REPORT OF THE

TECHNICAL SUBCOMMITTEE

OF THE

CANADA-UNITED STATES GROUNDFISH COMMITTEE

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

Twenty-Ninth Annual Meeting

June 7-9, 1988

Carmel, California

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I. CALL TO ORDER

Chairman R.L. Demory (ODFW) called to order the 29th Annual Meeting of the Technical Subcommittee at 1300 on June 7th, 1988 at Hudson House-Point Lobos, Carmel, California.

II. APPOINTMENT OF SECRETARY

Mr. F.D. Henry (CDFG) was appointed to serve as secretary.

III. INTRODUCTIONS

Members and invited participants introduced themselves. Dr. Bill Lenarz (NMFS-SWFC) replaced Mr. Norm Abramson (NMFS-SWFC) and Mr. Jack Tagart (WDF) replaced Mr. Tom Jagielo (WDF). Participants are listed by agency, with members indicated by asterisks:

Canada -- Department of Fisheries and Oceans (DFO)

Fisheries Research Branch
*Dr. Laura Richards
Mr. Mark Saunders

Field Services Branch
*Mr. Ed Zyblut (Canadian Member, Parent Committee)
Mr. Richard Jacobson

United States

National Marine Fisheries Service
Northwest and Alaska Fisheries Center (NWAFC)
*Mr. Tom Dark
Ms. Sandra McDevitt
Mr. William Robinson (Northwest Region)

Southwest Fisheries Center
Dr. Bill Lenarz

Alaska Department of Fish and Game (ADFG)
*Mr. Barry Bracken

Washington Department of Fisheries (WDF)
*Mr. Jack Tagart
Mr. Al Millikan

Oregon Department of Fish and Wildlife (ODFW)
*Mr. Bob Demory

California Department of Fish and Game (CDFG)
*Mr. Frank Henry
Mr. Tom Jow

Pacific Marine Fisheries Commission (PMFC)
Mr. Russell Porter (U.S. Member, Parent Committee)

Pacific Fishery Management Council (PFMC)
Mr. Larry Six
Mr. Jim Glock

International Pacific Halibut Commission (IPHC)
Mr. Steve Hoag

IV. APPROVAL OF THE 1987 REPORT AND 1988 AGENDA

Chairman Demory distributed the 1987 report which was approved by all members. Mr. Henry presented the recommendations from the U.S. Section concerning the need to re-evaluate the mission of the TSC. Chairman Demory expressed concern that the present agenda did not allow sufficient time for discussion of such a serious topic and suggested changes that the agenda be altered to accommodate thorough discussion of this. Mr. Bracken suggested placing this agenda item as item VI, which was approved by the group. The approved agenda is included as Appendix A.

V. TERMS OF REFERENCE OF THE SUBCOMMITTEE

No changes in the terms of reference of the Technical Subcommittee were proposed following discussion as to whether management topics were allowable under the present terms. Mr. Zyblut (DFO) read the applicable section of the terms of reference to the group. Following are the Terms of Reference of the Technical Subcommittee:

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 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 those recommendations.

VI. REVIEW OF AGENCY GROUNDFISH PROGRAMS

A. CANADA

The Groundfish Section continued to emphasize multispecies and inter-disciplinary studies in 1987. In particular, the

ecological dynamics of species assemblages were examined as part of the Hecate Strait project, while recruitment processes were investigated as part of the La Perouse project. Stock assessments were updated for all species in 1987 and new analyses were completed for several species.

1. Hecate Strait Project

In May-June, the third species assemblage survey cruise was conducted in Hecate Strait. The first two surveys facilitated a comparison of summer and winter distributions of on-bottom fish assemblages. The third survey allowed an assessment of inter-annual variation in the summer assemblage. Cluster analysis indicates very little inter-annual variation among assemblages. In summer, northern Hecate Strait is dominated by rock sole, skate, Pacific halibut, and spiny dogfish in shallow depths (10-40 fathoms), and by Pacific cod, English sole, rex sole, and Pacific sanddab in the deeper depths (41-79 fathoms). At the same time, southern Hecate Strait is characterized by rockfish, arrowtooth flounder, and Dover sole. Depth distributions and assemblage areas for the most abundant species tended to remain stable between years.

The May-June cruise provided information on food-resource division within the species assemblages. A total of 605 stomachs from 19 species of fish were collected. Analyses of stomach contents were also conducted from cruises in June and September 1985, January 1986 and May-June 1987.

2. La Perouse Project

This is a cooperative research project with the Institute of Ocean Sciences. The primary objective is to measure inter-annual variation in physical and biological conditions on La Perouse bank off southern Vancouver Island. The maximum anticipated life of the study is 10 y, which should encompass one (and possibly two) ENSO events. After this period, it should be possible to identify the dominant physical processes affecting circulation and water property structure, quantify the statistical variability of the seasonal cycle, and obtain estimates of the impact of inter-annual oceanic fluctuations on Pacific herring, sablefish and Pacific hake. These species have experienced strong fluctuations in recruitment success that seem to be associated with long-term changes in oceanic conditions. Specific projects are described under individual species.

3. Pacific cod

A study of the reproductive biology of Pacific cod continued in 1987 with three research cruises and two observer trips, during which ovary samples were collected for histological examination. Determination of oocyte size-frequency

distributions has begun. Samples for fecundity estimation were processed and fecundity parameters were estimated. Other data from research and port samples were used to show the extent of geographic and inter-annual variation in length-at-50% maturity in Hecate Strait.

Results of an investigation of factors affecting year-class strength of Pacific cod were published. Factors which tend to increase year-class strength include a high abundance of herring (presumably as feed) and water temperatures during the spawning period (February) in the range 6.5-7.5 C. Factors which tend to decrease year-class strength include lack of feed, adverse temperatures, and a strong northward current during the spawning period.

4. Rockfish

(a) Pacific ocean perch

No new field studies on Pacific ocean perch were initiated in 1987. Studies of the reproductive and population biology continued, including the processing of a second year of fecundity and histological samples from five stocks. Based on preliminary electrophoretic analysis, there is no isolation of the allozymes investigated for Sebastes alutus within B.C. waters. Stocks identified by parasite analysis have genetic distances that are similar at levels above 0.90 between Dixon Entrance and Vancouver Island. These results imply that while groups of S. alutus may be separate at the adult stage, there is still genetic exchange (for the enzymes investigated) among them. Whether this exchange is maintained by juvenile movements remains to be determined. Genetic analysis also showed lower levels of heterozygosity in older fish, compared with younger fish of the same size. This result differs from those of similar studies for shorter-lived organisms.

Analysis of length-at-age data for S. alutus was initiated to determine whether these data could be used to examine long-term growth changes, and why older fish are smaller than middle-aged fish. Preliminary results show that this species may exhibit an inverse relation between growth and survival rates, but that length-at-age data are inadequate to resolve the competing hypotheses of time trends in growth and growth-mortality interactions. A model of this problem for the general case is being developed.

(b) Shelf rockfish

The development of a length-frequency simulator for shelf rockfish was completed. The simulator can be used to estimate historical mortality rates from the length composition of commercial catches. It also permits incorporation of year-specific fishing mortality, stochastic recruitment and growth processes.

Biological sample data, collected in 1985 and 1986 from the west coast of Vancouver Island, were examined to quantify the prevalence of a parasitic copepod, Sarcotaces arcticus. There was a prevalence of 2.5% in silvergray rockfish, S. brevispinis and 0.0% in canary rockfish, S. pinniger. Prevalence declined with increasing size in silvergray rockfish. Also, a lower proportion of infected specimens were reproductively mature, implying a metabolic cost to infection. Prevalence was variable between years and among samples.

The first of a series of triennial sampling surveys for shelf rockfish begins in September 1988. The objective is to establish a baseline set of biological information on the length composition of yellowtail (S. flavidus), silvergray, and canary rockfish stocks. Rockfish sampling methodology aboard the research vessel W. E. RICKER will also be examined.

(c) Inshore rockfish

Copper rockfish and quillback rockfish are the major commercial species in the Strait of Georgia. SCUBA surveys were conducted in 1984-85 to study the habitats of these species. Analysis of the survey data is now complete. Both species apparently prefer high relief areas, with copper rockfish generally found at shallower depths.

Field angling studies to monitor rockfish abundance and size composition were continued in the northern Strait of Georgia and Johnstone Strait. As was found in 1986, rockfish abundance, measured by angling CPUE, was higher in areas that had not been exploited historically by the rockfish handline fishery. Larger quillback rockfish were also caught in areas where CPUE was higher.

5. Sablefish

For the fourth year, a survey to examine the relative abundance and distribution of sablefish larvae off the west coast of Vancouver Island wasconducted in April and May. Over the four years, there has been a 2-8 fold difference in larval success, as indicated by the presence of larvae in surface waters. Correlation between this index and abundance in the fishery will begin in 1988. Biological and oceanographic data, collected as part of the La Perouse project, were used to examine the biotic and abiotic factors influencing year class success. In addition, a species interaction trawl survey was conducted in August to assess the impact of sablefish and Pacific hake on herring stocks on La Perouse bank.

Approximately 2000 juvenile sablefish were tagged and released off the west coast of Vancouver Island as part of Canada's commitment to the international juvenile sablefish

tagging program. A report on oxytetracycline dosages for age-validation, based on tag recoveries, is in preparation.

Rearing of larval sablefish was continued. Gametes collected both at sea and from hormone-induced captive brood stock were used successfully. Experiments were conducted to determine the appropriate time of presentation, and the size, density and type of food organisms required to bring sablefish through the larval stages.

6. Flatfish

In 1986, a study of the annual cycle of ovarian development was initiated for English sole in Hecate Strait. Ovary samples for histological investigation were obtained during research cruises in May-June and November, and during observer trips in March and August. Microscope slide sections have been produced for most samples, and determination of size-frequency distributions for oocyte samples has begun.

The burnt-otolith cross-section method of ageing was validated for rock sole, and a manuscript on the age validation experiment was completed. An estimate of M obtained by this method is 0.21. The oldest rock sole obtained from commercial samples is a 17-y old female, while the majority of recent commercial landings are composed of fish from 4-8 y in age. Age composition data for rock sole are being updated.

A manuscript on the effects of ocean temperature and stock size on rock sole year-class production in Hecate Strait was completed. The relationship between temperature at the time of spawning and rock sole year-class strength is apparently dome-shaped. A Beverton-Holt type stock-recruit relationship appears to be valid. These results were presented at the INPFC-sponsored IRIS symposium in Vancouver, B.C., in October.

7. Pacific hake

A study to examine the reproductive response of Pacific hake to exploitation was continued. Differences in age- and size-specific fecundity and age-at-50% maturity are being examined for stocks in the Strait of Georgia, Puget Sound and offshore. An earlier analysis indicated that significant changes in size-at-age had occurred. Further examination of the consequences of these observed changes on stock production for the Strait of Georgia and offshore stocks is in progress.

8. Spiny dogfish

Approximately 4000 spiny dogfish in the Strait of Georgia, 4000 off the west coast of Vancouver Island, and 2000 off the

northeast coast of Vancouver Island were tagged in 1987. The experiments were designed to measure exchange between the Strait of Georgia and offshore stocks. In another study, a 1977-78 data set was examined for the impact of spiny dogfish predation on commercially important species in Hecate Strait.

9. Lingcod

In 1985, a hook-and-line survey of lingcod was conducted in the Gulf Island area of the Strait of Georgia. The purpose of the survey was to compare research CPUE with CPUE determined from commercial sales records. The three surveys that have been completed indicate that lingcod stocks are at low abundance.

A detailed study of lingcod growth was completed for the the west coast of Vancouver Island (Area 3C). Population growth estimates were based on mean fish weight and variance in the catch over the period 1956-86. These estimates agreed remarkably well with estimates based on weights of individual fish released in 1982 and recaptured in 1983.

10. Statistics and sampling

The principal activity in 1987 was the maintenance of the trawl and trap catch and effort database. Vessel captains are interviewed at time of landing, and biological data on the catch (length frequency, sex, age structures, gonad condition, etc.) are collected by sampling the various species landed. Database management applications are being developed to allow port samplers more rapid and accurate handling of logbook data. Work also continued on a computerized plotter/logbook system for trawl skippers. The intent is to develop a catch entering system linked to navigational information. This will facilitate work on charter vessels and logbook retrieval from commercial fishing vessels.

B. UNITED STATES

1. NORTHWEST AND ALASKA FISHERIES CENTER (NMFS-NWAFC)

The basic structure and organization of the groundfish research programs of the Northwest and Alaska Fisheries Center (NWAFC) remain unchanged since last reported. Essentially all groundfish work is still conducted within the Resource Assessment an Conservation Engineering (RACE) and Resource Ecology and Fisheries Management (REFM) Divisions. Dr. Richard Methot, formerly at the Southwest Fisheries Center in La Jolla, joined The REFM staff at the first of the year and will have a major role in the assessment of groundfish stocks in Washington-California region. 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 and subtasks during the past

year is presented below. Recent publications produced by RACE and REFM scientists are presented in Appendix I and division organizational structures with key permanent staff are found in Appendix II.

RACE Division

Groundfish Assessment Task-In 1987 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 surveys were conducted by the Bering Sea, Gulf of Alaska, and West Coast subtasks. There were 3 bottom trawl surveys, one trap survey, one longline survey, two hydroacoustic survey, and one ichthyoplankton survey. For the first time, the NWAFC conducted a longline survey using a chartered domestic vessel to sample sablefish abundance in the Gulf of Alaska. This is seen as the beginning of a transition from cooperative U.S./Japan longline sablefish surveys to sole U.S. participation. Major emphasis was in the Gulf of Alaska in keeping with plans to rotate comprehensive surveys among 3 major geographic areas on a triennial basis. The focus will be in the Bering Sea in 1988. A summary of tasks activities for the past year are presented below. (Task Leader, Mr. Miles Alton)

BERING SEA

Crab and Groundfish Survey--The 1987 Bering Sea crab and groundfish survey was completed during May-August. The standard crab and groundfish bottom trawl survey, conducted annually, was performed by the chartered stern trawlers Alaska and Pat San Marie. This survey consisted of 386 stations on the continental shelf (depths less than 200 m) between Unimak Pass and 62° N. latitude. In addition to this major work, several other experiments and studies were conducted. These included the tagging of Pacific cod, Pacific halibut, and Greenland turbot; collection of fish stomachs for feeding studies, establishing juvenile crab monitoring sites; investigation of reported scallop mortalities near Unimak Island; and estimation of crab by-catch in inshore trawling areas. Results are presented in the Stock Assessments section of this report.

NWAFC/Industry Crab By-Catch Survey--The NWAFC and the industry joined resources in a survey dedicated to seeking methods of reducing the by-catch of crabs in bottom trawl catches in the Bering Sea. The work first entailed engineering and model tank test evaluations of experimental and "control" Bering Sea combination trawls. Two experimental designs which employed design characteristics aimed at directing captured crab out of the net were tested. Five trawlers began the experiment under commercial conditions in August and completed the work by mid-September. Each vessel completed 15 tows with each of the experimental

trawls and 15 tows with each of two control trawls. A total of 241 valid tows were completed during the period. Results of the study revealed that: (1) the catch rates of the flounder/cod complex and the by-catch rates for king crab were similar during hours of daylight and darkness, but Tanner crab (C. bairdi) by-catch was more than 5 times higher at night than during the day; (2) the experimental trawl fitted with a "crab panel" caught 39% less flounder/cod, but retained 51% less king and 71% less tanner crab per ton of target species than did the control trawl, and (3) the experimental "crab chute" trawl caught flounder/cod at about the same rate as the control trawl, decreased king crab by-catches by 33%, but failed to appreciably reduce the by-catch of tanner crab. Differences between the "crab panel" and the control were statistically significant while differences between "crab chute" and control were not. U.S./Japan Sablefish Survey--The U.S. and Japan again cooperated in a longline survey in the Aleutian Islands, Bering Sea, and Gulf of Alaska. The Japanese longline vessel Anyo Maru No. 22 sampled 107 stations where it set a longline consisting of 7,200 hooks and which was 8.6 nmi in length. The most common depths sampled were 100-1000 m and the primary objectives included obtaining indices of sablefish and Pacific cod abundance, assessment of other major catch components such as halibut, arrowtooth flounder, Greenland turbot, thornyheads, and grenadiers, tag sablefish and turbot, and collect biological data from sablefish. The cruise occurred during May to September and for much of the time there was a cooperating U.S. scientist aboard the vessel.

GULF OF ALASKA

Gulf of Alaska Triennial Survey--During the summer of 1987 the NWAFC cooperated with the Far Seas Fisheries Research Laboratory, Japan in conducting another triennial groundfish assessment survey in the Gulf of Alaska. The U.S. charter vessels Letsgo and Nor-Dick and the Japanese charter vessel Taisei Maru No. 25 completed 826 scheduled bottom trawl stations and 131 trawls in a comparative fishing power experiment. The primary objectives of the survey were to measure the distribution and abundance of principle groundfish species. Sampling occurred between Cape St. Elias and 170o W. longitude and from 20 to 749 m. A second survey was conducted between Cape St. Elias and Dixon Entrance by personnel of the Auke Bay Biological Laboratory. Results are presented in the Groundfish Assessments section.

Juvenile Pollock Survey--During August-September a juvenile pollock survey was conducted in the western Gulf of Alaska by the chartered U. of W. vessel Alaska.. The survey included the area from Unimak Pass to the north end of Kodiak Island and included both offshore and inshore waters. The primary objectives were to determine the distribution of juvenile pollock and to obtain biological data, specimens, and water temperature data relevant to the distribution of young-of-

the-year pollock. North to south tracklines which were 17 nmi apart were sounded to a depth of approximately 200 m using the ship's echo sounder. All echo sounder records were annotated and kept for later evaluation. Aggregations deemed to be juvenile pollock were sampled with a 61-foot shrimp trawl. More than 3000 nmi of trackline surveyed and 119 trawl hauls were completed. Large aggregations of 0-age pollock were observed from the Shumagin Islands westward to Unimak Pass and near Chignik and Kujulik Bays in midwater layers at 26-28 m. These areas are downstream of the Shelikof trait spawning area, may consistently hold aggregations of young-of-the-year pollock and could possibly serve as sites for indexing yearclass strength. U.S. Longline Survey for Sablefish--For the first time, the NWAFC also conducted a large scale longline survey for sablefish in the Gulf of Alaska. Sampling occurred from July 15-September 21 and from the Islands of Four Mountains (170o W. longitude) to Dixon Entrance at the same sites sampled by the U.S./Japan cooperative survey since 1977. The sampling gear was identical to that used by the Japanese with regard to the number of hooks and the length of the skate, but differed with respect to the hooks, gangion length, anchoring arrangement, and bait. A comparison of Japanese and U.S. catch rates for sablefish showed the Japanese rates to be about 18% higher. It is anticipated that the domestic longline survey will be an annual occurrence and will replace the U.S./Japan survey should the latter be discontinued.

Modifications to the experimental design include additional sampling directed to gullies and troughs which are normally important sablefish habitats and to selected areas on the continental shelf in an effort to obtain a more complete assessment of Pacific cod abundance and yearclass strength.

WEST COAST

Sablefish Abundance Indexing--The charter vessel American Viking sampled during August 17-September 21 off Washington and Oregon in a continuing effort to monitor changes in the relative abundance of sablefish. Traps were fished on longlines in a standard fashion at 8 index sites and 7 depths between 150 and 1025 fms. Catch composition, length, weight, maturity, and age data were collected. Excess specimens were double tagged in a study of tag shedding rates and movements. Catch rates were 62% lower and the proportion of small fish (less than 52 cm) was less than observed during the 1985 survey. These results indicate that the trend of decreasing population size continues and that new recruitment is not likely to reverse that trend immediately.

Recruitment Processes Task--This task has participated annually since 1986 studies of the distribution and abundance of eggs and larvae from pollock spawning in Shelikof Strait as part of the joint NWAFC-Pacific Marine Environmental Laboratory's Fisheries-Oceanography Coordinated

Investigations (FOCI). The objective of FOCI is to investigate factors affecting survival of early life history stages (eggs and larvae) of pollock and thus influencing yearclass success. The task's efforts have concentrated on assessing starvation, growth, predation, and tracing the drift of eggs and larvae and relating their distribution to physical processes in the area. (Task Leader, Dr. Arthur Kendall)

Fish and Shellfish Pathology Task--This group has played a major role in the study of red and blue king crab diseases and continued to do so in 1987. In addition, a great deal of effort was expended to collect fish tissues for recently fish disease studies. Subtasks members participated in cruises off the west coast, the Gulf of Alaska, and in the Bering Sea collecting 1,393 fish and invertebrate samples. Samples taken in 1987 include: 104 yellowfin sole, 106 rock sole, 100 Pacific cod, 694 juvenile pollock, 91 pink shrimp, 32 red king crab, 31 blue king crab, and 83 miscellaneous invertebrates. All 1986 cases have been read, coded, and entered into the database. General objectives are to characterize the pathology of important groundfish and invertebrate species and to study the early life history stages of the myxozoan parasites, Kudoa paniformis and K. thyrsites. (Task Leader, Dr. Albert Sparks)

Conservation Engineering Task--Most survey work is heavily dependent on this task to provide sampling gear which conforms to rigid specifications and standardization. The task is also charged with research related to sampling mechanisms and gear performance. Several SCANMAR net mensuration systems have been purchased and now provide trawl performance monitoring during trawl surveys. An experimental electronic fish measuring board has been designed and a prototype should be available soon. The device will act as a microcomputer peripheral and will allow input of lengths as well as other specimen data from a remote workstation. (Task Leader, Mr. Rob Wolotira).

Pelagic Resources Assessment Task--Hydroacoustic/midwater trawl assessments of demersal or pelagic species is the primary activity of this task. Associated activities include echo integration system development and refinement, in situ target strength measurement, and variance estimator evaluation. The task conducts annual hydroacoustic assessments of pollock in the Shelikof Strait and on a triennial basis it also conducts a survey of Bering Sea pollock and another in the Washington- California region assessing the distribution and abundance of Pacific hake. (Task Leader, Dr. Jimmie Traynor)

Aleutian Basin Survey--In 1988, two portions of the Aleutian Basin in the Bering Sea were surveyed to determine the distribution and abundance of pollock there during February. Over 1600 nmi of transects were surveyed in the vicinity of

the international zone (donut hole) where very low pollock densities were observed. About 1200 nmi of tracklines were sampled in the southeast Aleutian Basin from Unalaska to the Islands of Four Mountains where a substantial aggregation of pollock was observed within about 30 nm of Bogoslaf Island. Spawning occurred approximately during the last week of February.

Shelikof Spawning Pollock Survey--Another hydroacoustic survey of spawning pollock in the Shelikof Strait occurred in March of 1988. This survey was comparable to those conducted in 1981 and 1983 through 1986 which were designed to provide age-specific biomass and population estimates of the midwater component of the stock during the period when spawning was at it's maximum. A second objective was to collect data on the in situ target strength of individual pollock using dual beam and split beam acoustic systems. Twenty six trawl hauls and 1700 nmi of transects were completed. The 1984 and 1985 yearclasses were very abundant providing some hope that the stock may be rebounding from recent low population levels.

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 Foreign Fisheries Observer Program and the following tasks: Age and Growth Studies, Socioeconomic Assessments, Resource Ecology and Ecosystems Modeling, and Status of Stocks and Multispecies Assessments. The work of these tasks culminates as technical reports and advice to the appropriate fishery management councils and international fisheries commissions.

Foreign Fisheries Observer Program-The Foreign Fisheries Observer Program is responsible for placing U.S. observers on board foreign and joint venture (JV) boats operating inside the U.S. EEZ. In 1987, the program deployed 348 observers. Observers were placed on foreign vessels which were either fishing on the basis of groundfish quotas allocated by the U.S. State Department, or receiving fish from U.S. vessels as part of JV arrangements. Vessels from Japan, the Republic of Korea (South Korea), the U.S.S.R., Poland, and the People's Republic of China were involved. The all region observer effort was 16,370 days. Coverage was 96.4% in the Bering Sea/Aleutian (BSA) region, 99.7% in the Gulf of Alaska (GOA) region, and 93.9% off the Washington-Oregon-California (WOC) region.

In the first two months of 1988, observer coverage of vessels involved in JV fisheries off Alaska was 90%. There is no foreign allocation for the BSA and the GOA regions for 1988.

For further information contact Russell Nelson, (206) 526-4194.

Age and Growth Studies Task--The Age and Growth Task of the REFM Division continues to serve as the Northwest and Alaska Fisheries Center's ageing unit for groundfish species. The task consists of a biometrician, technician, and 9 age readers. Ages are usually determined from otoliths, scales or finrays. 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 include species such as walleye pollock, Pacific whiting, Pacific Ocean perch, Atka mackerel, yellowfin sole, and rock sole.

Research currently focuses on two very difficult species: Pacific cod and sablefish. The ageing of Pacific cod has been a problem of classic difficulty in the northeast Pacific. A number of different Pacific cod structures are continuing to be investigated, but no firm conclusions have yet been reached. Sablefish has also proved to be a difficult species. It is hoped that the cooperative coastwide sablefish research plan involving the Pacific Biological Station and Tiburon Labs will help resolve inter-agency differences in criteria and improve precision. The task is also taking part in a joint sablefish OTC-tagging project with the Auke Bay Lab in hopes of validating ageing criteria.

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

Socioeconomic Task--Members of the Socioeconomic Task have been involved in a variety of groundfish projects during the past year. They include: 1) the preparation of reports on the economic status of the groundfish fisheries off Alaska; 2) enhancement of a bioeconomic model for pollock in the Gulf of Alaska; 3) the addition of an economic component to an age structural simulation model for pollock in the eastern Bering Sea; 4) an evaluation of the market differences for the traditional Alaska commercial species, and the implica-tions of these differences with respect to the linkages between fishery management and international trade issues; 5) a summarization of the catch and revenue characteristics of vessels harvesting sablefish off the west coast of the U.S.; 6) an analysis of alternative sablefish seasons in the Gulf of Alaska; 7) an analysis of an industry proposal alternative to control the bycatch of prohibited species in the Bering Sea-Aleutian Islands groundfish fishery; 8) the development of an ex-vessel price model for Pacific halibut; 9) an evaluation of sablefish markets; and 10) continual economic analysis of trawl mesh size regula-tions for the PFMC groundfish fishery. These projects have resulted in the preparation of NWAFC processed reports and technical memoranda, reports to the NPFMC, and journal articles.

For further information, contact Dr. Joe Terry (206) 526-4253.

Resource Ecology and Ecosystems Modeling Task-The Resource Ecology and Ecosystems Modeling Task has prepared program documentation for the analysis of data and for studying the effects of fishing. Age compositions of catches of most commercial species from the Bering Sea from 1976-86 have been analyzed using length data collected by foreign fishery observers.

The Trophic Interactions Subtask continued regular monthly collection of food habits information on key fish predators in the eastern Bering Sea. Assistance and training in food habits collection and analysis methods were furnished to other Center personnel who collected stomach scan information in the Gulf of Alaska. Food habits information was used to provide parameters for two population models: a VPA model which includes cannibalism for eastern Bering Sea walleye pollock and an eastern Bering Sea crab/groundfish model. Several papers were completed last year regarding: diet and daily ration of Greenland turbot; diet of Pacific cod; food habits and diet overlap of noncommercial and commercial eastern Bering Sea fishes; morphological differences between two species of Atheresthes; cannibalism of walleye pollock; and interannual trends in crab consumption by Pacific cod. Current research emphasis is on interannual changes in predation which might provide insight into changes in year class strength.

For further information, contact Dr. Taivo Laevestu (206) 526-4216.

Status of Stocks and Multispecies Assessments Task--The Status of Stocks and Multispecies Assessments Tasks are responsible for conducting studies which will enhance fishery manager's abilities to manage marine fishery resources properly. Scientists involved in these tasks assist in preparation of stock assessment documents for groundfish in the three management regions (BSA, GOA, and WOC), and they frequently provide management support in an official capacity through membership in regional groundfish management teams.

Bering Sea and Gulf of Alaska Stock Assessment Task-During the past year, Task scientists analyzed a number of proposed changes to the BSA, and GOA fishery management plans (FMPs). Amendment proposals pertaining to the BSA region were to: 1) implement a comprehensive bycatch scheme, 2) raise the optimum yield (OY) limit, which is currently set at 2.0 million t, 3) restrict joint venture fishing on roe-bearing rock sole, and 4) change some administrative procedures for the implementation of fishery regulations. Amendment proposals pertaining to the GOA region were to: 1) change the opening date of the sablefish longline season, and 2) require weekly reporting of catches by all floating

processors receiving EEZ caught fish to the Alaska Regional Office of NMFS. The Status of Stocks Task is also coordinating research designed to identify the stock structure of pollock found in the Bering Sea donut hole. This involves 1) inquiries in the areas of genetic structure, morphometrics, meristics, and the chemical composition of otoliths, 2) tagging studies, and 3) studies of egg and larval drift.

For further information, contact Dr. James Balsiger, (206) 526-4248.

West Coast Stock Assessment Task--The West Coast Stock Assessment Task is concerned with assessment of the abundance and productivity of groundfish stocks along the coasts of Washington, Oregon and California. These assessments are critically important for those species managed with annual quotas by the Pacific Fishery Management Council. The task is also involved with evaluation of alternative management schemes, and with investigations into future trends in abundance and species composition. A primary project during 1988 is a multi-dimensional assessment of the status of the sablefish stock along the west coast. The assessment incorporates information derived from pot surveys, trawl surveys, port sampling of the fisheries, and tag returns. The task continues to be involved with studies of recruitment variability in Pacific whiting and with stock assessment of Pacific whiting and Pacific ocean perch. Task scientists are involved in cooperative research activities between the U.S. and Canada on the Pacific whiting resource. A new management model is being developed which will offer improved biological information by accounting for the latitudinal age stratification of the stock along the coast. Other new projects this year include a role in the west coast Dover sole assessment. The task is also keenly interested in the proposed west coast mesh size project. Amendment proposals pertaining to the West Coast FMP were to: 1)incorporate habitat considerations into the FMP, and 2) incorporate provisions to consider and, if appropriate, provide for temporary adjustments due to unsafe weather or oceanic conditions. Currently, task scientists are providing technical assistance in the rewriting of the Pacific Coast Groundfish FMP.

For further information, contact Dr. Richard Methot (206) 526-6525.

2. SOUTHWEST FISHERIES CENTER (NMFS-SWFC)

Groundfish-related research is conducted by three major components of the Southwest Fisheries Center (SWFC): the Coastal Division (La Jolla), the Pacific Fisheries Environmental Group (Monterey), and the Tiburon Laboratory (Tiburon).

Coastal Division (La Jolla)

The Coastal Fisheries Resources Division has been involved in three areas of groundfish research to support the management needs of the Pacific Fisheries Management Council and to establish a basis for future research and more accurate management.

Documentation of the distribution of groundfish spawning is being accomplished by analysis of fish eggs and larvae in historical CalCOFI plankton samples. This effort will aid future attempts to measure species abundance by egg and larvae surveys. Studies of environmental effects on recruitment also depend upon an accurate assessment of the spawning distribution in time and space.

A study to estimate sablefish and Dover sole biomass in central California was initiated in 1987. During 1987 and 1988, a SWFC research party on the NOAA Fisheries Research Vessel David Starr Jordan conducted 40 days of trawl and plankton cruises. Distribution of eggs and larvae, fecundity, rate of spawning, size specific depth distribution and size at first maturity of sablefish and Dover sole were determined. Subsequent analysis will evaluate the precision and bias of estimates of fecundity. Specimens are also being used for studies of flesh condition and age determination.

The results of this research cruise are being analyzed to evaluate the feasibility of measuring sablefish and Dover sole biomass by trawl catch per effort, relative to the feasibility of doing the assessment by egg production techniques. A future stock assessment survey will be planned on the basis of these and subsequent data. In addition to fulfilling this management objective, these samples provide an opportunity to study the ecology of the fish communities of the continental slope and enable multispecies management in the future.

Pacific Fisheries Environmental Group

The Pacific Fisheries Environmental Group develops methods of examining relationships between physical and biological data series to help forecast recruitment and to understand fish stock behavior. Data series developed internally are made available to other researchers. Some of the types of information developed are: Coastal Upwelling Indices and other wind-related index series; California Current and other eastern boundary current anomaly diagnostic studies; interspecies covariance of fish catches with respect to climatic variables; and trends and interyear variability in atmosphere-ocean exchange processes in coastal upwelling habitats. Co-location with the U.S. Navy's Fleet Numerical Oceanography Center provides access to environmental data on a global scale. This facilitates inter-regional comparative studies as a means to identify key fishery-environmental

linkages, and to transfer fishery experiences among regions. Recent ongoing efforts involve developing improved ability to interpret available environmental data, which are mostly taken at the sea surface, in terms of conditions in the demersal habitat. Warm anomalies appear to have different properties with respect to attenuation or intensification with depth, depending upon whether their origin may have been due primarily to tropical processes (e.g., El Nino) or to mid-latitude processes. Another area of expanding interest at PFEG is the possible effect of bottom-trapped hydrodynamic structures (such as Taylor columns, shelf-sea fronts,etc.) in imposing important structure, on smaller spatial scales than heretofore supposed, within the feeding and reproductive habitats of groundfish. An associated set of research problems involves the possible interaction of vertical migrating behavior of larvae and food organisms with vertical structure in the ocean flow field, whereby weakly swimming organisms might exert important controls on their advection. These aspects are vitally lined to questions of stock separation, larval supply, and recruitment variability.

Biological data bases provide needed research material for studying the impact of natural environmental variability on fishery stocks. The PFEG has been working on the creation of a database of California Department of Fish and Game recreational groundfish data collected in the Monterey area between 1950 and 1970. The data consist of catch-per-effort and length frequencies by species. Another database that has been computerized is that of commercial landings at California ports from 1928 to 1985.

Tiburon Laboratory (Tiburon)

The groundfish program at the Tiburon Laboratory consists of four interrelated investigations: Groundfish Analysis, Groundfish Communities, Physiological Ecology of Pacific Coast Groundfish, and Underutilized Groundfish Resources.

The Groundfish Analysis Investigation conducts studies aimed at improving management of groundfish fisheries. The work includes stock assessments, development of new management models, development of methods for predicting rockfish recruitment, sampling rockfish landings and aging rockfish, conducting economic studies of alternate management policies, and conducting life history studies of rockfish. In addition, staff participation on the Groundfish Management Team principally involves work on stock assessments and development of management alternatives.

Members of the staff continued to conduct annual assessments of the widow rockfish fishery for the Council. In addition, a staff member is assisting the NWAFC assessment of the sablefish fishery.

The Recruitment Project's goal is to detect differences in year-class strength of important species of rockfish prior to 0entry of the year class into the fishery. Annual midwater trawl surveys for juvenile rockfish are carried out to determine abundance and distribution off the coast of central California. Information is also being gathered on factors that affect year-class strength, relationships between oceanographic conditions and distribution of juvenile rockfish, and interactions among the important species.

Landings of rockfish have been sampled cooperatively with California Department of Fish and Game (CDFG) since 1977. Several important species are aged and the data are being compiled with software developed by project members. These data are routinely used in stock assessments.

Members of the staff have also been monitoring the timing of parturition in mature Sebastes females in northern and central California since 1981. Data on prenatal larval development are collected through the cooperative CDFG and NMFS rockfish sampling program.

Work on groundfish economics is also carried on under the Groundfish Analysis Investigation, in cooperation with other SWFC and Southwest Region economists, industry representatives, and management biologists. This work includes studies of alternate management methods for groundfish including sablefish trip-limit assessment. Consequences of changing mesh-size restrictions, product yields, cost and earnings of trawlers, and economic contribution of groundfish to the California gillnet fishery.

In FY87 the Groundfish Analysis Investigation nearly completed work on development of a management model for California rockfish and development of a proposal for sablefish tagging. To assist in stock assessment of this species a graduate student continued to develop a management model that incorporates estimates of rockfish recruitment strength, and management.

The main objective of the Groundfish Communities Investigation is to determine how changes in the marine environment affect the distributions, abundances, and related year-class strengths of groundfish species. Changes being considered include regular seasonal transformations of the habitat, as well as changes associated with irregular environmental events such as El Ninos. Emphasis is on how these changes affect interspecific relationships, particularly those between predators 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 success is thought to correlate with certain elements of environmental changes, and this is another major topic of study.

The Physiological Ecology of Pacific Coast Groundfish Investigation is designed to determine the inherent and environmental factors most affecting the health, condition, and reproduction of three important rockfish species: yellowtail rockfish, bocaccio and widow rockfish. Work includes examination and analysis of adult and juvenile specimens collected from commercial landings and charter cruises. Results of analyses and supportive laboratory experiments are used to determine the most important characteristics of condition and reproduction to form measures of health and effective fecundity. Studies include proximate analysis of tissues, estimates of viable fecundity and egg resorption, bioenergetic patterns, examinations for diseases, parasites and malformations, and determination of lipid and nutrient cycles. Results will be combined with oceanographic and other data to determine environmental factors affecting condition and reproductive variability and capacity, and to place species populations in the context of their habitats.

The objective of the Underutilized Groundfish Resources Investigation is to expand the resource base of the groundfish fishery. As maximum sustainable yield is approached for the traditional species, the groundfish fishery will have to turn to other species, as well as to fish that are now being discarded. This study contributes to increased use of such species and to adding information about little-known species that the industry can use when appropriate. Methods are to obtain fish and information from fishermen or from research at sea, test flesh characteristics and market acceptability of underutilized species, and then publish reports of results in appropriate journals or disseminate information to the industry in other ways. Current fishes under study are the shortbelly rockfish, grenadier, and small flatfishes, which are all presently discarded by the fishery. A manuscript entitled "Utilization of the Pacific grenadier, Coryphaenoides acrolepis (Gadiformes, Macrouridae) in California" is being prepared for publication by the staff of the Underutilized Groundfish Resources Investigation, in collaboration with Tetsuo Matsui of Scripps Institution of Oceanography. The paper provides information on fishing methods, catch rates, reproductive biology, distribution and flesh characteristics of the presently underutilized Pacific grenadier.

3. ALASKA (ADFG)

The Alaska Department of Fish and Game groundfish program underwent considerable change again during 1987. The state groundfish budget, which was reduced substantially during

1986, was reinstated to near-1986 levels by July 1, 1987. The program funding was made up of a combination of state, federal aid matching, and federal contract funding. Much of the contract funding was for specific purposes and so the program objectives, particularly in the Central and Westward Regions, were redirected to a large extent.

Personnel levels were increased in both the Southeast and the Westward regions for the last half of 1987, but remained low in the Central Region. The Westward region was staffed with a project coordinator, a management biologist, and three observers in Kodiak as well as part-time support personnel in Dutch Harbor and Sand Point. The Central Region staff was reduced to a part-time data entry technician stationed in Homer for the purpose of entering groundfish tickets from landings in the Central Region. The Southeast Region was staffed with the project leader, an on-board observer, and a port sampler in Petersburg, an assistant project leader and a port sampler in Sitka, and a port sampler in Ketchikan. In addition, a state-wide groundfish information systems manager was hired and stationed in Juneau to set up and coordinate collection of catch data from the Exclusive Economic Zone (EEZ) off Alaska.

The Southeast Region's groundfish project has responsibility for research and management of all groundfish resources in state waters of the Eastern Gulf of Alaska. The project also cooperates with the federal government for management of the waters of the adjacent EEZ. The project leader participates as a member of the Gulf of Alaska Groundfish Plan Team and, with passage of amendment 14 to the Gulf of Alaska Groundfish Management Plan, the state has assumed management responsibility for shelf rockfish in both the federal and state managed waters of Southeast Alaska.

Project activities center around fisheries monitoring and in-season management of the groundfish resources based on data collected from the fisheries and from limited resource assessment surveys. Primary tasks include fish ticket collection, editing, and data entry for both state and federal managed fisheries; dockside sampling of sablefish and rockfish; skipper interview and logbook collection and data entry; and biological studies of important commercial species. Regulation development and review and information dissemination also require considerable staff time. Fish tickets are collected from as many as fifteen ports which accept groundfish within the region. The fish tickets are edited, batched, and entered on microcomputers in Petersburg and Sitka. Because of the intensity of many of the region's groundfish fisheries, a "soft data" accounting system using processor contacts is also utilized when necessary to track landings prior to fish ticket data entry. State entry of fish tickets from the EEZ was resumed in June of 1987 as the result of a contract from the National Marine Fisheries Service to accomplish that task.

During 1987 port sampling efforts included sampling of rockfish landings in Sitka, Ketchikan, and Petersburg, and sampling of sablefish landings in Petersburg and Ketchikan. The rockfish landings were sampled primarily for species composition and biological data including length, weight, sex, and maturity of key species. Otoliths were also collected from predominant rockfish species in anticipation of funding for age reading which resumed early in 1988. The sablefish landings were sampled for length and weight data and age structures were collected from deliveries of round fish. Skipper interview and logbook programs were continued with increased effort during 1987. Skipper interview effort concentrated on the state managed sablefish and rockfish fisheries and logbook effort concentrated on the mandatory trawl logbook program. Both of these programs are designed to provide detailed location and effort information which, when coupled with the fish ticket data, provides an estimate of CPUE by management area for the landed catch. As in past years, a disproportionate amount of time was spent monitoring and developing regulations for the rapidly expanding nearshore rockfish fishery. A draft management plan was completed and more restrictive regulations were implemented in May 1987 resulting in the first closure sever for state-managed rockfish fisheries.

Besides the report sampling, biological studies during 1987 were limited to a rockfish abundance indexing survey conducted in the coastal waters off Sitka during July. Data from that study is still being analyzed and will be used to redesign the subsequent surveys in that area.

Rockfish sex and maturity data from port samples in Sitka was summarized and incorporated into a report on reproductive timing of nearshore rockfish which was published as an ADF&G Informational Leaflet.

Management activity during 1987 included the closure of both inside area sablefish fisheries after the shortest seasons on record, and the closure of three areas to flatfish trawling for conservation reasons.

New regulations which went into effect during 1987 included establishment of groundfish management areas, setting preliminary demersal shelf rockfish harvest limits for each of those areas and establishing a provision for the retention of demersal shelf rockfish of 10 percent by weight after the closure of the directed rockfish fishery. The Central region groundfish project was effectively non-existent during 1987 with exception of fish ticket data entry in the Homer office. Responsibility for management of the Prince William Sound sablefish fishery was absorbed by salmon and shellfish management personnel.

Management action in the Central Region during 1987 was limited to the closure of the Prince William Sound sablefish

fishery. The fishery opened on April 1 to coincide with the opening of the adjacent EEZ fishery and closed on June 25 after 86 days of fishing, four days longer than the 1986 season.

The fishery was marred by problems with orcas and it was estimated that the loss to the whales accounted for 9 percent of the total 93 t harvest.

The Westward Region groundfish program, which is centered out of Kodiak, concentrated in fulfilling fish ticket data entry and on-board observer contracts funded during 1987. The domestic annual production (DAP) harvest has increased exponentially over the past few years. The observer program, although grossly under-funded and under-staffed, is expanding in an attempt to determine the bycatch rates of non-target species (crab, salmon, halibut) in those fisheries. The 1987 program consisted of 2-4 observers during peak fishing periods. The observers, stationed at Kodiak and Dutch Harbor, concentrated on the shore-based component of the domestic fleet rather than the offshore catcher-processor component during 1987. Results of the 36 observer trips made during 1987 were publicized in ADFG&G News Releases and summarized data was presented to the North Pacific Fisheries Management Council.

Fish ticket data entry was more difficult during the start up of the NMFS contract because of the considerable amount of work needed to systematize state/federal data collection and reporting procedures. That problem was not unique to the Westward Region and required considerable staff time statewide.

The Westward Region groundfish program coordinator serves as a member of both the Gulf of Alaska and the Bering Sea Groundfish Plan Teams and participates as an ADFG&G representative to INPFC. Headquarters participation in the groundfish program during 1987 was limited to NMFS contract supervision. The groundfish information systems manager hired to oversee collection and entry of catch data from the EEZ is stationed in the NMFS Alaska Region office in Juneau.

The Division of Sport Fish has been conducting a statewide angler survey in recent years to determine landings from recreational fisheries, including groundfish. In addition, detailed creel census programs are being conducted at major ports of landings in the southeast and southcentral areas of the state. The creel census forms have been modified to provide information from groundfish landings with emphasis on rockfish harvest. The Commercial Fisheries Groundfish staff has worked closely with creel census personnel to assist them with species identification and provide other information.

Beginning in 1987 an eight fish per day bag limit was adopted for all species of rockfish in Sitka Sound and adjoining

waters, the first such limit on recreational groundfish fisheries in the Southeastern area.

A limit of ten rockfish per day and ten in possession has been in affect in the Cook Inlet-Resurrection Bay salt water area since 1985. In 1987 a limit on lingcod of two per day and two in possession was also implemented for that area.

4. WASHINGTON

The Washington Department of Fisheries Marine Fish Program is responsible for research, management and enhancement of non-anadromous finfish resources. There are currently three divisions actively engaged in groundfish management; a list of personnel within those divisions is included in this report.

a. Coastal Marine Fish Management.

The Coastal Marine Fish Management Division is responsible for management and research of groundfish in all coastal waters and in the outer Strait of Juan de Fuca. The Division also handles all issues requiring interstate, regional, federal or international cooperation. Division responsibilities include membership on the Groundfish Management Team (GMT) of the Pacific Fishery Management Council (PFMC), membership on the Gulf of Alaska Plan Team of the North Pacific Fishery Management Council, 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.

The central focus of the Division is effective management of the coastal groundfish stocks. This 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.

Major accomplishments of the Division during 1987 were: 1) The second year of the comprehensive 5 year stock assessment investigations of black rockfish and lingcod was completed. These studies are funded by the federal Wallop/Breaux grant in aid program administered by the U.S. Fish and Wildlife Service. 2) Fishery data collection, tabulation and analysis is a major ongoing responsibility of the Division. This work includes monitoring commercial and recreational landings, collection of trawl logbook information, tabulating and analyzing biological data and preparing

management regulations. This work was seriously jeopardized when federal funding for port sampling and data processing was terminated effective May 1, 1988. All commercial fishery port sampling activities in Ilwaco, Neah Bay, and Seattle were discontinued until funding is restored. 3) The Division continued its participation on the GMT. Work included monitoring coastwide landings and developing and updating in-season catch projections of those species which are managed by quota or harvest guideline. The GMT also prepares an annual "status of the fishery" document. Division staff contribute stock assessment documents, coastwide landing tables, and special reports for the document. 4) The strong emphasis to achieve full compliance for the mandatory trawl logbook program continued in 1987. Virtually all coastal trawlers routinely submit completed trawl logbooks at the completion of each fishing trip. Compliance may deteriorate in ports where sampling has been discontinued. We intend to issue citations if logbooks are not submitted in accordance with the regulation. 5) A permit only coastwide thresher shark fishery was managed jointly with the Oregon Department of Fish and Wildlife. The permit controlled northward expansion of a drift net fishery which previously has operated adjacent to California. Fishing success and effort was lower than 1986 but interest in the fishery remains high. Oregon and Washington have completed a joint management agreement for 1988 which includes provisions for seasons, data collection, observer coverage, and a 372 mt (820,000 pounds) quota. Special provisions were included to minimize capture of marine mammals. A proposal for data collection and fishery plan development has been submitted by PMFC for funding under the Interjurisdictional Fisheries Act. 6) A revised age-structured assessment of the status of yellowtail rockfish stocks in the INPFC Columbia and Vancouver areas was undertaken. WDF completed aging of 25,000 stored yellowtail rockfish otoliths using the break and burn method of aging which allowed reconstruction of an 11 year time series of catch-at-age information. A draft report was submitted for review by the PFMC. Revisions are underway and a final report is due in the Summer of 1988.

b. Puget Sound Marine Fish Management.

The Marine Fish Program of the Washington Department of Fisheries defines Puget Sound as those waters east of the Sekiu River including the Strait of Juan de Fuca. The Puget Sound Marine Fish Division is responsible for the management of the marine fish resource in this area. The Division is organized into three units: Baitfish, Marine Fish Assessment, and Marine Fish Monitoring and Operations.

The Baitfish Unit is responsible for all research and management of the baitfish resource; chiefly Pacific herring (Clupea harengus pallasi) and several species of smelt (family Osmeridae). 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 extensive 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 extensive 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.

c. Technical Services

The Technical Services Division performs specialized work in support of stock assessment and harvest management activities of the other Marine Fish Divisions. Areas of work covered by Technical Services include: hydroacoustics, age determination, and computer data processing.

The Hydroacoustics Unit conducts biomass surveys for marine fish stock assessment from our 37-foot boat, M/V Pasquale, with specialized on-board hydroacoustic equipment. Species and areas surveyed on an ongoing basis include: black rockfish coastwide; true cod in Agate Pass; herring in Bellingham Bay, Hood Canal, Gulf of Georgia, and South Puget Sound; whiting in Port Susan; and sockeye salmon presmolts in Lake Washington. Other activities include bottom mapping coastwide and testing of new dual-beam hydroacoustic gear that will potentially provide greater accuracy in correlating target strength with actual biomass.

The Age Determination Unit conducts microscopic examinations of otoliths, spines, and other bony structures from marine

fish samples to determine the age of specimens in support of marine fish stock assessment. Current activities include the aging of pollock, arrowtooth flounder, and Puget Sound hake otoliths; widow, yellowtail, and black rockfish otoliths; and lingcod spines and English sole interopercula from 1988 samples. This unit recently developed aging criteria for arrowtooth flounder and cabezon and re-evaluated the criteria used for aging Puget Sound hake.

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. The unit is presently working on consolidating the Trawl Logbook and Biological Sample Databases on our in-house computer system, and streamlining our data storage and retrieval capabilities.

4. OREGON DEPARTMENT OF FISH AND WILDLIFE (ODFW)

Monitoring of the groundfish fisheries and the resource continued much as in the past. Major emphasis continued on the dominant trawl fisheries, especially species composition on rockfish. A strong shrimp fishery in 1987 resulted in a substantial effort shift from groundfish to shrimp fishing in the April-October period. Good markets for groundfish continued throughout the year. Most activities remained fairly routine and unchanged in substance from previous years, however.

In 1987 we collected 1044 biological samples, slightly more than the amount collected in 1986 (Table 1). Rockfish species composition samples accounted for two-thirds of the samples collected.

The Marine Finfish Program again monitored the new thresher shark drift gillnet fishery in 1987 much as was done in 1986. Because gillnets are a prohibited gear type the fishery was allowed to operate via State experimental fishing gear permits. There were 85 vessels permitted from both Oregon and Washington, of which only 29 actually landed thresher shark. Total three-state landings were 111 t (dr wt) of which 46 t were landed into Oregon ports, most of the remainder in Washington State under a coordinated interstate program. A small amount of Pacific whiting was caught but not landed. Federal Experimental Fishing Permits approved by the Pacific Fishery Management Council were issued by NMFS to permittees validated by ODFW or WDF in 1987 for the first time to allow retention-sale of bycaught soupfin, dogfish and leopard sharks ("Groundfish" under the FMP). Permittees landed 253 soupfin shark (about 6 t, dr wt) as a result.

Major analytical tasks started or completed in 1987 included a stock assessment of petrale sole in the INPFC Columbia and

Vancouver area and a draft report detailing trends in the fishery since implementation of the Magnuson FIshery Conservation and Management Act in 1976. We also completed an analysis of Dover sole tagging studies undertaken by ODFW since 1948.

Staff also participated in Pacific Fishery Management Council activities as members of the Groundfish Management Team, the Groundfish Select Group, the groundfish plan rewrite group, the Council's limited entry committee and the ad hoc stock assessment working group. A list of personnel is shown in Appendix 1.

5. CALIFORNIA DEPARTMENT OF FISH AND GAME (CDFG)

The California Department of Fish and Game's groundfish management and research activities are conducted by the Marine Resources Division (MRD) with data processing assistance from the Technical Services Branch. A considerable amount of groundfish monitoring work is conducted by MRD port biologists with assistance from federally-funded technicians.

Systematic commercial groundfish fishery sampling programs were conducted at all major California ports during the year for biological and species composition data on sablefish, rockfishes, Dover sole and English sole. Primary emphasis was given to the trawl fishery in northern California and to the set net fishery in central and southern California. Budget reductions resulted in the loss of field technicians in San Francisco and Morro Bay which severely impacted the rockfish and flatfish sampling programs. In 1987, 703 rockfish samples, 100 flatfish samples, and 145 sablefish samples were obtained from landed catches for species, age, and size composition.

The following major analytical efforts were completed during 1987. Data entry and summary programs were written to process the state's sablefish trap log database from 1979-1986 which was accomplished. The resulting summaries were distributed to

NMFS sablefish stock assessment biologists. Work is ongoing to further edit this database and to input 1974-1978 trap logs. Work also continued on a comprehensive gill net log data processing system. Currently, drift gill nets are processed by the swordfish-thresher shark project, whereas set gill net log data are partially captured by Departmental marine mammologists ascertaining incidental marine mammal mortality. To date, the gill net log database has not been adjusted by the corresponding fish receipt catch and value information.

A stock assessment was completed on bocaccio (Sebastes paucispinis) but was not submitted to the Pacific Fishery Management Council for the 1987 management cycle. The

analysis suffered from a lack of set net catch-at-age data. A limited amount of information is available from the set net fishery and will be included in future assessments of bocaccio.

Approximately 6,000 chilipepper (Sebastes goodei) age structures were aged from the 1985 and 1986 fishing years to extend the catch-at-age database to 1978-1986. An updated stock assessment for chilipepper is scheduled for 1989.

Production ageing and processing of Dover sole commercial sample data from the INPFC Eureka area continued during the period, representing over 6,000 age structures. A preliminary assessment of the Eureka area Dover sole stock is slated for 1988. The assessment will include calculation of von Bertalanffy growth parameters, a compilation of an extensive catch history, and a simplified application of the stock synthesis model developed by R. Methot (NMFS-NWAFC).

CDFG groundfish personnel cooperated with California Sea Grant researchers studying the age and growth of bank rockfish. Work began to determine the periodicity of otolith ring formation, to assess the precision and accuracy of various ageing methods, and to age the extensive 1977-1987 commercial fishery sample database.

Two gill and trammel net fishery investigation projects continued their monitoring efforts during 1987, principally by at-sea observations. The southern California project's primary goal is to assess the impact of the gill net fishery on recreational fishes with emphasis on white seabass and California halibut resources. The central California gill net monitoring project has focused on the problem of by-catches of anadromous fishes, marine birds and marine mammals in the nearshore fisheries for California halibut, white croaker, and rockfishes. The central California project has scale back its field work in order to analyze its data and publish its findings.

The nearshore set net fisheries have been heavily regulated in recent years with extensive area, time, and depth closures. As a result, many California fishermen have been displaced. Recently the Department began a program to develop alternative gear fisheries for these former gillnetters. The Department has worked with fishermen on the application of Danish seines for white croaker, large mesh trawls for California halibut, and small-boat pair trawling for croaker and other species. The program is too new to state the merit of these approaches, but these alternatives do appear to catch significantly fewer birds, mammals, and anadromous fishes.

California currently conducts several monitoring programs on recreational fisheries, with emphasis on commercial passenger fishing vessels. The projects sample sport vessels at sea for

catch and biological data on a site-specific basis. This site-specific information is coordinated with set net fishery observations to assess the impact of intensive commercial fishing on recreational fishing success at discrete fishing localities. during the year, this study expanded geographically to include ports in the Monterey to Fort Bragg area. The Nearshore Sportfish Habitat Enhancement Project supervises the placement and evaluation of artificial reef structures in the Southern California Bight.

6. INTERNATIONAL PACIFIC HALIBUT COMMISSION (IPHC)

The International Pacific Halibut Commission was established in 1923 by a Convention between Canada and the United States for the preservation of the halibut (Hippoglossus stenolepis) fishery of the North Pacific Ocean and the Bering Sea. The Convention was the first international agreement providing for joint management of a marine resource. The Commission's authority was expanded by several subsequent conventions, the most recent being signed in 1953 and amended by the protocol of 1979. Three com-missioners are appointed by the Governor General of Canada and three by the President of the United States. The commissioners appoint the director who supervises the scientific and administrative staff. The scientific staff collects and analyzes statistical and biological data needed to manage the halibut fishery.

Each year the Halibut Commission conducts various experiments, surveys, and data collection programs aimed at better understanding the biology of halibut, the effects of the fisheries upon the resource, and the changes taking place within the halibut population. These projects generally fall into categories of 1) annual field research; 2) special field research; and 3) stock assessment.

The Commission meets annually to review all regulatory proposals, including those made by the scientific staff and the Conference Board, which represent vessel owners and fishermen. The measure recommended by the Commission are submitted to the two governments for approval. Upon approval, the regulations are enforced by appropriate agencies of both governments.

VII. REVIEW OF NORTHEAST PACIFIC GROUNDFISH FISHERIES

A. Canada-United States Fisheries

1. Commercial Fisheries-domestic

a. Total

Canada-United States landings of groundfish (excluding Pacific halibut and joint venture) are reported in Table 1. Landings of groundfish were 576,876 t in 1987, compared with 138,093 t in 1986! Alaskan groundfish landings increased by

144 % to 408,724 t, thus accounting for the majority of the substantial increase. Landings in Washington, Oregon, and British Columbia increased by 21%, 23%, and 31%, respectively, while California landings decreased by 1 % from the 1986 level. In the British Columbia to California area, trawl gear accounted for 139,435 t or 85% of the total domestic catch. (Alaskan landings were not reported by geartype). Principal species comprising the trawl catch were rockfish (38%), Dover sole (14%), Pacific whiting (13%), Pacific cod (12%), and sablefish (5%). Line gears (longline, troll, hook-and-line) accounted for 8% of the total domestic catch.

b. Canada

Canadian landings of groundfish (excluding halibut) in 1987 were 67,941 t (Table 1), an increase of 29% above the 1986 level. Trawlers landed 60,491 t, 35% more than in 1986 and 89% above the 1977-1986 mean (Table 2). The major species in the trawl landings were Pacific cod (23%), Pacific hake (22%), Pacific ocean perch (10%), yellowtail rockfish (7%), silvergray rockfish (5%) and redstripe rockfish (5%). Principal areas of trawl production were 4B (20%), 5D (14%), 5B (14%) and 3C (14%).

Canadian landings of groundfish caught by gear other than trawl in 1987 totaled 8,450 t (Table 1). Trap gear accounted for 2,860 t (99% sablefish) and longline, handline and troll gear for 5,590 t (33% dogfish, 21% sablefish and 19% lingcod).

c. Alaska

The ADFG groundfish staff began collecting groundfish catch data from the EEZ under contract by NMFS in July 1987. The data entry system used is, however, not yet programmed to provide reliable catch data back to the area offices. Therefore, the ADFG catch report is limited to the state-managed fisheries again for 1987. The report on DAP fisheries in the EEZ will be provided by the observer from the North Pacific Fisheries Management Council.

With the exception of shelf rockfish in the Southeastern area, which are managed by the state in the EEZ, groundfish management authority is restricted to waters within three miles of shore and to the internal waters of Southeastern Alaska, Yakutat Bay, and Prince William Sound. The catch data included with this report is presented accordingly.

Landings of all species increased 23% in the state-managed fisheries from 3,681 t during 1986 to 4,526 t in 1987. The largest numeric increases were in the Pacific cod and lingcod landings which increased by 170% and 72% over the 1986 harvest levels. Sablefish landings dominated the state-managed groundfish harvest again in 1987, but catches remained nearly the same as in 1986 because of regulations

Table 1. Canada-United States groundfish landings (t) by gear type and location in 1986 and 1987 (Pacific halibut and joint venture excluded.

Gear	AK	BC	WA	OR	CA	TOTAL
			1986			
Trawl	*	44,329	16,274	20,841	32,469	113,913
Pot	*	3,277	37	1,426	686	5,426
Longline	*	4,246	2,545	1,386	**2856	11,033
Other	*	-	686	1,251	5,784	7,721
Total		51,853	19,542	24,904	41,795	138,093
			1987			
Trawl	*	60,491	18,751	25,951	34,242	139,435
Pot	*	2,860	-	1,704	354	4,918
Longline	*	5,590	4,817	1,448	**2661	14,516
Other	*	-	1,370	1,513	4,112	6,995
Total	408,300	68,941	24,938	30,616	41,369	570,164

** Alaska landings were not reported by gear type.

** California landings include all line gears.

Table 2. Trawl landings (t) from the northeastern Pacific Ocean in 1986 and 1987. (Joint venture landings excluded)

Species	AK	BC	WA	OR	CA	TOTAL	1986
Arrowtooth flounder	*	1,191	2,004	725	45	3,965	3,042
Dover sole	*	632	1,603	6,017	10,759	19,011	16,947
English sole	*	757	924	594	1,322	3,597	2,667
Petrale sole	*	443	523	852	824	2,642	2,010
Rex sole	*	84	86	286	825	1,281	1,289
Rock sole	*	879	32	1	4	916	515
Starry flounder	*	65	322	91	93	571	495
Other flatfish	*	221	197	448	703	1,569	1,142
Lingcod	*	2,376	866	559	496	4,297	4,258
Pacific cod	*	13,771	2,292	641	66	16,770	4,593
Pacific whiting (hake)	*	13,275	396	176	4,518	18,365	11,719
Sablefish	*	418	831	2,520	3,103	6,872	6,789
Walleye pollock	*	1,270	-	-	-	1,270	577
Rockfish	*	22,975	7,983	13,020	11,338	55,316	50,936
Spiny dogfish	*	1,427	464	-	-	1,891	2,730
Misc. species	*	707	228	21	146	1,102	3,235
Total		60,491	18,751	25,951	34,242	139,435	112,944

* Alaska landings were not reported by gear type.

and harvest restrictions in that fishery.

Virtually all of the sablefish, rockfish, and Pacific cod landed from state waters were taken on setline gear, while most of the flatfish landed were taken by trawl gear. Small landings of these groundfish species were also made by troll and mechanical jigging machine fisheries, but represent an insignificant amount of the total state-managed groundfish landings.

One exception to the dominance of setline and trawl gear in the Alaskan groundfish fisheries is in the lingcod fisheries where approximately 33% of the landings were by mechanical jigging machines and 8% were from troll gear. A large amount of the lingcod harvest reported as caught by mechanical jigging machines was actually taken by trollers using "dingle bar" gear licensed as jigging machines.

d. Washington

Total groundfish landings in Washington State from catches in Washington, Oregon and California waters (PMFC areas 2C, 3A, 3B, 3C, and 4A) were 23,700 t in 1987: 18,751 t caught by trawl, 3,579 t by setline, 545 t by shrimp trawl and 825 t by other gears. This represents a 19% increase over total landings of 19,989 t in 1986.

(a) Trawl Landings. In 1987, Washington's landings of trawl caught groundfish increased by 15% from 16,274 t in 1986 to 18,751 t in 1987 (Table 1). Declines were registered in only two of fifteen species categories.

(b) Other Gears. Washington's 1987 landings from gears other than trawl were 4,948 t representing a 33% increase over the 3,715 t landed in 1986 (Tables 2-6). No pot fishery landings were reported for 1987. The setline fishery landed 3,579 t; 2,786 t from the coast, and 793 t from Puget Sound. The coastal shrimp-trawl fishery landed 545 t in 1987, down slightly from the 686 t landed in 1986. Shrimp-trawl landings consisted of 74% rockfish, 9% lingcod, 7% dover sole, 4% sablefish, 3% arrowtooth flounder, and the remainder miscellaneous species. Inside Puget Sound, landings by gears other than trawl were 93% dogfish, 4% surfperch and 1% Pacific cod.

Trawl Landings by Species.

(a) Dover sole. Washington's Dover sole (Microstomus pacificus) landings were 1,603 t in 1987, comparable to the 1,493 t landed in 1986. This increase follows a 55% decline in Dover landings which occurred from 1984 to 1986.

(b) English sole. English sole (Parophrys vetulus) landings increased by 13% between 1986 and 1987 from 820 t to 924 t.

Puget Sound landings dropped 11% from 417 t in 1986 to 369 t in 1987. Coastal landings increased 27%, from 403 t in 1986 to 552 t in 1987.

(c) Petrale sole. Petrale sole (Eopsetta jordani) landings were 523 t in 1987 representing an 69% increase from the 310 t landed in 1986. Landings from the Washington-Oregon-California area have been vacillating between 300 and 600 t since 1980.

(d) Pacific cod. Pacific cod (Gadus macrocephalus) landings were 2,292 t in 1987 representing a 147% increase over the 928 t landed in 1986, reversing an eight year trend of declining landings. Catches from Puget Sound waters are responsible for 34% of the 1987 landings and increased 22% from 638 t in 1986 to 779 t in 1987.

(e) Lingcod. Trawl landings of lingcod (Ophiodon elongatus) increased 45% from 599 t in 1986 to 866 t in 1987. Landings increased in all PMFC areas except 4A (Puget Sound).

(f) Rockfish. Total landings of rockfish increased from 7,222 t in 1986 to 7,983 t in 1987, representing a 10% increase. Washington landings of rockfish by species and PMFC area for 1986 and 1987 are tabulated in Appendix II.

(g) Sablefish. Trawl landings of sablefish (Anoplopoma fimbria) totaled 831 t in 1987, a 49% increase over the 556 t landed in 1986. Trawl caught sablefish accounted for only 25% of the 3,391 t of sablefish landed by all gears.

(h) Spiny dogfish. Trawl landings of spiny dogfish (Squalus acanthias) were 464 t in 1987, up slightly from the 387 t landed in 1986. Current landings are well below the average of the previous ten year period.

e. Oregon

The total landed catch of groundfish (excluding Pacific halibut) by commercial gear types in 1987 was 30,616 t, 23 % greater than the 24,899 t landings of 1986. Most of the increase was attributable to the trawl fishery. The trawl fishery accounted for 25,951 t and represents 85% of the commercial landings. The 1987 trawl landings were 25% greater than 1986 landings and about 5% greater than the 10-year mean landing of 24,779 t.

Landed catch by other commercial gear types was 4,665 t, an increase of about 15% over 1986. Pot, longline and shrimp trawl were most important and accounted for 37%, 31%, and 24%, respectively. Commercial hook-and-line (vertical H-L, jig) accounted for most of the rest. Sablefish was the principal species landed for pot and longline gear while rockfish dominated the landings of incidental catch by shrimp trawls. Commercial landings of Pacific halibut into Oregon

ports were 416 t, a substantial increase over 1986. About 91 t (dr wt) were caught in IPHC Area 2A (Washington-Oregon-California) by longliners.

Trawl Landings by Species

(a). Dover sole. Trawl landings of Dover sole were 6,017 t, a 26% increase over 1986 and 14% greater than the 10-year mean. The major reason was strong markets throughout the year even though substantial trawl effort was directed towards the shrimp fishery. The areas of major production were PMFC areas 2B, 3A, and 2C.

(b). English sole. Trawl landings of English sole were 594 t, an increase of 8% over 1986 but 34% less than the 10-year mean.

(c). Petrale sole. Trawl landings of Petrale sole were 852 t, an increase of 21% over 1986 but 8% less than the 10-year mean landing. PMFC areas 2B and 3A accounted for most of the landings.

(d). Pacific cod. Pacific cod were notable in 1987. The trawl landings were 641 t, a 25-fold increase over 1986 and a 4-fold increase over the 10-year mean. The 1987 catch represents the highest catch of record. In past years, PMFC area 3A accounted for nearly all the landings. In 1987, landings by area were 3A-301 t, area 2B-175 t, and area 2C-101 t. The remainder was from areas 1C, 2A and 3B.

(e). Lingcod. Trawl landings of lingcod in 1987 were 559 t, an increase of 14% over 1986 but 51% less than the 10-year mean. The 1987 landings, although improved, are still part of a declining trend that has persisted since 1984. PMFC areas 2B and 3A accounted for most of the landings.

(f). Rockfish. Trawl landings of rockfish (all species) in 1987 were 13,020 t, an increase of 20% from 1986 and 2% greater than the 10-year mean. Bottom trawl landings were 7,593 t, while pelagic trawl landings were 5,427 t. Areas 3A, 2C, and 2B accounted for most of the landings. Major species were widow, yellowtail, canary, and darkblotched rockfishes, and thornyheads.

(g). Sablefish. Trawl landings of sablefish in 1987 were 2,520 t, 19% greater than in 1986 and 26% greater than the 10-year mean. In early November, landings of sablefish were prohibited because the coastwide quota had been reached. Discards are unknown at this time, but could have been substantial. trip limits of 6,000 lbs or 20%, whichever was greater, were imposed on October 2, 1988 but were not effective in preventing prohibited species status.

f. California

Commercial landings of groundfish, including California

halibut, by California fishermen in 1987 were 41,369 t (Table 1) with an ex-vessel value of $33.2 million dollars. This represents a negligible increase in catch but a 7% increase in value over 1986 levels. The trawl fishery increased its proportion of the total statewide groundfish catch from 78 to 82 % or 34,242 t. Set net gear accounted for 4,078 t (10.3%), followed by hook-and-line with 2,661 t (6.7%), pot gear with 354 t (0.9%), and "other" gears with 34 t (0.1%). Market demand was robust throughout the year for all species, but showed signs of weakening by year's end.

In 1987, trawl landings increased by 5.8% to 34,242 t, despite an 1,100 t reduction in the trawl sablefish harvest (Table 2). Shore-based whiting deliveries continued their expansion in recent years to 4,517 t in 1987 (from 2,940 t in 1986). Landings of the other principal trawl species exhibited moderate increases during the year. As in other years, Dover sole, rockfishes, Pacific whiting, and sablefish were the predominant trawl species. The number of trawlers landing groundfish decreased by four vessels to a 1987 total of 122 vessels. In 1982, the state's trawl fleet peaked in number at 195 trawlers.

The state's sablefish pot fleet decreased from 8 to 4 vessels last year and pot-caught sablefish landings dropped correspondingly from 832 to 332 t. During the height of the pot fishery in California in 1979, 69 vessels actively fished. An estimated 10 longline vessels fished for sablefish in 1987. Unfortunately, an estimate of set net fleet size is unavailable.

g. Halibut

Halibut fishing in 1987 continued a recent trend of increasing catches (Table 1). Preliminary landings and number of fishing days by management area for 1987 are presented in Table 2. The fishery landed 69.38 million pounds dressed weight (42,000 t round weight), and slightly exceeded the 68.82 million pound (41,700 t) catch limit set by the International Pacific Halibut Commission. The 1987 catch exceeded the 1986 catch of 68.96 million pounds (41,700 t), and was about three times larger than the recent low levels of about 22 million pounds (13,000 t) during the 1977-80 period. Largest abundance and the majority of catch occurred in the Gulf of Alaska (Alaska Peninsula through Southeast Alaska). In 1987, 436 Canadian vessels reported halibut landings. The number of Canadian vessels landing halibut is close to the maximum number of vessels authorized to fish for halibut under a limited entry system. In the United States, which has no restrictions on the number of vessels that may participate in the halibut fishery, 3,893 vessels reported halibut landings. An additional 2,000 U.S. vessels were issued an IPHC commercial license, but did not fish. Overall, the Canadian fleet reporting halibut landings was nearly five percent larger, and the United States fleet

nearly 14 percent larger than the respective fleets that fished in 1986.

2. Recreational Fisheries

a. Canada

Fisheries Branch (DFO) conduct creel surveys of the recreational angling fishery in the Strait of Georgia. Principal target species are chinook and coho salmon. Provisional estimates of 1987 catches were 65,789 fish for lingcod, 136,270 for all rockfish species and 4,056 for dogfish.

b. Alaska

Estimates of recreational groundfish harvests are not yet available for 1987. The statewide angler survey indicated that 101,258 rockfish and 81,351 other groundfish were retained from the recreational fisheries in Alaska in 1986. Assuming a five pound average for rockfish, these data indicate that approximately 230 t of rockfish were retained. Creel census data in Southeast ports indicate that discard of rockfish exceeds the retained portion of the catch suggesting that over 500 t of rockfish were taken in the recreational fisheries statewide.

No data is available to determine the species composition of the "other groundfish". It is assumed, however,that lingcod, Pacific cod, and flatfish are the predominant species taken. It should be noted that the discard rate on other groundfish also likely exceeds the retained portion of the total harvest.

The ADFG is attempting to obtain better data on recreational fisheries and has requested funding to determine the landings from the steadily increasing charter boat fleet.

c. Washington (Puget Sound).

(1) Total landings. 1987 Recreational data is not available at the writing of this report, however the 1986 data, not available for the 1986 TSC report, is presented here. The total harvest of groundfish in Puget Sound during 1986 was 799,000 fish, landed during an estimated 1,343,000 trips.

The Puget Sound Marine Fish Division reports recreational landings in numbers of fish. The Puget Sound groundfish recreational catch estimation procedure was substantially revised in 1988. Comparison of the recreational fishery landings reported previously may be misleading.

(a) Pacific cod. An estimated 114,000 Pacific cod (Gadus macrocephalus) were landed by Puget Sound anglers.

(b) Lingcod. In 1986 and estimated 31,000 lingcod were taken in Puget Sound.

(c) Rockfish. Recreational rockfish fisheries landed 223,000 fish.

(d) Spiny Dogfish. Spiny dogfish (Squalus acanthias) are not normally retained by recreational anglers, however in 1986 2,841 fish were landed by the recreational fisheries in Puget Sound.

d. Oregon

The 1987 recreational fishery off Oregon resulted in a catch of 218,419 fish, an 8% increase over the 1986 landings. The number of bottomfish-directed ocean angler trips in 1987 was 24,442, down slightly from the 26,153 that occurred in 1986. Charter boat anglers made 16,387 of these trips (67%), with private boat anglers contributing the rest. Bottomfish target anglers caught an average of 5.7 fish per trip; this is identical to the 1986 catch per angler trip.

Black rockfish (Sebastes melanops) was again the most numerous species in the catch, comprising 59% of the total. Combined rockfish species accounted for 88% of the catch, the same as 1986.

In 1987, Pacific halibut (Hippoglossus stenolepis) was one of the top ten species landed, comprising only 1.6% of the total catch by numbers, but nearly 10% of the landed weight. An intensive survey of the recreational halibut fishery in Oregon resulted in a 1987 catch estimate of 4,393 fish for the total season, with a catch weight of 72,123 lb. (dr wt). Approximately 96% of this was caught out of Newport. Charter boat anglers caught 88% of the halibut, with private boat anglers contributing the remaining 12%. This fishery is rapidly expanding; only 35,000 lb. were landed in Oregon in 1986, less than 2,000-8,000 lb. annually before 1986 as bycatch.

PMFC area 2C produced 238 t of recreationally-caught fish, 66% of the state total. This area includes the ports of Garibaldi, Newport, and Depoe Bay, that ranked second, third and fourth, respectively, in the state's landings.

e. California

California's recreational groundfish landings from commercial passenger fishing vessels in 1987 were 1,780,095 fish, including 1,698,523 rockfish, 42,504 lingcod, 10,311 flatfish, 9,840 Pacific whiting, 4,773 cabezon, and 14,144 fish of other species. Northern California ports (Morro Bay northward) landed 1,221,998 groundfish and southern California ports 558,097 groundfish. Groundfish catches from skiff, pier, jetty and skin-diving modes were unavailable as

of this report.

f. Halibut

Sport fishing regulations in Alaska and British were the same as in 1986. The fishery opened on February 1 in these areas and closed on December 31, with a daily bag and possession limit of two fish per person and no size limit. Off California, Oregon, and Washington, the season opened on February 1, but closed on September 30. The earlier closure, along with a minimum size of 30 inches, was an attempt to limit the catch in this area to 200,000 pounds. The daily bag and possession limits remained at two fish per person. In all areas, sport charter boats intending to land sport-caught halibut were required to obtain an IPHC license. The recreational harvest of halibut totaled approximately four million pounds in 1987. Catches are summarized by area for 1983-1987 in Table 3. The most dramatic increase for this period occurred in Washington and Oregon where the catch increased from 50,000 pounds in 1983 to 461,000 in 1987, far exceeding the 1987 management goal of 200,000 pounds. Major increases in the sport catch also occurred in southcentral Alaska, particularly in the fishery off the Kenai Peninsula.

The catches shown in Table 3 reflect revisions in the catch estimates for Alaska for prior years and are based on average weight data obtained from the Alaska Department of Fish and Game creel census program. These data are recognized as being representative of sport-caught halibut throughout Alaska.

Voluntary Logbook Program

Responding to a growing directed halibut charter boat fishery in Alaska, IPHC initiated a voluntary sport charter boat logbook program in 1983. The program has been gradually accepted by the industry and a record 65 boats participated coastwide in 1985. Participation declined in 1986 and 1987 as similar logbook programs offered by state agencies and the IPHC caused some charter operators to choose one program or another. This duplication of effort has been resolved and participation in the IPHC program is expected to increase in 1988. Participation is greatest in Alaska, particularly Homer, where a dedicated halibut fleet resides. Other important sport charter halibut ports include Kodiak, Seward, Juneau, Sitka, and Ketchikan. West coast participation in the program is moderate but expected to increase in 1988. Oregon and Washington charter boat associations expressed a willingness to cooperate in the program to improve estimates of the recreational catch off Oregon and Washington. Major fishing grounds off the west coast include Hecata and Stonewall Banks off Oregon and Swiftsure Bank and the Strait of Juan de Fuca off Washington.

Catch rates of 1.3 to 1.7 halibut per angler are common in

Alaska and slightly less but rising in Oregon and Washington as charter operators learn more about locating halibut. Numbers of anglers per vessel and average time spent fishing remained consistent over the past three years. Average weight of fish caught generally is between 15 to 20 pounds (net weight). Participants in the program have accounted for approximately 10 to 20 percent of the total recreational harvest.

B. Joint-Venture Fisheries

1. Canada

In 1987, twenty-one Canadian catcher vessels delivered Pacific hake and incidental species to seventeen processing vessels in cooperative fishing arrangements. These fisheries take place off the southwest coast of Vancouver Island (Area 3C). A total of 48,076 t of Pacific hake was processed by 11 Polish vessels, 5 Soviet vessels and one Korean vessel. The quotas and catches are outlined below:

Nation	Species	Quota (t)	Catch (t)
Poland	Hake	25,000	26,347
	Pollock	incidental	686
	Rockfish	incidental	44
	Other	incidental	20
USSR	Hake	18,000	18,866
	Pollock	incidental	325
	Rockfish	incidental	72
	Other	incidental	tr.
Korea	Hake	5,000	2,863
	Pollock	incidental	71
	Rockfish	incidental	5
	Other	incidental	-
Total	Hake	48,000	48,076
	Pollock	incidental	1,082
	Rockfish	incidental	121
	Other	incidental	20

2. United States

U.S. joint venture fisheries have become the dominant harvesters of groundfish in the Bering Sea and Gulf of Alaska at the expense of foreign fisheries. In 1987 there was no foreign fishing at all in the Gulf of Alaska. After a major increase in joint venture catches in the Bering Sea between 1985 and 1986, catches grew by only 17% in 1987 going from 1,130,784 t in 1986 to 1,355,897 t. All of the increase occurred in pollock (+25%) and in yellowfin sole (+19%) catches. Decreases were recorded in Pacific cod for the

second consecutive year (-11%) and other flounders (-45%). Gulf of Alaska catches continued their decline going from 65,277 t to 32,524 t, due almost entirely to the poor state of the Shelikof Strait pollock resource. Pacific cod and flounder catches, though relatively small, were up by 46% and 650%, respectively. Joint venture hake catches in the Washington-California region increased markedly again and were 106,094 t or 30% greater than in 1986. Joint venture allocations in 1988 are 1,442,867 t (+42%) in the Bering Sea, 23,250 t (-76%) in the Gulf of Alaska, and 106,250 t (-11%) in the Washington-California area. Joint venture catches for 1986 and 1987 are presented in table 1.

Fishing effort was up again in the Bering Sea where processor-vessel days increased from 9,851 to 10,445. The decline in effort continued in the Gulf of Alaska where the number of processor-vessel days went from 2,360 in 1985, to 582 in 1986, and then to 374 days in 1987. In the Washington-California region effort continued it's increase from 764 processor-vessel days in 1985, to 1695 in 1986, and to 1892 in 1987.

Joint venture allocations for 1987 and 1988 are compared in table 2. The major reduction in the 1988 pollock allocation in the Bering Sea reflects the strength of the domestic land based fishery (DAP) and it's allocation of over 600,000 t. Similarly, the DAP was allocated the entire OY in the Gulf of Alaska in 1988 leaving no room for a joint venture fishery. Allocations for the Washington-California joint venture fisheries are not yet available, but it is expected that U.S./Poland, Republic of Korea, Peoples Republic of China, USSR, and Japan companies will participate.

C. Foreign Fisheries

1. Canada

The USSR and Poland conducted national fisheries for Pacific hake off southwest Vancouver Island (Area 3C) in 1987. Eleven Polish and four Soviet vessels caught 19,141 t of Pacific hake. Fifteen of the processing vessels involved in the joint-venture fishery occasionally fished directly (supplemental fishing) when domestic vessels could not supply sufficient quantities of hake. This supplemental catch of 2,314 t is added to the national catch. A summary of foreign fishery catches follows:

Nation	Species	Quota (t)	Supplemental Catch (t)		Total catch (t)
Poland	Hake	25,000	7,663	2,054	9,717
	Pollock	incidental	19	3	22
	Rockfish	incidental	224	49	273

	Other	incidental	3	tr.	3
USSR	Hake	12,000	11,478	260	11,738
	Pollock	incidental	64	-	64
	Rockfish	incidental	29	5	301
	Other	incidental	2	-	22
Total	Hake	37,000	19,141	2,314	21,455
	Pollock	incidental	83	3	86
	Rockfish	incidental	520	54	574
	Other	incidental	25	tr	25

2. United States

Very large decreases in foreign groundfish catches persisted in 1987 in all areas as a direct result of ever greater participation in the fishery by domestic vessels (Table 3). In the Bering Sea catches were reduced by 86% for all species, but largest reductions were seen for pollock (-99%), yellowfin sole (-97%), turbot (-85%), and squid (-88%). For the first time since the advent of distant water fishing in the northeast Pacific ocean there was no directed foreign fishing in the Gulf of Alaska. Pacific hake catches in the Washington-California region increased from 50,737 t in 1985, to 69,861 t in 1986, but decreased in 1987 to 49,656 t as joint ventures begin to take a greater share of the OY. Poland, the Republic of Korea, and the Peoples Republic of China received directed allocations, but Poland took by far the greatest portion of the catch.

Foreign fishing effort was reduced drastically from 12,495 vessel days in the Bering Sea in 1985, to 5,015 in 1986, and further to 3,263 in 1987. Foreign effort in the Pacific hake fishery increased from 1,192 vessel days in 1985 to 1.497 in 1986, but fell to 1,067 vessel days in 1987 as the joint ventures began to expand their efforts.

The continuing trend of increasing domestic participation in the groundfish fisheries within the FCZ has resulted in almost complete exclusion of foreign fishing effort. In 1988 there is no directed foreign fishing allocation in either the Bering Sea/Aleutian Islands or the Gulf of Alaska. Final 1987 foreign groundfish allocations for the Washington-Oregon region are presented in Table 4. Allocations for 1988 are not yet available but are expected in June. Directed foreign fishing in the Washington-California region in 1988 is again expected by Poland, the Peoples Republic of China, and the Republic of Korea.

D. GROUNDFISH MANAGEMENT AND REGULATIONS -- SIGNIFICANT CHANGES

1. Canada

Managers implemented a mandatory logbook for domestic trawl fishing effective June 1, 1987.

a. Rockfish

(i) The open-fishing experiment in Dixon Entrance was extended beyond the 1987 projected closing date.

(ii) The Moresby Gully S. alutus quota was increased by 50% to 3000 t, as a result of an internal review of the stock assessment. Both the Moresby Gully and Goose Island Gully stocks were placed in the high-risk category of yield.

(iii) Managers adopted a combined south and central coast quota of 2000 t for yellowtail rockfish in 1987. Two quotas had previously been applied. The combined domestic quota was raised to 3500 t in 1988

b. Pacific cod

A 14-day opening was implemented at the start of each of January, February and March, 1988, for Pacific cod spawning within Area 3C. Otherwise, as has been the case for a number of years, trawling is not allowed.

2. United States

a. Eastern Bering Sea-Gulf of Alaska
1. North Pacific Fishery Management Council (NPFMC)

Ms. McDevitt reviewed NPFMC actions on groundfish. Since the last meeting of the TSC the plan teams for both the Bering Sea/Aleutian Islands Groundfish FMP and the Gulf of Alaska Groundfish FMP have been preparing amendments. Both amendments have undergone public review and are scheduled for final Council action at their June 21-24 1988 meeting.

Bering Sea Amendment 12 proposes: revising the upper limit of the optimum yield range; establish a bycatch management system for king crab, Tanner crab, and halibut; require all floating processors receiving groundfish caught in the U.S. EEZ to obtain federal permits and report catch weekly; establish limits on the bycatch of groundfish species for which the TAC has been previously attained; streamline the schedule for preparation of the annual Resource Assessment Document; and establish limits on the amount of roe-bearing rock sole that can be harvested by joint ventures.

The Gulf of Alaska Amendment 16 proposes delaying the opening of the longline sablefish fishing season by either a plan amendment or framework procedure. The longline sablefish season which currently opens on April 1 is being evaluated against several alternatives including a May 1 and July 1 opening. The later openings are being considered following

requests from industry to manage the sablefish fishery to minimize halibut bycatch, promote sablefish quality, and conduct the fishery during periods of better weather. As with the Bering Sea plan, the Gulf FMP is also being amended to require that all vessels receiving groundfish in the U.S.EEZ to have federal permits and report their catch on a weekly basis.

The NPFMC is continuing to focus its attention on several issues, the most challenging being bycatch. Having recognized the mixed species nature of the groundfish fishery, their desire to minimize wastage of the resource, and the goal to maximize the full potential of the groundfish resource as a whole, the NPFMC is working towards development of a comprehensive management policy with regard to incidental catch. The NPFMC is also in the process of sending out for public review several limited entry alternatives for the sablefish fishery. Both of these projects should be completed by the end of the year and a more detailed report will be available by the 1989 TSC meeting.

b. Washington to California

1. Pacific Fishery Management Council (PFMC)

Regulation of the groundfish fisheries seaward of three nautical miles is managed by the federal government under the Pacific Coast Fishery Management Plan developed by PFMC. Pertinent federal regulations for the Washington-California fishery in 1987 are as follows:

Effective January 1, 1987

- Recommended a coastwide widow rockfish trip limit of 30,000 pounds per week with no biweekly option. Only one landing per week above 3,000 pounds (coastwide OY = 12,500 t; ABC = 12,100 t).

- HG for Sebastes complex north of Coos Bay, Oregon (43 deg 21 min 34 sec N) fixed at 10,200 t.

- For Sebastes complex north of Coos Bay: recommended 25,000 pound weekly trip limit of which no more than 10,000 pounds may be yellowtail rockfish (or 50,000 pounds biweekly of which no more than 20,000 pounds may be yellowtail rockfish; or 12,500 pounds twice per week, of which no more than 5,000 pounds may be yellowtail rockfish--biweekly and twice weekly landings require appropriate declaration to state in which fish are landed).

- For Sebastes complex south of Coos Bay: recommended 40,000 pound trip limit; no trip frequency limit.

- Recommended landings of Sebastes complex and widow rockfish be unrestricted if less than 3,000 pounds.

- Recommended allocating the sablefish OY between trawl and fixed gear at 52 (6,200 t) and 48 percent (5,800 t), respectively; if the quota for either gear type is reached, sablefish becomes a prohibited species for that gear; coastwide OY, ABC = 12,000 t.

- Recommended 5,000 pound trawl and 100 pound fixed gear trip limits (round weights) for sablefish smaller than 22 inches total length (16 inches dorsal total length), and apply coastwide.

- Recommended the coastwide Pacific ocean perch limit should be 20 percent of all legal fish on board or 10,000 pounds whichever is less (in round weight); landings of Pacific ocean perch unrestricted if less than 1,000 pounds regardless of percentage on board; Vancouver Area OY = 500 t; Columbia Area OY = 800 t.

- Recommended an ABC and OY of 195,000 t for Pacific whiting.

- Recommended an ABC of 4,000 t for yellowtail rockfish.

Effective April 5, 1987

- Recommended that the size limit of processed sablefish be changed to 15.5 inches (dorsal total length).

Effective April 27, 1987

- Recommended that the trip limit for sablefish smaller than 22 inches (total length) caught by fixed gear be increased from 100 pounds to 1,500 pounds coastwide.

Effective May 3, 1987

- Recommended changing the definition of fishing week from Sunday through Saturday to Wednesday through Tuesday for Sebastes complex and widow rockfish.

Effective July 22, 1987

- Recommended that the weekly trip limit for yellowtail rockfish caught north of Coos Bay should be decreased to 7,500 pounds (or 15,000 pounds biweekly; or 3,750 pounds twice weekly).

Effective August 14, 1987

- Coastwide ABC'S for widow and chilipepper rockfish increased to 12,500 t and 3,600 t, respectively.

Effective October 2, 1987

- Recommended that the trawl trip limit for sablefish should be 6,000 pounds or 20 percent of the legal fish on board, whichever is greater, including fish under 22 inches. Trip limits for fish under 22 inches remained in effect.

Effective October 22, 1987

- Recommended that the weekly trip limit for widow rockfish be reduced from 30,000 pounds to 5,000 pounds when 95 percent of the widow rockfish OY is projected to be reached (i.e., at 11,875 t).

2. WDF

(1) Puget Sound

(a) Otter Trawl-mesh size. WAC 220-48-011 (a). Allows the use of 3 inch mesh from December 1 to April 14 in areas 28A, 28B, 28C and 28D. This is a housekeeping correction and clarifies the areas allowing the smaller 3 inch mesh.

(b) Otter Trawl-seasons. WAC 220-48-015 (c). Closes area 25D (Port Townsend Bay) from February 1 through April 14 annually. The Pacific cod stock which supported this fishery is in poor condition as evidenced by fishery performance in recent years. The elimination of trawling and Pacific cod set net gear (below) protects this stock during a period of recovery.

(c) Pelagic Trawl-seasons. WAC 220-48-017 (2). Opens area 26A (Possession Sound) October 1 through January 14; Monday through Thursday. Limited fishing for Pacific whiting (Merluccius productus) has been allowed in this area under authority of special permit for several years. There have been no problems observed.

(d) Set Net-Pacific Cod-gear and seasons. WAC 220-48-025 and WAC 220-48-026 and WAC 220-48-027. WAC repealed. Makes Pacific cod set net gear illegal. Closes all areas and repeals the requirement for a mandatory logbook. This fishery targets on the Pacific cod stocks, and effort centers around Port Townsend Bay. The fishery performance has been poor in recent years, this closure will protect this stock during this recovery period.

(e) Set Line-seasons. WAC 220-48-032. Closes an area north of Point Bolin in area 26A. Housekeeping change to clarify the wording of the existing regulation.

(f) Commercial Jig-logbooks. WAC 220-48-046. Repeals the requirement for mandatory logbooks. New requirements for the documentation of landings made by this gear has eliminated the need for logbooks. The data required for management can

now be gathered from fish receiving tickets.

(g) Troll Lines-logbooks. WAC 220-48-056. Repeals the requirement for mandatory logbooks. New requirements for the documentation of landings made by this gear has eliminated the need for logbooks. The data required for management can now be gathered from fish receiving tickets.

(h) Puget Sound Whiting Endorsement Validation Procedure. WAC 220-87-010 (1-4). Outlines the endorsement guidelines: Requires fishermen to have a valid trawl license, submit proof of landings and submit proof of ownership or lease of an otter trawl vessel and net. The owner of the endorsement must be aboard the vessel while engaged in fishing activity. The endorsement can only be issued to a natural person. An individual may possess only one endorsement. The enabling legislation (SSB 4741) permitted the director of the Department of Fisheries to establish rules to enact the legislation.

(i) Puget Sound Whiting Endorsement-transfer. WAC 220-87-020 (1-2). Outlines the transfer of endorsement guidelines: An individual may transfer the endorsement to that person's spouse or child. An individual may transfer the endorsement from one vessel to another. The enabling legislation (SSB 4741) permitted the director of the Department of Fisheries to establish rules to enact the legislation.

(2) Coastal Management Zone.

During 1987 regulation changes by the Washington Department of Fisheries paralleled those of the Pacific Fisheries Management Council.

3. Oregon

The Oregon Department of Fish and Wildlife added a 30-inch (T.L.) minimum size limit for Pacific halibut in the recreational fishery to match Area 2A regulations adopted by the International Pacific Halibut Commission.

3. International

The International Pacific Halibut Commission received regulatory proposals for the 1987 halibut fishery from fishermen, vessel owners, processors, government agencies, treaty Indian tribes from Washington state, and the Commission's scientific staff. A summary of all proposals identified by source was distributed to interested groups prior to the meeting. The scientific staff's proposals were affected by three significant management problems identified in the 1987 fishery: high daily catch rate jeopardizes managing at the catch limit; illegal fishing is on the rise;

and incidental fishing mortality within the longline fleet is increasing.

Daily catch rates continued high in 1987. The change to circle hooks from "J" hooks, increased abundance, and increased fishermen in some areas combined to produce potential daily catches of over 15 million pounds (9,000 t) in Areas 3A and 3B (areas which represent about 60% of the total catch). One-day seasons in these areas may no longer permit management within the catch limits, and seasons of less than 24 hours and trip limits were necessary.

High prices, short seasons and large profits are apparently the cause of increased fishing before and after legal openings or in closed areas. Reports from fishermen of illegal fishing activities is at an all time high. In addition to other difficulties a high level of illegal fishing activity compromises CPUE data.

Efforts by fishermen to increase efficiency are causing increased incidental mortality. During short openings, some fishermen set more gear than can be hauled during an opening to be sure that maximum fishing occurs. In such cases, fishing occurs up to the end of the season, and all unretrieved gear abandoned for later pick-up. Bad weather also forces gear to be left. Incidental halibut mortality also occurs when fishermen improperly release undersized halibut; short intense seasons reduce the incentive of fishermen to exercise full care in releasing undersized fish.

VIII. GROUNDFISH RESEARCH

A. Stock Assessments

1. Pollock

a. NMFS-NWAFC

The abundance of the walleye pollock (Theragra chalcogramma) resource in the eastern Bering Sea remains relatively high. The exploitable biomass is projected to decline from 8.4 million t in 1985 to 6.5 million t in 1988, based on cohort analysis. Using an F0.1 harvesting strategy, the recommended Acceptable Biological Catch (ABC) for 1988 was 1.5 million t, resulting in a 23% exploitation rate.

In the Gulf of Alaska, the pollock resource is projected to increase from 687,100 t in 1987 to 866,600-1,033,000 t in 1988 depending on the various recruitment and catch levels. The predicted increases in biomass are primarily due to the strong 1984 year class. A range of ABC'S of 99,000-185,000 was recommended for the combined Western and Central areas of the Gulf. Catches in this range would allow the biomass to increase into 1989 for three of the four recruitment

scenarios, and would keep the biomass stable for the most pessimistic scenario.

For further information, contact Bernard Megrey (206) 526-6190.

2. Pacific cod

a. NMFS-NWAFC

Abundance of Pacific cod (Gadus macrocephalus) in the eastern Bering Sea and Aleutian Islands remained high during 1987, when a record catch of 149,000 t was taken. The 1987 survey provided continuing support for the hypothesis that the 1982-85 year classes are strong, though not as strong as the 1977-78 year classes that sustained the fishery during the early-to-mid 1980's. The biomass estimate for 1987 was the highest to date (1,142,400 t), representing a slight increase over 1986 (1,134,100 t). During 1987, the North Pacific Fishery Management Council issued a new requirement that Acceptable Biological Catch be calculated as the product of exploitable biomass and the maximum sustainable yield (MSY) exploitation rate.

This, in turn, required an estimate of MSY. Four methods were used to estimate MSY for the Pacific cod stock: Stock reduction analysis, the simple yield-per-recruit model of Beverton and Holt, and two age-structured analyses - one assuming a Beverton-Holt recruitment relationship and the other assuming constant recruitment.

Interestingly, the MSY estimates obtained from all four analyses compared favorably (262,900 t, 235,500 t, 205,900 t, and 283,600 t, respectively), despite the fact that very different recruitment assumptions were involved: the SRA estimate assumed an extremely strong stock/recruit relationship, the Beverton-Holt analysis and the density-independent version of the age-structured model both assumed constant recruitment, and the density-dependent version of the age-structured model assumed an intermediate stock/recruit relationship. It was determined that under prevailing ecological and environmental conditions the best estimate of MSY probably comes from the density-dependent version of the age-structured model (205,900 t).

The same age-structured model yielded a 1988 ABC estimate (using the Council's formula) of 213,000 t. Annual surplus production for the eastern Bering Sea portion of the stock was projected to be 277,400 t in 1988. This estimate may be on the high side, since the model's 1987 biomass estimate turned out to be approximately 7% above the survey biomass estimate (although the model estimate did fall well within the survey's confidence interval).

The Pacific cod resource in the Gulf of Alaska was determined

to be in good condition based on biomass estimates from the NMFS 1987 trawl survey. The current estimate of biomass in the Gulf of Alaska is 481,700 t. Estimates of potential yield from the stock range from 99,000-185,000 t. Recent catches of Pacific cod have been well below these estimates of potential yield.

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

b. DFO

Standardized landing statistics and historical length-frequency distributions compiled from port samples were published. These will facilitate future stock assessments. A special stock assessment, including yield-per-recruit analysis, was also published for Pacific cod in the Strait of Georgia. Landings from southern Hecate Strait (5C) for the first quarter of 1988 have increased by about 300% over 1987, but have decreased slightly for northern Hecate Strait (5D). The strong 1985 year-class is a major component of the landings from all areas.

3. Flatfish

a.NMFS-NWAFC

The abundance of most of the species of flatfish in the eastern Bering Sea have shown substantial increases during the 1970s and 1980s and many are at observed peak levels of abundance. Yellowfin sole (Limanda aspera) which is the second most abundant species in this region after walleye pollock have undergone a long-term sustained increase due to the recruitment of a series (1968-77) of stronger than average year classes. The current biomass is believed to be 2.0 million t or more which is as high if not higher than the estimated virgin biomass. The abundance of yellowfin sole is expected to decline because of recent lower levels of recruitment but the decline is anticipated to be slow. This resource is being harvested at near the optimal F0.1 exploitation rate of 0.123 which will provide a catch of about 250,000 t in 1988.

Two of the other three principal species of small flatfish, rock sole, (Lepidopsetta bilineata) and flathead sole (Hippoglossoides elassodon) are also at observed peak levels of abundance. Based on 1987 survey data the biomass of rock sole was estimated at 1.2 million t and flathead sole at 406,000 t. Recruitment continues strong in these species. The abundance of the third of these other small flatfish, Alaska plaice (Pleuronectes quadrituberculatus) increased to a peak of 734,000 t in 1984 and has since stabilized at about 550,000 t. These three species combined have been estimated to support catches of more than 300,000 t.

Trends in abundance of the two principal species of large

flatfish in the eastern Bering Sea, arrowtooth flounder (Atheresthes stomias) and Greenland turbot (Reinhardtius hippoglossoides), have experienced opposed trends in abundance. The abundance of arrowtooth flounder has increased substantially from an estimated biomass of about 100,000 t in the late 1970s to nearly 400,000 t in 1987. Over much of this same period, recruitment of Greenland turbot has been at very low levels and the area of the eastern Bering Sea shelf occupied by young juveniles has decreased dramatically. Some decline in the adult population has been observed from survey data and reduced catch quotas (about 11,000 t in 1988) have been implemented to protect the spawning population until recruitment improves.

The flounder group in the Gulf of Alaska is determined to be in good condition. The 1987 NMFS trawl survey estimate of biomass was 2.1 million t. Potential yield from this group was estimated by applying the exploitation rate at the F0.1 level to the 1987 biomass estimate, resulting in a yield of 767,700 t. Gulfwide flounder catches are well below this estimate of potential yield.

For further information, contact Richard Bakkala (206) 526-4150.

b. DFO

A multiplicative model incorporating effects of depth and vessel horsepower was used to standardize effort time series for rock and English sole in Hecate Strait. CPUE indices derived using standardized time series indicate that English sole abundance is currently stable while rock sole abundance is starting to increase.

A series of yield simulations was conducted for arrowtooth flounder in Hecate Strait. Results of 50-y forward simulations indicate that the maximum yield obtainable for this species in the Hecate region is between 5000-6000 t per year. Maximum yields were achieved with recruitment at age 4 and a fishing rate of 0.6.

A time series of length-frequency anomalies was produced for "southern" west coast of Vancouver Island petrale sole. The time series is useful in evaluating recruitment trends. The anomalies indicate a very low recruitment trend in this area from the late 1970s through the mid-1980s. The warm-water years in the early 1980s which were supposed to be beneficial to petrale sole recruitment do not appear to have had any effect. There may be cause for concern about recent recruitment failures.

c. ODFW

The only new stock assessment undertaken in 1987 was for petrale sole. This assessment was undertaken on short notice in response to concerns by a group of Washington trawlers.

Results of the analysis showed that current levels of exploitation rate were relatively high, 0.34 in PMFC areas 2B-3B and 0.45 in PMFC area 3C. The exploitation rate in area 3C was considered to be of low reliability. Time constraints precluded a detailed analysis.

4. Sablefish

a. NMFS-NWAFC

The sablefish (Anoplopoma fimbria) stocks in the BSA region have rebuilt from low levels of abundance during the 1970s. Increases in abundance during the early 1980s were attributed to the strong 1977 year class. Relative indices of abundance from Japan-U.S. cooperative longline surveys have indicated decreases in the eastern Bering Sea in 1986 and 1987. There have been no indications of significant recruitment in the eastern Bering Sea since the appearance of the strong 1977 year class. The current estimate of exploitable biomass for the BSA region is 152,800 t. Applying the exploitation rate determined by Stock Reduction Analysis to produce Maximum Sustainable Yield (MSY), to the current estimate of biomass results in potential yields of 4,500 t for the eastern Bering Sea and 7,700 t for the Aleutian region. Sablefish of the GOA region have been determined to be in good condition due to good recruitment from the 1977 and the 1980 or 1981 year classes. The current biomass is estimated at 520,000 t based on the NMFS trawl survey. The recommended ABC is 35,000 t. This catch level, if applied for three years under pessimistic recruitment and biomass assumptions, would allow the population to remain above the 1977 estimated level which produced a strong year class.

For further information, contact Sandra McDevitt (206) 526-4230.

b. DFO

During 1987, a method to standardize sablefish trap CPUE was developed. Factors found to have a significant effect on CPUE were trap type, fishing area and vessel. While variability is high, CPUE appears to be an adequate abundance index. In 1986, standardized CPUE decreased off the Queen Charlotte Islands to 16.8 kg/trap from 18.2 kg/trap in 1985, and off the west coast of Vancouver Island to 10.3 kg/trap from 15.6 kg/trap in 1985. In Queen Charlotte Sound, standardized CPUE increased from 17.4 kg/trap in 1985 to 20.3 kg/trap in 1986.

Yield options were determined using forward simulations of a deterministic age-structured model. Numbers-at-age, used as the starting vector in the model, were calculated using Virtual Population Analysis (VPA). The analysis indicates that the strong 1977 year-class has peaked in terms of both numbers and weight. At average levels of recruitment and at current levels of effort, the recruited biomass will continue

to gradually decline. Yield options identified for 1988 were 3500-4000 t--low risk sustainable, and 4000-4500 t--high risk sustainable.

c. CDFG

A preliminary analysis of California's trap log database for the years 1979-1986 was completed during 1987. From analysis of 9012 trap sets, CPUE trends by depth, year, and area were determined. Catch-per-trap declined substantially from 1979-1982, increased slightly for two years, before declining further. Several problems with the log data were identified subsequently which affected the analysis, including the inclusion of large trap/processing vessel logs. For unknown reasons, CPUE values for these trap/processing vessels were significantly lower for all years and areas than the rest of the fleet. Further refinement of the database is underway in 1988 to treat these vessels separately as well as to eliminate some falsified logs.

5. Rockfish

a. NMFS-NWAFC

The Pacific ocean perch (POP) (Sebastes alutus) resource of the eastern Bering Sea and Aleutian Islands region continues to remain at a low level of abundance compared to levels during the early 1960s. Results from recent stock assessments, however, indicate that recruitment has improved somewhat. In both regions, Pacific ocean perch is currently managed as complex of five species (S. alutus; northern rockfish, S. polyspinus; rougheye rockfish, S. aleutianus; shortraker rockfish, S. borealis; and sharpchin rockfish, S. zacentrus). For the POP complex, biomass is estimated to be about 101,100 t in the eastern Bering Sea and about 276,500 t in the Aleutian region. Applying the F0.1 exploitation rate to these biomass estimates results in potential yields of 6,000 t for the eastern Bering Sea and 16,600 t for the Aleutian region.

The GOA slope rockfish assemblage of which POP comprises 45% of the biomass, is determined to be in a depressed condition. The recommended ABC for POP is based on an evaluation of a series of catch levels imposed in 1988 and continuing for several years. The value of 7,500 t produced relatively constant biomass beginning in 1988 for POP. The associated exploitation rate for this catch level was then applied to the biomass of the entire slope assemblage resulting in an ABC of 16,800 t for slope rockfish. Previous assessments of POP stocks in waters of the WOC region indicate that the resource continues at depressed levels of abundance. Stock recovery is likely to be a slow process unless one or more strong year classes recruit to these stocks. An analysis was conducted last year to detect the presence or absence of incoming strong year classes. This analysis utilized

research trawl length and age data from the INPFC Vancouver and Columbia areas and length data obtained from the Washington Department of Fisheries samples of commercial landings. Analysis of these data suggest that no strong recruitment was forthcoming, but there were indications that some improvement of recruitment had occurred.

For further information, contact Daniel Ito (206) 526-423

b. DFO

Sensitivity analysis of the stock projection model used in the Goose Island Gully S. alutus assessment showed that fecundity at age, natural mortality, partial vulnerability at age, and stock-recruitment parameters have the greatest influence on long-term (200 y) yield and biomass projections. By comparison, growth rate, initial numbers at age, recruitment variation, initial recruitment, and weight at age have little influence on yield and biomass.

An internal review of rockfish assessments suggested much higher yield (+75%) from the Moresby Gully S. alutus stock, than has been assigned in recent years. This result was derived from a different interpretation of field survey data. Consensus on this interpretation was not achieved.

Starting in 1987, assessments for yellowtail rockfish assume a unit stock for the west coast of Vancouver Island (3C and 3D) and southern Queen Charlotte Sound (5A and 5B).

c. ADFG

A two-week rockfish relative abundance indexing survey was conducted off the coast of Kruzof and Baranof Islands during July, 1987. That is the first year of a five-year study to determine rockfish abundance trends and to obtain biological information on rockfish, independent of the commercial fishery. Data analysis is continuing and a trip report is available on request.

d. WDF

Black Rockfish. Objectives of the ongoing black rockfish stock assessment project are to conduct a multi-stage tagging experiment to estimate survival rates, exploitation rates, and abundance of the population adjacent to the Washington coast. A secondary objective is to obtain further information on growth and migration of black rockfish. The coast has been stratified into subareas from Tillamook Head to Neah Bay with equal tagging effort expended in each subarea. The experimental design calls for annual tag releases through 1990.

During 1987, 5,301 black rockfish were tagged. To date, 887 tags have been recovered. Port sampling activities with

respect to black rockfish were also intensified. Fifty-one biological samples consisting of age, length and maturity data were conducted on landings from the various coastal fisheries harvesting black rockfish. A total of 1,275 otoliths were collected for ageing.

In addition to tagging, we are using acoustic surveys to estimate black rockfish population size along the Washington coast. The surveys began in 1986. The target area is stratified by bottom type. The project is in a pilot phase and no results are available to date.

e. NMFS-SWFC

Cohort analysis and catch-at-age analysis were used to estimate fishing mortality rates and population size for widow rockfish (Sebastes entomelas), using 1980-1986 catch-at-age data. Fishing mortality was moderately higher in 1986 than in 1985, due to a decrease in stock size and an increase in harvest. Projected stock biomass in 1987 and 1988 should be slightly lower than estimated levels in 1985 and 1986. Estimates of MSY ranged from 7,700 to 12,000 t, with an average of 10,100 t. The recommended fishing mortality rate for fully recruited fish was 0.30. At this level of fishing effort, average yield in 1988 and 1989 (an estimate of ABC) would be 12,100 t.

The estimate of acceptable biological catch (ABC) in 1985 was 9,300 t, an increase of 1,900 t over the 1984 ABC. The increase can be attributed not only to an increase in the length of the (relatively short) data series, but also to fluctuations in recruitment.

6. Pacific whiting

a. NMFS-NWAFC

The status of the Pacific whiting (Merluccius productus) resource in 1987 was evaluated on the basis of three major data sources: the 1986 Northwest and Alaska Fisheries Center bottom trawl and hydroacoustic survey data, the relative abundance of juvenile Pacific whiting in 1984-1986 California Department of Fish and Game juvenile survey data, and commercial fisheries data. The estimated total biomass of Pacific whiting in 1986 was 2.1 million t. The stock is currently supported by the 1980 and 1984 strong year classes. Preliminary data indicate that the 1986 year class will also be strong.

Estimates of offshore fishery production for Pacific whiting were made using an age-structured management model. A new management policy was imposed on the stock that constrained the spawner stock biomass to previously observed levels for most years. Estimates of long term production (MSY) from the U.S. and Canadian fisheries combined, ranged from 165 to 196

thousand t. The recommended level of acceptable biological catch (ABC) in 1988 for the United States and Canada combined, was 325 thousand t. The U.S. portion of the ABC was 232 thousand t.

In recent years, scientists from the Northwest and Alaska Fisheries Center (Seattle, Washington) and the Department of Fisheries and Oceans (Nanaimo, British Columbia) have cooperated in developing joint management recommendations and research objectives for the coastal stock of Pacific whiting. One of the goals set by these scientists was to develop an improved management model that incorporates differences in the size and age composition of the stock from 3 to 4 production zones. The production zones would be distinguished by the biomass, age distribution, and behavior of the stock within each zone at specific time periods. The objective of this project would be to evaluate: a.) the inter-relationship between U.S. and Canadian fishing practices and their impact on the long term status of the stock, b.) the relative advantage of allowing fish to reach full maturity and large size, and c.) the migratory behavior the stock.

For further information contact Anne Babcock Hollowed (206) 526-4223.

b. DFO

The fishery for Pacific hake in the Strait of Georgia has grown steadily since 1979, with a total of 5031 t landed in 1986. For the first time, the assessment was based on catch-at-age analysis. A general forward simulation model, using numbers-at-age from virtual population analysis, was adapted for Pacific hake and used to investigate past abundance trends and potential future yields. The analysis indicated that marketable biomass increased over the period 1979-83 and declined slightly to the present. The biomass estimates compare favorably with fishery independent hydroacoustic and trawl swept/volume biomass surveys conducted in 1981. The surveys will be repeated in 1988.

Yields of 11-16 thousand t were presented as sustainable to high-risk sustainable levels, given a management goal of maintaining a constant catch over the long term. If the management goal is to optimize yield-per-recruit, then the range of sustainable to high-risk sustainable yields is from 19-24 thousand t for 1988. The fishery for offshore hake in the Canadian zone continues to be supported by a series of strong year-classes. The 1980 and 1977 year-classes contributed 55.0% and 19.8%, respectively, to the 1986 catch.

In 1987 a cooperative research link, in the form of a TSC working group on hake, was re-established between Canadian and U.S. scientists. Canadian stock assessment work focused on obtaining and examining the simplified model currently in use, and working with U.S. scientists to draw up research

initiatives addressing assessment needs. The major areas addressed by the working group were growth parameters, catch-at-age methods, physical processes underlying recruitment and mortality rates.

c. WDF

Since 1984 the Port Susan-Possession Sound-Saratoga Pass area (PPSA) biomass of Pacific whiting as determined by acoustic survey has declined. In response to this decline managers have, based in part on evidence from research in British Columbia, determined that the exploitation rate on this species has been too high. In the 1986- 87 fishing season a management strategy was adopted which would determine the allowable harvest rate via a variable exploitation rate. For the fall fishery of 1986, a 454 t (1 million pounds) quota was established, down from the previous quota of 1361 t (3 million pounds). Under the management plan, no additional fishing will be allowed if the estimated biomass is less than 5,443 t (12 million pounds) of adult whiting; a 15% exploitation rate will be allowed if the biomass is between 5,443 and 6,804 t (12 and 15 million pounds); a 26% exploitation rate will be allowed if the biomass is between 11,340 and 15,876 t (25 and 35 million pounds); and a 33% exploitation rate will be allowed if the biomass exceeds 15,876 t.

In 1987, the estimated peak total biomass in PPSA declined to 5,579 t (12.3 million pounds). This compares to a biomass of approximate 8,165 t (18 million pounds) observed in 1985 and 1986. The reason for this decline is unclear, but there is evidence of an increase in the natural mortality due to large numbers of marine mammals. Further investigation of this matter and inclusion of the increased predation rate will be incorporated in the management of this fishery in the future.

Under the management plan a fishery was allowed in the fall of 1986 when approximately 416 t (918,000 pounds) of whiting were taken from a 454 t quota. Fishing activity in the fall fishery occurs in the southern portion of Saratoga Pass and Possession Sound. In March of 1987 two one day, (six and three hours) openings in Port Susan resulted in the harvest of 270 t (595,000 pounds) for a total harvest of 686 t (1.52 million pounds) for the season. The average length for females sampled from the Port Susan fishery was 36.5 cm and approximately 4.9 years in age. This was the lowest average length and age observed to date. Three to five year old fish dominated the age distribution with age 3 whiting comprising 35% of the females.

6. Spiny dogfish

a. DFO

The model of Wood et al. (1979) was updated with catches to

1986. The pulse in abundance set in motion by the the 1940s liver fishery has leveled out from a recent downward trend. At current levels of harvest (~ 2,000 t), abundance is predicted to increase steadily over the next 5-10 y both offshore and in the Strait of Georgia/Puget Sound. Yields of 15-25 thousand t were presented as sustainable to high-risk sustainable for the offshore stock, including U.S. waters. For the Strait of Georgia/Puget Sound stock, yields of 4,000-6,000 t were considered sustainable to high-risk sustainable.

A variable effort option was explored that could rapidly reduce biomass to below a recognized 'nuisance' level, and yet maintain an economically sustainable fishery. For the offshore stock, catches of 30 thousand t for the first four years could lower the stock rapidly to below a nuisance level. Subsequent catches ranging from 8-25 thousand t per year would maintain a steady stock size.

7. Lingcod

a. DFO

A new analysis of lingcod dynamics has been completed for the west coast of Vancouver Island (Area 3C). The analysis is based on Schnute's size-structured model. Both catch and effort data from the fishery and data from a mark-recapture experiment were examined. The model estimated an annual natural mortality of 24%. There was no measurable effect of the fishery on the stock. However, there was some evidence for a decline in recruitment since the early 1970s.

b. WDF

We are continuing a multi-stage tagging experiment to determine survival rates, exploitation rates, and population size of lingcod in the Neah Bay - Cape Flattery area. In 1987, 590 tagged fish were released bringing the total to date to 2,936. A total of 107 fish were recovered in 1987, bringing the total to date to 220. Additionally, on- going biological sampling stratified by gear, area, and month, will be used with catch statistics to evaluate the coastal recreational and commercial lingcod fisheries. Historical catch at age information has been compiled for the INPFC Vancouver and Columbia areas and an age structured population analysis is underway.

c. NMFS-SWFC

Overall landings of lingcod are generally well below the ABC's established in the Groundfish Management Plan. The exceptions are the Vancouver and Eureka areas where the total catch exceeds the ABC of 500 t. The increase in trawl landings in the Vancouver area is the principal concern. Catches there have doubled in the last two years, indicating a much stronger targeting on this species. This

is a substantial change in the fishery and deserves closer monitoring. The ABC's in both the Vancouver and Eureka areas were set on the basis of current catch levels, so exceeding the ABC's is not in itself a major cause for alarm. Accurate evaluation of the impact of this increased harvesting would require age-composition data. In the current Eureka area situation, lingcod catches of this level have been substantiated for a number of years and this is not the immediate problem that the Vancouver area is.

In future collection of catch statistics, individual trawl landings which include lingcod should be examined by area to determine the ability of the fishery to target on lingcod. Also, collection of data on commercial fisheries other than trawl needs to be improved, particularly in the Monterey and Conception area.

9. Pacific halibut

a. WDF

While WDF does not have management responsibility for Pacific halibut (Hippoglossus stenolepis), the Puget Sound Marine Fish Division provided technical assistance to the International Pacific Halibut Commission (IPHC) during 1987. The effort, funded by WDF and NMFS, provided for negotiations between recreational and commercial user groups to assure an orderly fishery within the harvest quota for Area 2A. WDF work products included: 1) a profile of the recreational fishery for halibut in Washington, 2) recreational biological data collection and 3) an early post season estimate of the commercial (treaty and non-treaty) and recreational catch.

In 1987 an estimated 176 t (388,700 pounds) of dressed halibut were landed by the north coast and Puget Sound recreational fisheries. The mean length of these fish was 89 cm (9.1 kg). The recreational catch rate was .27 fish per angler trip for combined charter and private boat effort.

Commercial fishery data was collected from the fish receiving ticket soft data system currently used by WDF. An estimated 20 t (43,700 pounds) were landed by treaty fishermen and 138 t (304,500 pounds) by non-treaty commercial fishermen in Washington and 77 t (170,500 pounds) in Oregon.

Including an estimated recreational catch of 33 t (72,000 pounds) by Oregon recreational anglers, a total of 466 t (1,027,000 pounds) of halibut were landed in Area 2A. This is in excess of the Total Allowable Catch (TAC) of 272 t (600,000 pounds) allocated to Area 2A for 1987. Both non-treaty commercial and recreational fisheries exceeded their allocation.

Allocation negotiations for the distribution of the 1988 TAC for Area 2A of 318 t (700,000 pounds) were conducted in late

1987. The result of these negotiations were as follows:

1)No quota on the treaty harvest. An increase to 45 t (100,000 pounds) is expected.

2)A 55/45 split between commercial/recreational fisheries.

3)Of the 45% allocated to recreational fishermen 27 t (60,000 pounds) will be allocated to Oregon recreational fisheries, 1 t (3,000 pounds) to the southern Washington coast, and the remaining 94 t (207,000 pounds) to the north Washington Coast and Puget Sound.

4)The 94 t allotted the northern regions of 2A would be split 50/50 between Neah Bay (point of access for the north Washington Coast) and Puget Sound.

5)In order to stay within negotiated allocations the recreational fishery will be restricted as follows:

	Coast	Puget Sound
Season:	May 1 through June 30	March 1 through June 15
Bag limit:	2 fish	1 fish
	no size limit	no size limit

b. IPHC

Assessment of the Pacific halibut stock is based primarily on methods of catch-age analysis (Quinn et al. 1985). The information used in 1987 for the assessment is comprised primarily of logbook catch and effort data, port samples of otolith length frequency with age estimates for a subsample, commercial landings, habitat size estimates, bottom area estimates, tag return information, and standard stock assessment surveys.

A summary of 1987 stock assessment results is given in Table 4. The ranges given for each item correspond to the span of estimates from the three catch-age analyses. Annual surplus production (ASP) is a basic measure of stock productivity and is defined as the excess biomass above what is needed to replenish the population each year. The range of total ASP for the stock as a whole was 82 to 88 million pounds in 1987. Total removals in 1987 (including recreational catch, bycatch and waste) were about 86 million pounds which is close to the ASP of the stock. The similarity of catch to ASP indicates that the halibut stock is currently fully utilized.

Constant exploitation yield (CEY) estimates have been the basis for setting catch limits the last three years, and is calculated by multiplying an exploitation fraction (0.35) by estimates of exploitable biomass of halibut the stock as a whole. Total CEY for the halibut stock as a whole ranged from 82 to 94 million lbs. Regulatory area estimates of CEY are obtained by partitioning the total CEY among regulatory

areas. Setline CEY (Table 4) was calculated by subtracting other removals during 1987 from the total CEY in a regulatory area; note that the amount of bycatch subtracted from each regulatory area is the estimated impact of incidental catch losses on future recruitment of fish into that regulatory area.

The combined area CEY estimates ranged from 65 to 77 million pounds with about half the CEY occurring in Area 3A. The 1987 setline catch limits fell within the range of CEY estimates for Areas 2B, 2C and 4. In Area 2A and 3B, the 1987 catches exceeded the CEY ranges, and in Area 3A the 1987 catch was below the CEY range. The setline CEY estimate for Area 2A is zero because other removals (sports harvest, bycatch, waste) exceeded the estimated total CEY for that area; in Area 2A, the CEY estimates should be viewed with caution since very little usable setline logbook data was available in 1987 for stock assessment.

Maximum sustainable yield (MSY) is estimated at 80.9 million pounds for the entire resource, but only 63.8 million pounds would be available for the directed setline fishery after subtracting current levels of other removals. Table 4 shows maximum sustainable yield (MSY) for each regulatory area. MSY is a useful long-term reference point, but it should not be used to set current catch quotas since MSY does not reflect current stock conditions.

B. Related Studies

a. NMFS-NWAFC

Groundfish Pathology--A baseline study of the pathology of juvenile and prerecruit Alaska groundfish has been initiated. In 1986, 145 pollock less than 10 cm long were collected and are being examined for parasites. A number of protozoan and metazoan parasites have been identified which may prove to be significant in evaluating the health of the species. The task has also begun to characterize the pathology of west coast groundfish. About 50 rockfish and flatfish species were obtained during the 1986 triennial survey for case study. In addition to the usual parasitic fauna, an unusual parasitic copepod (Sarcotaces sp.) was found in the bladder and musculature of several rockfish species. Multiple infections were common and a greater proportion (23%) of females than males (10%) were infected.

Fisheries-Oceanography Experiment (FOX)--1988 is the third year of a multidiscipline, multi-agency study of Shelikof Strait pollock and the environment in which they spawn and the young develop. The purpose is to relate environmental conditions to the survival of eggs and larvae and the success of yearclasses. The NWAFC and the Pacific Marine Environmental Laboratory have been assisted in the field work

by a Soviet vessel. In April, the horizontal and vertical distribution of pollock eggs and yolksac larvae were assessed as were key hydrographic features. In May, the focus shifted to the mapping of the distribution larvae and studying their feeding, growth, and behavior.

Bering Sea Groundfish Dynamics--Work is underway to determine how well prerecruit abundance estimates from bottom trawl surveys predict the strength of yearclasses of pollock, cod, and various species of flatfish. In addition, historical fishery and survey data is being used as a basis for describing the structure and long-term changes in the groundfish complex of the eastern Bering Sea.

Pilot Domestic Observer Program--The REFM Division is participating in the North Pacific Fishery Management Council's (NPFMC) pilot domestic observer program. Activities involve training the observers, participating in their debriefing, and the management of the data collected. Other key participants are the University of Alaska's Sea Grant Program, the Alaska Department of Fish and Game, the NMFS Alaska Regional Office, and the staff of the NPFMC.

b. DFO

Age determination

The preliminary validation of rock sole otoliths was published in 1987. Pacific cod fin-ray samples were gathered and examined as part of a project to compare fin-ray and length-frequency methods of age determination. Fin-ray cross sections of 500 oxytetracycline (OTC) tagged lingcod were aged and examined for presence and location of an OTC mark. This work will contribute towards validation of the ageing method.

c. ADFG

Sex and maturity data were recorded from port samples taken in the Sitka area rockfish fishery. Analysis of data collected over a three-year period indicates that reproductive timing for nearshore rockfish may not occur later in the year than in more southerly areas as previously reported. A report on reproductive timing of Sebastes rockfishes in Alaskan waters was published as an informational leaflet.

Work is also continuing on sablefish and rockfish age/growth studies although no results were published during 1987. Age structures collected from rockfish and sablefish fisheries and from the rockfish survey were sent to Kodiak for reading and ageing work which commenced early in 1988.

d. WDF

Puget Sound otter trawl survey. In October, the PSMFD

completed an otter trawl survey of Puget Sound with the assistance of the U.S. National Marine Fisheries Service (NMFS). The primary objective was to estimate the abundance of flatfish, especially English sole and starry flounder. The survey area included all U.S. waters (>10 fm) from Cape Flattery in the west to the Strait of Georgia in the north, and south to Case Inlet. A 400-mesh Eastern otter trawl with 1 1/4 inch mesh liner was towed by the F/V John N. Cobb at 102 stations. Catches were processed following standard NMFS sampling procedures. The results are not available at this time.

Incidental crab catch by otter trawl. As a result of studies conducted since 1984, WDF implemented a fishery advisory which restricted fishing activity in two defined portions of Area 20A (Gulf of Georgia); specifically that area over the Point Roberts Reef from April 15th through May 31st, and a slightly larger area from June 1st through June 30th. The time area closure would protect crab which are believed to concentrate around the reef while in the vulnerable soft shell condition. Since otter trawl fishing activity in this specific area occurs only when the Pacific cod stock is in the area, the impact on otter trawl fishing was minimal.

Observations of the advisory area were made at random, and an instantaneous count of fishing activity was made at each observation. Ten tows or portions of tows were observed during the sampling period. These counts were expanded using a Poisson rate function estimation procedure.

An estimated 58 tows were made during the time of the advisory, resulting in an estimated 13,900 crab handled. This was well below the management threshold of 17,400 crab.

After negotiation with the otter trawl fishermen the advisory areas will be purposed as annual closures and will resolve the incidental crab catch issue inside Puget Sound.

Recreational fisheries. In Puget Sound the second of a five-year project, partially supported by Wallop-Breaux funds from the Fish and Wildlife Service, included work in three main areas: Bottomfish habitat requirements, bottomfish sport fishery monitoring, and investigations of fishery trends. Seasonal habitat preferences of copper, quillback, and brown rockfish were identified from monthly SCUBA surveys and as expected, rocky reefs are very important to all life stages and species. A variety of intensive sport fisheries for bottomfish were monitored in 1987, including a pier fishery at LaConner for smelt, a winter fishery at Agate Pass for Pacific cod, and spring fisheries at Tacoma Narrows and Admiralty Inlet for lingcod. A voluntary logbook program for the charterboat fishery for bottomfish was completed. In addition, an angler opinion survey was conducted to identify angler preferences for reducing the catch in the rapidly-growing sport fishery for Pacific halibut, Trends in the

sport and commercial fisheries were analyzed in a stock assessment of Pacific cod.

Habitat investigations. Work during the first half of 1987 was committed toward concluding research on artificial reefs, which has been ongoing since 1977. Beginning in July, work was directed toward developing a planning document outlining the strategic goals and research priorities for FY 1988-1989 for the new Habitat Investigations Unit. This document emphasized the need to be responsive to current and future resource management priorities, and to develop the information needed to respond to habitat impacts with accurate assessments of the level of current and anticipated damage to marine resources. It is anticipated that development of habitat criteria for marine fishes in Washington and the inclusion of these criteria in the Hydraulic Code Rules will provide protection for critical habitats and will establish mechanisms for mitigative options to proposed development projects, or other occurrences impacting marine fish habitats.

e. ODFW

Field and laboratory work on retention studies on Dover, English and petrale sole and sablefish was concluded on December 31, 1987. This work was part of the OSU Sea Grant / ODFW project, "Biological Risks and Economic Consequences of Alternative Management Strategies."

f. NMFS-SWFC

Economics. The impact upon groundfish fleet size and composition of selected limited access criteria was analyzed using the PacFIN data base. The criteria assessed include: (1) participation frequency; (2) minimum vessel size; (3) minimum annual groundfish landings. The impacts are analyzed for: (1) average annual landings per vessel (catch rates); (2) vessel length class; (3) INPFC regions; and (4) gear types.

The Groundfish Analysis Investigation is studying the possible effects of changes of mesh size regulations on revenues from fishing by port, season and individual vessels.
Other. A bone softening process that is being tested by members of the Tiburon Laboratory staff may eliminate the principal impediment to marketing shortbelly rockfish. The procedure, which is used successfully on various species in Japan, involves cooking the fish under pressure at very high temperature. The fish is then breaded and deep fried, the result being that the bony structures become so soft that the cooked fish can be eaten without separating the flesh from the bones. Shortbelly rockfish marketability has been handicapped by its small size,which makes it impractical to fillet. The process may therefore be particularly suitable for that species.

The Librarian at the Tiburon Laboratory recently completed an annotated bibliography of the genus Sebastes. This document is available as a printed copy or as a computer readable file.

g. IPHC

Each year the Halibut Commission conducts various experiments, surveys and data collection programs aimed at better understanding the biology of halibut, the effects of the fisheries upon the resource, and the changes taking place within the halibut population. These numerous projects can be divided into two separate categories. The first category can be termed annual programs, which are designed to monitor the activities of the commercial and sport fisheries, and long-term changes in the population. These include various surveys, dockside interviews with fishermen, and collection of otoliths, or earbones, at ports along the coast. Projects in the second category are designed to answer specific questions or address problems that may arise in any given year. All of our charter operations during 1987 fall into this latter category, as we have tried to understand differences in the availability of halibut to setline gear along different regions of the coast. Research conducted in 1987 was quite varied in nature and spread the Commission staff from the Oregon coast to the Bristol Bay area of the Bering Sea.

ANNUAL PROGRAMS

In 1987, the Commission collected logbook information from commercial and sport fishermen and sampled landings from Oregon to the Bering Sea for age information. These programs have been going on since 1933. The standardized grid surveys in the Charlotte, Southeastern and Kodiak regions and the young fish trawl surveys were not conducted in 1987, vessel and staff time being used to investigate questions of catchability of adult halibut and the feasibility of a commercial fishery in the near-shore Bristol Bay area. We continued to release tags from the special survey operations.

Logbook Data Collection. Annual monitoring of the commercial and sport fisheries includes sampling for age information and the collection of logbook data. Although only recently initiated, the voluntary sport/charter boat logbook program is being well-received by that segment of the industry. In the commercial sector, logbook data have been collected since the initial days of the Commission. In 1987, commercial logbook data were collected from 2800 commercial fishing trips ranging from the Pribilof and Aleutian Islands in the Bering Sea to as far south as the Oregon coast, and represent over 26% of the commercial fishing trips that occurred and over 30% of the poundage landed during 1987.

Otolith Sampling. The sampling of otoliths, or earbones, from the commercial catches provides information used to estimate the age structure of the population. Mathematical models have been developed which use this age information, along with catch and other data, to estimate population abundance and develop recommendations for catch limits. During 1987, a new otolith collection scheme was used which called for smaller samples from each landing with more landings sampled. During 1987, Commission employees collected over 20,000 otoliths, originating from grounds in the Bering Sea to those off Oregon. Over 16,000 of the otoliths collected, representing 1,120 landings, were used to determine the age composition of the fish caught in 1987.

Tagging Program. Annual tagging programs are conducted each year in conjunction with all of our charter operations. These periodic releases of tagged fish and subsequent recoveries provide information on growth, survival and migrations of halibut within their range. Recoveries have shown that juveniles migrate extreme distances while in the most part adults move very little from one summer to the next. A high proportion of the adult halibut recovered in later years during our own survey fishing are caught exactly where released. In 1987, just over 3,200 halibut were tagged and released and just over 1,800 tags were recovered.

SPECIAL PROGRAMS IN 1987

Special field research effort in 1987 was divided among projects investigating the maturation and spawning of adult halibut, validation of our aging efforts, the feasibility of commercial fishing in the nearshore Bristol Bay portion of the closed nursery area, and two charter operations which gathered information on the availability of halibut to setline gear in the Charlotte and Kodiak regions. We also sent temporary employees as observers on commercial vessels to investigate halibut bycatch rates in non-halibut fisheries.

Halibut Rearing Project. In cooperation with the University of Washington and the U.S. Fish and Wildlife Service, the Commission has been conducting experiments investigating the holding and spawning of Pacific halibut. At the Service's facility at Marrowstone Island in Puget Sound we have been holding and attempting to spawn halibut since 1985. During 1987 we delivered additional fish to the project site and also delivered fish to the Nanaimo facility of the Department of Fisheries and Oceans. Preliminary work has been done tracking the changes in hormone levels associated with the onset of annual spawning in adult halibut and we are now able to predict sex and stage of maturation of halibut from blood samples. We are hoping to have a successful spawning of larval fish from the experiment this spring.

Age validation with OTC. During 1982 and 1983, almost 1,800 halibut were injected with oxytetracycline or OTC prior to being released. The OTC forms a noticeable mark on the forming otolith. Age validation research continued in 1987 as 21 otoliths recovered from the OTC group of releases were analyzed. Although the presence of OTC is weak, a halibut at large for five years showed four annual rings adjacent to the OTC mark. Several 1983 Area 2B and 3A releases show excellent OTC marks and three complete growth rings following completion of OTC absorption. This evidence suggests rings are indeed laid down annually.

Observer trips. During 1987, the Commission staff assisted state and provincial agencies in collecting information on the incidental catch of halibut in domestic fisheries. These opportunities consisted of two trips on a longline vessel fishing for Pacific cod around Kodiak Island and two trips on Canadian bottom trawlers fishing in Hecate Strait. The results from the Pacific cod setline trip off Kodiak Island indicate a halibut incidence much higher than was previously observed in the foreign fishery, over 3,000 halibut being caught on 19 sets totaling 358 skates of gear. The apparent mortality to the halibut on this trip appeared to be extremely low, less than 1 percent by number. The trawl vessels in Hecate Strait were targeting on Pacific cod and experienced significant catches of flatfish and rockfish. The bycatch rates observed on both trawl trips were similar to those previously reported for these fisheries.

Catchability Studies in Areas 2B and 3A. The Commission conducted experiments in Areas 2B and 3A to investigate apparent differences in the setline catchability of halibut between those areas. During mid-summer a trawler and setliner were chartered to determine paired estimates of relative abundance and stock composition in each area. These estimates were then used to assess differences in the setline catchability between areas. A total of 52 locations were fished, 25 in the Charlotte region and 27 in the Kodiak region. Fishing depth ranged from 16 to 104 fathoms with averages of 48 and 59 fathoms in the two areas, respectively. Compared to the setliner, the trawler caught about twice as many adult halibut in the Charlotte region and substantially fewer adult halibut in the Kodiak region. Because of the marked difference in size of fish caught by the two gear types, analysis of catches was performed using numbers of fish between 82 and 99 cm. Overall, differences on the order of four-fold were found between the two regions. We saw very high catches of dogfish in about half of the stations fished in the Charlotte region, dogfish representing about 70% of the total setline catch over all Charlotte stations. Recognizing the effect of hook occupancy by dogfish, we compared the stations in Charlotte which had relatively low dogfish catches with the stations in the Kodiak region. Making this comparison resulted in the calculated catchability difference between regions of 1.9. The

confidence interval around this estimate is quite broad, from 1.1 to 3.5, indicating a need for more stations in future comparisons. A similar study done in 1983 resulted in an overall catchability difference between regions of 1.5 and this was incorporated into our catch at age model. This value falls well within the confidence intervals calculated from our present experiment.

Continuous Fishing Experiments in Areas 2B and 3A. With the shortened fishing periods in recent years, little information has been available regarding changes in catch rate or stock composition during the progress of the fishing period. Historically, the first days catch rate has been high, followed by decreasing catch rates through the period of the opening. Catch per unit effort calculated for a one- or two-day fishery may not be comparable to catch per unit effort calculated for longer openings in the past. To investigate this effect, we designed an experiment to fish ten consecutive days on a small grid in both the Charlotte and Kodiak regions. Information gathered from the fishing would shed light on both change in catch rate over the fishing period as well as changes in stock composition and movement of fish into and out of the survey area. The Kodiak portion of the survey was plagued by bad weather and results from this area were not usable for these analyses. We fished eight days in the Charlotte region off Carpenter Bay, just inside and north of Cape St James in Hecate Strait. We fished a grid of 28 skates of gear in about 65 fathoms. For the eight days, 224 skates of gear caught 1576 halibut, 970 of which were legal sized for an unstandardized overall catch rate of 86 pounds per skate. The initial catch rate was 131 lbs per skate. There was little change in the size composition of halibut from day to day and, surprisingly, while showing initial drops in CPUE, the catch of halibut over the eight days remained good. The presence of cherry belly fish and model results indicate high rates of migration into the experimental area. The second most evident species was dogfish, the only group which showed a pronounced decline from day 1 to day 8. Analyses of the data showed very high initial abundance levels for dogfish but very low migration rates, resulting in dogfish being basically fished out by the middle of the experiment. Both adult and juvenile halibut had much lower initial abundance estimates but migration rates effectively replenished the fish in the experimental area. Extrapolating abundance estimates for halibut in the survey area to all of Area 2B using a CPUE factor within statistical areas resulted in biomass estimates for Area 2B which are similar to those predicted by our stock assessment. This analysis suggests that we are not likely to be underestimating the exploitable biomass in Area 2B with catch-age analysis.

Bristol Bay Survey. A proposal for a commercial fishery in the Bristol Bay near-shore area was presented to the IPHC at the 1987 Annual Meeting. This area has been closed to

commercial halibut fishing as a nursery area since 1967. We conducted an exploratory setline survey of the closed area to assess the commercial potential as well as the incidence of sublegal halibut. The area surveyed encompasses 20 miles offshore along the coast from cape Newenham to Cape Seniavin. One large setliner and two local vessels were used in the survey. The large boat caught 65 sublegal and 66 legal halibut on 323 skates of gear. The small boats caught 24 sublegal and 55 legal halibut on 99 skates. The average catch per skate of legal halibut was 3.8 pounds per skate for the large boat and 13 pounds per skate for the small boats. The survey suggests that there are very few legal-sized halibut in the Bristol Bay survey area. Although the Bristol Bay area is considered a halibut nursery ground, the catch of sublegal fish was small (less that .5 halibut per skate). It is possible that the small fish in this area are below the size selectivity properties of the circle hooks used.

C. Cooperative Research with Other Nations

In 1987 the United States was involved in cooperative research with the fishery agencies of the U.S.S.R., Japan, and the Republic of Korea (Table 5). Cooperative research may range from approval of research within the United States FCZ to joint field studies, analysis, and reporting of results. Eleven foreign vessels conducted research within the FCZ and some of those participated directly with U.S. vessels and NWAFC personnel in major surveys of groundfish resources in the Bering Sea and Gulf of Alaska. Foreign vessels from the U.S.S.R. and Japan scheduled to work cooperatively in U.S. waters during 1988 are listed in Table 6.

IX. OTHER TOPICS FOR DISCUSSION

A. Transboundary Management Issues

The U.S. Section reported on its proposal to include management discussions in the scope of TSC responsibilities. THe Canadian Section concurred with this recommendation and suggested the formation of species-oriented working groups to conduct pre-crisis discussions on management strategies. In addition to the existing Dover sole working group, three other species were considered to be of sufficient concern to warrant a working group. They are yellowtail rockfish, Pacific whiting, and sablefish. A decision was made to form a yellowtail rockfish working group to produce a joint Canada-U.S. stock assessment. Further work on this topic was deferred until the 1989 TSC meeting.

Mr. Bracken discussed the fisheries boundary dispute concerning the Dixon entrance area. Mr. Bracken informed the group that the boundary still has not been defined and groundfish harvests by both nations from the disputed area have not been quantified. Sablefish and, to a lesser degree,

rockfish are the major species of concern. The Alaskan and CAnaadian scientists present discussed this subject and agreed ti communicate on this issue, detailing harvests by both nations and summarizing the status of stocks in that area. Such information will be included in future agency TSC reports. Mr. Bracken volunteered to draft a TSC recommendation to itself on this issue.

B. PacFIN -PMFC Data Series Merger Project -- Progress Report

Mr. R. Porter summarized progress to date on the Data Series Merger. Log effort information continues to be the principal hindramnce to merger completion. CDFG is in the final stages of production of 1978-1986 trawl effort data, and will provide it to PacFIN in the desired format when it is available. WDF continues to have difficulty with the conversion to the enhanced PacFIN specification, and has halted work on this project. It is hoped that a re-specification of the PacFIN datafeed to non-aggregated receipt data will resolve WDF'S problems. Mr. Bracken stated that the lack of a log system for fisheries in the EEZ off Alaska is of particular concern; only a voluntary log system exists for fisheries in state waters. No recommendations were forthcoming from the TSC on this subject, but the TSC still supports the project.

C. Status of the Commitee of Age Reading Experts (CARE)

Mr. Porter summarized the report on the 1988 CARE meeting written by Dr. Chuck Woelke (PMFC). The newly-elected Care chairperson, Shayne MacLellan (DFO), expressed a need from the TSC for a listing of groundfish species of particular concern. The following ageing problems, by species, have been identified by CARE as the most pressing:

1) Pacific whiting: comparative work is urgently needed to ensure the consistent application of ageing criteria.

2) Sablefish: the identification of the first annual ring continues to present difficulties.

3) Dover sole: validation of broken-and-burnt ages is critically needed as well as consensus on identification of the first annual ring.

4) English sole: disagreement continues on the preferred structure

D. Dover Sole Working Group -- Progress Report

The purpose of the Dover sole working group is to compile coastwide tagging data into an overview document. Mr. Demory reported that tagging study reports from CDFG and ODFW have

been completed and submitted to Jergen Westrheim (DFO-retired), who is acting as editor for the coastwide publication. The Canadian manuscript is also complete, but the status of the Washington manuscript is unknown. Dr. Ellen Pikitch (Univ. of Washington) has been reminded to complete the report promptly. Mr. Westrheim informed Mr. Demory that the Groundfish Section at the DFO-Nanaimo Laboratory would underwrite the cost of publication in the North American Journal of Fisheries Management (NAJFM). It is hoped that the stock-delineation paper can be submitted to NAJFM in early 1989.

E. Revisions to TSC Agenda and Annual Report

Considerable effort was devoted to revisions to future TSC agendas and annual reports, which are necessary due to the inclusion of management talks on transboundary stocks of immediate concern. Mr. Tagart suggested the elimination of the U.S. Section meeting due to its redundancy with the full TSC meeting. He also recommended that the TSC concentrate on working group reports at its annual meeting.

The inclusion of economic reports in the annual TSC document was addressed next. Mr. T. Dark recommended that, due to the considerable work necessary to draft a report to the TSC, economic reports should not be requested routinely from agencies.

The section on pertinent regulation changes will be dropped in the report, in favor of treatment of current regulations and management practices in the working group reports. The final major change to both the agenda and annual report is the omission of a listing of all agency groundfish programs, unless the programs concern one or more of the species listed in the agenda. Publication and current staff lists will continue in their present form.

TSC members developed the following revised agenda for future meetings which will be used as a template for the annual report.

Technical Subcommittee Agenda (Revised)

1. CALL TO ORDER

II. APPOINTMENT OF SECRETARY

III. INTRODUCTIONS

IV. APPROVAL OF THE 1988 REPORT AND 1989 AGENDA

V. TERMS OF REFERENCE

VI. WORKING GROUP REPORTS
- A. CARE
- B. PacFIN Data Series
- C. Stock Assessment Groups***INCLUDE CURRENT MANAGEMENT PRACTICES***
- D. Other

VII. REVIEW OF GROUNDFISH FISHERIES
- A. commercial
- B. recreational

VIII. REVIEW OF AGENCY GROUNDFISH RESEARCH AND MANAGEMENT PROGRAMS
- A. Pacific cod
  Rockfish (primarily yellowtail,POP, Canary, nearshore spp)
  Sablefish
  Flatfish (Dover, English, arrowtooth,petrale)
  Pacific whiting
  Dogfish
  Pollock
  Lingcod
  Other
- B. Other related studies

OMIT ANY DISCUSSION OF REGULATION CHANGES HERE. PERTINENT REGS TO BE COVERED IN WORKING GROUP REPORTS.

IX. OTHER TOPICS FOR DISCUSSION

X. PROGRESS ON 1988 RECOMMENDATIONS

XI. 1989 TECHNICAL SUBCOMMITTEE RECOMMENDATIONS

XII. SCHEDULE OF FUTURE MEETINGS

XIII. ELECTION OF CHAIRPERSON

XIV. ADJOURNMENT

F. PFMC Request for a Synopsis of Canadian groundfish quotas and Management Practices

Mr. L. Six (PFMC) presented PFMC's request to the TSC for a brief synopsis of current British Columbia groundfish regulations, quotas, and management practices to aid the Council in its management of transboundary stocks. Dr. Richards volunteered to compile such a document on British Columbia fisheries by November, 1988. The Canadian document will be sent to Mr. J. Glock (PFMC) for use by the PFMC Groundfish Management Team and Council members. In return, PFMC will ensure that their Canadian counterparts receive the PFMC annual status of the fishery document.

X. PROGRESS ON 1987 RECOMMENDATIONS

A. The TSC to Itself

No recommendations were made.

B. To the Parent Committee

1. PacFIN - PMFC Data Series Merger

This topic was discussed in Section IX B. of this report.

2. International Implications of Bycatch and Discard Mortalities in the Groundfish Fisheries

Progress on the 1987 recommendation has taken two forms. First, Mr. S. Hoag (IPHC) noted that the IPHC dedicated $30,000 to ADFG to conduct Pacific halibut bycatch studies in Alaska. Secondly, bycatch considerations were included in the resource assessment document prepared by the Gulf of Alaska plan team for the North Pacific Fishery Management Council last year.

3. TSC Recommendation Concerning CARE

Section IX C. of this report deals with the present status of CARE. As requested by the Parent Committee, PMFC did fund and coordinate a 1988 meeting of CARE. Mr. Demory stated that he would communicate with CARE, convey the TSC's firm support, and apologize for not doing so in 1987.

C. From the Parent Committee

No recommendations were made.

XI. 1988 TECHNICAL SUBCOMMITTEE RECOMMENDATIONS

A. TSC to Itself

Report on Dixon Entrance Groundfish Harvests

Because the location of the fisheries boundary between Alaska and Canada has not yet been resolved, several species of groundfish, including sablefish and rockfish, are being harvested by both nations within the disputed zone in the Dixon Entrance area.

The TSC is concerned that the harvests of groundfish by both nations from that area has not been quantified and stock sizes have not been determined.

Therefore, the TSC recommends that its members from Alaska and CAnada provide information detailing groundfish harvests by both nations, summarizing stock status of groundfish

resources, and supply an overview of current regulations pertaining to Dixon Entrance groundfish management. This information should be included in agency reports and be available to the TSC at its June, 1989 meeting.

B. To the Parent Committee

1. Involvement of Fishery Managers in TSC

The TSC recognizes that its role and responsibilities are no longer properly focused or responsive to current management needs. Implementation of extended national fishery jurisdictions, resulting changes in management regimes, and increasing utilization of transboundary stocks require a change of emphasis. We believe that the Canada/U.S. Groundfish Committee's greatest value is serving as a vehicle for dialogue between our countries relative to the management of and research on transboundary groundfish stocks. Therefore, TSC holds that there is strong merit in emphasizing work aimed at determining the status and potential yields of transboundary stocks of mutual concern and examining the implications of various management strategies. To facilitate and guide TSC work and to provide for interchange among U.S. and Canadian managers and scientists, managers must have a more direct role in the deliberations of the Canada/U.S. Groundfish Committee and its Technical Subcommittee.

The TSC seeks Parent Committee approval of its proposed new emphasis. In addition, the TSC recommends to the Parent Committee that it promptly request the participation of appointed representatives from the North Pacific FIshery Management Council, Pacific Fishery Management Council, and appropriate Canadian counterparts.

2. Formation of Yellowtail Rockfish Working Group

Because of joint concern that yellowtail rockfish may be a coastwide unit stock, it is necessary for Canada and the U.S. to work toward a unified stock assessment and cooperative management strategies. The TSC recommends, as a measure to achieve cooperative management of yellowtail rockfish, that the Parent Committee convene a group of fisheries scientists from Canada and the U.S. to jointly assess the stock status of, fishery for, and management of yellowtail rockfish.

C. From the Parent Committee

No recommendations were made.

XII. SCHEDULE OF FUTURE MEETING

The next meeting of the Technical Subcommittee was scheduled from noon on June 6 to noon on June 8, 1989 in British Columbia.

XIII. ELECTION OF CHAIRPERSON

Mr. Tom Jagielo (WDF) was elected to succeed Mr. Bob Demory as chairperson for a two year term, beginning in 1989.

XIV. ADJOURNMENT

The twenty-ninth meeting of the Technical Subcommittee was adjourned at 12:00 pm on June 9th, 1988.

APPENDIX A

AGENDA FOR THE 29TH ANNUAL MEETING OF THE TECHNICAL SUBCOMMITTEE OF THE CANADA-U.S. GROUNDFISH COMMITTEE
CARMEL, CALIFORNIA JUNE 7-9,1989

1. CALL TO ORDER

II. APPOINTMENT OF SECRETARY

III. INTRODUCTIONS

IV. APPROVAL OF THE 1987 REPORT AND 1988 AGENDA

V. TERMS OF REFERENCE

VI. THE ROLE OF TSC IN MANAGEMENT OF TRANSBOUNDARY STOCKS

VII. FORMATION OF WORKING GROUPS TO ADDRESS JOINT ASSESSMENTS OF TRANSBOUNDARY STOCKS

VIII. OTHER TOPICS FOR DISCUSSION
- A. Transboundary Management Issues
- B. PacFIN/PMFC Data Series Merger
- C. Status of CARE
- D. Dover Sole Working Group-Status Report
- E. Revisions to TSC Agenda and Annual Report
- F. PFMC Request for Synopsis of Canadian Management Practices and Quotas

IX. PROGRESS ON 1987 RECOMMENDATIONS

XI. 1988 TECHNICAL SUBCOMMITTEE RECOMMENDATIONS

XII. SCHEDULE OF FUTURE MEETINGS

XIII. ELECTION OF CHAIRPERSON

XIV. ADJOURNMENT

APPENDIX B

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GROUNDFISH FISHERIES

OF

WASHINGTON, OREGON, AND CALIFORNIA

IN 1987

by

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June 1988

Summary of the Fishery in 1987

The following tables and figures present annual landings, exvessel values, and fishing vessel fleet data for the commercial groundfish fisheries off Washington, Oregon, and California from 1981 through 1987. During the 1987 fishing year shoreside landings increased by over 12 percent to 91,300 mt. Joint venture Pacific whiting landings were up 30 percent to over 106,000 mt. As a result the total commercial landed catch rose 21 percent when compared to the 1986 fishing year. The exvessel value of the total commercial landed catch was $83.5 million or 28.5 percent higher than in 1986. The exvessel value of shoreside and joint venture landings increased 28 and 33 percent, respectively.

Groundfish landings for individual species/species groups were generally higher in 1987, with lingcod, Pacific cod, Pacific whiting, rockfish, and all flatfish species increasing. Because of lower quotas or stricter trip limits, landings of sablefish and Pacific ocean perch decreased.

Landings were noticeably higher for trawl and longline gear but declined for pots and setnets. The declining trend in the size of the trawl fleet over the past few years was reversed in 1987. The groundfish otter trawl fleet increased in size for the first time since 1983. The pot and longline groundfish fleets remained about constant in 1987. As in past years the number of setnet vessels participating in the groundfish fishery cannot be determined.

The figures presented in this document characterize the trends in the West Coast groundfish fishery over the past several years. Landings and exvessel value by gear and for the major components of the fishery (i.e., shoreside and JV) are graphed from 1981-1987. All "real" exvessel values and prices presented in the accompanying tables reflect the general price level of 1986. They show changes from year to year after the effect of general inflation has been removed.

Table 1 - Landings and Exvessel Values of Landings in Washington, Oregon, and California, Including Joint Venture Deliveries in Waters off These States.

	1987	1986	% Change
Shoreside (mt)	92,320	82,298	+12.2
Joint Venture (mt)	106,095	81,855	+29.6
Total WOC Landings	198,415	164,153	+20.8
Shoreside Values $			
Current	71,875,000	56,240,000	+27.8
Real [1]	70,204,100	56,240,000	+24.8
Joint-Venture Value			
Current	11,663,000	8,760,000	+33.1
Real	11,391,900	8,760,000	+30.0
Total WOC Groundfish Landed Value			
Current	83,538,000	65,000,000	+28.5
Real	81,596,000	65,000,000	+25.5

Source: Pacific Coast Fishery Information Network (PacFIN); most current preliminary data as of June 1988
NMFS, Northwest Region

1/ Real values are current values adjusted to eliminate the effects of inflation. This adjustment has been made by dividing current values by the current year GNP implicit price deflator, with a base year of 1986. The GNP deflators are 1.00 in 1986 and 1.0238 in 1987.

Table 2- Average Annual Exvessel Prices Paid for Some Commercially Important Groundfish Species from 1977-1987.

	Sablefish		All Rockfish Combined		Widow Rockfish		Dover Sole		English Sole		Petrale Sole	
	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real
1978	.283	.448	.181	.286	-	-	.207	.327	.245	.388	.371	.587
1979	.356	.518	.199	.290	-	-	.215	.313	.286	.416	.447	.651
1980	.199	.265	.159	.212	-	-	.211	.281	.328	.437	.458	.611
1981	.215	.262	.169	.206	.135	.164	.223	.270	.297	.362	.512	.624
1982	.252	.289	.195	.224	.157	.180	.233	.267	.318	.365	.606	.696
1983	.237	.262	.223	.246	.192	.212	.224	.247	.322	.356	.682	.755
1984	.218	.232	.251	.267	.225	.240	.231	.246	.321	.343	.709	.755
1985	.334	.343	.281	.289	.250	.257	.240	.246	.333	.342	.736	.756
1986	.374	.374	.313	.313	.275	.275	.258	.258	.360	.360	.777	.777
1987	.472	.461	.350	.343	.322	.314	.305	.298	.402	.393	.816	.797

Source: PacFIN, Groundfish Report Series

NOTE: Real prices were adjusted for inflation using the GNP implicit price deflator, where 1986=1.00. All prices are weighted averages.

Table 3 - Commercial Landings (mt) of Individual Groundfish Species by State for 1986 and 1987.

Species	California		Oregon		Washington	
	1986	1987	1986	1987	1986	1987
Lingcod	514	929	656	719	714	1,023
Pacific Cod	-	73	31	659	303	1,545
Pacific Whiting	2,982	4,518	420	183	61	95
Sablefish	6,099	4,347	4,653	5,239	2,415	3,144
Pacific Ocean Perch	30	96	669	549	649	332
Widow Rockfish	2,468	2,274	4,329	6,300	2,765	4,113
Other Rockfish	14,414	14,309	6,771	7,856	4,742	4,581
Dover Sole	10,987	10,761	4,822	6,058	1,480	1,622
English Sole	1,074	1,322	552	595	403	560
Petrale Sole	711	824	709	855	313	526
Other Flatfish	1,701	1,771	1,285	1,572	1,982	2,403

Source: PacFIN, Groundfish Report Series

Table 4 - California, Oregon, and Washington Shoreside Commercial Groundfish Landings (Metric Tons) and Exvessel Values (Thousands of Dollars) from 1977-1987.

Year	California		Oregon		Washington		Total Coast	
	mt	$	mt	$	mt	$	mt	$
1977	32,082	12,185	10,172	4,150	12,712	4,362	54,966	20,697
1978	36,805	18,457	16,469	7,871	19,285	8,213	72,559	34,541
1979	36,392	19,566	28,935	17,264	22,508	11,112	87,835	47,942
1980	36,862	16,551	28,515	11,425	22,514	9,119	87,891	37,095
1981	42,578	21,448	37,502	14,721	23,093	10,100	103,173	46,269
1982	52,608	27,795	41,023	20,445	25,368	11,405	118,999	59,645
1983	39,498	21,984	35,158	18,345	22,970	11,257	97,626	51,586
1984	40,570	22,914	28,209	15,234	21,080	10,474	89,859	48,622
1985	43,062	26,516	29,023	17,095	19,229	12,449	91,314	56,060
1986	41,246	28,522	24,931	16,813	16,081	10,905	82,298	56,240
1982-86 Average	43,397	25,546	31,669	17,586	20,946	11,298	96,019	54,431
1987	41,410	30,682	30,627	24,328	20,283	16,866	92,320	71,875

Source: State Fishery Agencies
PacFIN, Groundfish Report Series; 1981-1987
Annual data updated and current as of June 1988

Table 5 - Landings and Value of Individual Groundfish Species Landed in Washington, Oregon, and California in 1986 and 1987.[1]

Species	1986		1987		% Change	
	mt	$	mt	$	mt	$
Lingcod	1,884	1,317,300	2,586	2,152,800	+37.0	+63.4
Pacific Cod	334	202,200	2,270	1,644,900	+580.0	+713.5
Pacific Whiting	3,463	448,500	4,795	666,100	+38.5	+48.1
Sablefish	13,167	10,867,700	12,730	13,244,600	-3.3	+21.9
Pacific Ocean Perch	1,348	822,700	976	704,400	-27.6	-14.4
Widow Rockfish	9,562	5,803,800	12,687	9,002,300	+32.7	+55.1
Other Rockfish	25,972	18,797,600	26,746	21,477,300	+3.2	+14.3
Dover Sole	17,289	9,821,000	18,441	12,400,400	+6.7	+26.3
English Sole	2,028	1,601,800	2,477	2,195,400	+22.1	+37.1
Petrale Sole	1,733	2,966,500	2,204	3,964,700	+27.2	+33.6
Other Flatfish	4,968	3,003,100	5,747	3,763,500	+15.7	+25.3
TOTAL	81,703	55,652,200	91,659	71,214,400	+12.2	+28.0

Source: PacFIN, Groundfish Report Series

1/ Includes domestic landings from U.S. coastal waters off WOC, but not Puget Sound; A small amount of landings of miscellaneous groundfish species are not included in the totals.

Table 6. West Coast Landings and Exvessel Value of Sablefish by Gear, 1986 and 1987.[1]

	Total WOC 1987				Total WOC 1986			
	mt		$		mt		$	
Ground trawl	6,430.0	(50.0)	4,625.5	(34.9)	6,007.7	(45.6)	3,554.7	(32.7)
Pot	2,017.0	(15.8)	2,293.7	(17.3)	2,115.9	(16.1)	2,084.6	(19.2)
Longline	4,152.0	(32.6)	6,231.6	(47.0)	3,572.0	(27.1)	4,163.5	(38.3)
Net	36.4	(0.3)	21.1	(0.2)	117.1	(0.9)	55.3	(0.6)
Other	94.7	(0.7)	72.7	(0.6)	1,354.0	(10.3)	1,009.6	(9.3)
Total	12,730.1		13,244.6		13,167.0		10,867.7	

1/ Figures in parentheses are the percentages each gear group contributed to the total landed catch and exvessel value.

Table 7 - West Coast Groundfish Shoreside Landings (metric tons) by gear group, 1981-87.

	Trawl	Trap/ Pot	Setline*/ Longline	Gill/Set** Net	Other/Misc
1981	90,797	3,956	3,997	1,632	2,791
1982	103,299	6,530	4,384	2,077	2,709
1983	81,668	5,423	2,191	2,243	6,101
1984	72,693	3,854	1,989	2,199	9,124
1985	75,352	3,703	4,603	3,918	3,737
1986	61,249	2,216	5,894	4,205	8,734
1987	74,719	2,076	6,952	3,903	4,740

Source: PacFIN, Groundfish Report Series, Annual data updated and current as of June 1988

* Includes commercial pole catch for California landings, because large quantities of sablefish are landed with this gear in PacFIN. Consequently values will differ from previous annual reports.

** Includes gill net, set net, and other net; but not dip, trammel, seine, or miscellaneous nets.

Table 8 - Exvessel Value (thousands of dollars) of West Coast Groundfish Landings by gear group, 1981-1987.

	Trawl	Trap/Pot	Set/Longline*	Gill/Set** Net	Other/Misc
1981	37,855	2,081	3,696	1,468	2,169
1982	46,987	4,863	4,551	1,814	1,430
1983	40,578	3,598	2,091	1,742	3,578
1984	36,885	2,338	2,083	1,955	5,361
1985	41,264	3,154	5,329	3,367	2,946
1986	36,916	2,171	6,811	3,715	6,627
1987	52,162	2,347	9,527	3,806	4,032

Source: PacFIN, Groundfish Report Series, Annual data updated and current as of June 1988.

* Includes commercial pole catch for California landings, because large qantities of sablefish are landed with this gear in PacFIN. Consequently values will differ from previous annual reports.

** Includes gill net, set net, and other net; but not dip, trammel, seine, or miscellaneous.

Table 9 - Number of Shoreside Vessels in Washington, Oregon, and California Commercial Groundfish Fleets, 1981-1987.

Year	Otter Trawl	Pot/Trap [1]	Longline [1]
1981	408	66	191
1982	444	82	208
1983	436	59	185
1984	397	34	96 [2]
1985	358	32	129 [2]
1986	308	25	190 [2]
1987	318	26	186 [3]

Source: State Fishery Agencies

1/ Vessels landing fish caught with this gear-type in two or more states are counted in each state for years 1982-83. These numbers therefore are an upper bound for the true number of vessels using this gear-type.

2/ Represents number of longline vessels landing in Oregon and Washington, where double counting has been eliminated; California data unavailable for those years.

3/ Includes count for sablefish longline vessels landing in California and Oregon and all coastal longline vessels in Washington.

Table 10 - Washington, Oregon, and California Groundfish Shoreside Trawl Fleet Characteristics, 1983-87.

	1984	1985	1986	1987
Total Number Landing	397	358	308	318
Frequency by Size (Length) Class				
< 30 feet	2	2	1	1
30-39	20	15	9	10
40-49	100	96	73	73
50-59	108	93	87	85
60-69	104	98	90	94
70-79	44	39	37	38
80-89	11	6	6	10
> 90	8	9	5	7
Vessel Characteristics:				
Average Length	57.41	57.6	58.2	58.8
Average Horsepower	312.4	309.7	310.8	318.9
Average Net Tonnage	45.5	45.8	47.6	49.7
Number Vessels Based in Each State				
California	169	157	126	121
Oregon	146	121	110	120
Washington	82	80	72	77
Vessels Landing in More than One State	61	41	34	35

Source: State Fishery Agencies

Table 11 - West Coast Commercial Groundfish Shoreside Landings, Exvessel Values (Thousands of Dollars) and Average Vessel Gross Revenues for Selected Gear Groups, 1980-1987. (Numbers of vessels using gear types other than the three listed below are unknown).

Year	Groundfish Otter Trawl[1]			Pot/Trap			Longline		
	mt	$	$ per Vessel	mt	$	$ per Vessel	mt	$	$ per Vessel
1981	90,800	37,900	92.9	3,956	2,080	31.5	3,997	3,700	11.3
1982	103,300	47,000	105.8	6,530	4,860	59.3	4,384	4,600	13.2
1983	81,700	40,600	93.1	5,423	3,600	61.0	2,191	2,100	7.2
1984	72,700	36,900	92.9	3,854	2,340	68.8	1,989	2,100	N/A
1985	75,400	41,300	115.4	3,703	3,154	98.6	4,603	5,300	N/A
1986	61,200	36,900	119.8	2,216	2,171	86.8	5,894	6,800	N/A
1987	74,700	52,200	164.1	2,076	2,347	90.3	6,952	9,500	51.1

Source: PacFIN, Groundfish Report Series, data updated and current as of June 1988.

1/ Includes bottom, roller, and midwater trawls.

Table 12 - Landings and Participation in Pacific Whiting Joint-Venture Fisheries off of Washington, Oregon, and California, 1979-1987.

Year	Landings (mt)	Estimated Dollar Value ($)	Number of Trawl Vessel	Average Revenue Per Vessel ($)
1979	9,054	1,162,000	11	105,600
1980	26,793	3,275,000	15	218,300
1981	43,758	6,345,000	21	302,100
1982	68,420	10,367,000	17	609,800
1983	72,140	10,217,000	19	537,700
1984	79,047	11,841,000	21	563,800
1985	31,567	3,751,000	17	220,700
1986	81,855	8,760,000	25	350,400
1987	106,095	11,663,000	30	388,800

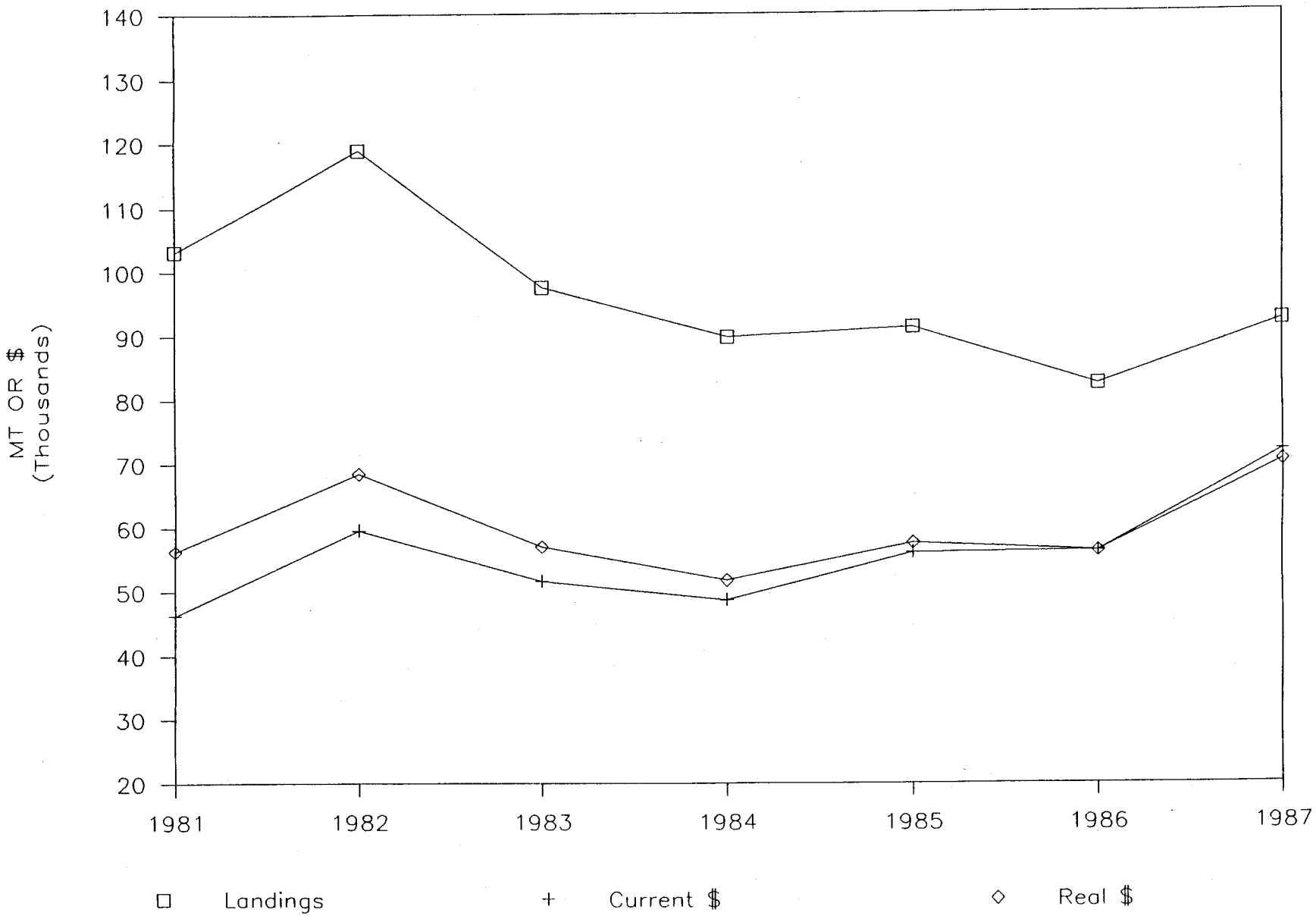
Source: PacFIN, Groundfish Report Series
NMFS, Northwest Regional Office

TOTAL WOC GROUNDFISH LANDINGS AND VALUE

, SHORESIDE AND JV, FROM 1981–1987

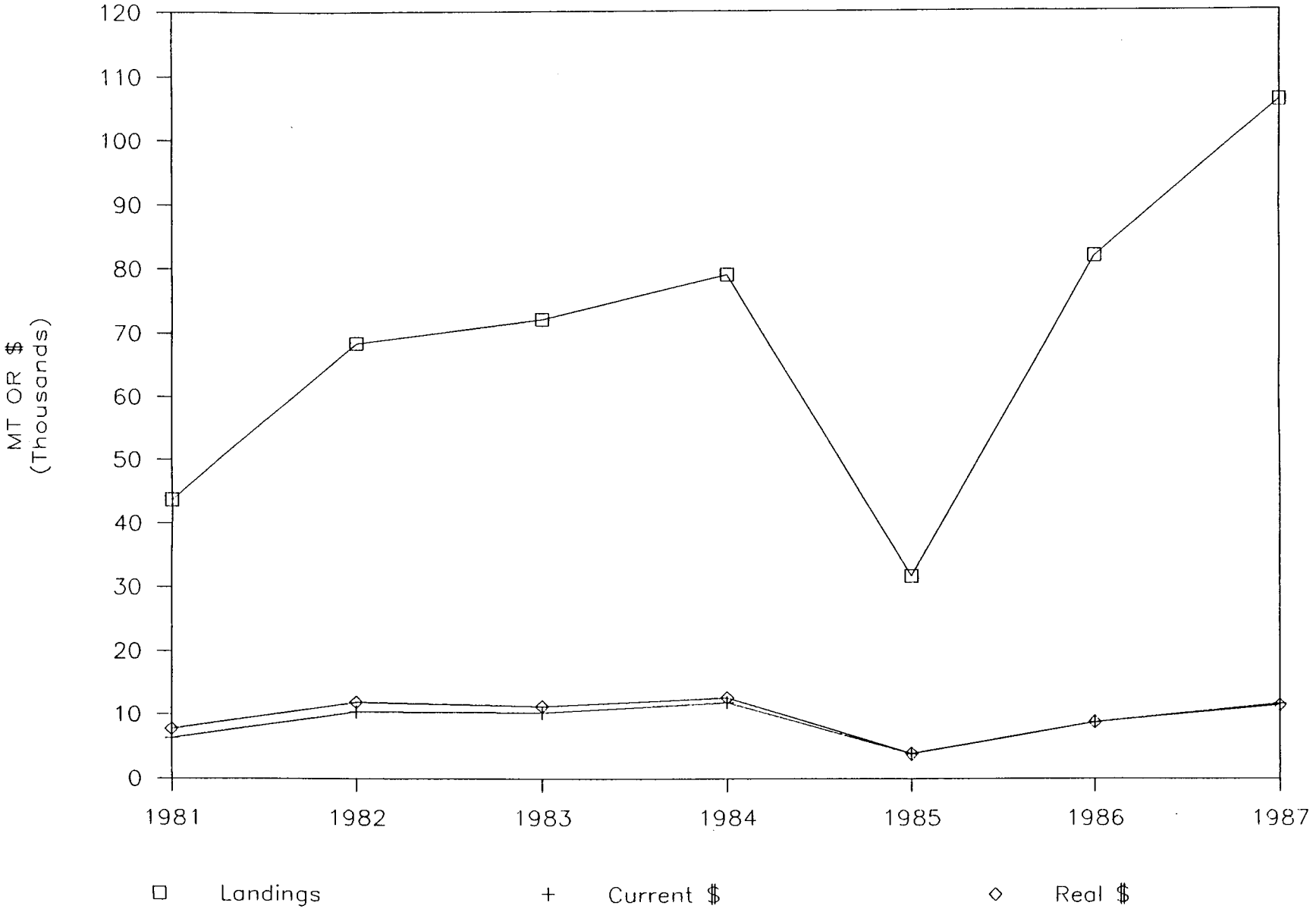
WOC SHORESIDE GROUNDFISH

LANDINGS AND VALUE FROM 1981–1987



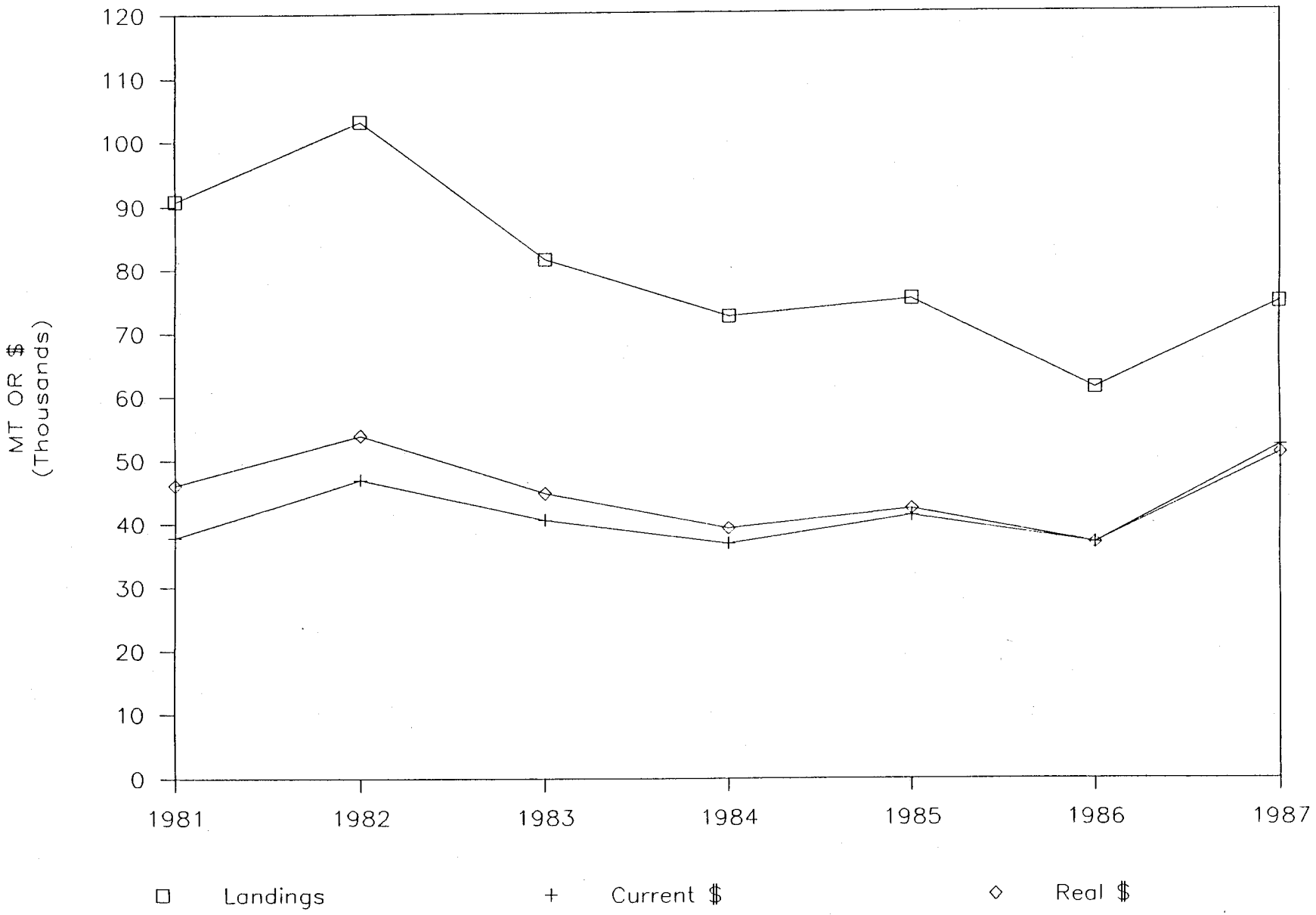
WOC PACIFIC WHITING JOINT VENTURE

LANDINGS AND VALUE FROM 1981–1987



WOC GROUNDFISH LANDINGS AND VALUE

FOR GROUNDFISH TRAWL GEAR, 1981–1987



WOC GROUNDFISH LANDINGS

FOR FIXED GEAR FROM 1981–1987

Alaska Groundfish Fisheries

by

Joseph Terry

Prepared for the

TWENTY-NINTH ANNUAL MEETING
of the
TECHNICAL SUBCOMMITTEE
of the
CANADA/UNITED STATES GROUNDFISH COMMITTEE

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Northwest and Alaska Fisheries Center
National Marine Fisheries Service
7600 Sand Point Way NE.
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Tables have been extracted from draft reports and the Pacific Fisheries Information Network (PacFIN) to provide information concerning the groundfish fisheries off Alaska. The data in the first table show the dramatic change that has occurred in the distribution of groundfish catch among the domestic, joint venture, and foreign fleets. The foreign fleet's share of the groundfish catch (excluding Pacific halibut) fell from approximately 99.9 per cent in 1976 to 3.7 per cent in 1987. During this period, the total annual catch of the three fleets combined ranged from 1.4 million metric tons (t) to 2.1 million t. The estimated ex-vessel value of the 1987 catch of 1.9 million t was $344 million.

The increased opportunities in the domestic and joint venture fisheries have attracted a large number of vessels. These vessels range from a large number of relatively small longline vessels to rapidly increasing numbers of relatively large factory trawlers and factory motherships. Increased demand for groundfish exports and relatively high wholesale prices for Pacific cod, pollock, and other species were sources of increased opportunities for the domestic fisheries.

The data in the tables extracted from PacFIN depict the changes that have occurred in the seasonality of the fisheries and changes in domestic ex-vessel prices.

Table I.A.1

D R A F T

Annual groundfish catch off Alaska by area, species, and fleet, 1976-1987 (1,000's metric tons).

		Gulf of Alaska				Bering Sea/Aleutians				Total			
	Year	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total
Pollock													
	1976	0.2	0.0	79.3	79.5	0.0	0.0	1,255.7	1,255.7	0.2	0.0	1,335.1	1,335.3
	1977	0.2	0.0	117.8	118.1	0.0	0.0	978.4	978.4	0.2	0.0	1,096.2	1,096.5
	1978	1.0	0.0	96.3	97.4	0.0	0.0	977.7	977.7	1.1	0.0	1,074.0	1,075.1
	1979	2.0	0.6	103.2	105.8	0.0	0.0	944.0	944.0	2.0	0.6	1,047.2	1,049.8
	1980	0.9	1.1	113.0	115.0	0.1	10.6	1,006.1	1,016.8	1.0	11.7	1,119.1	1,131.9
	1981	0.6	16.9	130.3	147.7	0.2	42.1	986.9	1,029.3	0.8	58.9	1,117.3	1,177.0
	1982	2.2	73.9	92.6	168.7	0.2	54.5	959.3	1,014.0	2.4	128.4	1,051.9	1,182.8
	1983	0.1	134.1	81.4	215.6	1.1	149.0	891.5	1,041.6	1.2	283.1	972.8	1,257.2
	1984	1.0	207.1	99.3	307.4	7.3	237.0	933.0	1,177.3	8.4	444.1	1,032.2	1,484.7
	1985	15.4	237.9	31.6	284.8	30.8	377.5	820.3	1,228.6	46.1	615.4	851.9	1,513.4
	1986	21.3	62.6	0.1	84.0	57.9	835.1	352.3	1,245.3	79.2	897.7	352.4	1,329.4
	1987	39.1	22.8	0.0	61.9	218.2	1,032.4	3.6	1,254.2	257.3	1,055.2	3.6	1,316.1
Pacific Cod													
	1976	0.2	0.0	6.5	6.8	0.1	0.0	58.3	58.3	0.2	0.0	64.8	65.0
	1977	0.2	0.0	2.0	2.3	0.1	0.0	35.9	35.9	0.3	0.0	37.9	38.2
	1978	0.6	0.0	11.4	12.2	0.3	0.0	46.8	46.8	0.8	0.0	58.2	59.0
	1979	0.8	0.7	13.2	14.9	0.8	0.0	41.4	42.0	1.6	0.7	54.6	56.9
	1980	0.5	0.5	34.2	35.3	2.5	8.4	37.3	51.2	5.8	8.9	71.5	86.6
	1981	1.1	0.1	35.0	36.1	14.1	9.2	39.1	62.4	15.2	9.2	74.1	98.5
	1982	2.3	0.2	26.9	29.4	24.9	13.5	28.2	66.5	27.1	13.7	55.1	95.9
	1983	4.2	2.4	29.8	36.4	42.0	14.4	41.5	97.8	46.2	16.8	71.3	134.2
	1984	3.2	4.6	15.9	23.8	38.7	30.8	58.5	128.0	41.9	35.4	74.4	151.7
	1985	3.0	2.3	9.1	14.3	45.8	41.3	57.2	144.3	48.8	43.5	66.3	158.6
	1986	8.1	1.4	15.2	21.9	34.3	63.9	39.9	140.8	42.4	65.3	55.1	162.7
	1987	29.0	2.0	0.0	31.0	44.9	57.5	54.4	156.7	73.9	59.4	54.4	187.7

Table I.A.1 (continued)

D R A F T

Annual groundfish catch off Alaska by area, species, and fleet, 1976-1987 (1,000's metric tons).

		Gulf of Alaska				Bering Sea/Aleutians				Total			
	Year	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total
Sablefish													
	1976	0.8	0.0	25.7	26.9	0.0	0.0	4.8	4.8	0.8	0.0	30.6	31.7
	1977	0.8	0.0	16.0	17.2	0.0	0.0	4.6	4.6	0.8	0.0	20.6	21.8
	1978	1.2	0.0	7.1	8.9	0.0	0.0	2.0	2.0	1.2	0.0	9.1	10.9
	1979	2.3	0.0	6.9	10.3	0.0	0.0	2.2	2.2	2.3	0.0	9.1	12.5
	1980	1.7	0.0	6.1	8.5	0.0	0.0	2.4	2.4	1.7	0.0	8.5	10.9
	1981	1.9	0.0	8.0	9.9	0.0	0.2	3.0	3.1	1.9	0.2	10.9	13.1
	1982	2.9	0.0	5.6	8.6	0.2	0.1	3.8	4.1	3.1	0.1	9.5	12.7
	1983	3.8	0.3	5.0	9.0	0.1	0.1	3.2	3.4	3.9	0.4	8.1	12.4
	1984	8.9	0.5	1.1	10.5	1.1	0.3	1.9	3.3	9.9	0.9	3.0	13.8
	1985	11.4	0.2	0.0	11.6	3.4	0.1	0.3	3.8	14.7	0.3	0.4	15.4
	1986	21.6	0.1	0.0	21.6	6.0	0.4	0.1	6.5	27.6	0.5	0.1	28.2
	1987	26.1	0.2	0.0	26.3	7.9	0.1	0.0	8.0	34.0	0.3	0.0	34.3
Flatfish													
	1976	0.2	0.0	5.9	6.1	0.0	0.0	137.3	137.3	0.2	0.0	143.3	143.4
	1977	0.7	0.0	16.0	16.7	0.0	0.0	136.6	136.6	0.7	0.0	152.6	153.3
	1978	0.8	0.0	14.3	15.2	0.0	0.0	235.8	235.8	0.8	0.0	250.1	251.0
	1979	0.4	0.1	13.5	13.9	0.0	0.0	191.0	191.0	0.4	0.1	204.5	204.9
	1980	0.2	0.2	15.5	15.9	0.0	12.4	166.3	178.7	0.2	12.6	181.8	194.6
	1981	0.4	0.0	14.4	14.9	0.0	22.0	173.2	195.2	0.4	22.1	187.6	210.1
	1982	0.3	0.0	9.0	9.3	0.0	26.6	155.3	181.9	0.3	26.7	164.3	191.2
	1983	0.4	2.7	9.5	12.7	0.0	34.3	166.3	200.6	0.4	37.0	175.8	213.3
	1984	0.4	3.4	3.0	6.9	0.0	50.2	186.1	236.3	0.4	53.6	189.2	243.2
	1985	0.5	2.4	0.2	3.1	0.1	172.7	147.6	320.5	0.5	175.2	147.8	323.6
	1986	1.5	1.0	0.1	2.6	6.6	216.9	78.0	301.4	8.1	217.8	78.0	303.9
	1987	2.7	7.2	0.0	9.9	24.0	214.7	7.4	246.1	26.7	221.9	7.4	256.0
Rockfish													
	1976	0.1	0.0	56.4	56.7	0.0	0.0	35.4	35.4	0.1	0.0	91.8	92.0
	1977	0.1	0.0	23.6	23.8	0.0	0.0	10.8	10.8	0.1	0.0	34.4	34.6
	1978	0.1	0.0	10.1	10.3	0.0	0.0	7.5	7.5	0.1	0.0	17.6	17.8
	1979	0.2	0.1	12.3	12.8	0.0	0.0	7.2	7.2	0.3	0.1	19.5	20.1
	1980	0.2	0.0	16.6	17.1	0.0	0.1	8.5	8.6	0.2	0.1	25.1	25.7
	1981	0.4	0.0	17.9	18.2	0.0	0.0	7.3	7.4	0.4	0.0	25.2	25.6
	1982	0.3	0.0	10.5	10.7	0.0	0.0	4.9	4.9	0.3	0.0	15.3	15.6
	1983	0.4	2.3	7.8	10.6	0.0	0.1	2.0	2.1	0.4	2.4	9.8	12.7
	1984	1.1	2.0	3.2	6.3	1.3	0.6	0.9	2.9	2.4	2.7	4.1	9.1
	1985	2.7	0.3	0.0	3.0	1.0	0.5	0.0	1.5	3.7	0.8	0.1	4.6
	1986	7.9	0.1	0.0	8.0	1.1	0.5	0.0	1.6	8.9	0.6	0.0	9.6
	1987	12.4	0.0	0.2	12.6	2.6	0.9	0.0	3.5	15.1	1.0	0.0	16.1

Table I.A.1 (continued)

D R A F T

Annual groundfish catch off Alaska by area, species, and fleet, 1976-1987 (1,000's metric tons).

	Gulf of Alaska				Bering Sea/Aleutians				Total			
Year	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total
Atka Mackerel												
1976	0.0	0.0	19.9	19.9	0.0	0.0	20.8	20.8	0.0	0.0	40.8	40.8
1977	0.0	0.0	19.5	19.5	0.0	0.0	21.8	21.8	0.0	0.0	41.2	41.2
1978	0.0	0.0	19.6	19.6	0.0	0.0	24.2	24.2	0.0	0.0	43.8	43.8
1979	0.0	0.0	10.9	10.9	0.0	0.0	23.3	23.3	0.0	0.0	34.2	34.2
1980	0.0	0.0	13.2	13.2	0.0	0.3	20.2	20.5	0.0	0.3	33.4	33.7
1981	0.0	0.0	18.7	18.7	0.0	1.6	18.1	19.7	0.0	1.6	36.8	38.4
1982	0.0	0.0	6.8	6.8	0.0	12.5	7.4	19.9	0.0	12.5	14.2	26.6
1983	0.0	0.8	11.5	12.3	0.0	10.5	1.2	11.7	0.0	11.3	12.7	24.0
1984	0.0	0.6	0.5	1.2	0.0	35.9	0.1	36.1	0.0	36.5	0.6	37.2
1985	0.0	1.8	0.0	1.8	0.0	37.9	0.0	37.9	0.0	39.7	0.0	39.7
1986	0.0	0.0	0.0	0.0	0.0	32.0	0.0	32.0	0.0	32.0	0.0	32.0
1987	0.0	0.0	0.0	0.0	0.1	30.0	0.0	30.2	0.1	30.0	0.0	30.2
All Species												
1976	2.0	0.0	193.9	195.9	0.0	0.0	1,512.4	1,512.4	2.0	0.0	1,706.2	1,708.3
1977	2.6	0.0	194.9	197.5	0.0	0.0	1,188.1	1,188.1	2.6	0.0	1,382.9	1,385.6
1978	4.7	0.0	158.8	163.5	0.1	0.0	1,294.0	1,294.1	4.7	0.0	1,452.8	1,457.6
1979	7.3	1.5	160.0	168.7	0.6	0.0	1,209.1	1,209.7	7.9	1.5	1,369.1	1,378.5
1980	4.5	1.9	198.7	205.0	5.7	31.8	1,240.8	1,278.3	10.2	33.7	1,439.5	1,483.3
1981	4.5	16.9	224.3	245.5	14.4	75.1	1,227.6	1,317.1	18.9	92.0	1,451.9	1,562.6
1982	8.0	74.1	151.4	233.5	25.2	107.2	1,158.9	1,291.4	33.3	181.4	1,310.3	1,524.8
1983	9.0	142.6	144.9	296.5	43.2	208.5	1,105.6	1,357.2	52.1	351.0	1,250.6	1,653.7
1984	14.8	219.6	123.7	358.1	48.4	357.5	1,191.2	1,597.2	63.2	577.2	1,314.9	1,955.3
1985	33.0	247.2	41.0	321.4	81.5	636.4	1,033.4	1,751.2	114.7	883.6	1,074.4	2,072.6
1986	60.9	65.3	15.5	141.7	106.4	1,156.4	475.2	1,738.0	167.3	1,221.7	490.7	1,879.8
1987	109.7	32.5	0.0	142.7	298.6	1,341.7	68.2	1,708.5	408.3	1,374.2	68.2	1,850.7

Sources: Domestic: 1976-80, CFEC, Condensed Gross Earnings Database.
Foreign: 1976, Murai et al., NOAA Tech. Memo. NMFS F/nwc-14, Sept. 1981.
JV 1979-80 and Foreign 1977-80: Berger, et al., NOAA Tech. Memo. NMFS F/NWC-99, March 1986.
Domestic, JV and Foreign: 1981-87, PacFIN.

Note: "All Species" includes herring, squid, and snails in the joint venture and foreign fisheries.
All joint venture and foreign data and domestic data beginning in 1981 are in round weight. Prior to 1981 domestic data are in landed weight which consists of a mix of round and dressed weights. The joint venture and foreign data are estimates of catch; however, the domestic data are estimates of landed catch excluding discards.

able I.8.

D R A F T

Number of vessels with groundfish catch in the wholly domestic fishery by gear type, and vessel length in feet, 1975-1987

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
rawl	16	44	51	49	76	57	63	84	82	78	80	80	147
ongline	322	381	307	326	578	444	374	382	361	485	619	945	1686
ot	13	6	10	10	11	8	5	4	6	14	24	25	30
ll Gears	602	652	619	724	1377	1007	874	869	835	986	1020	1449	1843
ll Gear													
< 60				631	1145	872	753	752	722	827	840	1157	1520
60 - 84				43	62	46	44	44	51	74	87	108	164
85 - 109				4	7	10	9	15	13	13	25	31	46
110 - 134				1		3	6	10	1	9	14	16	30
135 - 159						1		1	2	3	2	4	7
160 - 184								1	1	2	5	6	11
>= 185					1	1	2	2	1	2	3	3	7
Unknown				45	162	74	60	44	44	56	44	124	58
rawl Gear													
< 60				14	25	20	22	22	30	21	22	19	38
60 - 84				28	40	21	28	27	31	29	21	14	31
85 - 109				4	7	9	6	15	12	10	16	15	25
110 - 134						2	4	9	1	6	13	10	24
135 - 159						1		1	2	3	2	3	4
160 - 184								1	1	2	2	4	7
>= 185							1	1	1	2	3	3	7
Unknown				3	4	4	2	8	4	5	1	12	11
ongline Gear													
< 60				293	507	388	328	340	316	413	508	764	1472
60 - 84				13	21	20	13	16	19	40	72	89	140
85 - 109					1		1	1	1	2	6	15	18
110 - 134						1	2	1		2	2	3	6
135 - 159												1	2
160 - 184													2
>= 185						1	1	1					
Unknown				20	49	34	29	23	25	28	31	73	46
ot Gear													
< 60				7	9	4	3	4	5	7	13	4	13
60 - 84				1	1	2	1			5	4	8	4
85 - 109				1		1				1	4	6	4
110 - 134										1		4	3
135 - 159													1
160 - 184											3	2	3
>= 185													
Unknown				1	1	1	1		1			1	2

ource: CFEC, Condensed Gross Earnings database.

ote: Groundfish excludes Pacific halibut, all gear includes gear types other than the three identified above, and the large increase in the number of vessels in 1979 is in part explained by the unusually large number of troll vessels landing small amounts of groundfish.

able I.B.1.2 (continued)

D R A F T

Number of domestic vessels in the joint venture groundfish fish by length class, area, and gear, 1979-1987.

Alaska Total

Trawl

By length	1979	1980	1981	1982	1983	1984	1985	1986	1987
<59			2		2	1		3	
60-84	2	8	6	7	15	16	20	20	16
85-109	2	7	6	13	29	35	44	49	56
110-134		4	5	11	14	25	30	32	38
135-159	1	2	1	2	1	1	1	3	5
160-184				1					
>=185									1
No vessel data			1				1		1
Total	5	21	21	34	61	78	96	107	117

Longline

By length	1979	1980	1981	1982	1983	1984	1985	1986	1987
<59							4	4	
60-84							5	2	
85-109									
110-134									
135-159									
160-184									
>=185									
No vessel data									
Total	0	0	0	0	0	0	9	6	0

Note: the sums of vessels from the Bering Sea and Gulf of Alaska will not equal the total for Alaska since some vessels fish in both regions.

Source: NMFS, Juneau Office.

able I.C.1

D R A F T

Annual ex-vessel value of catch in the groundfish fisheries off Alaska, by species, area, and fishery, 1976-1987 ($1,000's).

	Gulf of Alaska				Bering Sea/Aleutians				Total			
	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total
ollock												
1976	4.0	0.0	--	--	0.0	0.0	--	--	4.0	0.0	--	--
1977	26.0	0.0	--	--	0.0	0.0	--	--	26.0	0.0	--	--
1978	138.0	0.0	--	--	3.0	0.0	--	--	141.0	0.0	--	--
1979	350.0	86.0	14788.9	15224.9	0.0	0.0	135284.5	135284.5	351.0	86.0	150073.4	150510.4
1980	130.0	157.6	16193.3	16481.0	18.0	1519.1	144184.0	145721.1	149.0	1676.7	160377.3	162203.0
1981	86.0	2421.8	18672.5	21180.3	0.0	6033.3	141432.5	147465.8	124.0	8455.2	160104.9	168684.1
1982	323.0	9286.0	11635.8	21244.8	28.0	6606.2	116280.9	122915.1	351.0	15892.2	127916.7	144159.9
1983	27.0	13007.7	7895.8	20930.5	86.0	12963.0	77560.5	90609.5	113.0	25970.7	85456.3	111540.0
1984	120.4	19674.5	9433.5	29228.4	1324.0	22041.0	86769.0	110134.0	1444.4	41715.5	96202.5	139362.4
1985	2668.6	22838.4	3033.6	28540.6	3609.2	36995.0	80389.4	120993.6	6277.8	59833.4	83423.0	149534.2
1986	2633.1	6635.6	10.6	9279.3	10102.0	87685.5	36991.5	134779.0	12735.0	94321.1	37002.1	144058.2
1987	6948.1	2918.4	0.0	9866.5	39313.9	131114.8	457.2	170885.9	46262.1	134033.2	457.2	180752.5
acific Cod												
1976	70.0	0.0	--	--	26.0	--	--	26.0	101.0	ERR	--	--
1977	111.0	0.0	--	--	28.0	--	--	28.0	140.0	ERR	--	--
1978	400.0	0.0	--	--	155.0	--	--	155.0	555.0	ERR	--	--
1979	368.0	145.8	2749.7	3263.5	595.0	0.0	8671.3	9266.3	964.0	145.8	11420.9	12530.7
1980	249.0	104.2	7124.2	7477.3	1481.0	1759.4	7812.5	11052.9	3515.0	1863.5	14936.7	20315.2
1981	303.0	20.8	7290.8	7614.6	5020.0	1926.9	8189.5	15136.5	5323.0	1947.8	15480.3	22751.1
1982	695.0	48.4	6512.3	7255.7	8890.0	2976.8	6218.2	18085.0	9584.0	3025.2	12730.5	25339.8
1983	1443.0	530.4	6585.8	8559.2	12543.0	2952.0	8507.5	24002.5	13987.0	3482.4	15093.3	32562.7
1984	976.6	998.2	3450.3	5425.1	16659.8	6683.6	12694.5	36037.9	17636.4	7681.8	16144.8	41463.0
1985	832.0	404.8	1601.6	2838.4	14796.6	8962.1	12412.4	36171.1	15628.6	9366.9	14014.0	39009.5
1986	2359.9	305.2	3313.6	5978.7	8049.0	13994.1	8738.1	30781.2	10409.8	14299.3	12051.7	36760.8
1987	11959.2	492.0	0.0	12451.2	17101.0	14835.0	14035.2	45971.2	29066.3	15327.0	14035.2	58428.5

ble I.C.1.1 (continued)

D R A F T

Annual ex-vessel value of catch in the groundfish fisheries off Alaska, by species, area, and fishery, 1976-1987 ($1,000's).

	Gulf of Alaska				Bering Sea/Aleutians				Total			
	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total
ablefish												
1976	705.0	0.0	--	--	0.0	0.0	--	--	705.0	0.0	--	--
1977	1235.0	0.0	--	--	0.0	0.0	--	--	1237.0	0.0	--	--
1978	1803.0	0.0	--	--	0.0	0.0	--	--	1809.0	0.0	--	--
1979	3757.0	0.0	2415.0	6172.0	0.0	0.0	317.6	317.6	3757.0	0.0	2732.6	6489.6
1980	1500.0	0.0	2135.0	3635.0	0.0	0.0	346.5	346.5	1503.0	0.0	2481.5	3984.5
1981	1108.0	0.0	2800.0	3908.0	0.0	28.9	433.1	462.0	1109.0	28.9	3233.1	4371.0
1982	3093.0	0.0	1960.0	5053.0	186.0	14.4	548.7	749.1	3280.0	14.4	2508.7	5803.1
1983	3162.0	146.4	2440.0	5748.4	22.0	17.4	556.8	596.2	3184.0	163.8	2996.8	6344.6
1984	6624.6	273.5	601.7	7499.8	407.4	95.4	604.2	1107.0	7032.0	368.9	1205.9	8606.8
1985	15646.3	109.4	0.0	15755.7	3737.7	30.1	90.3	3858.1	19384.0	139.5	90.3	19613.8
1986	28031.0	54.7	0.0	28085.7	6471.0	120.4	30.1	6621.5	34556.2	175.1	30.1	34761.4
1987	38991.3	109.4	0.0	39100.7	9682.3	30.1	0.0	9712.4	48676.5	139.5	0.0	48816.0
latfish												
1976	35.0	0.0	--	--	0.0	0.0	--	--	35.0	0.0	--	--
1977	162.0	0.0	--	--	0.0	0.0	--	--	162.0	0.0	--	--
1978	234.0	0.0	--	--	0.0	0.0	--	--	238.0	0.0	--	--
1979	153.0	11.3	1526.3	1690.6	0.0	0.0	21593.8	21593.8	153.0	11.3	23120.0	23284.3
1980	110.0	22.6	1752.4	1885.0	8.0	1401.9	18801.3	20211.2	119.0	1424.5	20553.7	22097.2
1981	127.0	0.0	1628.0	1755.0	0.0	3394.7	26725.8	30120.5	127.0	3394.7	28353.8	31875.5
1982	115.0	0.0	2035.0	2150.0	0.0	3988.4	23285.7	27274.2	116.0	3988.4	25320.8	29425.2
1983	137.0	737.1	2593.5	3467.6	0.0	4561.9	22117.9	26679.8	141.0	5299.0	24711.4	30151.4
1984	155.5	527.0	465.0	1147.5	6.1	6977.8	25867.9	32851.8	161.5	7504.8	26332.9	33999.2
1985	137.0	271.2	22.6	430.8	52.1	23832.6	20368.8	44253.5	189.1	24103.8	20391.4	44684.3
1986	487.2	160.0	16.0	663.2	2173.1	29064.6	10452.0	41689.7	2660.4	29224.6	10468.0	42353.0
1987	702.4	1108.8	0.0	1811.2	7050.4	31775.6	1095.2	39921.2	7752.8	32884.4	1095.2	41732.4
ockfish												
1976	43.0	0.0	--	--	0.0	0.0	--	--	43.0	0.0	--	--
1977	42.0	0.0	--	--	0.0	0.0	--	--	42.0	0.0	--	--
1978	50.0	0.0	--	--	0.0	0.0	--	--	50.0	0.0	--	--
1979	166.0	14.7	1807.8	1988.5	0.0	0.0	1058.2	1058.2	166.0	14.7	2866.0	3046.7
1980	106.0	0.0	2439.8	2545.8	0.0	14.7	1249.3	1264.0	106.0	14.7	3689.0	3809.7
1981	266.0	0.0	2630.8	2896.8	0.0	0.0	1072.9	1072.9	266.0	0.0	3703.7	3969.7
1982	250.0	0.0	3306.9	3556.9	0.0	0.0	1145.7	1145.7	252.0	0.0	4452.6	4704.6
1983	398.0	678.5	2301.0	3377.5	0.0	26.0	520.0	546.0	400.0	704.5	2821.0	3925.5
1984	886.3	618.0	988.8	2493.1	368.3	158.4	237.6	764.3	1245.6	776.4	1226.4	3248.4
1985	1534.8	59.7	0.0	1594.5	301.3	99.5	0.0	400.8	1836.1	159.2	0.0	1995.3
1986	3715.1	17.9	0.0	3733.0	403.8	89.5	0.0	493.3	4119.4	107.4	0.0	4226.8
1987	8159.7	0.0	62.2	8221.9	1349.1	279.9	0.0	1629.0	9512.2	279.9	62.2	9854.3

ble I.C.1.f (continued)

D R A F T

Annual ex-vessel value of catch in the groundfish fisheries off Alaska, by species, area, and fishery, 1976-1987 ($1,000's).

	Gulf of Alaska				Bering Sea/Aleutians				Total			
	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total	Domestic	JV	Foreign	Total
tka Mackerel												
1976	0.0	0.0	--	--	0.0	0.0	--	--	0.0	0.0	--	--
1977	0.0	0.0	--	--	0.0	0.0	--	--	0.0	0.0	--	--
1978	0.0	0.0	--	--	0.0	0.0	--	--	0.0	0.0	--	--
1979	0.0	0.0	1441.4	1441.4	0.0	0.0	3081.2	3081.2	0.0	0.0	4522.6	4522.6
1980	0.0	0.0	1745.6	1745.6	0.0	39.7	2671.2	2710.9	0.0	39.7	4416.8	4456.5
1981	0.0	0.0	2472.9	2472.9	0.0	211.6	2393.5	2605.1	0.0	211.6	4866.4	5078.0
1982	0.0	0.0	899.2	899.2	0.0	1929.9	1142.5	3072.4	0.0	1929.9	2041.7	3971.6
1983	0.0	106.4	1529.5	1635.9	0.0	1407.0	160.8	1567.8	0.0	1513.4	1690.3	3203.7
1984	11.6	130.2	108.5	250.3	0.0	7790.3	21.7	7812.0	0.0	7920.5	130.2	8050.7
1985	0.0	316.8	0.0	316.8	0.0	8224.3	0.0	8224.3	0.0	8541.1	0.0	8541.1
1986	0.0	0.0	0.0	0.0	1.8	4832.0	0.0	4833.8	0.0	4832.0	0.0	4832.0
1987	0.0	0.0	0.0	0.0	36.4	4770.0	0.0	4806.4	36.4	4770.0	0.0	4806.4
ll Species												
1976	857.0	0.0	--	--	26.0	ERR	--	--	888.0	ERR	--	--
1977	1576.0	0.0	--	--	28.0	ERR	--	--	1607.0	ERR	--	--
1978	2625.0	0.0	--	--	158.0	ERR	--	--	2793.0	ERR	--	--
1979	4794.0	257.8	24729.1	29780.9	595.0	0.0	170006.5	170601.5	5391.0	257.8	194735.6	200384.4
1980	2095.0	284.4	31390.2	33769.6	1507.0	4734.7	175064.8	181306.5	5392.0	5019.1	206455.0	216866.1
1981	1890.0	2442.7	35495.0	39827.7	5020.0	11595.5	180247.3	196862.8	6949.0	14038.1	215742.3	236729.4
1982	4476.0	9334.4	26349.2	40159.7	9104.0	15515.7	148621.8	173241.5	13583.0	24850.2	174971.0	213404.2
1983	5167.0	15206.5	23345.6	43719.1	12651.0	21927.3	109423.5	144001.8	17825.0	37133.8	132769.1	187727.9
1984	8775.0	22221.4	15047.8	46044.2	18765.6	43746.5	126194.9	188707.0	27519.9	65967.9	141242.7	234730.5
1985	20818.7	24000.3	4657.8	49476.8	22496.9	78143.6	113260.9	213901.4	43315.6	102143.9	117918.7	263378.2
1986	37226.3	7173.4	3340.2	47739.9	27200.7	135786.1	56211.7	219198.5	64480.8	142959.5	59551.9	266992.2
1987	66760.7	4628.6	62.2	71451.5	74533.1	182805.4	15587.6	272926.1	141306.3	187434.0	15649.8	344390.1

ources: Domestic: 1976-83, CFEC, Condensed Gross Earnings Database; 1984-87, PacFIN.
JV and Foreign: Computed from catch data in Table I.A.1 and JV prices obtained from NMFS Alaska Region.

otes: JV prices could not be obtained for all periods in which JV or foreign catch was reported.
No attempt has been made to estimate prices which would be appropriate for the valuation of foreign catch prior to 1980. From 1980 on, catch was valued in such cases at the nearest available JV price for the species. Domestic values are based on ex-vessel prices that do not include the value added by at-sea processing; therefore, they reflect the value of catch prior to processing.

able I.C.2.2

D R A F T

Estimated value of processed products from the domestic (DAP) groundfish fisheries off Alaska by area, 1976-1986 ($1000's)

ering Sea/Aleutians	Sablefish	Pacific Cod	Walleye Pollock	Rockfish	Total
1976	0	0	0	0	0
1977	0	0	0	0	0
1978	0	0	0	0	0
1979	0	611	0	0	611
1980	0	5,606	68	0	5,674
1981	0	17,015	146	0	17,161
1982	309	27,249	154	0	27,712
1983	110	41,241	897	0	42,249
1984	1,334	38,580	5,150	1,165	46,229
1985	6,221	53,211	21,729	1,071	82,232
1986	18,915	56,022	45,953	1,239	122,129
ulf of Alaska					
1976	3,333	172	0	204	3,709
1977	3,598	260	0	183	4,041
1978	5,659	791	639	177	7,267
1979	9,220	1,019	1,190	452	11,881
1980	7,831	611	615	330	9,387
1981	3,351	1,327	437	342	5,457
1982	4,475	2,517	1,698	247	8,937
1983	4,189	4,124	82	352	8,746
1984	10,792	3,190	705	986	15,673
1985	20,860	3,485	10,864	2,892	38,101
1986	68,096	8,024	16,905	8,903	101,928
laska Total					
1976	3,333	172	0	204	3,709
1977	3,598	260	0	183	4,041
1978	5,659	791	639	177	7,267
1979	9,220	1,630	1,190	452	12,492
1980	7,831	6,217	683	330	15,061
1981	3,351	18,342	582	342	22,617
1982	4,784	29,766	1,852	247	36,649
1983	4,299	45,365	979	352	50,995
1984	12,125	41,770	5,855	2,151	61,902
1985	27,081	56,696	32,593	3,963	120,333
1986	87,011	64,046	62,858	10,142	224,057

ote: Values are calculated as price per round weight times the amount landed. Although not included in this time series, flatfish processed products became significant in 1987, with an estimated value of $20,746,000.

Table 5.1.3.--Producer prices for domestic Alaska pollock and Pacific cod products, f.o.b. Seattle, monthly average, November 1986-March 1988 in cents per pound.

	Alaska pollock					Pacific cod	
	Blocks			Fillet		Fillet, shatter-pack	
Month	16.5#	55#	Minced	Shatter	IQF	8-16 oz	16-32 oz
1986							
Nov	108	92	45	160	160	218	223
Dec	112	104	45	152	157	242	250
1987							
Jan	115	105	47	152	160	260	270
Feb	122	104	50	153	165	257	267
Mar	120	104	45	146	155	252	262
Apr	120	105	42	155	160	248	261
May	121	110	42	152	155	245	256
Jun	122	105	42	152	152	243	256
Jul	122	105	42	150	150	243	256
Aug	121	104	42	147	147	243	256
Sep	118	102	42	142	150	243	256
Oct	120	102	--	138	145	238	251
Nov	114	--	42	125	132	232	240
Dec	112	--	42	118	130	228	235
1988							
Jan.	113	95	--	118	128	220	230
Feb.	114	--	--	110	128	--	--
Mar.	107	90	40	110	128	205	215

Source: Fishery Market News, Natl. Mar. Fish. Serv., 7600 Sand Point Way N.E., BIN C15700, Seattle, WA 98115-0070.

Table 5.2.1.--Exports of groundfish from Alaska and Washington customs districts, quantity in thousand pounds, value in thousand dollars, and average price in dollars per pound, 1981-87.

Product	Quantity	Value	Average price
WHOLE OR DRESSED			
Pollock			
1981	541	797	1.47
1982	1,185	491	.41
1983	112	186	1.65
1984	293	318	1.08
1985	1,055	920	.87
1986	1,937	2,145	1.11
1987	4,647	3,352	1.72
Sablefish			
1981	589	376	.64
1982	1,996	2,465	1.23
1983	1,004	780	.78
1984	9,377	10,374	1.11
1985	14,838	20,624	1.39
1986	24,323	32,438	1.33
1987	39,163	66,130	1.69
Halibut			
1986	10,293	16,988	1.65
1987	6,638	12,911	1.95
FILLETS & STEAKS			
Cod			
1986	7,099	9,503	1.34
1987	6,961	11,227	1.61
Halibut			
1986	1,685	2,782	1.65
1987	1,092	2,019	1.85

Source: U.S. Dep. of Commerce, Bur. of the Census, and NMFS data base from Northwest and Alaska Fisheries Cen., 7600 Sand Point Way N.E., BIN C15700, Seattle, WA 98115-0070.

PACFIN 03JUN88 11:34 REPORT #115 P R E L I M I N A R Y

NPFMC GROUNDFISH BY SOURCE REPORT: COMM. DATA FOR ALL GEARS FOR ALL AREAS

LANDED CATCH (MTONS)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1987	ADFG	6469	12418	16267	20489	12643	9223	15281	23146	26794	24792	25792	18132	211445
	AKR	10781	18289	12713	14897	10760	13014	18919	18849	16205	21810	21311	19526	197075
	WDF	-	-	-	-	4	17	-	-	62	113	-	-	196
	ODFW						6			2				8
	DAP	17250	30707	28980	35386	23407	22260	34201	41995	43062	46714	47103	37659	408724
	JVP	43738	329286	296136	252459	206523	118830	37884	7125	40463	40429	780	577	1374231
	DAH	60988	359993	325116	287845	229930	141091	72085	49120	83526	87144	47883	38235	1782955
	FOREIGN	2804	12971	3005	1368	2007	487	1282	2644	1745	14079	14966	10811	68169
	TOTAL	63792	372964	328121	289213	231938	141578	73366	51764	85271	101223	62849	49046	1851125
1986	ADFG	2372	14869	14013	20222	11276	9042	9946	9116	5363	11635	10093	5415	123363
	AKR	984	5341	4669	3925	1631	2308	2866	3850	4444	4004	3806	2637	40464
	WDF				3036	3	5		3	205		78	188	3519
	DAP	3356	20211	18682	27184	12911	11355	12811	12969	10011	15639	13977	8240	167346
	JVP	896	100310	206472	156594	92652	101425	187541	177674	105646	65792	19682	7052	1221735
	DAH	4252	120521	225155	183778	105563	112780	200352	190643	115657	81431	33658	15292	1389081
	FOREIGN	936	18577	17470	3540	6714	40247	92166	106179	92209	49887	43327	19475	490728
	TOTAL	5188	139098	242625	187318	112277	153027	292519	296822	207866	131318	76985	34767	1879808
1985	ADFG	2970	7666	9770	12278	12187	4688	6372	9818	13803	15831	5845	4448	105678
	WDF					5663	23		42	10	40	100	3102	8980
	DAP	2970	7666	9770	12278	17850	4711	6372	9860	13814	15871	5944	7550	114658
	JVP	3627	93547	177518	93223	60452	72572	161192	113260	70579	29290	7694	616	883567
	DAH	6596	101213	187288	105501	78302	77283	167564	123120	84393	45160	13638	8166	998225
	FOREIGN	24265	32522	33029	13132	12263	57136	142725	177785	167654	182403	130736	100758	1074409
	TOTAL	30861	133735	220317	118634	90565	134420	310289	300905	252047	227563	144374	108924	2072634
1984	ADFG	1609	2806	6798	7508	2533	2551	3470	2260	3785	1972	3796	5557	44646
	WDF	27			8992	954		59	2330	17			6132	18511
	DAP	1636	2806	6798	16501	3486	2551	3530	4590	3802	1972	3796	11689	63157
	JVP	10159	76109	135377	56007	20116	60024	98927	62949	32050	16544	6108	2797	577167
	DAH	11795	78915	142176	72507	23602	62575	102457	67539	35852	18516	9904	14486	640324
	FOREIGN	20049	77502	25186	20300	28908	110614	177784	200730	211792	172835	151820	117420	1314941
	TOTAL	31845	156417	167362	92807	52511	173189	280241	268269	247644	191351	161724	131906	1955265
1983	ADFG	2354	7621	6868	8308	4591	6140	3293	2785	674	1170	876	731	45411
	WDF		34	31	11	3995			2764		18	690	2586	10130
	DAP	2354	7654	6899	8320	8586	6140	3293	5550	674	1188	1565	3317	55541
	JVP	5914	44400	80617	22898	26215	45654	61360	45362	15201	1053	1108	3243	353027
	DAH	8268	52054	87516	31218	34801	51794	64653	50912	15876	2241	2674	6560	408567
	FOREIGN	21529	63337	56427	53492	56753	145850	188239	191226	176161	147446	103663	67183	1271305
	TOTAL	29797	115391	143943	84710	91554	197644	252892	242137	192037	149687	106336	73743	1679872

THIS REPORT INCLUDES ONLY DATA FOR NORTH PACIFIC COUNCIL INPFC AREAS
TR => LANDED CATCH LESS THAN 0.5 METRIC TONS (OR 50 LBS OR 50 FISH); * => CANNOT COMPUTE (DIVISOR=0)

NPFMC ATKA MACKEREL BY SOURCE REPORT: COMM. DATA FOR ALL GEARS FOR ALL AREAS

LANDED CATCH (MTONS)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1987	AKR	-	-	-	-	-	-	-	104	-	19	1	-	124
	DAP	-	-	-	-	-	-	-	104	-	19	1	-	124
	JVP	TR	TR	TR	21	8357	7548	7656	2033	1248	3021	146	-	30031
	DAH	TR	TR	TR	21	8357	7548	7656	2137	1248	3040	148	-	30155
	FOREIGN	-	-	-	-	-	-	-	TR	-	TR	TR	-	TR
	TOTAL	TR	TR	TR	21	8357	7548	7656	2137	1248	3041	148	-	30155
1986	ADFG	-	-	-	-	-	-	4	-	-	-	-	TR	4
	DAP	-	-	-	-	-	-	4	-	-	-	-	TR	4
	JVP	-	TR	TR	1943	7873	12463	9208	496	1	4	1	TR	31988
	DAH	-	TR	TR	1943	7873	12463	9212	496	1	4	1	1	31992
	FOREIGN	-	TR	TR	-	-	TR	TR	TR	TR	TR	6	TR	6
	TOTAL	-	TR	TR	1943	7873	12463	9212	496	1	4	6	1	31999
1985	JVP	TR	TR	38	5269	16194	8904	7144	311	1333	501	9	-	39704
	DAH	TR	TR	38	5269	16194	8904	7144	311	1333	501	9	-	39704
	FOREIGN	-	-	-	-	-	TR	TR	TR	TR	1	1	TR	3
	TOTAL	TR	TR	38	5269	16194	8904	7145	311	1334	502	10	TR	39708
1984	ADFG	-	-	-	-	-	-	-	-	-	31	TR	-	31
	DAP	-	-	-	-	-	-	-	-	-	31	TR	-	31
	JVP	1	TR	TR	2377	7254	10440	11650	4572	16	217	TR	TR	36528
	DAH	1	TR	TR	2377	7254	10440	11650	4572	16	248	TR	TR	36559
	FOREIGN	2	1	1	TR	1	35	210	28	27	33	257	52	647
	TOTAL	2	1	1	2377	7255	10476	11861	4601	43	281	258	52	37206
1983	JVP	-	TR	-	1057	2925	655	2552	3379	580	152	1	TR	11301
	DAH	-	TR	-	1057	2925	655	2552	3379	580	152	1	TR	11301
	FOREIGN	1	39	6	4	194	2130	4410	2591	1321	456	1036	496	12685
	TOTAL	1	39	6	1061	3119	2785	6962	5970	1902	608	1037	496	23986

THIS REPORT INCLUDES ONLY DATA FOR NORTH PACIFIC COUNCIL INPFC AREAS
TR => LANDED CATCH LESS THAN 0.5 METRIC TONS (OR 50 LBS OR 50 FISH); * => CANNOT COMPUTE (DIVISOR=0)

NPFMC FLATFISH BY SOURCE REPORT: COMM. DATA FOR ALL GEARS FOR ALL AREAS

LANDED CATCH (MTONS)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1987	ADFG	163	2307	356	95	304	300	1283	1209	336	133	282	217	6984
	AKR	2628	4019	752	1060	1024	1136	1643	1773	1365	1654	1222	1428	19705
	DAP	2791	6326	1109	1155	1329	1436	2926	2982	1701	1787	1504	1644	26689
	JVP	124	1657	46941	30937	52207	71609	9829	1086	3079	4104	356		221929
	DAH	2916	7983	48050	32092	53536	73045	12754	4067	4780	5891	1860	1644	248618
	FOREIGN	12	28	11	47	11	235	718	1426	436	2481	1864	161	7430
	TOTAL	2928	8011	48061	32138	53547	73280	13473	5493	5216	8372	3724	1806	256048
1986	ADFG	393	1126	432	43	9	200	453	406	462	886	197	226	4834
	AKR	21	1161	533	63	151	180	175	111	111	252	167	135	3060
	WDF				71							10	109	191
	DAP	414	2287	965	178	160	380	628	517	573	1138	375	469	8084
	JVP	3	764	9697	44651	56019	28637	22929	25266	18582	10428	733	108	217815
	DAH	416	3051	10662	44829	56179	29017	23557	25783	19155	11566	1108	577	225899
	FOREIGN	2	45	1634	1068	582	3427	11651	13277	13516	17088	9909	5837	78036
	TOTAL	419	3096	12296	45897	56761	32443	35208	39059	32671	28654	11017	6414	303935
1985	ADFG	37	16	12	5	1	1	5	5	44	31	62	289	508
	WDF					TR			TR	TR		6	29	35
	DAP	37	16	12	5	1	1	5	5	44	31	68	318	543
	JVP	8	489	1665	12363	33376	31552	29293	34747	20908	10002	710	79	175193
	DAH	44	505	1677	12368	33378	31553	29298	34752	20952	10033	778	398	175735
	FOREIGN	8455	2999	8704	8232	5880	11759	12259	21292	21182	21131	15582	10339	147816
	TOTAL	8500	3504	10381	20600	39258	43312	41557	56044	42134	31164	16360	10737	323551
1984	ADFG	133	76	85	9	4	TR	TR	3	1	8	43	62	424
	WDF	27								1			4	32
	DAP	159	76	85	9	4	TR	TR	3	2	8	43	66	455
	JVP	363	363	845	5153	6989	11531	7119	9243	10134	1339	448	97	53623
	DAH	523	438	930	5162	6992	11531	7119	9245	10136	1347	491	163	54078
	FOREIGN	1222	1393	5289	11057	5520	13655	21301	28038	23741	28625	27206	22105	189152
	TOTAL	1745	1832	6219	16220	12513	25186	28420	37283	33877	29971	27697	22268	243230
1983	ADFG	80	55	9	10	13	1	TR	TR	1	7	33	130	338
	WDF		34	31									46	111
	DAP	80	88	40	10	13	1	TR	TR	1	7	33	176	449
	JVP	4	197	2445	3228	6855	7677	7582	5999	1369	265	482	895	37000
	DAH	84	285	2485	3238	6868	7678	7583	5999	1370	272	515	1072	37449
	FOREIGN	2895	6262	11261	9473	10983	13740	16485	21390	19970	19812	20005	23546	175823
	TOTAL	2979	6548	13746	12711	17851	21418	24068	27389	21341	20084	20520	24618	213273

THIS REPORT INCLUDES ONLY DATA FOR NORTH PACIFIC COUNCIL INPFC AREAS
TR => LANDED CATCH LESS THAN 0.5 METRIC TONS (OR 50 LBS OR 50 FISH); * => CANNOT COMPUTE (DIVISOR=0)

NPFMC PACIFIC COD BY SOURCE REPORT: COMM. DATA FOR ALL GEARS FOR ALL AREAS

LANDED CATCH (MTONS)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1987	ADFG	1140	3913	8606	3634	2316	3142	4290	6649	3066	2988	3610	2375	45728
	AKR	2457	4377	3992	3173	995	1645	1778	2150	1694	2104	2064	1908	28338
	WDF					TR	1							1
	DAP	3597	8289	12598	6807	3312	4788	6068	8800	4760	5092	5674	4283	74067
	JVP	1795	14314	10595	7105	4785	6882	7319	1065	3342	2115	121		59438
	DAH	5392	22603	23193	13911	8096	11670	13387	9865	8101	7207	5796	4283	133505
	FOREIGN	2654	12332	2843	1197	1835	170	428	672	1162	9936	11471	9673	54374
	TOTAL	8046	34935	26036	15108	9932	11840	13815	10537	9264	17143	17267	13956	187879
1986	ADFG	1147	5197	6382	3457	854	1700	2265	1080	334	1181	1232	751	25580
	AKR	622	3110	3195	2668	181	413	784	718	360	628	713	643	14036
	WDF				2627		TR						65	2692
	DAP	1769	8307	9577	8752	1035	2114	3049	1798	694	1809	1945	1460	42308
	JVP	52	5932	10024	6107	8600	10859	4869	6146	6746	4750	970	243	65298
	DAH	1821	14239	19601	14859	9636	12972	7918	7944	7440	6560	2914	1703	107606
	FOREIGN	901	12435	7475	1050	2485	941	1515	2565	3800	5161	12064	4677	55071
	TOTAL	2722	26675	27076	15909	12121	13914	9433	10508	11240	11721	14978	6380	162677
1985	ADFG	2351	5998	7790	9245	7299	1389	3969	1113	584	1238	863	958	42798
	WDF					5450	TR						529	5979
	DAP	2351	5998	7790	9245	12749	1389	3969	1113	584	1238	863	1487	48777
	JVP	120	4096	8032	3166	2860	5998	6911	6102	4310	1721	205	17	43537
	DAH	2470	10094	15822	12411	15609	7387	10880	7215	4894	2959	1069	1505	92315
	FOREIGN	915	13021	5398	2996	1660	1036	2075	4143	4359	10575	10633	9454	66263
	TOTAL	3385	23115	21221	15407	17269	8423	12955	11358	9252	13533	11701	10958	158578
1984	ADFG	1268	2536	6223	6758	1275	615	1648	450	1303	861	1791	2917	27646
	WDF	TR			8809	933			1508				2993	14243
	DAP	1269	2536	6223	15566	2208	615	1648	1958	1303	861	1791	5910	41889
	JVP	720	3872	7645	3892	2706	4484	4506	3580	3107	618	246	46	35421
	DAH	1988	6408	13868	19458	4914	5099	6154	5538	4411	1479	2038	5955	77310
	FOREIGN	2672	8948	3979	3230	834	5930	3689	5378	5362	9369	12371	12646	74407
	TOTAL	4661	15357	17847	22688	5747	11029	9843	10915	9772	10848	14409	18601	151717
1983	ADFG	2196	7393	6284	7430	3030	4381	2121	1917	68	697	800	523	36841
	WDF					3827			2647		TR	554	2308	9337
	DAP	2196	7393	6284	7430	6857	4381	2121	4565	68	698	1354	2831	46177
	JVP	23	631	524	844	1681	3601	4757	2838	864	95	238	691	16788
	DAH	2219	8024	6808	8275	8538	7983	6878	7403	932	792	1592	3522	62966
	FOREIGN	2572	6220	6768	4871	4297	5945	5742	4543	4316	5816	9090	11104	71283
	TOTAL	4791	14244	13576	13146	12835	13928	12621	11946	5248	6608	10681	14626	134249

THIS REPORT INCLUDES ONLY DATA FOR NORTH PACIFIC COUNCIL INPFC AREAS
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NPFMC ROCKFISH BY SOURCE REPORT: COMM. DATA FOR ALL GEARS FOR ALL AREAS

LANDED CATCH (MTONS)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1987	ADFG	93	159	269	331	426	138	169	112	118	135	99	31	2078
	AKR	136	121	780	1117	1591	2080	1599	1672	1639	1704	556	5	13002
	WDF	–	–	–	–	3	13			TR	1	–	–	18
	ODFW						4	–	–					4
	DAP	229	279	1049	1449	2020	2235	1768	1784	1758	1840	655	36	15102
	JVP	TR	2	TR	35	54	170	422	84	71	189	2		1029
	DAH	229	281	1049	1484	2075	2405	2190	1868	1828	2029	657	36	16131
	FOREIGN	TR	TR	TR		TR		2	2	TR	2	4	1	12
	TOTAL	229	281	1050	1484	2075	2405	2192	1870	1829	2032	661	38	16143
1986	ADFG	69	226	221	632	177	120	248	1322	349	377	996	81	4818
	AKR	–	16	31	160	500	360	177	572	1675	292	237	85	4106
	WDF					2	2			2		3	1	10
	DAP	69	241	252	793	679	482	424	1894	2026	669	1236	167	8934
	JVP	–	4	TR	13	154	179	54	10	105	65	17	9	611
	DAH	69	246	252	806	833	660	478	1904	2132	734	1254	177	9545
	FOREIGN	1	1	3	TR	TR	2	4	3	7	3	14	1	40
	TOTAL	70	247	256	806	833	663	482	1907	2139	737	1268	178	9585
1985	ADFG	36	181	90	280	501	407	158	489	1011	77	293	61	3583
	WDF						22	–	39	8		2	1	72
	DAP	36	181	90	280	501	429	158	528	1020	77	295	62	3655
	JVP	1	11	2	47	130	231	39	7	147	137	15	4	771
	DAH	37	192	92	328	630	659	197	535	1166	214	310	65	4426
	FOREIGN	6	1	1	5	9	15	10	8	14	25	22	16	131
	TOTAL	43	194	93	333	639	674	207	543	1180	239	332	81	4558
1984	ADFG	42	29	93	142	146	101	121	143	661	479	368	46	2370
	WDF							TR	–	15		–	–	16
	DAP	42	29	93	142	146	101	121	143	676	479	368	46	2386
	JVP	18	29	9	365	521	488	581	376	93	146	24	4	2654
	DAH	60	58	101	507	666	589	703	519	769	625	391	49	5040
	FOREIGN	9	13	3	9	24	1128	1199	863	257	317	216	57	4095
	TOTAL	69	71	105	516	691	1718	1902	1382	1027	942	607	107	9135
1983	ADFG	2	9	28	63	65	61	37	31	31	31	21	58	435
	WDF				1						TR		7	8
	DAP	2	9	28	63	65	61	37	31	31	31	21	65	443
	JVP	TR	1	2	64	590	324	333	393	429	245	19	22	2421
	DAH	2	10	29	128	654	385	369	423	460	276	40	87	2863
	FOREIGN	30	43	113	112	658	1709	1845	1150	829	2012	1048	255	9801
	TOTAL	32	52	143	239	1312	2094	2214	1573	1289	2287	1088	342	12664

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NPFMC SABLEFISH BY SOURCE REPORT: COMM. DATA FOR ALL GEARS FOR ALL AREAS

LANDED CATCH (MTONS)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1987	ADFG	108	352	301	11534	5154	944	1682	835	4660	36	13	2	25622
	AKR	330	437	1571	1165	943	1070	988	719	528	353	99	_	8203
	WDF	_	_	_	_	1	2	_	_	61	111	_	_	175
	ODFW									2				2
	DAP	438	789	1872	12699	6098	2016	2671	1554	5252	500	112	2	34002
	JVP	_	TR	TR	TR	3	7	20	23	72	176	TR	_	303
	DAH	438	789	1873	12699	6102	2023	2691	1577	5324	676	112	2	34305
	FOREIGN	1	1	TR	TR	1	TR	1	1	1	6	12	10	33
	TOTAL	439	790	1873	12699	6103	2023	2692	1578	5325	682	123	12	34338
1986	ADFG	242	652	984	9883	5415	1717	765	917	2002	789	39	250	23656
	AKR	96	579	373	705	461	269	213	430	302	71	45	126	3670
	WDF					1	2		3	203		64	12	285
	DAP	338	1232	1357	10588	5877	1988	977	1350	2507	860	148	388	27611
	JVP	_	1	1	TR	31	39	31	59	171	120	20	TR	475
	DAH	338	1233	1357	10588	5908	2028	1009	1409	2679	980	168	388	28086
	FOREIGN	_	1	TR	TR	2	1	10	10	10	18	31	25	110
	TOTAL	338	1234	1358	10589	5910	2029	1019	1419	2689	999	200	414	28196
1985	ADFG	236	556	1310	2653	3492	1911	1247	724	763	1267	16	424	14600
	WDF					TR	TR				40	92	8	140
	DAP	236	556	1310	2653	3492	1911	1247	724	763	1307	108	432	14741
	JVP	TR	1	3	12	33	20	38	23	43	132	22	10	335
	DAH	236	557	1313	2665	3525	1931	1285	747	806	1439	131	442	15076
	FOREIGN	1	6	8	6	15	19	9	6	36	73	72	99	351
	TOTAL	238	563	1321	2671	3540	1950	1295	753	842	1512	202	540	15427
1984	ADFG	67	89	229	538	1070	1802	1599	1655	1726	216	436	167	9593
	WDF				49			59	4	TR			226	338
	DAP	67	89	229	587	1070	1802	1657	1659	1727	216	436	394	9930
	JVP	46	8	1	11	54	86	271	111	102	152	26	8	876
	DAH	113	96	230	597	1124	1888	1928	1770	1828	368	462	402	10807
	FOREIGN	111	69	115	214	73	132	55	279	211	781	529	459	3029
	TOTAL	224	165	345	812	1197	2020	1984	2049	2039	1149	991	861	13836
1983	ADFG	8	40	181	355	669	627	363	496	466	430	17	8	3661
	WDF				11	1			2		18		160	191
	DAP	8	40	181	366	670	627	363	498	466	447	17	168	3852
	JVP	TR	1	3	8	18	26	118	64	39	24	46	42	389
	DAH	9	40	184	374	688	654	481	562	504	471	63	210	4241
	FOREIGN	71	175	231	306	697	696	593	406	631	1014	1284	2039	8144
	TOTAL	79	216	415	681	1385	1349	1075	969	1135	1486	1346	2249	12385

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NPFMC WALLEYE POLLOCK BY SOURCE REPORT: COMM. DATA FOR ALL GEARS FOR ALL AREAS

LANDED CATCH (MTONS)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1987	ADFG	4935	5664	6704	4874	4417	4665	7834	14099	18484	21260	21610	15409	129954
	AKR	5229	9335	5616	8379	6201	7083	12910	12428	10978	15881	17332	16141	127514
	DAP	10163	14999	12320	13253	10618	11748	20744	26527	29461	37142	38942	31549	257468
	JVP	41791	313149	238030	213062	140067	31039	11693	2768	32346	30561	150	577	1055234
	DAH	51955	328147	250351	226315	150685	42787	32438	29295	61808	67703	39092	32126	1312702
	FOREIGN	43	251	35	16	26	63	98	480	76	1022	954	533	3596
	TOTAL	51998	328399	250385	226331	150711	42850	32535	29775	61884	68724	40046	32659	1316298
1986	ADFG	415	7518	5867	6198	4803	5292	6206	5348	2208	8385	7455	4083	63776
	AKR	245	463	515	298	183	989	1433	2020	1992	2691	2641	1647	15118
	WDF				338									338
	DAP	660	7982	6382	6834	4985	6281	7639	7367	4200	11076	10096	5730	79233
	JVP	836	93347	186311	103070	19154	47888	149481	144424	78933	49715	17853	6682	897694
	DAH	1496	101329	192693	109904	24139	54168	157121	151792	83133	60791	27949	12412	976927
	FOREIGN	16	5948	8253	1217	3468	35612	78605	89804	74146	26580	20275	8519	352443
	TOTAL	1513	107277	200945	111120	27608	89780	235725	241596	157279	87371	48224	20931	1329370
1985	ADFG	304	913	562	89	878	970	981	7451	11250	12741	4537	2710	43385
	WDF					213							2536	2748
	DAP	304	913	562	89	1091	970	981	7451	11250	12741	4537	5246	46134
	JVP	3442	87310	167279	71417	6760	25442	116955	70671	42594	16341	6687	502	615400
	DAH	3746	88223	167841	71506	7850	26411	117936	78122	53843	29083	11224	5749	661533
	FOREIGN	14816	16106	18733	1503	4260	43657	127979	151709	141155	149109	103009	79835	851870
	TOTAL	18561	104329	186574	73009	12110	70068	245915	229831	194998	178192	114233	85583	1513404
1984	ADFG	93	75	161	53	23	TR	88	6	90	372	1145	2361	4469
	WDF				135	20			818				2908	3881
	DAP	93	75	161	188	44	TR	88	823	90	372	1145	5269	8350
	JVP	8778	70974	126573	44025	1884	32347	74461	44701	18389	14003	5354	2623	444112
	DAH	8872	71049	126734	44214	1928	32347	74550	45524	18479	14375	6499	7892	452462
	FOREIGN	15872	66856	15494	5489	22210	88252	150444	165067	180703	131848	109249	80765	1032249
	TOTAL	24744	137905	142228	49703	24138	120599	224994	210591	199182	146223	115749	88657	1484712
1983	ADFG	65	91	100	182	135	60	TR	27	60	1		6	727
	WDF					168			115			136	64	483
	DAP	65	91	100	182	303	60	TR	142	60	1	136	70	1210
	JVP	5856	43511	77537	17602	13927	33134	45639	32171	11726	241	257	1544	283145
	DAH	5921	43602	77637	17784	14230	33195	45639	32313	11786	242	393	1614	284355
	FOREIGN	15191	49654	36708	37490	37963	119032	157513	159064	146985	115992	68939	28288	972821
	TOTAL	21112	93256	114345	55274	52193	152227	203152	191377	158771	116234	69331	29902	1257176

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NPFMC DOMESTIC PERIOD REPORT: MONTHLY COMM. GROUNDFISH ESTIMATED PRICES PER POUND FOR 1987 FOR ALL GEARS, ALL AREAS

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
ARROWTOOTH FLOUNDER				0.204	0.202	0.486	0.413	0.365	0.345	0.246	0.101	0.100	0.228
UNSPECIFIED TURBOTS		0.134				0.133	0.133		0.133	0.133	0.133	0.133	0.133
___TURBOTS		0.134		0.204	0.202	0.173	0.394	0.365	0.135	0.133	0.130	0.101	0.168
ALASKA PLAICE	0.345	0.328	0.330	0.330					0.049			0.049	0.141
DOVER SOLE	0.063		0.204		0.199	0.063	0.141			0.155	0.154	0.154	0.153
ENGLISH SOLE	0.059	0.060	0.136	0.059	0.059	0.059	0.220			0.250	0.143	0.183	0.112
GREENLAND TURBOT	0.215	0.270	0.281	0.206	0.220	0.275	0.317	0.280	0.214	0.200	0.202	0.202	0.258
PETRALE SOLE						0.262	0.500						0.265
REX SOLE	0.059	0.060	0.060	0.059	0.100	0.059	0.073	0.067	0.059	0.060	0.059	0.067	0.087
ROCK SOLE	0.079	0.061	0.071	0.069	0.065	0.062	0.072	0.095	0.060	0.087	0.082	0.115	0.067
STARRY FLOUNDER	0.291	0.250	0.250	0.245	0.250	0.210	0.250	0.250	0.099	0.250	0.247	0.234	0.238
YELLOWFIN SOLE	0.250	0.173	0.179	0.100	0.100					0.100	0.095	0.086	0.110
OTHER FLATFISH	0.064	0.067	0.097	0.080	0.169	0.061	0.271	0.059	0.060	0.143	0.060	0.114	0.097
UNSP. FLATFISH	0.054	0.090	0.206	0.062	0.060	0.050	0.052	0.050	0.052	0.054	0.107	0.064	0.066
___ALL FLATFISH	0.079	0.065	0.111	0.108	0.149	0.146	0.246	0.216	0.151	0.156	0.145	0.081	0.132
BLACK ROCKFISH	0.293	0.298	0.302	0.495	0.727	0.382	0.488	0.403	0.268	0.230	0.287	0.378	0.445
CANARY ROCKFISH	0.487	0.482	0.465	0.346	0.327	0.369	0.341	0.471	0.214	0.420	0.466	0.385	0.411
DARKBLOTCHED ROCKFIS			0.270	0.135	0.145	0.134	0.271	0.268		0.286	0.293		0.167
DUSKY ROCKFISH	0.094	0.124	0.246	0.246	0.251	0.114	0.264	0.665	1.863	0.502	0.488	0.273	0.344
OTHER DEMERSAL RKFSH	0.632	0.364	0.536	0.350	0.410	0.323	0.456	0.464	0.214	0.503	0.494	0.676	0.480
QUILLBACK ROCKFISH	0.527	0.526	0.548	0.497	0.442	0.449	0.571	0.603	0.540	0.517	0.518	0.931	0.526
REDBANDED ROCKFISH	0.196	0.250	0.204	0.255	0.250	0.203	0.523	0.292	0.310	0.291	0.571	0.294	0.275
REDSTRIPE ROCKFISH					0.280								0.280
ROSETHORN ROCKFISH	0.236	0.377	0.456	0.369	0.264	0.345	0.407	0.474		0.381	0.441	0.457	0.388
ROUGHEYE ROCKFISH	0.304	0.257	0.265	0.412	0.223	0.181	0.125	0.125	0.236	0.195	0.373	0.286	0.320
SHORTRAKER ROCKFISH				0.590		0.539	0.539	0.539	0.281	0.539			0.518
SILVERGREY ROCKFISH			0.096	0.105	0.111			0.477	0.550	0.393	0.420		0.197
YELLOWEYE ROCKFISH	0.522	0.517	0.499	0.472	0.425	0.347	0.500	0.496	0.335	0.352	0.515	0.688	0.463
YELLOWTAIL ROCKFISH							0.250	0.444	0.250				0.251
PACIFIC OCEAN PERCH	0.250	0.250	0.249	0.243	0.179	0.190	0.251	0.245	0.180	0.180	0.183	1.000	0.205
THORNYHEADS	0.802	0.696	0.628	0.662	0.701	0.728	0.762	0.842	0.690	0.220	0.220	0.188	0.674
UNSP. ROCKFISH	0.114	0.225	0.135	0.157	0.149	0.161	0.173	0.269	0.255	0.230	0.302	0.461	0.164
___ALL ROCKFISH	0.375	0.471	0.478	0.355	0.270	0.227	0.301	0.328	0.223	0.195	0.226	0.763	0.287
ATKA MACKEREL								0.133		0.133	0.133		0.133
LINGCOD	0.455	0.444	0.426	0.391	0.386	0.358	0.428	0.421	0.407	0.326	0.437	0.500	0.404
PACIFIC COD	0.159	0.138	0.163	0.223	0.213	0.179	0.142	0.166	0.197	0.218	0.184	0.215	0.178
SABLEFISH	0.513	0.563	0.496	0.615	0.656	0.586	0.600	0.599	0.897	0.635	0.448	0.619	0.653
WALLEYE POLLOCK	0.079	0.081	0.076	0.076	0.072	0.079	0.080	0.079	0.078	0.078	0.080	0.079	0.078
___ALL ROUNDFISH	0.113	0.116	0.147	0.315	0.273	0.160	0.140	0.122	0.201	0.102	0.094	0.096	0.152
SPINY DOGFISH		0.070								0.104	0.085	0.103	0.090
UNSPECIFIED SQUID	0.134					0.133	0.133			0.133			0.134
OTHER GROUNDFISH						0.300				0.598	0.368	1.218	0.683
UNSP. GROUNDFISH	0.295	0.234	0.075	0.066	0.123	0.244	0.392	0.222	0.222	0.222	0.058	0.044	0.168
___MISC. GROUNDFISH	0.293	0.143	0.075	0.066	0.123	0.246	0.264	0.222	0.222	0.219	0.059	0.047	0.165
ALL GROUNDFISH	0.111	0.109	0.157	0.310	0.266	0.166	0.158	0.138	0.200	0.108	0.097	0.095	0.156

DOLLAR VALUES FOR CATCH PROCESSED AT SEA ARE ESTIMATED [illegible] SHORE-BASED EX-VESSEL AVERAGE PRICES
THIS REPORT INCLUDES ONLY DATA FOR NORTH PACIFIC COUNC[illegible]FC AREAS

NPFMC DOMESTIC PERIOD REPORT: MONTHLY COMM. GROUNDFISH LBS PRICED PERCENTAGES FOR 1987 FOR ALL GEARS, ALL AREAS

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
ARROWTOOTH FLOUNDER	-	-	-	9.1	0.0	0.0	93.9	100.0	100.0	27.2	0.0	0.0	39.7
UNSPECIFIED TURBOTS	-	0.0	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
___TURBOTS	-	0.0	-	9.1	0.0	0.0	87.6	100.0	1.1	0.1	0.0	0.0	14.6
ALASKA PLAICE	100.0	100.0	100.0	100.0	-	-	-	-	0.0	-	-	0.0	32.5
DOVER SOLE	0.0	-	100.0	-	0.0	0.0	28.0	-	-	0.0	0.0	77.1	21.9
ENGLISH SOLE	83.2	59.3	40.1	27.6	0.0	0.0	84.3	-	-	100.0	46.5	100.0	54.1
GREENLAND TURBOT	11.9	6.8	0.0	0.8	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
PETRALE SOLE	-	-	-	-	-	0.0	100.0	-	-	-	-	-	1.4
REX SOLE	72.5	75.7	0.0	43.7	0.0	0.0	4.1	0.0	0.0	0.2	0.0	62.0	8.2
ROCK SOLE	0.2	0.3	16.0	1.7	0.0	0.0	0.0	0.0	0.0	9.8	0.0	9.2	1.6
STARRY FLOUNDER	95.5	99.9	100.0	100.0	100.0	73.0	100.0	97.5	0.0	100.0	97.9	91.2	91.1
YELLOWFIN SOLE	12.0	73.9	100.0	100.0	0.0	-	-	-	-	100.0	0.0	52.8	58.5
OTHER FLATFISH	89.2	16.8	34.2	37.9	0.0	0.8	100.0	0.3	0.0	43.8	3.9	64.6	34.7
UNSP. FLATFISH	0.2	0.2	2.6	1.6	0.0	0.0	0.0	0.0	0.0	0.2	1.0	1.3	0.6
___ALL FLATFISH	2.1	1.3	18.0	3.6	4.7	0.1	0.8	0.7	0.0	2.2	12.9	6.4	3.1
BLACK ROCKFISH	96.7	84.8	81.9	89.1	11.5	60.0	98.9	92.8	81.0	52.0	93.6	100.0	65.2
CANARY ROCKFISH	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	57.8	74.7	100.0	96.8
DARKBLOTCHED ROCKFIS	-	-	0.0	100.0	100.0	36.2	11.6	0.0	-	32.1	100.0	-	73.6
DUSKY ROCKFISH	94.6	100.0	100.0	33.0	96.7	54.1	0.0	77.3	100.0	100.0	72.5	100.0	50.1
OTHER DEMERSAL RKFSH	100.0	100.0	100.0	94.1	100.0	100.0	100.0	100.0	100.0	8.1	100.0	100.0	65.1
QUILLBACK ROCKFISH	100.0	100.0	100.0	98.9	96.8	99.9	100.0	100.0	100.0	100.0	100.0	100.0	99.3
REDBANDED ROCKFISH	100.0	100.0	100.0	98.5	99.6	63.0	100.0	100.0	100.0	100.0	100.0	100.0	87.2
REDSTRIPE ROCKFISH	-	-	-	-	0.0	-	-	-	-	-	-	-	0.0
ROSETHORN ROCKFISH	100.0	99.7	100.0	99.6	99.7	100.0	99.7	100.0	-	100.0	99.2	100.0	99.8
ROUGHEYE ROCKFISH	100.0	100.0	99.1	98.4	98.2	46.2	0.0	0.0	100.0	100.0	100.0	100.0	90.5
SHORTRAKER ROCKFISH	-	-	-	100.0	-	0.0	0.0	10.8	100.0	100.0	-	-	25.4
SILVERGREY ROCKFISH	-	-	100.0	97.1	100.0	-	-	90.0	100.0	100.0	99.3	-	98.0
YELLOWEYE ROCKFISH	99.7	98.9	95.6	95.7	95.8	76.2	80.2	74.5	28.2	53.8	96.7	92.5	88.5
YELLOWTAIL ROCKFISH	-	-	-	-	-	-	100.0	100.0	100.0	-	-	-	100.0
PACIFIC OCEAN PERCH	3.5	30.2	0.6	0.5	3.3	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.2
THORNYHEADS	7.3	1.1	0.0	3.4	4.7	1.1	0.8	0.7	15.5	0.3	0.0	100.0	2.4
UNSP. ROCKFISH	11.5	20.7	10.1	7.3	5.2	3.5	1.1	8.6	35.3	44.5	80.9	91.8	6.4
___ALL ROCKFISH	40.4	54.2	24.1	18.9	15.6	5.3	4.5	3.0	5.1	4.5	14.4	81.5	10.8
ATKA MACKEREL	-	-	-	-	-	-	-	0.0	-	0.0	0.0	-	0.0
LINGCOD	100.0	100.0	100.0	98.7	95.4	84.5	99.8	95.7	96.2	51.1	99.7	100.0	91.7
PACIFIC COD	13.5	8.8	17.7	26.1	20.5	2.3	0.3	0.2	0.7	1.6	4.0	39.6	10.9
SABLEFISH	17.3	10.1	0.1	59.5	24.8	11.1	5.4	3.3	83.0	26.0	0.0	0.0	41.6
WALLEYE POLLOCK	18.8	1.6	0.1	1.8	0.3	0.0	0.0	0.0	0.0	0.0	1.7	30.1	4.9
___ALL ROUNDFISH	17.5	4.4	8.5	29.3	11.2	2.0	0.6	0.2	11.1	0.5	2.1	31.3	9.6
SPINY DOGFISH	-	100.0	-	-	-	-	-	-	-	41.6	95.8	99.5	79.7
UNSPECIFIED SQUID	0.0	-	-	-	-	0.0	0.0	-	-	0.0	-	-	0.0
OTHER GROUNDFISH	-	-	-	-	-	100.0	-	-	-	100.0	100.0	100.0	100.0
UNSP. GROUNDFISH	89.7	100.0	78.6	67.5	25.4	89.1	100.0	0.1	0.0	0.2	6.3	52.3	11.6
___MISC. GROUNDFISH	88.7	100.0	78.6	67.5	25.4	89.1	50.4	0.1	0.0	1.7	12.0	53.5	13.8
ALL GROUNDFISH	15.4	4.3	9.4	28.0	11.2	2.2	0.8	0.4	10.4	0.8	2.6	30.3	9.2

THIS REPORT INCLUDES ONLY DATA FOR NORTH PACIFIC COUNCIL INPFC AREAS

WASHINGTON DEPARTMENT OF FISHERIES

PROPOSAL TO REORGANIZE THE TECHNICAL SUBCOMMITTEE

We propose a reorganization of the U.S. section of TSC to better meet the realities of the current management regime and to establish communication on transboundary stocks and fisheries with Canadian management authorities. We believe this could be accomplished by:

1) directly linking TSC to the PFMC and NPFMC and,

2) expanding the TSC terms of reference to address conservation and management of transboundary groundfish stocks.

Over the years the TSC was a productive vehicle for scientific exchange. Many beneficial research programs were coordinated and published; coast wide landing statistics were compiled and reported annually; and workshops on technical methodology such as age reading and hydroacoustic stock assessment were periodically convened. Following the adoption of extended jurisdiction and the exclusion of foreign fishermen from national waters, the effectiveness of the TSC declined. Canadian involvement in the Subcommittee decreased and the level of enthusiasm among all participants has waned. Furthermore, in the United States, regional councils now are responsible for many of the issues previously considered by the TSC.

In recent years, TSC has stimulated only limited commitments with regard to research on transboundary stocks, and we have had no influence on coordinated management of these stocks. For example, we have met and exchanged information and conducted coordinated research efforts on Pacific whiting but there are no current protocols for joint management of this transboundary stock. We have reviewed the status of stocks of Pacific ocean perch, published reports on areas of agreement and disagreement between Canada and the United States, called for working groups to formulate transboundary research and management recommendations; yet there has been no movement toward joint management of transboundary Pacific ocean perch stocks. Unless management (PFMC and NPFMC and their Canadian counter part) is formally represented on the TSC and/or the Parent Committee, TSC will continue to be a paper tiger, with little hope of creating significant movement toward coordinated management of transboundary stocks.

Adoption of our proposal will provide the U.S. Regional Fishery Management Councils with an official vehicle for informal discussions of the management of transboundary groundfish stocks; reduce paperwork by consolidating annual status reports into a PFMC, NPFMC and Canadian status report; and it will stimulate productive discussions among researchers and managers which will result in recommendations for action supported by the respective management agencies.

Although this is a seemingly simple concept, there are a myriad of details which must be resolved. How will the official members of the TSC be nominated? Do we need to expand the Parent Committee? How will the annual status report be changed? If we can agree in principal that the direction of TSC should be changed, details for the restructuring can be worked out.

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MEMORANDUM

DATE: June 3, 1988

TO: Groundfish TSC

FROM: Chuck Woelke (PMFC Coordinator)

SUBJECT: May 24-26, 1988 CARE Meeting

A meeting hosted by the Washington Department of Fisheries was held at the Sand Point, Seattle facilities by the CARE group between 1:00 p.m. May 24th and Noon on May, 26, 1988. There were 17 participants from agencies ranging from Alaska to Southern California. In addition, five "speaker/observers" from WDF and NMFS Sand Point sat in on part of the meetings.

Changes to the Rockfish Ageing Manual "Terms of Reference" and Age Reading Methodology approved by the TSC in 1986 were implemented by the group. Officers selected for the coming year were as follows: Chair: Ms. Shayne MacLellan of the Pacific Biological Station in Nanaimo; Vice-Chair: Ms. Joan Ried of Alaska Department of Fish and Game in Kodiak, AK. The position of recorder was left open to be filled by whoever hosts the next meeting. A revised membership/participation list was prepared and is attached to this memo. This list becomes a part of the manual. A revised "Age Reading Methodology" table has been prepared with the addition of Bank Rockfish and Turbot (Arrowhead Sole) as well as the addition of a column on "Reading Status" to indicate past work, current work or work planned for the immediate future.

Committees were established to review and update the Sablefish and Calibration sections of the manual and a mechanism was put in place to collect and reproduce photographs for inclusion in the manual. These tasks are to be completed by the end of June and the results of the efforts sent to me for incorporation into a revised manual. A number of working changes and additions were also made to the manual and I hope to bring everything together by mid-July in the form of an updated renamed "Groundfish Ageing Manual".

The "Status of Flatfish Ageing" coastwide has also been documented by agency, species, structures used, and method of preparation of materials for ageing.

In the area of validation, Pacific Biological Station (PBS) has completed and published their work on Rock Sole and is preparing a report on Ling Cod. Both are based on tagging.

NMFS (Sand Point and Auke Bay) have work underway on sablefish and are planning work on Pollock (both using oxytetracycline (OTC).

Testing for precision (accuracy of readings) within agencies are as follows:

PBS Tests all readers at least annually using 100 + otoliths read by two readers and usually get 80% agreement in one year depending on species.

NMFS (Tiburon) Does quarterly testing with a double reader system and gets about 70% agreement on sablefish.

NMFS (Sand Point) Double reads 20% of their otoliths. They report in terms of % agreement without variability (% error). They report on 82% agreement on a 20% sample of 3,000 perch otoliths.

The other agencies are doing limited or no precision testing at the present time.

In the area of new methods, Bill Barss of ODFW demonstrated an advance made towards permanent otolith storage. Surrounding the burned otolith with clear coating resin seems to overcome the difficulties encountered with nail polish. If this technique proves successful, exchanges to test for between agency variability (bias) will be greatly simplified.

A lengthy discussion on high-tech methods (image analyzers, electronics, etc.) revealed the following:

PBS has digitizer equipment which works fairly well on sockeye salmon scales but is not useful for production ageing of rockfish.

NMFS (Tiburon) is using an image analyzer for following daily growth of juvenile rockfish.

CDFG. Diego Busatto is working with high-tech approaches to ageing marine-caught sportfish.

WDF looked into image analyzers and concluded it is just as labor intensive as traditional methods with no improvement in results.

General consensus of the group seemed to be one of keeping an eye on developments but they don't expect any effect on production ageing in the foreseeable future.

Recommendations:

To achieve better ageing agreement between laboratories on problem species, CARE suggests that TSC and the agencies consider ways to fund (or budget for) interagency visitations of personnel to resolve differences on a "one on one" basis (some agencies do this at present).

With the above mechanisms in place, CARE suggests meetings every two years (not annually) in March or April.

In the event of emergence of major changes in technology or major new coastwide problems in ageing more frequent meeting could be held.

Attachment: Revise CARE mailing list

Distribution: Memo and Attachment to Guy Thornburgh, TSC and all CARE participants.

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Mat 24-25, 1988

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