

RESEARCH AND DATA NEEDS

Situation: On even numbered years the Council reviews and updates its research and data needs and economic data plan. The Scientific and Statistical Committee takes a lead role in this process, compiling comments from other advisory entities. In June, due to workload, the approval of a draft document for public review was delayed to this meeting. If the Council finds the document to be ready for public review at this meeting, final adoption would be scheduled for November. After final adoption, the next step of the biennial cycle is an early December meeting among the staffs of involved agencies to develop a consensus on high-priority initiatives to address Council needs.

Council Action:

- 1. Approve draft research and data needs for public review.**

Reference Materials:

1. Research and Data Needs 2000-2002 Draft (Exhibit F.1, Attachment 1).
- ✓ 2. West Coast Fisheries Economic Data Plan Draft (Supplemental Exhibit F.1, Attachment 2), *received*
3. Exhibit F.1, Supplemental SSC Report.

PFMC
08/28/00

RESEARCH AND DATA NEEDS

2000-2002

DRAFT

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TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY	ES-1
Criteria	ES-1
Highest Priority Needs	ES-1
Economic and Social	ES-1
Groundfish Management Plan	ES-1
Salmon Fishery Management Plan	ES-2
Coastal Pelagic Fishery Management Plan	ES-3
Marine Reserves	ES-3
INTRODUCTION	1
ALL FISHERY MANAGEMENT PLANS	2
General Data Collection	2
Fishery Information Networks	2
Economic Data Plan	2
Other Fishery Sampling Programs	2
Access to Alaska Fishticket Data	2
Coordination of Economic and Biological Data Collection	2
Fishticket Data	3
Improved Data Capture	3
Assessment of Enforcement Effectiveness	3
Economic and Social Data Collection and Research	3
Data Collection	4
Analysis	4
Modeling	5
GROUND FISH FISHERY MANAGEMENT PLAN	6
Fishery Monitoring and Data Collection	7
Review Data Collection Projects	7
Port Sampling	8
Fishticket Data	8
Logbook Data	8
Discard Data	9
Management Approaches	9
Resource Assessment Surveys	9
Slope Surveys	10
Shelf Surveys	10
Alternative Survey Methodologies	10
Environmental Data Collection	11
Other Collection Tasks	11
Biological Information Including Fishery and Productivity Parameters	11
Age Data	11
Stock Structure	12
Species Group/Complex Specific Needs	12
Deep-water Complex	12
Nearshore Flatfish and Other Groundfish	12
Rockfish	12
Grenadiers	13
Environmental Data Collection	13
Stock Assessment Modeling	13
Localized Depletion	13
Multi-species Management	13

Harvest Policies and Biological Reference Points	13
Performance of Stock Assessment Models	13
Decision Theory and Uncertainty Analysis	14
Lingcod and Rockfish	14
Pacific Whiting	14
Socioeconomic and Management Factors Affecting Assessment Data	14
Habitat	14
SALMON FISHERY MANAGEMENT PLAN	15
Stock Assessment	16
Planning Tools	16
Improvements in Management Planning Models	17
Alternative Management Strategies	18
Stock Identification	18
Life History Studies	19
Freshwater Habitat	19
Estuarine and Ocean Survival	20
Hatchery/Wild Interactions	20
COASTAL PELAGIC FISHERY MANAGEMENT PLAN	21
Sardines	21
Pacific Mackerel	23
Market Squid	23
Live Bait Fishery	24
PACIFIC HALIBUT ALLOCATION	25
Bycatch	25
Distribution and Abundance	25
MARINE RESERVES	26
Increase Monitoring of Existing Areas with Restricted Fishing	26
Modeling of Marine Reserve Impacts	26
Design of Marine Reserve	27
Species Movement	27
Life Phase of Density Dependent Effects	27
Catch and Bycatch Location	27
Stock Assessment Models (With Reserves in Place)	27
Social and Economic Data Needs	27
Location of Current Harvest	28
Current CPUEs For Different Harvest Areas	28
Harvester Costs and Differentials Between Harvest Areas	28
Recreational Harvester and Site Specific Demand	29
Processors	29
Offsite Nonconsumptive Values	29
Family Dependence	29
APPENDIX A	
Species Specific Groundfish Research and Data Needs	A-1

EXECUTIVE SUMMARY

Council research and data needs are updated on a biennial cycle. This document presents a compilation of high priority data needs for the Pacific Fishery Management Council (Council) for the 2000 through 2002 cycle. As these data needs are identified for 2000 through 2002, the Council is completing work on a long-run strategic planning effort. Upon completion of the long-run strategic plan, it may be appropriate that this document be reviewed midcycle to ensure that it is consistent with and acts in concert with the strategic plan. Data needs are categorized by fishery management plan plus economic needs and needs related to marine reserves. The three to five highest priority items for each category are identified with the aid of a set of ranked criteria developed by the Scientific and Statistical Committee (SSC). Items in the section on "General Data Collection" are not included in the summarized priorities. In this summary the criteria are presented, followed by the highest priority needs in each category.

CRITERIA

1. Projects address long term fundamental problems of West Coast fisheries.
2. Projects improve the quality of information, models, and analytical tools used for biological assessment and management.
3. Projects increase the long run market competitiveness and economic profitability of the industry.
4. Projects contribute to the understanding by decision makers of social and economic implications in meeting biological and conservation objectives.
5. Projects provide data and/or information to meet the requirements of the Magnuson-Stevens Act, the Regulatory Flexibility Act, and other applicable laws.

HIGHEST PRIORITY NEEDS

Economic and Social

- Comparative analysis of limited access and rights-based management programs in the context of West Coast fisheries.
- Baseline description of the fishing industry and communities (combined with) periodic assessment of "status of the fisheries."
- Economic and social analysis of groundfish and salmon harvest and management strategies.
- Recreational fishery net economic value and angler participation models.
- ~~Economic analysis to improve the effectiveness of fishery science~~
- Economic analysis to evaluate the benefits of alternative fishery research and data collection efforts and the tradeoffs between alternative fishery policies and the need for research and data generated by those policies.

Groundfish Management Plan

- ~~A collaborative mechanism to identify and prioritize stock assessment information needs and assign responsibilities to initiate the collection of coordinated biological, economic, and fishery data by state and federal agencies and industry.~~

- ~~— • **A coastwide multi-state system for electronic recording of fishticket information and fishery logbooks in consistent form** (develop and implement).~~
- ~~— • **Methods, programs, or analytical tools to quantify amount of groundfish discarded by the various fishing sectors**, particularly the trawl fleet, to estimate total harvest removals for control of total harvest and stock assessments (develop). Include an evaluation of a mandatory observer program and full retention program for all sectors of the fishing industry. Evaluate alternative methods of estimating discard rates against accurate observations made by observers. And, design tools to minimize discards.~~
- ~~— • **A cooperative agency/fishing industry plan to conduct annual resource surveys** to meet shortcomings identified by the 1995 review of West Coast stock assessments (develop and implement). This includes establishing infrastructure, survey staff, and analytical teams required to produce timely results from the surveys, so that they are incorporated into stock assessments as early as possible. Surveys should cover the full range of the fish distributions to the extent practical and should be coordinated with Canada.~~
- ~~— • **Investigate impact of fishing gear on specific habitats and habitat productivity on the West Coast fishing grounds.** From existing and new sources, assemble information on fishing activities for each gear type to prioritize gear research by gear, species, and habitat type. Information on the extent of fishing impacts on the productivity of fishing ground bottom habitat is important to goals of ecosystem management.~~

[UPDATED HIGH PRIORITY LIST NOT YET AVAILABLE FOR GROUND FISH]

Salmon Fishery Management Plan

- ~~— • **A more accurate assessment of total fishing related mortality of natural stocks of coho and chinook.** Fishery management regimes designed to reduce impacts through nonretention or selective fishing depend for success on unbiased estimates of noncatch mortality.~~
- ~~— • **Advances in genetic stock identification, otolith marking, and other techniques may make it feasible to use a variety of stock identification technologies to assess fishery impacts and migration patterns.** The increasing necessity for weak-stock management puts a premium on the ability to identify naturally reproducing stocks and stocks that contribute to fisheries at low rates. The code-wire tag (CWT) marking system is not suitable for these needs. The Council should encourage efforts to apply these techniques to management.~~
- ~~— • **Encourage development of probabilistic habitat-based models that incorporate environmental variation to establish harvest policies and enable risk assessment for fishing strategies.** Overfishing definitions must relate to a measure of maximum sustainable yield (MSY). MSY for salmon is related to productivity, which varies annually in freshwater and the marine environment. Techniques for evaluating productivity, or survival, in freshwater and marine habitats are needed to set appropriate harvest targets and associated conservation guidelines such as escapement floors and overfishing definitions.~~
- **A more accurate assessment of total fishing related mortality of natural stocks of coho and chinook.** Fishery management regimes designed to reduce impacts through nonretention or selective fishing depend for success on unbiased estimates of noncatch mortality.
- **Advances in genetic stock identification, otolith marking, and other techniques may make it feasible to use a variety of stock identification technologies to assess fishery impacts and migration patterns.** The increasing necessity for weak-stock management puts a premium on the ability to identify naturally reproducing stocks and stocks that contribute to fisheries at low rates. The CWT marking system is not suitable for these needs. The Council should encourage efforts to apply these techniques to management.

- **Encourage development of probabilistic habitat-based models that incorporate environmental variation to establish harvest policies and enable risk assessment for fishing strategies.** Overfishing definitions are required to relate to a measure of MSY. MSY for salmon is related to productivity, which varies annually in freshwater and the marine environment. Techniques for evaluating productivity, or survival, in freshwater and marine habitats are needed to set appropriate harvest targets and associated conservation guidelines such as escapement floors and overfishing definitions.

Coastal Pelagic Fishery Management Plan

- ~~• **Coastwide abundance information on Pacific sardine and Pacific (chub) mackerel.** Research approaches could include: egg pump, LIDAR, spawning biomass and spawning area surveys, and northward extension of the CalGOFI sampling pattern (collect):~~
- ~~• **Fishery dependent and fishery independent data for coastal pelagic species (CPS) off Baja California in collaboration with Mexican scientists (collect):**~~
- ~~• **Sardine coast wide as forage for salmon and groundfish stocks (study importance):**~~
- ~~• **Information on the market squid biology, distribution, abundance and fishery economics (collect):**~~
 - Gain more information about the status of the CPS resource in the north using egg pumps used during NMFS surveys, sonar surveys, spotter planes.
 - Develop a coastwide (Mexico to British Columbia) synoptic survey of sardine biomass, i.e., coordinate a coastwide sampling effort (during a specified time period) to reduce “double-counting” caused by migration.
 - Evaluate the role of CPS resources in the ecosystem, the influence of climatic/oceanographic conditions on CPS; predatory/prey relationships. Increase the use of fishery information to estimate seasonal reproductive output of stock (e.g., fat/oil content).

Marine Reserves

- **Information on the location of current harvest** relative to a proposed marine reserve area is needed in order to begin to evaluate the degree of impact and effectiveness of the creation of marine reserves. Most harvest information currently collected is not on a fine enough geographic scale to use for evaluation of marine reserves.
- **Information on advection of eggs and larva and pre-settlement juveniles.** Particularly emphasis on differences between areas upstream and downstream of major geographical features. This will primarily be a physical oceanographic exercise.
- **Information on the movement of juveniles and adults.** This will primarily be a literature search followed by a biological field program. Little is known about the movement of post settlement juveniles.
- **Knowledge of when in the life cycle density dependent effects occur** is important in the assessment of the effects of marine reserves (as it is in assessing conventional catch management).
- **Increased biological monitoring of existing marine reserves** and other areas of restricted fishing in order to gain information on current reserves that might be extrapolated to evaluate the creation of additional reserves on the West Coast.

INTRODUCTION

Council research and data needs are updated on a biennial cycle. This document presents a compilation of high priority data needs for the Pacific Fishery Management Council (Council) for the 2000 through 2002 cycle. As these data needs are identified for 2000 through 2002, the Council is completing work on a long-run strategic planning effort. Upon completion of the long-run strategic plan, it may be appropriate that this document be reviewed midcycle to ensure that it is consistent with and acts in concert with the strategic plan.

The recent re-authorization of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) added directives to 1) prevent overfishing, 2) rebuild depressed fish stocks to levels of abundance that produce MSY, 3) develop standardized reporting methodologies to assess the amount and type of bycatch, 4) adopt measures that minimize bycatch and bycatch mortality, to the extent practicable, 5) describe and identify essential fish habitat (EFH), and 6) assess the impact of human activities, including fishing impacts, on habitat. The Magnuson-Stevens Act encourages the participation of the fishing industry in fishery research. Additionally, Standard 8 mandates consideration of effects of fishery management measures on communities. These new directives require substantial expansion of the data collection and research efforts required to support Council management of West Coast fisheries.

This document is a compilation of research and data needed by the Council to implement its responsibilities as defined by the Magnuson-Stevenson Act, the Regulatory Flexibility Act, and other pertinent legislation. ~~The SSC has taken input from a wide variety of sources, including the Council and its advisory committees, state and federal agencies, Stock Assessment Review (STAR) panels, the Working Together for West Coast Groundfish Conference held in 1998, and the public for this document.~~ In addition to an annotated list of "high priority needs", the SSC has chosen three to five "highest priority needs" in five categories 1) Economic, socioeconomic, and social; 2) Groundfish FMP; 3) Salmon FMP; and 4) CPS FMP; and 5) Marine Reserves. These highest priority needs are highlighted in the introduction to each section. Following is the ~~We also established a set of criteria used to aid us in~~ identifying the highest priority needs.

The following ranked criteria were used to guide the selection and prioritization of research and data projects:

- 1. Projects address long term fundamental problems of West Coast fisheries.**
- 2. Projects improve the quality of information, models, and analytical tools used for biological assessment and management.**
- 3. Projects increase the long run market competitiveness and economic profitability of the industry.**
- 4. Projects contribute to the understanding by decision makers of social and economic implications in meeting biological and conservation objectives.**
- 5. Projects provide data and/or information to meet the requirements of the Magnuson-Stevens Act, the Regulatory Flexibility Act, and other applicable laws.**

All research and data projects listed in this document are considered either "high priority" needs or "highest priority needs" according to their ability to meet the criteria listed above.

ALL FISHERY MANAGEMENT PLANS

GENERAL DATA COLLECTION

Fishery Information Networks

Funding of the Pacific Coast Fisheries Network (PacFIN) and Recreational Fishery Information Network (RecFIN) databases will continue to be high priority for the Council. While the PacFIN database was designed to support the groundfish FMP through the provision of data on the commercial fishery, the Council also relies on the database in fulfilling other management responsibilities. As assessments are developed and management concerns arise regarding stocks targeted by sport fisheries, information provided by RecFIN will become more important in supporting the Council's conservation and allocation decisions. There is a need to increase sampling levels in the RecFIN project in order to develop estimates that are more reliable at a finer geographic scale. A finer geographic scale, however, is necessary, but not sufficient; some modifications of current RecFIN sampling procedures will also be needed. PacFIN and RecFIN projects are also important sources of data for economic and social analyses. Failure to maintain these databases could significantly disrupt Council management.

Economic Data Plan

The Council has adopted a plan that specifies how a Council plan to coordinate the collection and dissemination of economic data related to West Coast fisheries might be coordinated. Developing a coordinated effort for the collection of economic data for West Coast fisheries is a high priority. This plan is scheduled to be adopted at the same time that these research and data needs are finalized. The data needs covered by this plan include commercial enterprise operations and capital costs (harvesters, processors, and charter vessels), value and expenditure information on recreational fishers, and economic/socioeconomic information on fishing communities. Once adopted, Additional efforts need to be undertaken to implement the coordination aspects elements of the plan. In particular, funding needs to be maintained for the Pacific States Marine Fisheries Commission (PSMFC) project to collect and manage economic data for the commercial fisheries and for the RecFIN socioeconomic add-on survey.

Other Fishery Sampling Programs

The Sport Fish Restoration Act, Anadromous Fish Act, and Interjurisdictional Fisheries Act all provide funds which support the vast majority of groundfish, salmon, and pelagic fish sampling programs conducted by the member states. Decreases in the funds provided through these legislative initiatives and the Pacific Salmon Treaty threaten the collection of vital information used in Council management. Some of the data collected in these sampling programs are central to the FIN databases discussed above (e.g., catch composition breakdowns for data that are aggregated on fishtickets).

Access to Alaska Fishticket Data

Alaska fishticket data are available to analysts for work on North Pacific Fishery Management Council issues, but may not be used by those same analysts to work on Pacific Fishery Management Council issues. Access to these data for work in support of the Pacific Fishery Management Council is necessary to fully understand the activities of vessels which participate in West Coast and Alaska fisheries and to assess the response to and impacts of West Coast regulations.

Coordination of Economic and Biological Data Collection

Any plans for new efforts to collect biological or economic fishery-dependent data or plans for modification of existing programs should be coordinated with the economic data collection program being coordinated through PSMFC with the cooperation of National Marine Fisheries Service (NMFS). Efforts to collect fishery-dependent data can benefit from the economic perspective provided by the program and, where warranted and appropriate, serve as vehicles to assist in the collection of additional economic data.

Fishticket Data

Economic data on fishtickets are inadequate. Needed improvements include better recording of codes for condition, species, price, disposition, and gear type. A "days fished" field is provided and used by some states for salmon fishtickets. Such a field should be added to fishtickets for use in other fisheries or possibly a field for start date for the trip.

Improved Data Capture

Evaluate feasibility of alternative technologies for rapid and accurate capture of logbook and other real-time fishery data. Approaches might include optical scanning (such as is currently being used in California) and data entry at the processor and vessel level.

ASSESSMENT OF ENFORCEMENT EFFECTIVENESS

Assess the effectiveness of enforcement to evaluate which management measures are working. Identify areas where the management system may be resulting in the under reporting of landings.

ECONOMIC AND SOCIAL DATA COLLECTION AND RESEARCH

Marine and anadromous fisheries are managed under a complex set of goals and objectives related to preserving the resource and meeting the needs of the fishing industry, consumers, and fishing communities. The common property nature of the resource combined with public goals and objectives results in regulations that are greater in number and more intrusive than for many other industries. A consequence of the intense regulatory environment is a greater need for economic analysis and information, compared to less regulated industries. The Magnuson-Stevens Act, Regulatory Flexibility Act, National Environmental Policy Act, and executive orders (EO), such as EO 12886 on Federal Regulations, all require consideration of economic impacts of government regulations. The demand for economic analysis and information becomes even more acute when allocation issues are involved. The widening gap between fishing capacity and allowable harvest has resulted in an increasing number of management actions with direct and indirect allocation implications. Failure to adequately consider economic effects of regulations can result in lawsuits challenging the regulations.

Based on the criteria listed in the introduction of this document, **the following economic projects were selected as highest priority needs:**

- **Comparative analysis of limited access and rights-based management programs in the context of West Coast fisheries.**
- **Baseline description of the fishing industry and communities (combined with) periodic assessment of "status of the fisheries."**
- **Economic and social analysis of groundfish and salmon harvest and management strategies.**
- **Recreational fishery net economic value and angler participation models.**
- ~~**Economic analysis to improve the effectiveness of fishery science**~~
- **Economic analysis to evaluate the benefits of alternative fishery research and data collection efforts and the tradeoffs between alternative fishery policies and the need for research and data generated by those policies.**

These highest priority needs and other high priority needs are described below in more detail.

Data Collection

Social Data. An effort is needed to identify types of social analysis that may assist in fishery management decisions and to identify any data collection programs that should be initiated to support such analyses over the long term, particularly regarding impacts on coastal communities. Based on the new provisions of the Magnuson-Stevens Act and NMFS guidelines, determine what information is needed for decision making, then determine data and research needed to produce that information.

Baseline Description of the Fishing Industry and Communities. Develop a baseline description of the fishing industry and communities which are affected by Council-managed fisheries, including vessel characteristics, fishing strategies, catch mixes, and vessel mobility for both commercial vessels and recreational charter vessels. Based on the new provisions of the Magnuson-Stevens Act and NMFS guidelines, determine what information is needed for decision making, then determine data and research needed to produce that information. This information would be useful in developing assessments of possible responses to closures or other regulatory constraints and for maintaining the Fishery Economic Assessment Model used for development of income impact assessments. For the commercial fishery significant progress is being made in this area through work ongoing under the PSMFC cost-earnings project. A project has been ~~needs to be initiated for charter vessels and needs to be completed.~~ Information is needed on the full range of commercial activities that might be undertaken by recreational charter vessels along different areas of the coast.

Socioeconomic Baseline Profiles of the Fishing Industry and Fishing Communities. Socioeconomic baseline studies need to be developed for the fishing industry including various gear groups (e.g., trawl, pot, hook and line), allocative sectors, (commercial and recreational) and fishing communities. Based on the new provisions of the Magnuson-Stevens Act, Regulatory Flexibility Act, and NMFS guidelines, determine what socioeconomic information is needed for decision making by the Council, then determine data and research needed to produce that information.

Analysis

Comparative Analysis of Limited Access And Rights-Based Management Programs in the Context of West Coast Fisheries. Comparative analyses of existing limited access programs (including but not limited to license limitation, community development quotas, and individual quota programs) are needed to 1) understand their effects on management objectives including conservation, income distribution, efficiency, safety, enforcement costs, and management costs; 2) address long run allocation problems including allocation between gear types and the recreational and commercial sectors; and, 3) increasing direct involvement of industry in research and management.

Periodic Assessment of "Status of the Fisheries." An annual or semi-annual analysis of "status" of Council-managed fisheries is needed to determine whether fisheries are meeting stated management objectives. Analysis would include economic, social, and conservation objectives. Economic analysis would include quantitative measures including profitability, jobs, and income.

Economic and Social Analysis of Groundfish and Salmon Management Strategies. Conduct economic and social analysis of alternative groundfish and salmon management strategies. For salmon this analysis should include 1) the potential economic and social implications of watershed-based management approaches; 2) the costs and benefits of alternative hatchery practices; 3) the costs and benefits of alternative harvest strategies; and 4) cost-effective analysis to meet objectives stemming from achieving biological objectives (e.g., Endangered Species Act) and treaty rights obligations. For groundfish, this analysis should include the costs and benefits of alternative harvest and management strategies, including capacity reduction.

Economic Analysis of Marine Reserves. Marine Reserves are being proposed as tools for fisheries management and science. There are many alternative designs which could be appropriate depending on management/science objectives and biological/ecological characteristics of the resource. Economic-policy analysis is needed for developing efficient and/or cost effective designs which reveal tradeoffs associated with 1) design elements, 2) ecological characteristics, and 3) management objectives.

Economic Analysis of Alternative Programs to Document, Analyze, and Reduce (Regulatory) Discards.

There are many programs being proposed to document harvests and/or reduce discards. The potential costs of some programs may exceed benefits. Economic analysis is needed to evaluate alternative programs and potential for realizing program objectives.

Economic Analysis of Management Approaches Which Increase Fishery Stability and Reduce Harvest Variability.

Stability in management and harvests can provide economic benefits to industry and communities. However, it may also generate costs associated with decreases in average harvests. Economic analysis is needed to evaluate the potential benefits and costs of alternative management strategies to reduce harvest variability.

Economic Analysis to Improve the Effectiveness of Fishery Science.

The new mandates of Sustainable Fisheries Act (SFA) and the existing paucity of data relevant to fisheries increase the need for additional research. Scientific budgets, however, remain limited. Economic analysis is needed to assist in prioritizing research needs and evaluating alternative science approaches including collaboration with industry, nongovernment organizations (NGOs), state agencies, and universities. Such analysis would be critical for designing and implementing a comprehensive and coordinated research and data plan.

Modeling

Documentation of the Fishery Economic Assessment Model.

The Fishery Economic Assessment Model generates income impact estimates used by the Council. ~~The model coefficients were recently updated and should be reviewed to determine adequacy, completeness, and documentation.~~ There is a continuing need to collect and document expenditure information for the commercial and recreational fisheries. New commercial data should be forthcoming from the PSMFC economic data collection project.

Development of Industry Response Models.

Participation models need to be developed to project industry responses to alternative management regulations. Some elements necessary for development of these models are identified above as separate needs. These elements are fishing cost and revenue information and baseline descriptions of the fishing industry. The participation models need to be considered when cost and revenue information collection plans and baseline descriptions are developed in order to ensure the data collected and baselines are useful for the participation model. Participation models are also needed to predict the effect of management measures on angler effort and harvest in the groundfish fishery and ocean and inriver components of the salmon fishery.

Recreational Fishery Net Economic Value and Angler Participation Models.

A review of currently available estimates of net economic value (NEV) is needed for the salmon, groundfish, and halibut recreational fisheries. The need for information on groundfish fisheries may become particularly acute if the Council pursues development of allocations for the recreational fisheries in conjunction with the development of a groundfish trawl buyback program. Information is needed on the relationship of angler trip NEV to mode of fishing (private vessel, charter vessel, and bank fishing), success rates, retention opportunities and limits, and species caught. Studies of both ocean and inriver components of the salmon fishery, the rockfish, and the lingcod fisheries are of most immediate importance. Information on substitution rates between recreational activities is also needed as well as information on the net economic value generated by recreational fishing on charter vessels for each target species.

GROUND FISH FISHERY MANAGEMENT PLAN

Recent increases in federal funding and scientific personnel, specifically for groundfish, have improved the outlook for enhancing monitoring, resource surveys, and research activities directed at stock assessments. Improvements and expansion of groundfish surveys are underway and will include increased participation of the fishing industry. ~~New~~ Magnuson-Stevens Act directives require expansion of the West Coast stock assessment research effort to improve scientific information for groundfish management, specifically, additional effort is necessary to better quantify species abundance, to evaluate overfishing levels and rebuilding plans, to address bycatch, and to reduce the magnitude of bycatch in groundfish fisheries. The challenge will be to expand survey effort using new designs and the existing fleet of West Coast fishing vessels to meet the high priority needs and generate information that can quickly be incorporated into the stock assessment process.

Groundfish research and data needs are broad, and efforts to address these needs may compete or overlap. In order to assure that the resources available for meeting these needs are utilized in an efficient and effective manner, **a plan is needed for the development of research and data collection projects.** This plan should include specific projects as well as mechanisms for coordination and development of an ongoing interagency program for addressing West Coast groundfish research and data needs.

The top five highest priority groundfish management plan research and data needs are:

- **Establish a collaborative mechanism to identify and prioritize stock assessment information needs** and assign responsibilities to initiate the collection of coordinated biological, economic, and fishery data by state and federal agencies and industry.
- **Develop and implement a coastwide multi-state system for electronic recording of fishticket information and fishery logbooks in consistent form.**
- **Development of methods, programs, or analytical tools to quantify amount of groundfish discarded by the various fishing sectors**, particularly the trawl fleet, to estimate total harvest removals for control of total harvest and stock assessments. Include an evaluation of a mandatory observer program and full retention program for all sectors of the fishing industry. Evaluate alternative methods of estimating discard rates against accurate observations made by observers. And, design tools to minimize discards.
- **Develop and implement/Continue to work on a cooperative agency/fishing industry plan to conduct annual resource surveys** to meet shortcomings identified by the 1995 review of West Coast stock assessments. This includes establishing infrastructure, a role for cooperative opportunities with industry, survey staff, and analytical teams required to produce timely results from the surveys, so that they are incorporated into stock assessments as early as possible. Surveys should cover the full range of the fish distributions to the extent practical and should be coordinated with Canada.
- **Investigate impact of fishing gear on specific habitats and habitat productivity on the West Coast fishing grounds.** From existing and new sources, assemble information on fishing activities for each gear type to prioritize gear research by gear, species, and habitat type. Information on the extent of fishing impacts on the productivity of fishing ground bottom habitat is important to goals of ecosystem management.

Species specific groundfish research and data are provided in Appendix A. The Council's high priority and immediate groundfish research and data needs have been divided into five categories:

Fishery Monitoring and Data Collection. One of the most important Council needs is accurate assessment of total removals to estimate fishing mortality and accurate tally of fishery landings in-season. The benefits of fishing regulations cannot be evaluated unless there is good information on the effects of the regulation on

harvest. In-season monitoring of catch rates is necessary to ensure that harvests do not substantially deviate from target levels. Currently, the greatest concerns are accurate estimates of amounts of fish discarded in multi-species fisheries and unreported or under reported landings.

Resource Assessment Surveys. For the Council to set appropriate target harvest levels, accurate estimates of current biomass and size of incoming year classes for the groundfish resources are needed. Groundfish survey strategy is primarily based on a triennial schedule that includes a bottom trawl survey of the shelf resources and an acoustic/midwater trawl survey for Pacific whiting and an annual bottom trawl survey of slope resources. The bottom trawl survey design is inadequate for estimating many of the nearshore flatfish, does not extend beyond the shelf, and has too few stations to estimate shelf rockfish with the desired level of precision. Annual CalCOFI surveys off California, which have been used for coastal pelagic stocks, may have application to some groundfish stocks such as nearshore flatfish. An annual trawl survey of the slope groundfish resources using chartered commercial vessels is being conducted that is synoptic of the entire coast. Data from this survey will become more useful as the time series becomes longer ~~has not had sufficient number of days to adequately cover the entire coast line~~. With the expanding emphasis to improve the stock assessments for the groundfish, new opportunities and sampling technologies are becoming available to expand the survey frequency and areas and species not normally sampled by trawling.

Biological Information Including Fishery and Productivity Parameters. Assessment models of the productivity of the various groundfish stocks depends not only on good estimates of fishery catch by age and current estimates of biomass and recruitment, but also reliable parameter estimates of growth in length and weight, fecundity and sexual maturity, natural mortality, and differential location/movement by size, age, and sex. The data from which these parameters can be derived come from sampling of fish in commercial and recreational catches and survey catches. With possible expansion in survey activities and increased fishery sampling, there will be new opportunities to collect basic biological data to improve fishery and biological parameters needed for improving stock assessment modeling.

Stock Assessment Modeling. Development of reliable stock assessment models of the dynamics of the important fish stocks is critical to evaluating optimum yield and MSY control rules for species or species groups for managing annual fisheries. These model results are usually presented as updated stock assessment reports.

Habitat. The reauthorized Magnuson-Stevens Act established new priorities for the consideration of impacts on habitat. Additionally, the Council is moving forward on the development of marine reserves. More information is needed to understand the impacts of different fishing gears on habitat and the importance of different habitats and/or refugia for maintaining the fishery.

FISHERY MONITORING AND DATA COLLECTION

It is critical that the agencies maintain and expand a coastwide comprehensive fishery monitoring program. Ongoing monitoring of the fishery and collection of information is essential for effective management of the groundfish fishery, including sampling to determine species, size, and age composition of landings stratified by area and depth; effort levels by fishery, area, and/or gear type; landed value; etc. This information would improve both stock assessments and control of total harvest, and economic evaluation.

Review Data Collection Projects

~~Catalog existing fishery monitoring and data collection projects conducted by the agencies which are designed to meet Council management needs.~~

~~Expand the scope of the stock assessment and review processes to include~~ Conduct a review of the main modeling methodologies, major all fishery data sources used for stock assessments (i.e., port samples, gear, and vessel information, age structures, etc.) ~~collected by states and NMFS~~ and plans for future data collection. Set priorities for the most effective use of available personnel, equipment, and funds.

Establish a collaborative mechanism to identify and prioritize stock assessment information needs and assign responsibilities to initiate the collection of biological, economic, and fishery data by state and federal agencies and industry in a timely fashion.

Port Sampling

Monitor the effectiveness of port sampling efforts coastwide to ensure there are no major gaps in data, such that no major components of the landings and/or species go unsampled including the rapidly growing live-fish fishery, particularly in California. Maturity, average weight and age data need to be collected using a more systematic approach. ~~The 1999 canary rockfish assessment and the 1998 sablefish assessment suffered from the need for fishery sample data that were more representative, temporally, spatially, and across gear types. Maturity and length relationships are needed for Petrale sole in the late summer and autumn. Lingcod length and age data are needed for the non-trawl fishery and private recreational vessels.~~

~~Evaluate the results of data collected to determine whether plant workers can, in a cost effective manner, collect representative samples to augment the port sampling program. Establish a port sampling program in cooperation with the fishing fleet and seafood processors to expand biological sampling. This should. Such in plant sample collection may particularly benefit species like Dover sole.~~

~~Continue the development of standardized biological databases across the state agencies and move the port sampling/biological data to a centralized database. Observer program data should also be incorporated.~~

Expand monitoring for species, age and length composition by specific depth and area strata for important nearshore recreational fisheries and the growing hook-and-line fisheries (e.g. blackgill rockfish). In California, categorization of species for species composition sampling is inadequate for management purposes, and levels of sampling are sparse in some ports. Oregon has attempted to extend rockfish species composition sampling to miscellaneous gears, yet coverage remains low, and few biological samples are obtained. In Washington, longline, shrimp trawl, and miscellaneous gears are not sampled.

~~Re-instate sampling of flatfish age structures by the port sampling program. English sole and Petrale sole stock assessments could not be extended into California, because biological sampling of nearshore flatfish in California had not occurred. [moved]~~

~~Inventory and catalogue CDFG port samples from the 1980s. These data would be useful for blackgill and other species of rockfish. (Moved to species appendix)~~

Fishticket Data

Develop and implement a coastwide multi-state system for electronic recording of fishticket information as part of a fully integrated fishery statistics program, including logbooks, observer program and biological sampling.

Pursue coastwide standardized species and market categories on fishtickets and ensure states apply standard product recovery rates for dressed fish landings.

Improve the quality and coverage of all types of fisheries landing data particularly for southern rockfish and the two species of thornyhead rockfish.

~~Evaluate Accuracy of current landings data needs to be evaluated and systematically eliminate any significant sources of under-reporting be systematically eliminated. Receipt of premium fish by wholesale buyers in California is very different from the traditional landing of fresh fish. Most is purchased by dealers operating from trucks or vans equipped with live wells. Off-loading sites can be quite variable. This leads to a strong suspicion of under-reporting of landings.~~

Logbook Data

~~Continue development and implementation of a coastwide multi-state system for electronic recording of fishery logbooks.~~

~~Conduct on an on-going basis the nearly implemented port interview program to improve the quality of logbooks and interpretation of the information. Include questions about the characteristics of POP fishing.~~

Develop a logbook system for nontrawl sectors of the fleet including recreational charter vessels for target species such as sablefish, lingcod, rockfish, and specifically for blackgill rockfish to generate an information base on spatial distribution of fishing effort and levels of catch per unit of effort (CPUE).

Continue evaluation of the use of trawl logbook data to measure relative abundance of groundfish. At the same time, conduct an evaluation of the current logbook data collection system including types of information related to fishing power (e.g., mesh size, head rope, and foot rope parameters, etc.). Continue to pursue programs such as the port interview program to gain additional insight on interpretation of the logbook data.

~~Update for lingcod the effective effort and CPUE time series from 1994 to present for the trawl fishery.~~

~~Re-examine standardization of Pacific Ocean perch CPUE data from the domestic fishery logbook data to confirm abundance index time series for 1956 through 1973.~~

~~Expand the reporting of logbook catches of rockfish by species, (e.g., chilipepper) rather than as unspecified rockfish. Establish equivalency between market categories and taxonomic groupings on which logbook data are organized. Refine and increase the number of species categories in logbooks to make reporting equivalent to species categories used in port samples and to facilitate integration of fish ticket, logbook, biological sample and economic data.~~

Discard Data

Develop methods, programs, or analytical tools to quantify amount of groundfish discarded by the various fishing sectors, particularly the trawl fleet, to estimate total harvest removals for control of total harvest and stock assessments. Include an evaluation of a mandatory observer program and full retention program for all sectors of the fishing industry. Evaluate alternative methods of estimating discard rates against accurate observations made by observers.

~~Collect size frequency information for at-sea discards would be useful for some species (e.g. Petrale sole).~~

~~Continue Examination of observer data from Oregon Trawl Commission/agency program for potential insight on the appropriateness of the assumed discard rates 16% discard rate for Pacific Ocean perch and other species.~~

~~Continue Conduct laboratory and field research for sablefish, lingcod, halibut, and other critical species to document acute and chronic mortality of discarded and bycatch species by the various gear types, and develop improved field criteria for predicting the mortality of at-sea discards.~~

Management Approaches

Evaluate the extent to which proposed management measures minimize bycatch to the extent practicable, as per the national standards guidelines Section 600.350 (d)(3)). Regulations which induce discards should be evaluated to determine their effects on yield. Oregon Trawl Commission/Oregon Department of Fish and Wildlife observer data and PacFIN price and size data may be available for such an analysis.

~~Evaluate the effectiveness of revised recreational bag limits (black rockfish) and minimum size limits (lingcod) to accomplish their original intended purpose (should be undertaken prior to the next stock assessment).~~

~~Evaluate the current use of cumulative limits to achieve a year-round fishery and possibilities for developing alternative management approaches given the limitations on management resources, data, modeling and enforcement. Provide scientific information to guide the development of alternative approaches such as individual quotas.~~

RESOURCE ASSESSMENT SURVEYS

Develop and implement a cooperative agency/fishing industry plan to conduct annual resource surveys to meet shortcomings identified by the 1995 review of West Coast stock assessments. This includes establishing infrastructure, survey staff, and analytical teams required to produce timely results from the

surveys, so that they are incorporated into stock assessments as early as possible. Surveys should cover the full range of the fish distributions to the extent practical and should be coordinated with Canada. Surveys should be conducted in a manner that allows better definition of temporal patterns in spatial distribution.

Slope Surveys

Surveys for slope groundfish that should be considered in developing a strategy are:

- Continue expanded *Miller Freeman* slope trawl survey to provide synoptic coverage and to calibrate and complement the survey being conducted using chartered commercial vessels.
- Expand the area of the Continue the expanded annual synoptic slope trawl survey for sablefish, Dover sole, and thornyheads to include synoptic coverage of the coast each year. Continue the cooperative survey started in 1998 using commercial trawl vessels and standard gear. This survey should continue to collect biological information by depth as well as harvest rate information. (Slope trawl surveys should be coordinated with annual shelf trawl surveys).
- Establish ongoing pot or longline surveys for sablefish ranging from ten fathoms to 1000 fathoms. Such a survey could also target thornyheads and grenadiers. Conduct survey using industry vessel in conjunction with the research vessel *Miller Freeman* slope survey and the new cooperative trawl survey to calibrate the three surveys.

Shelf Surveys

Surveys for shelf groundfish and nearshore recreational species that should be considered in developing a survey strategy are:

- Conduct an Annual shelf bottom trawl survey (coordinated with slope trawl surveys).
— Include the entire California coast, along with Oregon and Washington. If the area south of Point Conception cannot be surveyed with trawl gear, institute a hook-and-line survey in the area. During development of the survey evaluate the adequacy of the methods for assessment of shelf flatfish stocks.
- Biennial Conduct annual whiting acoustic surveys including measures of target strength. Measure in-situ target strength as a function of fish length for converting NMFS acoustic survey data to improve the estimates of whiting biomass and reduce uncertainty of the annual stock assessment results. There will be opportunities for collaborative work involving agencies in the U.S., the fishing industry, and Canadian scientists.
- Implement a Periodic survey effort (depth and area specific) for important nearshore recreational species and flatfish stocks (coordinated with shelf surveys).
- Design and implement Continue and expand annual recruitment surveys for juvenile sablefish, Pacific whiting, and rockfishes.

Alternative Survey Methodologies

- Evaluate feasibility of and develop as appropriate alternative survey methodologies for measuring abundance and distribution of groundfish, including egg and larval survey, visual, acoustic and laser systems.
- Develop improved survey methodologies for rockfish in untrawlable habitat. This is important for the northern Washington coast and southern California. Estimates of abundance for reef-oriented rockfish depend on information on available habitat and fish densities for specific habitat types. Existing survey methodologies, such as transect surveys using submersible vehicles or longlines could be applied on an expanded basis to estimate local fish densities. Side-scan sonar can map bottom habitat. Many of these species are now targeted by a growing hook-and-line fishery and are vulnerable to over harvest due to their extreme longevity. This is important for yellowtail, widow, yelloweye, canary, blackgill, grass, gopher, china, and copper rockfishes.

Environmental Data Collection

Data collection to determine whether there have been long term changes in productivity or recruitment relationships due to environmental changes. Collect oceanographic data to determine the relationship between oceanographic conditions and productivity and recruitment. Conduct field studies to validate relationships. Equip cooperating trawlers with electronic oceanographic and environmental monitoring instruments to increase the amount of environmental data that can be correlated to the biological and fishery information.

Other Collection Tasks

Calibrate trawl surveys by estimating survey catchability coefficients (Q) to increase the accuracy of stock assessments, particularly those based on short time series.

Continue the Enhanced Data Collection Program and the Depth-Specific Sampling Project to meet the need for depth-specific biological samples for sablefish, thornyheads, and Dover sole.[moved]

Measure in-situ target strength as a function of fish length for converting NMFS acoustic survey data to improve the estimates of whiting biomass and reduce uncertainty of the annual stock assessment results. There will be opportunities for collaborative work involving agencies in the U.S., the fishing industry, and Canadian scientists.

Implement "Exempted Fishing Permits" to create fishing opportunities to reimburse cooperative fishing vessels for conducting surveys to maintain and augment current survey levels.

Develop improved survey methodologies for rockfish in untrawlable habitat. This is important for the northern Washington coast and southern California. Estimates of abundance for reef-oriented rockfish depend on information on available habitat and fish densities for specific habitat types. Existing survey methodologies, such as transect surveys using submersible vehicles or longlines could be applied on an expanded basis to estimate local fish densities. Side-scan sonar can map bottom habitat. Many of these species are now targeted by a growing hook-and-line fishery and are vulnerable to over harvest due to their extreme longevity. This is important for yellowtail, widow, yelloweye, canary, blackgill, grass, gopher, china, and copper rockfishes.

Re-establish the northern Washington lingcod tagging project to improve annual estimates of lingcod recruitment, adult abundance, and mortality.

Develop an intensive sablefish tagging study to acquire information about migratory patterns, growth, mortality and abundance. Re-establish cooperative U.S.-Canada tagging program for sablefish to define migration and potential for estimating biomass.

Consider a northward expansion of the CalCOFI ichthyoplankton surveys to estimate spawning biomass of slope species, nearshore flatfish, and, potentially, rockfish off central/northern California, Oregon, and Washington.

Continue the evaluation of Russian survey data related to POP and other slope rockfish.

BIOLOGICAL INFORMATION INCLUDING FISHERY AND PRODUCTIVITY PARAMETERS

Age Data

Validation. Age validation studies are important to assure that the basic data used in stock assessments are accurate, particularly for species like shortspine thornyhead and bocaccio. Aging techniques routinely employed have not been researched and/or validated for many rockfish species. Radiometric studies of shortspine thornyheads should be continued, and tagging data should be collected for both shortspine thornyheads and bocaccio. Radiochemical dating is also needed for cowcod and blackgill rockfish otoliths. Conduct an interagency comparison of the reading of lingcod age structures to establish consistent aging

criteria and validate annuli. Improper aging results in unreliable stock assessment data. Collaboration with Canadian efforts may be appropriate for some transboundary stocks.

Collection. Age composition data are critical to generate precise stock assessments with stock synthesis and other assessment models. Collection and analysis of coastwide age structure data from research surveys and commercial fishing needs to be expanded and continued for whiting, Pacific Ocean perch, chilipepper rockfish, lingcod, Petrale sole and other flatfish. There are species and areas in which the collection of age data is very incomplete, (e.g., sablefish dressed at sea and rockfish taken by nontrawl gear). Also, data on particular size ranges are sparse for some species (e.g. small Petrale sole). For Pacific Ocean perch, resume the collection and reading of otoliths from the commercial fishery and re-read, if possible, pre-1983 otoliths using the break and burn technique. The frequency of the collection of flatfish otoliths from port samples has diminished and should be increased. There is a need to increase the amount of otoliths read per year to provide sufficient catch-at-age data and estimates of growth for groundfish stock assessments.

~~Previous sablefish age sampling programs have not been extensive enough to allow examination of age composition by area, season, and gear type. Failure to account for these components of sablefish catch can lead to biased results and erroneous conclusions. There is a particular need to collect otoliths of sablefish caught in the nontrawl fishery, much of which is headed and gutted prior to unloading. The high percentage of dressed fish in some gear/area strata severely compromises age composition estimates. At-sea collections by observers may be needed to gather the necessary data.~~

Stock Structure

Conduct research on the population genetic structure of groundfish stocks to monitor the long term implications of management measures. In particular, the genetic structure of sablefish and many rockfish populations are largely unknown.

Evaluate implications of assessment and management boundaries at US-Canada border for species with transboundary distributions.

Species Group/Complex Specific Needs

Deep-water Complex

~~Continue the Enhanced Data Collection Program and the Depth-Specific Sampling Project to meet the need for depth-specific biological samples for sablefish, thornyheads, and Dover sole.[moved]~~

Nearshore Flatfish and Other Groundfish

~~Re-instate sampling of flatfish age structures by the port sampling program. English sole and Petrale sole stock assessments could not be extended into California, because biological sampling of nearshore flatfish in California had not occurred. [flatfish related need moved] The backlog of unread Petrale sole otoliths needs to be aged for the proposed 1999 assessment.~~

Expand research on basic life history of the other nearshore groundfish stocks that are targeted by hook and line fisheries and recreational fisheries.

Rockfish

~~Conduct maturity studies for Pacific Ocean perch and shortspine thornyhead rockfish to determine the age of sexual maturity for the West Coast areas using histological methods.~~

Biological information, including size and age sampling, is needed for the large majority of rockfish species. Standardized sampling methods and tools need to be developed for dockside handling of live fish, to quickly obtain measurement data without injury to the specimens.

~~Conduct maturity studies for Pacific Ocean perch and shortspine thornyhead rockfish to determine the age of sexual maturity for the West Coast areas using histological methods.~~

For canary rockfish, thornyheads and Pacific Ocean perch laboratory-based histological examination of reproductive tissue would be useful for evaluating the visual determinations of maturity made by port biologists and determining the age of sexual maturity.

Grenadiers

Research is needed to develop information on the biology and population abundance of grenadiers. Since 1995, the fishery has been expanding. An assessment should be conducted in the near term. This effort would be facilitated by separating the catches of Pacific and giant grenadiers in the official landing statistics.

Environmental Data Collection

Equip cooperating trawlers with electronic oceanographic and environmental monitoring instruments to increase the amount of environmental data that can be correlated to the biological and fishery information.

STOCK ASSESSMENT MODELING

Place a high priority on conducting assessments for species that have not been previously assessed.

Localized Depletion

Localized depletion of groundfish stocks, especially Dover sole, shortspine and longspine thornyheads, black rockfish, may occur in areas where fisheries are concentrated. The use of area-specific harvest guidelines for these species should be evaluated.

Multi-species Management

Groundfish management must ultimately evolve to multi-species management. The need for management of this type is epitomized by the deepwater trawl fishery where sablefish, Dover sole, and thornyheads are the dominant species. To manage such an assemblage effectively, biological, oceanographic, and economic factors (including foreign markets) must be considered and melded into multi-species management plans and management models. A theoretical framework for assemblage management is needed. NMFS's new program at Newport, Oregon, is focusing on the deepwater assemblage.

Harvest Policies and Biological Reference Points

Continue the evaluation of MSY control rules, biological reference points, spawner-recruit relationships and harvest policies used to make decisions about acceptable biological catch and harvest guideline/optimum yield for groundfish. This work is particularly important for groundfish with diverse or extreme life histories (e.g., Bocaccio rockfish and Pacific ocean perch). The evaluation of the appropriate harvest policy may involve consideration of whether the fishery is being managed for commercial or recreational purposes and whether there have been long term changes in productivity or recruitment relationships due to environmental changes.

Performance of Stock Assessment Models

Collaborate with Canadian scientists to conduct coast-wide stock assessment for Pacific Ocean perch.

Evaluate the statistical properties (i.e., bias, estimability, variance, etc.) of current stock assessment models used for groundfish needs. This should include an evaluation of the quality, quantity, and frequency of basic input data from fishery dependent (e.g., fishery age compositions) and independent sources (e.g., surveys).

Conduct field projects and modeling studies to determine which selectivity assumptions (dome shape vs. asymptotic) are most appropriate for the various groundfish stocks including lingcod and numerous species of rockfish with age structured assessment.

Conduct an evaluation of characteristic patterns of discrepancies in stock assessment retrospective analyses to develop a knowledge base for interpreting information in these patterns.

Decision Theory and Uncertainty Analysis

Evaluate how best to account for and present uncertainty in the results in all stock assessments.

Lingcod and Rockfish

Consider developing an age structured model for lingcod in the southern half of the range as additional years of age composition data become available for the California fisheries.

Evaluate the effectiveness of revised recreational bag limits (black rockfish) and minimum size limits (lingcod) to accomplish their original intended purpose (should be undertaken prior to the next stock assessment).

Pacific Whiting

Resolve the uncertainty of the magnitude of the 1994 year class based on the 1998 acoustic survey.

Resolve differences between ancillary data and stock projections by potentially incorporating environmental indexes.

Conduct sensitivity analysis of the stock projection model with respect to the acoustic survey results.

Socioeconomic and Management Factors Affecting Assessment Data

Develop indices for monitoring and documenting market, fishery management, and other factors that may affect fishery dependent data which can be used in the annual stock assessments to improve interpretation of the results.

HABITAT

Investigate impact of fishing gear on specific habitats on the West Coast fishing grounds. From existing and new sources, assemble information on fishing activities for each gear type to prioritize research by gear, species, and habitat type. Information on the extent of fishing impacts on the productivity of fishing ground bottom habitat is important to goals of ecosystem management.

Test methods for reducing the impacts of gear on habitat.

Map benthic habitats on spatial scales of the fisheries and with sufficient resolution to identify and quantify fish/habitat associations, fishery effects on habitat, and spatial structure of populations. Mapping of the rocky areas of the continental shelf is critical for the identification of the rocky shelf and non-rocky shelf composite EFHs.

Identify habitat areas of particular concern: habitats that are rare, sensitive, and vulnerable to fishing and nonfishing effects. Identify associated life stages and their distributions, especially for species and life stages with level one (or no) information.

Standardize methods, classification systems, and calibrate equipment and vessels to provide comparable results in habitat research studies and enhance collaborative efforts.

Develop technologies to determine the fish associations related to particular sea floor features.

SALMON FISHERY MANAGEMENT PLAN

The Council's salmon fisheries will be increasingly focused on the protection of individual naturally spawning stocks in response to listings under the ESA, National Standards Guidelines under the Sustainable Fisheries Act, and the consideration of Essential Fish Habitat. Research and data needs to support stock-specific management range widely including improved stock assessments and planning tools, and better understanding of interactions between habitat conditions and productivity. In addition, special care is needed to ensure that hatchery programs do not unintentionally jeopardize naturally spawning runs.

Salmon fishery management in the Pacific Northwest is undergoing a shift from mixed stock fisheries to selective fisheries for hatchery stocks. Successful implementation of selective fisheries will require accurate estimates of nonretention mortalities and new, more detailed information on fishery stock contributions and migration patterns. Recent expansion of listings under the Endangered Species Act, and the new definition of EFH, expand the Council's concerns with both freshwater and marine habitat in relation to harvest strategies and conservation. The revised Magnuson-Stevens Act requires better definitions of MSY and better understanding of population dynamics.

The three highest priority research and data needs for the Salmon FMP are:

- ~~Stock size estimators and predictors of ocean abundance for stocks currently assessed only in-river.~~ Incomplete accounting of total ocean abundance compromises the ability of harvest models to estimate catches and the ability of predictors to incorporate changes in ocean harvest and survival rates.
- ~~Improved models of mark-selective fisheries for coho and chinook salmon.~~ Selective fisheries alter the fishing dynamic and increase the importance of non-catch mortality for unmarked stocks. In addition, the coded-wire tag data base is severely affected.
- ~~Methods to assess risks of Council harvest regimes to natural spawning populations at low abundance.~~ Statutory requirements are causing the Council to balance benefits of fisheries against risks to individual stocks, sometimes at very low abundance. A risk assessment framework is needed to assist the Council in decision-making.
- **A more accurate assessment of total fishing related mortality of natural stocks of coho and chinook.** Fishery management regimes designed to reduce impacts through nonretention or selective fishing depend for success on unbiased estimates of noncatch mortality.
- **Advances in genetic stock identification, otolith marking, and other techniques may make it feasible to use a variety of stock identification technologies to assess fishery impacts and migration patterns.** The increasing necessity for weak-stock management puts a premium on the ability to identify naturally reproducing stocks and stocks that contribute to fisheries at low rates. The CWT marking system is not suitable for these needs. The Council should encourage efforts to apply these techniques to management.
- **Encourage development of probabilistic habitat-based models that incorporate environmental variation to establish harvest policies and enable risk assessment for fishing strategies.** Overfishing definitions are required to relate to a measure of MSY. MSY for salmon is related to productivity, which varies annually in freshwater and the marine environment. Techniques for evaluating productivity, or survival, in freshwater and marine habitats are needed to set appropriate harvest targets and associated conservation guidelines such as escapement floors and overfishing definitions.

The following specific research and data needs are examples of projects that implement the above highest priority needs and other high priority needs:

The comprehensive list of research and data needs is grouped in three main categories:

Stock Assessment. Programs needed to provide information on stock-specific impacts of fishery management regimes.

Planning Tools. Stock-specific management puts a premium on the ability of run-size predictors and harvest models to accurately evaluate impacts of regulatory proposals.

Life history. Research needed to obtain an improved understanding of relationships between habitat and productivity and between hatchery and wild stocks.

Stock Assessment

- ~~**Optimal Tagging and Data Collection Designs for Use of Coded-Wire Tag Information in the Context of Selective Fisheries**~~ Release group sizes, number of replications, and recovery sampling programs, particularly for freshwater escapement, lack uniformity across states and have little or no sound theoretical basis. Improved interagency reporting of CWT returns is needed for adult salmon escaping to hatcheries. Tagging of stocks representing overfished stocks may not be feasible. Alternative stock identification technologies should be used to supplement CWT data.
- ~~**Stock Contribution**~~ Research to improve ability to identify stocks in ocean fisheries and escapement. Improve estimates of stock contribution to ocean fisheries using 1) genetic stock identification, otolith marking, and scale studies; 2) improved statistical applications to current CWT data; and 3) accomplishment of other basic research on stock distribution as noted above.
- **Indicator stocks.** Indicator stock programs are needed for Central Valley spring, fall, and winter Chinook; California and Oregon coastal spring and fall Chinook; Northern California coho; and four components of Oregon Coastal Natural coho to provide information on distribution and migration patterns and stock exploitation rates.
- **Metapopulations.** Research is needed to quantify the rate of genetic flow between naturally-spawning populations and to better delineate populations for fisheries management. Understanding of metapopulation structure may also contribute to better evaluation of stock status and improved estimates of allowable exploitation rates.
- **Design of data collection programs.** Research is needed to determine optimal release group sizes, number of replications, and recovery sampling programs for fisheries and escapement. Improved interagency reporting of CWT returns is needed for adult salmon escaping to hatcheries.
- **Data Reporting.** Improvements in reporting of CWT data are required to permit the completion of cohort analyses to estimate exploitation rates and fishery impacts. Improvements in the timeliness of data are needed to evaluate fishery performance and design corrective measures to constrain impacts on stocks of concern. For some areas, particularly escapements and inland fisheries, recovery data are sporadically reported, often without rigorous estimates of expansion factors.

Planning Tools

- **Run Size Predictors.** Many abundance projections are currently expressed in terms of terminal run sizes and consequently reflect uncertain assumptions regarding impacts of prior ocean fisheries. These types of forecasts become less useful under conditions of substantial variability in ocean fishery impacts. Research is needed to develop accurate predictors of ocean abundance, including incorporation of the influence of environmental factors on intra-brood year survival rates and maturation schedules.

- **Gear-related Mortality.** Recent studies have found widely varying rates of hook and release mortality and variable gear selectivities for chinook and coho. Council management depends heavily on estimates of noncatch, gear-related mortality. Low-biased estimates of mortalities could negate restoration efforts during periods of low marine survival. Information from recent studies needs to be reviewed in the context of Council-managed fisheries, and new methodologies for estimating gear-related mortalities need to be developed. Specific data needs include:
 - Estimate the proportion of fish hooked or netted that are not brought to the boat (drop-offs) and the rate of drop-off mortality. This may vary with factors such as gear type, area, species, and time of year. This would include removal of salmon from fishing gear by predators.
 - Improve estimates of encounter rates in various recreational and commercial fisheries and develop ways to reduce these rates through gear selectivity or modification (e.g., four spreads per wire).
- **Non-Catch Fishing Mortality.** In recent years, an increasing proportion of impacts of Council fisheries on naturally-spawning stocks have been caused by non-catch mortality as regulations such as landing ratio restrictions and mark-selective retention have been employed. Research, using standardized methodologies (e.g., handling, holding, reporting, post-mortem autopsies, etc.), is needed to estimate release mortality, encounter, and drop-off rates associated with gears and techniques that are typically employed in different areas and fisheries. Fleet profile data (i.e., fishing technique and gear compositions) are needed to estimate release mortality rates for individual fisheries.

Improvements in Management Planning Models

- **Explicit Consideration of Uncertainty and Risk.** Current planning models employed by the PFMC are deterministic. Most aspects of salmon management, such as abundance forecasts and effort response to regulations, are not known with certainty. Given the increased emphasis on stock-specific concerns and principles of precautionary management, the Council should receive information necessary to evaluate the degree of risk associated with the regulations under consideration. Research is needed to evaluate the accuracy of existing planning models, characterize the risk to stocks and fisheries of proposed harvest regimes, and to effectively communicate information on uncertainty for use in the Council's deliberations.
- **Continuous Catch Equations.** Because current planning models employed by the Council are constructed using simple linear, independent equations, interactions between stocks and fisheries within a given time step are ignored. This can result in biased estimates of impacts. Research is needed to investigate the feasibility of recasting the models from discrete to continuous forms. e.g., competing exponential risk catch equations.
- **Migration.** The Council current employs "single pool" type models (i.e., ocean fisheries operate simultaneously on the entire cohort) for evaluating alternative regulatory proposals. Under certain conditions, such models can produce results that are inconsistent with expectations of biological behavior. For example, if a fishery off Central California is closed to coho fishing for a given time period, the fish that were saved become available to fisheries off the Northwest Coast of Washington in the next time period. Research is needed to determine the feasibility of incorporating explicit migration mechanisms into planning models.
- **Resolution.** Some of the models currently employed by the Council attempt to represent time-area-fishery strata at a level of resolution which is difficult to support with available data. This creates a public impression of management precision that does not reflect reality and obscures problems of uncertainty in parameter estimation. Consideration should be given to reducing the number of time-area-fishery strata to levels that can be reliably supported by available information.
- **Catch Composition.** Research is needed to compare stock and age compositions from fishery samples against model-generated estimates. This is a model validation exercise.

- **Coastwide Models.** Currently, at least five models are employed to evaluate impacts of proposed regulatory alternatives considered by the Council. A single coastwide chinook model would provide analytical consistency and eliminate the need to reconcile and integrate disparate results. Additionally, research is needed to determine the feasibility of combining chinook and coho into a single model to simplify tasks of estimating mortalities in fisheries operated under retention restrictions (e.g., landing ratios or non-retention).

Alternative Management Strategies

- Investigate and evaluate the feasibility of alternative approaches to time and area quota management. The development of seasonal harvest rates, which promote coastwide simultaneous fisheries on coho and chinook salmon, may reduce the likelihood of high harvest rates on key stocks of concern. Other benefits include greater fishery stability, simpler regulations, and a reduction in management costs.
- Develop and evaluate the comprehensive Washington coho management framework which streamlines the preseason planning process and reduces its dependence upon preseason estimates of abundance and exploitation.
- **Alternatives to time-area management.** The annual planning process centers on the crafting of intricate time-area management measures by various groups. The feasibility of using alternative approaches (e.g., pre-defined decision rules to establish upper limits on fishery impacts, individual quotas, effort limitation) to reduce risk of error, decrease reliance on preseason abundance forecasts, improve fishery stability, simplify regulations, and reduce management costs needs to be investigated. For instance, the integration of Council planning processes with the abundance-based coho management frameworks under consideration by the Pacific Salmon Commission and by the State of Washington and western Washington treaty tribes to streamline the preseason planning process needs to be developed and evaluated.
- **Selective Fisheries.** Develop harvest models applicable to selective fisheries. Such models need the capability of estimating noncatch mortalities of marked and unmarked stocks. It is appropriate at this point to consider three changes in the way fisheries are modeled:
 - Model at lower temporal and spatial resolutions or with less reliance on the precision of stock predictors.
 - Combine chinook and coho fisheries in one model. This would simplify the problem of predicting coho mortalities in chinook-only fisheries external to the harvest model.
 - Include migration in the model.
- **Selective fisheries.** The Council began to employ mark-selective retention restrictions for coho fisheries in 1998. Research is needed to investigate the utility of other types of selective fisheries. For example, time-area closures might reduce exploitation rates on concentrations of stocks of conservation concern.

Stock Identification

- **Mass Marking** Beginning with the 1995 brood, a large proportion of the hatchery coho salmon have been marked with an adipose fin clip. Numerous chinook stocks are also being mass-marked. This provides a range of new research opportunities including:

Estuary Ecology of Hatchery and Natural Stocks. Migration timing, habitat utilization patterns, competition for food or space, and predator interactions are areas of interest. Differences between hatchery and natural smolts in these areas could help address the questions of the importance of density-dependent growth and survival and potential negative effects of hatchery releases on natural stock production. (moved)

Early Ocean Life-history Studies Comparing Hatchery and Natural Stocks. Points of comparison could include: ocean distribution, migration paths and timing, size and growth, food habits, and survival rates. A program similar to the purse-seining study directed by Dr. Bill Pearcy from 1980 to 1985 has been initiated by NMFS and should yield significant new information with mass-marked fish.(moved)

- **Mass marking.** Estimates of mark rates are essential for planning mark-selective fisheries. The accuracy of mark and release rates needs to be evaluated as well as the variability of mark-induced mortalities under operational conditions.
- **Stock Identification.** In most cases it is not be feasible to rely upon coded-wire-tagging of natural stocks, particularly those in depressed status, to obtain direct information on patterns of distribution and exploitation. Alternative stock identification technologies should be explored as a means to collect data necessary for stock assessment purposes. Research is needed to improve ability to estimate contributions of natural stocks in ocean fisheries and escapement. Potential research areas include: 1) association studies to determine the degree to which hatchery stocks can be used to represent distribution and migration patterns of natural stocks; 2) genetic stock identification, DNA, otolith marking, and scale studies; 3) improved statistical methods and models; and 4) basic research on stock distribution and migration patterns.

Life History Studies

Under the National Standards for the Sustainable Fisheries Act, MSY is identified as an upper limit to fishery impacts. Further, MSY is a consideration under principles of precautionary management embraced by the United States in the U.N. Convention for Highly Migratory and Straddling Fish Stocks and the determination of overfishing. MSY for salmon is related to productivity, which varies annually in freshwater and the marine environment. Techniques for evaluating productivity, or survival, in freshwater and marine habitats are needed to set appropriate harvest targets and associated conservation guidelines.

Freshwater Habitat

Research is needed to identify and quantify those factors in the freshwater habitat which limit the productivity of salmon stocks. Research should focus on 1) quantifying relationships between habitat factors and salmon production; 2) measuring the quantity and quality of these habitat factors on a periodic basis; and 3) evaluating habitat restoration projects for both short-term and long-term effects. Activities such as water diversions, logging, road building, agriculture, and development have reduced production potential by adversely affecting freshwater conditions. Habitat quality and quantity are crucial for the continued survival of wild stocks. The following specific research areas have been identified as being of particular importance.

- ~~Quantification of land use patterns related to anadromous fish production from fresh water. Efforts are underway to link maps of freshwater habitats with models of salmon production for use in risk assessment, in designing habitat restoration programs, and in guiding land use policy development.~~
- **Predictive models for land-use impacts.** Determine if reliable, quantified relationships between land use patterns and anadromous fish production can be developed. Efforts are underway to link maps of freshwater habitats with models of salmon production for use in risk assessment, in designing habitat restoration programs, and in guiding land use policy development. As part of the Oregon Plan for Salmon and Watersheds (OPSW), indicator watersheds are being established and monitored for land use impacts and fish production.
- ~~Identify limiting factors of the freshwater environment and ecosystem focusing on ways in which the limitations can be removed to restore wild fish production and restore the most important ecological structures and processes of the entire habitat.~~
- ~~As part of the Oregon Coastal Salmon Restoration Initiative (OCSRI), indicator watersheds are being established and monitored for land use impacts and fish production.~~

- **Limiting factors.** Identify limiting factors. Develop strategies to prioritize actions to reduce or overcome limiting factors to restore wild fish production and essential ecological processes.

Estuarine and Ocean Survival

- **Environmental influences on survival.** Determine natural survival and stock distribution in the estuary and ocean, year-to-year, age-to-age, and life-history variability, and relationships to measurable parameters of the environment (i.e., temperature, upwelling, etc.). Some work has been done for coho, but little is known for chinook. Included in the information need are long-term and short-term relationships between environmental conditions and fluctuations in chinook and coho salmon survival, abundance, and maturation rates. (Substantial predictive errors in forecasts based on previous year returns and apparent large-scale multistock fluctuations in abundance suggest important large-scale environmental effects.)
- **Immunocompetence.** Studies of juvenile and adult salmon are needed to evaluate relationships among physiological state, environmental conditions, and survival.
- **Predation.** Research is needed to quantify the mortality rate on salmon by pinnipeds, seabirds, and predatory fish. Predation is potentially a problem in certain estuaries and in the ocean. Potential for restoration of some runs may be limited by predatory pinniped or bird populations.

Hatchery/Wild Interactions

- **Genetics.** Determine the extent to which there may be gene flow between hatchery and wild stocks. ~~This can be approached by first determining~~ One approach would be to estimate the stray rate of hatchery fish into natural spawning areas ~~and then determining~~, the rate at which ~~these strays may be spawning with wild fish~~ hatchery and wild fish interbreed, and survival rates of progeny.
- **Freshwater Ecology.** Investigate the ecological (competition, predation, displacement) effects of hatchery fish on natural production in freshwater. All life stages from spawner to egg to smolt may be affected.
- **Estuary Ecology.** Migration timing, habitat utilization patterns, competition for food or space, and predator interactions are areas of interest. Differences between hatchery and natural smolts in these areas could help address the questions of the importance of density-dependent growth and survival and potential negative effects of hatchery releases on natural stock production. [moved]
- **Early Ocean Life-history.** Points of comparison between hatchery and wild stocks could include: ocean distribution, migration paths and timing, size and growth, food habits, and survival rates. [moved]
- **Identification of hatchery fish.** The presence of hatchery fish ~~in large number may prevent~~ may interfere with the accurate assessment of the status of natural stocks ~~status~~. This problem ~~can be circumvented by estimating the contribution of hatchery fish to fisheries and natural spawning populations. These assessments can be facilitated by mass marking of all hatchery fish~~ may be alleviated by the use of mass-marking using otolith marking, CWT, genetic marking, fin removal, or other technologies to estimate the contribution of hatchery fish to fisheries and natural spawning populations.
- ~~Conduct studies of competition and predator-prey relationships between hatchery and wild salmon.~~
- **Supplementation.** Research is needed to investigate the utility of using artificial propagation to supplement and rebuild natural stocks. Guidelines for the conduct of supplementation to preserve genetic diversity and legacy of populations are needed. Special care is needed to ensure that supplementation programs do not unintentionally jeopardize natural runs.

COASTAL PELAGIC FISHERY MANAGEMENT PLAN

The CPS FMP includes northern anchovy, Pacific sardine, Pacific (chub) mackerel, jack mackerel, and market squid. Annual stock assessments are currently conducted for Pacific sardine and Pacific mackerel, the two actively-managed species in the plan. Whereas, in years past, the geographic coverage of CPS stock assessments has been largely limited to California, several recent developments highlight the need to enhance current assessment procedures in order to meet the requirements of the new FMP. These include 1) the development of new fisheries for Pacific sardine, Pacific (chub) mackerel, and squid in Oregon and Washington; 2) increasing recognition of the importance of CPS as principal forage for many salmon and groundfish stocks that are currently at low abundance levels; and 3) the importance of CPS biomass estimates to the Council's annual determination of allowable coastal pelagic harvests. A pressing need exists for stock assessments that accurately reflect the reproductive characteristics of CPS stocks throughout their geographic range and for additional stock assessment personnel in NMFS and the three Pacific coast states to carry out these assessments.

The highest priority research and data needs for the CPS FMP are:

- ~~Gather coastwide abundance information on Pacific sardine and Pacific (chub) mackerel.~~ Research approaches could include: egg pump, LIDAR, spawning biomass and spawning area surveys, and northward extension of the GalGOFI sampling pattern.
- ~~Collect fishery-dependent and fishery-independent data for CPS off Baja California in collaboration with Mexican scientists.~~
- ~~Study the importance of sardine coast wide as forage for salmon and groundfish stocks.~~
- ~~Gather information on the market squid biology, distribution, abundance, and fishery economics.~~
- Gain more information about the status of the CPS resource in the north using egg pumps used during NMFS surveys, sonar surveys, and spotter planes.
- Develop a coastwide (Mexico to British Columbia) synoptic survey of sardine and Pacific mackerel biomass, i.e., coordinate a coastwide sampling effort (during a specified time period) to reduce "double-counting" caused by migration.
- Increase fishery sampling for age structure (Pacific sardine and Pacific mackerel) in the northern and southern end of the range. Establish a program of port sample data exchange with Mexican scientists (INP, Ensenada).
- Evaluate the role of CPS resources in the ecosystem, the influence of climatic/oceanographic conditions on CPS; predatory/prey relationships. Increase the use of fishery information to estimate seasonal reproductive output of stock (e.g., fat/oil content).
- Improve information on salmon and other bycatch in the CPS fishery.

SARDINES

Sardine have been increasing in abundance along the entire coast from Baja California to British Columbia. New fisheries for sardine in Oregon, Washington, and British Columbia are developing. ~~Indices of abundance used to estimate biomass and set fishery quotas are, however, based on surveys in the Southern California Bight. New or expanded surveys that cover the range of sardine along the entire coast are urgently needed.~~

NMFS Southwest Fisheries Science Center has recently developed an "egg pump", a quantitative tool which holds great promise as a cost-effective way to track egg production and spawning biomass of pelagic stocks. NMFS used an egg pump on board the *Miller Freeman* during the July through August 1998 acoustic survey for Pacific whiting, and measured large quantities of sardine eggs off of Oregon and Washington. Annual egg pump surveys would better enable estimation of sardine spawning area and spawning biomass using the daily egg production method. Key uncertainties about adult reproductive parameters (spawning season, spawning frequency, eggs per spawning batch, spawning intervals, etc.) need to be resolved for northern areas. These parameters should be through systematic sampling of adult sardine with midwater trawl in conjunction with egg sampling surveys.

Sardine have probably replaced many of the species used as forage by salmon along the West Coast, but no information about this important possibility is available. Abundance of sardine and management of the sardine fishery may have direct impacts on West Coast salmon including endangered and depleted species. Diets of potential sardine predator species should be reevaluated to identify changes related to recent ecological and oceanographic conditions.

The following research and data needs for sardines were drawn largely from the Sardine Symposium 2000 (May 23-25, 2000), organized by the Pacific States Marine Fish Commission, National Marine Fisheries Service, California Department of Fish and Game, and the Scripps Institute of Oceanography. Practicality of items were not determined and no priorities were set; items are listed in no particular order.

- Increase sampling for age structure in northern and southern end of range.
- Convert Oregon-Washington egg surveys carried out by National Marine Fisheries Service, Northwest Fisheries Science Center to biomass by estimating adult parameters (batch fecundity and spawning frequency).
- Improve existing southern California spawning biomass estimates based on egg surveys by measuring adult spawning parameters (batch fecundity and spawning frequency).
- Conduct aerial surveys of sardine schools using spotter pilots to provide coast wide indices of sardine abundance and estimate the extent of offshore distribution.
- Add airborne lidar to the above aerial surveys.
- Conduct coast-wide inventory of sardine biomass using CUFES.
- Conduct acoustic-trawl survey coast wide to provide coast wide estimate of biomass.
- Conduct coast-wide intensive sampling for certain periods using industry and multiple agency contributions resembling the URICA biomass surveys of Peru, except the focus would be on age structure and reproductive rates. One suggestion was to focus on April since the April CalCOFI survey provides the longest fishery independent time series; a summer focus would also be useful since the northern fishery occurs in the summer.
- Conduct short fishing vessel cruises to establish offshore limit to sardine distribution and to obtain age structure information.
- Examine micro-constituents of sardine otoliths to determine the origins of fish (a low cost alternative to tagging).
- Implement electronic logbooks with GPS and time stamp to improve locality and time data on catches.
- Establish network to archive industry derived estimates of size specific oil yield to be used in estimating seasonal reproductive output of stock.

- Investigate feeding selectivity and the role of diet to determine the causal factors of bursting abdomens (the hot tummy phenomena).

PACIFIC MACKEREL

California's Pacific mackerel fishery has been sampled by CDFG for age composition and size-at-age since the late-1920s. The current stock assessment model incorporates a complete time series of landings and age composition data from 1929 onward. Ensenada (Baja California) landings have rivaled California's over the past decade, however, no biological information is currently available from Mexico's fishery. Landings are accounted for in the assessment, but size and age composition are assumed to be similar to the San Pedro, CA fishery. Like sardine, there is a need to establish a program of port sample data exchange with Mexican scientists (INP, Ensenada) to fill this major gap in the stock assessment.

Fishery-independent survey data for measuring relative changes in Pacific mackerel recruitment and spawning biomass are generally lacking. The current CalCOFI sampling pattern provides information on mackerel egg distributions in the Southern California Bight, the extreme northern end of the spawning area. Mexican scientists have conducted a number of egg and larval surveys off of Baja California in recent years (e.g. IMECOCAL program). Access to this data would enable us to continue the historical CalCOFI time series which begins in 1951. This information could be directly incorporated into the assessment model.

Pacific mackerel biomass has been declining since the early 1980s, but recent El Nino events have concurrently extended their northern range to British Columbia. Pacific mackerel are caught incidentally in the Pacific whiting and salmon troll fisheries. A simple reporting system is needed to document incidental take of mackerel in fisheries to the north. Presence-absence information may allow us to detect southward movement or further decreases in biomass.

MARKET SQUID

~~Market squid are poorly understood, relative to CPS finfish. Impacts on EFH are most likely during fishing which occurs almost entirely on spawning aggregations in shallow water. There are two areas of potential concern that have not been quantified: damage to substrate used to attach eggs and damage to egg masses.~~

~~Information about how squid spawning grounds are distributed with depth and their locations along the coast is required. Information on spawning grounds in deep water and to the north of central California is particularly meager. In addition, information about egg survival and paralarvae production per unit area in different types of spawning habitats is needed for understanding potential impacts of fishing in shallow water.~~

~~Information describing mechanisms and patterns of dispersal of adults and paralarvae along the coast (i.e., stock structure) is required for determining how local impacts might be mitigated by recruitment from other areas in this short lived species.~~

~~Egg mortality associated with purse seining for squid has not been quantified.~~

~~Factors that determine spawning grounds have not been precisely identified.~~

Market squid are poorly understood, relative to CPS finfish, as extensive biological data needed for assessment purposes is lacking. Recent age and growth information suggests that maximum age is less than one year, and the average age of squid taken in the fishery is approximately 6 to 7 months. Landings data indicates a sharp decline in squid availability associated with El Nino events.

Although some information exists on coastwide market squid distribution and abundance from fishery-independent midwater and bottom trawl surveys aimed at assessing other species, there is no good measure of annual recruitment success beyond information attained from the fishery. As fishing activity occurs only on shallow-water spawning aggregations, it is not clear if reduced landings reflect only a decline

in availability to the fishery, or if overall stock size is diminished, since squid have been commonly documented at greater depths using other gear methods.

Better information on the extent and distribution of spawning grounds along the Pacific coast is required, particularly in deep water and areas north of central California. Additionally, fecundity, egg survival and paralarvae production per unit area estimates in different types of spawning habitats and water conditions are needed. Furthermore, information describing mechanisms and patterns of dispersal of adults and paralarvae along the coast (i.e., stock structure) is required for determining how local impacts might be mitigated by recruitment from other areas in this short-lived species.

Although some fishery effort information is now being collected with a newly-implement logbook program in the state of California, the continuation of this program is essential to provide estimates of catch per unit effort in the future. Continuation and/or establishment of annual surveys using midwater trawls, bottom trawls, Remotely Operated Vehicles (ROV's), satellite and aerial surveys may also provide useful to provide annual indices of abundance and effort.

Potential impacts to EFH would most likely occur during fishing activity with purse-seine gear on spawning aggregations in shallow water, when gear may possibly make contact with the bottom. There are two areas of potential concern that have not been quantified; damage to substrate where eggs may be deposited, and damage or mortality to egg masses from contact with the gear itself.

LIVE BAIT FISHERY

Although tonnage of CPS and squid taken in the live bait fishery is minimal compared with volume taken in the commercial fishery, better estimates of live-bait landings and sales of sardine, anchovy and squid is essential as it pertains to estimates of the overall economic value of these fisheries. Outdated estimates have previously shown that the value of the live-bait fishery for sardine has equaled that of the commercial catch. In the case of squid, there is no documentation of the dramatic expansion of live-bait sales in southern California made by commercial light vessels in recent years.

The live bait fishery supplies a product for several recreational fisheries along the Pacific coast, primarily in southern California. Live bait catch is generally comprised of both Pacific sardine and Northern anchovy, the predominant species depends on biomass levels and local availability. Recent landings estimates range between 5,000 and 8,000 mt annually statewide, with effort increasing in summer months. However, these estimates are based only on voluntary logbooks provided by some bait haulers, and estimates provided by the CPFV industry. Since the sale of live bait in California is not documented in a manner similar to that used for the commercial sale of CPS, estimates of tonnage and value are imprecise. No estimates of volume or value for the sale of market squid for live bait are available at this time whatsoever.

PACIFIC HALIBUT ALLOCATION

BYCATCH

Data are needed to estimate halibut bycatch rates and mortality of discarded halibut bycatch by gear type for West Coast fisheries. Also, see discussion of Discard Data under Groundfish Data Needs.

DISTRIBUTION AND ABUNDANCE

Continue with setline surveys to estimate halibut abundance and distribution in Area 2A and Area 2B.

MARINE RESERVES

The Council has specified a two-stage process to evaluate whether or not marine reserves may have a role in more effectively managing the West Coast groundfish fisheries. The first phase is a conceptual evaluation of the potential role marine reserves may play. If marine reserves appear to be a potentially valuable tool, specific sites would be proposed as part of a second phase. During the initial evaluation process, certain data shortcomings were identified pertaining to both the general analysis and the specific siting of marine reserves.

While marine reserves are being considered primarily with respect to the groundfish fishery, a variety of fisheries may be affected depending on the types of fishing that need to be controlled in order to create an adequate marine reserve system. The Council has the authority to regulate only those fisheries that take species managed under a Council FMP.

The top five priority research and data needs related to marine reserves are:

- **Information on the location of current harvest** relative to a proposed marine reserve area is needed in order to begin to evaluate the degree of impact and effectiveness of the creation of marine reserves. Most harvest information currently collected is not on a fine enough geographic scale to use for evaluation of marine reserves.
- **Information on advection of eggs and larva and pre-settlement juveniles.** Particularly emphasis on differences between areas upstream and downstream of major geographical features. This will primarily be a physical oceanographic exercise.
- **Information on the movement of juveniles and adults.** This will primarily be a literature search followed by a biological field program. Little is known about the movement of post settlement juveniles.
- **Knowledge of when in the life cycle density dependent effects occur** is important in the assessment of the effects of marine reserves (as it is in assessing conventional catch management).
- **Increased biological monitoring of existing marine reserves** and other areas of restricted fishing in order to gain information on current reserves that might be extrapolated to evaluate the creation of additional reserves on the West Coast.

Increase Monitoring of Existing Areas with Restricted Fishing

There is a need for increased biological monitoring of existing marine reserves and other areas of restricted fishing in order to gain information on current reserves that might be extrapolated to evaluate the creation of additional reserves on the West Coast. There are 17 very small reserves in California that prohibit either recreational, commercial or all harvest. There is one very small no fishing reserve off Oregon (Whale Cove). There are 3 or 4 small reserves that prohibit recreational and commercial bottom fishing in Puget Sound. There are no marine reserves deeper than 100 meters anywhere off the West Coast. There are some other types of marine reserves in California that may also benefit from study. These include spawning/nursery grounds with restricted fishing, the prohibition of trawling within three miles of shore and the exclusion of gillnetting for nearshore rockfishes.

Modeling of Marine Reserve Impacts

Current information limits reserve models are fairly simplistic. More sophisticated models require additional information. Development of realistic species specific models is limited by the lack of basic information on fish mobility, larval transport, recruitment mechanisms and habitat-dependent life history parameters. Modeling recruitment for populations with a significant proportion of their biomass in reserves will be more problematic than for current stock assessments because the reserve stocks will have different age structures, population densities, and possibly different recruitment success than areas open to fishery. Lacking this information, current models do not demonstrate substantial benefits as compared to fisheries properly regulated to achieve optimum yield, however, it has not been demonstrated that the regulatory

intent of achieving optimum yield is being met by current fishery management regulations. Information limits for successful application of marine reserves are not necessarily greater than the information limits for successful traditional management, however, it will require significant data analysis and probably additional monitoring to acquire the information needed to assess reserve effects.

Assessment of the effects of reserves on ecosystems is severely limited by the lack of knowledge concerning the long-term effects of the selective removal of specific components of the fauna, alternation of the benthos by fishing gear and inter-species interactions.

Design of Marine Reserve

Species Movement

General information is needed on species movement by life history stage (larval, juvenile and adult), particularly where improvement of stock health is one of the primary purposes of the reserve. Little is known about the movement of post settlement juveniles.

Area specific information is needed on reproductive success and subsequent patterns of settlement and recruitment. The design and siting of a marine reserve system would be enhanced by understanding of the hydrographic links between source and settlement populations. The connection between adult source populations and sites of successful settlement and recruitment may be critical in designing effective reserves. Part of this involves understanding mechanisms of larval dispersal (including patterns of dispersal, retention and redistribution).

Life Phase of Density Dependent Effects

Knowledge of when in the life cycle density dependent effects occur is important in the assessment of the effects of marine reserves (as it is in assessing conventional catch management). It is likely that density dependent effects occur either during adult or post settlement life phases. Negative density dependent effects during the adult phase could result in less production per unit of biomass when adults are concentrated in an area such as marine reserves as compared to when they are dispersed. On the other hand, negative density dependent effects in the post-settlement juvenile stage would imply a higher probability that marine reserves will have a positive effect on stock populations outside the reserve area.

Catch and Bycatch Location

Better precision is needed on the location of catch and bycatch in order to enhance the potential usefulness of reserves for controlling fishing mortality in a multispecies fisheries. For example, areas may be closed where a particular species is taken as bycatch at a higher rate than in other areas.

Stock Assessment Models (With Reserves in Place)

Reserve stocks will have different age structures, population densities, and possibly different recruitment success than areas open to fishing. Information may be needed to develop area-specific stock parameters. Significant data collection and additional monitoring will likely be needed to acquire the necessary information.

Social and Economic Data Needs

Much of the data needed for analysis of marine reserves is not available from traditional fishery data systems. Details on area of catch are not recorded on a fine enough scale to be useful in modeling the effects of marine reserves. For this reason, it is likely that reserve location and assessment of social and economic impacts would have to be based largely on key informant and anecdotal information. The collection and summarization of such information may require the assistance of individuals with social science expertise from outside fishery management agencies.

Location of Current Harvest

Information on the location of current harvest relative to a proposed marine reserve area is needed in order to begin to evaluate the degree of impact and effectiveness of the creation of marine reserves. Location of harvest information would allow statements to be made about:

1. The number of harvesters and amount of harvest that will be dislocated by the creation of a marine reserve area.
2. The number of harvesters and amount of harvest by harvesters in the area that may be secondarily impacted by the shift of harvest effort out of the marine reserve area.

Information about the location of alternative fishing grounds would allow analysts to begin to analyze some differences in travel costs to the different fishing grounds.

Knowledge about amounts of displaced effort and catch as a proportion of the effort and catch in alternative fishing areas would begin to indicate the magnitude of cost increases related to the additional competition on the alternative fishing grounds.

Some information of this nature is available from trawl logbooks and some from charter vessel logs in California. In 1999 and 2000 there has been an effort to collect specific fishing location information from recreational fishers.

	Groups				
	Nonconsumptive on site (e.g. ecotourism)	Recreational Fishers	Charter Vessels	Seafood Harvesters	Processors
Source of Ocean Area Data	None identified	California Charter Vessel Logs 1999-2000 RecFIN Data (sample data—not expanded)	California Charter Vessel Logs	Trawl Logbooks	If information is available on seafood harvesters it can be tied to a processor ID.

Current CPUEs For Different Harvest Areas

A second piece of information needed for an economic analysis is the size of alternative fishing areas and CPUEs in those alternative fishing areas. With this information a short-term initial assessment might be made of the differences in costs of fishing between the marine reserve area and the alternative areas. This information may be available for groundfish trawl vessels coast wide and recreational charter vessels in California (Thomson, 1998).

Stock movement and total abundance information for the ranges of the stocks in the alternative fishing area; stock recruitment and growth parameters; and relationships of these and other factors to CPUE would be needed to assess the ability of alternative fishing areas to absorb displaced effort over the long term.

Harvester Costs and Differentials Between Harvest Areas

Harvester cost and expenditure information is necessary to quantify impacts to local and national economies. The impacts that need to be modeled with respect to short term costs relate to how costs vary between fishing sites. Over the long-term, changes in costs depend on the effectiveness of marine reserves in preserving and rebuilding stocks and the relationship of stock abundance to CPUE. Prediction of such changes are problematic given the constrained data available for models.

Recreational Harvester and Site Specific Demand

A completely quantitative economic analysis would require information on site specific angler preferences and expected changes in recreational harvester demand associated with the changes in CPUE (if CPUE predictions could be made). These values could be used to generate estimates of total trips expected with changing fishing opportunities and changes in consumer surplus. A recent RecFIN socioeconomic survey of West Coast anglers collected information on hypothetical responses to hypothetical changes in rockfish and lingcod bag limits. This data might be useful in gaining some insight into changes in demand with changes in harvest opportunity.

Processors

If the impacts of a marine reserve on commercial landings to a specific port can be estimated, the next question is whether product is processed locally or shipped to another location for processing or direct sale. Information required for a full quantitative assessment of impacts on processors would include amounts of product processors acquire from local and outside sources, processor variable costs, fixed and variable costs, processor prices, and overall effect of marine reserve policies on total fish available from West Coast fisheries.

Offsite Nonconsumptive Values

Estimates of existence, bequeathal, and option values are difficult to derive. The methods most generally used to estimate such values are surveys. Another indicators of such values might be the portion of environmental organization budgets dedicated to the creation of marine reserves on the West Coast.

Family Dependence

Information will be needed on the dependence of families in the community on income from fishing, alternative sources of income, and resources available in the community to assist families in adapting to change.

APPENDIX A

Species Specific Groundfish Research and Data Needs

The following species specific groundfish research and data needs were derived largely from the Stock Assessment Review Panel (STAR) reports on stock assessments conducted in 1999 and 2000.

Bank Rockfish 2000

1. Set up a separate species market category for Bank rockfish in Monterey and northern Conception ports to improve tracking of landings and improve length and age composition sampling for this species.
2. Obtain better catch information from southern Conception fishery.
3. Develop a new survey sampling project to provide a fishery independent measure of population abundance and recruitment.
4. Investigate more robust decision rules for data limited species assessments.

Black Rockfish 1999

1. There were benefits to the multiple model descriptions which were presented and continuation of the practice is recommended. These models should include simpler models and analyses, e.g. catch curve, production models, size frequency information.
2. The black rockfish is recruited to the fishery before the 50% maturity age. Yield and SSB isopleths should be examined to assess the effect of changing size of capture.
3. The tagging study should be expanded to better define the stock and to produce better abundance estimates.
4. The STAR panel was concerned about the high M estimates, especially on females, and recommends that both model configurations and independent data be investigated.
5. Stock status data, either abundance or effort, which were not used in tuning, should be compared to model outputs in order to integrate this information.
6. The implications of using tagging data only from the central area (near Westport) to assess the population throughout the stock unit needs to be investigated.

Bocaccio Off California 1999

1. Examine the long time series of nuclear power plant larval fish impingement data to see if a pre-recruitment index could be developed.
2. Environmental data and recruitment patterns should be examined for trends. Research should include exploring the possibility of community interactions along with environmental coupling in an effort to develop alternative models that more accurately affect the population dynamics of this species. Changes to the synthesis model or model inputs should be made to explore alternative hypotheses about fish that may be 'hidden' from the fisheries.
4. Fishery independent methods of monitoring the bocaccio resource should be continued, and additional fishery independent methods of sampling should be developed. Anticipated low future harvest levels under a rebuilding plan may reduce or eliminate sampling opportunities needed to track recovery of the stocks.
5. Examine the CalCOFI data set when it becomes available. By extending the model back into the 1950s and 1960s, it may be possible to calibrate stock productivity to the colder conditions during those years as opposed to the warm conditions that have prevailed since the mid-1970s.

Canary Rockfish (Northern and Southern) 1999

1. Future canary rockfish stock assessments could be significantly improved by increased sampling of commercial landings and increased frequency of fishery-independent resource surveys. Currently, port sampling protocols are neither consistent from year to year nor strictly standardized between the three states. The current status of the resource is quite depressed. The size and age composition derived from collection of data from all segments of the canary rockfish fishery will be extremely important in tracking its recovery and assessing the productivity of the stock(s). These data must be collected annually over the geographic range of the fisheries to eliminate the current data gaps in size and age data from the fishery.
2. The current frequency of the NMFS bottom trawl survey should be increased from the triennial schedule to an annual basis. Canary rockfish captured in the survey must be sampled to determine length, sex, and age composition. The annual age-composition information from the survey will be very valuable for tracking the magnitude of incoming recruitment, as well as following cohorts through the fishery.
3. The canary rockfish age structures (otoliths) collected from the fisheries and surveys must also be routinely processed. Routine data collection over time will also provide insight into stock structure and natural mortality schedules of the older females.
4. Given that the resource appears to be very depressed, efforts to reduce fishing mortality under the Council's available management measures will likely result in higher discard mortalities. Therefore, improved effort to monitor total fishing mortality, including discard catches, will be important to track stock rebuilding progress.
5. A major research effort should be undertaken along the U.S. West Coast to resolve whether a model with constant female mortality and dome-shaped age-specific selectivity or an age-dependent mortality model with asymptotic selectivity is closest to reality. A number of U.S. West Coast groundfish stocks appear to have an unusually low number of older female fish given the life span of the male population. The alternative modeling assumptions of age-dependent mortality versus dome-shaped selectivity patterns can both replicate the age structure of the female population as observed in the fishery or summer bottom trawl surveys. This lack of resolution contributes considerable uncertainty in estimates of current stock condition and yield projections. A major research effort to locate larger females or to examine age-dependent mortality for mature female fish would benefit a number of assessments and stock rebuilding plans.
6. The Panel discussed potential effects of environmental changes (regime shifts) on stock productivity, and the possible influence on expected recruitments and estimates of future unfished stock size. The increasing trend in sea surface temperatures for the California Current region since the late 1970s has been well documented and is associated with increased productivity of sardines (and decreased zooplankton volumes in CalCOFI time series). Sufficient recruitment information may now be available from recent stock assessments to test for regime effects in groundfish stock productivity, and a rigorous analysis would benefit management. No clear evidence has been presented for a productivity response to environmental conditions in groundfish stocks, possibly due to life history traits, such as longevity, delayed age at maturity, and the presence of numerous year classes in the spawning biomass. However, it may be a relevant management issue for groundfish, particularly for those stocks in need of formal rebuilding. Possible environmental effects on productivity are a germane management issue, as demonstrated by its inclusion in the sardine harvest control rule.

Cowcod 1999

1. The analysis of the recreational logbook data made excellent use of available information. An improvement in the precision of this analysis may be possible by using spatially contiguous statistical blocks for determination of habitat areas and aggregation of the data.
2. The extreme decline in recruitment and abundance of cowcod is probably due to a combination of a climate shift (increasing water temperature and decreased ocean productivity beginning in 1977)

affecting stock productivity and the high levels of catch. In order to better distinguish the relative contribution from these two causes and to predict time frames for rebuilding, further research is needed on the effect of the ocean climate on the distribution and recruitment of cowcod.

3. An assessment for cowcod in the areas north of Point Conception should be conducted, especially to improve understanding of the possible climate effects on cowcod in the southern area.
4. Cowcod occur in a mixed species fishery, and are relatively rare components of this fishery. In order to better determine the current level of fishery impacts on this stock, there should be improved species differentiation in the catch, either through increased sampling for species proportions, or by requiring more complete sorting of the catch.

Darkblotched Rockfish 2000

Landings values used in the assessment from the foreign fishery in the late 1960's and 1970's are based for the most part on observations from samples obtained from the domestic fishery. Data from Russian scientific cruises are now available and should be examined to determine if the species composition of the foreign fisheries can be more accurately estimated. In any case a consistent methodology should be developed and documented so that all assessments are working with the same landing data.

Grenadiers

Research is needed to develop information on the biology and population abundance of grenadiers. Since 1995, the fishery has been expanding. An assessment should be conducted in the near term. This effort would be facilitated by separating the catches of Pacific and giant grenadiers in the official landing statistics.

Lingcod (Eureka, Monterey, and Conception INPFC Areas) 1999

1. With the current low level of spawning biomass, sampling opportunities are likely to be reduced along with reduced catches. If nearshore initiatives allow increased sampling in California – some funds should be used to review and improve sample design for lingcod. The Council, state and federal managers may need to consider alternative management approaches if data are inadequate to provide a clear picture of stock status.
2. Estimates of growth parameters should be improved by additional sampling of younger, and perhaps older fish. Methods should be developed to estimate growth parameters and associated transition array within the model.
3. If nearshore management decreases traditionally used fishery-dependent sampling opportunities, new research initiatives should be pursued to increase development of fishery-independent methods of sampling or surveying lingcod populations.
4. Data should be more formally evaluated including a spatial analysis of fishery and fishery independent data. Such analysis should focus on at least two products. First, the statistical structure of the data should be examined with the goal of improving sampling design. Second, models should be reviewed and modified to more accurately reflect distribution of the resource, and the distribution of the fishery in time and space. For lingcod, areas of particular concern is sexual dimorphism, separation of sexes and sizes by area and impacts these population features may have on sampling and interpretation of sampling products in the modeling process.
5. Additional approaches to modeling that might improve assessments should be considered. In particular, exploration of alternative model variance structures [multinomial vs multivariate] was identified as one possible area of fruitful research.

Lingcod (Coastwide) 2000

1. The ADMB models for LCN and LCS were unable to handle length frequency data. The time series of length data for lingcod is much longer than the series of age data. Also, in some cases, length composition data might provide more information for resolving selectivity curves, stock separation, and geographic movements. Future ADMB assessment models for lingcod should be extended to

accommodate length composition data. Alternatively, the length-based version of Stock Synthesis could be used.

2. The apparent discrepancy in age-reading methods between WDFW and Tiburon should be resolved by a controlled experiment of multiple readings by staff from both laboratories. The experiment should use fin ray collections that cover the entire west coast and thus test for potential north-south differences in growth-ring formation.
3. The sex-specific natural mortality coefficients (M) should be reevaluated given the available data on sex ratio and age composition based on the new age-reading criteria. The current assessment uses values for M (0.18/yr for females; 0.32/yr for males) that were based on age composition data derived using the old WDFW age reading criteria.
4. A fishery-independent survey is needed to evaluate changes in stock abundance, especially given recent management measures that undoubtedly have influenced the relationship between fishery catch-per-unit-effort and abundance. The current NMFS trawl survey is not effective at catching lingcod and the survey biomass index is highly variable. Other gear types (e.g., gill-net or longline) might provide a more reliable and useful biomass index.
5. A study should be conducted to evaluate the mortality rates for lingcod that are discarded by the recreational and commercial fisheries.
6. The California recreational CPUE data should be further evaluated and analyzed by development of Generalized Linear Models (GLM) to standardize the data for area, season, and gear-type effects and their possible interactions.
7. Expanded tagging experiments should be conducted to evaluate exploitation rates and geographic movements. Results from the tagging program by WDFW may not be representative of the entire West Coast.
8. Canadian assessment scientists and fishery biologists should be invited to participate in future stock assessment workshops and STAR Panel reviews.
9. The trawl logbook CPUE data should be evaluated using more comprehensive GLM analyses that include provisions for zero-catch hauls and main effects for trawl-type (e.g., roller gear versus flatfish trawl) and season and potential interaction terms.
10. In future assessment reviews that use newly coded models the STAT teams should be required to demonstrate that their software is working correctly, either from simulated test data sets with known characteristics or by reproducing previous assessment results.
11. Lingcod length and age data are needed for the non-trawl fishery and private recreational vessels.

Pacific Ocean Perch 2000

1. The accuracy and precision of stock status evaluations would be increased if more resources were devoted to data collection. For example, the assessment would improve if the 1995 survey ages were processed, discard rate was monitored, age composition of catch was sampled, and frequency of surveys were increased.
2. Investigate methods to estimate the proportion of POP in historical foreign red rockfish catch, including analysis of Soviet exploratory fishing data and domestic trawl fishery species composition data from the same era. Consider the technical merits of developing estimates that are consistent with other rockfish estimates. Information from the Soviet cruises should also be examined for consideration as an index of relative stock size.
3. Re-examine standardization of Pacific Ocean perch CPUE data from the domestic fishery logbook data to confirm abundance index time series for 1956 through 1973.
4. The technical merits and feasibility of assessing the resource as a trans-boundary stock should be considered.
5. Evaluate the advantages and sensitivities of general model features. One is exploration of methods for constraining recruitment estimates and including spawner-recruitment relationships. Another is use of constant fishery selectivity, versus changes in selectivity indexed to known events such as mesh size changes, versus constrained time-varying fishery selectivity. Investigation and guidance on these two issues would be useful for all assessments that use similar models.
6. Collaborate with Canadian scientists to conduct a coast-wide stock assessment for Pacific Ocean perch.

Petrале 1999

1. For juvenile petrale sole it is clear that it is not possible to obtain size at age or abundance indices except through surveys. Need increased survey data, both coverage in terms of increased age sampling and annual surveys. In particular in all surveys should collect age, length and sex samples. Maturity and length relationships are needed for Petrale sole in the late summer and autumn.
2. There is an urgent need for a consistent long-term strategy for sampling for ageing and length measurements from commercial catches. In particular age and length samples are needed from all regions and all years and techniques for age reading should be standardized.

Sablefish 1998

The 1998 sablefish assessment suffered from the need for fishery sample data that were more representative, temporally, spatially, and across gear types. Previous sablefish age sampling programs have not been extensive enough to allow examination of age composition by area, season, and gear type. Failure to account for these components of sablefish catch can lead to biased results and erroneous conclusions. There is a particular need to collect otoliths of sablefish caught in the nontrawl fishery, much of which is headed and gutted prior to unloading. The high percentage of dressed fish in some gear/area strata severely compromises age composition estimates. At-sea collections by observers may be needed to gather the necessary data.

Whiting 1999

Evaluate the effect of using a more straightforward catch-at-age matrix in the stock assessment without the accumulation of "marginal" age groups. The accumulation rules employed in the stock assessment are somewhat arbitrary and further examination may show that such accumulation is unnecessary.

Widow Rockfish 2000

1. The age composition data used in current assessment includes a mix of surface ages and break-and-burn ages and treats them as being equivalent. Future assessments of widow rockfish should evaluate whether there are important discrepancies between the age-reading methods.
2. The current model was unable to handle length frequency data. In some cases, these length data might provide more information for resolving selectivity curves and geographic movements. For future assessments a model should be developed that can use these types of additional data. Alternatively, the length-based version of Stock Synthesis could be used.
3. The panel discussed the STAT Team's approach to power transformation of the mid-water recruitment index and agreed that it was adequate in the current assessment. However, alternative approaches to variance stabilization, such as iterative weighting schemes, might be more appropriate and should be considered.
4. The lack of good fishery independent abundance indices, and conflicts among the indices used, indicate that a hydroacoustic survey for widow rockfish, possibly using industry vessels, could provide invaluable information that would improve the assessment. Recent management measures undoubtedly have influenced the relationship between fishery catch-per-unit-effort and abundance, thus disrupting the consistency of both the trawl logbook CPUE index and the whiting fishery widow bycatch/minute index.
5. The California bottom trawl logbook data should be separated from the midwater trawl data. Catch rates from these distinctly different fishing methods do not necessarily share the same relationship with stock size. For example, midwater CPUE is unlikely to be proportional to stock abundance given unrecorded search effort to locate suitable fish schools.
6. More comprehensive analyses of the Oregon and California bottom trawl logbook CPUE data are required. GLM analyses that include provisions for zero-catch hauls and main effects such as trawl-type (e.g. roller gear versus flatfish trawl) and season, as well as potential interaction terms, would help elucidate issues concerning interpretation of the indices.
7. All widow rockfish collected during surveys should be measured for length and sex and otoliths should be taken. These extra data would clearly help provide information on the size, age and sex structure of the population, as well as lead to improved interpretation of the survey indices themselves.

8. A fecundity study, especially to determine the fecundity of small fish, would update current estimates and improve confidence in their values. The current assessment used an assumed relationship for fish in the south. However, a member of the STAR Panel checked fecundity estimates available from Southern CA Bight and found little discrepancy with relationship used in current assessment.
9. The NMFS triennial bottom trawl survey data should be examined more closely to reconcile the discrepancies between the survey trends and the apparent population trends based on the population dynamics model.
10. In future reviews of assessments that use newly coded models, the STAT Teams should be required to demonstrate that their software is working correctly, e.g., from simulated data or by reproducing previous assessment results.
11. Future coastwide assessments of widow rockfish should re-examine the sensitivity of the North-South biomass division, and determine whether and how this biological separation might affect the population dynamics and the fishery.

Yellowtail Rockfish 2000

Prioritized recommendations:

1. Increase the frequency of the trawl survey.
2. The presently used maturity/fecundity ogive should be updated to include the observed changes in growth.
3. An updated estimate of discards should be made, especially in the light of increased regulations.
4. Evaluate factors that could cause year-to-year changes in trawl survey catchability.
5. Include the trawl survey information within the Canadian portion of the Vancouver area.
6. Examine trawl survey data to better estimate growth of young fish.
7. Re-evaluate North Columbia/South Columbia border based on locations of aggregations in the trawl survey and in fishery logbook data.
8. Tissue samples should be collected for DNA analysis of stock structure.
9. The status of yellowtail rockfish south of Cape Mendocino is unknown. This could be investigated either as a southward extension of this assessment, or as a component of a multi-species investigation of rockfish species in the south.
10. Hook and line and recreational data should be included in the assessment, especially when the assessment is extended south of Cape Mendocino.
11. If the whiting bycatch CPUE is going to be used in the future, then a GLM approach should be used to incorporate a month/area effect.

WEST COAST FISHERIES ECONOMIC DATA PLAN

DRAFT

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TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY	ES-1
1.0 INTRODUCTION	1-1
1.1 Problem Statement	1-1
1.2 Objectives for the Collection of Economic Data	1-2
1.3 Objectives for the Data Plan	1-2
2.0 THE ECONOMIC DATA NEEDED	2-4
2.1 Commercial Harvesting	2-1
2.2 Commercial Fish Buying and Processing	2-2
2.3 Charter Vessels	2-3
2.4 Recreational Fishers	2-3
2.5 Fishing Communities	2-5
3.0 PLAN FOR ACTION	3-1
3.1 Priority Projects	3-1
3.1.1 Commercial Fisheries (Harvesters and Processors)	3-3
3.1.1.1 Maintain and Enhance PacFIN and Data Access	3-3
3.1.1.2 Develop a Harvester and Processor Stratification System (PSMFC Economic Data Project)	3-3
3.1.1.3 Prioritize the Needs for Data on the Commercial Fishery	3-3
3.1.1.4 Complete the Economic Cost-Earnings Data Collection Pilot Project (PSMFC Cost-Earnings Project)	3-3
3.1.1.5 Maintain the Fishery Economic Data Collection Program	3-3
3.1.3 Recreational Charter Businesses	3-4
3.1.1 Commercial Fisheries (Seafood and Recreational)	3-4
(a) Maintain and Enhance PacFIN and Data Access	3-4
(b) Maintain the Fishery Economic Data Collection Program	3-4
3.1.32 Recreational Fishers	3-5
3.1.53 Communities	3-5
3.1.64 Habitat	3-6
3.1.75 Special Projects	3-6
3.2 Implementation	3-6
3.2.1 Commercial Fisheries (Seafood and Recreational)	3-7
3.2.2 Charter Businesses	3-7
3.2.2 Recreational Fishers	3-7
3.2.3 Communities	3-7
3.2.4 Habitat	3-7
3.2.5 Special Projects	3-7
3.3 Guidelines for Development of Data Collection, Management, and Dissemination	3-7
APPENDIX A	
APPLICATIONS FOR ECONOMIC DATA	A-1
Types of Management Actions Which May Need to Be Analyzed	A-1
Commercial Harvester Regulations	A-1
Commercial Processors and First Fish Buyer Regulations	A-1
Recreational Fishery Regulations (Including Private and Charter Recreational Harvesters)	A-1

Types of Economic Analyses and Data Required	A-2
Financial Analyses	A-2
Input/Output Impact Analysis	A-2
System Behavior Analysis	A-2
Cost-Benefit Analyses	A-3
Risk and Trade-off Analysis	A-4
APPENDIX B	
CORE DATA NEEDS	B-1

LIST OF TABLES

	<u>Page</u>
TABLE 1. Outline of requirements for each section of a groundfish fishery management plan (FMP) amendment package and identification of potential contributions by economist	T-1
TABLE 2. Economic data needed on commercial seafood harvesters.....	T-5
TABLE 3. Economic data need on commercial processors.....	T-8
TABLE 4. Economic data need on recreational charter vessels.....	T-10
TABLE 5. Economic data need on recreational fishers	T-12
TABLE 6. Economic data need on fishing communities	T-13

LIST OF FIGURES

	<u>Page</u>
FIGURE ES-1 West Coast Fisheries Economic Data Plan	ES-3
FIGURE ES-2 West Coast Fisheries Economic Data Program	ES-4

EXECUTIVE SUMMARY

This document is a data collection plan developed by Pacific Fishery Management Council (Council) in consultation with National Marine Fisheries Service (NMFS) economists and the Pacific States Marine Fisheries Commission. Implementation of the plan benefits both state and federally managed fisheries. While the plan has been adopted by the Council, the Council has neither the resources nor personnel to implement the plan. Implementation and success depends on continued funding and commitment of the agencies and agency personnel to the concepts embodied in this plan.

Economic data are needed for fishery management. Marine and anadromous fisheries are managed under a complex set of goals and objectives related to preserving the resource and meeting the needs of the fishing industry, consumers, and fishing communities. The common property nature of the resource combined with these publicly mandated goals and objectives result in regulations that are greater in number and more intrusive than for many other industries. A consequence of the intense regulatory environment is a greater need for economic information than for other less regulated industries. The Magnuson-Stevens Fishery Conservation and Management Act, the Regulatory Flexibility Act, the National Environmental Policy Act, and executive orders such as E.O. 12866 on Federal Regulations all require consideration of economic impacts of government regulations. The demand for economic information becomes even more acute when allocational issues are involved. The widening gap between fishing capacity and allowable harvest has resulted in an increasing number of management actions with direct and indirect allocational implications. Better economic data would result in more complete and higher quality analyses. Failure to adequately consider economic effects of regulations may result in development of unacceptable or ineffective regulations and can result in lawsuits challenging the regulations.

Current economic data fall short of the need. Much of the needed economic data are unavailable or of poor quality. When the need for an economic analysis to support a particular fishery management decision becomes apparent, it is generally too late to initiate a data collection effort that can be completed in a timely fashion. Additionally, when the industry is asked to provide information in a data collection effort related to a specific controversial management issue, questions arise regarding data reliability.

This plan (Figure ES-1) specifies a program for the collection and dissemination of economic data (Figure ES-2). The West Coast Economic Data Plan is intended to assist in ~~provide a coordinating instrument for development and implementation of~~ a coordinated, systematic approach to acquiring the needed economic data in a consistent and timely manner. ~~When implemented, it suggests will provide a direction for the development of efforts to collect economic data, ensuring that various data collection activities are integrated with each other, helping avoid duplication of data collection efforts, and providing for the efficient dissemination of data while preserving confidentiality. The expected end result of the data plan is the implementation of a West Coast Fisheries Economic Data Program.~~ This plan was first adopted by the Council in 1998. Since that time, a number of activities that address some of the elements have been initiated including cost-earnings surveys for various fishery management plan fisheries, community impact analyses, and other studies. Many of these efforts are embodied in the PSMFC's Fisheries Economics Data Program. The Fisheries Economics Data Program is a cooperative data collection program of the PSMFC and NMFS with the help of the Pacific and North Pacific Councils.

The plan covers all West Coast fisheries and includes interfaces with other data systems. The scope of the plan is the economic data needed for management of fisheries covered by Pacific Fishery Management Council (Council) fishery management plans and other marine and anadromous fisheries in the Washington, Oregon, California, and Idaho area. The primary focus of activity for the plan is gathering and disseminating information related to West Coast fisheries, and, as appropriate, coordination of those activities with similar programs for Alaska and the West Pacific. The plan also specifies ~~a database development, coordination and information dissemination functions with respect to economic data collected in geographic areas and for information on industry sectors related to fisheries through impacts on fish habitat.~~ The database systems created should readily interface and provide agreed upon core information needed for the National Fishery Information System and Vessel Registration System.

The plan specifies-identifies the major high priority projects needed and recommends guidelines for their implementation. The plan recommends Ppriorities for the collection of specific data elements would be determined by steering committees for each project. The steering committees would include representation from NMFS, Pacific States Marine Fisheries Commission, and the Council. Individual projects would be designed to minimize the burden on industry and preserve confidentiality. Developing industry confidence and a cooperative long-term relationship is an important guiding principle for the projects (Section 3.3). An important element of many of the projects will be developing cooperative efforts with existing projects that focus on the collection of noneconomic data.

Core Economic Data Needs. The following table lays out some of the major categories of core economic data for which substantial improvement is needed. These data needs are covered in greater detail in the tables referenced under each category.

Harvesters (Table 2)	Processors (Table 3)	Charter Vessels (Table 4)	Recreational Fishers (Table 5)	Communities (Table 6)
	Revenue Data	Revenue Data	Effort and Catch by Target Species	Tax Revenues
Cost Data	Cost Data	Cost Data	Cumulative per Angler Catch and Effort	Fishery Related Economic Infrastructure
Employment and Income	Employment and Income	Employment and Income	Trip Costs and Angler Demographics	Fishery Related Employment and Income
Capacity Information			values and Preferences Held by Anglers with Respect to Species, Sites and Regulations	Geographic and Physical Characteristics

Funds. For 1998, the expenditures on economic data collection projects which have been undertaken and would be integrated under this plan total approximately \$600,000. These projects are identified in Figure ES-2 and in Section 4 of the plan. There are some additional unfunded start-up projects that have been identified. Once projects have been initiated ongoing funding needs of \$950,000 have been identified. There are some areas where economic data collection is needed for which specific projects and funding needs have yet to be identified. Once developed, these projects will add to the total funding needs. These funds are needed to support management decisions affecting a West Coast commercial fishing industry fisheries which generated close to \$400 million in exvessel revenue and supported approximately five million to six million recreational angler trips in 1996. This plan seeks funds (\$150,000 annually) to maintain efforts to collect and disseminate economic data for commercial fishing businesses (seafood and recreational, Section 3.1.1), \$450,000 for recreational fishers (Section 3.1.2), and \$150,000 for community-related projects (Section 3.1.3). In addition, it is recommended a special projects fund be created (\$150,000 annually) for the purpose of augmenting ongoing baseline data collection efforts with coordinated special data collection activities to respond to specific questions that arise from year to year (Section 3.1.5). These projects are identified in Figure ES-2. There are some additional unfunded start-up projects that have been identified. Funding needs for the collection of economic data related to habitat have yet to be identified (Section 3.1.4). Excluding PacFIN, RecFIN, and the unidentified amount needed for data on habitat, but including an annual effort to collect socioeconomic information from recreational anglers, the total identified ongoing funding needs come to \$1,250,000 with an additional \$155,000 needed for initial start-up projects related to communities. These funds are needed to support management decisions affecting West Coast state and federally managed fisheries that, in 1999, generated \$340 million in exvessel revenue (all commercial fishtickets for marine and anadromous species landed on the West Coast) and supported approximately 11.6 million recreational angler trips (total marine trips as reported by RecFIN).

Figure ES-1. West Coast Fisheries Economic Data Plan

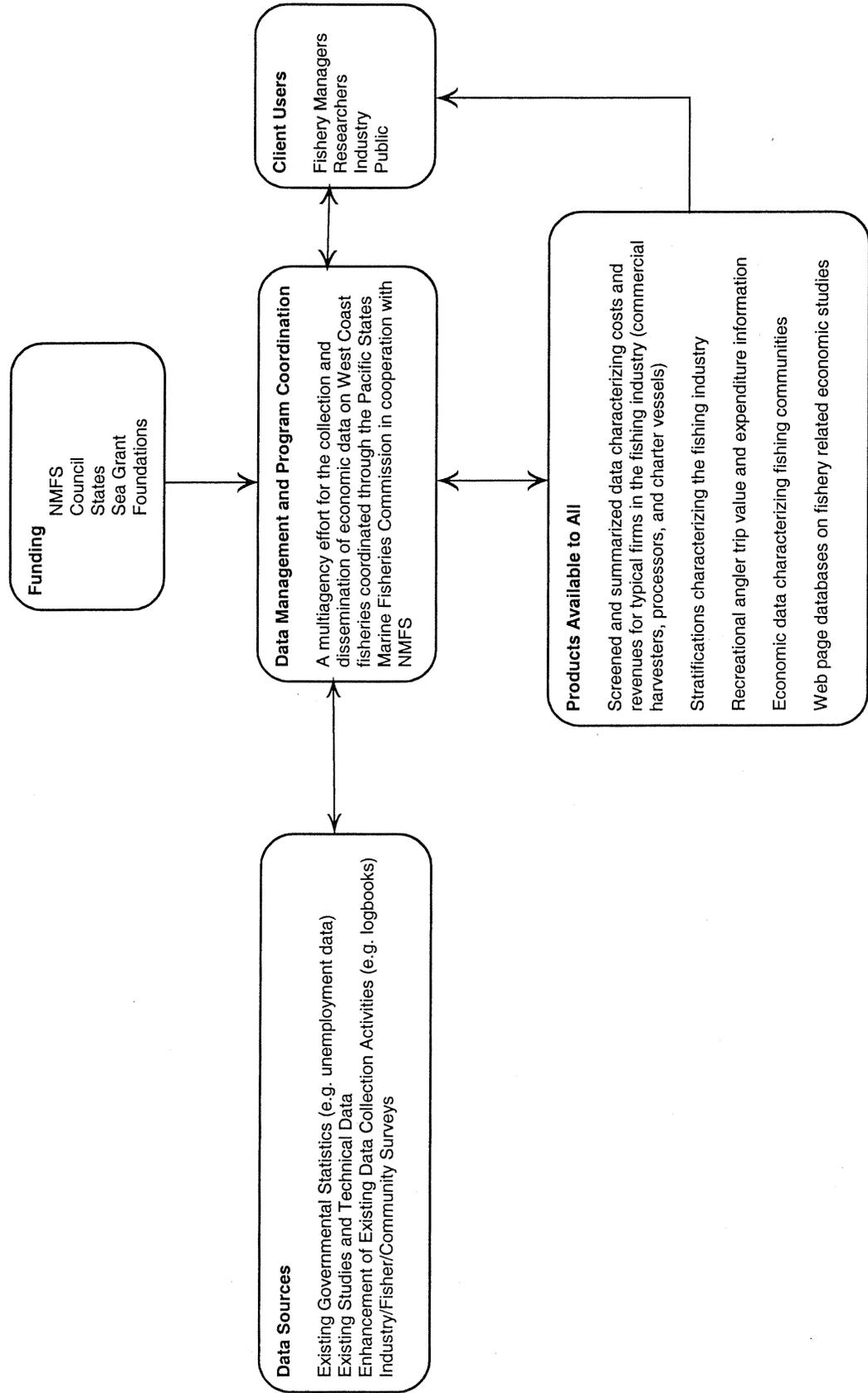
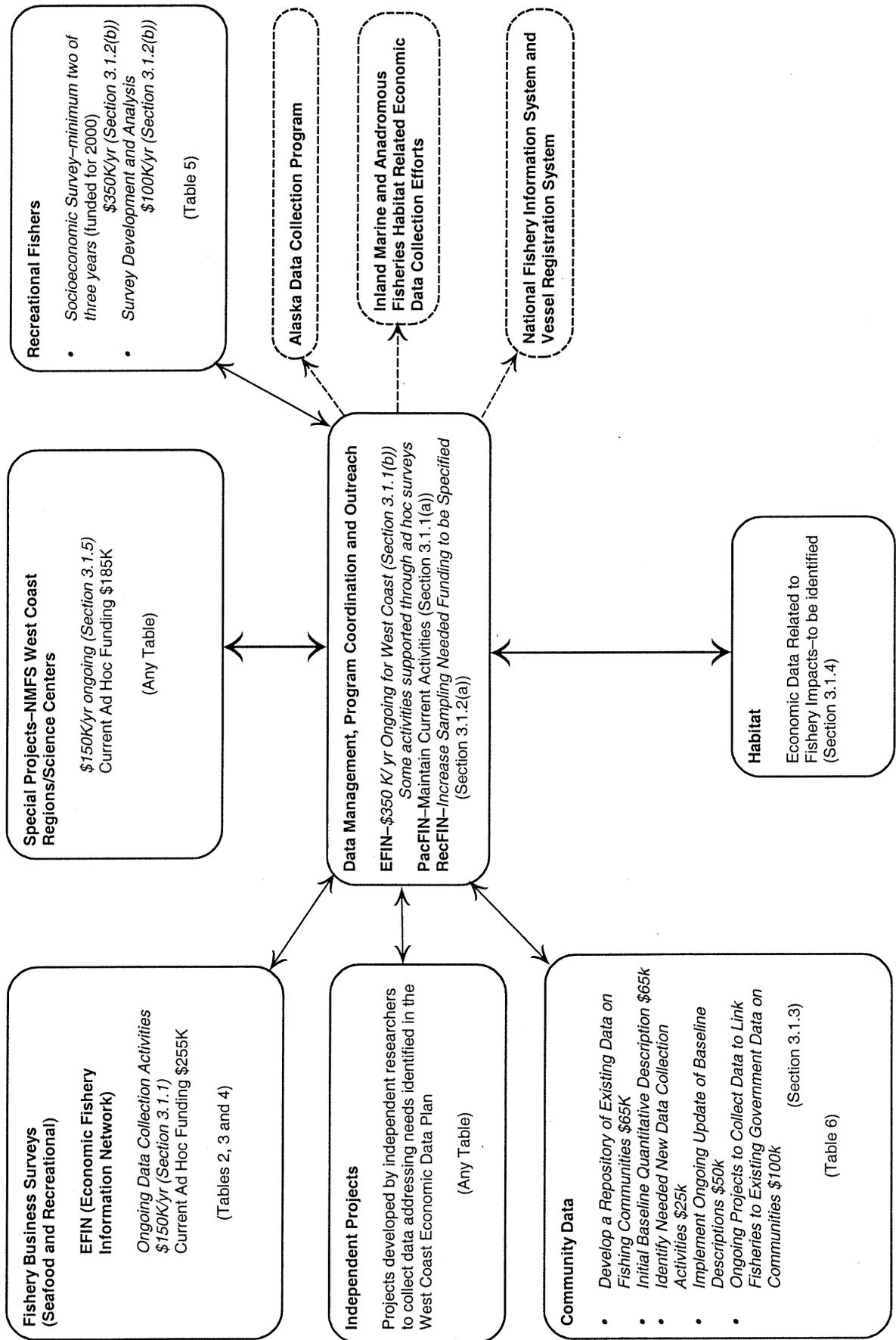


Figure ES-2. West Coast Fisheries Economic Data Program (italics indicate projects for which funding needs have been identified but not met).



1.0 INTRODUCTION

The West Coast Economic Data Plan is intended to provide a framework that depicts how different data collection efforts fit together, helps avoid duplication of data collection efforts, assists in integrating data collection efforts, and serves as a coordinating instrument for the development and implementation of a systematic approach to the fulfillment of economic data needs.

~~The West Coast Economic Data Plan is intended to provide a coordinating instrument for developing and implementing a systematic approach to acquiring the needed economic data in a consistent and timely manner. When implemented, it will provide a direction for the development of efforts to collect economic data, ensuring that various data collection activities are integrated with each other, helping avoid duplication of data collection efforts, and providing for the efficient dissemination of data while preserving confidentiality.~~ An economic data plan for the West Coast is needed to provide a coordinating instrument for developing and implementing a systematic approach to acquiring the needed economic data in a consistent and timely manner. This plan suggests will provide a direction for the development of efforts to collect economic data, ensuring that various data collection activities are integrated with each other, helping avoid duplication of data collection efforts, and providing for the efficient dissemination of data while preserving confidentiality. The needs for economic data are those of fishery managers, the industry, and general public. The scope is the economic data needed for management of fisheries covered by Pacific Fishery Management Council (Council) fishery management plans and other marine and anadromous fisheries under the jurisdiction of the states in the Council area.^{1/} The scope includes economic data needed for all Council-managed species (currently groundfish, salmon, coastal pelagics, and halibut)^{2/} as well as other West Coast fisheries. Both the commercial and recreational fisheries are included within the scope, as are the communities of which these sectors are a part. The commercial sector is divided into harvesters and processors, and the recreational sector is divided into the recreational fishers and the charter vessels catering to those fishers.

1.1 Problem Statement

Marine and anadromous fisheries are managed under a complex set of goals and objectives related to preserving the resource and meeting the needs of the fishing industry, consumers, and fishing communities and the trust interest of the general public. The common property nature of the resource combined with these publicly mandated goals and objectives result in regulations that are greater in number and more intrusive than for many other industries. A consequence of the intense regulatory environment is a greater need for economic information than for other less regulated industries. The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the Regulatory Flexibility Act, the National Environmental Policy Act, and executive orders such as E.O. 12866 on Federal Regulations all require consideration of economic impacts of government regulations (Table 1). The demand for economic information becomes even more acute when allocational issues are involved. The widening gap between fishing capacity and allowable harvest has resulted in an increasing number of management actions with direct and indirect allocational implications. Better economic data would result in better more complete analyses. Failure to adequately consider economic effects of regulations may result in development of unacceptable or ineffective regulations and can result in lawsuits challenging the regulations. Ongoing data collection is needed to monitor and evaluate the health of the industry and provide managers with information on the consequences of their actions so that appropriate adjustments can be made and repetition of poor policy choices avoided.

While the need for fisheries-related economic data is apparent, there are many shortcomings in the ~~state~~ of the current collection and management of such data:

1. Much of the needed economic data have not been collected, is unavailable, or of poor quality.
2. When the need for an economic analysis to support a particular fishery management decision becomes apparent, it is generally too late to initiate a data collection effort that can be completed on time to support the required analyses.

1/ The specified scope includes state managed fisheries. This is consistent with the scope of the national fishery information system mandated under the Sustainable Fisheries Act and is in line with the broader interests of Pacific States Marine Fisheries Commission (PSMFC) and the states.

2/ A plan for highly migratory species is under development.

3. When the industry is asked to provide information in a data collection effort related to a specific controversial management issue, questions arise regarding data reliability.
4. Most of the efforts to collect economic data in the past have occurred in numerous short-term, ad hoc projects managed by different economists. ~~The data resulting from the projects generally reside in the offices of the individual economists who have managed these projects.~~ Efforts need to continue to bring these data into documented and accessible repositories with appropriate protections for confidential information. Other economic data are dispersed among a wide variety of data sources, and information about the data and its quality is not readily available to other analysts.
5. Database structures, fields, units, and coding are not consistent among data sets.
6. Duplication of effort, higher-than-necessary costs and greater-than-necessary industry burden could result from lack of coordination between economic data collection efforts and between efforts to collect economic and noneconomic data. Similar situations may occur with respect to the management of the repositories for such data.

1.2 Objectives for the Collection of Economic Data

Objective: Provide economic information and analyses needed for fisheries management of fisheries to achieve a broad variety of objectives including protection of the fishery resource, habitat, and ecosystem, as well as social and economic objectives. (Mandates which require the use of economic information include the Magnuson-Stevens Act, Executive Order 12866, the Regulatory Flexibility Act, and the National Environmental Protection Act [Table 1].)

The types of economic information and analyses needed include the following.

1. Baseline descriptions of the fishing industry (commercial and recreational, including charter) and communities including measures of economic performance over time, ~~and~~ assessments of user and community dependence on the fishery and specific harvest areas.
2. Predictions and estimates of economic impacts of management measures and fishery developments on groups (e.g., crew members, coastal communities, fishing communities, vessel owners, enforcement agencies, processor workers), including impacts on personal income, employment, financial viability, and agency/government budgets.
3. Predictions of responses to management regulation and market changes.
4. Predictions and estimates of regulation-induced changes in net economic value of fishery resources.
5. Evaluations of cost effectiveness of government fishery management activities.

1.3 Objectives for the Data Plan

Objective 1: Generate systematic, efficient, and coordinated economic data collection efforts.

Actions Specified to Meet the Objective

1. Identify data needs.
2. Identify and pursue high priority data collection projects and the financial and personnel support required.
3. Modify existing organizational structure and processes as necessary to facilitate coordination of economic data collection activities.
4. Specify and implement guidelines for development and management of a system for the collection of economic data.
5. When practical and appropriate, integrate West Coast data planning, collection, and management efforts with Alaska and Western Pacific efforts.
6. Assist independent researchers (i.e., university and Sea Grant researchers) in identifying, developing, and seeking support for projects which will provide needed data to West Coast fishery management economists.

Objective 2: Develop integrated and efficiently accessible data and information repositories.

Actions Specified to Meet the Objective

1. Identify high priority data management and dissemination projects and the financial and personnel support required.
2. Modify existing organizational structure and processes as necessary to develop a data repository and data dissemination system.
3. Specify and implement guidelines for development and management of a system for the evaluation, holding, maintenance, and dissemination of economic data.
4. To the extent practicable, ensure that collected data are specified, formatted, and coded so that they are compatible with the Fishing Vessel Registration and Fisheries Information Management System.

2.0 THE ECONOMIC DATA NEEDED

This section presents core economic data needs at a very general level. Core data needs are described as those essential for economic analysis that need to be collected on a periodic basis. During a December 1996 meeting of West Coast fishery economists a more detailed list of core data needs was developed. These are provided in Appendix B. Prioritization of data needs is difficult, because incompleteness in the data in any of the below categories can often create enough uncertainty regarding the direction of a result to render the analysis equivocal in its conclusions.^{3/} Priorities for specific data needs within these broad categories should be determined as part of the scope of projects initiated to collect the needed data. Additional detail on the types of data needed and an assessment of current availability is provided in corresponding tables.

2.1 Commercial Harvesting

Exvessel Value (Price and Quantity)

Exvessel value may be the highest priority data need, because it provides a starting point that sets a likely upper bound on the net value that may be generated from harvesting (Table 2). It also provides the total amount of revenue which must be divided into different expenditure categories for input-output analyses. For financial analyses it provides half the equation for evaluating the financial viability of the firm.

Exvessel values are currently collected through Pacific Coast Fisheries Information Network (PacFIN). Uncertainties regarding the values in PacFIN have to do with the form in which the product is delivered (level of processing prior to first delivery), the meaning of size categories (it is believed that there is some variability in size categories by year and area), and whether buyers have provided or received compensation in addition to the sale price of the fish (e.g., provided ice or additional compensation not recorded on fish tickets). Information on area of catch is needed on a finer geographic scale in order to understand fisheries/habitat interactions the effects area closures, such as marine reserves, may have on the industry and communities.

Harvester Costs and Effort Information

Cost and expenditure information is needed for financial analysis of the effects of regulations on fishing businesses, estimates of personal income generated in local communities, and cost-benefit analyses. In order to understand the long-term effects of regulations, a better understanding is needed of how harvesters may respond. This requires revenue and cost information for not only the vessels activity in the fishery to which the regulations being considered will apply, but also the other fisheries in which the harvester participates or may turn to in the face of increasing regulation.

Closely related to the cost and revenue information are measures of effort. Measures of effort may be in terms of factors such as soak or tow time and numbers of hooks or size of mesh and nets used. Effort information is the critical link between marginal costs and marginal revenue. Most fishery regulations are directed at modifying the duration or effectiveness of effort. Thus cost and revenue information needs to be characterized in terms of units and quality of effort. In order to assess need for marine reserves, evaluate baseline and project economic impacts, effort information is needed on a finer geographic scale than is currently collected through means such as log books.

A complete harvester behavioral response analysis or cost-benefit analysis of harvesting activities would require estimates of all production costs including information on debt burden and available capital. The largest single cost of any harvesting operation is generally labor. Crew labor often constitutes between 30% and 50% of total variable costs. For cost-benefit analyses and behavioral analysis, opportunity cost of labor is needed. Knowing the opportunity costs of labor may narrow the range of possible net benefits more than

3/ This is a particularly sensitive problem when allocational issues are involved.

any other single input. Financial analyses and input-output analyses of income impacts require information on actual payments to labor. For income impact analyses, the single most important element of the expenditures are the direct income payments (payments to labor and owner profits). The effect on the income impact results from misspecifying the amounts spent on any other item in the firm budget is relatively minor compared to a misspecification of the amount going to direct income.

There is currently no systematic and consistent collection of harvester cost data. Various ad hoc studies have been conducted, however, the information is often difficult to access, outdated, and not specified and disaggregated to the level needed for economic analysis of regulatory effects.

Ownership

It is usually assumed vessels and business firms are equivalent units; however, many businesses take part in the ownership of more than one vessel (horizontal integration), and some vessels are owned by firms that also own processing facilities (vertical integration). In order to understand the impacts of regulations such as owner-on-board provisions or the elimination of foreign ownership rights in the industry (provisions that might be considered or congressionally mandated under future individual quota programs), more information is needed on the forms in which vessels are owned and degrees of horizontal and vertical integration, including exclusive marketing contracts.

2.2 Commercial Fish Buying and Processing

Exprocessor Values (Price and Quantity) and Product Recovery Rates

Cost and revenue information is also needed for processors. As with the harvesting sector, exprocessor values provide a likely upper bound on the total net value generated by the time the product leaves the processor level. Product recovery rates help relate volume of raw product to total output. When exvessel and exprocessor values are known, likely upper bound for the total net value generated at the processor level can be generated. The role of exprocessor values in financial and income impact analyses is similar to that described for exvessel values.

Some exprocessor values are collected through annual processed product surveys conducted by the NMFS regional offices. These surveys were initiated for the purpose of allocating Saltonstall-Kennedy Act funds between regions of the country. In the past, there have been substantial questions about the reliability of the exprocessor value information collected through these surveys. Concerns center around accuracy and completeness of the information provided and whether or not the information is representative of the processing industry.

Processor Costs

Fishtickets provide information on raw product costs. Labor may comprise a smaller component of processing costs than it does of vessel costs, however, it remains an important component for the purposes of income impact analysis and understanding the place of the processor in the local economy (see Section 2.5). As discussed above with respect to harvesters, for income impact analysis proper identification of expenditures going directly to personal income is one of the most important steps in developing an accurate assessment of income impacts.

Information on processing costs is sparse. The best information available is probably on whiting processing, because of surimi production feasibility studies conducted in the 1980s, and because of data collection efforts in response to whiting allocation battles in the 1990s.

Ownership

The paragraph on ownership in Section 2.2 also applies to processors.

2.3 Charter Vessels

The information needed for charter vessels is similar to that needed for the commercial harvesters discussed in Section 2.1 (Table 4). There is probably less cost and revenue information on the charter vessel sector than any other sector of the fishing industry. In comparison to the commercial harvest sector for which there is substantial harvest and revenue information from fishtickets, there is only limited collection of vessel-specific harvest information for charter vessels. Revenue information may be the highest priority need, for reasons similar to those stated for harvesting vessels. There have been few ad hoc studies focused on the acquisition of economic information on charter vessels. Recently, NMFS has provided some onetime funds for a survey of charter vessels. Some of the initial pieces of information which would be useful ~~by vessel~~ are types of charter activities engaged in, by vessel, typical fees charged for each type of activity, and total revenues. To understand the relationships between management actions and charter vessel activities, this revenue information needs to be available in the context of units of production (numbers of vessel trips and angler trips), amounts of resource consumed (catch information), ~~and~~ time of year and specific location of catch (important for considering local area closures). This information is analogous to catch weight, price, and trip information conveyed by commercial fishery fishtickets. Labor and other cost information would be needed to conduct full financial and cost benefit analysis. Also needed is vessel information such as vessel size and passenger carrying capacity.

2.4 Recreational Fishers

The central repository for recreational fishery data (RecFIN) primarily contains information generated from the Marine Recreational Fisheries Statistics Survey (MRFSS) survey and some data from the state sampling programs. ~~This~~ The MRFSS ~~survey~~ is designed to provide state level annual estimates of effort, catch, and discards. To avoid duplication of sampling effort, MRFSS sampling does not customarily occur in fishing modes, areas, and times of year when the states conduct their own recreational sampling programs. Some variables that are critical for conducting economic analysis (e.g., number of trips by target species, area of residence of the angler) are not consistently collected across all sampling programs. However, in the last few years NMFS funded economic surveys have been conducted in connection with MRFSS, and the needed data has been collected for all modes and times. The need for data to support the economic surveys has sometimes resulted in more overlap with state sampling program.^{4/} It is important that effort, catch, target species, and other variables that are critical for economic analysis be available in a comparable manner for all segments of the recreational fishery in all years.

Programs are being developed to apply post-stratification techniques to MRFSS data in order to generate estimates at lower levels (for example, local level as opposed to state level and two-month periods rather than annual). The level of sampling for MRFSS is not high enough to provide precise estimates at these lower levels or for two variables at the same time (for example, the number of trips targeting on a species using a particular mode. This makes it very difficult to adequately answer questions such as "How dependent is Lincoln County and its recreational fishing industry on new money attracted to the area by lingcod fishing opportunities?" The Council has recently undertaken consideration of marine reserves. Accurate projection of the impacts of creating marine reserves would require knowing not only what port recreational fishers departed from, but also the area in which they fished. The MRFSS field survey is asking fishers to more precisely identify the area in which they fish. More ~~complete~~ and refined estimates of catch, discards and effort by mode of fishing, target species and geographic areas are needed (Table 5). These estimates would provide starting points for baseline assessment of the importance of the recreational fishery to the local areas; empirical information for projection of responses to changes in management regulations; and information needed to improve estimates of the values anglers place on the fishery. ~~At present there are gaps in the MRFSS field sampling effort that make it difficult to identify the number of trips targeting on a particular species and the residence of the angler. For Washington this information is complete mission for coastal trips, for Oregon it is missing for trips taken in July and August, for California target species~~

4/ On other occasions where MRFSS and state sampling have occurred concurrently, differences in the resulting estimates of effort and catch have generated confusion regarding which sets of estimates should be used to evaluate the effects of management actions. Attempts to resolve these discrepancies are expected to result in improvements to both the MRFSS and state sampling programs.

information is missing for party boat trips north of San Luis Obispo for July-December in recent years. Additionally, the level of sampling for MRFSS is so low that it is difficult to use the information to assess effort at less than the state level or for two variables at the same time. For example, the confidence intervals around estimates of the number of trips targeting on a species using a particular mode (e.g. shore, private, or charter) is large and substantially larger when such a question is of interest for a particular port. This makes it nearly impossible to answer questions such as "How dependent is Lincoln county and its recreational fishing industry on new money attracted to the area by the opportunity to fish lingcod?"

The two of the other major types of economic information needed on recreational fishers are consumer surplus and expenditure information. Consumer surplus provides information on the value anglers place on a particular fishing experience and—Information is needed not only on the dollar values anglers place on a particular experience, but also on how that value changes by fishing area and management regulations and the value of the experience relative to other activities in which the fisher might engage.—Consumer surplus information is needed in detail that is sufficient to predict angler response to changing management regulations. Expenditure information can be used for the generation of estimates of consumer surplus and has immediate use for developing estimates of personal income associated with recreational fishing and the dependence of communities on recreational fishing.

Travel cost and contingent value models^{5/} are often used to generate estimates of consumer surplus. Information for these models is collected through carefully structured surveys. There have been a number of travel cost and contingent value studies conducted for West Coast recreational fisheries. More have been conducted for salmon than for other species. Generally, not all of the needed information is captured in a single survey. Information is needed not only on the dollar values anglers place on a particular experience, but also on how that value changes by fishing area and management regulations and the value of the experience relative to other activities in which the fisher might engage. Often missing from the travel cost and contingent value studies is information on how the estimated values, and hence angler effort, would vary depending on the fishery management regulations in place.— This information on fisher values can be used to Ppredictions of behavioral response to regulations, are needed both—and so to estimate the effect of regulations on economic activities in local communities as well as to modeling the conservation effects of the regulations. For example, in response to a reduced bag limit, do fishers continue to spend the same amount of time going after their target species, target on alternative species, or cease marine water fishing in favor of other recreational activities? For purposes of predicting fisher behavior, ranking of relative values of alternative recreational activities may be more important than generating dollar estimates of the value of different experiences. In 1998, the annual MRFSS survey was augmented with socioeconomic questions designed to generate travel cost estimates and ask contingent behavior response questions. These contingent behavior questions will provide some information of relative value and behavior response for different management regulations. These data are currently being analyzed. In 2000, the MRFSS is being augmented with socioeconomic questions designed to generate estimates of the economic impact of the recreational fishery on local economies.

The current NMFS plan to conduct a recreational fishery socio-economic survey on the West Coast once every three years is not considered to be adequate for West Coast needs. While there is an overlap in the information needed for estimates of the economic impacts of recreational fishing activities and for consumer surplus, the information needed is different enough between the two that it must be gathered in separate surveys. If the survey alternates between emphasis on development of estimates of economic impacts and estimates of consumer surplus then a survey emphasizing consumer surplus would occur only once every six years. There are a number of factors that make it difficult to make a comprehensive estimate of the value of various types of recreational fishing experiences in a single year. These factors include: low contact rates for fishers who participate in the particular kind of recreational fishing activity for which a value estimate is sought, and between year differences in the quality of recreational fishing opportunities due to variation in the fishery management regulations and recreational fishing opportunities available (particularly when large scale events are occurring such as major restrictions in the salmon fishery and el nino related shifts in the available ocean species). Additionally, there is enough uncertainty about the appropriate survey

5/ Contingent value models generally rely on fishers response to questions posed regarding their willingness to pay for fishing or accept compensation in return for not fishing.

questions to use for generating various estimates of recreational values and enough different aspects of the recreational values that need to be measured that subsequent surveys will be required to validate initial results and further explore the characteristics of fishing trips which change the value of such a trip to the angler. In particular, there is will likely be an ongoing need to evaluate likely angler response to different types of fishing regulations. All of these factors lead to the conclusion that a survey focused on estimating consumer surplus needs to be conducted more frequently than once every six years. An increase in funds to carry-out surveys would need to be accompanied by increased funds for survey design and analysis of results.

2.5 Fishing Communities

Fishing and fish processing operations interact with communities through the jobs provided, tax revenues paid, and public services and infrastructure required. The development of a fishing community in a particular location may depend on services and infrastructure available at a port, protection from ocean conditions, ocean access, and proximity to exploitable fish populations and major population centers. The latter of these factors are classified here as geographic and physical characteristics of the port. The following are the data collection needs related to fishing communities (Table 6).

Employment and Income Provided

Information is generally readily available on total employment and income levels and income classes in a particular community. To relate these general statistics to the fishery, information is needed on employment generated by the fishing industry and income levels of the participants. The high priority types of information needed by job class are number and duration of jobs, wages paid, and employee total household income. Information on wages is covered under the costs sections for harvesters, processors, and charter vessels.

Tax Revenues

Information is needed on the amount of tax revenue generated by the fishing industry. Information on local tax payments is needed in the context of local area governmental budgets. Some information on tax revenues generated for state and local communities may be forthcoming as part of the effort to meet the needs for cost data for each sector discussed above.

Public Services and Infrastructure

The public services and infrastructure required by the fishing industry may either burden or benefit the local community. Needs for electrical services or the treatment of sewage outfall may place a burden on the local community. On the other hand, the commercial activities generated may provide the justification for public works projects such as channel dredging, the major part of which may be financed with external funds and the benefits of which flow to more than just the fishing industry. To fully understand the role of the fishing industry in the economic health of the local community, information should be collected on the local infrastructure which supports the fishing industry and special public projects or expansions of public services related to the fishing industry.

Port Characteristics

Geographic and physical port characteristics include information on geographic proximity to exploitable fishing resources, ease and safety of ocean access, degree of shelter provided by the port, distances to major markets and distribution points for commercial fishing products, and distances to major population centers from which recreational fishers come. ~~which utilize recreational fishing opportunities.~~

Much of this information is likely to be readily available through a few contacts at each port. Information on distances to exploitable fishery resources may be the most difficult to develop. Good quality information collect in response to essential fish habitat concerns may also be useful in describing the potential fishery resource base of a community.

3.0 PLAN FOR ACTION

3.1 Priority Projects

One of the principles for developing this section is that projects be included only if there is a reasonable opportunity for progress in the next two or three years. The intent is to keep the plan workable and within reach so that it can be pursued with the hope of success. At the same time, to improve the current situation the plan must look beyond the resources that are available today.

The following are projects which need to be continued or undertaken as the next steps in developing West Coast fishery economic data. For most projects, an estimate is provided for the funds necessary to support the project. Costs of time and travel are included. Funding estimates are not provided where the next identified step is to develop a project proposal to meet a particular need. No estimates are provided for activities which can be conducted with current personnel as a part of normal work and meeting activities.

The top priority for this plan is to maintain and expand as needed the funding to support current PacFIN and RecFIN projects. The RecFIN project in particular is likely to need additional funds to expand sampling effort to meet needs for management and economic data. ~~Another \$750,000 is sought to maintain annual efforts to collect economic data for the commercial and recreational fisheries (Sections 3.1.1.5 and 3.1.4). Special new projects are identified with total funding requirements of \$180,000 (Sections 3.1.3 and 3.1.5). The new project related to communities may result in ongoing activities that can be maintained at an annual additional expense of about \$50,000. In addition, it is recommended a \$150,000 special projects fund be created for the purpose of augmenting ongoing baseline data collection efforts with coordinated special data collection activities to respond to specific questions that arise from year to year. Funding needs for the collection of economic data related to habitat and the ongoing expense of collecting charter vessel cost information have yet to be identified (Sections 3.1.3 and 3.1.6). Excluding PacFIN, RecFIN, and the unidentified amount needed for data on recreational charter operations and habitat, but including an annual effort to collect socioeconomic information from recreational anglers, the total identified ongoing funding needs come to \$950,000 with an additional \$180,000 needed for initial start-up projects.~~ This plan seeks \$500,000 annually to maintain efforts to collect and disseminate economic data for commercial fishing businesses (seafood and recreational, Section 3.1.1), \$450,000 for recreational fishers (Section 3.1.2), and \$150,000 for community related projects (Section 3.1.3). In addition, it is recommended a special projects fund be created (\$150,000 annually) for the purpose of augmenting ongoing baseline data collection efforts with coordinated special data collection activities to respond to specific questions that arise from year to year (Section 3.1.5). Funding needs for the collection of economic data related to habitat have yet to be identified (Section 3.1.4). Excluding PacFIN, RecFIN, and the unidentified amount needed for data on habitat, but including an annual effort to collect socioeconomic information from recreational anglers, the total identified ongoing funding needs come to \$1,250,000 with an additional \$155,000 needed for initial start-up projects related to communities. The following table summarizes the identified costs and references the section with the corresponding project description.

Project	Funded (1998)	Funds Needed	
		Initial	Ongoing
Commercial Fishery (Harvesters and Processors)			
3.1.1.1			N/A
3.1.1.2	\$50,000		
3.1.1.3	\$60,000		
3.1.1.4	\$125,000		
3.1.1.5			\$150,000
			\$250,000
Charter Vessels			
3.1.3		\$50,000	
			N/A
Recreational Fishers			
3.1.4			N/A
			\$350,000
Communities			
3.1.5		\$65,000	
		\$65,000	
			\$50,000
Habitat			
3.1.6			N/A
Special Projects			
3.1.7			\$150,000
Total for Identified Funding Needs	\$595,000	\$100,000	\$950,000

Project	Current Ad Hoc Funding	Funds Needed for Economic Projects	
		Initial	Ongoing
Commercial Fishing Businesses (Seafood and Recreational)			
3.1.1	\$255,000		\$150,000
	0		\$350,000
Recreational Fishers			
3.1.2			not included
	\$350,000		\$350,000
			\$100,000
Communities			
3.1.3		\$65,000	
		\$65,000	
		\$25,000	
			\$50,000
			\$100,000
Habitat			
3.1.4			not available
Special Projects			
3.1.5	\$185,000		\$150,000
Total for Identified Funding Needs	\$790,000	\$155,000	\$1,250,000

~~3.1.1 Commercial Fisheries (Harvesters and Processors)~~

~~3.1.1.1 Maintain and Enhance PacFIN and Data Access~~

~~Maintain and continue to enhance the PacFIN data system. This system provides West Coast fisheries economists with vessel revenue information for all shoreside landings of marine and anadromous species. This important information is available to economists and others in a number of useful reports and standardized summary files. However, economists often require specialized subsets of this information in order to analyze specific management problems. PacFIN personnel and personnel associated with the PSMFC commercial fishery economic data project provide economists with an important link to this data:~~

~~Augment Current Funding As Necessary to Maintain and Enhance Current Functions~~

~~3.1.1.2 Develop a Harvester and Processor Stratification System (PSMFC Economic Data Project)~~

~~Develop a standardized industry stratification system to assist in the completion of a baseline description of the fishery and provide a framework for organizing a data collection effort. This stratification system may also provide the descriptive framework which may be used to more efficiently and consistently communicate analytical results regarding the effects of alternative management measures on the fishing industry.~~

~~\$50,000 (Currently Funded)~~

~~3.1.1.3 Prioritize the Needs for Data on the Commercial Fishery, Develop a Data Model, and Specify a Data Collection and Dissemination System for Meeting the Needs (PSMFC Cost-Earnings Project)~~

- ~~1. Determine which of the data needs listed in Appendix B are of highest priority and determine whether other needs listed are high priority.~~
- ~~2. Develop data models for meeting the high priority data needs.~~
- ~~3. Identify those high priority data needs best collected in a pilot project focused solely on the collection of economic data and those high priority needs which might be collected as part of other fishery monitoring activities.~~
- ~~4. Begin development of the data system that will act as a repository and dissemination point for economic data. Include as part of the data system Internet access to results from economic studies.~~
- ~~5. Begin development of alternative data sources by pursuing the "add-on" of economic data collection tasks to other fishery monitoring efforts.~~

~~\$60,000 (Currently Funded)~~

~~3.1.1.4 Complete the Economic Cost-Earnings Data Collection Pilot Project (PSMFC Cost-Earnings Project)~~

~~PSMFC has acquired funding for a pilot project for the collection of economic data. The completion of this project is crucial to the long term success of the commercial fishery portion of this data plan.~~

~~\$125,000 (Funded through 1998)~~

~~3.1.1.5 Maintain the Fishery Economic Data Collection Program for Commercial Fisheries~~

~~The cost-earnings pilot project will assist in determining the best way to implement an annual program for the collection of cost and earnings data from harvesters and processors. Funding should be sought to use the results from the pilot project (3.1.1.4) to create an ongoing project which would become a permanent part of the West Coast fishery information system. The ongoing project should include both the extension of the pilot project as a permanent activity and the full development of the data management and dissemination system identified in Section 3.1.1.3. Part of the data management and dissemination project should include development and implementation of estimation routines needed to derive costs estimates~~

from survey results. The funding need for the ongoing data collection activities is \$150,000 per year. The need for the ongoing data management and dissemination system is estimated at \$200,000.

(Maintain current funding and expand as needed, \$350,000 per year)

~~3.1.3 Recreational Charter Businesses~~

- ~~1. Develop an inventory of West Coast recreational fishery charter vessels. Incorporate readily available information on geographic location and other data specified in Appendix B. _____ \$50,000~~
- ~~2. Develop project proposals for the collection of needed data and development of cost-earnings data sets on charter businesses.~~
- ~~3. Acquire the needed funding and implement the project proposals identified in Item 2.~~

(Needed funds to be identified as part of Item 2)

3.1.1 Commercial Fisheries (Seafood and Recreational)

(a) Maintain and Enhance PacFIN and Data Access

Maintain and continue to enhance the PacFIN data system. This system provides West Coast fisheries economists with vessel revenue information for all shoreside landings of marine and anadromous species. This important information is available to economists and others in a number of useful reports and standardized summary files. However, economists often require specialized subsets of this information in order to analyze specific management problems. PacFIN personnel and personnel associated with the PSMFC commercial fishery economic data project provide economists with an important link to this data.

Augment Current Funding As Necessary to Maintain and Enhance Current Functions

(b) Maintain the Fishery Economic Data Collection Program for Commercial Fisheries

The beginnings of an economic data collection program have been established by the PSMFC. In 2000, a cost-earnings pilot project for trawl vessels and processors was carried out that is expected to assist in determining the best way to implement an annual program for the collection of cost and earnings data from harvesters, processors, and first buyers. This project was conducted under a cooperative agreement between NMFS and PSMFC. Other cooperative projects being undertaken include a survey of the albacore and swordfish fleets (soon to be undertaken, see Section 3.1.5) and surveys of the charterboat and fixed gear/open access fleets (these surveys are being developed). Baseline funds should be committed to establish an economic data collection program as a permanent part of the West Coast fishery information system. This program should include both data collection and the full development of a data management and dissemination system. Economic information is needed not only to estimate the direct effects of regulations on the commercial fishery, but also to project impacts on communities.

Elements of the program:

1. Determine which of the data/information needs listed in Appendix B are of highest priority.
2. Identify those high priority data needs best collected in projects focused solely on the collection of economic data and those high priority needs which might be collected as part of other fishery monitoring and data collection activities.
3. Develop cost estimation routines that can be used with survey results and other data collected. (Development of such estimation routines can ensure cost data is collected in the needed format.)
4. Continue economic data collection projects and modifying as appropriate based on initial experiences.
5. Continue development of the data system that will act as a repository and dissemination point for economic data.
6. Begin development of alternative data sources by pursuing the "add-on" of economic data collection tasks to other fishery monitoring and data collection efforts.
7. Conduct interagency and industry coordination and outreach to gain cooperation.

Ongoing Funding Need

The ongoing funding need estimated for this program is:

Data collection (Element 4 of the program)	\$150,000
System design, implementation, management, interagency advocacy and industry outreach.	\$350,000
Total Ongoing Funding Need	\$500,000

Current Funding

As of October 2000, NMFS has funded three projects that are actively being carried out and may lead to the collection of cost data that may be integrated with PacFIN and other vessel specific data:

Salmon and Processor Data Sets for Economic Analysis	\$20,000
Preparation for Salmon Cost/Earnings Survey	\$10,000
Cost, Earnings and Employment Survey of West Coast Limited Entry and Open Access Harvesters	\$95,000
Total Current Funding for the Seafood Industry	\$135,000
Recreational Charter Vessel Survey	\$125,000
Total Current Funding for the Commercial Fishery	\$255,000

Additionally, \$185,000 has been provided for a special project on highly migratory species (HMS) (Section 3.1.5). The contract for the special HMS project has been given to the PSMFC economic data program and will help maintain the PSMFC staff devoted to the West Coast program while stable funding is sought. The HMS project is counted as a special project rather than as part of the base program, because the cost data to be collected will be summarized and not be available to the system or economists on a vessel specific basis. This is the type of targeted need project that Section 3.1.5 is intended to cover. Including the HMS project, a total of \$440,000 of West Coast economic data collection activities are being managed by the PSMFC project, as of October 2000.

3.1.32 Recreational Fishers

- (a) Provide full funding for the RecFIN program, expand or redirect sampling to increase the reliability of estimates of effort and catch for less than annual periods and at the community level. Expand use of the MRFSS angler intercept forms or questions to provide complete estimates for such factors as target species, catch composition, and county of angler residence.

Fully fund program (~~1998=\$1.3 million~~) and augment as necessary to maintain full functions (Year 2000 funding was about \$1.1 million, approximately \$400,000 short of what is needed to fully fund the program)

- (b) Fully fund and increase the frequency of socioeconomic add-on survey, and work with the RecFIN program to make optimal use of the opportunity to economically collect data on the recreational fishery through existing survey programs. At a minimum the socioeconomic survey should be run in alternating years or in two out of every three years with the focus of the survey rotating between generating estimates of angler experience values and expenditures.

Supplement with \$350,000 per year for an annual socioeconomic survey and \$100,000 per year to fund a position to assist with survey design and data analysis

3.1.53 Communities

1. Develop a repository of economic and social data on geographically defined communities. Many of these data are currently available from federal and state agencies. The data should be summarized and located in tables readily available to West Coast fishery economists and linked to PacFIN and RecFIN landings and effort data. \$65,000

2. Develop baseline quantitative descriptions of the importance of commercial and recreational fisheries in the economies of coastal communities. Include estimates of income and employment generated from fishing activities. Inventory commercial and marine recreational opportunities supporting infrastructure and the geophysical amenities of the ports. \$65,000
3. Identify community data not currently available that may be useful in understanding the effects of fishery management actions on communities and develop proposals for the collection of such data. \$25,000
4. Implement an ongoing program to maintain and augment community data and update community descriptions. \$50,000
5. Initiate an ongoing data collection project to collect demographic and social data on the fishery that will allow analysts to link fishery information with generally available government statistics on geographic communities and provide better assessments of community impacts. \$100,000

3.1.64 Habitat

Determine the priority for acquiring economic information which may be needed to fulfill Council and NMFS responsibilities regarding the identification and protection of essential and critical fish habitat. Regulatory Flexibility Analyses may be required on best management practices for restoring habitat. When habitat is defined as critical, analysis of the implications may be required. If appropriate, develop project proposals for the collection of needed data.

3.1.75 Special Projects

No data system can or should try to collect every type of data that may be needed for economic analyses. An efficient system that attempts to acquire the needed data while keeping the burden on industry low may best be achieved through the use of special projects to focus on the collection of certain data elements as needs arise. A fund should be established for special projects to address high priority data collection needs that arise, but are not covered by the projects listed above. Such a fund would be reminiscent of the socioeconomic fund administered for many years by the economists at the NMFS Southwest Region/Center. Specific plans for the use of this money should be developed in consultation with the steering committees for the projects specified in this plan and appropriate within NMFS monitoring and coordination. Data resulting from these studies should be integrated with the economic data systems developed under other projects of this plan.

\$150,000

3.2 Implementation

~~The PSMFC will take the lead in implementing this data plan. This plan will be submitted to the following entities for their endorsement:~~

- ~~— Pacific Fishery Management Council~~
- ~~— Pacific States Marine Fisheries Commission~~

~~The plan will be submitted to the Council during the Council's biannual development of its research needs list. The plan will be published under the name of all endorsing groups, with the consent of each.~~

The following implementation details were agreed to by the affected parties when this plan was first adopted in 1998. With the assistance of the PSMFC staff, the economic data plan steering committee for commercial fisheries (Section 3.2.1) and the RecFIN economic subcommittee will review and update the data plan once every two years, ensure that the plan is distributed to all interested persons, identify potential funding sources, and actively seek support for the implementation of the plan. PSMFC will maintain descriptive information on all projects conducted in support of this plan and provide this information to any researcher interested in using the data or developing new data collection efforts.

3.2.1 Commercial Fisheries (Seafood and Recreational)

Implementation of the collection of data related to the commercial fishery will be coordinated through the Pacific Coast Data Committee. The Commercial Fisheries Economic Database Coordinator assigned to the PSMFC PacFIN office will work with a steering committee comprised of economists from the NMFS Northwest and Southwest Regions and Centers, ~~the NMFS Alaska Fishery Science Center~~, and the Council.

~~3.2.2 Charter Businesses~~

~~Development of project proposals on collection of data for the charter businesses will be initiated by PSMFC. Specific projects for the collection of data on the charter businesses may be presented to the Pacific Coast Fisheries Data Committee or the RecFIN committee depending on which appears best suited for the project.~~

3.2.2 Recreational Fishers

Implementation of data collection efforts related to recreational fishers will be coordinated through the RecFIN committee and, in particular, its economic subcommittee. The PSMFC RecFIN Coordinator will work with the subcommittee in coordinating these efforts.

3.2.3 Communities

PSMFC will work with NMFS and the Council in developing projects to address the need for community level data for analysis of fishery impacts (Section 3.1.53).

3.2.4 Habitat

The Council economist will work with the NMFS Northwest Region Economist ~~and the Scientific and Statistical Committee Economic Subcommittee~~ in determining whether to maintain habitat-related economic data as a part of this plan and, if so, to further specifying data needs.

3.2.5 Special Projects

The West Coast economists should encourage NMFS to reinstate annual funds for special economic studies related to West Coast management issues.

3.3 Guidelines for Development of Data Collection, Management, and Dissemination Projects

For each project intended to contribute to the economic data system:

1. Data models should be developed which show how the project fits in with other efforts to collect economic and noneconomic information.
2. A design review committee should ensure that the system developed meets the users' needs. This committee should be comprised of representatives from the NMFS Northwest and Southwest Regions/Centers, ~~the NMFS Alaska Fishery Science Center~~, the Council, the PSMFC, and, as appropriate and requested, the states. The design review committee would play a role similar to that played by the Pacific Coast Data Committee with respect to PacFIN and the RecFIN committee with respect to the MRFSS survey and related data repository.
3. It should be a primary concern of each design review committee that activities be coordinated with related projects in order to minimize duplication and industry burden and ensure that related data sets can be harmonized and integrated. In particular, data collection efforts should be coordinated with efforts in Alaska.^{6/} Additionally, to the extent appropriate, the design review committees should ensure

6/ Coordination with the North Pacific Fishery Management Council is important to the success of projects for the collection of data on commercial fisheries. Such coordination will enhance the efficiency of the data collection efforts and help develop and maintain a cooperative relationship with industry. Overlaps

that data collected is consistent with the standards and formats necessary to allow summary for transmittal to the national fishery information system.

4. Common coding should be maintained between West Coast data sets. Common coding includes standardized naming of variables, standardized coding of the variables (e.g., standard species codes), and standardized units of measure. National coding standards and coding used for Alaska data collection programs should be taken into account in developing coding for West Coast data.
5. Where the data to be collected may have applications broader than those of direct interest to economists, to the extent practicable, effort should be made to ensure that data elements are specified in a manner useful in those applications. This may be particularly important with respect to effort data.
6. It should be a primary concern to develop and maintain a cooperative long-term relationship with industry.
7. In determining the data collection approach to be used for a particular project, consideration should be given to the quality of information likely to be collected, degree of burden placed on industry and data collection costs.^{7/} Required degrees of accuracy and needed sample sizes should also be addressed in each individual project.
8. Convenient, accessible, and secure systems should be developed for the delivery of collected data to fishery analysts. To maintain the cooperation and confidence of industry, it is essential to the success of all projects that there be strict adherence to confidentiality standards.

include data collected from commercial vessels which participate in both Council areas and the development of data collection methodologies.

7/ Potential data collection methodologies identified by West Coast economists during a December 1996 meeting included: key informant approach, Delphi approach, group interviews, individual in-person interviews or phone interviews (including recreational intercept surveys), mailed surveys, logbooks, engineering approach, and direct observation.

TABLE 1. Outline of requirements for each section of a fishery management plan (FMP) amendment package with an economic aspect and identification of potential contributions by economists.
(Page 1 of 5)

Primary Legislation and Executive Orders (E.O.) Affecting Contents of FMP Amendment Packages ^{a/}					
Major Element of the Amendment Package	Magnuson-Stevens Act	E.O. on Regulatory Planning and Review (E.O. 12886)	Regulatory Flexibility Act (RFA)	National Environmental Policy Act (NEPA) & Other Resource Protection Acts ^{b/}	Economist Contributions
Purpose and need for action (Problem Statement)		Identify the problem and assess its significance.	Identify why the action is being considered.		How significant is the problem? Quantify if possible. Identify market failures.
Management objectives	Management objectives should be consistent with the National Standards (priorities should be set among competing objectives)		State objective and legal basis for the proposed action.		Are the management objectives likely to address the problem given the economic dynamics of the situation?
Describe alternatives	National Standard 7. Conservation and management measures shall, where practicable, minimize costs	<ul style="list-style-type: none"> • Include no action alternative. • Include alternatives to direct regulation (e.g., marketable permits) and seek alternatives which minimize effect on non-Federal governments. • Design the alternatives to be cost effective and least burdensome while achieving their objective (flexibility and equity are included as costs/benefits). • Draft the alternatives to be simple and easy to understand. • To the extent feasible, specify performance objectives rather than behaviors or manner of compliance. 	Identify alternatives which minimize impacts on small businesses.		Are there alternatives which meet management objectives, but are more cost effective or have less of a burden on small businesses and small governmental jurisdictions? Have all relevant alternatives with differing economic effects been considered?

TABLE 1. Outline of requirements for each section of a fishery management plan (FMP) amendment package with an economic aspect and identification of potential contributions by economists.
(Page 2 of 5)

Primary Legislation and Executive Orders (E.O.) Affecting Contents of FMP Amendment Packages ^{a/}					
Major Element of the Amendment Package	Magnuson-Stevens Act	E.O. on Regulatory Planning and Review (E.O. 12886)	Regulatory Flexibility Act (RFA)	National Environmental Policy Act (NEPA) & Other Resource Protection Acts	Economist Contributions
Description	<p>Description of the fishery including</p> <ul style="list-style-type: none"> • Sectors (commercial, recreational and charter) • Landings trends • Number of vessels • Gear used • Species • Location of activities • Likely management costs • Fishery revenues • Fishing communities • Foreign fishing • Indian treaty fishing rights 			<p>Description of the Affected Environment</p> <ul style="list-style-type: none"> • Physical • Fishing Industry • Consumers • Communities • Governmental • Jurisdictions (ports, towns, counties etc.) • Agencies 	<p>Include descriptive information which will provide a baseline for evaluation of impacts under the criteria of the RFA. E.g.,: What groups are affected? What is the composition of the groups in terms of small and large entities? What is the size of the groups relative to the sector of which they are a part?</p>
Environmental consequences	National Standard 1. Prevent overfishing.	Under EO 12886 environmental consequences would be included in the cost benefit analysis.		<p>Environmental Consequences</p> <ul style="list-style-type: none"> • Bio Impacts (e.g., redirection of effort, bycatch, benthic organisms) • Physical Impacts (e.g., habitat destruction) • Protected Resources (ESA, MMPA) • Cumulative Impacts (e.g., ecosystem, other agency activities)^{c/} 	<p>Project behavioral changes that have environmental consequences (e.g., the highgrading incentive created under cumulative harvest limits).</p>
Cost benefit analysis	National Standard 5. Where practicable, consider efficiency in the utilization of fishery resources	Include both quantitative and qualitative factors as well as an accounting of distributional, safety, and other effects of social concern.	Identify all costs associated with each of the alternatives and estimate the classes of small entities that will be subjected to the costs.		<p>Economists take lead in developing the cost benefit analysis.</p>

TABLE 1. Outline of requirements for each section of a fishery management plan (FMP) amendment package with an economic aspect and identification of potential contributions by economists.
(Page 3 of 5)

Primary Legislation and Executive Orders (E.O.) Affecting Contents of FMP Amendment Packages ^{a/}					
Major Element of the Amendment Package	Magnuson-Stevens Act	E.O. on Regulatory Planning and Review (E.O. 12886)	Regulatory Flexibility Act (RFA)	National Environmental Policy Act (NEPA) & Other Resource Protection Acts ^{b/}	Economist Contributions
Effects on groups identified in description	<p>Fishery Impact Statement: assess effects on participants in the fisheries, fishing communities, and in fisheries conducted in adjacent areas under the authority of other Councils.</p> <p>National Standard 4. Conservation and management shall not discriminate between residents of different states . . . allocations shall be: (1) fair and equitable, . . . (3) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.</p> <p>National Standard 8. Conservation and management measures shall . . . take into account the importance of the fishery to fishing communities in order to . . . [sustain participation and minimize economic impacts on communities].</p>	<p>Assess effects on employment, profits, competitive position, efficiency, and regulatory burden. Include management and implementation costs for governmental agencies.</p>	<p>Provide information for evaluation of whether or not there will be a significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act^{b/}. Compare the costs of compliance for small businesses to those for large businesses. Assess effects on production and employment.</p>	<p>National Environmental Policy Act (NEPA) & Other Resource Protection Acts^{b/}</p>	<p>Provide economic information on distributional effects and consequences. Evaluate significance for RFA.</p>

TABLE 1. Outline of requirements for each section of a fishery management plan (FMP) amendment package with an economic aspect and identification of potential contributions by economists. (Page 4 of 5)

Primary Legislation and Executive Orders (E.O.) Affecting Contents of FMP Amendment Packages ^{a/}					
Major Element of the Amendment Package	Magnuson-Stevens Act	E.O. on Regulatory Planning and Review (E.O. 12886)	Regulatory Flexibility Act (RFA)	National Environmental Policy Act (NEPA) & Other Resource Protection Acts ^{b/}	Economist Contributions
Evaluation of alternatives based on policy criteria	<ul style="list-style-type: none"> M-S Act National Standards.^{e/} National standards not listed elsewhere in this column: Standard 2, use the best scientific information available; Standard 3, manage the stock throughout its range; Standard 6 take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches; National Standard 9, minimize bycatch; National Standard 10, promote safety. M-S Act 302(c) Criteria for Actions Limiting Entry to the Fishery M-S Act 304(e) Requirements to specify rebuilding schedules while taking into account the needs of the community Management Plan Objectives Socio-economic Framework Criteria (for Groundfish FMP^{f/}) Management Objectives Identified for the Proposed Action Does the Act Resolve the Problem 	The alternative chosen should maximize net benefits (net benefits include such factors as equity considerations).	Evaluate significance under the RFA. The RFA requires consideration of alternatives which minimize impacts on small entities. It does not require that the alternative with minimum impacts be selected, but does require the specification of a rationale for not selecting the minimum impact alternative.	Section 7. Consultation may be required under the ESA.	Provide summary on the performance of alternatives with respect to economic criteria--most of this will likely be derived directly from sections above.
Other applicable law	National Standard 7. . . . avoid unnecessary duplication.	Avoid inconsistency, incompatibility, or duplication of other regulations.	Identify any Federal rules which duplicate, overlap, or conflict with the proposed rule.		Help identify conflicting policies, e.g. policies to reduce capacity and the Capital Construction Fund.

a/ Not included in the body of this table are the following executive orders and legislation which may need to be addressed in the analytical documents:

E.O. 12612. Federalism. Requires that federal preemption of state law be the minimum level necessary. Proposed policies with federalism implications must be accompanied by a "Federalism Assessment".

E.O. 12630. Requires preparation of a "Takings Implication Assessment" for actions that effect or may effect the use of any real or personal property. Includes prohibition of a gear.

Coastal Zone Management Act (CZMA). Requires federal consistency with state coastal management programs to maximum extent practicable.

Paperwork Reduction Act (PRA). Requires federal agencies to minimize paperwork and reporting burdens. Requires OMB clearance of any new information collection requirements. The Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA).

c/ NEPA considerations which may but often do not relate to fisheries management actions by the Pacific Council include impacts on marine sanctuaries, aquaculture, and hatcheries.

TABLE 1. Outline of requirements for each section of a fishery management plan (FMP) amendment package with an economic aspect and identification of potential contributions by economists.
(Page 5 of 5).

- d/ The following are guidelines to be used in evaluating criteria of the RFA. Substantial number: over 20% of small entities in the sector. Small business: less than \$2.0 million. Significant impact: (a) five percent reduction in gross revenues, (b) five percent increase in total costs, (c) compliance costs as a percent of sales for small entities are ten percent higher than for larger entities, (d) capital costs of compliance requires a significant portion of the capital available to small entities, (e) over two percent of small business entities will be forced to cease operation.
- e/ M-S Act decision criteria would take precedence over RFA decision criteria. M-S Act decision criteria took precedence over E.O. 12291. However, this executive order has been replaced by E.O. 12886. No interpretation of the status of E.O. 128896 with respect to the M-S Act has been provided.
- f/ Section 6.2.3 of the groundfish fishery management plan.

TABLE 2. Economic data needed on commercial seafood harvesters. (Page 1 of 3)

Data Need	Application ^{a/}	Available	Current Source	High Priority Core Need	Comment on Priority and Adequacy (if some data is available)	Additional Description
1. West Coast exvessel value of catch, including price, quality, and quantity, and catch location	A, B, C, D, E, F, G, H, I	Most	PacFIN	Y	Generally adequate. Does not include other goods and services that may be provided by processors in addition to direct payments for the fish. Does record payments not included on the fishticket. Gear information should be more specific and be available for each line on the fish ticket. More specific area of catch is needed to facilitate development and analysis of marine reserves.	Data should include all relevant market information such as species, condition (dressed, headed, and gutted, etc.), gear used, and, where relevant, size. Data for salmon should include number of fish caught.
2. Total firm revenues	A, F, G, H, I	Minimal	Ad hoc surveys and Southwest Center West Coast Fishing Vessel Cost Earnings Database	Y	Fishing revenue for vessels in nonWest Coast activities are the top priority within this category. Available information is often outdated and applies only to certain sectors of the fleet. Little work has been done above the vessel level.	What are the firm's total revenues from all sources, including other vessels owned by the firm and nonWest Coast fisheries in which the vessels participate, as well as nonfishing activities? Ideally, net revenues are desired.
3. Other revenue information	E, F, H	Minimal	Fishery Management Area(FMA)	Y	Historic market order prices negotiated by FMA for association trawlers. Not currently available for other gears and species.	Processor market orders and market limits.
4. Employment and labor costs (crew and skipper)--nominal and opportunity costs	A, B, C, D, E, F, G, H, I	Some	Ad hoc study results	Y	Available information is often outdated, incomplete, and applies only to certain sectors of the fleet during certain types of operations.	Method of determining payments should be included (e.g., share, wage, piece). Whether or not a hired skipper is used. All operational costs are needed at the trip level with information on how costs vary with duration of trip and amounts of harvest. Labor cost data is needed by crew/operator position. Information is needed on number, types, and durations of jobs; numbers of days worked by vessel, and type of fishing activity.
5. Nonlabor operation costs	A, B, C, D, E, F, G, H, I	Some	Ad hoc study results	Y	Same as above	All operational costs are needed at the trip level with information on how costs vary with duration of trip and amounts of harvest.
6. Owner profits and opportunity costs	E, F, G, H	None	N/A	Y	-	Information is needed at the trip level or lowest level of activity aggregation across which opportunity costs vary. Information is needed on differences between owner-operator and owner nonoperators.

TABLE 2. Economic data needed on commercial seafood harvesters. (Page 2 of 3)

Data Need	Application ^{a/}	Available	Current Source	High Priority Core Need	Comment on Priority and Adequacy (if some data is available)	Additional Description
7. Capital costs	A, B, C, D, E, F, G, H, I	Some	Ad hoc surveys,	Y	Information generally incomplete and difficult to acquire. Some information has been available from the Capital Construction Fund.	Includes cost of vessels and permits.
8. Employee and owner income	B, C, D, F, I	Minimal	Ad hoc study results	Y	Information is often outdated and applies only to certain sectors of the fleet during certain types of operations.	Income levels of employees/owner households; household dependence on fishing income; and dependence on government assistance; and community of residence.
9. Employee and owner characteristics	F, I	Minimal	Ad hoc study results	-	Information is often outdated and applies only to certain sectors of the fleet during certain types of operations. There is no centralized system for identifying and tracking vessel owners and operators. Owner and operator identity may be more important in predicting vessel activity and impacts than most other data elements described.	Length of participation in the fishery and amount of experience.
10. Effort information	F, G, H	Some	Oregon pilot observer program, coastwide logbooks	Y	Most information available is for trawl gear. Improvements need to be made in accessibility to this data.	Type, size/number/quantity of gear, soak/tow times, number or tows/sets, times of tows/sets, search time, trip length by target species information is needed, tied to specific landings.
11. Other catch information	F, G, H	Some	Data on trawl discards from Oregon pilot observer program.- Catch area data from trawl logs.	-	Discard information is most important. Specificity of catch areas is of substantially less importance.	Information is needed on discards by target species and more specific information is needed on catch area.
12. Vessel information	A, F, G, H, I	Some	USCG, PacFIN, NMFS Limited Entry Office, state license programs	-	Updated, better quality and better access is needed to information on vessel size and permits held. Fish hold capacity information is generally not available.	Vessel size, fish hold capacity, and permits held. Identity of vessel operator and owner.
13. Other vessel and information	A, B, C, D, E, F, G, I (depending on the approach to analysis)	Some	USCG and state license programs, fish tickets.	u.	Priority depends on approach to developing estimates of operating costs. If an engineering approach is taken, this item may have a higher priority.	Vessel engine(s) including auxiliary (and model), and equipment, and ability to use different types of gear.

TABLE 2. Economic data needed on commercial seafood harvesters. (Page 3 of 3)

- a/ Types of analyses:
- A. Financial analysis
 - B. Input/output income impact
 - C. Input/output job impact
 - D. Input/output impact by income level (income or job)
 - E. Effects on supply and demand
 - F. Prediction of fishers' strategic response to regulations
 - G. Bio-economic models
 - H. Cost benefit analysis
 - I. Baseline fleet and community descriptions

TABLE 3. Economic data needed on commercial processors. (Page 1 of 2)

Data Need	Application ^{a/}	Available	Current Source	High Priority Core Need	Comment on Priority and Adequacy (if some data is available)	Additional Description
1. Exprocessor value of products, including price, quality, quantity, and product form	A, B, C, D, E, G, H, I	Some	Processed Product Survey and PacFIN information	Y	Generally incomplete. This type of information is a high priority for species for which the product is brought to shore in different product forms (e.g., whiting and sablefish). There are questions regarding bias in the processed product survey estimates. The information is also needed to fully assess the community dependence on the fishing industry.	Data should include all relevant market information such as species, condition (dressed, headed, and gutted, etc.), and, where relevant, gear used and size.
2. Product recovery rates and raw product costs by product form	A, B, C, D, E, G, H, I	Some	PacFIN data, ad hoc studies and agreed standards for enforcement	Y	PacFIN data provides information on product landed at the site of the processing plant but not information on product transported to the plant from other locations.	Raw product costs are also covered under harvester exvessel prices. Information is needed on fish landed directly to the processing plant and fish transported to the processing plant from other landings sites. Product recovery rates are necessary to determine the amount and cost of raw product cost for a given amount of exprocessor sales.
3. Total firm revenues	A, I	Minimal	Ad hoc survey	Y	Some information as been collected on horizontal integration of West Coast processing plants.	What are the firm's total revenues from all sources including other processing plants owned by the firm and nonWest Coast products which are handled, as well as nonfishing activities. Ideally, net revenues for nonfish related activities would be obtained or estimated.
4. Other revenue information	E	Minimal	FMA	-	Historic market order prices negotiated by FMA. This information may be available from either the vessels or the processors.	Processor market orders and market limits.
5. Employment and labor costs--nominal and opportunity	A, B, C, D, E, G, H, I	Some	Ad hoc study results	Y	Available information is often outdated and applies only to certain species or processes.	Method of determining payments should be included (e.g., share, wage, piece). Labor cost information is needed by type of position. Information is needed on number, types, and durations of jobs; and numbers of days worked by type of processing activity.
6. Nonlabor operation costs	A, B, C, D, E, G, H, I	Minimal	Ad hoc study results	Y	-	-
7. Owner profits and opportunity costs	A, B, C, D, E, G, H, I	Minimal	Ad hoc estimates based on cost information.	Y	-	If both owner profits and payments to labor were known along with their related opportunity costs, the need to know other costs would diminish.

TABLE 3. Economic data needed on commercial processors. (Page 2 of 2)

Data Need	Application ^{a/}	Available	Current Source	High Priority Core Need	Comment on Priority and Adequacy (if some data is available)	Additional Description
8. Capital costs	A, B, C, D, E, G, H, I	Minimal	Ad hoc surveys	Y	Information generally incomplete and difficult to acquire. Priority is substantially higher for operations processing Pacific whiting.	-
9. Employee and owner income	C, D, I	Minimal	Some ad hoc study results	Y	Information is often outdated and applies only to certain processing sectors. In addition to helping to better describe impacts on individuals the information would assist in describing effects on communities.	Income levels of employee/owner households; household dependence on fishing income; dependence on government assistance; and community of residence.
10. Location of fish buying and processing plants and transshipments	B, C, D, I	Minimal	Some ad hoc study results	Y	In order to properly model the effects of fisheries on communities it is important to know whether fish landed in a particular port is also processed there. The license number in the processor code field of the fish tickets may be for a buying station or processing facility. Even if offloaded at a processing facility, in some cases raw product may be transhipped to another plant for processing.	Is the first point of sale a buying station or processing facility. What is the location of the first significant processing of the product?
11. Employee and owner characteristics	B, C, D, I	Minimal	Some ad hoc study results	-	-	Length of participation in the fishery and amount of experience.
12. Other plant information	A, B, C, D, E, F, G, I (depending on the approach to analysis)	Minimal	Some ad hoc study results	-	Priority depends on approach to developing estimates of operating costs. If an engineering approach is taken, this item may have a higher priority. It may also be of more importance for certain product forms such as surimi.	Needed information may include brand and model numbers for equipment in the plant.

a/ Types of analyses: A. Financial analysis
 B. Input/output income impact
 C. Input/output job impact
 D. Input/output impact by income level (income or job)
 E. Effects on supply and demand
 F. Prediction of fishers' strategic response to regulations
 G. Bio-economic models
 H. Cost benefit analysis
 I. Baseline fleet and community descriptions

TABLE 4. Economic data needed on recreational charter vessels. (Page 1 of 2)

Data Need	Application ^{a/}	Available	Current Source	High Priority Core Need	Comment on Priority and Adequacy (if some data is available)	Additional Description
1. Charter operation revenue	A, B, C, D, E, F, G, H, I	Minimal	Ad hoc studies	Y	Any information available is generally outdated, difficult to acquire, and applies only to certain sectors of the fleet during certain types of operations. Information needs to be tied to area of catch in order to facilitate analysis of marine reserves.	Total revenue Information should include, by trip type, total trips, price of all goods and services (including gratuities), and typical per angler expenditures.
2. Total firm revenues	A, F, G, H, I	Minimal	Ad hoc studies	Y	Same as above.	Total vessel earnings in all activities and total firm earnings.
3. Employment and labor costs (crew and skipper)--nominal and opportunity	A, B, C, D, E, F, G, H, I	Minimal	Ad hoc studies	Y	Same as above.	Method of determining payments should be included (e.g., share, wage, piece) and whether or not a hired skipper is used. All labor costs (including gratuities) are needed at the trip level. with information on how costs vary with duration of trip and number of customers on board. Cost information is needed by crew/operator position. Information is needed on number, types, and durations of jobs; numbers of days worked by vessel and type of activity.
4. Nonlabor operation costs	A, B, C, D, E, F, G, H, I	Minimal	Ad hoc studies	Y	Same as above.	All operational costs are needed at the trip level with information on how costs vary with duration of trip and number of customers on board. These costs include payment to charter offices.
5. Owner profits and opportunity costs	A, B, C, D, E, F, G, H, I	Minimal	Ad hoc studies	Y	Same as above.	Information is needed at the trip level or lowest level of activity aggregation across which opportunity costs vary.
6. Capital costs	A, B, C, D, E, F, G, H, I	Minimal	Ad hoc studies	Y	Same as above.	Includes cost of vessels and permits.
7. Income (including self employment)	B, C, D, F, I	Minimal	Ad hoc studies	Y	Same as above.	Income levels of employee/owner households; household dependence on fishing income; dependence on government assistance; and community of residence.
8. Employee and owner characteristics	F, I	Minimal	Ad hoc studies	Y	There is no centralized system for identifying and tracking vessel owners and operators. Owner and operator identity may be more important in predicting vessel activity and impacts than most other data elements described.	Length of participation in the fishery and amount of experience.

TABLE 4. Economic data needed on recreational charter vessels. (Page 2 of 2)

Data Need	Application ^{a/}	Available	Current Source	High Priority Core Need	Comment on Priority and Adequacy (if some data is available)	Additional Description
9. Effort information	F, G, H	Minimal	Harvest data, California charter vessel log books and ad hoc studies.	Y	Average angler success rates are available, other information needed is generally unavailable.	Average number of passengers, number of poles, trip length, target species, angler success rates, travel time from home port to fishing grounds, travel time between different fishing grounds, harvest/customer satisfaction strategies. Harvest methods (trawling, mooching, types of hooks and weights, depths of fishing).
10. Catch Information	F, G, H	Some	Data from harvest monitoring programs and ad hoc studies.	Y	The RecFIN MRFSS study provides estimates, however, the information is not vessel specific.	Discards and catch composition by vessel target species.
11. Vessel Information	A, F, G, H, I	Some	Information may be available through licensing programs.	Y	Data is not readily available.	Vessel identification, size, passenger carrying capacity, ports of operation, home port.
12. Other Vessel Information	A, B, C, D, E, F, G, I (depending on the approach to analysis)	Minimal	Ad hoc studies. Some data may be available through licensing programs.	-	Data is not readily available. Priority depends on approach to analysis.	Vessel engine(s) including auxiliary (HP and model) and equipment.

a/ Types of analyses:

- A. Financial analysis
- B. Input/output income impact
- C. Input/output job impact
- D. Input/output impact by income level (income or job)
- E. Effects on supply and demand
- F. Prediction of fishers' strategic response to regulations
- G. Bio-economic models
- H. Cost benefit analysis
- I. Baseline fleet and community descriptions

TABLE 5. Economic data needed on recreational fishers. (Page 1 of 1)

Data Need	Application ^{a/}	Available	Current Source	High Priority Core Need	Comment on Priority and Adequacy (if some data is available)	Additional Description
1. Total effort and catch by target species including inland anadromous stock fisheries	A, B, C, D, E, F, G, H, I	Some	RecFIN MRFSS, state and tribal creel surveys, California charter vessel logbooks	Y	The RecFIN program collects much the needed marine data, however, the estimates produced are generally valid only at the state coastwide and annual level. The data is needed for biological modeling, baseline community descriptions, and modeling of angler effort responses that are needed for most economic analyses of regulatory effects. Data for inriver fisheries are available only for areas and time periods covered by state and tribal sampling programs.	Total catch, discard, and catch-per-unit effort information is needed by target species, fish size, harvest mode, area and season for marine and inriver fisheries.
2. Angler experience values	E, F, G, H	Some	RecFIN socioeconomic survey and ad hoc study results.	Y	The RecFIN program is attempting to collect some of this information through the socio-economic add-on to the MRFSS. Frequency of this effort has increased but commitment to two out of three year or every year studies has not been made. One year of funding has been made available. Available information is often outdated, incomplete, and applies only to certain sectors of the fleet during certain types of operations.	How does consumer related-economic value vary with types of species available, fishing site, and fishing regulations? What fishing and nonfishing activities will individuals substitute for the most desired target species?
3. Angler by angler data on fishing activity (number, type of trips) trip expenditures and angler demographics	A, B, C, D, E, F, G, H, I	Some	RecFIN socioeconomic survey and ad hoc studies.	Y	The RecFIN program is attempting to collect some of this information. One year of funding has been made available. Other available studies are outdated or incomplete.	Fishing activity, trip cost and demographic data are needed to estimate economic value of fishing trips by target species, mode, area and season, and to predict changes in angler behavior and value associated with changes in regulations. Trip expenditure data is also needed to estimate economic impacts of recreational fishing on local communities.
4. Factors important to anglers' recreational choices	F, H	Minimal	RecFIN socioeconomic survey and possibly some ad hoc study results.	?	Some information may be forthcoming from this year's the 1998 RecFIN socioeconomic survey. Additional studies are needed.	What characteristics of catch (e.g. number or size of fish, total weight of catch, catch versus keep) are most important to anglers? What fishing and nonfishing activities do anglers view as best substitutes for most desired target species?

a/ Types of analyses: A. Financial analysis

B. Input/output income impact

C. Input/output job impact

D. Input/output impact by income level (income or job)

E. Effects on supply and demand

F. Prediction of fishers' strategic response to regulations

G. Bio-economic models

H. Cost benefit analysis

I. Baseline fleet and community descriptions

Table 6. Economic data needed on fishing communities. (Page 1 of 1)

Data Need	Application ^{a/}	Available	Current Source	High Priority Core Need	Comment on Priority and Adequacy (if some data is available)	Additional Description
1. Fishery related employment, wages, income and other demographic descriptors	I	Minimal	Ad hoc studies	Y	Existing data is often outdated and applies only to certain sectors of the fleet during certain types of operations.	In order to relate a fishery to other general socio-economic statistics on communities collected by various governmental bodies, similar statistics are needed on the fishing industry. For example, to relate impacts of groundfish open access hook-and-line regulations to income classes and ethnicity in a geographic community, one needs to know both the income classes and ethnicity of the fishery and the geographic community in which participants reside. to the fishery; information is needed on employment generated by the fishing industry by community. The types of information needed is specified in previous tables covering each type of fishing activity.
2. Baseline socio-economic data	I	Yes	Census and state agency data	Y	Data needs to be compiled and regularly updated.	Total population, personal income, employment, per capita income, income distribution, employment cycles, tax base
3. Tax revenues	I	Minimal	Ad hoc studies	Y	Information on tax revenues generated for state and local communities should be collected as part of an effort to meet the needs for cost data needs related to each sector discussed above.	Information is needed to further describe dependence of communities on fisheries.
4. Fishery related economic infrastructure	I	Minimal	Ad hoc studies and reports	Y	The public services and infrastructure required by the fishing industry may either burden or benefit the local community.	Inventory of required and available public services and infrastructure.
5. Geographic and physical characteristics of the fishing harbors including distances to fishing grounds	I	Some	Ad hoc studies and reports	Y	Much of this information likely to be readily available through a few contacts at each port.	Geographic and physical port characteristics include information on geographic proximity to exploitable fishing resources, ease and safety of ocean access, degree of shelter provided by the port, and distances to major markets, and distribution points for commercial fishing products and major population centers which utilize recreational fishing opportunities.

- a/ Types of analyses: A. Financial analysis
 B. Input/output income impact
 C. Input/output job impact
 D. Input/output impact by income level (income or job)
 E. Effects on supply and demand
 F. Prediction of fishers' strategic response to regulations
 G. Bio-economic models
 H. Cost benefit analysis
 I. Baseline fleet and community descriptions

APPENDIX A

APPLICATIONS FOR ECONOMIC DATA

Types of Management Actions Which May Need to Be Analyzed

In Section 2 the legislative mandates for conducting economic analyses are reviewed. This section lists some of the types of management actions taken by the Council which are often the subject of economic analysis.

Commercial Harvester Regulations

- Reporting requirements
- Change in level of harvest
- Capacity reduction measures (e.g., permit buyback and permit stacking)
- Change of a trip size/frequency limit
- Change of a cumulative limit
- Opening/closing (shortening/increasing) a season
- Changing catch per unit of effort by restricting gear (e.g., mesh size, cod-end size, amount of gear, type of hook)
- Gear prohibition (e.g., gillnet)
- Requirements to carrying an observer
- Change in a size limit (e.g., salmon)
- Local area closures (some of which just increase travel times while others may effectively eliminate a fishery)
- Bycatch retention or control measures
- Stock rebuilding programs
- Actions to regulate adverse impacts of fishing gear on habitat

Commercial Processors and First Fish Buyer Regulations

- Reporting requirements
- Requirements for onshore observers
- Utilization requirements
- Waste disposal requirements

Recreational Fishery Regulations (Including Private and Charter Recreational Harvesters)

- Reporting requirements
- Change in level of harvest (including changes which result from revisions of allocations, rebuilding schedules, or optimal harvest strategies)
- Capacity reduction measures for charter vessels (including new limited entry programs and buyback programs)
- Opening/closing (shortening/increasing) a season
- Change in bag limits
- Change in size limits
- Gear restrictions (e.g., barbless hooks and circle hook requirements)
- Prohibitions on retaining wild fish
- Local area closures
- Bycatch retention or control measures
- Stock rebuilding programs
- Actions to regulate adverse impacts of fishing gear on habitat

Types of Economic Analyses and Data Required

Financial Analyses

Financial analyses provide information on the effect of management actions on the financial viability of fishing industry businesses. Financial viability is generally measured in terms of profit levels after taking into account all firm expenses including taxes and debt burden. To conduct financial analyses, information is needed on firm costs and revenues. In financial analysis it is generally assumed that prices remain unchanged or an estimated change in prices is provided as a result of econometric^{1/} estimation of supply and demand (see System Behavior Analysis).

For harvesting and processing costs and exprocessor prices, analysts are often faced with the need to initiate new data collection efforts or attempt to adapt existing data. Existing data are often outdated and/or only partially appropriate for the needs of the analysis at hand. In order to be useful, cost data must be broken down to the level of the business operation on which the management regulation has effect. For example, in order to analyze the effect of a change in trip limits on the financial viability of an operation, information is needed on how costs vary with the amount of fish taken on and duration of a particular trip. Annual or monthly information is of little use unless it can be used to derive the needed trip level information.

Input/Output Impact Analysis

Input/output analysis is a method by which the flows of production are traced among the various sectors of the economy (local, state, or national) through to either the final consumers or an export. Econometric methods are used to develop input/output models. Regional input/output models are used to estimate regional changes in economic activities (impacts) resulting from management actions. Regional effects of a management action may vary from effects measured from a national perspective, even to the extent of being the opposite of a national effect.

One type of input/output analysis models effects on personal income. Income impact estimates can be generated for direct, indirect, and induced personal income.^{2/} Information on fishing firms similar to that needed for financial analysis is used for generating income impact estimates. To develop input/output income models for the fishery, fishery expenditure information is combined with input/output data and results such as those derived from the U.S. Forest Service IMPLAN model.

Regional input/output models can also be used to develop estimates for a variety of other economic impacts including changes in total sales or employment. Modifications can be applied to the models to allow the generation of estimates of the effect on income or employment by income level. To develop job generation estimates or stratify income impact information by the income level of those affected, additional information would be required on number of workers in the industry, wages, and family income levels.

System Behavior Analysis

For fisheries, system behavior analysis refers to a variety of approaches to economic analysis that involve assessing the dynamic effects of changes in fishery management. Examples include price responses to changes in supply and demand, fisher behavioral response modeling, and bioeconomic modeling. Aspects of these analyses may incorporate or contribute to other types of analyses discussed here.

1/ Econometrics is the use of economic theory and data to develop statistical models to estimate economic relationships.

2/ Direct income is that income paid directly to crew members and owners of harvesting and processing firms (including charter vessels for the recreational charter industry). Indirect income is that income earned by workers and owners who supply the harvesting and processing firms (e.g., a bait supply operation or engine repair business). Induced income is that income earned by those from whom the workers and owners purchase goods (e.g., income of clerk at grocery store where crew members and the owner of a bait operation purchase groceries for personal use).

Estimation of market demand and supply help predict the effects of changes in product supply on prices. Estimates of supply and demand may also be used in the estimation of total consumer and producer surplus for the purpose of developing cost-benefit (net economic value) analyses. Estimation of these relationships generally require the application of econometric techniques to historic information on prices and volume for the product which is the subject of the analysis. Other information used in models estimating supply and demand includes historic prices and volumes for close substitutes for the product being considered and information on other factors which influence prices, such as consumer income, foreign currency exchange rates, population, and variables which may reflect changes in consumer preferences over time. Most of the needed time series information is routinely collected by various governmental bodies.

Modeling of fisher behavioral response is important if we are to understand the effects of management actions on communities and other fisheries. Projecting response is also important in evaluating whether a particular management action is likely to be successful over the long term. The information typically needed for response modeling includes both the information used for cost-benefit analysis of the activities in the fishery in question as well as costs and revenues associated with participation in alternative fisheries, costs associated with moving between fisheries, and degree to which fishing skills are transferable between fisheries.

Bioeconomic modeling attempts to account for a number of processes which respond dynamically to changes in management. For example, changing the time of year of a fishery may change the age classes exploited by the fishery which in turn affects long term sustainable yields and the future age structure available to the fishery. Age structure of the harvest and season-dependent flesh quality affect the quality of product delivered. The time of year and amount and quality of product delivered in turn affect market prices. A broader variety of information is needed for this type of modeling as compared to other analyses mentioned so far. In addition to the biological information required for such modeling, economic information is needed on price response to the amount and quality of product supplied. The complete bioeconomic model requires some unit of economic measure in which to quantify results. These units may be gross value (sale price unadjusted for costs) or in units resulting from financial impact or cost-benefit components of the bioeconomic model.

Cost-Benefit Analyses

Cost-benefit analyses are attempts to estimate the producer and consumer surpluses that would be expected to result from alternative management actions.^{3/} One approach to cost benefit analysis involves the identification, quantification, and valuation of the true costs and benefits of a proposed action as measured from a national, as opposed to private perspective. It varies from financial analysis in that effects on all members of the economy, including consumers and the public at large, are considered rather than just the effects on individual firms. From an economy-wide perspective, the market prices used in financial analysis may not reflect the true cost or benefit of a particular item, (i.e., may not reflect the opportunity cost). For example, assume an individual is hired to work in a fishery at a rate equivalent to \$2,000 per month and that absent the opportunity to fish the next best job this person could obtain would pay \$1,800 per month. For the purpose of the firm financial analysis the cost of this person's labor would be \$2,000 per month, but for the cost-benefit analysis the cost would be \$1,800 per month. In other words, the cost-benefit analysis would show a \$200 benefit associated with the higher wage earned by the individual when employed in the fishery while the financial analysis would show the entire amount of wages paid as a cost. Additionally, in some cases, cost-benefit analyses impute values for factors for which there is no significant market transaction and hence no market price that can be used to measure value. An example of such nonmarket transactions would be a recreational fishing trip on a private vessel. Because market prices may not reflect values from a social point of view or may not exist, the cost and revenue information needed for the cost-benefit analysis may differ from that needed for the financial analysis.

Cost-benefit analyses usually assume fixed prices, wages, and discount rates, however, if the scope of the

3/ Producer surplus is the amount producers are paid to produce a certain quantity of goods minus the minimum amount they would have been willing to accept to produce the same quantity. Consumer surplus is the amount consumers would have been willing to pay for a given quantity of goods less the amount they actually had to pay.

action is sufficiently large, these must be determined within the analysis. The estimation of demand and supply needed to project changes in prices can also be used to estimate producer and consumer surplus. Data needed for the estimation of demand and supply curves is discussed above in the section on system behavior analysis.

Risk and Trade-off Analysis

Risk and trade-off analyses can be used to portray results from any of the above analyses in a format which helps those making decisions better understand the consequences of their actions.

Risk analysis involves the development of information on possible outcomes and probabilities of outcomes given different courses of action. Outcomes can be measured using the results from cost-benefit analyses, income impact analyses, or financial analyses. A typical risk analysis would display alternative courses of action, alternative assessments of the current situation and/or future events (e.g., current stock status or future possible recruitment levels), and the outcomes which might result from every possible combination of action and current situation. Using this approach an array of possible outcomes for each action will be displayed. Ideally, for each assessment of a current situation a probability that the assessment is correct would be provided. However, providing these probabilities is often difficult.

Trade-off analyses identify effects of concern and show how those effects vary depending on the chosen course of action. Effects of concern are generally related to policy objectives. Risk assessments are a type of trade-off analyses. For example, a risk assessment assists in evaluating the trade-off between higher harvest rates and the size of the downside risk that harvest will have to be reduced in the future. Another type of trade-off analyses might display a trade-off between national economic efficiency and the number of jobs or amount of income generated for a local economy depending on a particular policy option chosen.

APPENDIX B CORE DATA NEEDS

The following is a list of core fishery economic data needs identified during a December 1996 meeting of West Coast fishery economists.

Commercial Harvesters and Processors and First Fish Buyers

Employment

- Employment by harvesters and processors
- Crew size and positions
- Use of hired skippers
- Crew and skipper residence
- Length of employment opportunity (include work time at-sea and on-shore)
- Unemployment benefits (extent of coverage)
- Nonfishing employment of crew and skippers
- Labor opportunity costs
- Experience of employees (by fishery and gear type)
- Percent of total household income from fishing
- Method of payment (share, wage, piece)
- (Information is needed by fishery/gear type)

Catch and Landings--Commercial

- Discards
- More specific areas of catch
- Catch quality
- Targeting and ability to control catch composition
- Processor market orders and market limits

Prices

- Exvessel prices
- Exprocessor price by species, product form, and quality
- Permit and license prices
- Unit prices for inputs

Vessels

- Identification of owners (especially for undocumented vessels)
- Updated and better quality information needed on vessels including:
 - Vessel size
 - Engine horse power
- Information needed on vessel:
 - Hold capacity
 - Engine models
 - Presence of auxiliary engines
 - Market value
- Vessel ability to use different gears
- List of all permits held by vessel (may be provided through the core statistics program)

Effort

For nontrawl vessels:

- Trip length (total)
- Set times
- Number of sets

For all vessels:

- Search time
- Gear used
 - Type deployed
 - Quantity deployed

Cost and Earnings

Total vessel and firm earnings in all fisheries including Alaska

Earnings by share for vessel skipper crew etc.

Total costs/expenditures broken down as necessary for cost benefit analysis and income impact modeling (see "Economic Data Needs" developed at the Northeast Data Needs Workshop, March 31-April 1, 1993)

Debt burden

Gear

Concern was expressed about the quality of the gear codes on fish tickets. Specific gaps identified were as follows:

- Gear by line on fishtickets to allow recording of gear used on multigear trips
- Specific type of gear--e.g., trawl (bottom trawl, pelagic trawl, shrimp trawl), longline (including type of longline, e.g., snap) etc.
- Size/number/quantity of gear used

Processor and First Fish Buyer

Ownership information related to horizontal integration

Buyer codes

Employment (number of workers by type)

Wage basis (hourly, piece, etc.)

Plant capacity

Products

Equipment

Markets

Recovery rates

Weigh backs

Recreational Charter Businesses

Employment

Crew size and positions

Use of hired skippers

Crew and skipper residence

Length of employment opportunity (include work time at-sea and on-shore)

Unemployment benefits (extent of coverage)

Nonfishing employment of crew and skippers

Labor opportunity costs

Experience of employees (by fishery)

Percent of total household income from fishing

Method of payment (share, wage, piece)

(Information needed by fishery)

Catch and Landings

Discards
Target catch composition

Prices

Pricing of goods and services provided and typical gratuities (because pricing schemes vary widely, breakdowns will be needed to detail what is and is not included in the prices)
Unit prices for inputs

Vessels

Vessel identification
Ports of operation
Identification of owners (especially for undocumented vessels):
Information needed on vessel:

- Vessel size
- Engine horse power
- Passenger capacity
- Home port
- Market Value

Vessel ability to target on different species from the specified home port
List of all permits held by vessel (may be provided through the core statistics program)

Effort and Gear

Average number of passengers
Trip length
Travel time from home port to fishing grounds for each species
Travel time between fishing grounds for each species

Cost and Earnings

Total vessel earnings in all sea-going activities
Total firm earnings in all activities
Earnings by share for owner, vessel skipper, crew, charter office, etc.
Total costs/expenditures broken down as necessary for cost benefit analysis and income impact modeling (see "Economic Data Needs" developed at the Northeast Data Needs Workshop, March 31-April 1, 1993)
Debt burden

Gear

Average number of fishing poles
Harvest methods and gears used (e.g., trolling, mooching, types of hooks and weights, depths of fishing)

Marketing

Marketing strategies
What attracts the clients

Recreational Fishers

An economic database on recreational fisheries should include by fishing mode and geographic location:

- Total number of anglers targeting on particular species
- Catch, discards, and success rates
- Average angler expenditures per trip

Related economic tables might contain information on:

- Net economic value by target species
- Fishing gear and method used

Information is needed on the relationship of angler trip net economic values to mode of fishing (private vessel, charter vessel, and bank fishing), producer surplus, success rates, retention opportunities and limits, and species caught. Studies of both ocean and inriver components of the salmon fishery are of most immediate importance with studies of the halibut, rockfish, and lingcod fisheries of greater long-range importance.

Data is needed on substitution rates between recreational activities and angler response to changes in recreational management measures such as size limits, bag limits, gear restrictions, and season closures. Such data would include measures of angler preferences and studies of the process by which decisions are made to target on particular species during a particular trip.

Fishing Communities

- Socioeconomic statistics by community
 - Total population
 - Total personal income
 - Total employment
 - Per-capita income
 - Frequency distribution of income levels
 - Employment cycles
 - Tax base
 - Fishery-related employment
 - Fishery-related income
 - Fishery-related municipal revenues
- Marine recreational opportunities by community
- Inventories of recreational market fishing businesses by community
- Cycle or recreational activities in the community
- Commercial harvest opportunities by distance from community port
- Inventories of commercial harvester and processor business by community
- Cycle of commercial fisheries for the community port(s)

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON RESEARCH AND DATA NEEDS

The version of draft research and data needs that appears in the briefing book reflects a number of changes suggested by the Scientific and Statistical Committee (SSC) and other Council advisory bodies before the Council's groundfish strategic plan became available to us. At this meeting the SSC again reviewed the draft research and data needs, largely to ensure that it reflects the recommendations contained in the strategic plan.

Many of the strategic plan recommendations - pertaining, for instance, to capacity reduction, estimation of total removals, frequency of fishery independent surveys, role of industry in data collection, improved stock assessments, evaluation of environmental effects on recruitment and productivity, evaluation and reduction of effects of gear and fishing practices on habitat - were already reflected in the research and data needs. In some cases, specific items have been edited or reprioritized to improve clarity or to make the connection to the strategic plan more explicit. In addition, several new items were added to the draft research and data needs, including a section on marine reserves and an analysis of the extent of overcapacity in the charter boat fleet. Specific SSC recommendations regarding wording changes to research and data needs are described below.

The SSC also updated the draft West Coast Fisheries Economic Data Plan. The document reflects recommendations contained in the strategic plan, with the most notable addition pertaining to evaluation of the socioeconomic effects of marine reserves. The SSC intends to provide additional wording in the document that describes other economics planning and data collection efforts that have been initiated in recent years and the relationship of the economic data plan to these other efforts.

The SSC appreciates the efforts of Mr. Jim Seger in updating the draft research and data needs and the draft economic data plan. Once the proposed changes have been made, the SSC will consider both documents to be ready for public review.

Recommended Wording Changes to Attachment F.1

Ensure the wording of the high priority recommendations provided in the Executive Summary is consistent with the body of the document.

All Fishery Management Plans

Page 2 Add "and species" after "geographic" in fourth sentence. Delete "geographic" in fifth sentence. Replace "will" with "may" in sixth sentence.

Economic Data Plan. In second sentence replace "Developing a coordinated effort" with "Continued development of a coordinated effort."

Page 3 Add a section titled "General Analytical Needs". Subsume "Assessment of Enforcement Effectiveness." Add a second item: "Resources under PFMC jurisdiction respond to large shifts in ocean productivity. For instance, growth and recruitment of rockfish, ocean survival of salmon and the relative abundance of coastal pelagics responded to the major North Pacific climate shift in the late 1970s. In addition, year to year patterns in fishery production tend to show similarities across species (FMP) groups. These holistic resource responses need to be assessed and incorporated into the management process."

Page 3 Economic and Social Data Collection and Research. Delete the last bullet.

Page 4 Add a new item under "Analysis" that reads "Analysis to evaluate extent of overcapacity in the charter vessel fleet."

Groundfish Management Fishery Management Plan

- Page 6 First bullet. Rewrite as follows: “Establish a West Coast coordinator to identify and prioritize stock assessment information needs, to track programs that fulfill those needs and to facilitate establishment of new programs to address unmet needs. This coordinator would report status of biological data collection activities to the Council, with emphasis on anticipated deficiencies identified with respect to stock assessment and management needs.” Make a similar change to the last paragraph on page 7.
- Delete 2nd bullet on electronic monitoring.
- Third bullet. Delete “particularly the trawl fleet.” Delete 2nd sentence. In the third sentence insert “and reducing” after “estimating” and delete “against accurate observations made by observers.” Delete 4th sentence.
- Page 10 Slope Surveys. Move the last sentence of the third bullet to the first bullet.
- Page 11 Environmental Data Collection. In 1st sentence, replace “Data collection” with “Collect, analyze and synthesize data.” In 4th sentence, replace “trawlers” with “vessels”.
- Page 13 Stock Assessment Modeling. Add a second sentence that reads “Develop new models for species for which fishery-independent data are not available (e.g., nearshore rockfishes).”

Salmon Management Fishery Management Plan

- Page 16 Indicator Stocks. Add a sentence to the end of the paragraph that reads “Escapement goals are needed for Washington and Oregon coastal fall chinook.”
- Page 17 Non-Catch Fishing Mortality. Add a sentence prior to the last sentence of the paragraph that reads “Special attention needs to be paid to mid- and long-term mortality.”

Coastal Pelagic Fishery Management Plan

- Page 22 First bullet. Replace “in northern and southern end of range” with “throughout its range.”

Marine Reserves

- Page 26 3rd para. Delete “five”.
- Add a new first bullet: “Identify type and scale of information needed to conduct stock assessments after establishment of marine reserves and evaluate the feasibility and cost of collecting such information.”
- Current first bullet. Insert “and structure” after “location”.
- Subsume the current 2nd, 3rd, 4th and 5th bullets under an introductory sentence. “Research is needed to understand the biological effects of marine reserves and determine the extent to which ABCs would need to be modified when marine reserves are implemented, over the short and long term.”
- Page 27 Stock Assessment Models. After the last sentence, add “As part of the evaluation of marine reserves relative to the status quo, the types and scale of information needed to conduct stock assessments after establishment of reserves should be identified and the feasibility and cost of collecting such information should be analyzed.”

Page 27 Social and Economic Data Needs. In second sentence, replace “are not recorded on a fine enough scale to be useful in modeling” with “are needed on a fine enough scale to model”. Replace 3rd and 4th sentences with “Information is also needed on the extent of displacement of fishing activity from the reserve and the extent to which effort is diverted to other fisheries.”

Page 29 Recreational Harvester and Site Specific Demand. In first sentence, replace “the changes in CPUE (if CPUE predictions could be made)” with “site-specific closures”.

Offsite Nonconsumptive Values. Change “bequeathal” to “bequest.” Delete 3rd sentence.

Add “Other Marine Related Industries. Inventory and assess dependence of businesses supporting commercial and recreational fisheries as well as other ocean based activities (e.g., ecotourism.)”

PFMC
09/12/00

PROPOSED CHANGE IN TERMS OF COUNCIL ADVISORY BODY MEMBERS

Situation: To reduce administrative work load and improve Council and staff efficiency in handling fishery management issues, the staff recommends extending subpanel, Scientific and Statistical Committee (SSC), and Habitat Steering Group (HSG) appointments from two- to three-year terms. This is the same length as Council member appointments and would require modification of Council Operating Procedures (COP) 2, 4, and 6. The Council would need to make a decision on this issue at the September meeting since the next request for nominations to the advisory bodies will be issued following this meeting.

Another issue which the Council may wish to consider and solicit input for is the restriction in COP 2 which limits advisory body members to one alternate per year who cannot be reimbursed by the Council. This restriction may cause unnecessary hardship for some subpanel members and require additional Council deliberations without any beneficial purpose. The Council could choose to consider this and other issues which may arise during the agenda discussion, at a later meeting.

Council Action:

1. Consider amending COPs 2, 4, and 6 (subpanels, SSC, and HSG) to provide that the Council appoint members for three- rather than two-year terms.
2. Consider and provide guidance for any other pertinent issues involving COPs for advisory bodies, including the limitation on alternates for subpanel members.

Reference Materials:

1. Council Operating Procedure 2, Advisory Subpanels (Exhibit F.3, Attachment 1).

PFMC
08/30/00

COUNCIL OPERATING PROCEDURE

Advisory Subpanels

Approved by Council: 07/20/83

Revised: 11/17/89, 11/13/90, 04/06/95, 04/17/96, 10/25/96, 09/12/97, 09/18/98

2

PURPOSE

To establish procedures for advisory subpanels.

OBJECTIVES AND DUTIES

When requested by the Council chairperson or executive director, the advisory subpanels shall:

1. Offer advice to the Council on the assessments, specifications and management measures pertaining to each fishery management plan (FMP) with particular regard to (a) the capacity and the extent to which the fishing vessels of the United States will harvest the resources considered in FMP's, (b) the effect of such management measures on local economies and social structures, (c) potential conflicts among groups using a specific fishery resource, or (d) enforcement problems peculiar to each fishery with emphasis on the expected need for enforcement resources.
2. Offer advice to the Council on (a) FMP's, amendments and regulatory amendments during preparation of such FMP's or amendments by the Council, (b) FMP's prepared by the Secretary of Commerce and transmitted to the Council for review, and (c) the effectiveness of the FMP's, amendments, regulations and other measures which have been implemented.
3. Attend public hearings on the FMP's or amendments.
4. Attend Council meetings at the request of the Council chairperson or executive director to advise the Council on specific fisheries, with particular reference to the socioeconomic implications of managing those fisheries.
5. Keep the Council advised of current trends and developments in fishery matters.
6. Identify specific legal or enforcement questions on proposals and request response through the executive director from the appropriate parties. (Note: The Council staff will attempt to anticipate the need for enforcement and legal advice and arrange for the Enforcement Consultants and/or National Oceanic and Atmospheric Administration general counsel to attend subpanel meetings.)
7. Perform such other necessary and appropriate duties as may be required by the Council to carry out its functions under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

COMPOSITION

1. Subpanels shall consist of not more than 20 members (unless additional members are deemed necessary by the Council), each concerned with carrying out the objectives and duties of the subpanel with respect to a fish species or stock.
2. The Council may establish or abolish subpanels as it deems necessary to perform its duties as specified under the Magnuson-Stevens Act.
3. Each subpanel shall meet at the call of the Council chairperson or executive director.
4. The subpanels shall report to the Council as directed by the Council chairperson or executive director.

MEMBERSHIP

Terms

Members shall be appointed by the Council for two-year terms expiring December 31 on even-numbered years, and may be reappointed at the pleasure of the Council. Vacancy appointments shall be for the remainder of the unexpired term of the vacancy.

Termination of Members

A subpanel member will be replaced at the Council's discretion if he/she (1) transfers employment or moves to a different location, (2) is absent from three consecutive meetings without giving adequate notification to the Council executive director, or (3) appears unable to fulfill his/her obligations as a subpanel member.

Replacement of Members

Upon receipt of a letter of resignation, completion of two-year terms, or following Council action to remove a member, the executive director shall advertise through the news media for qualified nominees. Announcements will be distributed widely and be specific about the duties and responsibilities.

Nominations must be accompanied by adequate information on the amount and kinds of experience which qualify the nominee for the particular position. Nominations must be received on or before a deadline published by the Council.

Alternates

If the executive director is notified in advance, in writing, a subpanel member may send an alternate to a subpanel meeting no more than once per year when the official member is unable to attend. The alternate will not be reimbursed for travel expenses.

Officers

Subpanel officers shall be appointed by the Council chairperson and shall serve one-year terms.

Subcommittees

The subpanels may establish such subcommittees as they deem necessary to facilitate their duties.

MEETINGS

The subpanels shall meet at the request of the Council chairperson or executive director, as often as necessary to fulfill their responsibilities.

Public Participation

The public will be permitted to comment on items relative to the agenda. Comments may be limited if deemed necessary by the subpanel chairperson. Written statements also may be submitted prior to and during the meeting. The public may be permitted to interject comments during the meeting at the direction of the chairperson. Members of the public may be asked to leave the meeting at the chairperson's discretion if their conduct is impeding the orderly progress of the meeting.

Draft reports or statements prepared and discussed at these meetings will be available to the public in final form after submission to the Council. They will not be distributed to the public during the meeting unless authorized by the chairperson. The granting of permission for the public to tape all or any part of the meeting is at the discretion of the subpanel chairperson and such permission must be obtained in advance.

Copies of this operating procedure will be distributed to the public attending subpanel meetings on request.

Public Notification of Meetings

Notice of subpanel meetings shall be published in the *Federal Register* and news media.

MINUTES

If practicable, a Council staff member shall attend and draft summary minutes of each subpanel meeting.

STAFF RESPONSIBILITIES

Council staff members will assist the subpanels as requested.

REPORTS TO COUNCIL

Reports will describe both areas of consensus and differences. The subpanel chairperson will present both majority and minority reports.

NEW MEMBER ORIENTATION

Council staff will hold orientation sessions for new members, if necessary.

AD HOC ADVISORY GROUPS

The Council chairperson may appoint special groups to address particularly contentious issues, such as allocation. Such groups will be as small as possible, while representing the various interests, and representation will be balanced. Members of these groups may or may not be members of the advisory subpanels. These groups will be terminated when the task assigned is completed.

STATEMENT OF THE GROUND FISH ADVISORY SUBPANEL ON
CHANGES TO ADVISORY BODIES

The Groundfish Advisory Subpanel (GAP) discussed changes in the Council's Operating Procedures relating to the GAP and makes the following recommendations:

1. The GAP agrees with the recommendation that GAP terms be extended to three years, beginning January 2001. The GAP views this as a cost saving measure.
2. The GAP recommends the number of meetings which a GAP member can miss should be limited to two per year. Missing two meetings will be cause for dismissal.
3. The GAP recommends a member be allowed to be replaced with an alternate once each year upon prior notification of the Council Chair, and the alternate be compensated for his/her expenses.
4. The Council should make clear to applicants for advisory bodies what their responsibilities are including the number of meetings they will be required to attend.

The majority of the GAP discussed GAP composition and recommends no changes be made at this time. A minority requested greater representation from the open access sector.

PFMC
09/14/00

APPOINTMENTS TO ADVISORY GROUPS

Situation: There are two elements to this agenda item. First, consideration of issues relating to, and nominations for, current plan team and subpanel vacancies. Second, the composition of advisory entities and solicitation of nominations for the new term beginning 2001.

A. Considerations for Current Vacancies

HIGHLY MIGRATORY SPECIES ADVISORY SUBPANEL (HMSAS)

Due to his appointment to the Council, Mr. Donald Hansen is unable to attend future meetings of the HMSAS. Mr. Hansen has designated Mr. Robert Fletcher as the alternate to his seat on the subpanel.

Mr. Joe Ciaramitaro has resigned from the subpanel due to time constraints. Mr. Ciaramitaro has requested that Anthony Vuoso be allowed to replace him for the remainder of the term.

In regard to these positions being filled by Mr. Fletcher and Mr. Vuoso, the Council has been requested to consider waiving the Council Operating Procedure (COP) that restricts alternates from representing members more than once per year. In both cases, the vacancies came too late to allow the Council to follow the procedures in COP 2 (advertising the positions and selecting new representatives) and seat new members at the November subpanel meetings. Allowing the alternates to sit at two meetings this year could resolve this problem until members are selected for the new term beginning 2001. The chair of the HMSAS has also requested, by e-mail of August 15, the expenses for the HMSAS alternates be reimbursed. COP 2 also prohibits this reimbursement (currently, National Marine Fisheries Service [NMFS], rather than the Council, pays for HMSAS member travel expenses).

Mr. Hansen is the sole representative for charter boat operators and Mr. Ciaramitaro is one of two processor representatives on the subpanel. As the Council develops the highly migratory species fishery management plan, it is important that all affiliations on the subpanel be represented.

GROUND FISH ADVISORY SUBPANEL (GAP)

The appointment of Donald Hansen to the Council has also created a vacancy in the California Charter Boat Operator position of the GAP. Since notification of Mr. Hansen's appointment was not available until after the June meeting, the Council has not advertised to fill the GAP vacancy. Under COP 2, a replacement for the vacant GAP position could not be approved until the November Council meeting, too late to allow a replacement within the current term. Therefore, it appears the seat will go vacant in September and November and be filled in the new term beginning in 2001.

A letter of nomination for Mr. Darby Neil to the position vacated by Mr. Hansen has been received from the Sportfishing Association of California. Unless otherwise informed, Council staff will consider this letter as a nomination for the new term beginning 2001.

COASTAL PELAGIC SPECIES MANAGEMENT TEAM (CPSMT)

The resignation of Dr. Richard Parrish has created a vacant seat representing NMFS on the CPSMT. A letter of nomination for Dr. Paul Smith has been received from NMFS, Southwest Region. The nomination letter and Dr. Smith's curriculum vitae are included under the Closed Session tab of this briefing book.

National Marine Fisheries Service

<u>Nominee</u>	<u>Nominated By</u>
Dr. Paul E. Smith , Southwest Fisheries Science Center, La Jolla, CA	Mr. Rodney R. McInnis, NMFS Southwest Region, Long Beach, CA

SALMON TECHNICAL TEAM (STT)

The U.S. Fish and Wildlife Service (USFWS) seat on the STT is vacant because the former representative, Mr. Dell Simmons, is now employed by NMFS. The Council has received a letter from USFWS nominating Mr. Henry Yuen to fill the vacancy. The nomination letter and Mr. Yuen's curriculum vitae are included under the Closed Session tab of this briefing book.

In addition, NMFS has requested Mr. Simmons remain on the STT as an eighth member. The COP allows for up to eight members on planning teams. The current seven positions on the team represent the following entities: one member each from the state agencies of California, Oregon, and Washington; one member each from the NW and SW Regions of NMFS; one USFWS representative; and one tribal representative. Plan team appointments are for indefinite terms.

U.S. Fish and Wildlife Service	
<u>Nominee</u>	<u>Nominated By</u>
<i>Mr. Henry Yuen</i> , USFWS, Columbia River Fisheries Program Office, Vancouver, WA	Mr. Timothy W. Roth, USFWS Council Representative, Vancouver, WA

National Marine Fisheries Service	
<u>Nominee</u>	<u>Nominated By</u>
<i>Mr. Dell Simmons</i> , NMFS, Lacy, WA	NMFS

B. Composition of Advisory Entities and Solicitation for Nominations for 2001

The two-year terms of the Scientific and Statistical Committee, advisory subpanels, and most members of the Habitat Steering Group (HSG) expire on December 31, 2000. The Council needs to review the composition of each group, revise them if appropriate, and solicit nominations for the next term (two or three years, depending on Council action under Agendum F.3). Appointments will be made at the October 31-November 3, 2000 meeting. The respective groups may have comments on their composition and, if so, will report these to the Council at the September meeting.

The current advisory body compositions are provided below.

Habitat Steering Group - 13 members

- One National Marine Fisheries Service (NMFS)
- One U.S. Fish and Wildlife Service (USFWS)
- One Pacific States Marine Fisheries Commission (PSMFC)
-
- Four state fishery management agencies
- Two tribal representatives (one Klamath, one Northwest or Columbia River)
- Two fishing industry
- One conservation representative
- One at-large

The Council, NMFS, USFWS, and PSMFC members serve indefinite terms. The remaining members serve two-year terms, and these seats need to be advertised. **The Council deferred final action to this meeting in regard to establishing a seat for a Salmon Advisory Subpanel (SAS) representative to the HSG.**

Scientific and Statistical Committee - 14 members

- Four state fishery management agencies (Washington, Oregon, Idaho, California)
- Three NMFS (Alaska, Northwest, and Southwest Centers)

One tribal fishery management entity
Six at-large (three social scientists of which two must be economists)

Coastal Pelagic Species Advisory Subpanel - 11 members

Three California commercial fishers
One Oregon commercial fisher
One Washington commercial fisher
One Northern California charter/sport fisher
One Southern California charter/sport fisher
Three processors
One conservation representative

Groundfish Advisory Subpanel - 16 members

Three trawlers (Washington, Oregon, California)
One open access fisher
Three charter boat operators (Washington, Oregon, California)
Two sport fishers
Two processors
One at-sea processor
Three fixed gear (at-large)
One conservation representative

Halibut Advisory Subpanel - 6 members

One longliner (Washington)
Two charter boat operators (Washington Coast, Oregon)
Two sport fishers (Washington, Oregon)
One processor

Salmon Advisory Subpanel - 17 members

Three Trollers (Washington, Oregon, California)
One gillnetter
One processor
Three charter boat operators (Washington, Oregon, California)
Four sport fishers (Washington, Oregon, Idaho, California)
Three tribal representatives (Washington Coast, Columbia River, California)
One conservation representative
One public at-large

Highly Migratory Species Advisory Subpanel - 12 members

One commercial troll
One commercial purse seine
One commercial gillnet
One commercial at-large
One private sport fisher
One charter boat operator
One Northern processor
One Southern processor
Two public at-large (at least one conservation representative)

Council Action:

1. In response to the need to fill current vacancies in the HMSAS for the remainder of the 1999-2000 term, consider waiving those portions of COP 2 that prohibit subpanel alternates from (a) representing members more than once per year and (b) receiving reimbursement for travel-related expenses.

2. Appoint new members to the CPSMT and STT.
3. Review composition of advisory entities and revise for the next term, if appropriate.
4. Direct staff to solicit nominations for members to the HSG, SSC, GAP, HAS, SAS, and HMSAS for the new term beginning in 2001.

Reference Materials:

1. Resignation and nomination letter for the HMSAS from Mr. Joe Ciaramitaro (Closed Session, Attachment 1).
2. Nomination letter for the GAP from Mr. Bob Fletcher (Closed Session, Attachment 2).
3. Nomination letter and curriculum vitae for CPSMT from Mr. Rod McInnis (Closed Session, Attachment 3).
4. Nomination letter and curriculum vitae for STT from Mr. Tim Roth (Closed Session, Attachment 4).

PMFC
08/31/00

REPORT OF THE BUDGET COMMITTEE

Dr. Donald McIsaac presented the Budget Committee with an Executive Director Report that included four items: (1) the financial audit report for calendar year (CY)1999; (2) status of the supplemental funding request for CY 2000; (3) status of the CY 2000 budget; and (4) status of the proposed 2001 grant application.

The audit for CY 1999 indicates that the Council's financial operations for the year ended in conformity with generally accepted accounting principles. There were no questioned expenditures for CY 1999.

The request for CY 2000 supplemental funding in the amount of \$14,675 was submitted in late July and has not yet been acted on. The funding should be available before the end of the year and will be included in staff considerations of expenditures for the remainder of CY 2000.

The overall status of the CY 2000 budget was discussed by the committee. Staff indicated that firmer numbers for planning expenditures through the end of the year would be available by mid-October for committee review. The Budget Committee will be provided updated estimates by mail prior to the October/November Council meeting.

Planning and submission of the CY 2001 grant application will be at the CY 2000 base funding level of \$1,907,750. The committee discussed details of the proposed CY 2001 budget and highlighted some categories for closer review. Concern was expressed about anticipating increased travel costs due to the expectation of continued higher oil prices and increased committee and staff workloads to implement Council management plans.

The Budget Committee passed a motion which (1) approved the staff's preliminary assessment of CY 2000 expenditures with a more detailed review to follow in mid-October to identify the most beneficial options for fully utilizing the CY 2000 grant and (2) directed the staff to prepare the proposed CY 2001 grant application for submittal to NMFS in general conformity with the figures presented at the meeting and the discussion regarding future travel costs.

The agenda items for Status of the Groundfish Strategic Plan Facilitation Contract and Legislative Update were not discussed as a result of Dave Hanson's attendance at an emergency meeting of the North Pacific Fishery Management Council.

PFMC
09/14/00

PROPOSED AGENDA ITEMS

Pacific Fishery Management Council

Red Lion Hotel at the Quay
100 Columbia Street
Vancouver, Washington 98660
(360) 694-8341
October 30 - November 3, 2000

CLOSED SESSION

A. Call to Order

1. Opening Remarks, Introductions, Roll Call
2. Executive Director Report
3. National Marine Fisheries Service (NMFS) Report on Regulation Implementation
4. Approve Agenda - **ACTION**
5. Approve September Meeting Minutes - **ACTION**

B. Pacific Halibut Management

1. Summary of 2000 Fisheries
2. Estimate of Bycatch in 1999
3. Changes to Catch Sharing Plan and Regulations for 2001 - **ACTION**

C. Salmon Management

1. Sequence of Events and Status of Fisheries in 2000
2. Results of Scientific and Statistical Committee Methodology Review - **ACTION**
3. Report on Selective Fisheries in 2000 - **DISCUSSION**
4. Final Report of the Oregon Coastal Natural Coho Work Group - **ACTION**
5. Progress Report on Review of Queets Wild Coho Status - **DISCUSSION**
6. Status of Amendment 14
7. Salmon Option Hearing Sites - **Discussion**

D. Habitat Issues

1. Report of the Habitat Steering Group - **ACTION**

E. Coastal Pelagic Species Management

1. Limited Entry Fishery - Capacity Goal and Other Issues - **ACTION**
2. Pacific Sardine Harvest Guideline - **ACTION**
3. Pacific Sardine Suballocation - **ACTION**

F. Highly Migratory Species Management

1. Update on Fishery Management Plan (FMP) Development - **ACTION**

G. Groundfish Management

1. Status of NMFS Research Programs and Other Activities - **DISCUSSION**
2. Exempted Fishing Permit Applications - **ACTION**

G. Groundfish Management, (continued)

3. Adoption of Rebuilding Plans for Cowcod and Canary Rockfish - **ACTION**
4. Final Harvest Levels for 2001 - **ACTION**
5. Sablefish Permit Stacking - **ACTION**
6. Permit Transfer Regulations - **ACTION**
7. Observer Program Design
8. Vessel Monitoring System as a Fishery Management Tool
9. Review of Stock Assessment Process - **ACTION**
10. Management Measures for 2001 - **ACTION**
11. Status of Fisheries and Inseason Adjustments - **ACTION**

H. Administrative and Other Matters

1. Report of the Budget Committee - **ACTION**
2. Status of Legislation
3. Research and Data Needs and Economic Data Plan
4. Appointments - **ACTION**
5. Draft Agenda for March 2001 - **ACTION**

Other Possible Agenda Topics

- Marine Reserves - Phase II
- Groundfish Strategic Plan Implementation
- American Fisheries Act FMP

PFMC
09/13/00