

SOUTHWEST FISHERIES CENTER

NATIONAL MARINE FISHERIES SERVICE

SOUTHWEST FISHERIES CENTER

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AUGUST 1986

REPORT OF A MEETING ON WEST COAST GROUND FISH RESEARCH COORDINATION

By

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SUMMARY

Fourteen scientists involved in West Coast Groundfish research from the Northwest and Alaska Fisheries Center (NWAFC) and the Southwest Fisheries Center (SWFC), met at Tiburon, California, 7-8 August 1986. The objective of the meeting was to develop an operational plan for coordinating compatible research activities of the NWAFC and the SWFC on Pacific coast rockfish, flatfish, and sablefish.

The group outlined research objectives for the next five years utilizing existing resources and discussed activities needed to address these objectives. They also outlined areas where cooperation already exists between the two Centers and new areas where future cooperation would be advantageous and feasible. In addition, they discussed and identified areas where future joint program planning would be possible. It was decided that sablefish was the best subject for a joint research program between the NWAFC and the SWFC, and that a research-planning document will be prepared in October and November, 1986, that will cover stock-assessment techniques and associated research and establish priorities and responsibilities for sablefish work in the short term. It was decided that a final, comprehensive planning document on West Coast sablefish research would be prepared after the amended sablefish section of the PFMC Groundfish Management Plan is completed by the Groundfish Management Team in March 1987. Other areas suggested for joint sablefish research were investigations relating to fish condition ("soft flesh"), age validation, mesh sizes, and economic evaluations of management decisions.

INTRODUCTION

The Groundfish Research Coordination Meeting, held 7-8 August 1986 at the Tiburon Laboratory, was the first of a continuing series of joint meetings between the West Coast Centers, in accord with a recommendation contained in the draft NMFS West Coast Groundfish Program Plan. It also followed a recommendation by the Select Committee engaged to review SWFC programs to have NWAFC and SWFC program leaders meet to consider what the Centers can jointly apply to Washington-Oregon-California groundfish management problems, and how they can be integrated among the various NMFS research groups. Participants at the Coordination Meeting are listed in Table 1.

PROCEEDINGS

On the first day of the meetings, the group collectively listed what they considered to be major objectives for West Coast groundfish research that could be addressed both independently and/or jointly by the two Centers. A list of these objectives, annotated to provide major points discussed in their formulation, is provided in Appendix I. After a review of the various groundfish activities/Tasks at the NWAFC and the SWFC, the group listed areas where cooperation already exists between the two Centers (Appendix II) and identified new areas for future cooperative study (Appendix III).

It was agreed that the best subject for a joint NWAFC/SWFC program would be sablefish. The major elements of a short-range joint sablefish plan would be to 1) conduct field evaluations of different methodologies

TABLE 1.--Participants in NMFS West Coast groundfish research
coordination meeting.

Mr. Norman Abramson Southwest Fisheries Center Tiburon, CA 94920	Dr. William Lenarz Southwest Fisheries Center Tiburon, CA 94920
Mr. Peter B. Adams Southwest Fisheries Center Tiburon, CA 94920	Dr. Richard Marasco Northwest & Alaska Fisheries Center Seattle, WA 98115-0070
Mr. Tom Dark Northwest & Alaska Fisheries Center Seattle, WA 98115-0070	Dr. Richard Methot Southwest Fisheries Center La Jolla, CA 92038
Dr. John Hunter Southwest Fisheries Center La Jolla, CA 92038	Dr. Jerrold Norton Southwest Fisheries Center Pacific Fisheries Environmental Group Monterey, CA 93940
Dr. Edmund Hobson Southwest Fisheries Center Tiburon, CA 94920	Ms. Susan Smith Southwest Fisheries Center Tiburon, CA 94920
Dr. Daniel Huppert Southwest Fisheries Center La Jolla, CA 92038	Dr. Gary Stauffer Northwest & Alaska Fisheries Center Seattle, WA 98115-0070
Mr. Susumu Kato Southwest Fisheries Center Tiburon, CA 94920	Dr. Jeannette Whipple Southwest Fisheries Center Tiburon, CA 94920

proposed for estimating sablefish abundance, i.e., determine the best assessment techniques; 2) conduct age-validation studies using tagging and tetracycline injection; and 3) conduct physiological studies of the water content in sablefish flesh in conjunction with tagging to investigate movements and distribution of "soft-flesh" individuals. Details on major topics discussed regarding joint sablefish research are provided in Appendix IV. Other joint projects discussed were mesh-size studies and cost/benefit evaluations of various management decisions.

ACTION ITEMS

Action items resulting from the meeting were as follows:

1. The NWAFC and the SWFC will appoint individuals¹ to prepare a preliminary sablefish stock-assessment planning document which will include research plans for evaluating stock-assessment techniques and conducting related biological studies. It would also identify the scope of the joint sablefish program, prioritize items in a time scale, and set responsibilities. A preliminary draft, to be completed by 1 October 1986, will define work needed in the short term. Copies of this draft will be distributed to members of the group, and a revised version

¹The week following the Coordination Meeting, Tom Dark was appointed from the Northwest and Alaska Fisheries Center, to be assisted by Jim Balsiger; and John Hunter was appointed from the Southwest Fisheries Center, to be assisted by Richard Methot.

drafted in November by group members attending the Council Meetings in Portland, Oregon, 16-18 November 1986. Although the research planning document will outline general needs for management evaluation research, this topic will be covered in greater detail in a more comprehensive sablefish research plan that will be prepared after completion of the amended sablefish sections of the Groundfish Plan (March 1987) now being developed by the Groundfish Team.

2. Richard Marasco (NWAFC) will communicate with Daniel Huppert (SWFC), Kate King (NWR), and Wes Silverthorn (SWR) prior to the September 1986 Groundfish Team Meeting to be held in Seattle at the NWAFC. They will discuss the types of economic information/expertise they could provide that would be useful to the Team in developing their report on amending sablefish sections of the Groundfish Plan. Marasco will attend the Team Meeting.

3. Tetracycline (OTC) injection of tagged sablefish would begin on the NWAFC pot survey in the fall.²

4. William Lenarz, working with Joseph Hightower (SWFC), will begin work on designing a sablefish tagging program for biomass estimation to be completed by the end of FY 87.

²This activity was later postponed, because time was needed to investigate its feasibility in light of FDA regulations governing the use of oxytetracycline hydrochloride in fish released in the wild.

APPENDIX I

West Coast Groundfish Research Objectives

1. Assess abundance of Dover sole and sablefish resources.
 - A. Evaluate methodologies used to assess abundance.
 - B. Obtain biomass estimates.

A major goal of the SWFC is to assess the available yield of sablefish and Dover sole beginning in FY88. Initially, the study will cover the area between Point Conception and San Francisco, then be expanded coastwide. Hunter will begin with a limited assessment of Dover sole and sablefish in 1987, comparing the ichthyoplankton and swept-area trawl methods to determine which is most appropriate. Various members of the group stressed the need for information on general level of abundance, mortality rates, recruitment, and growth of the stocks; and Richard Marasco added that fishery-dependent as well as fishery-independent methods should also be evaluated.

2. Determine condition of Dover sole and sablefish stocks: Obtain mortality rates, growth information, potential productivity, and recruitment.

All agreed that there was a great need for information that would provide an understanding of biological parameters and processes--items that would fall under the category of biological assessment. Abramson referred to the proposed changes in the Magnuson Act, which incorporate Allowable Biological Catch (ABC)

and stress the importance of this type of information. He added that knowledge of the biomass alone does not allow determination of how much harvesting the biomass will sustain. For example, Methot pointed out that recent ageing of Dover sole has included significant bias and variance in the traditional ageing technique, so that the historical database is now of marginal use. It was agreed that many types of research activities or techniques would fall in the category of biological assessment.

3. Investigate latent groundfish resources such as arrowtooth flounder, Sebastolobus, etc.

Tom Dark suggested that information on underutilized groundfish resources as well as target species be obtained on both NWAFC and SWFC trawl surveys in the upper slope area, if personnel are available to make the extra sampling effort.

4. Obtain fishery-dependent stock assessment information in an efficient, stable, and consistent fashion for all important groundfish species.

Bill Lenarz stressed the need to collect port-sampling data efficiently and consistently, an effort he felt has been hampered by difficulties in obtaining adequate long-term funding. He also suggested the possibility of placing observers on vessels as well as port samplers.

5. Forecast future abundance of all stocks.

The group was unanimous in stressing the importance of forecasting the future abundance of stocks, but expressed differing opinions on methods. Marasco and Methot pointed out the importance of determining mean recruitment first and then variability. Stauffer added that variability about the mean is also important when attempting to forecast the productivity of the stock. Members of the group then discussed the relative importance of recruitment versus growth in predicting stock abundance and production. Stauffer felt that recruitment was the most important, whereas Hunter considered it less important, especially when dealing with long-lived species such as Dover sole. He pointed out that in certain cases there is so much averaging of recruitment over year classes in the fishery that getting a very precise estimate of the mean abundance and mean productivity would be relatively unimportant. Marasco said that average recruitment can be obtained from biomass and total mortality rates. Stauffer considered growth important, but not as important as understanding average recruitment and its variability. Lenarz said that being able to predict recruitment is important as a long-term objective in forecasting future abundance. This is especially true of long-lived rockfish, such as widow rockfish and Pacific Ocean perch, because one or two strong year classes can contribute a very large portion of the catch of such species.

6. Evaluate management methodology.

Abramson said there is a need for research on methodology for management. The means to predict the consequences of management decisions is of great importance to the Regional Directors and other members of the Fishery Management Council. Examples include decisions on the effects of mesh selection, time and area closures, and trip limits.

7. Document standards for cost/benefit evaluations of management decisions.

Bill Lenarz suggested that economists who are directly or indirectly involved in Council work might identify which kinds of economic evaluations are feasible and which are not. This could be presented as a document that not only defines what can and cannot be done but also identifies problems in obtaining certain kinds of data. Dan Huppert added that standards might be applied in evaluating studies of broad institutional changes such as limited entry versus free access, allocation between gears and between different kinds of users, cost/benefits of having different levels of quotas, and time patterns of resource use. In particular, standards would also be helpful in evaluating work on studies involving trip limits and mesh sizes, where obtaining accurate predictions may be a problem.

8. Understand processes involved in changes in fish populations over time.

Ted Hobson emphasized the need to understand the physical and biological processes that are implicated in fluctuations of groundfish populations over time.

9. Understand multispecies problems and interactions.

John Hunter suggested that multispecies interactions (predation, cannibalism, and species community structure) may be particularly important, perhaps more important than juvenile recruitment, when dealing with long-lived groundfishes. Richard Marasco added that information is also needed on how targeting on one species co-impacts other species by measuring what is caught as opposed to what is landed.

APPENDIX II

Existing Cooperative Activities Between the NWAFC and the SWFC

1. The NWAFC is ageing otoliths from the pilot sablefish sampling program designed and coordinated by the SWFC and executed by the states. Ageing of catches from SWFC research cruises and validation of ageing are being discussed.
2. Sea time, collections, and samples are being shared.
3. Gear is being loaned to the SWFC by the NWAFC.
4. Both Centers (and also the Northwest and Southwest Regions) have staff members on the PFMC Groundfish Team.
5. The Utilization Division of the NWAFC and the Underutilized Fisheries Resources Investigation of the SWFC have been cooperating in underutilized groundfish work with regard to fish samples, analytical analyses, taste tests, and loan of equipment.
6. The two Centers, through a jointly funded contract, co-sponsor a juvenile rockfish identification guide by Wayne La Roche.
7. Economists from both Centers are working with other economists and industry representatives to estimate the consequences of various methods of limiting entry to groundfish fisheries.

8. Environmental data is being provided by the SWFC (Pacific Fisheries Environmental Group) to the NWAFC.
9. Cooperative mesh-size studies are underway, with Oregon State University/Sea Grant taking the lead, the NWAFC and West Coast Foundation (S-K) providing funding, and the SWFC participating in planning.
10. The two Centers are cooperating in the use of the PacFIN database.
11. The next West Coast Groundfish Conference is being organized as a joint effort by the two Centers.
12. Both Centers are co-participants in the Technical Subcommittee (TSC) of the Canada-United States Groundfish Committee.

APPENDIX III

New Areas for Possible Cooperative Study

1. Coordinate January 1987 surveys, both generic and sablefish and Dover sole cruises - Hunter (SWFC)/Kendall (NWAFC).
2. Share databases.
3. Adopt the NWAFC trawl database format for SWFC survey data.
4. Analyze switching behavior of fishermen (NWAFC and SWFC economic groups).
5. Explore cooperative ageing techniques, possibly with different groups focusing on certain species. Consult with the Committee of Ageing Research Experts (CARE), a group organized by the TSC, which specializes in standardizing ageing techniques.
6. Co-author a paper on juvenile rockfish for presentation at the International Rockfish Symposium (Lenarz [SWFC] and Kendall [NWAFC]).
7. Explore the feasibility of expanding the SWFC technique of using salmon as juvenile rockfish samplers to Northwest areas.
8. Conduct tagging studies to estimate sablefish biomass. The SWFC to cooperate with the NWAFC; Lenarz and Hightower will develop tagging plan before FY 88. (Lenarz/Laurs) to cooperate with the NWAFC.

9. Coordinate future surveys of the upper continental slope.

10. Analyze sablefish flesh characteristics in relation to the animals' habitat and behavior based on biopsies of tagged sablefish.
(NWAFC/SWFC Groundfish Physiological Ecology Investigation)

11. Conduct joint studies with the Pacific Fisheries Environmental Group, combining physical and biological environmental time series to determine various impacts of the physical environment on the biology of sablefish reproduction and growth.

APPENDIX IV

Major Topics of Discussion on Joint Sablefish Research

Biomass Assessment, General

Four ways of doing biomass assessment are 1) cohort analysis (fishery-dependent); 2) tagging (fishery-dependent); 3) swept area by trawl (fishery-independent); and 4) ichthyoplankton surveys (fishery-independent). The sablefish pot index was considered an index of abundance that could be calibrated by the above methods. There is a need to evaluate the efficacy of these four methods in order to determine which technique(s) would be the most feasible and suitable for sablefish. This evaluation was considered of immediate importance and an essential part of the initial phases of the joint sablefish program.

Cohort Analysis

1. This technique does not appear to be feasible in the short term. There are issues that must be resolved before proceeding, and about 10 years is necessary to collect the data for an adequate analysis. A key uncertainty is the bias and lack of precision using existing ageing techniques. For example, the NWAFC standard policy for production ageing is 75% or better agreement among readers (every fifth otolith is read by a second person), but 25% agreement is typical in sablefish. Age estimates of a fish by different reading groups can vary by 15 to 20 years or more. In general, the problem increases with deeper-living and larger fish, in areas of low fishing effort, and where growth may be particularly slow.

2. Port-sampling difficulties, which need to be resolved, are now being worked on by Hightower (SWFC). Information on discard rates from Ellen Pikitch (OSU) will also be used to determine if port sampling must be augmented by sampling at sea. It has not yet been decided whether increased port sampling will coincide with the first fishery-independent biomass assessment so that the two methods can be compared.

Tagging

1. There was general agreement that before beginning a major initiative on tagging sablefish for biomass assessment, a detailed experimental design should be developed and results of past tagging carefully examined. The design should include costs of the tagging and recovery procedures.
2. Lenarz and Hightower (SWFC) will take the lead in starting the design work and should have it completed or near completion by the end of FY87. Both are aware that NWAFC people are working on the existing coastwide sablefish tagging data, and will draw from this data where warranted.
3. Pot surveys and commercial pot boats may be the best sites for tag releases because they cover a wide area in a relatively short period of time. For recoveries, samplers could scan for marked fish at landing sites to estimate the ratio of marked to unmarked fish (as is done for salmon), but there may be a problem in counting the number of observed unmarked fish. Also, with such a procedure, tag recoveries from unsampled loads could not be used.

4. Tom Dark has a proven software system available for handling tag returns that could be used.
5. Abramson suggested that double tagging may be important to estimate tag shedding. Lenarz questioned the initial results of the Canadian sablefish tagging study compared to work on other species, and would like to see it verified.
6. If most adult sablefish do not move appreciably, as results of previous tagging indicate, this would have to be considered in designing the tagging/biomass assessment methods because one cannot assume there is dispersion throughout the range.
7. Age-validation and "soft-flesh" studies can be done in the short term (see under separate headings).

Swept-Area Trawl Surveys

1. Critical issues in this approach are the need for better documentation of net performance and better data on the size-specific vertical distribution of juvenile and adult sablefish.
2. The problems with trawl surveys are mainly variability and availability and/or catchability, as those terms are defined by Ricker. Involved with this variability are untrawlable areas, net avoidance, vertical movements of the fish, size selection of the mesh, as well as stochastic variation. The outer boundaries of sablefish distribution were believed to be trawlable, as the maximum depth of this species is believed to be 600-700 fathoms.

3. All agreed that basic data on all species collected on research trawls should be recorded by the SWFC using NWAFC forms and format. Methot will work with Picquelle (NWAFC) on this.

Ichthyoplankton/Egg Production

1. The SWFC La Jolla Lab will use histological and standard fecundity methods in work on sablefish reproduction next year. Information is needed on seasonality of sablefish reproduction, how much synchrony occurs over the year, and whether there is a standing stock of eggs from which the female draws or recruitment of new eggs over the season. Hunter will be using decline in egg counts during a survey to calculate how fast eggs are being released. But the same problem exists as in swept-area trawling--it may be difficult to get a representative sample of adults. It was suggested that an attempt be made to overlap NWAFC trap-survey lines and SWFC trawl-survey lines in the Point Conception-San Francisco fishery area. These data could be compared to look at differences in sablefish size composition between methods and to determine the best way for getting a representative size range of sablefish needed for egg production work.
2. There may be a problem obtaining enough eggs in full water column oblique plankton tows. Alternatively, an opening/closing net could be used to filter more water in a specific depth zone with high egg density and low plankton volumes. This would cut down on sample sorting/processing costs and increase egg counts.

3. Hunter and Methot are planning to compare ichthyoplankton and swept-area methods during a 40-day cruise this winter. Hunter suggested that Kendall (NWAFC) increase the number of deep tows in his broad-scale ichthyoplankton sampling in January so that information on the outer boundary of sablefish egg and larval distribution could be obtained. The small area covered by the SWFC in its egg and larval survey is not designed to obtain this kind of needed information.
4. Hunter pointed out that information on spawning biomass is most useful if it is structured into age classes, again stressing the need for suitable ageing methods.

Ageing/Age Validation

1. All agreed that age validation of sablefish and the development of a method for production ageing were top priority research problems. Ageing was not only important from the standpoint of cohort analysis, it was also useful for converting fishery-independent biomass assessments to abundance at age. Because of the critical importance of age determination, it was agreed that age validation should be an element of the initial joint program between the NWAFC and the SWFC.
2. Hunter suggested that the SWFC (La Jolla) could become involved in age-validation work using the tetracycline/daily increment/scanning electron microscopy method of age validation. Other alternate age-validation methods that can be pursued at the La Jolla Lab involve assessing the microconstituents of otoliths and age pigments (lipofuscin). The latter two methods are unproven, however,

and would take a number of years to develop, whereas the daily increment method can be used immediately.

3. Tom Dark suggested that the NWAFC inject some tagged sablefish with tetracycline during the pot survey next fall. This would provide means to corroborate results of SWFC age-validation studies using the daily increment/tetracycline method.
4. The development of sablefish-ageing techniques should include input from CARE, a group of readers that meet every year to standardize methods and interpretations of ageing structures.
5. In ageing sablefish, there is a need to determine the precision required for a given study. Recruitment studies require high precision, whereas mortality estimation requires less--perhaps 5-year increments are sufficient.

Fish Condition/"Soft Flesh" Problem

1. A routine assessment of water content of sablefish would be a useful addition to survey cruise activities. In particular, it would be meaningful to relate water content of the fish to otolith band configurations, season, depth, and reproductive cycle.
2. It would be useful to develop a rapid field biopsy for water content that could be performed on tag releases in the field and recaptures. Jeannette Whipple said this was an area she was interested in and asked that samples from surveys be obtained for her to examine.

3. The NWAFC's Utilization Research Division is working on water content of sablefish in relation to depth, season, size, and reproductive cycle. The Division is also trying to work out a field bioassay for water content. Hunter offered to provide material from the upcoming SWFC survey if requested.