is relatively low. In the past it has been in the 9-10% range because many juvenile fish were present. In 1994 the rate was down to 1.8%, or 21,000 mt. This is a considerable reduction from the 89,000 mt discarded in 1991. Though this is very "pure" fishery, the discard rates will fluctuate depending on the presence of strong juvenile year classes. Because of the intermingling, it would be very difficult for harvesters to avoid bycatch. Industry thinks that the increased retention of pollock in 1994 could be attributed to higher production of fish meal, growth of a pollock year-class, or larger mesh sizes being used.

The Council is moving to address waste and discard in a comprehensive fashion. At its December 1994 meeting, it initiated an in-depth examination of a potential regulatory change that would prohibit discards of target groundfish. Retention standards would be developed and phased in over one to three years, possibly by mid-1996 at the earliest. The goal would be to achieve 100% retention. There also may be a utilization standard, with a minimum percentage of 50 to 90% processed for human consumption. Final action may be taken by the Council in December 1995. Secretarial review and approval would occur during the first six months of 1996, and the program could start in mid-1996, but more likely in 1997. It will concentrate on four fisheries to begin with: BSAI midwater trawl pollock, BSAI trawl rock sole, Gulf of Alaska flatfish trawl, and BSAI Pacific cod longline fisheries. When implemented, it will completely change the way the fisheries are prosecuted. Seasons will be longer, there will be much more product on the market, and it is hoped that fishermen will become more selective in their fishing patterns.

B. MANAGEMENT ACTIONS

Sablefish and Halibut IFQ Program

In 1994, the Council continued to address several aspects of the sablefish/halibut IFQ program scheduled to take effect in March 1995. Some of these actions were clarifications or affirmations of previous actions, while others initiated potential changes to the program. Fine tuning of this program will likely continue in the future and should be part of the Council's agenda in future meetings. Issues considered and approved by the Council in an omnibus amendment include the following:

1. Reaffirmed that the entity which existed in 1991 will be used for purposes of determining the nature of the business entity receiving an initial allocation of QS in southeast Alaska (IPHC Area 2C). This is to ensure that the owner-on-board provisions specific to this area not be circumvented.

2. Reaffirmed that catcher vessel QS/IFQ for sablefish (but not halibut) can be used on freezer vessels so long as no processed IFQ product is on board for that trip. This allows for freezing of non-IFQ species.

3. Clarified that all personal use fish, as well as that intended for sale, must be deducted from a person's IFQ account.

4. Initiated an examination of potential hardship provisions to the program.

5. Initiated an amendment to the program which would allow a one-time trade of QS/IFQ received under the CDQ compensation formula between parties in different regulatory areas.

6. Initiated an amendment to the program which would establish three Canadian ports where it will be legal to make U.S. IFQ landings: Port Hardy, Prince Rupert, and Vancouver.

7. Initiated an amendment to have an earlier opening date for the Aleutian Islands sablefish fishery than for other IFQ areas, which are scheduled to open March 1.

8. Initiated an amendment to examine possible changes in ownership caps for the Bering Sea and Aleutian Islands areas.

9. Confirmed that an underage provision, as well as the overage provision, should be included in the program, allowing fishermen to carry over some amount of unharvested IFQ from one year to the next.

10. Initiated an amendment to require hail weight accuracy for landings outside Alaska; also initiated an amendment to require hail weight estimates for landings inside Alaska.

11. Initiated a discussion paper to evaluate the differences between the current pollock Community Development Quota (CDQ) program and the future CDQ program for sablefish and halibut.

12. Declined to proceed with a proposal to consider CDQs for Gulf of Alaska communities.

13. Reiterated the need and intent to form a central point of registry for titles and liens on QS.

The Council also reviewed the status of various regulatory and plan amendments in progress relative to the sablefish and halibut individual fishing quota (IFQ) program for fixed gear. A new amendment was initiated by the Council which will examine an exemption from the Block Amendment for QS allocated as Community Development Quota (CDQ) compensation. The issue of a central registry for titles and liens on QS has been a topic of interest to the fishing industry, banking community and the Council over the past several meetings. NMFS reported to the Council that they are still examining the options for NMFS' involvement as the keeper of this registry, and whether it would be a mandatory or voluntary registry. The Council reiterated their desire that this be a central, mandatory registry kept and maintained by NMFS. An additional amendment is being prepared which will allow for freezing of non-IFQ species on vessels using catcher vessel IFQ (for sablefish) and will prohibit the use of halibut catcher vessel IFQ on freezer vessels.

On the issue of potential hardship considerations for the program, the Council received a report from NMFS outlining the various considerations which would be involved in opening up the program to hardship claims. The Council determined that the original qualifying period (which allowed eligibility based on any landing during a three year window from 1988-1990) was sufficient consideration, and that no additional hardship provisions would be considered for this program.

The Council took action to allow for exemption of the sablefish fixed gear fisheries from the halibut PSC caps. This regulatory amendment is being processed by NMFS and will be in place in 1995. This amendment was approved by the Council to eliminate the possibility of sablefish IFQ holders being unable to harvest their IFQs if the fixed gear cap is reached during the year. Because so many sablefish IFQ holders will also utilize halibut IFQ and retain their halibut bycatch, the total halibut bycatch mortality is expected to be lower than in previous years. The Council will still set PSC caps for the remaining fixed gear fisheries each year.

The Council reviewed and approved the Governor's recommendations for 1995-97 CDQ apportionments for halibut and sablefish.

The Council received a report on program implementation from NMFS Restricted Access Management (RAM) Division which indicates that the program is on schedule for a March 1 opening in 1995.

The Council also reviewed a report from the NMFS and the International Pacific Halibut Commission (IPHC) which described changes necessary to achieve consistency between the groundfish regulations and the halibut regulations, the latter of which are developed by the IPHC under the provisions of the Halibut Act. Many of these changes are administrative in nature and the Council approved the recommendations from staff regarding these items. Included in this list is the removal of trip limits in Area 4B, 4C, and 4E, which are considered unnecessary under the IFQ program. A few of the issues were more substantive in nature, and fall primarily under authority of the IPHC. As such, the Council will make recommendations to the IPHC on the following issues:

1. The IPHC staff will be proposing the continuation of clearance requirements for vessels fishing between areas in the BSAI. The Council voted to recommend to the IPHC that these clearance requirements continue.

2. Current regulations prohibit vessels from setting longline gear 72 hours prior to a halibut opening, if they intend to participate in the halibut fisheries. The Council approved a motion to recommend to the IPHC that the 72 hour prohibition continue, and that it would apply to vessels who intend to participate in directed sablefish and halibut fisheries.

3. Current groundfish regulations do not prohibit the use of hook strippers (crucifiers), while the halibut fishery regulations do prohibit them. For consistency under the joint sablefish/halibut IFQ fisheries, one of these regulations has to give! Because of the pace of fishing expected under the IFQ program, coupled with the nature of halibut handling relative to sablefish, it is not expected that hook strippers will be a negative factor in the IFQ fisheries. There are also safety advantages associated with the use of hook strippers in sablefish fisheries. For these reasons, the Council is recommending to the IPHC that the prohibition on hook strippers be lifted, for Areas 2C through 4E. Careful release regulations will remain in place for both fisheries.

Finally, on December 19, 1994, U.S. District Court Judge James Singleton rejected all ten points raised in a lawsuit brought against the U.S. Department of Commerce by the Alliance Against IFQs. Unless there is a successful appeal, this decision cleared the way for full implementation of the program in 1995.

Observer Program

The Council reviewed the North Pacific Fisheries Research Plan which will establish fees for groundfish, halibut, and crab fisheries to support observer coverage. The Plan was designed to become partially effective in 1995. Fees of up to 2% of exvessel value will be assessed, with observer coverage requirements continuing under current regulations. The first year of the program is designed to provide necessary start-up funding for the program, with full implementation in 1996. The program will require everyone to pay the fee in 1995, even if they are paying directly for observer coverage, with a rebate occurring in mid-1995 to those who paid both the fee percentage and paid directly for observer coverage.

This will require 'double payment' for some fishing operations, though they would be rebated at some point in the year. The Council will be recommending to the Secretary of Commerce that this proposed fee assessment and collection process be altered to remain consistent with the Council's original intent for the program; that there be no 'double payment' required. Instead, the Council is recommending that other alternatives be explored and specifically is recommending that fishing operations simply be allowed to deduct the amount of their direct payments from the fee percentage that they owe.

Other action by the Council included a review of the agency operating budgets for the Observer Plan, projections of fish prices and landings for 1995, estimates of costs of observer coverage for 1995, and finally, the projected fee percentage necessary for 1995 under the Plan. The fee percentage projected is at the maximum allowed, which is 2%.

A "start-up" year for the program will occur in 1995. Current observer requirements will remain in effect and direct payments to contractors still will be required by those vessels and processors that have already been doing so. Sufficient start-up funds must be generated in 1995 to allow full implementation of the Research Plan by January 1996. NMFS will continue to contribute towards the financial support of the observer programs, at least through fiscal year 1996. Actual costs paid by persons for direct observer coverage during 1995 will be fully credited to their portion of their fee liability and there will be no "double payments" by any component of the Research Plan fisheries in 1995. With these conditions in mind, the fees that will be applied to the various fisheries in 1995 are:

Bering Sea, Aleutian Islands, and Gulf of Alaska Groundfish Fisheries

1. One half of the fee percentage will be applied to retained catch by vessels less than 60 feet in length overall (LOA).

2. All catcher vessels 60 ft and over LOA are exempt from the half of the fee percentage that would otherwise be collected from these vessels.

3. One half of the fee percentage will be applied to the retained catch received by an on-shore processor or a mothership; however, each such processor may subtract its observer coverage costs from the processor's portion of its bimonthly bill.

4. The full fee percentage of 2% will be applied to the retained catch of a catcher/processor vessel; however, each such processor may subtract its observer coverage costs from its bimonthly bill.

Bering Sea and Aleutian Islands King and Tanner Crab Fisheries

1. The full 2% fee percentage will be applied to retained catch delivered to on-shore processors, floating processors, and crab caught or delivered to catcher/processors. However, each such processor may subtract its observer coverage costs from the processor's portion of its bimonthly bill.

2. Crab catcher vessels that participate in special-use permit crab fisheries are exempt from the half of the fee percentage that would otherwise be collected from these vessels for their catch in the special-use permit fisheries. Special-use fisheries are developing crab fisheries and less than 2 percent of the crab catcher vessels participate in them. They are required to obtain a special-use permit from ADF&G and to carry observers. Those developing fisheries are limited in scope and the associated observer coverage costs are insignificant relative to the total exvessel value of the crab fisheries.

Halibut Fishery

1. The full 2% fee will be applied to all retained catch in the halibut fishery.

The overall fee liability of 2% will be based on a standardized exvessel price for each species. There was discussion of an alternative method of basing the fee liability on the actual exvessel price as recorded on fish tickets, an option previously considered and rejected by the Council. This alternative will be examined in the future, with the possibility of amending the program at a future time.

Comprehensive Rationalization Plan

The Council reviewed progress on the current analyses of License Limitation alternatives for the groundfish and crab fisheries off Alaska. The current CRP initiatives are still centered around some form of a license limitation program, as a first step toward development of potential IFQ programs in the future. The original schedule called for a public review period in the fall 1994, with a final decision by the Council in January of 1995. Because of the multitude of possible elements and options within the license limitation alternatives, the Council has altered this schedule slightly to accommodate further public review and comment and expects to make a final decision in April or June 1995.

The Council reviewed the License Limitation alternatives developed over the last several meetings and identified specific elements and options of primary interest, though all of the elements and options listed will be available for the Council to choose from when they make a final decision on this proposal. Some new alternatives added at the December 1994 meeting will require additional analyses before public review commences. The complete analytical package for the License Limitation alternative will be released in February 1995 to allow for public review and comment before the final decision in April. That analytical package will include: (1) the baseline analysis (EA/RIR) dated September 18, 1994, with Appendices I-VI; (2) Appendix VII dated November 14, 1994, which highlighted specific alternatives identified by the Council in September, and provided additional analysis specific to those alternatives; (3) Appendix VIII dated November 14, 1994, which contained analyses specific to the proposed "A" and "B" license concept; and (4) a supplemental analysis specific to the alternatives highlighted in December by the Council.

Also included as part of the overall analytical package are the Community Profiles developed by the Council and the Fleet Sector Profiles and Preliminary Social Impact Assessment developed under contract by the Council. These documents are available now, upon request to the Council offices. An additional "bridging" document is being developed which will provide more specific information on the social impact aspects of the License Limitation alternatives under consideration.

Moratorium

The Council revisited its moratorium for the groundfish and crab fisheries. The moratorium was originally adopted by the Council in June 1992, and rejected by the Secretary of Commerce (SOC) in August 1994. At the September meeting, the Council submitted a revised moratorium to the SOC, which contained the following:

1. Remove halibut and sablefish from the moratorium when both species come under the IFQ program (i.e., landings of sablefish or halibut will not qualify a vessel to participate in groundfish and crab fisheries).

2. The appeals process for the moratorium will be the same as is outlined for the sablefish and halibut IFQ program.

3. The eligibility period for moratorium qualification will be January 1, **1988** through February 9, 1992 (as opposed to the original moratorium period of January 1, 1980 through February 9, 1992).

4. Crossovers are allowed between groundfish and crab fisheries (the Council did not change this aspect of the moratorium).

5. As originally proposed, the moratorium will sunset three years from the effective date.

In December the National Marine Fisheries Service Regional Director requested the Council consider changes to their revised moratorium to more fully address the concerns of the SOC as identified earlier. The Council unanimously endorsed the proposed changes, which are primarily aimed at limiting crossovers between groundfish and crab fisheries to those using the same gear types. The exact wording of the proposed changes are shown below:

1. A vessel that made a qualifying landing in the BSAI or GOA groundfish fisheries would be eligible to participate in the BSAI/GOA groundfish fisheries under the moratorium.

2. A vessel that made a qualifying landing in the BSAI crab fisheries would be eligible to participate in the BSAI crab fisheries under the moratorium.

3. A vessel that made a qualifying landing in the BSAI or GOA groundfish fisheries would be eligible to participate in the BSAI/GOA groundfish fisheries **AND** the BSAI crab fisheries under the moratorium providing:

(a) it uses only the same fishing gear in the BSAI crab fisheries that it used in the groundfish fisheries to qualify for the moratorium, and

(b) it does not use any fishing gear prohibited in the BSAI crab fisheries.

4. A vessel that made a qualifying landing in the BSAI crab fisheries would be eligible to participate in the BSAI crab fisheries **AND** the BSAI/GOA groundfish fisheries under the moratorium providing:

(a) it uses only the same fishing gear in the groundfish fisheries that it used in the BSAI crab fisheries to qualify for the moratorium, and

(b) it does not use any fishing gear prohibited in the BSAI or GOA groundfish fisheries.

5. A vessel that made a qualifying landing in the BSAI or GOA groundfish fisheries, and during the period February 9, 1992, through December 11, 1994, made a landing in the BSAI crab fisheries would be eligible to continue to participate in the BSAI crab fisheries under the moratorium using the gear with which the crab landing was made.

6. A vessel that made a qualifying landing in the BSAI crab fisheries, and during the period February 9, 1992, through December 11, 1994, made a landing in the BSAI or GOA groundfish fisheries would be eligible to continue to participate in the BSAI/GOA groundfish fisheries under the moratorium using the gear with which the groundfish landing was made.

This change in the revised vessel moratorium would allow limited crossovers of BSAI crab fishing vessels into the groundfish fisheries under the moratorium without those vessels having made qualifying landings in the groundfish fisheries. It also would allow limited crossovers of BSAI/GOA groundfish vessels into the BSAI crab fisheries without those vessels having made qualifying landings in those crab fisheries. For example, a vessel that made a qualifying landing in the BSAI crab fisheries using pot gear would be limited to using pot gear to harvest groundfish. Likewise, a vessel that qualified under the moratorium for a groundfish permit would be limited to using the same gear type it used in the groundfish fisheries to harvest crab as long as the gear was not prohibited in the BSAI crab fisheries. This limited crossover provision recognizes the similarity of the groundfish and crab fisheries in terms of pot fishing gear. It also would prevent a vessel from dramatically changing its configuration while the Council develops a comprehensive rationalization management program for groundfish and crab fisheries.

This change also would allow a vessel that qualified in one moratorium fishery and crossed over and landed fish in another moratorium fishery, in reliance on the Council's original moratorium proposal of June 1992, to continue to participate in the newly entered moratorium fishery. At the same time, it would prevent a crab pot fishing vessel that landed only BSAI crab during the qualifying period from entering the groundfish trawl fishery for the first time during the moratorium solely because of its qualifying crab landings while excluding other vessels, that had made landings in other FMP fisheries but had not made qualifying groundfish landings, from entering the groundfish trawl fisheries. Likewise, it would prevent a groundfish trawl fishing vessel that landed only groundfish during the qualifying period from entering the BSAI crab pot fishery for the first time during the moratorium solely because of its qualifying groundfish landings while excluding other vessels, that had made landings in other FMP fisheries but had not made qualifying crab landings, from entering the BSAI crab pot fisheries.

This change would address the Council's concerns about fishing vessels that entered into the proposed moratorium fisheries after the Council took its original action in 1992. The original cutoff date would be maintained.

Additional analyses, along with implementing regulations are being prepared by NMFS and Council staff. A proposed rulemaking should be published by the SOC sometime in early 1995, and will be subject to a public review and comment period. If approved, the moratorium would not likely be in place until 1996.

Inshore-Offshore Allocations

The Council discussed the inshore-offshore program which is scheduled to expire at the end of 1995 along with the pollock CDQ program. The alternatives which will be analyzed are (1) no rollover, and (2) rollover of the existing program as is, including the CDQ program, for a period of three years. The Council reviewed an analytical "game plan" for the proposed continuation of the inshore/offshore processing allocations for the Gulf of Alaska and the Bering Sea/Aleutian Islands, as well as the current pollock Community Development Quota (CDQ) program. Both of these management programs are scheduled to expire at the end of 1995. Final Council action on the proposed continuation of these programs is scheduled for June 1995. The Council developed a Draft Problem Statement at the December 1994 meeting.

Directed Fishing Standards

Directed fishing standards (DFS) limit the amount of a species that may be retained on a vessel when fishing for that species is restricted to bycatch only. The standards are expressed as a percentage of the total amount of fish and fish products on board. Retention over that percentage is considered evidence of a directed fishery for that species. The current DFS, which are highly specific for bycatch species, areas, and gears, are complex and difficult to enforce. To address this problem, NMFS developed a regulatory amendment to address DFS for all groundfish in the Gulf of Alaska and Bering Sea/Aleutian Islands area.

The Council reviewed an analysis of proposed changes to directed fishing standards and adopted an alternative that simplified DFS by using the same DFS for each species regardless of gear type or management area. The DFS for vessels using pelagic trawl gear would be eliminated. A matrix system to help fishermen identify the DFS would be updated as necessary on the NMFS bulletin board. Specific changes to DFS are listed below, and should be in effect for the 1995 fisheries.

Sablefish: The DFS for sablefish will be set at 15% relative to other deepwater species and at 1% relative to all other fish species.

Greenland turbot: The DFS for Greenland turbot will be set at 35% against rockfish, sablefish, deepwater flatfish, flathead sole, and rex sole, and at 1% against all other species.

Demersal Shelf Rockfish: The DFS for demersal shelf rockfish (DSR) in the GOA will be set at 1% against deepwater flatfish, rex sole, flathead sole, sablefish and other rockfish of the genera Sebastes and Sebastolobus plus 10% of the amount of each other fish species.

Rockfish: The DFS for rockfish (except DSR in the GOA) will be 15% against deepwater species (deepwater flatfish, rex sole, flathead sole, sablefish, rockfish, and Greenland turbot) plus 5% against all other species.

Other fish species: The DFS for all other fish species will be set at 20%.

With the exception of rockfish, the DFS based on aggregate groupings of target species will be eliminated and DFS would be established that are specific to each target species. NMFS will provide a matrix of DFS that plots each target species against each other target species. The revised regulations will define directed fishing as being greater than the indicated percent. Additionally, regulations will be revised so that when a fishery category reaches its specified prohibited species bycatch allowance the applicable DFS for the groundfish fishery will not be based on an aggregate grouping (except for rockfish, which would remain in the aggregate) but will be consistent with the species-specific DFS proposed.

Pollock 'A' Season Starting Date

The Council took final action on starting dates for the Bering Sea pollock 'A' season. They adopted a start date for the offshore pollock "A" season of January 26. This change also includes a provision for a 10 day waiting period for vessels fishing in the BSAI or GOA trawl fisheries or in the BSAI crab fisheries prior to January 26, so that any such vessels could not enter the "A" season offshore pollock fishery until after February 5th; CDQ vessels fishing before January 26 would not be subject to this regulation. These regulations will be in effect for the 1995 "A" season pollock fishery.

Total Weight Measurement

A draft analysis for a proposed regulatory amendment to improve total catch weight estimates in the groundfish fisheries was reviewed. The Council released the analysis for public review, with some suggested changes. Specifically, the Council recommended that additional analysis be done on using other approved procedures for determining total weight, such as volumetrics, as long as these procedures can determine total weight within a specified range of accuracy. The three alternatives analyzed include the status quo, all processors with 100% observer coverage would be required to weigh groundfish catch before any discard or processing, and all processors with at least 30% observer coverage would be required to weigh groundfish catch before any discard or processing. An option of requiring catcher vessels with 100% observer coverage to weigh groundfish discards is also considered under the alternatives is also included.

PSC Exemption for Jig Gear & PSC Reapportionment

Halibut PSC bycatch allowances for non-trawl gear in the BSAI area is allocated between Pacific cod and other non-trawl fisheries, including all pot and jig fisheries. Although hook and line fisheries for Pacific cod did not use all their allowance (725 mt) prior to a TAC closure, other non-trawl fisheries are likely to be shut down early when the PSC cap (175 mt) is reached. The Council requested that an Emergency Rule be implemented to allow the Pacific cod jig fishery to continue in 1994, without being shut down due to the hook and line halibut PSC cap. As such, the Council recommended that the jig fishery be exempted from the cap for 1994. Additionally, to allow continuation of the sablefish fishery in the Aleutian Islands, the Council requested an emergency reallocation of hook and line halibut PSC. Specifically, from all available PSC remaining in the BSAI, 50 mt are requested to be reallocated to the sablefish hook and line fishery.

Grid Sorting of Halibut on Trawlers

In October 1993, the International Pacific Halibut Commission (IPHC), Highliners Association, and the NMFS-AFSC conducted an experiment to evaluate methods of increasing survival of halibut taken as bycatch in bottom trawls. The experiment, conducted aboard the *F/T Northern Glacier*, involved sorting halibut from the groundfish catch more rapidly than currently practiced and evaluating subsequent changes in discard mortality rates. Results and implications of the study were reported to the Council in June. Based on these results, the Council has initiating analysis of a regulatory amendment to require improved sorting, by grid or other method, in order to improve survival of halibut discarded from bottom trawls.

Total Weight Measurement

The Council approved a regulatory amendment to improve total catch weight estimates in the groundfish fisheries. The total weight of all pollock harvested or processed by all processors while engaged in directed pollock fishing must be determined by weighing on a scale (that meets specific performance standards) prior to discard or processing. This would not apply to catcher vessels, only to catcher/processors, motherships and shore-based processors. Regulations fully implementing this requirement will not be in place until late 1996, or early 1997.

Trawl Mesh Regulations

The Council adopted a regulatory amendment that would require top panels of trawl codends to be constructed of single layer square mesh in trawl fisheries for Pacific cod, pollock, and rock sole. The objective of the proposed regulation is to reduce discarding in these fisheries, and to increase the usable portion of the catch. Minimum mesh sizes adopted were 6 inch (stretched, between-knot measure) for the BSAI rock sole fishery and the BSAI and GOA Pacific cod fisheries, and 3.25 inch for the GOA and BSAI pollock fisheries. The Council later modified their recommendations by concurring with industry suggestions that diamond mesh should also be allowed. The Council adopted an alternative that would require single layer, diamond or square mesh top panel codends with the same minimum mesh sizes between- knot measurements listed above.

To accommodate changes in bycatch rates that would likely be caused by a mesh regulation of the BSAI rock sole fishery, rock sole would be separated out from the other trawl category in the Vessel Incentive Program and assigned a maximum allowable rate. Some fishermen will be using the larger mesh in 1995, although regulations officially implementing the mesh size regulations won't be in place until 1996. Observer data from 1995 will be examined for effectiveness of these larger mesh sizes.

Full Retention/Full Utilization and Harvest Priority

Full Retention/Full Utilization (FR/FU) and Harvest Priority (HP) have been proposed to address bycatch and discards. The Council recommended further evaluation of these proposals, and a committee was established to further flesh out the alternatives and details of each program, focusing on four specific fisheries as case examples. These fisheries were Bering Sea/Aleutian Island (BSAI) pollock mid-water trawl, BSAI rock sole trawl, Gulf of Alaska (GOA) flatfish trawl, and BSAI Pacific cod longline fisheries.

The Council directed staff to analyze the BSAI rock sole and pelagic trawl pollock fisheries for improved retention and utilization. In addition to status quo, options for retention and utilization, and a timeline of implementation will be analyzed. Retention options include prohibiting discards of target species in subject fisheries and prohibiting discards of all target species in all fisheries. Options suggested for timelines include setting an effective date of January 1, 1996, or 1997, or a phase-in over three years to achieve 100% retention in the third year after implementation. Three minimum percentages of target species harvest which must be processed for human consumption will be analyzed: 50%, 70%, and 90%. These standards apply to the percentage of a delivery that would be processed into human consumption. In addition to these improved retention and utilization options, the Council directed staff to analyze seasonal apportionment of the rock sole TAC, with options of a 50/50 and a 40/60 split into roe and non-roe seasons.

Bering Sea/Aleutian Islands Groundfish Specifications

The Council adopted final groundfish specifications for the 1995 Bering Sea and Aleutian Islands (BSAI) groundfish fisheries, including Acceptable Biological Catches (ABCs), Total Allowable Catches (TACs), Prohibited Species Catch (PSC) limits, and apportionments. The Council recommendations for ABCs, TACs, and apportionments are based on the most current stock assessment information, as well as recommendations from the Plan Team, Scientific and Statistical Committee, and Advisory Panel.

Groundfish abundance in the BSAI remains relatively stable for most species. For 1995, the Council recommended a BSAI pollock TAC of 1,250,000 mt for the Eastern Bering Sea, with 45% to be allocated to the roe season ("A") and 55% to the non-roe season ("B"). The "A" season will begin on January 20 for the inshore fleet and January 26 for the offshore fleet. The "B" season will begin on August 15 for both sectors. The pollock TAC for the Aleutian Islands area is set at 56,600 mt, and 1,000 mt for the Bogoslof district (Area 518). The Council continues to recommend no directed fishing for pollock in the Bogoslof district. Based on a 7.5% allocation, the 1995 Community Development Quotas (CDQs) will be 93,750 mt for the Eastern Bering Sea and 4,245 mt for the Aleutian Islands area.

The annual specification process also includes an option to apportion the amount of pollock between pelagic trawl and bottom trawl fisheries, to control the bycatch of crab and halibut. Although no such apportionment has been made since 1990, the Council wished to notice the public that it may consider the possibility of making this apportionment in 1996. The Council will come back to this issue in April.

The Council also set a Pacific cod TAC of 250,000 mt for 1995, up from 1994's TAC of 191,000 mt. Under the TAC allocations of Amendment 24, 2% of the TAC will be reserved for jig gear, 44% for hook and line gear, and 54% for trawl gear. For the fixed gear seasonal apportionment of Pacific cod, the Council recommends that 68,000 mt be released during the first trimester (January 1 - April 30), 18,000 mt for the second trimester (May 1 - August 31), and 7,500 mt for the third trimester. The remaining 16,500 mt of this gear's allocation will be held in reserve.

The Council also set 1995 apportionments of prohibited species (halibut, herring, red king crab, and bairdi Tanner crab) catch limits for the designated trawl and non-trawl fisheries. The total PSC limit for herring (1,861 mt) is 1% on the estimated herring stock biomass in the eastern Bering Sea. Total PSC limits for other species are specified in the FMP, but modifications to apportionments among designated fisheries are allowed under the annual specification process. Halibut PSC bycatch is tabulated in terms of halibut discard mortality, rather than total halibut handled. The Council recommended that NMFS manage the fisheries, except longline Pacific cod, using the same discard mortality rates that were used in 1994, subject to re-evaluation and revision in June. The halibut discard mortality rate in the Bering Sea and Aleutian Islands and Gulf of Alaska will be set at 12.5% to reflect new careful handling and release rules. The halibut PSC limit for the non-trawl fisheries is set at 900 mt of mortality. The Council recommended that 725 mt of the non-trawl fisheries cap be placed in the Pacific cod hook and line fishery, and the remaining 175 mt be allocated to other non-trawl fisheries, including turbot and rockfish. The Council apportioned the halibut PSC cap for the Pacific cod fishery by recommending 475 mt for the first trimester, 40 mt for the second trimester, and 210 mt for the third trimester. Any unused PSC from the first trimester would be reapportioned to the third trimester. The Council recommended that sablefish hook and line fisheries, and jig gear fisheries be exempt from the non-trawl halibut PSC program for 1995.

Gulf of Alaska Groundfish Specifications for 1995

The Council approved the final Stock Assessment and Fishery Evaluation (SAFE) document for the 1995 Gulf of Alaska (GOA) fisheries. The pollock ABC was reduced to 65,360 mt for 1995 from 109,300 mt in 1994. This recommendation was based on a new stock assessment which calculated an ABC based on the fishing mortality rate that produced a minimal (5%) probability of falling below the threshold spawner biomass level in the long term. This exploitation strategy was chosen because of recent trends of poor recruitment of Gulf of Alaska pollock and ecosystem considerations. Biomass projections would be below threshold by 1997 without reduced fishing mortality. The approved TAC was set at the ABC level of 65,360 mt. The 1993 trawl survey noted a westward geographic shift in the pollock biomass, resulting in different ABC distributions between the West/Central areas (i.e., a shift of the largest concentration of pollock biomass from the Kodiak area in 1990 to the Shumagin area in 1993) and may reflect migration of Eastern Bering Sea pollock into the Gulf.

The Pacific cod ABC for 1995 increased to 69,200 mt from 50,400 mt in 1994. A new stock assessment was used for estimating Pacific cod ABC for 1995, incorporating a higher biomass estimate and natural mortality rate (the same as used for Eastern Bering Sea Pacific cod). This resulted in a higher ABC, although the stock has been in a period of decline since 1987. The approved TAC was set at the ABC level of 69,200 mt. The TAC was apportioned by management area approximately as the 1993 survey biomass was distributed: 29% in the Western area, 66% in the Central area, and 5% in the Eastern area.

Conservative exploitation rates were also recommended for Pacific ocean perch (POP) and other slope rockfish. Based on recommendations by ADF&G, the Council deferred setting a TAC for POP until a later meeting, set TAC for other slope rockfish equal to the 1994 TAC (2,235 mt) to be further adjusted downwards by NMFS to restrict harvest of other slope rockfish to bycatch only in fisheries for other species, and set thornyhead (1,900 mt) and shortraker/rougheye (1,910 mt) for bycatch only. The Council has recommended an amendment to the Gulf groundfish plan to allow setting TAC for POP not to exceed the current method for calculating POP TAC from the rebuilding schedule. Currently, the rebuilding schedule is set in the Gulf plan and cannot be adjusted by the Council without an amendment or emergency action.

The Prohibited Species Catch (PSC) limits for halibut in the Gulf of Alaska are set by gear type and may be apportioned seasonally over the fishing year. For 1995, the Council recommended the following PSC apportionments for the Gulf of Alaska groundfish fisheries.

Trawl		Hook and Line*	
1st quarter	600 mt (30%)	1st trimester	250 mt (26.7%)
2nd quarter	400 mt (20%)	2nd trimester	30 mt (66.7%)
3rd quarter	600 mt (30%)	3rd trimester	20 mt (6.7%)
4th quarter	400 mt (20%)		
TOTAL	2,000 mt		300 mt

*includes 10 mt for demersal shelf rockfish

Season	Shallow Water	Deep Water	Total
Jan 20 - Mar 31	500 mt	100 mt	600 mt
Mar 31 - Jun 30	100 mt	300 mt	400 mt
Jun 30 - Sep 30	200 mt	400 mt	600 mt
Sep 30 - Dec 31	no apportionment		400 mt
TOTAL	800 mt	800 mt	2,000 mt

The Council approved initiating a regulatory amendment to exempt the IFQ sablefish fishery from the halibut PSC requirement, subject to annual review. The lowered PSC cap for hook and line gear includes 10 mt for demersal shelf rockfish fisheries in the Southeast Outside District, to be taken throughout the year. The second trimester apportionment will again be released coincident with the opening of the sablefish season on May 15, and will end on August 31. The third trimester apportionment will be released on September 1. As in 1993 and 1994, pot gear will be exempt from the halibut PSC limits. The Council approved 1995 discard mortality rates recommended by the International Pacific Halibut Commission for all GOA gear, except for 12.5% for the Pacific cod hook and line and 55% for the Pacific cod trawl fisheries, which were the rates used for those fisheries in 1994. Discard mortality rates will be reexamined in June 1995 to incorporate 1994 in-season data and may be adjusted then for the remainder of the year.

C. NORTH PACIFIC COUNCIL ISSUES AT A GLANCE FOR 1995

1. Limited Access and Comprehensive Rationalization

Sablefish and Halibut Fixed Gear Individual Fishing Quotas: Fishery commences March 15 using IFQs. Regulations may be adjusted for 1996 after this shakedown year.

Moratorium: The original proposal was disapproved by the Secretary. The Council adjusted the proposed moratorium in September and December 1994, and will submit it to the Secretary in February 1995 for approval and implementation by 1996.

Groundfish and Crab License Limitation: Many alternatives are being considered for a potential license limitation system for groundfish and crab. Analyses will go to formal public review in March 1995 and Council final action may occur in April (or June). Secretarial review probably will not begin until late summer. If approved, program administration, notification, and appeals would be completed in 1996. The system could be in place for 1997 or 1998.

Inshore-Offshore Pollock/Cod Processing Allocations and Pollock CDQ Program: Current allocations will expire at the end of 1995. A continuation is being analyzed and will go to public review after the April meeting. Final decision in June. If approved, inshore-offshore and pollock community development quotas would continue for another three years beginning January 1, 1996.

Groundfish and Crab Individual Fishing Quotas: Study of alternative systems may begin in September 1995 after decisions have been made on licenses and inshore-offshore. Council decision is likely in 1996. Program administration, notification and appeals would occur in 1997, and implementation might occur in 1998. This schedule could vary considerably depending on complexity of program, number of species covered, and relationship to the license limitation program.

Demersal Shelf Rockfish License Limitation: A separate license limitation program has been proposed for a small rockfish fishery off Southeast which is managed jointly by the Council and ADF&G. The State of Alaska is performing the analysis which will be initially reviewed by the Council this fall.

2. Conservation and Rebuilding

Overfishing Definitions: The Council's Scientific and Statistical Committee is reviewing the groundfish overfishing definitions to determine if they can be improved.

Ecosystems Management: Groundfish plan teams have been developing more comprehensive information on ecosystem management for inclusion each year in the Council stock assessment documents. The SSC will be reviewing ways to improve that information during 1995.

Rebuilding POP: The Council already has approved a 14-year rebuilding plan for Pacific ocean perch in Gulf of Alaska. Minor adjustments may be made in 1995 to require bycatch-only and not allow any target fishery.

Capelin Prohibition: Capelin is a forage fish that is prey to many other fish species and marine mammals. The Council is considering a prohibition on any development of that fishery, because of the importance of capelin to Steller sea lions.

Crab Rebuilding: The Council has established a committee of groundfish and crab plan teams to review information on various sources of crab mortality and significant influences on crab abundance that would aid the development of a rebuilding plan for the crab resource.

3. Bycatch, Discard and Waste

Full Retention/Utilization: An in-depth examination was initiated in December 1994. Extensive discussion is scheduled for the April 1995 meeting when the Council will determine which alternatives to analyze formally. Retention and utilization standards would be developed and incentives explored. Implementation could occur sometime in 1996 or 1997.

Harvest Priority: Being examined concurrently with the full retention/utilization initiative, this proposed program would grant additional fishing privileges to vessels meeting certain "clean fishing" standards. Further discussion and review of legal hurdles are scheduled for April 1995.

Crab Bycatch: Emergency action was taken in November 1994 to close an area in Bristol Bay to groundfish trawling to protect king crab stocks. In-depth examination of adjustments in bycatch limits for all species of crab and alternative closed areas will occur in 1995 for possible implementation in 1996. Long range rebuilding strategies will also be developed in 1995. Crab bycatch also is limited in the scallop dredge fishery.

Salmon Bycatch: Salmon is a prohibited species in the groundfish fishery. In January 1995, the Council approved bycatch limits and a trawl closure to limit bycatch of chum salmon, to be implemented for the pollock "B" season in the Bering Sea. Final decision on bycatch limits for chinook salmon will be made at the April 1995 meeting.

Halibut Grid Sorting: The Council is considering a regulatory proposal to require grids to be placed over fish receiving holds so halibut can be sorted quickly and returned to the sea with increased survival. An ad hoc working group is examining the need for observers and changes in the vessel incentive program and will report back in April. New regulations, if approved, could be in place for 1996, but more likely 1997.

Minimum Mesh Size for Trawl Codends: Minimum mesh sizes for pollock, rock sole, and cod trawl fisheries were approved by the Council in December 1994. The proposed rule being prepared for possible implementation in 1996.

Pribilof Trawl Closure: Closed area around the Pribilofs to protect blue king crabs and forage for seabirds was approved by Council in 1994. The Secretary has approved the closure and implemented it in January 1995.

Careful Handling/Release of Halibut: The Council approved a regulation requiring careful release of halibut on longliners. Implemented initially on May 18, 1993.

4. Reporting and Monitoring

Seamount Fisheries Restrictions: In January 1995, the Council approved requirements for vessels fishing sablefish on seamounts in Gulf of Alaska to carry NMFS-provided transponders and offload fish before fishing in the EEZ. Regulations under preparation; will be implemented sometime in 1995.

Observer Fee Program: This will be the startup year for the observer fee program. Next year it will be fully operational. The Council will probably make adjustments for 1996 after this first year in operation.

Total Weight Measurement: In October 1994, the Council approved requirement for all processors in the directed pollock fishery to weigh all pollock harvested on a scale. Will be fully implemented in late 1996 or early 1997.

5. Allocations

Halibut Charter Boat Cap: The Council is considering catch limits for the guided charterboat industry and possibly for all recreational fisheries. Analysis of options will be presented in December 1995 or January 1996.

Inshore-Offshore and CDQs: As noted above under limited access, the Council will take final action in June 1995 on rolling over the inshore-offshore allocational split for pollock and cod, and the CDQ program for another three years. The current program lapses at the end of 1995.

ATTACHMENT E

ACCOMPLISHMENTS OF THE TECHNICAL SUBCOMMITTEE OF THE CANADA-U.S. GROUNDFISH COMMITTEE, 1960-84

by

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A. INTRODUCTION

The Technical Subcommittee (TSC) was created by the International Trawl Fishery Committee (now the Canada-U.S. Groundfish Committee) at the latter's initial meeting in Seattle, Washington, on November 4, 1959. The TSC first met in Portland, Oregon, on January 19-20, 1960. Dr. K. S. Ketchen (Canada) served as Chairman. Member agencies at the time were the Fisheries Research Board of Canada (now Department of Fisheries and Oceans), Washington Department of Fisheries, Fish commission of Oregon (now the Oregon Department of Fish and Wildlife) and the California Department of Fish and Game. In 1972, two more agencies became members -- Alaska Department of Fish and Game and the U.S. Bureau of Commercial Fisheries (now the National Marine Fisheries Service).

The TSC has met at least annually since 1960, and submitted a processed report of each meeting to its Parent Committee.

The Terms of Reference of the parent committee, and perforce, of TSC, were as follows:

1. To review proposed changes in trawl regulations affecting fisheries of mutual interest before they are implemented.

2. To review the effectiveness of existing regulations.

3. To exchange information on the status of bottomfish stocks of mutual concern and to coordinate wherever possible programs of research.

4. To recommend the continuance and further development of research programs in order to provide a basis for future management of the trawl fishery.

These terms of reference did not apply to Pacific halibut, whose research and management are the responsibility of the International Pacific Halibut Commission.

The Terms of Reference remained unchanged until 1981 when modifications were approved by the member Governments to acknowledge the new management regimes arising form the 1977 promulgations of 200-mile economic zones by Canada and the United States. Following are the new terms of Reference:

1. Exchange information on the status of groundfish stocks of mutual concern and coordinate, whenever possible, desirable programs of research.

2. Recommend the continuance and further development of research programs having potential value as scientific basis for future management of the groundfish fishery.

3. Review the scientific and technical aspects of existing or proposed management strategies and their component regulations relevant to conservation of stocks or other scientific aspects of groundfish conservation and management of mutual interest.

4. Transmit approved recommendations and appropriate documentation to appropriate sectors of Canadian and U.S. governments and encourage implementation of these recommendations.

There was no change in the status of Pacific halibut, but representatives of IPHC have been regular attendees, as observers, at TSC meetings, since 1969.

The TSC has exhibited considerable flexibility in reacting to the diverse problems of the dynamic groundfish fishery off western Canada and the United States. It has coordinated coastwide fishery statistics and research projects; created working groups to deal in depth with specific problems; scheduled workshops at which appropriate specialists met to jointly deal with specific problems and exchange data and information; and provided an on-going forum for exchange of data, procedures, and regulations. The TSC has identified problems associated with the utilization and management of groundfish resources of importance to both countries, often well in advance of the public or agency awareness. Significant were the concerns expressed in 1962 by the TSC over the development of foreign fisheries and recommendations for stock assessments. TSC-coordinated Canada-U.S. research on Pacific ocean perch provided the basis for negotiation of bilateral fishing agreements between the United States and Japan and the USSR. Furthermore, the continually updated information provided the basis for quotas imposed in 1977 by Canada and the United States when they both promulgated their 200-mile zones of extended jurisdiction.

The importance of groundfish research and management activities was also recognized as both nations supported increases in effort. Combined agency staffs increased from 17 in 1960 to over 150 in 1983. In 1983, the TSC recommended that economists from each nation be invited to attend future meetings as observers. Both nations sent economists to the 1984 TSC meeting.

B. COORDINATION

The single most important coordinated project was that of creating the PMFC Groundfish Data Series (1956-date). This project began at the 1960 meeting and resulted in the annual publication of groundfish landings by species by month by TSC established International Statistical Area. Initially these records were limited to trawl landings in the California-B.C. Region (Areas 1A-5E), but were expanded to include groundfish landings of all gear (1973), and expanded northward in 1975 to include all of Alaska (Areas 7A-8C). A further refinement in 1982 was reporting annual landings of "other" rockfish (other than Pacific ocean perch) by species.

Coordinated coastwide research projects, not handled by working groups or workshops, are listed chronologically below:

1960. Petrale sole stock delineation (tagging) and stock assessment to evaluate effectiveness, and problems associated with, the winter closure promulgated in 1958 for the B.C.-Oregon region. Results of the analyses led TSC to recommend abolishment of the closure.

1962. Reviewed stock assessments of Pacific cod, and concluded that the substantial decline in abundance was not due to the fishery, and hence no regulations were necessary.

1964. Recommended coastwide stock-delineation analysis of English sole, based on tagging. Results were published in PMFC Bulletin 7 (1969).

1965. Recommended compilation of a groundfish bibliography. Result was published as FRBC Tech. Rep. 246 (1971).

1967. Noted that: 1) collecting trawling effort by depth, as well as area, might eliminate the necessity of using qualification levels; and 2) catch-per-unit-effort as a measure of abundance has serious disadvantages, and a better measure is needed. In 1983 Canada published a report which utilized for the first time the depth arrays of landings and effort to allot trawling effort in a mixed-species fishery (Can. J. Fish. Aquat. Sci. Vol. 40).

1968. Continuing discussions of age-determination problems led U.S. agencies to establish an age-reading center in Seattle, Washington. Canadian specialists assisted in training readers to interpret Pacific ocean perch otoliths.

1969. Coordinated agency-wide update on sablefish stock assessments and an FRBC-WDF stock assessment of Pacific cod in Area 3C.

1972. Coordinated agency-wide reports on groundfish ageing techniques, biology of other rockfish, Area 3C lingcod stock assessment, and sablefish research programs.

1973. Coordinated coastwide sablefish tagging, for stock delineation.

1976. Coordinated joint Canada-U.S. field test of biomass-estimation techniques on Pacific ocean perch in Queen Charlotte Sound.

Coordinated preparation of other rockfish bibliography, published as FRBC Tech. Rep. 659 (1976).

1977. Coordinated joint Canada-Poland-U.S. field calibration of hydroacoustic equipment aboard the R/Vs G. B. REED, PROFESSOR SEIDLECKI, and MILLER FREEMAN, September 1977.

1979. Coordinated joint Canada-U.S. trawl survey of rockfish in the Dixon Entrance-Cape Ommaney Region, September 1979.

1960-80. Coordinated recommendations of regulations concerning stocks of mutual concern with respect to domestic and foreign fleets. Particular attention was paid to Pacific ocean perch.

1984. Recommended that a fishery economic report be submitted annually by each country beginning in 1985.

Coordinated species endorsements for the break and burn otolith age determination method.

1985. Established a Dover sole working group for the purpose of defining stock elements coastwide using all available tag recovery information.

1986. Coordinated division of PFMC area 3C and INPFC Vancouver area into national components: 3C-S (US) and 3C-N (Canada); Vancouver -S (US) and Vancouver-N (Canada).

Recognized Mr. Jergen Westrheim and Mr. Tom Jow for their long-standing involvement in the TSC and numerous contributions. Both would be retiring within the year.

1987. The move to establish a POP working group was abandoned. Nothing further could be accomplished considering state of stock (low) and current management strategies.

Recommended that management agencies make attempts to determine bycatch, bycatch mortality and at-sea discard rates in all groundfish fisheries.

Re-affirmed its endorsement of CARE.

1988. Established a yellowtail rockfish working group charged to produce a joint Canada-US stock assessment.

Coordinated effort to revise the TSC agenda to focus more on transboundary stock issues and research; eliminate the US section meeting as being redundant; and not request annual economic reports.

Recommended to the Parent Committee that it request participation in TSC meetings of appointed representatives from the NPFMC, PFMC, and appropriate Canadian counterparts.

1989. Recommended to Parent Committee that respective national managers begin deliberations on whiting allocation.

Dover sole working group tagging report completed. Working group dissolved.

1990. Accepted Pacific whiting working group report; recommended continued research on this species.

Recommended that a Dover sole working group be formed to develop a protocol for age validation for this species.

Recommended that a sablefish symposium be developed for early 1992.

Again recommended that managers deliberate whiting allocation.

Recommended to the whiting working group that they include adjustments for northern biomass; examine adequacy of survey area; and correction for inaccuracy in survey measured biomass.

1991. Recommended that a sablefish symposium be held in April 1993.

Recommended that OTC injection for age validation of Dover sole and other important flatfish be undertaken in the upcoming 1992 flatfish survey.

Recommended that CARE include agencies not now attending the annual meeting. The TSC also encourages CARE to establish a systematic program to investigate otolith edge formation.

Reiterated the need for rapid settlement of whiting allocation between the two countries.

Recommended that the HAL database be given one final review by contributing agencies and, subsequent to review, be made available upon request.

1992. Recommended that the cooperation between U.S. and Canadian scientists continue in the hydroacoustic survey of Pacific hake and that the two agencies (DFO and NMFS) cooperate in the design and implementation of surveys to assess other transboundary stocks, e.g. yellowtail rockfish, sablefish, etc. In particular, the utility of expanding the U.S. bottom trawl survey into Canada should be examined.

Recommended that member agencies direct significant efforts toward research validating the ageing criteria for thornyheads and rockfish species.

Recommended measures to assure the success of planned Dover sole age validation involving release of tagged and OTC injected (or otherwise marked) fish. Measures included restricting releases to 2-3 sites with substantial fishing activity to facilitate recoveries and suggested release platforms.

Recommended that a rockfish management workshop be convened to discuss rockfish management options and to advocate appropriate measures to manage this valuable marine resource.

Recommended that Canadian and U.S. managers initiate discussions to develop management plans in their respective countries to insure that conservation mandates are met with regard to yellowtail rockfish.

Recommended that the U.S. section of the Parent Committee take steps necessary to initiate the development of standard, well-documented approval procedures for using oxytetracycline (OTC) to mark otoliths of fish for age validation purposes. CARE was instructed to provide technical assistance as necessary in communications with the FDA.

Once again, recommended bilateral discussions between Canadian and U.S. governments on allocation of Pacific hake resume as soon as possible and encouraged work towards agreement to resolve allocation before conservation issues become more serious.

1993. Provided guidance to CARE by responding to recommendations from that group. Recommendations dealt with alternative compounds for marking otoliths for validation, establishment of radiometric capabilities, utilization of imaging technology, documenting otolith exchange information, and publication of the CARE Ageing Manual.

Reaffirmed the need for age validation of Dover sole and arrowtooth flounder, raising the possibilities of alternative methods such as radioisotope dating and use of alternative otolith marking compounds.

Provided clarification on the purpose of the rockfish management workshop for the Parent Committee, explaining the consensus that the focus should be on management approaches for nearshore rockfish stocks and discouraging presentations on rockfish biology as inconsistent with the objectives of this workshop.

Reaffirmed its recommendation to the Parent Committee to pursue a standard, well-documented procedure with the FDA for approving the use of OTC for fish age validation.

Noting that the combined Canada/U.S. harvest of Pacific hake continues to exceed the ABC and that this level of harvest is considered undesirable, recommended that bilateral negotiations again be encouraged to arrive at a quick resolution to this issue.

1994. Recommended to itself measures to facilitate timely exchange and dissemination of the information in agency TSC reports. The objective of this was to minimize routine reporting of activities and allow discussions during the annual TSC meeting to focus on addressing issues of concern solicited from member agencies and the Parent Committee in advance of the meeting.

Recommended that the two previous (1984 and 1992) reports detailing the accomplishments of the TSC, be combined, updated to the present, and submitted to the TSC.

Recommended that the Parent Committee contact the California Department of Fish and Game and urge continued participation in the TSC.

Supported wide distribution of the Nearshore Rockfish Management Workshop summary document. Noting that all objectives of the workshop were not achieved, the TSC recommended that a future workshop should be considered to identify management alternatives for nearshore rockfish and other species in the absence of reliable fishery and biological data.

Reiterated their concern and recommendation for quick resolution of the Canada/U.S. Pacific hake allocation issue.

Provided guidelines to CARE to improve communication of their accomplishments to the TSC in the form of improved meeting minutes, an annual summary of activities, and a documentation of their history and accomplishments.

C. WORKING GROUPS

As the groundfish fisheries increased in complexity, the TSC responded by creating working groups to undertake specific problems, deal with them between meetings, and usually submit written reports to subsequent meetings. During 1969-89, TSC created 20 temporary working groups, and in 1982, a standing group called CARE (Committee of Age Reading Experts) was created. Following is a chronological list of working groups:

	WORKING GROUP	TIME ESTABLISHED	RESULTS
1.	Lingcod stock assessment in Area 3C	1969	Report submitted at 1970 TSC Meeting
2.	Sablefish stock assessment, coastwide	1969	Report submitted at 1970 TSC Meeting
3.	Pacific ocean perch stock assessment, B.C.-Oregon	1970	Report submitted to 1972 TSC Meeting, 1972 INPFC Meeting, and published as FRBC Tech. Rep. 369 (1972)
4.	Pacific ocean perch stock assessment -- II. B.C.-Oregon	1973	Report submitted to 1974 TSC Meeting, 1974 INPFC Meeting, and published as FRBC Tech. Rep. 690 (1977)
5.	Pacific cod stock assessment in Area 3C	1973	Report submitted to 1974 TSC Meeting
6.	Identify species and areas of concern other than Pacific ocean perch and sablefish	1973	Report submitted to 1974 TSC Meeting
7.	Other rockfish species composition, landings, effort, and LPUE	1975	Report submitted to 1977 TSC Meeting, 1977 INPFC Meeting, and published as WDF Tech. Rep. 34 (1977)
8.	Pacific cod/lingcod/petrale sole multispecies stock assessment in Area 3C	1976	Postponed due to priority changes in one agency. Dissolved in 1978.
9.	Pacific cod/lingcod/rock sole multispecies stock assessment in Areas 5A and 5B	1976	Postponed due to priority changes in one agency. Dissolved in 1978.
10.	Sablefish statistics, biology, and stock assessment	1977	Report submitted to the 1978 TSC Meeting

	WORKING GROUP	TIME ESTABLISHED	RESULTS
11.	Shelf rockfish stock assessment	1977	Reported to Interim 1977 TSC Meeting
12.	Pacific ocean perch	1977	Report submitted to 1978 TSC Meeting
13.	Pacific ocean perch stock assessment in Area 3C	1981	Report submitted to 1982 TSC Meeting
14.	Pacific hake stock assessment, coastwide	1981	Report submitted to 1982 TSC Meeting
15.	Sablefish stock assessment, coastwide	1982	Report submitted to the 1983 TSC Meeting
16.	Sablefish tagging evaluation	1983	Report submitted at 1984 TSC Meeting
17.	Pacific whiting. Joint Canada-US stock assessment with special attention to a technical fix on migration.	1981	Progress report submitted to TSC in 1989. Work was to continue.
18.	Dover sole. Stock delineation using all tag return data from all west coast studies.	1985	Accepted for publication by the North American Journal of Fisheries Management, 1990.
19.	Yellowtail rockfish. Provide joint Canda-US stock assessment.	1988	Progress report submitted to TSC in 1990.
20.	Dover sole. Develop protocol for Dover sole age validation.	1989	No progress as of April 1992.

D. WORKSHOPS

During 1978-94, eleven workshops have been scheduled by TSC to provide opportunities for specialists to meet and deal with specific technical problems. Following is a chronological list of workshops:

	WORKSHOP	TIME	PLACE
1.	Age determination	April 1978	Nanaimo, B. C.
2.	Hydroacoustics	April 1978	Seattle, WA
3.	Sablefish	February 1978	Seattle, WA
4.	Recreational fisheries	1980	Monterey, CA
5.	Lingcod	1981	Nanaimo, B.C.
6.	Pacific hake (whiting)	1982	Seattle, WA
7.	Age determination I	January 1983	Pacific Grove, CA
8.	Age determination II	April 1983	Seattle, WA
9.	Age determination III	August 1983	Nanaimo, B.C.
10.	Sablefish Symposium	April 1993	Seattle, WA
11.	Rockfish Management	April 1994	Portland, OR

E. EXCHANGES

1960 Synopsis of otter trawl regulations in effect January 1, 1960.

1961 Summary of petrale sole tagging experiment results.

1962 Summaries of recent petrale sole taggings and returns.

1963 Catalogue of market sampling techniques used by Canada, Washington, Oregon, and California.

Revised summary of otter trawl regulations in effect July 1, 1963. Preliminary results of tagging experiments of all agencies (exchanged annually after 1963).

1966 Groundfish tag release inventory, 1955 onward (updated annually). Preliminary results of completed tagging experiments.

1969 Synopsis of otter trawl regulations in effect July 1, 1969.

1970 Synopsis of otter trawl regulations and their rationale as of July 1, 1970.

1971 Historic trawl fishery data of all agencies. Current market sampling techniques of all agencies.

1975 Summary of coastal groundfish regulations in effect July 1, 1975.

1979 List of reports published by TSC agencies for the past year (appended to TSC annual report 1979 and annually thereafter.

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