APPENDIX B
OPTIONS AND ANALYSES FOR THE COASTAL PELAGIC SPECIES FISHERY MANAGEMENT PLAN

Page

1.0 OPTIONS AND ANALYSES FOR THE COASTAL PELAGIC SPECIES FISHERY MANAGEMENT PLAN

This appendix (Appendix B) explains the options and analysis for the fishery management plan (FMP) for coastal pelagic species (CPS). CPS include Pacific sardine, northern anchovy, Pacific (chub) mackerel, jack mackerel, and market squid. Stocks and fisheries are described in detail in Appendix A. Costs involved in this FMP are estimated in Appendix C. Essential fish habitat is described in Appendix D. References are included in Appendix E. The Council's final recommendations on options constitute the main plan amendment document.

1.1 Introduction

CPS are found in the exclusive economic zones (EEZ) of Mexico, the U.S., and Canada as well as further offshore in international waters. They are taken in U.S. waters in a multispecies fishery (along with bonito, tunas, and other species) that operates mainly off southern California but occasionally as far north as Washington State. Components of the CPS fishery in U.S. waters currently or potentially include U.S. commercial fisheries (that produce fish for human food, pet food, fish meal, fish food, live bait, dead bait, and other uses), foreign catcher and processor vessels, foreign vessels engaged in joint ventures, party, and charter boats that carry anglers, and other anglers who target CPS or use them as bait.

CPS are taken directly and incidentally in fisheries that use many types of gear. Purse seines and other roundhaul nets are the primary gear used to harvest CPS; but midwater trawls, pelagic trawls, longlines, gill nets, dip nets, trammel nets, trolls, pots, hook and line, and jigs are also used.

Sardine and Pacific (chub) mackerel are currently managed by the California Department of Fish and Game (CDFG) under state laws with substantial scientific support from the National Marine Fisheries Service (NMFS). There are currently few regulations pertaining to CPS harvest in Oregon and Washington, other than provisions for experimental fisheries. The Pacific Fishery Management Council (Council) manages northern anchovy under the northern anchovy FMP and jack mackerel (as bycatch north of 39° N latitude) under the Pacific coast groundfish FMP. The CPS FMP will remove management of jack mackerel from the groundfish plan. In addition, existing state regulations are consistent with the FMP.

Northern anchovy, market squid, and sardine are forage for at least two bird species (brown pelican and least tern) and four marine mammals (fin whale, humpback whale, sei whale, and Guadalupe fur seals) classified as endangered under the Endangered Species Act (ESA); one marine mammal species (Northern or Steller's sea lion) classified as threatened under the ESA; and one marine mammal species (northern fur seal) classified as depleted under the Marine Mammal Protection Act. In addition, anchovy, sardine, and squid are forage for all depleted, threatened, and endangered salmon stocks along the coast.

CPS finfish are taken in both state and federal waters. CDFG staff estimate that roughly 95% of anchovy were taken in federal waters during the historical reduction fishery (state regulations did not allow reduction fishing near shore). The same sources estimate that 30% of Pacific (chub) mackerel, 50% of jack mackerel, and 50% of Pacific sardine are taken in federal waters. A larger fraction of sardine landings were taken in federal waters during the historical fishery when biomass was high.

Landings, exvessel prices, and revenues for northern anchovy, sardine, mackerel, and market squid landed in California during 1997 are given in Table 1.0-1. Together, these species account for most of the landings in the CPS fishery. Landings of anchovy are stable at low levels and used primarily for live and dead bait in the valuable recreational fishery. Landings of mackerels have been low in recent years due to poor availability. Landings of sardine have increased in recent years with increased biomass and higher quotas. In 1997, sardine supported the second largest (by volume, not value) fishery in California. Squid landings increased recently to record high levels due to increased availability and prices but decreased dramatically during the El Niño of 1997 to 1998. In 1997, squid supported the largest and most valuable fishery in California. There are roughly 20 processing plants in California that handle about 95% of total CPS finfish and squid landings and roughly half handle at least 500 mt per year.

The CPS fishery as a whole is the largest in California. In 1997, CPS finfish contributed 32% and CPS finfish plus squid contributed 68% of total commercial landings in California (Table 1.0-2). Market squid, sardine and chub mackerel were the top three species in terms of total landings.

1.2 Need for Fishery Management Plan Management

1.2.1 Incidental Catch Considerations

Consolidation of responsibilities for CPS under a single FMP would make management of directed fisheries and incidental catch more efficient and effective. Incidental catch is common in the CPS fishery but may be difficult to coordinate under current management. For example, if the current downward trend in anchovy abundance were to continue and the stock became overfished, it would be difficult for federal authorities to manage anchovy catch in the directed sardine fishery which is managed by California.

1.2.2 International and Interstate Cooperation

Management of all CPS under a single FMP would facilitate cooperative international and interstate management and scientific work. CPS are transboundary resources shared by the U.S., Mexico, and Canada. Harvest levels in Mexico have increased to the point where combined U.S. and Mexican harvests threaten the long term productivity of all CPS stocks except jack mackerel and anchovy. Modest, but increasing, catches of CPS are occurring off Oregon and Washington. Sardine, anchovy, and Pacific (chub) mackerel are all taken in Canadian waters. No cooperative arrangement for management of CPS in U.S., Mexican, and Canadian waters exists. Experience with the anchovy fishery indicates that management agreements and programs for collaborative scientific work with Mexico are difficult to obtain, even for FMP managed species. In the absence of an FMP and direct federal involvement, however, the likelihood of cooperative management and scientific work is further reduced.

The U.S., Mexico, and ten other nations recently signed the "Declaration of Panama" which commits the signatories to measures that ensure the long-term sustainability of living marine resources in the eastern Pacific Ocean. In addition, the United Nations conference on straddling stocks and highly migratory species is expected to result in a treaty that the U.S. and Mexico will both sign. The new agreements and climate of cooperation between the U.S. and Mexico provide a unique opportunity for cooperative work and management of CPS, particularly Pacific sardine, that support fisheries in both countries. A decision to implement an FMP for CPS will demonstrate U.S. support for these international agreements and help capitalize on the currently favorable international climate for management of stocks shared by the U.S. and Mexico.

1.2.3 Continued NMFS Participation in CPS Management

In the absence of an FMP for CPS, it is likely that scientific expertise and capability in NMFS will deteriorate in the short term to the point where collection of data, monitoring, stock assessment, and field studies are not possible for CPS. NMFS is downsizing and reductions in staff and support can be expected in areas where federal responsibilities are not clearly defined. Although NMFS has informally agreed to continue assisting California with management of CPS in the absence of an FMP, details have not been spelled out and NMFS assistance may not be possible beyond the short term without an FMP. In the absence of an FMP, the CPS fishery may lose scientific and management support of NMFS, reducing benefits to the ecosystem and taxpayers.

Continued federal involvement in the fishery would facilitate exchange of information necessary for management of CPS in U.S. waters. Landings, age composition, and other data from Mexico, Oregon, Washington, and Canada are required for biomass assessments used to manage CPS fisheries in U.S. waters. Federal and Council involvement lends weight and urgency to international requests for data from federal agencies in Mexico and Canada.

Continued federal involvement in the fishery is also essential for data collection. Stock assessment models used by state and federal biologists to determine the status of CPS stocks and set quotas are all based on California Cooperative Oceanic Fishery Investigation (CalCOFI) and fish spotter data which are collected by NMFS. In the absence of an FMP, it is likely that CalCOFI and fish spotter information would disappear or degrade, because neither state nor Mexican scientists have the resources or expertise to carry out the necessary data collection and analysis. The size of the CalCOFI survey area has been reduced over the last two decades to the minimum size useful for fishery management. Further reductions would render CalCOFI data useless.

Continued federal involvement in the fishery is essential for effective scientific cooperation. Field surveys for direct estimation of CPS biomass need to be conducted along the entire coast in Mexican as well as U.S. waters. These surveys are too large and complicated in scope to be managed by California, Oregon, Washington, Canada, and Mexico scientists without assistance from NMFS.

1.2.4 Control of Future Fishery Expansion

There is a high probability for further rapid development of CPS, particularly sardine and market squid, fisheries that could not be managed effectively without an FMP. Pacific sardine biomass has increased by about 35% per year since 1983 and is currently around 600,000 mt. As sardine biomass increased, fishing opportunities in northern areas increased and sardine began to occur off Oregon, Washington, British Columbia, and international waters more than 200 miles offshore of southern California. Sardine were taken in large commercial quantities as far north as British Columbia during the historical fishery when sardine biomass was around one million mt. Catches off Oregon, Washington, and outside state waters (50% of Pacific sardine are taken in federal waters) could not be managed effectively under existing California regulations.

An FMP for CPS facilitates limited entry management in the CPS finfish (anchovy, sardine, and mackerels) fishery. California could develop a limited entry plan for finfish unilaterally, but has no economists and few staff to carry out supporting analyses and develop options.

An important advantage in implementing an FMP with limited entry at this time is that future increases in capacity of the CPS fishery could be managed before problems arise. The collapse of the historical sardine fishery in the 1950s was due to overcapitalization and resulting overfishing at the same time as unfavorable environmental conditions. It is likely that the CPS fishery will become overcapitalized faster than management authorities can react if sardine, or other CPS, increase in abundance or markets develop. Experience with the CPS and other fisheries indicates that the process of developing fishery management programs at the state or federal level is slower than the rate at which a fishery can become overcapitalized. There is substantial excess capacity in the groundfish, herring and salmon fisheries (including the factory trawler fleet), for example, that could enter the CPS fishery in a matter of months if markets develop. Boats from overcapitalized herring fisheries off Oregon, Washington, and Alaska, for example, recently entered the California squid fishery in response to increased availability and prices. The total number of boats harvesting squid in the California squid fishery approximately doubled during 1994 to 1997.

NMFS could manage CPS under emergency authority if a crisis were to develop. However, recent experience in Alaska with management of the scallops suggests that this approach is unsatisfactory, because NMFS cannot use emergency authority to address allocation problems, which are usually paramount. At most, NMFS can open or close a fishery to all vessels when operating under emergency authority. An FMP provides a more comprehensive and effective approach that can handle all contingencies.

Trawl fleets (joint venture and factory trawlers) expressed interest in developing an offshore fishery for underutilized jack mackerel in the early 1990s. There would be substantial incidental catch of other CPS if an offshore fishery for jack mackerel developed (SWFSC 1991). To date, exploratory fishing and marketing efforts for jack mackerel have failed and no offshore fishery has developed, but the possibility of an offshore fishery remains, particularly for sardine. An offshore fishery and associated incidental catch could not be managed under current state regulations.

1.2.5 State and Federal Scientific and Monitoring Resources

At the present time, neither NMFS nor CDFG have enough scientific or monitoring resources to manage CPS on their own, but their combined resources may be sufficient. Stock assessment and management resources in state and federal agencies for stock assessment and management have declined over the last decade.

CDFG resources are currently insufficient to collect fishery data and conduct stock assessments for Pacific (chub) mackerel and sardine, which are the mainstay of the CPS finfish fishery. Federal resources available for management of northern anchovy are eroding slowly, but at a rate that may increase in the absence of an FMP for CPS. State and federal authorities are currently able to meet their responsibilities for management of CPS because of informal cooperation and collaboration. An FMP for CPS would make maximum use of scarce resources available at the state and federal levels to manage one of the largest fisheries on the West Coast.

1.2.6 Industry Support

Industry strongly supports an FMP in the CPS fishery. Strong industry support is unusual and an important advantage in implementing an FMP with limited entry at this time. As conditions in the fishery improve, excess capacity increases, and more stakeholders become involved, it is likely that industry support will become less unanimous and effective management will become more difficult.

1.2.7 Opportunity for Risk Averse Management

An FMP for CPS would conform to the NMFS stated policy of risk averse management which is described in National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and ensure that one of the largest fisheries in the Nation continues to be managed according to risk averse principals. Risk averse management is particularly important for CPS which are highly variable, often at low abundance levels, but potentially very productive, and ecologically important as forage for predators that include sportfish and endangered species.

1.2.8 Overfished Status of Pacific Sardine and Pacific (Chub) Mackerel

NMFS has identified both Pacific sardine and Pacific (chub) mackerel as being overfished in a recent report. This FMP amendment clearly responds to concerns about the status of these stocks relative to their long-term potential yield. Under overfishing definitions in this plan, neither Pacific sardine nor Pacific (chub) mackerel are overfished (See sections 4.1 and 4.2 of this appendix).

1.2.9 Council Involvement in California Fisheries

Benefits to the nation would likely be enhanced if the CPS FMP is adopted, because it provides an opportunity for federal authorities to better serve constituents in southern and central California (where a large fraction of the West Coast population resides) at relatively low, near status quo costs.

1.3 History of the Fishery Management Plan

Council initiated the development of the FMP for northern anchovy in January of 1977. A final draft of the Plan was approved and submitted to the U.S. Secretary of Commerce (Secretary) in June of 1978. Regulations implementing the FMP for northern anchovy were published in the *Federal Register* on September 13, 1978. Subsequently, the Council has considered seven amendments.

The first amendment changed the method of specifying the domestic annual harvest for northern anchovy and added a requirement for an estimate of domestic processing capacity and expected annual level of domestic processing. Approval for this amendment was published in the *Federal Register* on July 18, 1979.

The second amendment, which became effective on February 5, 1982, was published in the *Federal Register* on January 6, 1982. The purpose of this amendment was to increase the domestic fishing fleet's opportunity to harvest the entire optimum yield (OY) of northern anchovy from the U.S. EEZ. This was to be accomplished by reallocating all or part of the northern area reduction quota reserve if the northern fishery had not harvested or demonstrated an intent to harvest the full reserve by the end of the fishing season.

During the spring of 1982, the Council considered a third amendment that divided the quota for northern anchovy into two halves and made release of the second half conditional on the results of a mid-season review of the status of the stock. The methods proposed for the mid-season assessment were considered too complex to implement, and the amendment was not approved.

The fourth amendment, which had two parts, was published in the *Federal Register* on August 2, 1983 and became effective on August 13, 1983. The first part abolished the five-inch size limit in the commercial fishery and established a minimum mesh size of 5/8 inch for northern anchovy. The mesh size requirement did not become effective until April 1986 in order to give the fleet additional time to comply without undue economic hardship. The second part established a mid-season quota evaluation that was simpler in design than the method proposed in Amendment 3. The annual quota was split in half. The first half was allocated at the beginning of the season. The second half was allocated unless available evidence indicated that its harvest would reduce the following year's spawning biomass below the level of one million short tons.

The fifth amendment in 1983 incorporated advances in scientific information concerning the size and potential yield of the central subpopulation of northern anchovy. When the original FMP was developed, scientists had estimated that the subpopulation ranged up to about 3.6 million mt (four million short tons) and could support an average annual catch of about 454,000 mt (500,000 short tons). These estimates were based on the larva census method of stock assessment. New estimates, based upon an egg production method of assessment, were developed and showed that the population had a maximum size of only about 2.5 million mt and a maximum average yield of about 340,000 mt per year. Since annual fishery catch quotas are based upon measurements of population size, the FMP had to be revised to incorporate OY formulas consistent with the new scientific assessments.

In addition, the fifth amendment included changes to a variety of other management measures. Two or more alternative actions were considered in each of seven general categories (1) OY and harvest quotas; (2) season closures; (3) area closures; (4) quota allocation between areas; (5) the reduction quota reserve; (6) minimum fish size or mesh size; and (7) foreign fishing and joint venture regulations. The alternatives for the fifth amendment were reviewed by the Council during 1983. The final rule, on the fifth amendment measures adopted, was published in the *Federal Register* on March 14, 1984.

The sixth amendment in 1990 implemented a definition of overfishing for northern anchovy consistent with National Standard 7 of the Magnuson-Stevens Act. The amendment defined overfishing as any harvest of northern anchovy when the estimated spawning biomass during the current and proceeding seasons was less than 50,000 mt.

Council began developing the seventh amendment as a new FMP for CPS on a motion from NMFS and California in 1990. A complete draft was available in November of 1993. Council suspended further work because NMFS withdrew support due to budget constraints. In July of 1994, the Council decided, on a motion by California, to proceed with the plan through the public comment period. NMFS agreed with the decision on the condition that the Council also consider the options of dropping or amending the anchovy FMP. Thus, four principal options were considered for managing CPS (1) drop the anchovy FMP (no federal or Council involvement in CPS); (2) continue with the existing FMP for anchovy (status quo); (3) amend the FMP for northern anchovy; and (4) implement an FMP for the entire CPS fishery. In March of 1995, after considering all four principal options, the Council decided to proceed with the FMP for CPS. Final action was postponed until June 1995, so that NMFS and the Council's Scientific and Statistical Committee (SSC) could review the draft plan in detail and provide comments to the Coastal Pelagic Species Plan Development Team (CPSPDT). At the June meeting in 1995, the Council adopted a draft plan that had been revised to address comments provided by NMFS and the SSC and the plan was submitted to the Secretary. Amendment 7 was rejected by NMFS, Southwest Region, because of cost considerations. NMFS announced its intention to drop the FMP for northern anchovy (in addition to FMPs for other species) in the *Federal Register* on March 26, 1996, but the action was never completed.

1.3.1 History of Amendment 8

At a meeting during June 23-25, 1997, the Council directed the CPSPDT to amend the FMP for northern anchovy to conform to the recently revised Magnuson-Stevens Act and to expand the scope of the FMP to include the entire CPS fishery. The Council's decision was based on a motion by the CDFG and supported by NMFS. Supporting documentation was provided by the CDFG in the form of an "issue paper" that described increases in the abundance, distribution, and catch of sardine and market squid and insufficient resources available at the state level for management. The CPSPDT was directed to base its work on Amendment 7 (which was rejected by NMFS as described above), to consider market squid for inclusion in the plan, and to analyze options for limited entry in the CPS fishery south of 39° N latitude.

TABLE 1.0-1. Landings, prices, revenues and percent of total revenues for the principal species in the CPS fishery (including live bait) during 1997.

	Landings (round wt, mt)	Revenue ($1,000)	Average Price ($/lb)	Percent Total Revenue
Anchovy[a/]	7,416	1,979	0.12	six percent
Mackerel[b/]	17,061	2,711	0.07	nine percent
Sardine[c/]	40,419	5,127	0.06	16%
Squid	70,683	21,941	0.14	69%

a/ Includes 2,000 mt (approx) of live bait at $681/mt and 1,757 mt landed at $281/mt.
b/ Pacific (chub) mackerel plus jack mackerel plus unspecified mackerel.
c/ Includes 2,000 mt (approx) mt of live bait at $681/mt and 11,933 mt landed at $148/mt.

TABLE 1.0-2. Commercial landings and revenues for the most important species landed in California during 1997. Landings, revenues and prices from fish tickets and do not include figures for live bait.

Species	Landings (mt)	Revenues ($1000)	Price ($/lb)	Landings Rank	Revenue Rank
Market Squid	70,683	21,941	0.14	1	1
Pacific Sardine	38,419	3,765	0.04	2	13
Pacific Chub Mackerel	16,015	2,478	0.07	3	19
Pacific Herring	7,300	12,173	0.76	4	3
Red Sea Urchin	7,010	12,518	0.81	5	2
Pink Shrimp	6,378	5,381	0.38	6	8
Pacific Whiting	6,336	583	0.04	7	33
Northern Anchovy	5,416	617	0.05	8	32
Skipjack Tuna	5,060	4,395	0.39	9	11
Dover Sole	5,008	3,152	0.29	10	16
Yellowfin Tuna	4,364	4,638	0.48	11	10
Albacore	3,277	5,631	0.78	12	7
Sablefish	2,747	8,346	1.38	13	5
Chinook Salmon	2,732	7,256	1.21	14	6
Bluefin Tuna	2,228	2,727	0.56	15	17
Dungeness Crab	1,926	8,374	1.97	16	4
Nominal Longspine Thornyhead	1,920	3,168	0.75	17	15
Unspecified Rockfish	1,608	1,513	0.43	18	20
Unspecified Skate	1,316	556	0.19	19	37
Nominal Widow Rockfish	1,292	954	0.34	20	27
Nominal Chilipepper	1,103	1,070	0.44	21	24
Jack Mackerel	1,046	233	0.10	22	49
Total (all species)	193,184	111,469			

2.0 GOALS, OBJECTIVES, AND A FRAMEWORK MANAGEMENT PROCESS FOR THE COASTAL PELAGIC SPECIES FISHERY

Amendment 8 replaces the fishery management plan (FMP) for northern anchovy to establish procedures for management of coastal pelagic species (CPS) along the West Coast of the United States. It also changes the name from the existing "Northern Anchovy Fishery Management Plan" to "Fishery Management Plan for Coastal Pelagic Species".

The CPS fishery targets Pacific sardine, Pacific (chub) mackerel, northern anchovy, jack mackerel, and market squid. Of these, Pacific sardine and Pacific (chub) mackerel are "Actively managed" while the others are "Monitored" (Table 1.0-1). Management decisions and procedures are based on a framework process described below. Degree/intensity of monitoring, assessment, and management will vary by fish species depending on stock and fishery status as recommended by the Coastal Pelagic Species Management Team (CPSMT), Coastal Pelagic Species Advisory Subpanel (CPSAS), or the Pacific Fishery Management Council (Council).

2.1 Goals and Objectives

Goals and objectives for the CPS FMP (not listed in order of priority):

1. Promote efficiency and profitability in the fishery, including stability of catch.
2. Achieve optimum yield (OY).
3. Encourage cooperative international and interstate management of CPS.
4. Accommodate existing fishery segments.
5. Avoid discard.
6. Provide adequate forage for dependent species.
7. Prevent overfishing.
8. Acquire biological information and develop long term research program.
9. Foster effective monitoring and enforcement.
10. Use resources spent on management of CPS efficiently.
11. Minimize gear conflicts.

2.1.1 "Active" Management versus "Monitored" Management

The CPS FMP includes two management categories for CPS fish stocks: "Active" management and "Monitored" management. "Active" is for stocks and fisheries with biologically significant levels of catch, or biological or socioeconomic considerations requiring relatively intense harvest management procedures. This category is particularly important for stocks that are or may be overfished. The second category, "Monitored," is for stocks and fisheries not requiring intensive harvest management and where monitoring of catches and available abundance indices are considered sufficient to manage the stock.

The purpose of Active and Monitored management is to use available agency resources in the most efficient and effective manner while satisfying goals and objectives of the FMP. The distinction enables managers and scientists to concentrate efforts on stocks and segments of the CPS fisheries that need greatest attention or where the most significant benefits might be expected.

Active management may be characterized by periodic stock assessments, and/or periodic adjustments of target harvest levels based on maximum sustainable yield (MSY) control rules. Monitored management, in contrast, involves tracking trends in catches and qualitative comparison to available abundance data but without periodic stock assessments or periodic adjustments to target harvest levels. Species in both categories may be subject to management measures such as catch allocation, gear regulations, closed areas, closed seasons, or other forms of Active management.

Explicit MSY control rules, definitions of overfishing and overfished stocks must be developed for all Actively managed species. Monitored management, in contrast, may use "generic" or general definitions of overfishing and overfished stocks that do not have specific fishing mortality or biomass cutoffs. Essential fish habitat (EFH) must be described for all stocks in the management unit, including Actively managed and Monitored species.

The CPSMT will annually review all CPS stocks and make recommendations to the Council and agencies regarding appropriate management categories for each stock ("Active" or "Monitored"). Changes to the appropriate management category for each species can be made annually by the Council based on all available data, including acceptable biological catch (ABC) levels and MSY control rules, and the goals and objectives of this FMP. Changes in a management category may be accomplished according to any of the four procedures for establishing and adjusting management measures described below in section 2.2.1. In addition, CPS in the Monitored management category can be reassigned to Active management on short notice under the point-of-concern framework.

TABLE 2.1.2. Species included in the CPS FMP (other species can be added as appropriate).

Common Name	Scientific Name
ACTIVE MANAGEMENT:	
Pacific sardine	*Sardinops sagax*
Pacific (chub) mackerel	*Scomber japonicus*
MONITORED MANAGEMENT:	
Northern anchovy	*Engraulis mordax*
Central and northern subpopulations	
Market squid	*Loligo opalescens*
Jack mackerel	*Trachurus symmetricus*

2.2 Framework Management

The framework approach to management of CPS allows changes and modifications to be made in a timely and efficient manner without need to amend the FMP. The FMP establishes two framework procedures through which the Council is able to recommend establishment and adjustment of management measures. The "point-of-concern" framework allows the Council to develop management measures in response to resource conservation and ecological issues. The "socioeconomic" framework allows the Council to develop management measures in response to social and economic issues.

Management measures are normally imposed, adjusted, or removed at the beginning of the fishing year but may, if the Council determines it necessary, be imposed, adjusted, or removed at any time during the year. Management measures may be imposed for resource conservation ecological, social, or economic reasons consistent with FMP procedures, goals, and objectives.

Because potential actions taken may cover a wide range, analyses of biological, ecological, social, and economic impacts will be considered when a particular change is proposed. As a result, time required to take action will vary depending on nature of the action, its impacts on the fishing industry, resource, and environment, as well as review of these impacts by interested parties. Satisfaction of legal requirements for other applicable laws (e.g., the Administrative Procedure Act, Regulatory Flexibility Act, Executive Order 12866, etc.) for actions taken under this framework requires analysis and public comment before measures may be implemented by the U.S. Secretary of Commerce (Secretary).

Management measures addressing a resource conservation or ecological issue must be based on the point-of-concern framework consistent with procedures and criteria listed in Section 2.2.1.2.

Management measures addressing social or economic issues must be based on the socioeconomic framework consistent with procedures and criteria described in Section 2.2.1.3.

2.2.1 Procedures for Establishing and Adjusting Management Measures

Under the point-of-concern or the socioeconomic frameworks, there are four different categories of management actions, requiring slightly different processes. Management measures may be established, adjusted, or removed using any of four actions:

1. **Automatic Actions** may be initiated by the National Marine Fisheries Service (NMFS) Regional Administrator without prior public notice, opportunity to comment, or a Council meeting. These actions are nondiscretionary and the impacts must previously have been taken into account. Examples include fishery closure when a harvest guideline is attained and an inseason release of geographic allocations. The Secretary will publish a single notice in the *Federal Register* making the action effective.

2. **"Notice" Actions** require at least one Council meeting and one *Federal Register* notice. These include all management actions other than automatic actions that are either nondiscretionary or have probable impacts that have been previously analyzed.

   Notice actions are intended to have temporary effect and the expectation is that they may need frequent adjustment. They may be recommended at a single Council meeting, although the Council will provide as much advance information to the public as possible concerning the issues it will be considering. The primary examples are management actions defined as routine in Section 2.2.1.1. These include release of surplus incidental catch harvest guidelines to the directed fishery, and inseason changes to incidental catch allowances. Previous analysis must have been specific as to species and gear type before a management measure can be defined as routine and acted upon at a single Council meeting. If recommendations are approved, the Secretary may waive, for good cause, the requirement for prior notice and comment in the *Federal Register* and will publish a single notice in the *Federal Register* making the action effective. This category of actions presumes the Secretary will find that the extensive notice and opportunity for comment along with other information provided by the Council will serve as good cause to waive the need for additional prior notice and comment in the *Federal Register*.

3. **Abbreviated Rulemaking Actions** normally require at least two Council meetings and one *Federal Register* rule. These include all management actions intended to have permanent effect and be discretionary in nature with impacts that have not been previously analyzed. Examples include specification of harvest guidelines and quotas, including incidental catch portions and any amount allocated to joint venture processing (JVP), total allowable level of foreign fishing (TALFF), etc. The Council will develop and analyze the proposed management actions over the span of at least two Council meetings and provide public advance notice and opportunity to comment on proposals and analysis prior to and at the second Council meeting. If the NMFS Regional Administrator approves the Council's recommendation, the Secretary may waive, for good cause, the requirement for prior notice and comment in the *Federal Register* and publish a final rule in the *Federal Register* which will remain in effect until amended. If a management measure is designated as routine by final rule under this procedure, specific adjustments of that measure can subsequently be announced in the *Federal Register* by notice as described in this FMP. The Secretary may waive the opportunity for prior notice and comment in the *Federal Register*.

   The primary purposes of the previous two categories of abbreviated notice and rulemaking procedures are (1) to accommodate the Council's meeting schedule for developing annual management recommendations; (2) to satisfy the Secretary's responsibilities under the Administrative Procedures Act; and (3) to address the need to implement management measures by a specified date each fishing year.

   The two-Council meeting process refers to two decision meetings. The first meeting to develop proposed management measures and their alternatives, and the second meeting to make a final recommendation to the Secretary. Identification of issues and the development of proposals normally will begin at a Council meeting prior to the first decision meeting.

4. **Full Rulemaking Actions** normally require at least two Council meetings and two *Federal Register* rules (Regulatory Amendment). These include any proposed highly controversial management measure or

any measure which directly allocates resources. The Council will follow the two meeting procedures described for the abbreviated rulemaking category. The Secretary will publish a proposed rule in the *Federal Register* with an appropriate period for public comment followed by publication of a final rule in the *Federal Register*.

2.2.1.1 Routine Management Measures

Routine management measures are those the Council determines likely to be adjusted annually or more frequently. Measures are classified as routine by the Council through either full or abbreviated rulemaking process. In order for a measure to be classified as routine, the Council will determine that the measure addresses an issue at hand and may, in the near future, require further adjustment to achieve its purpose.

Once a management measure has been classified as routine through the abbreviated or full rulemaking procedures, it may be modified thereafter through the single meeting notice procedure if (1) modification is proposed for the same purpose as the original measure; and (2) impacts of the modification are within the scope of the impacts analyzed when the measure was originally classified as routine. Analysis need not be repeated when the measure is subsequently modified if the Council determines impacts do not differ substantially from original analysis. The Council may remove a routine classification.

Any measure designated as routine for one specific species, species group, or gear type may not be treated as routine for a different species, species group, or gear type without first having been classified as routine through the rulemaking process.

To facilitate this process, the Council will appoint a CPSMT in consultation with the CPSAS, state and federal resource agencies, Council staff, and interested persons. The CPSMT will annually review all CPS stocks and make recommendations to the Council and agencies regarding assessment or management needs, and appropriate management categories ("Active" or "Monitored"). The Council will consider need for changing management category based on all available data or acceptable biological catch (ABC) levels and MSY control rules specified in Section 4.4 (Monitored stocks) as it meets the goals and objectives of this FMP.

The following measures are classified as routine measures at the outset of this FMP:

1. Reallocation of surplus incidental catch harvest guideline to the directed fishery (all species and fishery segments).
2. Inseason changes in the incidental catch allowance.

2.2.1.2 Resource Conservation Issues and Point-of-Concern Framework

The point-of-concern process is the Council's second major tool (along with setting harvest guidelines and harvest quotas) for exercising resource stewardship responsibilities. The process is intended to foster continuous and vigilant review of Pacific Coast CPS stocks and fisheries. The process is also to prevent overfishing or any other resource damages. CPSMT will monitor the fishery throughout the year, and account for any new information on status of each species or species group to determine whether a resource conservation issue exists. Point-of-concern criteria are intended to assist the Council in determining when a focused review on a particular species is warranted and may require implementation of specific management measures. This framework provides the Council authority to act based solely on a point-of-concern. Thus, the Council may act quickly and directly to address resource conservation issues. In conducting this review, CPSMT will utilize the most current catch, effort, abundance and other relevant data from the fishery.

In the course of the continuing review, a "point-of-concern" occurs when one or more of the following is found or expected:

1. Catch is projected to exceed the current harvest guidelines or the harvest quota.
2. Any adverse or significant change in the biological characteristics of a species (age composition, size composition, age at maturity, or recruitment) is discovered.
3. An overfishing condition appears to be imminent or likely within two years.
4. Any adverse or significant change in the availability of CPS forage for dependent species or in the status of a dependent species is discovered.
5. Developments in a foreign fishery occur that affect the likelihood of overfishing of CPS.
6. An error in data or a stock assessment is detected that significantly changes estimates of impacts due to current management.
7. MSY control rule (harvest policy) parameters or approach require modification.
8. Projected catches for a Monitored species are expected to exceed the ABC using either a species-specific control rule or the default control rule. This could require moving a Monitored species to the Actively managed classification.

Once a point-of-concern is identified, the CPSMT will evaluate current data to determine if a resource conservation issue exists and will provide its findings in writing at the next scheduled Council meeting. If the CPSMT determines a resource conservation issue exists, it will provide its recommendation, rationale, and analysis for appropriate management measures that will address the issue.

In developing its recommendation for management action, CPSMT will recommend options from one or more of the following categories which include types of management measures most commonly used to address resource conservation issues.

MANAGEMENT MEASURES

- MSY, OY, a harvest guideline, or harvest quota.
- Cessation of directed fishing (foreign, domestic or both) with appropriate allowances for incidental harvest of that species or species group.
- Landing limits.
- Trip frequency limits.
- Area or subarea closures.
- Time closures.
- Seasons.
- Size limits.
- Gear limitations, which include but are not limited to definitions of legal gear, mesh size specifications, cod end specifications, marking requirements, and other gear specifications as necessary.
- Observer coverage.
- Reporting requirements.
- Other appropriate measures.

Direct allocation of a resource between different segments of a fishery is, in most cases, not the preferred response to a resource conservation issue. The Council recommendations to directly allocate the resource will be developed according to criteria and processes in the socioeconomic framework described in Section 2.2.1.3.

After receiving the CPSMT report, the Council will take public testimony and, if appropriate, recommend management measures to the NMFS Regional Administrator accompanied by supporting rationale and analysis of impacts. The Council analysis will include a description of (1) resource conservation issues consistent with FMP objectives; (2) likely impacts on other management measures and other fisheries; and (3) socioeconomic impacts, particularly cost and benefit to commercial and recreational segments of the fishing industry.

The NMFS Regional Administrator will review the Council's recommendation and supporting information and will follow appropriate implementation processes described in Section 2.2.1, following public notice and comment. If the Council contemplates frequent adjustments to the recommended measures, it may classify them as "routine" through the appropriate process described in Section 2.2.1.1.

If the NMFS Regional Administrator does not concur with the Council's recommendation, he/she will notify the Council in writing of the reasons for rejection. Nothing prevents the Secretary from exercising authority to take emergency action under Section 305 © and d) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Nothing precludes or limits Council access to the point-of-concern framework.

2.2.1.3 Nonbiological Issues and the Socioeconomic Framework

From time to time, nonbiological issues may arise which require the Council to recommend management actions to address certain social or economic conditions in the fishery. Resource allocation, fishing seasons, or landing limits based on market quality and timing, safety measures, and prevention of gear conflicts are examples of possible management issues with a social or economic basis. In general, there may be situations where the Council determines that management measures are necessary to achieve social or economic FMP objectives.

Either on its own initiative or by request, the Council may evaluate current information and issues to determine if social or economic factors warrant imposition of management measures to achieve the Council's established management objectives. Actions that are permitted under this framework include all categories of actions authorized under the point-of-concern framework with the addition of direct resource allocation and access-limitation measures.

If the Council concludes that management action is necessary to address a social or economic issue, the Council or the CPSMT will prepare a report containing rationale supporting its conclusion. The report will include proposed management measures, a description of viable alternatives, and analyses addressing (1) achievement of FMP goals and objectives; (2) likely impacts on other fisheries and other management measures; (3) sociobiological impacts; and (4) economic impacts, particularly costs and benefits to the fishing industry.

The Council, following review of the report, supporting data, public comment and other relevant information, may recommend management measures to the NMFS Regional Administrator accompanied by relevant background data, information, and public comment. The recommendation will explain the urgency in implementation of the measure(s), if any.

The NMFS Regional Administrator will review the Council's recommendation, supporting rationale, public comments and other relevant information and, if it is approved, will undertake the appropriate method of implementation. Rejection of the recommendation will be explained in writing.

Procedures specified in this FMP do not affect authority of the Secretary to take emergency regulatory action under Section 305(e) of the Magnuson-Stevens Act; nor do they affect the Secretary's ability to take action under Section 305(g) of the Magnuson-Stevens Act.

If conditions warrant, the Council may designate a management measure developed and recommended to address social and economic issues as a routine management measure provided that the criteria and procedures in Section 2.2.1.1 are followed.

2.2.1.3.1 Allocation

In addition to other requirements in this FMP, the Council will consider the following factors when considering direct allocation of the resource:

1. Present participation in and dependence on the fishery, including alternative fisheries.
2. Historical fishing practices in, and historical dependence on, the fishery.
3. Economics of the fishery.

4. Agreements or negotiated settlements between the affected participants in the fishery.
5. Potential biological impacts on any species affected by the allocation.
6. Consistency with the Magnuson-Stevens Act national standards.
7. Consistency with the goals and objectives of this FMP.

Modification of a direct allocation cannot be designated as "routine" unless the specific criteria for the modification have been established in the regulations.

2.2.1.4 Procedures for specifying Maximum Sustainable Yield and Optimum Yield

As data become available, improve, or are updated, MSY control rules and OY specifications or procedures for setting MSY control rules or OY specifications may need to be modified. Changes and additions to these formulas are authorized by the FMP and may be accomplished through the point-of-concern mechanism or the socioeconomic mechanism.

2.2.1.5 Management Agreements with Other Nations

In the event that a management agreement between the U.S. and a foreign nation concerning CPS occurs, the FMP authorizes changes or modifications to any management measure through Council processes described herein.

2.2.1.6 Management Measures to Protect Non-Coastal Pelagic Species

CPS fishing activities may directly impact certain non-CPS species. This FMP authorizes implementation of measures to control CPS fishing to support conservation objectives identified under overfishing definitions adopted by the Council, the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), or other applicable law, while minimizing disruption of the CPS fishery. Any of these measures described in this FMP may be employed to control fishing impacts on non-CPS species. However, allocation may not be the primary intention of any such regulation.

The process for implementing and adjusting such measures may be initiated at any time. In addition, some measures may be designated as routine (see Section 2.2.1.1), which will allow adjustment at a single meeting based on relevant information available at the time if (1) modification is proposed for the same purpose as the original measure, and (2) impacts of the modification are within the scope of the impacts analyzed when the measure was originally classified as routine.

Generally, the Council will initiate the process of establishing or adjusting management measures when a resource problem with a non-CPS is identified, and it has been determined that CPS fishing regulations will reduce the total impact on that species or stock. It is anticipated this will generally occur when a state or federal resource management agency (such as the U.S. Department of the Interior, NMFS, or a state fishery agency) presents the Council with information substantiating its concern for a particular species. The Council will review the information and refer it to the Scientific and Statistical Committee, CPSMT or other appropriate technical advisory group for evaluation. If the Council determines that management measures may be necessary to address requirements of the ESA, MMPA, international agreements, or other relevant federal law or policy, it may implement appropriate management measures in accordance with the procedures identified in Section 2.2.1. The intention of the measures may be to share conservation burdens while minimizing disruption of the CPS fishery, but under no circumstances may the intention be simply to provide more fish to a different user group or to achieve other allocation objectives.

2.2.2 Other Management Measures

2.2.2.1 Generic

These management measures apply to all vessels participating in the CPS fishery.

2.2.2.1.1 Observers

All fishing vessels operating in this management unit, including catcher/processors, at-sea processors, and vessels that harvest in Washington, Oregon, or California and land catch in another area, may be required to accommodate NMFS certified observers on board to collect scientific data. An observer program will be considered only for circumstances where other data collection methods are deemed insufficient for management of the fishery. Implementation of any observer program will be in accordance with appropriate procedures outlined under this framework.

As determined by the NMFS Regional Administrator, there may be a need for observers on at-sea processing vessels to collect data normally collected at shore-based processing plants. Processing vessels must accommodate on board observers and may be required to provide the NMFS certified observers prior to issuance of any required federal permits. Observers are required on foreign vessels operating in U.S. waters.

2.2.2.1.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (revised in Public Law 104-267, The Sustainable Fisheries Act [SFA]) requires Councils to include descriptions of EFH in all federal FMPs. In addition, the Magnuson-Stevens Act requires federal agencies to consult with NMFS on activities that may adversely affect EFH. Appendix D of this FMP includes a description of EFH for the five CPS included in this plan (Northern anchovy, Pacific [chub] mackerel, Jack mackerel, market squid, and Pacific sardine), fishing effects on EFH, non-fishing effects on EFH, and options to avoid or minimize adverse effects on EFH or promote conservation and enhancement of EFH.

2.2.2.1.2.1 Magnuson-Stevens Act Directives Relating to EFH

Magnuson-Stevens Act directives and NMFS guidance on implementation are addressed in greater detail in Appendix D. The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." To clarify this definition, the following interpretations are made: "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers the full life cycle of a species. The definition of EFH may include habitat for an individual species or an assemblage of species, whichever is appropriate to the FMP.

The Magnuson-Stevens Act requires councils to describe in FMPs any fishing activities that may adversely affect EFH. The Magnuson-Stevens Act also requires FMPs to include management measures that minimize adverse effects on EFH from fishing, to the extent practicable.

In addition, the EFH regulations require identification of nonfishing adverse impacts on EFH. The Magnuson-Stevens Act specifies that councils may comment on and make recommendations to the Secretary and any federal or state agency concerning any activity authorized, funded, or undertaken, or proposed to be authorized, funded or undertaken, by any state or federal agency that, in the view of the Council, may affect the habitat, including EFH, of a fishery resource under its authority. If the Secretary receives information that an activity of a state or federal agency would adversely affect EFH, the Secretary shall recommend to such agency measures that can be taken by such agency to conserve such habitat. Nonfishing impacts on EFH and corresponding potential conservation measures are included in Appendix D.

2.2.2.1.2.2 Definition of Essential Fish Habitat for CPS

The CPS fishery includes four finfish (Pacific sardine, Pacific [chub] mackerel, northern anchovy, and jack mackerel) and the invertebrate, market squid. CPS finfish are pelagic (in the water column near the surface and not associated with substrate) because they generally occur above the thermocline in the upper mixed layer.

Options

Option 1: No Definition of EFH

This option is not acceptable under the Magnuson-Stevens Act

Option 2: Define CPS EFH as follows:

For the purposes of EFH, the four CPS finfish are treated as a complex because of similarities in their life histories and similarities in their habitat requirements. Market squid are also treated in this same complex because they are similarly fished above spawning aggregations.

This definition of EFH for CPS finfish is based on a thermal range bordered by the geographic area where CPS occur at any life stage, where CPS have occurred historically during periods of similar environmental conditions, or where environmental conditions do not preclude colonization by CPS. The identification of EFH for CPS accommodates the fact that the geographic range of CPS varies widely over time in response to the temperature of the upper mixed layer of the ocean.

The east-west geographic boundary of EFH for CPS is defined to be all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the exclusive economic zone (EEZ) and above the thermocline where sea surface temperatures range between 10º C - 26º C. The southern boundary is the United States-Mexico maritime boundary. The northern boundary is more dynamic, and is defined as the position of the 10º C isotherm, which varies seasonally and annually. Appendix D provides a more detailed description of this variability.

Option 3: Define CPS EFH to include the entire EEZ

At high abundance levels, It is possible that CPS range throughout the entire EEZ. However, CPS finfish are generally not found at temperatures colder than 10° C or warmer than 26° C and preferred temperatures and minimum spawning temperatures are generally above 13°C. Defining CPS EFH as the entire EEZ is not a preferred option because it would include a broader area than the waters necessary for spawning, breeding, feeding, or growth to maturity.

The Council chose Option 2.

2.2.2.1.2.3 Management Measures To Minimize Adverse Impacts on EFH from Fishing

The Council may use any of the following management measures to minimize adverse effects on EFH from fishing, if there is evidence that a fishing activity is having an identifiable adverse effect on EFH. Currently, there is not evidence that a fishing activity is having an identifiable adverse effect on CPS EFH. Such management measures shall be implemented under the Point of Concern Framework as described in Section 2.2.1.2.

- Fishing Gear Restrictions
- Time/Area Closures
- Harvest Limits, or other applicable measures

In determining whether it is practicable to minimize an adverse effect from fishing, the Council should consider whether, and to what extent, the fishing activity is adversely impacting EFH, including the fishery; the nature and extent of the adverse effect on EFH; and whether management measures are practicable, taking into consideration the long and short term costs and benefits to the fishery and EFH, along with other appropriate factors, consistent with National Standard 7 (conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication).

2.2.2.1.3 Vessel Safety Considerations

The Council will consider and may provide, after consultation with the U.S. Coast Guard and persons utilizing the fishery, temporary adjustments for access to the fishery by vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safety of the vessels.

2.2.2.1.4 Limited Entry

This FMP authorizes changes and modifications to any effort limitation programs established herein and development of additional effort limitation programs. Changes may include, but are not limited to, requirements for obtaining, maintaining, and renewing permits in any effort limitation system.

2.2.2.2 Domestic Commercial

All measures, unless otherwise specified, apply to all domestic vessels regardless of whether catch is landed and processed on shore or processed at sea.

2.2.2.2.1 Permits

Federal permits may be required for individuals or vessels that harvest CPS, and for individuals or facilities (including vessels) that process CPS or purchase live CPS. In determining whether to require a harvesting or processing permit, and in establishing the terms and conditions for issuing a permit, the Council may consider any relevant factors including whether a permit:

1. Will enhance the collection of biological, economic, or social data.
2. Will provide better enforcement of laws and regulations, including those designed to ensure conservation and management and those designed to protect consumer health and safety.
3. Will help achieve the goals and objectives of the FMP.
4. Will help prevent or reduce overcapacity in the fishery.
5. May be transferred, and under what conditions.

Separate permits or endorsements may be required for harvesting and processing, or for vessels or facilities based on size, type of fishing gear used, species harvested or processed, or such other factors that may be appropriate. The permits and endorsements are also subject to sanctions, including revocation, as provided by section 308 of the Magnuson-Stevens Act.

In establishing a permit requirement, the Council will follow the rulemaking procedures in Section 2.2.1.

2.2.2.2.1.1 Permit Revocation and Reinstatement

This FMP allows National Oceanic and Atmospheric Administration (NOAA), under procedures of 15 CFR Part 904, to revoke or suspend any permit issued under authority of the CPS FMP.

2.2.2.2.2 Catch Restrictions

This FMP authorizes the commercial and recreational harvest of CPS and provides for limiting the harvest of CPS managed under this plan. Catch restrictions may be modified under the framework provisions.

2.2.2.2.2.1 Prohibited Species

This FMP does not authorize the taking, retaining, or possessing of any species by CPS gears, if such taking or possessing is prohibited by other state or federal regulations. Current federal regulations prohibit retention of Pacific halibut and salmonids caught with trawl gear. State regulations prohibit the landing of crab incidentally caught in trawl gear off Washington and Oregon. However, trawl fishers may land Dungeness crab in the State of California in compliance with the state landing law. All groundfish species are prohibited unless caught with legal groundfish gear or according to specifications in the Groundfish FMP. Retention of Pacific halibut by any net gear is prohibited. Salmonids are prohibited species for longline and pot gear and purse seines. Sturgeon are prohibited species for purse seine, lampara, or drag seine gear in certain areas off Washington. Halibut may be retained and landed by troll and longline gear only during times and under conditions set by International Pacific Halibut Commission and other federal regulations. Salmon taken by troll gear may be retained and landed only as specified in troll salmon regulations. Steelhead, striped bass, yellowtail, barracuda, or white seabass are prohibited species for roundhaul gear in California.

Species identified as prohibited must be returned to the sea as soon as practical with a minimum of injury after allowing for sampling by an observer, if any. Exceptions may be made for recovery of tagged fish.

This FMP authorizes the designation of other prohibited species in the future, or the removal of a species from this classification, consistent with other applicable law for that species.

2.2.2.2.3 Gear Restrictions

This FMP authorizes the use of net gear, hook-and-line, pots (traps), longlines, and any other types of gear as legal gear for the commercial harvest of CPS, unless such gear is specifically prohibited by state law. A complete listing of current state regulations in Washington, Oregon, and California is in Section 2.2.5.2.

Various state restrictions on gear, season, and area exist in Washington, Oregon, and California. Logbooks are required by states in some instances. Washington requires an experimental permit to take certain CPS in ocean waters with purse seine, and use of seines and dip bag nets in certain bays to take anchovy and sardine is permitted, but with specific gear, area, and time restrictions. Oregon permits the use of seines only in specific estuaries, and the use of set and drift gill nets is restricted and requires an experimental permit in specific areas. Other gear (trawl, pots, traps, longlines) are subject to gear restrictions. Gear, season, and areas are restricted for anchovy in some areas off California.

Implementation and modification of specific management measures regarding gear, such as definitions of legal gear, mesh size restrictions, gear marking, or other gear restrictions are authorized by this FMP. Gear restrictions may be established, modified, or removed under the point-of-concern or socioeconomic frameworks. Any changes in gear regulations should be scheduled so as to minimize costs to the fishing industry, insofar as this is consistent with achieving the goals of the change.

2.2.2.2.4 Option for Closed Fishing Areas

The northern anchovy fishery management plan closes certain areas to commercial round-haul fishing or fishing for reduction processing (See Figure 2.2.2.2.4-1). Those areas were originally closed by the State of California to avoid commercial fishing conflicts with sport fisheries and reduce potential impacts on sport fish and salmon. This FMP authorizes the issuance of exempted fishing permits (See 2.2.2.8 Exempted Fishing) for fishing in closed areas consistent with the goals and objectives.

Options considered are (1) retain all closed areas to reduction or round-haul fishing for anchovy, (2) retain all closed areas to all CPS fishing, (3) have no closed areas, or (4) consider each closed area separately for inclusion in the FMP.

The Council chose Option 1.

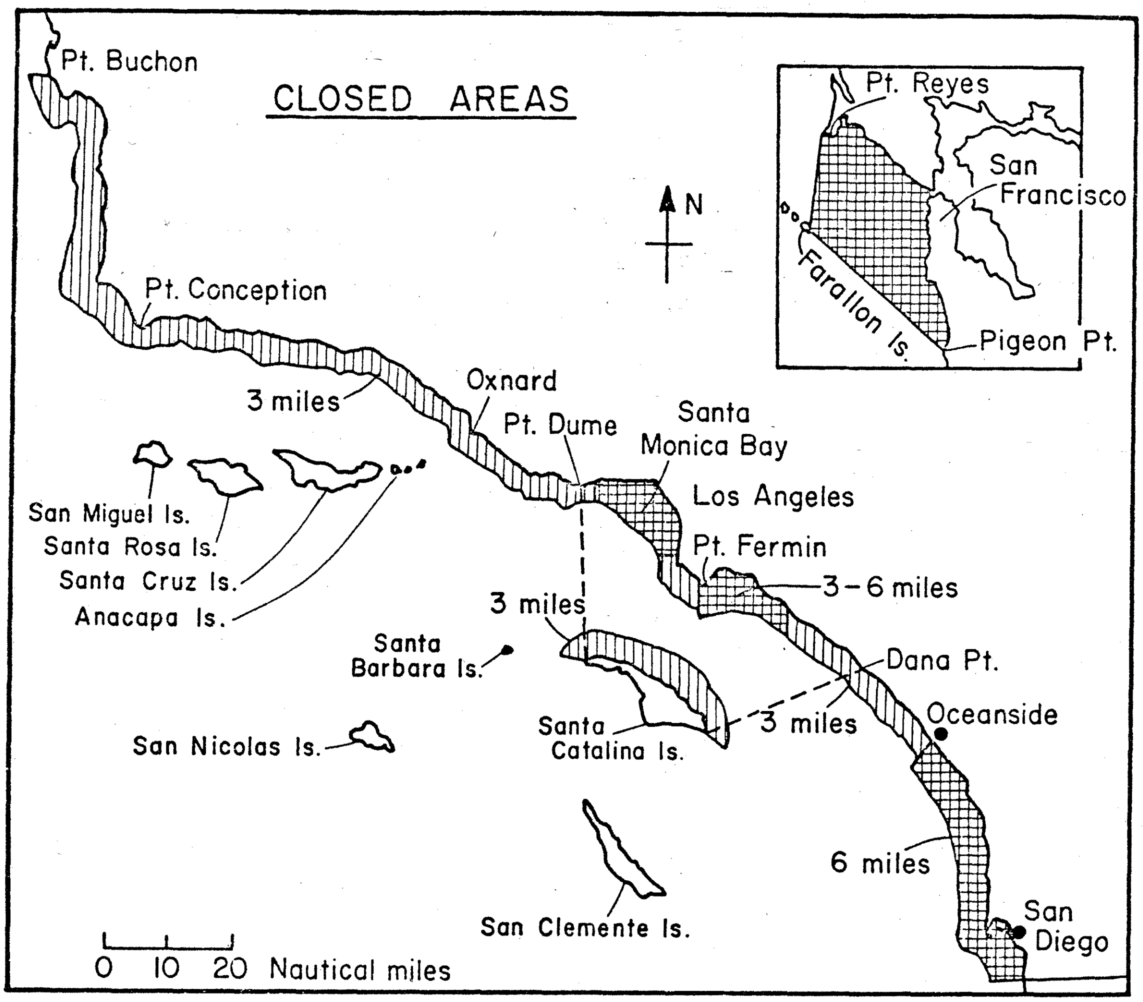

FIGURE 2.2.2.2-4. Existing California area closures, and optional Catalina Channel closure (outlined by dashed lines).

2.2.2.2.5 Reporting Requirements

This FMP authorizes domestic annual harvest (DAH) survey, exempted fishing permit (EFP) application, and foreign vessel reporting and records keeping requirements. This FMP authorizes other domestic vessel permit applications and reporting requirements in the future.

2.2.2.2.5.1 Surveys to Determine Domestic Annual Harvest

Surveys of the domestic industry will be conducted by NMFS at the appropriate time to determine amounts of fish not needed by the domestic processing industry, which then may be made available to joint venture or foreign fishing.

2.2.2.2.5.2 Other Reporting and Record Keeping Requirements

This FMP authorizes DAH survey, EFP application, and foreign vessel reporting and records keeping requirements. This FMP authorizes other domestic vessel permit applications and reporting requirements in the future.

Surveys to Determine Domestic Annual Harvest

Surveys of the domestic industry will be conducted by NMFS at the appropriate time to determine amounts of fish not needed by the domestic processing industry, which then may be made available to joint venture or foreign fishing.

Other Reporting and Record Keeping Requirements

Catch, effort, biological, and other data necessary for implementation of this FMP will continue to be collected by the states of Washington, Oregon, and California under existing state data collection provisions. Federal reporting requirements, such as logbooks, will be implemented only when data collection and reporting systems operated by state agencies fail to provide the Secretary with statistical information for adequate management. Any special reporting requirement should be imposed only if it is expected to enhance NMFS' ability to monitor the catch accurately.

Conditions may develop in the CPS fishery that make current state reporting requirements insufficient. For example, a large capacity vessel such as a factory trawler might operate within state waters but outside the area of limited entry trip limit restrictions (i.e., north of 39° N latitude), harvest substantial amounts of CPS, and either unload catch after a period of delay or outside the management area. It is possible that delays in obtaining catch data or missing catch data could affect stock assessments or other management efforts. To address these potential future problems, the FMP authorizes implementation of federal reporting requirements in addition to those of the various states. The purpose of these measures would be to enhance Council's ability to manage CPS stocks effectively. Additional reporting requirements would be developed under framework management procedures and announced in the *Federal Register*.

The Council intends that any special reporting requirement be imposed only if it is expected to enhance NMFS' ability to monitor the catch accurately.

2.2.2.2.6 Vessel Identification

The FMP authorizes vessel identification requirements which may be modified as necessary to facilitate enforcement and vessel recognition.

2.2.2.3 Domestic Recreational

Measures described in this section apply to domestic recreational fisheries only, although most measures could be used to manage foreign recreational fisheries as well.

2.2.2.3.1 Permits

Washington, Oregon, and California have state laws concerning recreational licenses and permits. In the event that a federal licenses or permits become necessary, they may be required under this FMP.

2.2.2.3.2 Catch Restrictions

This FMP authorizes establishment of catch restrictions on the recreational fishery consistent with goals and FMP objectives and national standards established by Magnuson-Stevens Act.

2.2.2.3.3 Gear Restrictions

There are no federal restrictions on legal recreational gear for CPS. Existing state regulations apply in Washington, Oregon, and California. The FMP authorizes federal recreational regulations for CPS.

2.2.2.4 Domestic Vessels in a Joint Venture

U.S. vessels operating in joint ventures on the West Coast are domestic vessels and traditionally have been treated the same as U.S. vessels delivering to shore facilities. However, conditions in the fishery could warrant separate treatment in the future. Although all U.S. vessels have been subject to the same regulations, joint venture catcher operations may be affected indirectly by restrictions (such as closed areas) placed on the foreign processing vessels that receive U.S. catch at sea.

2.2.2.5 Foreign Vessels in a Joint Venture or Foreign Fishery

These measures apply to foreign vessels that process fish taken by U.S. catcher-boats under joint venture processing or to foreign vessels that operate in a fishery directed at a species for which there is a TALFF. The CPS FMP provides authority to establish, modify or remove future regulations including; but not limited to, harvest guidelines, harvest quotas, seasons, area closures, incidental harvest restrictions, trip and landing limits, and gear restrictions.

2.2.2.5.1 Permits

All foreign vessels operating in this management area shall have on board a permit issued by the Secretary pursuant to the Magnuson-Stevens Act.

2.2.2.5.2 Target Species

A foreign nation may conduct joint venture operations only for species for which there is a JVP and only using boats with appropriate permits. Directed fishing is allowed only for species for which the foreign nation has received an allocation of TALFF.

2.2.2.5.3 Incidental Catch

Incidental catch refers to CPS which are unavoidably caught while fishing for another species. It is recognized that incidental harvest of domestically fully utilized CPS is unavoidable in joint venture and foreign fisheries. Minimal incidental allowances consistent with the status of the stocks and the efficiency of the joint venture or foreign fisheries will usually be allowed. These incidental allowances are not to be considered as surpluses to domestic processing needs and are allowed only to provide for full utilization of the species targeted in the joint venture or foreign fishery.

Allowances for incidental harvest in joint ventures or foreign fisheries may be percentages or some other quantity at the Council's discretion. Incidental allowances may be established or changed at any time during the year, but are published at least annually, concurrent with the annual specifications of JVP.

The NMFS Regional Administrator may establish or modify incidental species allowances to reflect changes in the condition of the resource and performance of the U.S. industry. The Council will consider public testimony, and consider the following factors before establishing or changing incidental allowances, (1) observed catch rates in any previous joint venture or foreign fishery; (2) current estimates of relative abundance and availability of species caught incidentally; (3) ability of the foreign vessels to take the JVP or TALFF; (4) past and projected foreign and U.S. fishing effort; (5) status of stocks; (6) impacts on the domestic industry; and (7) other relevant information. Inseason changes will be made as a routine management measure.

2.2.2.5.4 Prohibited Species

Prohibited species means salmonids or any species of fish that a joint venture or foreign vessel is not authorized to retain. Prohibited includes fish received in excess of any authorization, landing limit, or harvest guideline. These species must be immediately returned to the sea with a minimum of injury after allowing for sampling by an observer, if any. This FMP authorizes the designation of other prohibited species in the future, or the removal of a species from this classification if consistent with the applicable law for that species.

2.2.2.5.5 Season and Area Restrictions

There is no season restriction unless otherwise specified according to this FMP. There is no area restriction, unless otherwise specified according to this FMP. Joint venture and foreign fisheries for CPS may not be conducted within the license limitation area if one is adopted.

Season and area restrictions for foreign vessels operating in a joint venture or foreign fishery may be established, modified, or removed at any time during the year in accordance with the procedures in sections 2.2.1.2 and 2.2.1.3 or by foreign vessel permit conditions.

2.2.2.5.6 Reporting and Record Keeping Requirements

Foreign nations receiving U.S. harvested fish in a joint venture or participating in a foreign fishery are required to submit detailed reports of fishing effort, location, amount, and disposition by species or species group, and transfer of fish or fish products, as needed for monitoring and management of the fishery. Reports may be required at specified time intervals. The NMFS Regional Administrator may require daily reports when a specified fraction of JVP, TALFF, or incidental allowance is reached. In addition, each country may be required to report arrival, departure, and positions of each of its vessels, as specified under the regulations and permit conditions, as needed for monitoring fleet deployment. Logbooks may be required to fulfill fishery conservation, management, and enforcement purposes of Magnuson-Stevens Act. These logs may include; but are not be limited to, communications logs, transfer logs, or daily joint venture logs with haul by haul and daily receipt data, effort, and production information.

2.2.2.5.7 Dumping

Foreign and other vessels are prohibited from dumping pollutants and fishing gear which would degrade the environment or interfere with domestic fishing operations.

2.2.2.5.8 Fishery Closure

A joint venture or directed foreign fishery shall cease each year when, (1) the JVP or TALFF is reached; (2) the maximum incidental catch allowance for that nation of any species or species group is reached; (3) the overall harvest guideline or harvest quota for the allocated species is reached; (4) the applicable open season is ended; or (5) as necessary for resource conservation reasons under the point-of-concern mechanism.

2.2.2.5.9 Observers

Observers shall be placed on each foreign vessel while it is operating in a foreign or joint venture fishery, as provided by Title II of the Magnuson-Stevens Act. The law provides for the following exceptions to this requirement:

1. If observers are aboard motherships of a mothership/catcher vessel fleet.
2. If the vessel is in the EEZ for such a short time that at observer would be impractical.
3. If facilities for quartering an observer are inadequate or unsafe.
4. For reasons beyond the control of the Secretary an observer is not available.

2.2.2.5.10 Other Restrictions

The Secretary may impose additional requirements for the conservation and management of fishery resources covered by the vessel permit or for national defense or security reasons. These restrictions include, but are not limited to, season, area, and reporting requirements.

The highest priority of this FMP is to provide for conservation of the resource. Any restriction on the joint venture fishery may be modified under the point-of-concern mechanism for resource conservation reasons.

2.2.2.6 Foreign Recreational

Foreign recreational fishing refers to any fishing from a foreign vessel not operated for profit or scientific research, and not involved the sale, barter, or trade of any part of the catch. This FMP authorizes establishment of catch restrictions on the foreign recreational fishery which are consistent with the goals and objectives of the FMP and the national standards established by the Magnuson-Stevens Act.

2.2.2.7 Limited Entry

Research and monitoring programs may need to be developed and implemented for the CPS fishery so that information required in a limited entry program is available. Such data should indicate the character and level of participation in the fishery, including but not limited to, (1) investment in vessel and gear; (2) the number and type of units of gear; (3) the distribution of catch; (4) the value of catch; (5) the economic returns to the participants; (6) mobility between fisheries; (7) purchase or sale prices of limited entry permits; various social and community considerations.

2.2.2.8 Exempted Fishing

"Exempted fishing" is defined to be fishing practices that are new to the fishery or not allowed under the FMP. Under this FMP, the NMFS Regional Administrator may authorize the targeted or incidental harvest of CPS for experimental or exploratory fishing that would otherwise be prohibited including closed areas. The NMFS Regional Administrator may restrict the number of experimental permits by total catch, time, or area. The NMFS Regional Administrator may also require any level of industry-funded observer coverage for these experimental permits.

Exempted fisheries are expected to be of limited size and duration and will require EFPs issued under Section 303(b)(1) of the Magnuson-Stevens Act. The duration of EFPs will ordinarily be one year. Permits will not be renewed automatically. An application must be submitted to the NMFS Regional Administrator for each year. A fee sufficient to cover administrative expenses may be charged for EFPs. An applicant for an EFP need not be the owner or operator of the vessel(s) for which the EFP is requested as long as the proposed activity is compatible with limited entry and other management measures in the FMP.

The FMP authorizes mandatory data reporting and mandatory on-board observers with exempted fishing permits. Installation of vessel monitoring units aboard vessels with exempted fishing permits may be required.

Criteria and procedures for the issuance of EFPs are as follows:

1. Applicants must submit a completed application in writing to the NMFS Regional Administrator at least 60 days prior to the proposed effective date of the permit. The application must include, but is not limited to, the following information:

    A. Date of the application.

    B. Applicant's name, mailing address, and telephone number.

C. Statement of the purposes and goals of the experiment for which an EFP is needed, including, as appropriate:

   1. Identification the problem or potential opportunity addressed .
   2. A description of area to be fished.
   3. A description of unauthorized gear or fishing practices which are proposed under the EFP.
   4. A description of all relevant aspects of the experimental fishing arrangements.
   5. A general description of arrangements for disposition of all fish harvested under the EFP.
   6. Valid justification explaining why issuance of the EFP is warranted.

D. Statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals.

E. For each vessel to be covered by the EFP:

   1. Vessel name.
   2. Name, address, and telephone number of owner and master.
   3. U.S. Coast Guard documentation, state license, or registration number.
   4. Home port.
   5. Length of vessel.
   6. Net tonnage.
   7. Gross tonnage.

F. Description of the species (target and incidental) to be harvested under the EFP and the amount(s) of such harvest necessary to conduct the experiment.

G. For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size and amount of gear to be used.

H. Signature of the applicant.

The NMFS Regional Administrator may request additional information necessary to make required determinations.

2. The NMFS Regional Administrator will review each application and make a preliminary determination whether or not the application contains all required information and constitutes a valid experimental program that is appropriate for further consideration. If the NMFS Regional Administrator finds any application does not warrant further consideration, he/she shall notify both the applicant and the Council in writing of the reasons for his/her decision. If the NMFS Regional Administrator determines any application warrants further consideration, he/she will publish a notice of receipt of the application in the *Federal Register* with a brief description of the proposal, and will give interested persons an opportunity to comment. The notice may establish a cutoff date for receipt of additional applications to participate in the same or a similar experiment, or may limit the total number of applications that will be accepted.

   The NMFS Regional Administrator also will forward copies of the application to the Council, U.S. Coast Guard, and fishery management agencies of Oregon, Washington, California, and Idaho, accompanied by the following information:

   A. Current utilization of DAH and processing capacity (including existing experimental harvesting, if any) of the target and incidental species.

   B. Statement of why the target species is considered underutilized or why the issue and opportunity are important (if applicable).

C. Citation of the regulation or regulations which, absent the EFP, would prohibit the proposed activity.

D. Biological information relevant to the proposal.

3. At a Council meeting following receipt of a complete application, the NMFS Regional Administrator may choose to consult with the Council and the directors of the state fishery management agencies concerning the permit application. The Council shall notify the applicant in advance of the meeting, if any, at which the application will be considered and invite the applicant to appear in support of the application if the applicant desires.

4. As soon as practicable after receiving responses from the agencies identified above, and after any consultation, the NMFS Regional Administrator shall notify the applicant in writing of his/her decision to grant or deny the EFP, and, if denied, the reasons for the denial. Grounds to deny issuance of an EFP include, but are not limited to, the following:

   A. The applicant has failed to disclose relevant information, or has made false statements in the application.

   B. According to the best scientific information available, the harvest to be conducted under the permit would detrimentally affect any species of fish in a significant way.

   C. Issuance of the EFP would inequitably allocate fishing privileges among domestic fishermen or would have economic allocation as its sole purpose.

   D. Activities to be conducted under the EFP would be inconsistent with the goals and objectives of the FMP.

   E. The applicant has failed to demonstrate a valid justification for the permit.

   F. The activity proposed under the EFP could create a significant enforcement or safety problem.

5. If the permit is granted, the NMFS Regional Administrator will publish a notice in the *Federal Register* describing the experimental fishing to be conducted under the EFP. The NMFS Regional Administrator may attach terms and conditions to the EFP consistent with the purpose of the experiment, including, but not limited to:

   A. The maximum amount of each species which can be harvested and landed during the term of the EFP, including trip limitations and incidental harvest restrictions (trip allowance and/or total incidental reserve, harvest guideline, or harvest quota) for incidental species, where appropriate.

   B. The number, size, names, and identification numbers of the vessel authorized to conduct fishing activities under the EFP.

   C. The time(s) and place(s) where experimental fishing may be conducted.

   D. The type, size, and amount of gear which may be used by each vessel operated under the EFP.

   E. The condition that observers be allowed aboard vessels operated under an EFP.

   F. Reasonable data reporting requirements.

   G. Such other conditions as may be necessary to assure compliance with the purposes of the EFP consistent with the objectives of this FMP.

   H. Provisions for public release of data obtained under the EFP.

6. Failure of a permittee to comply with the terms and conditions of an EFP shall be grounds for revocation, suspension, or modification of the EFP with respect to all vessels conducting activities under that EFP. Any action taken to revoke, suspend, or modify an EFP shall be governed by 15 CFR §904, Subpart D.

   Nothing in this FMP is intended to exclude or to limit use of CPS, markets, or processing methods as long as the process in question is compatible with measures and intentions of this FMP.

2.2.2.8.1 Policies for Issuing Exempted Fishing Permits

Priorities for issuing EFPs are as follows:

1. Domestic boats delivering to domestic processors and domestic factory trawlers (with equal priority).
2. Domestic catcher-boats delivering to a foreign offshore processor.

Boats already involved in developing a fishery for an underutilized species (i.e., boats with a catch history or previous EFP) should receive highest priority in applying and renewing permits.

2.2.2.9 Other Fees and Permits

Nothing in this FMP is intended to exclude use of additional fees or permits in the future as long as the fee or permit is consistent with applicable law, management measures, and intent of this FMP. It may, for example, become desirable to issue permits for processing CPS in onshore plants or processing vessels offshore. It may be desirable to charge fees sufficient to cover administrative costs of issuing additional types
of permits. Changes in requirements for obtaining, maintaining, and renewing permits are authorized.

2.2.3 Scientific Research

Nothing in this FMP is intended to inhibit or prevent any scientific research involving CPS which is acknowledged by the Secretary through procedures set out in 50 CFR §600.745.

Proposed activity is not scientific research unless it is submitted in writing to the Secretary in the form of a research proposal which addresses all of the factors below. An activity may be acknowledged as scientific research if its primary objective, purpose, or product is the acquisition of data, information, or knowledge as determined by consideration of all of the following factors:

1. The proposed program will result in information useful for scientific or management purposes.
2. The application of existing knowledge alone is insufficient to solve the scientific or management subject or problem presented by the scientific research proposal.
3. Facts/data/samples will be collected or observed and analyzed in a scientifically acceptable manner and the results will be formally prepared and available to the public.
4. Recognized scientific experts, organizations, or institutions with expertise in the field or subject matter area are conducting, sponsoring or are otherwise affiliated with the activity.

2.2.3.1 Secretarial Acknowledgment of Scientific Research

If the Secretary agrees that an activity constitutes scientific research involving CPS, a letter of acknowledgment should be issued to the applicant and operator or master of the vessel conducting the scientific research. The letter will include information on the purpose, scope, location, and schedule of the acknowledged activities. Any activities not in accordance with the letter of acknowledgment should be subject to all provisions of the Magnuson-Stevens Act and its implementing regulations. The Secretary should transmit copies of letters of acknowledgment to the Council, state or federal administrative and enforcement agencies to ensure they are aware of the research activities.

CPS taken under the scientific research exclusion may be sold to offset all or part of the cost of carrying out the research plan including costs associated with operating the research vessel.

2.2.4 Restrictions on Other Fisheries

For each non-CPS fishery, a reasonable limit on the incidental CPS catch may be established that is based on the best available information. The objectives of restrictions on other fisheries under this framework are to:

1. Minimize discards in the non-CPS fishery by allowing retention and sale, thereby increasing fishing income.
2. Discourage targeting on CPS by the non-CPS fleet.

Incidental limits may be imposed or adjusted in accordance with appropriate procedures described in this FMP. The Secretary may accept or reject but not substantially modify the Council's recommendations.

2.2.5 Procedures for Reviewing State Regulations

This FMP acknowledges that state regulations are a fundamental part of CPS management. All existing state regulations at the time of implementation of this plan are consistent with this FMP. Those regulations are listed in section 2.2.5.2.

This FMP establishes a framework review process by which any state may obtain a determination that its regulations are consistent with the FMP and the national standards. As necessary, the Council may also recommend to the NMFS that duplicate or different federal regulations be implemented in the EEZ. While the Council retains the authority to recommend federal regulations be implemented in the EEZ, the preference is to continue to rely on state regulations in that area as long as they are consistent with the FMP.

While states are not required to submit regulations which they wish to apply in the EEZ to the Council for a consistency determination, regulations which have not received a consistency determination run the risk of being declared inconsistent and invalid if challenged in state law enforcement proceeding. The Council invites submission of all present and future state fishery regulations relating to the harvest of species managed under this FMP which are applicable in the EEZ.

2.2.5.1 Review Procedure

Any state may propose that the Council review a particular state regulation for the purpose of determining its consistency with the FMP and the need for complementary federal regulations. Although this procedure is directed at the review of new regulations, existing regulations affecting the harvest of CPS managed by the FMP may also be reviewed under this process. The state making the proposal will include a summary of the regulation in question and concise arguments in support of consistency.

Upon receipt of a state's proposal, the Council may make an initial determination whether or not to proceed with the review. If the Council determines that the proposal has insufficient merit or little likelihood of being found consistent, it may terminate the process immediately and inform the petitioning state in writing of the reasons for its rejection.

If the Council determines sufficient merit exists to proceed with a determination, it will review the state's documentation or prepare an analysis considering, if relevant, the following factors:

1. How the proposal furthers or is not otherwise consistent with the objectives of the FMP, the Magnuson-Stevens Act, and other applicable law.
2. Likely effect on or interaction with any other regulations in force for the fisheries in the area concerned.
3. Expected impacts on the species or species group taken in the fishery sector being affected by the regulation.
4. Economic impacts of the regulation, including changes in catch, effort, revenue, fishing costs, participation, and income to different sectors being regulated as well as to sectors which might be indirectly affected.

5. Any impacts in terms of achievement of harvest guidelines or harvest quotas, maintaining year-round fisheries, maintaining stability in fisheries, prices to consumers, improved product quality, discards, joint venture operations, gear conflicts, enforcement, data collection, or other factors.

The Council will inform the public of the proposal and supporting analysis and invite public comments before and at the next scheduled Council meeting. At its next scheduled meeting, the Council will consider public testimony, public comment, advisory reports, and any further state comments or reports, and determine whether or not the proposal is consistent with the FMP and whether or not to recommend implementation of complementary federal regulations or to endorse state regulations as consistent with the FMP without additional federal regulations.

If the Council recommends the implementation of complementary federal regulations, it will forward its recommendation to the NMFS Regional Administrator for review and approval. The NMFS Regional Administrator will publish the proposed regulation in the *Federal Register* for public comment, after which, if approved, he/she will publish final regulations as soon as practicable. If the NFMS Regional Administrator disapproves the proposed regulations, he/she will inform the Council in writing of the reasons for disapproval.

2.2.5.2 Current State Regulations

Each of the West Coast states has regulations managing pelagic fisheries. They are presented in summary form and are available in full text from each state.

2.2.5.2.1 Washington Coastal Pelagic Species Regulations - Summary

SARDINE

No fishing except by special permit in the ocean. No sardine fishing in Puget Sound.

ANCHOVY

Puget Sound - seine, dip net, and lampara only. Puget Sound open except specific areas and times are closed to prevent bycatch of herring. Detailed list of closed times/areas available. Maximum seine net length is 600 feet.

Ocean - seine, lampara, and dip net only. Open all year. Maximum seine or lampara length is 1,400 feet with 0.5 inch mesh.

Columbia River - purse seine and lampara. Open all year.

Gray's Harbor and Willapa Bay - dip net. Open all year. Purse seine and lampara open June 1 to October 31.

SQUID

Ocean and Puget Sound - beach seine gears, dip net, brail, and jig gear only. No fishing within .25 mile of any incorporated city or town. No more than ten kilowatts of lighting may be used. Director may issue special permits. NOTE: Treaty Indian fishing not under these limits.

MACKEREL

Incidental catch only.

EMERGING COMMERCIAL FISHERY PERMITS

The Director has the authority to issue experimental fishery permits to a new or emerging commercial fishery. The number of participants may be limited.

2.2.5.2.2 Oregon Coastal Pelagic Species Regulation Summary

Anchovy, sardine, and squid are listed as Category A species under Oregon's Developmental Fisheries Program. Pacific (chub) mackerel and jack mackerel are Category C species because the vast majority of the catch of these two species is incidental to the Pacific whiting fishery.

Oregon Administrative Rules Chapter 635

Sec 635-006-0820

Each January the Commission adopts a list of food fish species to be managed under the Develpmental Fisheries Program. Any person may request that species be added or removed from the list by October 31 of the preceding year.

Sec 635-006-0830 Listing as a developmental species.

Species must be underutilized to be included on a developmental list, there are three categories:

A. Not under any other state or federal FMP and shall have permit and gear limitations established annually by the commission.
B. Not under any other state or federal FMP and not shown to have any potential to be a viable fishery.
C. Currently under another state or federal FMP already establishing permit and/or gear limitations .

Sec 635-006-0840 Removing a species from developmental list.

1. *Fishery becomes developed.*
2. *Declared threatened or endangered.*
3. *Harvest is in excess of optimum yield.*
4. *User conflicts.*
5. *Gear conflicts, habitat damage, incidental catch, etc.*

Sec 635-006-0850 The list.

Partial list of category A species.
Anchovy and Herring
Sardine and Saury
Market Squid and Other Squid

Partial list of category C species.
Pacific (Chub) Mackerel
Jack Mackerel

Number of Permits

Anchovy and Herring --15
Sardine and Saury------15
Market squid--------------30 trawl and 30 other gear permits split geographically at Heceta Head.
Mackerel-------------------Managed under FMP, no permit required.

Requirements

Renewal requirements for all these Developmental Fishery Permits are the same:
Five annual landings totaling at least 500 pounds.
One landing of at least 5,000 pounds.

Gear

Specially adapted small mesh gill nets may be used for anchovy and sardine. Experimental gear permits may be required.

Sec.635-006-0870 Methods of Obtaining Information.

For all category A species.
Department shall collect fishery and biological information with the goal of a long term management plan.

Sec.635-006-0880 Establish Commercial Harvest Program and Limited Entry System.

Establishes authority and applies to species in category A.

Sec.635-006-0890 Log Books.

Log books are required for developmental fisheries.

Sec.635-006-0900 Requirements for Developmental Species Permit.

Effective January 1, 1995.
Unlawful to take a species in developmental list without a permit.
Unlawful to buy a listed species from a person without a permit.
Permit is in addition to commercial fish licenses and boat registrations.
Permit is not required if species is allowed to be taken incidentally under a federal FMP.

Sec. 635-006-0910 Procedures for Issuing Permits, Transfer and Renewal.

Cost $75.
One permit per person per species.
Nontransferable.

2.2.5.2.3 California Pelagic Fish Regulations - Summary

2.2.5.2.3.1 California Code of Regulations Title 14 - Anchovy

Sec. 147 Anchovy Reduction.

Areas

Northern Permit Area August 1 to June 30.
Southern Permit Area September 15 to June 30.

Permits

Issued to owner or operator of vessel.
Permittee must be aboard vessel.

Condition of Permits

48-hour notice to permittee of any season closure.
Valid until revoked or terminated.

1. *Gear Specifications.*

   Roundhaul net wet-stretched mesh not less than 10/16 of an inch.
   Except bag of net maybe not less than 8/16 of an inch wet-stretched mesh.
   Bag may not be more than 12.5% of total area of net.
   No other fishing gear may be possessed aboard when fishing for reduction purposes.

2. *Gear Inspections.*

   Gear may be inspected by department at anytime.

3. *Vessel I.D.*

Each vessel must display in 14-inch numerals (black on white background) its Fish and Game number on the sides and top of superstructure amidships.

4. *File letter of declaration to take anchovies for reduction.*

   In southern permit area, a vessel must file letter of intent to take, carry,or deliver anchovies for reduction.

Exception must be filed to take anchovies for any other purpose when declaration is in force.

5. *Permit Areas and Quotas.*

   (a) *Northern permit area - Waters of Pacific Ocean north of a line due west for Pt. Buchon. Closed areas are Districts 2, 8, 9, 11, 12, 13, 15, Tomales and Bodega Bays, District 10 from Pigeon Pt. to the U.S. Navigational Light at SE Farallon Island and a line to Point Reyes Navigational Light, District 16 lying southerly of Monterey breakwater magnetic east to Shoreline, District 18 within three miles of shore between a line drawn magnetic west Pt Estero and Point Buchon, and District 18 within three miles of shore between a line drawn magnetic west from Point San Luis and Arroyo Grande Creek.*

   (b) *Southern Permit Area - Waters of Pacific Ocean south of a line due west from Pt. Buchon. Closed areas - within three miles of shore south of Pt. Buchon, all areas where roundhaul nets are prohibited; within four miles of shore between a line 235 magnetic from steam plant stack at Mandalay Beach and 205 magnetic from steam plant stack at Ormond Beach; within the area encompassed by a line extending six miles 165 magnetic from Point Fermin, thence to a point located three miles offshore on a line drawn 210 magnetic from Huntington Beach Pier; within six miles of the mainland shore south of a line running 210 magnetic from the tip of the outer breakwater at Oceanside Harbor.*

   (c) *Quotas*

   5,000 tons if no biomass estimate.

   (d) *Adjustments to Quota*

   Commission may increase quota in northern or southern area.
   After May 15, any remaining northern quota will be available to southern area.

(6) Permits to Reduce Anchovies

- *(a) Qualifications*
  Must have license in 8042a (no section).
- *(b) Applications*
  Must be received by Commission by July 15.
- *(c) Limitation of permit*
  One per plant.
  Nontransferable.
- *(d) Duration of permit*
  Specified on permit.
- *(e) Records*
  Must submit daily landing records to department.
- *(f) Plant Delivery*
  No plant may take delivery of anchovies from a vessel unless the vessel has filed a letter of intent to take anchovies for reduction.
- *(g) Weighing of Fish Landed*
  Anchovies taken for reduction must be unloaded at a weighing device approved by the Bureau of Weights and Measures, and operated by a state licensed weighmaster, and a receipt must be issued to the fisherman immediately after unloading.
- *(h) Fish from South of the International Border*
  If landed in California they will apply to the southern quota.

(7) Applicant Must Sign That He Understands and Agrees to Be Bound by the Terms of Permit

(8) Revocation of Permit
Commission may revoke permit.

2.2.5.2.3.2 California Department of Fish And Game Code (CDFG)- Anchovy

CDFG Code 8180. Take for human consumption; South of Pt. Mugu.

South of a line drawn east and west through Pt. Mugu anchovies may be taken in any quantity for bait or human consumption in a fresh state, or, by contract with the department for hatchery food not to exceed 500 tons per year.

CDFG Code 8181. Anchovies taken south of line.

Anchovies taken south of that line in waters not less than three nautical miles form the nearest point of land on the mainland shore, and anchovies taken north of that line in any waters, may be possessed, transported, sold, or otherwise dealt within any district or part of a district south of that line.

CDFG Code 8182. Registration number to be displayed at all times on boats south of line duplicates Title 14.

CDFG Code 8183. Humboldt Bay taking.

- *(a) Live bait may be taken May 1 to Dec 1 and dead bait May 1 to August 31. Operator of a vessel must use anchovies in his or her own fishing operation,* ***except anchovies may be sold to local sport fishermen as bait.***
- *(b) Observers may inspect and halt operation if game species are affected.*
- *(c) Anchovies may be taken only north of a line between channel marker 8 and 9 in District 8 an 9 in Humboldt Bay.*
- *(d) No more than 15 tons of anchovies may be taken between May 1 and August 31 and not more than 15 tons between Sept 1 and Dec 1 of each year.*

(e) Use only bait nets.
(f) Release game fish immediately by hand scoop or by lowering cork line. Accurate records must be kept and must be available for inspection by department.

CDFG Code 8190. State policy regarding anchovy resource; larvae surveys; effective dates.

This section is operative only with federal funding.

<u>Round Haul Area Closures</u>

CDFG Code 8751. District 1, 2, and 3.

These are inland districts that include parts of bays or harbors.

CDFG Code 8752. In Districts 6, 7, 8, 9, 10, and 11 roundhaul nets may be used.

CDFG Code 8754. Districts 16, 17, 18,and 19.

Purse seines and ring nets may not be used in that portion of District 19 lying within three miles offshore from the line of the highwater mark along the coast of Orange County from sunrise Saturday to sunset Sunday from May 1 to September 10, inclusive.

CDFG Code 8755. District 20A and 21 (Should be 20 not 21).

(1) Catalina Island week end closure within three nautical miles.
(2) Catalina Island closure June 1 to September 10.

CDFG Code 8757. Use of roundhaul nets for live bait.

Allows the use of roundhaul nets for the take of live bait in areas otherwise closed in District 16, 17, 18, 19, 20, 20A, and 21.

(a) Round haul nets may not be use within 750 feet of Seal Beach Pier or Belmont Pier.
(b) It is unlawful to possess, sell, or process dead fish taken under this section.

CDFG Code 8780. Definitions.

(a) Bait net means a lampara net made of Number 9 cotton twine or equivalent. The net shall not have rings or any method of pursing the net.
(b) Bait nets may be used to take fish for bait in Districts 6, 7, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19, 19A, 19B, 20A, 21, 118 and 118.5.
(c) In District 19A bait nets may be use to take only anchovies, queenfish, white croakers, mackerel, sardines, squid, and smelt for bait only.
(d) In district 19A no other species of fish may be taken by a boat carrying a bait net, except that a load may contain up to 18% by weight of fish other than baitfish which are taken incidentally to fishing operations.

CDFG Code 8870. Restrictions.

Dip nets may by used with following restrictions:

(a) In Districts 1, 1.5, 2, 3, and 4, dip nets may not be baited and may not measure more than six feet in greatest breadth.
(b) In District 19, hand held dip nets 30 feet or less in greatest breadth may be used. They may not be use within 750 feet of any pier, wharf, jetty, or breakwater, except to take anchovies, squid, and sardine for bait, and to take smelt.

2.2.5.2.3.3. California Code of Regulations Title 14 - Sardines

Section 157. Importation of Sardines for Bait.

Persons importing sardines for bait must send bill of lading to CDFG with country of origin. Must advise CDFG where sardines are stored and they must be packaged showing bait only and country of origin, etc.

Section 158. Sardines.

Establishes a sardine live bait permit and requires permittee to keep an accurate record of their activities in a live bait log provided by the department.

2.2.5.2.3.4 California Fish And Game Code - Sardines

CDFG Code 8150.5. Taking sardines; Restrictions, etc.

(a) Loads of fish may contain 15% or less by weight of sardines which are taken incidentally to fishing operations.
(b) Allows importation, see Title 14, Section 157.
(c) Allows imported sardines for dead bait, see Title 14, Section 157.
(d) A is operative only when 8151 is inoperative.

CDFG Code 8150.7. Intent of Legislature to Rehabilitate Sardine Resource.

Requires CDFG to estimate sardine biomass during first two months of the year. If biomass is over 20,000 tons, a 1,000 ton fishery will be allowed. May raise quota if warranted.

CDFG Code 8150.8. Quota Allocation of Sardines.

One-third, two-thirds allocation between northern and southern California. San Simeon is the division between north and south.

CDFG Code 8150.9. Untaken Sardines-Reassignment of Quotas.

Any remaining quota on September 30 will be reallocated and divided evenly between north and Game Code south areas.

CDFG Code 8151. Incidentally Taken Sardine Tolerances.

Established tolerance of 25% to 45% by weight when mixed with other species and an elaborate scheme to adjust tolerance on a monthly basis.

CDFG Code 8152. Sardine as Live Bait.

Allows the take of sardines for bait at any time.

CDFG Code 8154. Receive, Possess, or Sell Sardines; Exceptions.

No person shall receive, possess, or sell sardines for any purpose except for that purpose specified on the landing receipt completed at the time of landing.

Round Haul Area Closures

All code sections listed under anchovy also apply to sardines.

2.2.5.2.3.5. California Code of Regulations Title 14 - Pacific (chub) mackerel (Chub Mackerel)

Section 148. Permits to Commercially take Pacific (Chub) Mackerel.

(a) Permits are valid April 1 to March 31 of each year.

(1) Revocable nontransferable permits are issued to the owner or operator of a currently registered California commercial fishing vessel. Permittee must be aboard and any permittee who has had his permit revoked may not assist in taking Pacific (chub) mackerel for the remainder of the season. Permits are required to take or possess more than three tons or to use round haul nets for Pacific (chub) mackerel.

(2) Only issued in Long Beach.

(b) Condition of Permits.

(1) Monitoring of Resource.
CDFG shall sample landings and determine tonnages of Pacific (chub) mackerel landed. Director may revoke permits when allowable catch has been taken. If the resource can withstand additional harvest, the Director my activate the permits again. Notice of changes in allowable catch or permit status shall be by certified mail and shall be effective 48 hrs after CDFG posts such notice.

(2) Permit areas.
(A) Northern Permit Area.
Waters of Pacific Ocean between a line due west of Pt. Buchon and the Oregon Border.
(B) Southern Permit Area.
Waters of the Pacific Ocean between a line due west of Pt. Buchon and the US-Mexican border.

(3) Load composition.
Does not apply to northern area.
(A) Department may sample loads of Pacific (chub) mackerel to determine compliance with load composition requirements. Permittee may not obstruct or delay department personnel in performing their duties.
(B) Permittee shall not possess loads of fish containing Pacific (chub) mackerel except as follows:
(1) In effect only during season until quota is taken. All Pacific (chub) mackerel landings including those landed mixed with other species will be counted toward the allowable catch quota. The department shall announce via VHF/channel 16 when the quota has been reached. This shall be considered official notice.
*(2) When the quota has been taken, Pacific (chub) mackerel may only be taken subject to Code Sections 8415 and **8416.***
a. Loads of fish three tons or less may contain any percentage of Pacific (chub) mackerel.
b. Loads of fish greater than three tons may only contain 50% by weight of Pacific (chub) mackerel.
c. For the purpose of this section only jack mackerel shall be considered when determining percentage species composition.

(4) *Landing requirements.*
   (A) *All Pacific (chub) mackerel must be landed and weight at an approved weigh station.*
   (B) *Such fish shall be weighed by a license weighmaster and immediately recorded on a fish and game receipt.*
   (C) *Copies of receipts shall be handled in accordance with CDFG Code Sections 8011and 8015. Weights record shall be used to calculate species composition.*

(5) *Director may revoke permits for violations.*

2.2.5.2.3.6 California Fish And Game Code - Pacific Mackerel (Chub Mackerel)

CDFG Code 8410. Establishes season July 1 to June 30.

CDFG Code 8411. Population Studies.

CDFG will maintain population above 20,000 tons.

Total population is defined as all Pacific (chub) mackerel over age one on July 1 of each year.

Prepare status report on or before February 1 of each year. Report shall include population size for current season and an estimate of population size at the beginning of the next season.

CDFG Code 8412. Moratoriums and Quotas.

(a) *When population is below 20,000 tons a moratorium will be in effect, except that mixed loads containing no more than 18% by weight of Pacific (chub) mackerel taken incidental to other fishing operations will be permitted.*
(b) *If population is over 20,000 tons but less than 150,000 tons the director may establish a quota based on 30% of the amount over 20,000 tons.*
(c) *If the population is over 150,000 tons there will be no limit on the take of Pacific (chub) mackerel.*
(d) *Quotas may be taken with a permit issues by the department. Part of the quota may be allocated for landing from waters of the Pacific Ocean north of Pt. Sal.*

CDFG Code 8413. Department Shall Make Public Notice 48 Hours Prior to the Closing of the Season.

CDFG Code 8414. During Any Portion of the Season the Director May Decrease or Increase the Quota Established under Section 8412.

CDFG Code 8415. Mixed Species Tolerance Level.

After the quota is taken, the director may establish a tolerance level of 50% by number in landings greater than six tons and up to 100% in landings six tons or less.

Round Haul Area Closures

Area closure listed under Anchovy also apply to Pacific (chub) mackerel.

Jack Mackerel

The take of jack mackerel is unrestricted in California, except that net restrictions listed for anchovy also apply to jack mackerel.

2.2.5.2.3.7 California Code of Regulations Title 14 - Market Squid

Section 149. Taking of Squid North of Point Conception (Will be amended to conform with CDFG Code.)

(a) In District 16 and 17 squid shall not be taken by a vessel using or possessing a roundhaul net between 1200 hours (noon) Friday and 2400 hours (midnight) Sunday.
(b) In District 16 and 17 south of a line running 252 magnetic from Moss Landing Harbor Entrance, squid may not be taken by a vessel using or possessing a roundhaul net, between 200 hours (noon) and 2400 hours (midnight) on any calender day Monday through Thursday.

2.2.5.2.3.8 California Fish And Game Code -Summary Squid

CDFG Code 8399. Superceded by Article 9.7 (Sher Bill).

CDFG Code 8399.1 Take Restrictions on Squid in District 10.

(a) Following activities are unlawful:
  (1) Attract squid by displaying lights except from a vessel deploying nets for the take of squid or from the seine skiff of the same vessel.
  (2) Attract squid by displaying lights from a vessel whose primary purpose is not deploying nets for the take of squid.
  (3) To encircle any vessel, other than by the seine skiff of a vessel deploying nets for the take of squid, while that vessel is engaged in the taking of squid.

(d) Defines seine skiff-unlicenced vessel that assist larger licensed vessel.

Article 9.7

CDFG Code 8420. Legislative Funding and Declaration.

Establishes the importance of squid as a commercial species and for forage. Declares that overfishing is possible because of lack of data and recommends that a plan for sustainable harvest be developed possibly including a limit on the number of days per week that squid may be taken.

CDFG Code 8420.5.

North of a line due west from point conception squid may be taken for commercial purposes only between noon on Sunday and noon on Friday of each week.

CDFG Code 8421. Permit.

(a) Establishes a squid permit.
(b) Squid vessel permit will be issued only to vessel deploying purse seine, lampara, or dip nets. No other nets may be used to take squid. Permit not required if landings are less than two tons per day. It is also unlawful to possess more than two tons taken incidentally per trip.
(c) Permit is issued to person who is owner of a commercial fishing vessel.
(d) Owner includes a person who has a lease purchase agreement for the vessel.
(e) Permit may not be sold, trade, or transferred to another person.
(f) Permit will be issued annually beginning with the 1998 through 1999 permit year.
(g) Commission may revoke permit.
(h) Squid landed in excess of limit in CDFG Code 8421b shall be forfeited to the CDFG.

CDFG Code 8421.5.

If permit is issued to a corporation or partnership, the individual who operates the vessel shall be identified at the time the permit is issued. Following any change in agreement the CDFG will reissue the permit to the new operator.

CDFG Code 8422.

(a) Established squid vessel permit and fee of $2,500.
(b) Purchase by April 30, 1998, renewable annually only if you had a permit the preceding year.
(c) $250 late fee if purchased by May 31, 1998.
(d) All applications received after May 31 will be denied.

CDFG Code 8423 .

Establishes light boat permit and fee of $2,500.

CDFG Code 8423.5.

(a) Deadline for applying for light boat permit is April 30, 1998. Renewable only if you had a permit the preceding year.
(b) $250 late fee after April 30.
(c) Permits denied if application received after May 31 of each year.

CDFG Code 8424. Landing Requirements.

(a) No person shall purchase squid from a vessel unless that person is a licensed fish buyer, employs a certified weighmaster, and the facility is located at permanent fixed location.
(b) This section does not apply to the transfer at sea of squid for live bait in an amount of less than 200 pounds per day.

CDFG Code 8425.

Commission will hold annual public hearings at which squid regulations are adopted.

CDFG Code 8426.

(a, b) Director shall establish squid research scientific committee and a fishery advisory committee and hold public hearings.
(c) Report to the legislature due April 1, 2001.

CDFG Code 8427. Transfer of Permits.

(a) May be transferred to another vessel owned by the permit holder only if the original vessel was lost, stolen, or inoperable.
(b) Claim rejected if fraudulent.
(c) Proof of loss is required.
(d) Establishes a $250 transfer fee.

CDFG Code 8428.

Funds collected from permit fees must be used for squid research.

CDFG Code 8429.

Permit may be revoked under penalty of perjury if false statements made on application.

CDFG Code 8429.5. Authority of Director.

CDFG 8429.7.

Article 9.7 (squid) will become inoperative on April 1, 2001 and repealed as of January 1, 2002 unless extended.

Roundhaul Area Closure

See anchovy section which also applies to squid.

2.2.6 Annual Assessment and Management Cycles

This FMP specifies that annual schedules for Actively managed CPS must be developed based on the Council's workload and meeting schedule, opportunity for industry and technical review of biomass estimates and harvest guidelines or quotas, seasonal patterns in the fishery, collection and processing of California Cooperative Fisheries Investigations (CalCOFI) data during the peak spawning season, collection of other data, time required for notification of fishers, and workload of the Coastal Pelagic Species Plan Development Team and CPSAS. The FMP does not specify what those schedules will be, since they will be implemented through regulations.

The Council's decisions about harvest levels will be made as "notice" actions requiring one *Federal Register* notice and one Council meeting under the CPS framework process.

2.2.6.1 Pacific (Chub) Mackerel

At the outset of this FMP, Pacific (chub) mackerel will be managed using a July-June annual cycle already used by the State of California (Table 2.2.6.1-1). Under this schedule, Pacific (chub) mackerel is assessed during late March-early May and reviewed during late May. Harvest guidelines will be set by the Council at the annual meeting held in June. NMFS will make all necessary *Federal Register* announcements prior to the season opening on July 1.

TABLE 2.2.6.1-1. Assessment schedule for Pacific (chub) mackerel.

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1. Spawning season	Aug								Apr ------------				Aug						
2. Recruitment				Nov --------			Feb									Nov --------			Feb
3. Fishery data						Jan												Jan	
4. CalCOFI survey	Aug							Mar ----		May	Jun ----		Aug						
5. CalCOFI data avail.			Oct												Oct				
6. Aerial spotter index				Nov				Mar								Nov			
8. Stock assessment									Apr										
9. Preliminary review										May									
10. Council Meetings	Aug	Sep		Nov				Mar	Apr		Jun			Sep		Nov			
11. Fishing season starts												Jul							

2.2.6.2 Pacific Sardine

At the outset of this FMP, Pacific sardine will be managed using the January to December annual cycle already used by the State of California (Table 2.2.6.1-1.). Pacific sardine will be assessed during late August-early October and reviewed during late October. Harvest guidelines will be set by the Council at the annual meeting held in November. NMFS will make all necessary *Federal Register* announcements prior to the season opening on January 1.

TABLE 2.2.6.1-2. Assessment schedule for Pacific sardine.

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1. Spawning season						Jan	----	----	Apr										
2. Recruitment	----	----	----	----	----	Jan						Jul	----	----	----	----	----	Jan	
3. Fishery data	Aug												Aug						
4. CalCOFI survey						Jan	----	----	Apr									Jan	----
5. CalCOFI data										May									
6. Aerial spotter index										May									
7. DEPM							Feb-Mar												
8. DEPM results avail.											Jun								
9. Biomass estimation		Sep												Sep					
10. Preliminary review			Oct												Oct				
11. Council Meetings		Sep		Nov				Mar	Apr		Jun			Sep		Nov			
12. Season starts						Jan												Jan	

2.2.6.3 Monitored Species

The CPSMT will prepare an annual Stock Assessment and Fishery Evaluation (SAFE) report describing the status of the CPS fishery as a whole including landings, prices, revenues, and economic, biological or environmental conditions not covered elsewhere in assessments for Actively managed species. The report will include all available information that may be used to determine if a stock should be promoted to the Actively managed category because a point of concern exists (e.g., overfishing is expected to occur within two years based on a default or species-specific MSY control rule) or for some other reason. At a minimum, the report should contain landings data for Monitored stocks and any available information about trends in abundance.

3.0 LIMITED ENTRY IN THE COASTAL PELAGIC SPECIES FINFISH FISHERY

The Pacific Fishery Management Council (Council) is considering limited entry for coastal pelagic species (CPS) finfish including northern anchovy, Pacific (chub) mackerel, jack mackerel, and Pacific sardine landed south of 39° N latitude as part of Amendment 8 to the fishery management plan (FMP) for northern anchovy. As described below, the Council considered extending limited entry to market squid, another key species in the CPS fishery, but decided to limit options to CPS finfish only. Limited entry was a preferred option in Amendment 7, which was adopted by the Council but rejected by the U.S. Secretary of Commerce (Secretary).

The Council currently has responsibility for management of the central subpopulation of northern anchovy (central Baja California and central California) and jack mackerel north of 39° N latitude. California currently has sole responsibility for management of the California fisheries for Pacific sardine and Pacific (chub) mackerel. Oregon and Washington have responsibility for fishing on CPS stocks (i.e., northern subpopulation of anchovy) and portions of stocks (e.g., sardine) found in state waters. Options being developed for Amendment 8 would bring all CPS finfish into the Council process under a single FMP.

3.1 Background

Northern anchovy biomass has increased recently from a low to a moderate level, more than 390,000 mt in 1997. Pacific (chub) mackerel has declined over the last decade and biomass is currently at a moderate level, about 100,000 mt during 1997. Pacific sardine biomass increased dramatically over the last decade and was about 500,000 mt in 1997. Sardine availability seems to be increasing all along the coast from Baja California to British Columbia, Canada. Biomass and harvests are expected to increase in the near term. Jack mackerel abundance and trends are unknown.

The 1997 to 1998 El Niño had significant effects on availability, distribution and (probably) abundance of CPS finfish. Stocks were shifted to northern areas and CPS finfish fishing opportunities increased, at least temporarily, in Oregon, Washington, and British Columbia. Abundance estimates and management advice for 1997 and 1998 were particularly uncertain, because El Niño conditions will likely be short lived.

Limited entry is complicated for CPS stocks, because of natural variability in stock size (e.g., sardine biomass has ranged from almost zero to 3.5 million mt) and stock distribution (sardine and Pacific [chub] mackerel range from Baja California to British Columbia when abundant but are confined to the Southern California Bight or Mexico when abundance is low). Abundance of CPS stocks and available harvest for the coastal pelagic fishery as a whole (see landings data below) may be less variable, but natural variability in stock size undermines the concept of an "optimum" fleet size. However, the current CPS fleet is able to adapt to changes in available harvest and abundance by targeting alternate CPS and non-CPS species, because operating costs are low. The same degree of flexibility could be expected if limited entry is adopted.

Fisheries that currently harvest CPS finfish include (1) the directed net gear (roundhaul, gillnet and trammel net) fisheries for CPS finfish; (2) the live bait fishery for CPS finfish; (3) the dead bait fishery for CPS finfish; (4) fisheries for non-CPS finfish species that take incidental quantities of CPS finfish; (5) the small boat fishery for CPS finfish; and, (6) recreational fisheries. Additionally, at-sea harvester-processors and the offshore trawl fleet could potentially harvest significant quantities of CPS finfish. There is a great deal of overlap among CPS finfish fisheries (e.g., among the gill and trammel net, small boat, and incidental segments), as well as the directed roundhaul fisheries for CPS finfish and squid.

3.1.1 Historical Participants

Approximately 200 vessels participated in the sardine fishery during its heyday in the 1940s and 1950s. Some present day roundhaulers are remnants of the sardine fleet. Other remnants of the fleet can be found among roundhaulers that target squid but land very small amounts of CPS finfish (primarily near Ventura and Monterey, California). Although such vessels may not have fished CPS finfish during the Council's window period, many of them use the same type of gear used in the directed CPS finfish fishery, and would likely be interested in fishing for mackerel and sardine in northern areas such as Monterey if markets and resource availability are sufficient.

3.1.2 Present Participants

Over the last five years California roundhaulers have accounted for 99% of Pacific Coast CPS finfish landings. The roundhaul fleet's CPS finfish landings are sold as relatively high volume/low value products (e.g., mackerel canned for animal and human consumption, and anchovy reduced to meal and oil). In addition to fishing for CPS finfish, many of these vessels also target market squid, Pacific bonito, bluefin tuna, and Pacific herring.

There are other vessels that target CPS finfish in small quantities and usually sell their landings to specialty markets for relatively high prices. These include:

a. Approximately 18 live bait vessels in southern California and two vessels in Oregon and Washington that take about 5,000 mt per year of CPS finfish (mostly anchovy) for sale to recreational anglers (live bait harvest of anchovy off southern California is unrestricted except at very low levels of spawning biomass).

b. Roundhaul vessels that take a maximum of 1,000 mt to 3,000 mt of anchovy per year that are sold as dead bait to recreational anglers.

c. Roundhaul and other mostly small vessels that target CPS finfish (particularly mackerel and sardine) for sale in local fresh fish markets or canneries.

Many other vessels routinely harvest CPS finfish incidentally while targeting other species.

3.1.3 Potential Participants

There is a general level of excess harvest capacity (maximum potential harvest exceeds the available or target harvest) in most West Coast and North Pacific fishing fleets (e.g., groundfish, shrimp, crab, halibut, salmon, etc). As these other fisheries become increasingly overcrowded, it becomes likely that capacity will be redirected to the West Coast CPS finfish fishery when downturns occur elsewhere. This occurred in the CPS fishery for market squid. When export markets for squid developed, landings and number of vessels increased by 66% and 56% respectively during 1993 to 1997. In addition, the largely unexploited population of jack mackerel has attracted the attention of factory trawlers and offshore trawl vessels. Harvesting and marketing experiments have been unsuccessful to date, but a new fishery may develop in the future. CPS may become available in northern areas when abundance is high (e.g., sardine) or water is warm (e.g., Pacific [chub] mackerel during El Niño) so that fisheries may develop, at least temporarily, in northern areas.

3.2 Landings, Revenues, and Trips

Between 50,000 mt to 100,000 mt of CPS per year were landed coast wide during 1981 to 1997 (Figure 3.2-1). Landings of finfish declined recently while squid landings increased (data for 1997 are incomplete). El Niño conditions virtually eliminated the squid fishery in 1998, and its future is uncertain. About 99% of the total CPS harvest during each year is landed in central and southern California. Small quantities are landed in Oregon and Washington although interest in northern fisheries for sardine and Pacific (chub) mackerel seems to be increasing.

Squid have been the economic mainstay of the CPS fishery in recent years (see below). In 1996, market squid supported the largest (80,000 mt) and most valuable ($33 million exvessel) fishery in California. Sardine, mackerel and anchovy landings in California during 1996 were about 44,000 mt with exvessel revenues about $6 million. Exvessel prices for CPS finfish are relatively low (often less than $100 per mt) while prices for market squid are much higher (often around $400 per mt). Although squid has been the mainstay in recent years, finfish (including tunas and non-CPS species) have been the dominant species historically.

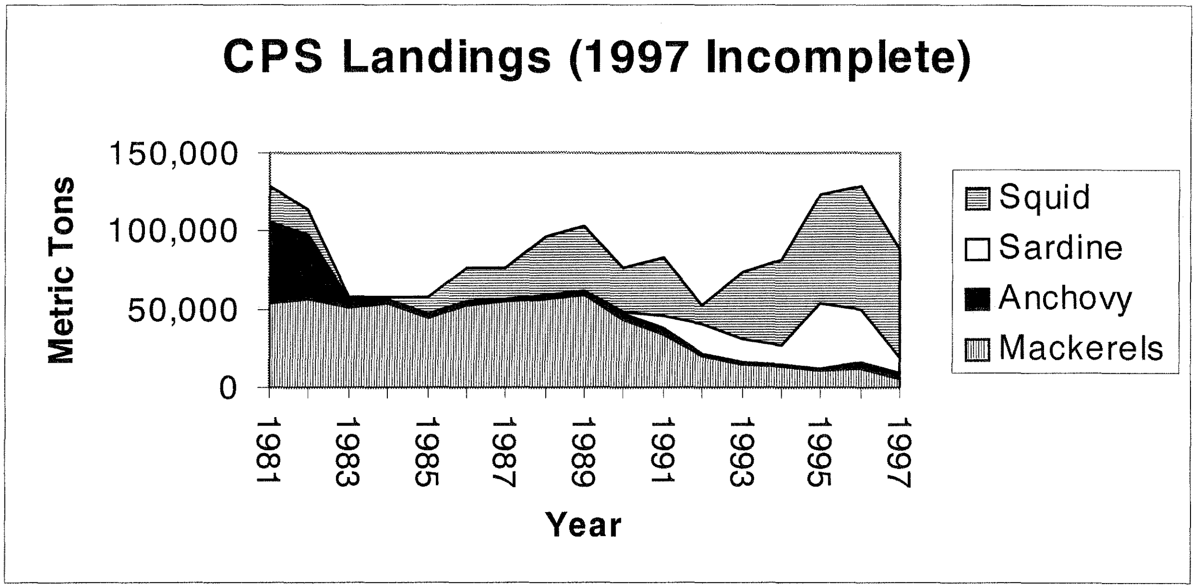

Figure 3.2-1

The number of squid trips (trips with any squid) has increased while the number of finfish trips (trips with any anchovy, sardine or mackerel) has remained static (Figure 3.2-2). Activity in the fishery, measured as total number of trips, was relatively high during 1996 (the last year with complete data). Preliminary data indicate that the number of squid trips plummeted during 1997 to 1998 due to El Niño conditions.

Over the last decade, the number of vessels along the coast harvesting at least five mt of CPS finfish per year has increased slightly (Figure 3.2-3). The number of vessels catching at least five mt of squid or at least five mt of squid plus finfish has increased more rapidly.

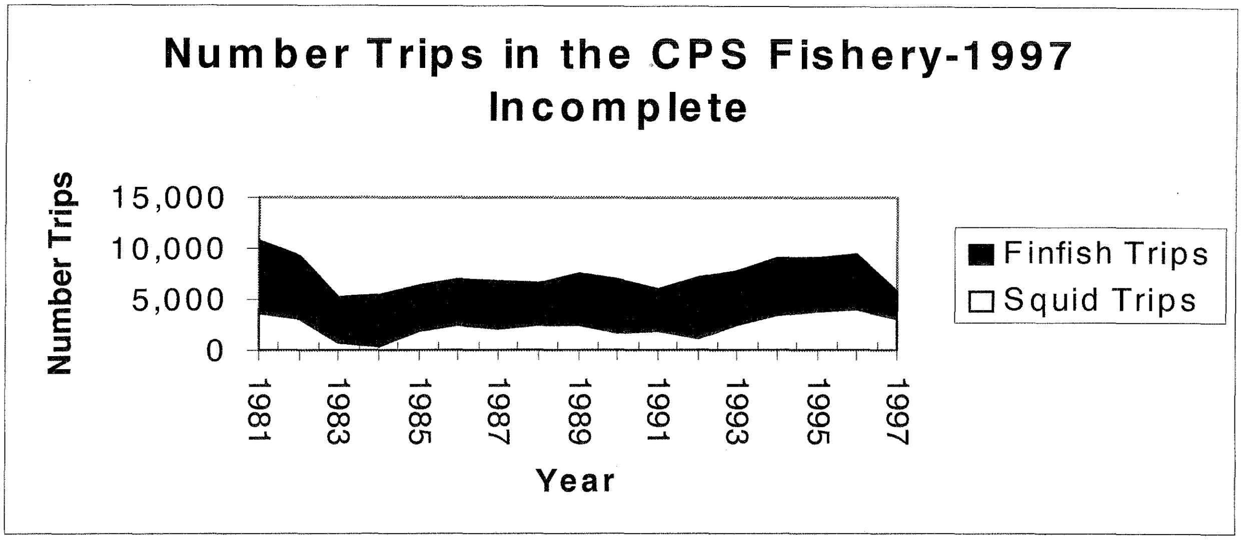

Figure 3.2-2

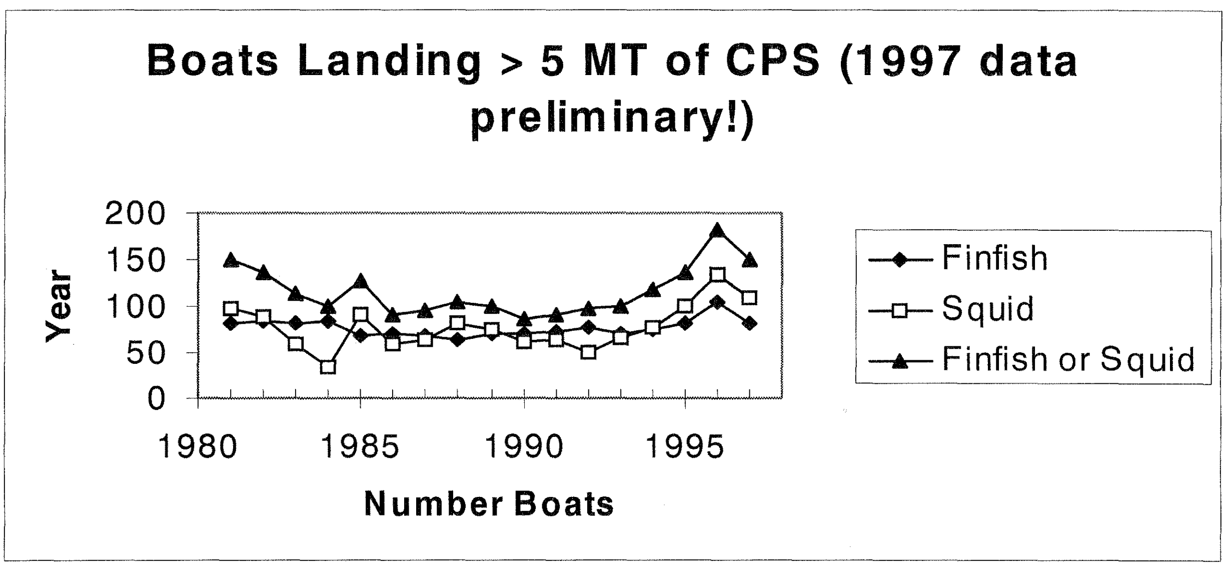

Figure 3.2-3

The largest vessels in the CPS fishery have hold capacities of more than 20 mt but the median size of trips is about 20 mt, probably due to landings limits imposed by processors (Figure 3.2-4). For the figure below, total landings of CPS finfish plus squid were calculated for each boat that landed any squid or CPS finfish during 1993 to 1997. Totals for each boat (one record for each boat) were then sorted into 100 mt landings categories (e.g., "50" means 1-99.9 mt) and merged with fish ticket (single trip data) so that distributions of landings per trip could be plotted against landings category using "box-whisker" plots. In the plots, the central '◆' is at the median trip size (50% of trips smaller and 50% larger). The box starts on the left at the first quartile (25% of trips are smaller than the first quartile) and extends to the third quartile (25% of trips are larger than the third quartile). Thus, the box covers the central 50% of the data and the right hand side of the box has a value that is larger than 75% of the trips. Trips that lie outside the median ± `.5 inter-quartile range are shown individually.

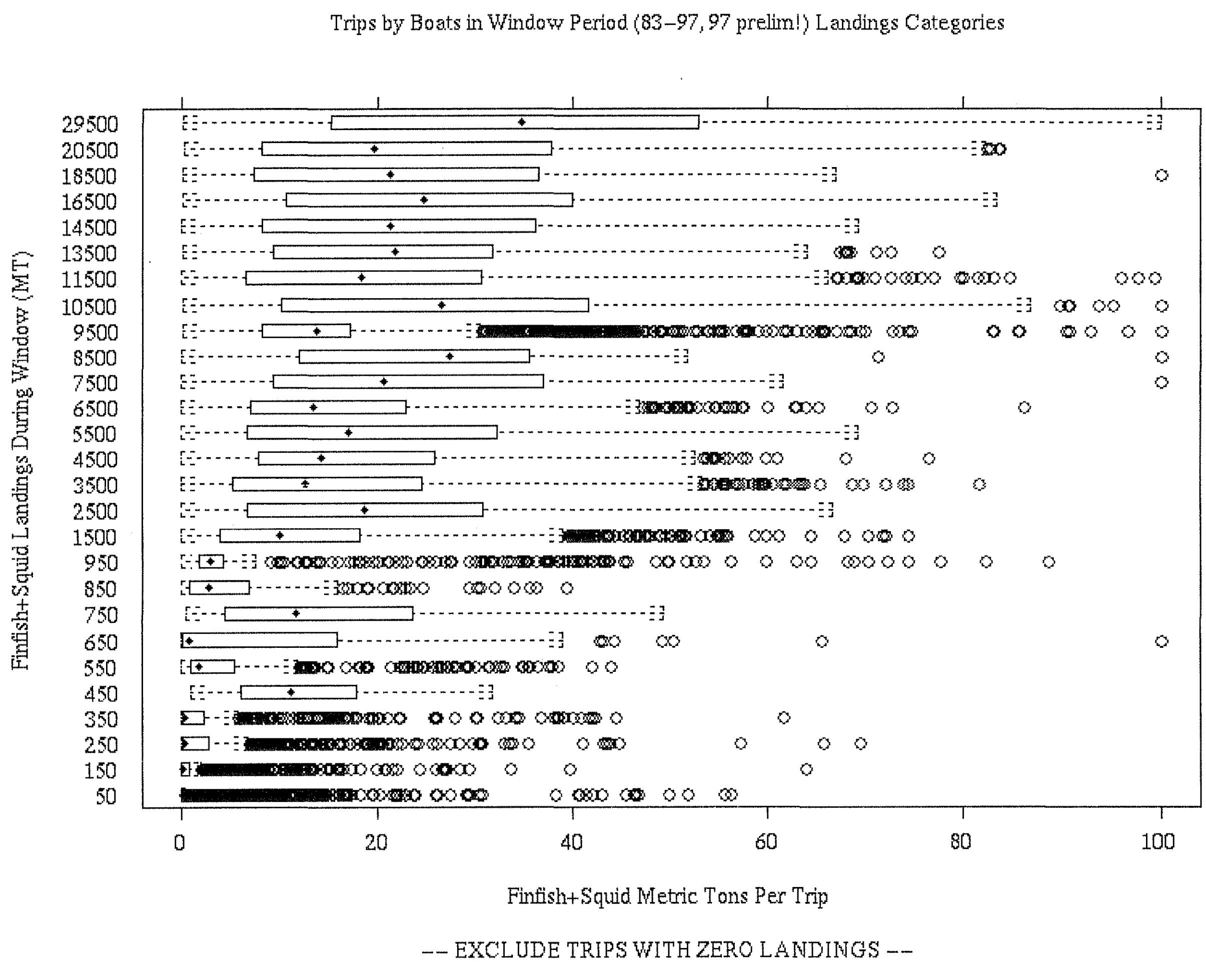

Figure 3.2-4

3.3 Dependence on Coastal Pelagic Species

There were very few vessels with large landings who relied solely on CPS finfish (Figure 3.3-1). Almost all were either squid specialists or harvested squid extensively. Vessels with the highest landings in the CPS fishery rely heavily on CPS revenues (particularly revenues from squid). There were 67 vessels with "large" (more than 800 mt of) CPS landings (finfish plus squid) during 1993 to 1996. In most cases, CPS finfish plus squid revenues accounted for more than 80% of total revenues for vessels with large landings (Figure 3.3-2).

DISTRIBUTION OF CPS VESSELS BY FINFISH AND SQUID LANDINGS (COMBINED LANDINGS GREATER THAN 800 MT-- 67 VESSELS), 1993-96.

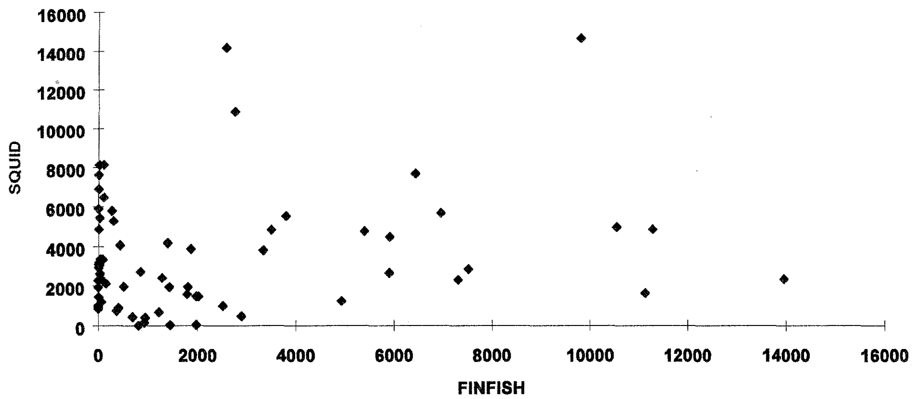

Figure 3.3-1

DISTRIBUTION OF CPS VESSELS BY FINFISH PLUS SQUID LANDINGS, AND FINFISH PLUS SQUID REVENUES AS PERCENTAGE OF VESSEL'S TOTAL REVENUES (COMBINED) LANDINGS GREATER THAN 800 MT - 67 VESSELS), 1993-96.

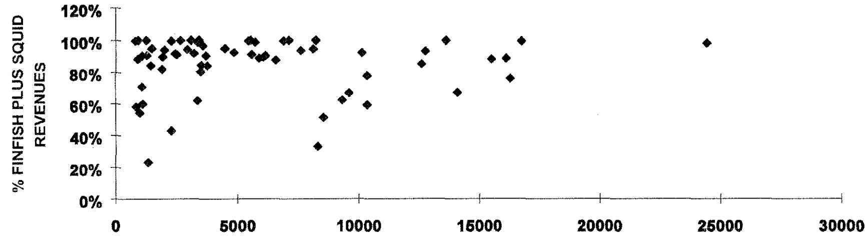

Figure 3.3-2

In contrast, there were 134 vessels with "medium" landings of finfish plus squid (greater than 20 mt but not more than 800 mt) during 1993 to 1996. Vessels with medium landings tended to specialize in either finfish or squid (Figure 3.3-3). Revenues from CPS finfish plus squid were a variable fraction of total revenues for vessels with medium landings (Figure 3.3-4).

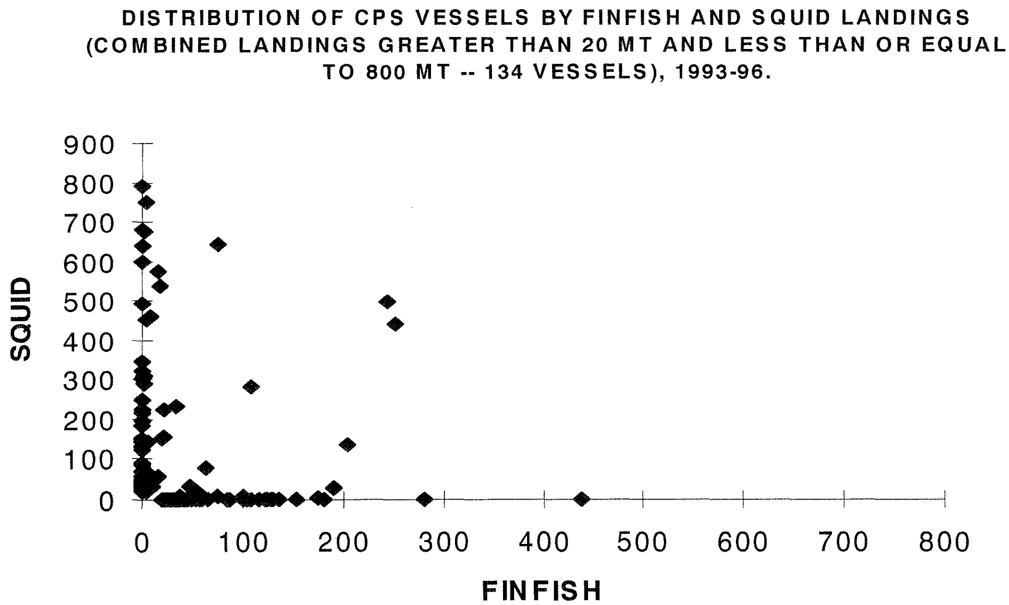

Figure 3.3-3

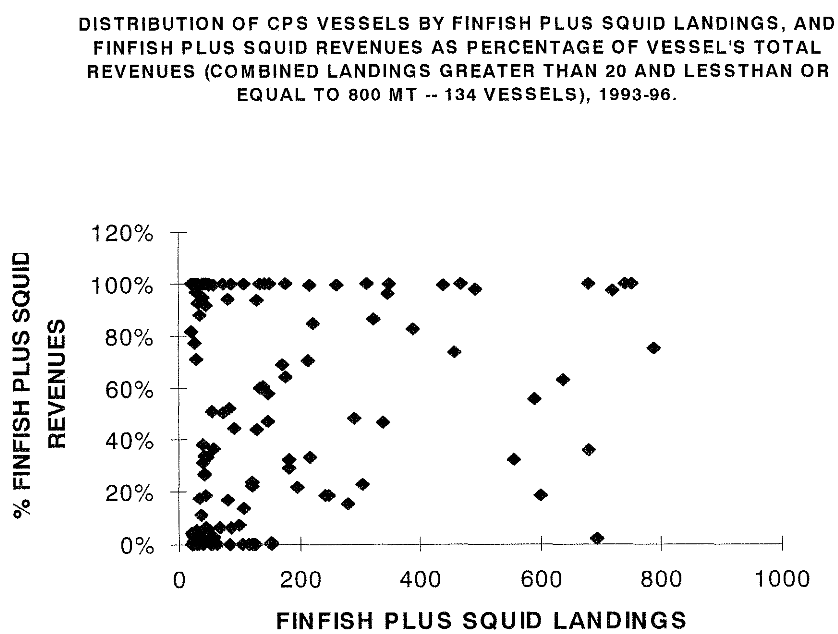

Figure 3.3-4

3.4 Reasons for Considering Limited Entry (Statement of the Problem)

Vessels currently participating in the CPS finfish fishery are capable of harvesting more CPS finfish than is available under current biomass conditions. Fisheries characterized by excess harvesting capacity are described as overcapitalized in terms of the number of vessels, and the amount of gear and equipment devoted to harvesting. As fisheries become overcapitalized, harvesting costs increase while catches remain the same. This situation represents an economically inefficient use of society's productive resources, and causes several problems for managers and the fishing industry when abundance declines and catches are reduced. As harvest capacity in the fisheries increases, problems arising from the need for more restrictive management measures and resolution of allocation issues become more acute. No relief from these problems will occur if harvest capacity continues to rise.

There were 640 vessels with CPS finfish landings for the period January 1, 1993 through November 5, 1997. Forty-one of these vessels, six percent, accounted for more than 95% of finfish landings for the five-year period (Table 3.8.7-1). Available information indicates that present participants could harvest at least as much CPS finfish as would be available under conditions of greater availability. Participants during the five-year period include 105 low-volume (landings of at least five mt but less than 200 mt of CPS finfish during the 1993 to 1997 period) and 63 high-volume producers (more than 200 mt of CPS finfish landings during the period). Low-volume producers could probably average about five mt per trip. Assuming five trips a week and a six-month season, these vessels could land (five mt/trip x five trips/week x 26 weeks/year) 650 mt of CPS finfish per boat per year. High-volume producers could probably average 50 mt per trip. Assuming five trips a week and a six-month season, these vessels could land (50 x 5 x 26) 6,500 mt per boat per year. On this basis, 105 low-volume and 63 high-volume producers could land about (68,250 + 409,500) 477,750 mt of CPS finfish per year. Thus, current capacity may be as much as 20% greater than the combined maximum sustainable yield (MSY) for anchovy, Pacific (chub) mackerel and sardine (about 400,000 mt per year)[1] These crude estimates of excess capacity are exaggerated to some extent because many present participants catch species other than CPS finfish, participate in the CPS fishery on a seasonal or intermittent basis, and are involved in other fisheries. Market squid landings, for example, average about 30,000 mt per year and utilize fleet harvesting capacity that might otherwise be in excess. Recent experience in the fishery and some crude calculations indicate that about 75 vessels would have sufficient harvesting capacity to take almost all of the CPS finfish likely to ever be available.

In addition to current CPS finfish participants, newcomers are likely to be attracted to the fishery, because of the expanding sardine biomass and squid fishery, and as competition in other Pacific Coast fisheries becomes more intense. In the latter instance, nearly all groundfish stocks are now fully harvested by domestic fishers in the Pacific coast groundfish fishery. As pointed out above, potential participants in the CPS finfish fishery consist of fishers leaving other West Coast and north Pacific fisheries that have grown increasingly more restrictive and overcrowded relative to available harvests.

In the Pacific Coast CPS finfish fishery, excess harvest capacity is likely to result in an increasing number and complexity of regulations. Accordingly, the Council will face increased pressure to balance the conflicting need to protect the resource with the need to provide sufficient allowable catch to sustain the fishery.

Increased number and complexity of regulations have many adverse impacts in such areas as fleet costs, resource utilization, safety, enforcement costs, and effectiveness. Moreover, there is a point beyond which additional regulations, which interfere with day to day vessel operations (e.g., trip limits or mesh size regulations), will not improve the Council's ability to accomplish its management goals. Pressures on industry arise not only from management measures which restrict operations, but also from increased competition for the allowable catches among larger numbers of vessels.

1/ The estimate 400,000 mt per year is the sum of estimated MSY for each stock reduced by a crude estimate of the fraction of the stock in U.S. waters. It is unlikely that all stocks would be abundant at the same time and that 400,000 mt of catch would be available in any one year.

3.5 Managing Harvest Capacity by Controlling Access to the Coastal Pelagic Species Finfish Fishery

Two manageable components of fleet harvest capacity (maximum potential harvest) are vessel fishing power (relative ability of a vessel to catch fish as determined by its size, gear and equipment crew and other productive inputs) and number of vessels.

Harvest capacity relates to a vessel's or fleet's ability to harvest fish. A vessel or fleet directly produces fishing effort which, when applied to a stock of fish, results in catch. The amount of effort produced depends on the number of vessels, their physical attributes, gear and equipment, crew and other inputs, and on the time and area fished. Hence, harvest capacity is linked to effort production which in turn corresponds to the size of the fleet and its use of available inputs.

Managing harvest capacity, therefore, entails controlling vessel effort production, the number of vessels, or both. As a first step, limiting access of vessels to the fishery may be particularly useful.

There are three basic approaches to controlling the number of vessels participating in the CPS finfish fishery (1) open access management; (2) limited entry; and, (3) individual transferable quotas (ITQs). The Council, Coastal Pelagic Species Plan Development Team (CPSPDT), Coastal Pelagic Species Advisory Subpanel (CPSAS), and other industry representatives discussed all three approaches to managing harvest capacity in the CPS fishery at length and a concerted effort was made to inform all participants about the benefits and problems associated with each.

Under open access (status quo in the CPS finfish fishery), no measures are taken to limit fishing effort or capitalization in the fishery. Open access fisheries tend to become overcapitalized, resulting in too much fishing effort (too many fishers with too much capital equipment producing too much effort in the pursuit of too few fish). Overcapitalization may be due to too many vessels in a fishery or to too much investment in capital equipment used on individual vessels. As a fishery becomes overcapitalized, economic efficiency is reduced and pressure to over harvest stocks increases (Wilen 1988; Townsend 1990). Other serious biological (resource depletion) and practical problems (short seasons, wastage, dangerous fishing practices) are typical of open access conditions and exacerbated by overcapitalization. Management of vessel access and fishing effort plays an important role, therefore, in the conservation and efficient exploitation of fishery resources.

Limited entry programs restrict the number of vessels having access to the fishery. Participants are issued licenses/permits which are usually transferable. Economic efficiency is promoted to the extent that more efficient fishers purchase permits from less efficient ones. However, limited entry programs are not completely effective in managing fishing effort and capitalization (Rettig and Ginter 1978; Townsend 1990) because vessel effort production can still be increased by expanding unregulated dimensions of effort (e.g., expanding hold size, increasing engine horsepower, or installing electronics). Reducing fleet size to an efficient level at the outset of a limited entry program is difficult because participants who would be excluded under the program typically oppose it.

ITQ programs involve transferable shares of an overall quota (Maloney and Pearse 1979; Copes 1986; Clark et al. 1988; Sissenwine and Mace 1992; Squires et al 1998). ITQs theoretically eliminate overcapitalization, inefficiency, and dangerous fishing practices associated with the "race for the fish;" but also engender practical problems with monitoring and enforcement.

ITQs are also generally acknowledged to be more costly to monitor and enforce than limited entry programs. For example, recurring costs for a proposed ITQ program for fixed gear sablefish were estimated at $1,133,000 to $2,174,000 per year (Council 1993) or 15% to 29% of the exvessel value of the CPS fishery in 1992 ($7,500,000, according to Thomson et al. 1993).

Under the Magnuson-Stevens Fishery Management and Conservation Act (Magnuson-Stevens Act) there is a moratorium on ITQs until October 1, 2000. This leaves two options available for controlling access to the fishery.

3.5.1 Option for Open Access Management (Status Quo)

This option would maintain open access management (status quo) in the CPS finfish fishery. The advantages of this option are that regulations and costs of limited entry are avoided and that operations of individual vessels and firms are not restricted by regulations.

If the status quo is adopted, an opportunity to implement a limited entry system in the CPS finfish fishery under favorable conditions would be lost. Another disadvantage of the status quo option is that open access management leads almost inevitably to overcapitalization and pressure on managers to allow high harvest levels. With open access, there is an increased likelihood for high mid-term and long-term management costs (to develop and implement other regulatory measures, e.g., trip limits[2]) associated with overcapitalized fisheries and depleted stocks. The collapse of the sardine fishery in the 1940s and 1950s and problems in the Pacific (chub) mackerel fishery during periods of poor recruitment suggest that problems linked with overcapitalization recur in the CPS fishery. The historical growth of the sardine fishery during the 1930s and 1940s and general experience with purse seine fisheries indicates that the CPS fishery may become overcapitalized quickly (faster than management could react) under a number of plausible scenarios (i.e., recovery of sardines, development of an offshore fishery for CPS, development of new markets for CPS).

According to Scofield (1938), the historical open access sardine fishery in California experienced a dramatic increase in fleet size as sardine landings increased prior to collapse of the fishery. The number of vessels increased from 150 in the 1930 to 1931 season, to 200 in 1933 to 1934, to over 300 in 1936 to 1937, with landings increasing from 200,000 tons to 400,000 tons to 700,000 tons. Fleet size peaked at 380 vessels in 1937 to 1938 as landings began to decline. The maximum allowable catch (MAXCAT) for sardine and anchovy recommended under the FMP will likely be 200,000 to 400,000 mt per year of which about 50% to 90% would be available in the U.S. It is difficult to predict the size of an open access fleet in the U.S. under conditions of high sardine and anchovy biomass when catches of all CPS might rise as high as 360,000 mt. Based on historical data, however, a fleet size of 175 vessels to 250 vessels seems plausible, particularly since the fleet would take species other than anchovy and sardine (e.g., mackerels, squid, bonito, and tuna).

3.5.2 Option for Limited Entry

This option would establish limited entry in the CPS finfish fishery by license limitation. A number of different suboptions for implementing a limited entry program were developed. These and other details may be modified, and are discussed more fully below:

- Permits are permanent subject to legal, performance, or other renewal requirements.
- Permits are assigned for use on one vessel at a time.
- A limited entry permit may not be used with a vessel unless it is registered for use with that vessel.
- Limited entry permits will be registered for use with a vessel and a registered vessel may be changed according to procedures outlined in the FMP and regulations.
- The vessel owner is responsible for maintaining the permit and any other documentation required on board each vessel with a permit to fish for CPS.
- Only a person eligible to own a documented vessel may be issued or may hold, by ownership or otherwise, a limited entry permit.
- No more than one limited entry permit will be issued for each qualifying vessel. The permit will be issued only to the current owner of the vessel, unless (1) The previous owner of a vessel qualifying for a permit has, by the express terms of a written contract, reserved the right to the permit, in which case the permit will be issued to the previous owner based on the catch history of the qualifying vessel; or (2) a vessel that would have qualified for a limited entry permit was lost before a permit was issued. In this case, the owner of the vessel at the time it was lost retains the right to the permit, unless the owner

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2/ In groundfish, trip limits are used primarily to obtain a year-round fishery under catch constraints. In CPS, trip limits might be used to limit fleet capacity and to distinguish between different types of fishing or different types of limited entry permits.

conveyed the right to another person by the express terms of a written contract.

- A person who owned a vessel that met the landing requirements and who reserved, by the express terms of a written contract, the right to a future limited entry permit on the basis of the catch history of that vessel, may receive a limited entry permit.
- Permits may be transferred to other owners for use with other vessels or used with other vessels under the same ownership subject to legal, performance or other requirements for transfer.
- Limited entry permits assigned to one vessel may be transferred to use on another only once during each calendar year.
- Application, renewal, and other fees may be charged by National Marine Fisheries Service (NMFS) to cover administrative costs.
- A limited entry permit expires on failure to renew the limited entry permit. Permits must be renewed every two calendar years.
- If the permit will be used with a vessel other than the one registered on the permit, a registration for use with the new vessel must be obtained from the Regional Director and placed aboard the vessel before the vessel is used to fish for CPS.
- If a vessel would have qualified for a limited entry permit but was lost before permits were issued, the vessel may be replaced within two years of the date of the loss, and the owner may obtain a permit for the new vessel.

3.5.3 Nature of the Interest Created

CPS limited entry permits confer a privilege to participate in the West Coast CPS fishery in accordance with the limited entry system established under this FMP and implementing regulations, or any future amendment to the FMP and implementing regulations. Future amendments to the FMP may modify or even abolish the limited entry system. The permits are also subject to sanctions including revocation, as provided by the Magnuson-Stevens Fishery Conservation and Management Act, 16 USC 1858(g) and 15 CFR part 904.

3.5.4 Notice of Date for Proposed Rule Making (Control Date)

The Council adopted November 5, 1997 as a *Federal Register* notice date for use in establishing a potential limited entry program for CPS finfish. This date precludes speculative fishing by vessels for the sake of obtaining a limited entry permit after the Council announced its intention to consider limited entry for the CPS finfish fishery.

3.5.5 Appeals Process

If an application for a permit is denied, the applicant may appeal the denial to the NMFS Regional Administrator.

The appeal must be in writing, state the action being appealed, and reasons. The appellant may request an informal hearing before a hearing officer and the NMFS Regional Administrator will decide if a hearing is required. If required, hearings will be carried out in a timely fashion (normally within 30 days of the receipt of sufficient information).

The NMFS Regional Administrator will decide the appeal in accordance with the criteria for limited entry permits specified in this FMP and implementing regulations. The NMFS Regional Administrator will consider the information submitted by the appellant, the summary record of the hearing and hearing officer's recommendation (if any) and other relevant information.

3.5.6 Underutilized Species and Limited Entry

CPS include underutilized species (e.g., jack mackerel offshore) that may be the subject of exploratory fishing under the terms of this FMP. In accordance with Council policy, vessels with a catch history during the exploratory phase that were involved in developing the fishery will be given priority if a limited entry system is developed or modified to accommodate fishing for the previously underutilized species.

Vessels already involved in developing a fishery for an underutilized species (i.e., vessels with a catch history or previous experimental fishing permit) should receive highest priority if a limited entry program is implemented for a previously underutilized species.

3.6 Goals and Objectives for Coastal Pelagic Species Finfish Limited Entry

The goals and objectives for the Pacific Coast CPS FMP are presented in section 1.0. The most important of these in the context of limited entry are:

1. Promote efficiency and profitability in the fishery.

2. Achieve optimum yield (OY).

3. Accommodate existing fishery segments.

4. Use resources spent on management of CPS efficiently.

Not all these objectives are complementary. It may be difficult to promote efficiency and profitability in the fishery and at the same time accommodate existing fishery segments. The challenge is to create a limited entry program which strikes a balance between increasing net returns from the fishery, achieving OY, accommodating participation by those with substantial investments in the fishery, and efficiently using management resources.

3.7 Achievement of Goals and Objectives and Need for Additional Measures to Reduce Capacity

The limited entry program adopted under this amendment to the Northern Anchovy FMP will not in itself immediately accomplish the goals and objectives the Council has established for the fishery. It is a first step that may slow or prevent the worsening of conditions which impede the Council from achieving the overall goals and objectives for the fishery. It may be reasonable to expect that the primary objective will be accomplished through this limited entry system (i.e., there will be an effective limit which reduces growth in the active fleet and results in less harvest capacity in the fishery than would have been present in its absence). The effectiveness of this first step will depend on identifying and achieving a fleet size that does not exceed the productive capacity of the CPS finfish stocks.

Establishment of this limited entry system will provide a starting point for any future programs which may be necessary to further reduce harvest capacity. To further reduce harvest capacity, a voluntary buyback program could be considered under section 312(b) of the Magnuson-Stevens Act. Future implementation of a CPS finfish ITQ program may also be considered as a means of further reducing harvest capacity, after the moratorium on IFQs in section 303(d) of the Magnuson-Stevens Act expires.

3.8 Limited Entry Options

There are a number of issues that need to be considered in the design and development of a limited entry program for CPS finfish species. These issues are discussed below, where options are presented and analyzed.

3.8.1 Species

Background

The Pacific coast CPS fishery targets Pacific (chub) mackerel, northern anchovy, jack mackerel, Pacific sardine, and market squid. From 1993 to 1997, there were 640 vessels with Pacific coast landings of CPS finfish. About 40 California round haul vessels based mainly in San Pedro, and to a lesser extent Port Hueneme and Monterey, have routinely accounted for well over 90% of total coastwide landings of mackerel and anchovy. These vessels have also been major participants in the sardine fishery since the moratorium on directed harvest was lifted in 1987. In addition to fishing for CPS finfish, many of these vessels also target market squid, Pacific bonito, bluefin tuna, and Pacific herring.

Options

Option 1 would establish a limited entry program for CPS finfish only. Option 2 would establish a CPS limited entry program for finfish and squid.

The Council chose Option 1.

Analysis

There appears to be excess capacity in the traditional CPS finfish fisheries; and there may be some long term benefits in a limited entry program for finfish only, especially if sardine biomass and harvests continue to increase and exvessel prices rise. However, given the nature of CPS finfish fisheries, growth in the sardine segment of the fishery could be short lived. A limited entry program for CPS finfish now would prevent excessive buildup of harvest capacity directed toward sardine, and future spillover into other finfish species and squid.

Since 1993 there has been a significant increase in the number of vessels landing squid (Figure 3.2-3). Although the squid harvest potential is not well known, there may be room for additional harvest capacity in this segment of the CPS fishery. A federal limited entry program for squid may not be necessary at this time. However, familiarity with open access fisheries indicates this situation could change quickly. California is currently implementing its own vessel licensing program for squid, which might serve as the foundation for a future coastwide squid limited entry program.

There is substantial overlap between fishing activity for squid and finfish. Vessels switch between finfish and squid based on availability, quotas, and markets. Recent increases in squid landings and revenues, participating vessels, and current experience in California suggests that it would be too difficult and controversial to identify and limit the number of vessels harvesting squid to a reasonable number at this time. Limited entry for finfish only would be relatively uncontroversial and could probably be extended, or a separate limited entry program developed, to include squid should the need arise in the future.

Recent data indicate that there are many vessels that specialize in squid, particularly among those vessels that had the highest CPS landings during 1993 to 1996, whereas vessels with large amounts of finfish landings during the period also had substantial landings of squid (Figure 3.3-1). Vessels with smaller CPS landings during the 1993 to 1996 period tended to be even more specialized in either finfish or squid (Figure 3.3-3). This suggests that there is an operational basis for separate finfish and squid limited entry programs, and that a finfish only limited entry program would circumvent excessive effort in the finfish segment of the CPS fishery.

3.8.2 Geographic Scope of Limited Entry for Coastal Pelagic Species

Background

The center of distribution for CPS and principal spawning grounds occur in the southern California bight and off northern Baja, California. CPS, particularly northern anchovy, Pacific (chub) mackerel, and sardine, increase their range when abundant and tend to be found farther offshore and to the north when abundance is high or unusually warm water conditions (El Niño) prevail. When abundance declines, the distribution of CPS stocks shrinks towards the center of their distribution in the southern California bight. The southern California bight is the most important spawning and nursery ground for jack mackerel but less is known about how the distribution of jack mackerel depends on abundance.

Most CPS species experience dramatic changes in abundance, even in the absence of a commercial fishery. However, they rarely fluctuate in the same direction simultaneously (i.e., when one species is low in biomass, this will be offset by another species being high in biomass). Consequently, availability of CPS is expected to vary considerably over time by individual species, but not for CPS finfish as a whole. When abundance is high or El Niño conditions occur, CPS fishing opportunities may exist outside the range of present participants. When abundance is lower and no El Niño conditions exist, CPS fishing opportunities will occur primarily off southern California in areas utilized by present participants. Thus, this option is a means to take advantage of fishing opportunities that might exist on northern fishing grounds in years when biomass is high or El Niño conditions exist. In years when biomass is low and environmental conditions are normal, CPS fishing opportunities are not expected to be available in northern areas and the open access fishery in northern areas would be effectively "turned off."

Options

Option 1 would establish a coastwide CPS finfish fishery limited entry program. Option 2 would establish a CPS finfish limited entry program for the fishery south of 39° N latitude (approximately Point Arena, California). Under Option 2 fishing north of 39° N latitude is not affected by limited entry requirements. CPS finfish fishing in the northern area would be managed as an open access fishery.

The Council chose Option 2.

Analysis

The Council considered a CPS limited entry program for the entire Pacific Coast. Almost all of Pacific Coast CPS harvests are from waters south of 39° N latitude (Pt. Arena, California). During both the heyday of the sardine fishery (1915 through 1945) and recent years, more than 99% of CPS finfish and squid taken coastwide were harvested south of 39° N latitude. CPS fishing in the northern area could be most effectively managed as an open access fishery when abundance is high and distributions extend to northern areas. This would not preclude effective management or future extension of limited entry in the north.

This option would establish a northern boundary to the license limitation fishery for CPS. Fishing north of 39° N latitude (approximately Pt. Arena, California) would not be affected by license limitation requirements, while fishing south of 39° N latitude would require license limitation permits. Vessels from northern California, Oregon, and Washington would probably not qualify for a permit under a coastwide limited entry program. Thus, this option would provide these vessels a means to take advantage of fishing opportunities in northern areas during periods of high biomass without increasing the number of permits in the CPS fishery and without increasing the number of boats and fishing pressure on spawning stocks off southern California during periods of low biomass.

Option 1 would improve economic efficiency by capping or reducing the number of vessels participating in the customary fishery, while allowing for additional vessels when the need arises in the north. There would be less impact on traditional fishing patterns and operations, and more effective use of management resources than under Option 2.

The principal disadvantage of this option is the possibility of overcapitalization and latent harvest capacity in northern areas resulting from increased fishing opportunities for sardine or jack mackerel that only occur periodically. If northern fisheries develop quickly, then it may be difficult to implement an effective limited entry system for northern grounds.

As a practical matter, determination of area fished would be based on landings of CPS finfish landed at ports north and south of 39° N latitude, the closest being Bodega Bay, California. Port of landing is assumed a reasonable proxy for area fished.

3.8.3 Area Specific Endorsements South of 39° N Latitude

Background

The state of California allocates the overall quota for Pacific sardine to participants in the northern and southern areas of the fishery, delimited at San Simeon Point (San Luis Obispo County, California). The state of California may also allocate the overall Pacific (chub) mackerel quota between the northern and southern areas of the fishery delimited at Pt. Sal (Santa Barbara County, California). Under the northern anchovy FMP, the overall reduction quota is allocated between the northern and southern areas of the fishery, delineated at Pt. Buchon (San Luis Obispo County, California). Division of the overall quotas into the northern and southern areas is primarily intended to prevent the larger southern CPS finfish fleet from taking the entire quota before the smaller northern fleet has a chance to fish. Thus, there is recognition of distinct northern and southern fleets in the CPS finfish fishery.

Options

Option 1 would not break the area south of 39° N latitude up into separate areas with separate limited entry permits. Option 2 would distinguish between northern and southern areas in the limited entry fishery south of 39° N latitude. The northern part of the area south of 39° N latitude might extend from Pt. Conception to 39° N latitude, while the southern area might extend from the Mexican border to Pt. Conception. Based on qualifying criteria (likely CPS landings in the northern and southern areas), boats could receive an endorsement to fish in one or both areas. Boats with southern area endorsements, for example, would not be able fish in northern grounds unless they also had a northern area endorsement.

The Council chose Option 1.

Analysis

The likely effect of separate north-south area endorsements would be to reduce the amount of harvest capacity in each area. This could lead to insufficient harvest capacity in the north during periods of intense northern expansions of the fishery, and encourage use of other inputs to increase effort production. The option might have conservation benefits because it would prevent boats with northern area permits from moving south as stock biomass declines and stock boundaries shift to the south (and *vice-versa*). A disadvantage would be additional administrative complexity and costs with separate sets of qualifying criteria and an increased monitoring and enforcement burden for permits in northern and southern areas. Separate north-south endorsements would probably eliminate harvesting options for some vessels and reduce their operational flexibility, which could make them less efficient in their overall harvesting operations.

3.8.4 Exclude Trips with Small Landings from Limited Entry

Background

Small quantities of CPS finfish species are caught by vessels targeting other species or engaged in other fisheries. The CPS finfish limited entry program could distinguish between exempted and nonexempted landings of CPS finfish based on an exempted trip limit and exclude exempted landings from limited entry requirements south of 39° N latitude (i.e., allow exempted landings by boats without a limited entry permit). Exempted trips should not be confused with open access fishing. The Council's intent in adopting an exempted trip limit would be to accommodate small landings of CPS finfish that occur mainly during fishing for other species and for specialized markets. It is not the Council's intention to establish an open access fishery that would operate "beside" the limited entry fishery for CPS finfish.

Options

The following options would define exempted landings at the outset of the CPS FMP. The definition of exempted landings used in limited entry for CPS finfish could be changed later using the socioeconomic framework process without amending the FMP.

Option 1 does not distinguish between exempted and nonexempted landings (all landings of CPS finfish require limited entry permits). Option 2 defines exempted landings as CPS finfish landings less than 0.5 mt per trip (landings less than 0.5 mt per trip are exempted from limited entry requirements). Option 3 defines exempted landings as CPS finfish landings less than one mt per trip (landings less than one mt per trip are exempted from limited entry requirements). Option 4 defines exempted landings as CPS finfish landings less than five mt per trip (landings less than five mt per trip are exempted from limited entry requirements). Option 5 would allow from one mt through five mt of exempted CPS finfish landings per trip (landings from one mt , but no greater than five mt per trip are exempted from limited entry requirements).

The Council chose Option 5, which allows the Council to define the level of exempted landings exempted from limited entry permits between one mt and five mt by regulation. This level will remain in place until the Council changes it by regulatory amendment.

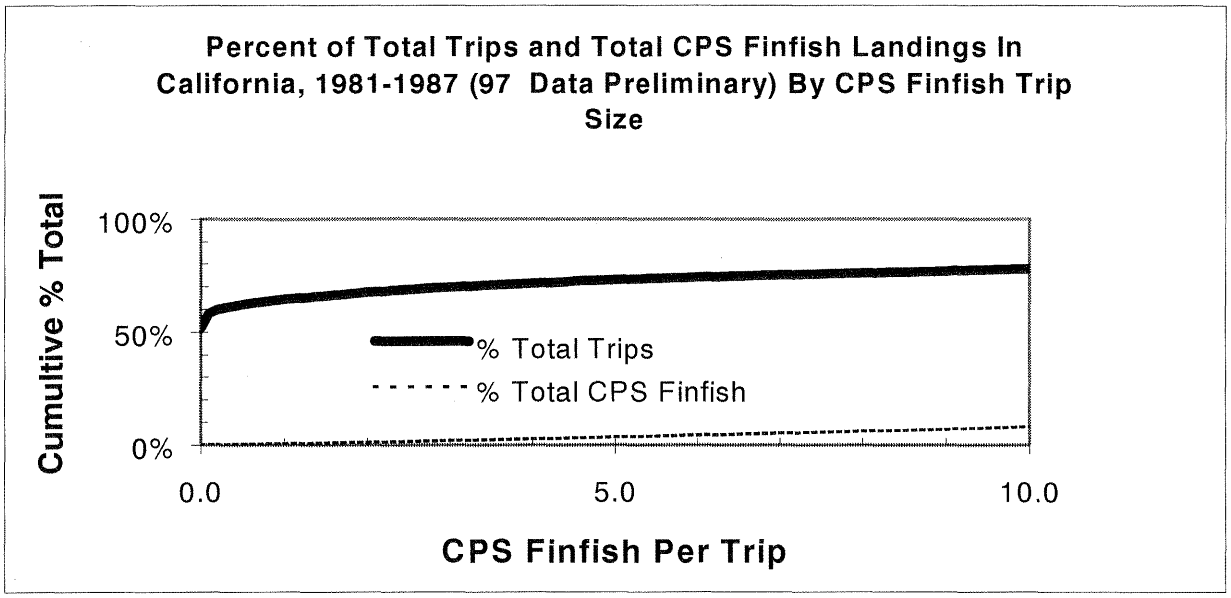

Figure 3.8.4-1

Analysis

Landings data from California for 1981 to 1997 (1997 preliminary) covering all of the more than 115,000 trips landing CPS finfish (by about 2,600 boats) show that many trips land very small amounts of CPS finfish (Figure 3.8.4-1). For example, 74,000 trips (64% of total trips) that individually landed less than 1 mt of CPS finfish contributed less than 4,400 mt (less than 0.5%) of the total CPS finfish catch (about 900,000 mt). There were 71,000 trips (62% of total trips) that individually landed less than 0.5 mt of CPS finfish and contributed less than 2,421 mt (0.3%) of total CPS finfish catch. Similarly, there were about 77,000 trips (67% of total trips) that individually landed less than two mt of CPS finfish and contributed only 9,200 mt (1.1%) of total CPS finfish catch.

Exempting small landings from limited entry requirements may be useful as a way to avoid wasting enforcement and management resources in dealing with catches of negligible size and of little biological or economic importance. A potential disadvantage is increased possibility of misreporting due to vessels that try to avoid exceeding the exempted trip limit.

Exempting small landings from limited entry requirements may reduce discard by vessels outside the limited entry fishery that take some CPS finfish while fishing for other species. However, as described above and in Figure 3.8.4-1, the total amount of fish taken during exempted trips is a small fraction (0.3% to 1.1%) of total CPS finfish landings.

Exempting small landings from limited entry requirements would allow managers to accommodate existing fishing practices. Small landings of CPS finfish currently occur often (62% to 67% of all trips landing any CPS finfish). However, it might be possible for amounts of catch landed to increase significantly if conditions change after limited entry is introduced. For example, if all of the 77,000 trips with less than two mt of CPS finfish during 1981 to1997 had actually landed two mt of CPS finfish, then total landings would have been increased by [(77,000 x 2) - 9,000]/17 = 8,500 mt per year.

It will probably be important to ensure that exempted catches are significantly smaller than typical trip sizes in the limited entry fishery to avoid undermining the value of limited entry permits. Trips as small as five mt of CPS finfish are common by vessels that would likely receive limited entry permits. Thus, two mt per trip (about half of five mt) should probably be viewed as an upper limit on the range of possible definitions for exempted landings in the CPS finfish fishery.

Anecdotal information suggests that there may be a few vessels that fish exclusively for limited, but highly specialized CPS finfish markets (e.g., dead bait). These vessels would typically land small amounts (< three mt) per trip and might fail to qualify for a limited entry permit based on total landings over the window period. If there were no exempted landings allowance, these vessels would have to obtain (purchase) limited entry permits in order to continue operating. With a minimal exempted landings allowance, these vessels would be faced with either having to obtain a limited entry permit, or making more, smaller volume trips. The former alternative would represent increased investment in the fishery, the latter alternative would likely result in less efficient operations. By allowing exempted landings of as much as two mt per trip these vessels could probably continue harvesting CPS finfish for specialized markets without investing in a limited entry permit, or an output induced increase in their operating costs.

3.8.5 Exclude Recreational Fishing from Limited Entry

Background

Pacific (chub) mackerel are the only CPS often taken by recreational anglers although they are not a major target species. During the period 1981 to 1994, the recreational catch of Pacific (chub) mackerel in southern California averaged 1,150 mt per year, and accounted for ten percent to 15% by weight of the total recreational catch. Pacific (chub) mackerel is also caught by anglers in northern California but in very modest amounts. The California recreational catch of Pacific (chub) mackerel is only two percent to three percent by weight of the total combined commercial and recreational catch.

Options

Option 1 would include recreational caught CPS finfish in a limited entry program. Option 2 would exclude recreational anglers from CPS finfish limited entry, although recreational harvest could still be restricted by quotas, area closures or any other type of management measure.

The Council chose Option 2.

Analysis

Recreational fisheries are typically managed to achieve resource conservation goals (outputs). Limited entry is primarily used to achieve economic goals, by controlling harvest capacity (inputs). Overcapitalization, in terms of excess numbers of anglers taking nontarget CPS finfish species, would not seem to be a major issue with respect to CPS management at this time. Moreover, it would be almost impossible to design a limited entry program to specifically reduce or cap the number of anglers, or recreational vessels, taking CPS finfish. In this context, limited entry would have to be applied to the marine angling population in general, which could have significant impacts on overall participation in marine recreational fisheries. The volume of business for firms dependent on marine recreational fishing (e.g., charter vessels) would be affected in this regard. On the other hand, limited entry in recreational fishing may be feasible if overcapitalization is in terms of too many recreational charter vessels.

By excluding recreational catches of CPS finfish from limited entry, no resources would be expended to manage harvesting capacity in the recreational fishery where the total catch of CPS finfish is trivial. This option maintains existing fishery segments and helps avoid discards. A recreational limited entry program would be unlikely to affect quantities of CPS finfish taken by anglers. Therefore, the impact on earnings and profitability in the commercial fishery would be minimal.

3.8.6 Exclude Live Bait Used for Sportfishing and Commercial Fishing from Limited Entry

Background

Live bait is defined as CPS species sold to anglers for live use in recreational or commercial fishing. Relatively small quantities of CPS finfish are harvested for use as live bait. Anchovy is the principal live bait species in southern and central California recreational fisheries. Sardine, mackerel and squid are also harvested for live bait but to a much lesser extent. There is a relatively small, stable fleet of vessels that harvest live bait for the major sportfishing markets in California. In northern California, Oregon, and Washington, CPS finfish are used almost exclusively as dead bait.

CPS species are also harvested for live bait in commercial albacore fisheries. Amounts harvested for this purpose are unknown but presumed to be very small.

Options

Option 1 would not require a limited entry permit for the capture and sale of CPS as live bait used in recreational fisheries or commercial fisheries (live bait landings of CPS are excluded from limited entry requirements). Option 2 would require a limited entry permit to participate in the CPS finfish live bait fishery.

The Council chose Option 1.

Analysis

CPS finfish are important as live bait in valuable recreational fisheries off southern and central California and, to a much lesser extent, off northern California, Oregon, and Washington. About 5,000 mt of CPS finfish (mostly anchovy) are harvested annually by about 18 vessels based in southern California and two vessels based in Oregon and Washington. Unlike other segments of the commercial CPS finfish fishery the live-bait segment is a low volume, high value business.

This segment of the CPS fishery is not currently or likely to become overcapitalized. Potential markets for live bait are thought to be strictly limited by the amount of sportfishing conducted near areas where live bait can be caught. No dramatic increases in demand for CPS as live bait are expecte. Therefore, with or without limited entry, there should not be any significant impacts on gross earnings and profitability in other sectors of the CPS finfish fishery due to less resource being available.

It is likely that most live-bait vessels would have sufficient window period landings of CPS finfish to qualify for a limited entry permit (live bait is not captured in the PacFIN system). However there may be some live-bait vessels that would have insufficient landings for the window period. These vessels might be able to operate under an exempted landing provision, otherwise they would have to acquire a limited entry permit to continue participation in the fishery.

The live bait fishery to supply commercial albacore fisheries is much smaller (approximately four vessels coastwide) and is also limited by the amount of pole and line albacore fishers in the area.

Under this option no resources would be expended to manage harvest capacity in a small and effectively market limited segment of the CPS fishery. In addition, this option would extend current practice and long standing arrangements in the fishery (live bait harvest is not subject to quota management in the existing FMP for northern anchovy). It maintains existing fishery segments, helps avoid discard, and uses resources spent on management of CPS efficiently. The live bait harvest would be subject to harvest control measures as required. For conservation purposes, live bait harvesting could still be managed by quota, allocation, mesh size regulations, or any other potential management measure.

3.8.7 Target Fleet Size

Background

Presently, there is excess harvesting capacity in the CPS finfish fishery which leads to declines in economic efficiency and increases the likelihood of biological overfishing. The limited entry program recommended by the Council would reduce harvesting capacity by eliminating some vessels from the CPS finfish fishery. In this regard there is some optimum or target fleet size which would best strike a balance between increasing net returns from the fishery, accommodating participation by those with substantial investments in the fishery and resource conservation.

Options

The options being considered by the Council identify a target CPS limited entry fleet size based on a proportion of total CPS finfish landings south of 39° N latitude during the window period. Option 1 would result in a limited entry fleet consisting of those vessels accountable for 80% of total CPS finfish landings during the window period. Option 2 would result in a limited entry fleet consisting of those vessels accountable for 85% of total CPS finfish landings during the window period. Option 3 would result in a limited entry fleet consisting of those vessels accountable for 90% of total CPS finfish landings during the window period. Option 4 would result in a limited entry fleet consisting of those vessels accountable for 95% of total CPS finfish landings during the window period. Option 5 would result in a limited entry fleet consisting of those vessels accountable for 99% of total CPS finfish landings during the window period.

The Council chose Option 5. While the Council recognized the optimal fleet size was likely smaller, Option 5 was chosen to be less disruptive in terms of displacing vessels from the fishery and to reduce impacts on existing fishing patterns and, therefore, on fishing communities. An integral part of the Council's choice of Option 5 was the presumed attrition in fleet size that would occur gradually through the nontransferability of permits as described in Section 3.8.14.

Analysis

Vessels with landings of CPS finfish south of 39° N latitude during the 1993 to 1997 window period were ranked in descending order based on their proportion of total window period landings. The number of vessels that would comprise the limited entry fleet at different proportions of total window period landings is shown in Table 3.8.7-1.

TABLE 3.8.7-1. Number of vessels (640) landing CPS finfish by landing area and minimum qualifying tonnage for different size CPS finfish limited entry fleets based on proportion of total **CPS finfish** landings south of 39° N latitude during the **five-year window period**, 1993-1997 (1997 preliminary).

	Total Number of Limited Entry Vessels					
	21	26	31	41	70	640[1]
Principal Landing Area	Number (%) by Principal Landing Area					
Washington	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (<1%)
Oregon	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	9 (<1%)
N. California	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	8 (<1%)
San Francisco	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (3%)	114 (18%)
Monterey/Santa Cruz	1 (5%)	5 (19%)	8 (26%)	10 (25%)	19 (27%)	119 (19%)
San Luis Obispo	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	18 (3%)
Ventura/Santa Barbara	3 (14%)	3 (12%)	3 (10%)	6 (15%)	14 (20%)	75 (12%)
Los Angeles/Orange	17 (81%)	18 (69%)	20 (64%)	25 (62%)	33 (47%)	200 (31%)
San Diego	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	92 (14%)
Other California	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (<1%)
% Total Landings of Finfish, 1993-97 (225,986 mt)[2]	80%	85%	90%	95%	99%	100%
% Total Landings of Finfish + Squid, 1993-97 (523,711 mt)[2]	59%	64%	67%	73%	85%	100%
Minimum Finfish Landings (MT), 1993 to 1997	3,629	2,420	1,818	862	100	.01
Vessels with no Squid landings, 1993 to 1997	0 (0%)	0 (0%)	1 (3%)	1 (3%)	5 (7%)	475 (74%)
Vessels with Squid Landings < 10 (MT), 1993 to 1997	0 (0%)	0 (0%)	1 (3%)	2 (5%)	11 (16%)	526 (82%)
Number of vessels 1997	21 (100%)	25 (96%)	29 (94%)	38 (92%)	60 (86%)	266 (42%)
Whose Last Year 1996	0 (0%)	0 (0%)	0 (0%)	1 (3%)	5 (7%)	99 (15%)
with Finfish and/or 1995	0 (0%)	1 (4%)	1 (3%)	1 (3%)	3 (4%)	79 (12%)
Squid Landings was: 1994	0 (0%)	0 (0%)	1 (3%)	1 (3%)	2 (3%)	100 (16%)
1993	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	96 (15%)

1/ The number of vessels having any CPS finfish landings during the window period, and therefore, accounting for 100% of the CPS finfish landings for the period.

2/ For the 640 vessels with finfish landings during the 1993 to 1997 period.

The proportion of total landings approach to determining fleet size targets those vessels that could be considered to constitute the core CPS finfish fleet, for inclusion in the CPS finfish limited entry program. The vessels included under this criteria would most likely represent the optimum harvest capacity in terms of quantities landed, given recent conditions of resource availability in the CPS finfish fishery. Also, because these different size fleets consist of those vessels accounting for the highest proportions of CPS finfish landings they are probably those with the greatest investments in the fishery, and are likely to be the most efficient harvesters in the fishery. Under Option 4, 41 vessels would make up the CPS finfish limited entry fleet. These 41 vessels are probably capable of harvesting more CPS finfish then they did during the five-year window period. Therefore, there are likely to be increased net benefits from the fishery by reducing the fleet to 41 vessels through limited entry. Under Option 5, 70 vessels would comprise the limited entry fleet. Reducing the fleet to 70 vessels is unlikely to result in the magnitude of efficiency gains that would be realized with a reduction to 41 vessels under Option 4. However, Option 5 would be less disruptive in terms of displacing vessels from the fishery, and in this sense would have less of an impact on existing fishing patterns and, therefore, on fishing communities.

Allowing too many vessels to qualify initially might require a subsequent buyback program to achieve the target fleet. Variability and uncertainties about landings and revenues will make industry sponsored buyback and permit consolidation options difficult. Landings levels and revenues may change dramatically from one year to the next and tend not to remain high for extended periods. This type of uncertainty about revenues makes long term planning and financial decisions difficult.

Low revenues in the CPS finfish fishery also make industry sponsored buyback and permit consolidation difficult. CPS finfish are typically low value per unit weight and support valuable fisheries only when landings levels are high. Low prices and frequency of low biomass conditions make it unlikely that there will be sufficient revenues in the fishery to support a vessel buyback program such as the one under consideration for groundfish. It also seems unlikely that there will be opportunities for single vessels to purchase and combine large numbers of permits from other vessels (as factory trawlers did in the Pacific whiting fishery).

The ability of vessels participating in the CPS finfish fishery to harvest alternate species reduces the need for procedures to reduce the size of the limited entry fleet. CPS finfish purse seine fisheries off California are flexible and accommodate significant changes in catch levels. When CPS finfish are unavailable or market conditions for CPS finfish are not favorable, CPS purse seine vessels tend to switch to alternative species such as market squid, tunas, herring, bonito, sharks, and swordfish.

3.8.8 Limiting Effort Beyond the Number of Vessels

Background

As discussed above, limiting the number of vessels participating in a fishery does not prevent those vessels from expanding their harvest capacity by increasing their fishing power. Therefore, limited entry might be accompanied by additional restrictions on a vessel's ability to improve its fishing power. One way this can be done is by placing endorsements on the limited entry permit with respect to the vessel's length, hold size, engine horsepower, or some other dimension of fishing effort. If, for example, a permit has a length endorsement, it can only be used on a vessel of the endorsed length. This prevents a permitted vessel from being replaced with a vessel of greater length. Thus fishing power is fixed in the dimension of vessel length. Without the length endorsement, a permitted vessel could be replaced with a vessel of greater length.

Options

Option 1 would not limit fleet harvest capacity beyond the number of vessels by restricting vessel length, hold size or some other dimension of fishing effort. Option 2 would limit fleet harvest capacity beyond the number of vessels by restricting vessel length, hold size, or other dimensions of fishing effort.

The Council chose Option 1. However, the Council's decision to limit transfer of limited entry permits after the first year effectively places limits on capacity, since it prevents replacement vessels of greater capacity.

Analysis

Option 1 would place no restrictions on harvest capacity other than the number of vessels. It would enable a permitted vessel to increase its use of other inputs in order to expand effort production and improve fish handling, which could advance economic efficiency and product quality. It would allow the fleet to become modernized to improve the quality and value of landings. In the case of a permit transfer, or vessel replacement, this option would not lock in existing technology. It would allow a second generation vessel of totally different design and effort producing capability.

As discussed below, the trip limit option would likely limit increases in an individual vessel's harvest capacity. Also, the 20 mt median landings per trip due to processor limits would serve to limit increases in an individual vessel's harvest capacity.

Option 2 would prevent harvesting capacity from expanding in other input dimensions, and more likely assure increased efficiency in the fishery. Overcapitalization due to input substitution would frustrate efforts to improve economic performance in the fishery by simply limiting entry. However, without knowledge of the input substitution possibilities, it is difficult to know what other inputs to limit. Moreover, limiting the use of other inputs may stymie innovation and the ability to modernize a vessel to meet changing market conditions.

3.8.9 Window Period

Background

The window period establishes a time frame during which potential permit holders would be qualified based upon total CPS finfish landings. The choice of a window period is somewhat arbitrary but it should be of sufficient length to reflect typical conditions in the fishery, but not too long that it would qualify vessels that have not been recently active in the fishery. Landings of individual CPS finfish species tend to vary by year, so it is desirable that total CPS finfish landings and vessel participation levels would be relatively consistent during the proposed window period.

Options

Option 1 is for a five-year window period (January 1, 1993 through November 5, 1997). Option 2 is for an eight-year window period (January 1, 1990 through November 5, 1997). The end date for both options is a notice date (also known as a control date) already adopted by Council for limited entry in the CPS fishery.

The Council chose Option 1.

Analysis

CPS finfish landings south of 39° N latitude were about 50,000 mt per year during the early 1980s and averaged about 40,000 mt during the proposed window period. Mackerel landings (Pacific [chub] mackerel plus jack mackerel) declined from about 50,000 mt per year during 1985 to 1989 to about 15,000 mt during 1992 and were between 2,000 mt to 20,000 mt per year during the recommended window period. Sardine landings increased throughout the proposed window period to about 30,000 mt per year. Northern anchovy landings have been low (generally less than 5,000 mt per year) since large scale reduction processing ceased in the early 1980s. Market squid landings (which would not be included in the limited entry program for CPS) increased to record levels during the 1993 to 1997 period.

The most significant events in the CPS fishery in the last two decades were (1) the cessation of the anchovy reduction fishery in the early 1980s (due to low prices); (2) a remarkable increase in sardine abundance (roughly 30 % to 40% per year) and landings beginning in the early 1980s; (3) recent decrease in Pacific (chub) mackerel landings (due to decreased biomass); and (4) recent increase in market squid landings. The demise of the anchovy reduction fishery happened more than a decade ago and is likely no longer important in making decisions about a window period for CPS finfish. The increase in sardine landings has largely offset the decrease in anchovy landings. Market squid were the economic mainstay of the fishery during the recommended window period, but squid probably would not be included in the potential limited entry program for CPS finfish. As described above, increased squid landings did not preclude harvest of CPS finfish.

A five-year window period appears long enough to capture vessels that have a history of catching CPS finfish (including vessels that may not participate in the CPS fishery intensively but intermittently) and short enough to make identification of "current" participants meaningful. Most importantly, a five year window period provides a wide range of flexibility in making decisions about the optimum size of a limited entry fleet. Depending on landings criteria, the number of vessels that get limited entry permits could range from zero to at most 811. Decisions about minimum landings requirements will likely be more important than decisions about the window period in potentially establishing a window period for limited entry in the CPS finfish fishery.

An eight-year window period might be necessary to identify and issue limited entry permits to vessels that were part of the CPS finfish fishery but had quit fishing for finfish to harvest squid exclusively prior to 1993. Fish ticket data show that this hypothetical class of vessels is very small or does not exist (Tables 3.8.7-1 and 3.8.9-1). The data show that ten vessels with principal landings areas in Los Angeles and Orange counties during 1990 to 1992 stopped catching finfish and squid altogether and did not switch to squid exclusively (Table 3.8.9-1). It is true that squid landings began to increase in 1993 (Table 3.8.9-2) and that many vessels increased their squid catches. However, increased squid catches were not at the expense or exclusion of finfish because squid fishing is seasonal and there were markets and finfish available along the entire central and southern California coast during each year of 1993 to 1997. Vessels in the CPS finfish fishery simply caught squid in addition to finfish, rather than instead of finfish. The eight-year window period option would likely give permits to too many vessels that have been inactive (no finfish, no squid) in the CPS fishery for periods of five years to eight years.

Compared to an eight-year window period, a five-year window period would result in a smaller fleet under any proportion of total landings criteria. Therefore, there are likely to be greater efficiency gains by using a five-year rather than an eight-year window period.

Additional information about the vessels switching from CPS finfish to squid and back again can be gleaned from examining the catch history of vessels in the CPS fishery on a boat-by-boat and year-by-year basis (Table 3.8.9-3). There is little evidence that vessels left the CPS finfish fishery to catch squid during 1990 to 1997.

TABLE 3.8.9-1. Number of vessels (1,103) landing CPS finfish by landing area and minimum qualifying tonnage for different size CPS finfish limited entry fleets based on **CPS finfish** landings south of 39° N latitude during the **eight-year window period**, 1990 to 1997 (1997 preliminary).

		Total Number of Limited Entry Vessels					
		23	28	35	48	85	1,103[1]
Principal Landing Area		Number (%) by Principal Landing Area					
Washington		0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	6 (<1%)
Oregon		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	46 (4%)
N. California		0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	24 (2%)
San Francisco		0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (5%)	250 (23%)
Monterey/Santa Cruz		1 (5%)	3 (11%)	6 (17%)	9 (19%)	19 (22%)	206 (19%)
San Luis Obispo		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	66 (6%)
Ventura/Santa Barbara		2 (8%)	3 (11%)	4 (11%)	7 (15%)	14 (16%)	113 (10%)
Los Angeles/Orange		20 (87%)	22 (78%)	25 (72%)	32 (66%)	43 (51%)	260 (24%)
San Diego		0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (4%)	131 (12%)
Other California		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (<1%)
% Total Landings of Finfish, 1990 to 1997 (358,331 mt)[2]		80%	85%	90%	95%	99%	100%
% Total Landings of Finfish + Squid, 1990 to 1997 (735,746 mt)[2]		59%	64%	71%	77%	89%	100%
Minimum Finfish Landings (MT), 1990 to 1997		4,923	3,724	1,956	888	141	.01
Vessels with no Squid landings, 1990 to 1997		0 (0%)	0 (0%)	1 (3%)	1 (2%)	8 (9%)	890 (81%)
Vessels with Squid Landings < 10 (MT), 1990 to 1997		0 (0%)	0 (0%)	1 (3%)	2 (4%)	17 (20%)	975 (88%)
Number of vessels	1997	21 (92%)	26 (92%)	31 (88%)	40 (84%)	64 (76%)	271 (25%)
Whose Last Year	1996	0 (0%)	0 (0%)	0 (0%)	2 (4%)	6 (7%)	102 (9%)
with Finfish and/or	1995	1 (4%)	1 (4%)	1 (3%)	1 (2%)	2 (2%)	84 (8%)
Squid Landings was:	1994	1 (4%)	1 (4%)	1 (3%)	1 (2%)	2 (2%)	103 (9%)
	1993	0 (0%)	0 (0%)	0 (0%)	1 (2%)	1 (1%)	108 (10%)
	1992	0 (0%)	0 (0%)	1 (3%)	2 (4%)	5 (6%)	198 (18%)
	1991	0 (0%)	0 (0%)	1 (3%)	1 (2%)	3 (4%)	79 (7%)
	1990	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2%)	158 (14%)

1/ The number of vessels having any CPS finfish landings during the window period, and therefore, accounting for 100% of the CPS finfish landings for the period.
2/ For the 1,103 vessels with finfish landings during the 1990 to 1997 period.

TABLE 3.8.9-2. Number of vessels that landed CPS finfish or market squid or both, and anchovy, mackerel, sardine, and squid landings south of 39° N latitude, 1985 to 1997.

Year	Finfish Only Vessels	Squid Only Vessels	Finfish + Squid Only Vessels	Total Vessels	Anchovy Landings	Mackerel Landings	Sardine Landings	Total Finfish Landings	Squid Landings
1985	346	86	81	513	1638	37772	6	39415	11072
1986	270	76	71	417	1557	48809	388	50755	21294
1987	383	73	63	519	1467	46725	439	48632	19988
1988	387	77	68	532	1518	50864	1188	53571	37234
1989	473	60	57	590	2511	47713	837	51061	40937
1990	549	42	67	658	3259	40092	1664	45015	28449
1991	268	33	57	358	4068	32019	7587	43675	37723
1992	462	52	47	561	1166	19045	17954	38164	13117
1993	263	44	69	376	2003	12129	15347	29478	42894
1994	237	63	73	373	1859	10293	11644	23796	56002
1995	201	66	85	352	2016	8823	40256	51094	70375
1996	200	75	106	381	4505	9730	32553	46788	80430
1997	209	106	114	429	5778	20140	42816	68734	71046

TABLE 3.8.9-3 Number of CPS finfish and market squid trips (trips with finfish > 0 or squid > 0) on a vessel-by-vessel (one vessel per row) and year-by-year (one year per column) basis. The data shown are for 85 vessels that accounted for 99% of finfish landings under during 1990 to 1997 and all vessels in the table landed at least 141 mt of CPS finfish during 1990 to 1997. Vessels are listed in random order and not ranked by landings. For example, the vessel in the first row of the table landed CPS finfish during 1990 to 1992 and squid during 1990 but landed neither finfish nor squid during later years.

		YEAR								
VESSEL	LANDINGS	1990	1991	1992	1993	1994	1995	1996	1997	Grand Total
1	FINFISH	1	1	1	0	0	0	0	0	3
	SQUID	1	0	0	0	0	0	0	0	1
2	FINFISH	1	1	1	1	0	1	1	0	6
	SQUID	1	1	1	1	1	1	1	1	8
3	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	0	1	1	1	1	1	7
4	FINFISH	1	1	1	0	1	1	1	1	7
	SQUID	1	0	0	0	1	1	1	1	5
5	FINFISH	1	1	1	1	1	0	1	1	7
	SQUID	1	1	1	1	1	1	1	1	8
6	FINFISH	0	0	0	0	0	0	0	1	1
	SQUID	0	0	0	0	0	0	0	0	0
7	FINFISH	1	1	1	1	1	1	0	0	6
	SQUID	1	1	0	1	1	0	0	0	4
8	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
9	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
10	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	0	0	0	1	1	1	1	1	5
11	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	0	0	1	1	1	1	6
12	FINFISH	1	1	1	1	1	0	0	0	5
	SQUID	1	0	1	1	1	0	0	0	4
13	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	0	1	1	1	1	1	7
14	FINFISH	1	1	0	1	1	1	1	0	6
	SQUID	1	1	1	1	1	1	1	1	8
15	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
16	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	0	0	1	1	1	1	1	6
17	FINFISH	1	1	1	1	0	0	1	1	6
	SQUID	0	0	0	0	0	0	1	0	1
18	FINFISH	1	1	1	1	1	1	0	1	7
	SQUID	1	1	1	1	1	1	0	0	6
19	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
20	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
21	FINFISH	1	0	1	0	0	0	0	0	2
	SQUID	1	0	1	0	0	0	0	0	2
22	FINFISH	1	1	0	0	0	0	0	0	2
	SQUID	1	1	0	0	0	0	0	0	2
23	FINFISH	0	0	0	0	0	0	0	1	1
	SQUID	0	0	0	0	0	0	1	1	2

24	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	0	0	0	1	0	0	0	0	1
25	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
26	FINFISH	1	1	0	1	0	1	0	0	4
	SQUID	1	1	1	1	1	1	1	1	8
27	FINFISH	1	0	0	0	0	0	0	0	1
	SQUID	0	0	0	0	0	0	0	0	0
28	FINFISH	0	0	0	0	0	0	0	1	1
	SQUID	0	0	0	0	0	0	0	0	0
29	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	0	1	0	1	1	1	1	1	6
30	FINFISH	0	0	0	0	0	0	0	1	1
	SQUID	0	0	0	0	0	0	0	1	1
31	FINFISH	1	1	1	1	1	1	1	0	7
	SQUID	1	1	1	1	1	1	1	0	7
32	FINFISH	1	1	0	1	1	1	1	1	7
	SQUID	0	0	0	0	0	1	0	0	1
33	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
34	FINFISH	1	1	1	1	1	1	1	0	7
	SQUID	0	0	1	0	0	0	0	0	1
35	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	0	0	0	1	0	1	4
36	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
37	FINFISH	0	0	0	0	1	1	1	1	4
	SQUID	1	1	1	1	1	1	1	1	8
38	FINFISH	1	1	0	0	0	0	0	0	2
	SQUID	1	1	0	0	0	0	0	0	2
39	FINFISH	0	0	0	0	0	1	0	1	2
	SQUID	0	0	0	0	1	1	1	1	4
40	FINFISH	0	0	0	0	0	0	1	1	2
	SQUID	0	0	0	0	0	0	1	1	2
41	FINFISH	0	1	0	0	0	0	0	0	1
	SQUID	0	0	0	0	0	0	0	0	0
42	FINFISH	0	0	0	0	0	0	1	1	2
	SQUID	0	0	0	0	0	0	0	0	0
43	FINFISH	0	1	1	0	0	1	1	1	5
	SQUID	0	1	1	0	0	1	1	1	5
44	FINFISH	1	1	0	0	1	0	1	1	5
	SQUID	1	1	1	1	1	1	1	1	8
45	FINFISH	1	1	1	1	1	1	1	0	7
	SQUID	0	0	0	1	0	1	0	0	2
46	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	0	1	1	1	1	1	7
47	FINFISH	1	1	1	0	0	1	1	1	6
	SQUID	1	1	1	1	1	1	1	1	8
48	FINFISH	1	0	0	0	0	0	0	0	1
	SQUID	1	0	0	0	0	0	0	0	1
49	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
50	FINFISH	1	1	1	1	1	1	1	0	7
	SQUID	1	1	0	0	0	1	1	0	4

51	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	0	1	1	1	1	1	1	1	7
52	FINFISH	1	1	0	0	0	1	1	0	4
	SQUID	1	1	1	0	0	1	1	1	6
53	FINFISH	1	0	0	0	0	1	0	1	3
	SQUID	1	1	1	1	1	1	1	1	8
54	FINFISH	1	1	0	1	1	1	0	0	5
	SQUID	1	1	1	1	1	1	1	1	8
55	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
56	FINFISH	0	1	1	0	0	0	0	0	2
	SQUID	0	1	1	0	0	0	0	0	2
57	FINFISH	1	0	0	1	1	1	1	1	6
	SQUID	0	0	0	0	0	1	1	1	3
58	FINFISH	0	0	0	1	1	0	0	0	2
	SQUID	0	0	0	0	1	0	0	0	1
59	FINFISH	0	1	0	0	0	1	1	1	4
	SQUID	1	1	1	1	1	1	1	1	8
60	FINFISH	0	0	0	0	0	0	1	1	2
	SQUID	0	0	0	1	1	1	1	1	5
61	FINFISH	0	1	1	1	1	1	0	0	5
	SQUID	1	1	0	1	1	0	0	0	4
62	FINFISH	1	0	0	0	0	0	1	1	3
	SQUID	1	0	0	0	0	1	1	1	4
63	FINFISH	0	0	0	0	0	0	0	1	1
	SQUID	0	0	0	0	0	0	0	1	1
64	FINFISH	0	0	0	0	0	1	1	1	3
	SQUID	0	0	0	0	0	1	1	1	3
65	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	0	1	1	1	1	1	7
66	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	0	1	1	1	1	1	7
67	FINFISH	0	0	0	1	1	1	1	1	5
	SQUID	1	0	0	1	1	1	1	1	6
68	FINFISH	0	0	0	0	0	1	1	0	2
	SQUID	0	0	0	0	0	1	1	1	3
69	FINFISH	1	1	1	1	0	0	0	0	4
	SQUID	1	1	0	0	0	0	0	0	2
70	FINFISH	1	0	0	0	0	0	0	0	1
	SQUID	0	0	0	0	0	0	0	1	1
71	FINFISH	0	0	0	0	0	0	1	1	2
	SQUID	0	0	0	0	0	0	1	1	2
72	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	0	1	1	1	1	1	7
73	FINFISH	1	1	1	0	0	0	0	0	3
	SQUID	0	1	0	0	0	0	0	0	1
74	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	0	0	0	0	0	0	1	0	1
75	FINFISH	1	1	1	1	0	1	1	1	7
	SQUID	1	1	1	1	1	1	1	1	8
76	FINFISH	0	1	1	1	0	1	1	1	6
	SQUID	1	1	1	1	1	1	1	1	8
77	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8

78	FINFISH	1	1	1	0	0	0	1	0	4
	SQUID	0	0	0	0	0	0	0	0	0
79	FINFISH	1	1	1	0	0	0	0	0	3
	SQUID	0	1	1	0	0	0	0	0	2
80	FINFISH	1	1	0	1	0	0	1	1	5
	SQUID	1	1	1	1	1	1	1	1	8
81	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	1	1	1	1	1	1	8
82	FINFISH	1	0	0	0	0	0	1	1	3
	SQUID	0	0	0	0	0	0	1	1	2
83	FINFISH	0	0	0	0	0	0	1	0	1
	SQUID	0	1	0	0	0	0	1	0	2
84	FINFISH	0	0	0	0	0	0	0	1	1
	SQUID	0	0	0	0	0	0	0	0	0
85	FINFISH	1	1	1	1	1	1	1	1	8
	SQUID	1	1	0	1	1	1	1	1	7

3.8.10 Landings Qualifying Criteria

Background

Vessels would qualify for a CPS finfish limited entry permit based on some minimum quantity of CPS finfish landings, or CPS finfish and squid landings, or CPS finfish landings and/or squid landings during the five-year window period. Landings criteria would be based on total CPS finfish landings of all species since availability of CPS finfish is expected to vary considerably over time by individual species, but not for CPS finfish as a whole. Landings qualifying criteria apply only to the five-year window period (January 1, 1993 through November 5, 1997) since squid landings are not being considered in the context of a eight-year window period (January 1, 1990 through November 5, 1997).

Options

Option 1 would identify current participants and issue limited entry permits for CPS finfish based on CPS finfish (northern anchovy, Pacific sardine, Pacific [chub] mackerel and jack mackerel but no market squid) landings south of 39° N latitude (Bodega Bay and ports south) during the five-year window period. Option 2 would identify current participants and issue limited entry permits for CPS finfish based on CPS finfish plus market squid landings south of 39° N latitude with the restriction that CPS finfish landings during the five-year window period must be greater than zero. Option 3 would identify current participants and allocate limited entry permits for CPS finfish based on CPS finfish plus market squid landings south of 39° N latitude during the five-year window period, and would allow vessels without finfish landings to qualify.

The Council chose Option 1.

Analysis

The alternative of using finfish and squid landings (with the additional requirement that CPS finfish catch is greater than zero) increases the number of permits beyond the number necessary to catch finfish at the 99% cumulative harvest level, because finfish limited entry permits would be issued to squid specialists with very little finfish landings. In addition, it appears that some vessels that consistently catch modest amounts of CPS finfish with little or no squid landings might be squeezed out of the limited entry fishery for finfish by squid specialists with little or no finfish landings but large quantities of squid landings. If finfish or squid are used (i.e., finfish or squid landings could be zero), the number of permits is further increased, with permits being issued to vessels without finfish landings at the expense of vessels with finfish landings.

Numbers and other information about permits issued based on CPS finfish only and CPS finfish plus squid landings can be compared in Tables 3.8.7-1, 3.8.10-1 and 3.8.10-2. The Council has endorsed the idea of determining the size of the CPS limited entry fleet for finfish based on the number of vessels landing either 95% or 99% of total CPS finfish landings during the window period. Numbers of limited entry vessels based on finfish landings only (41 vessels for 95% and 70 vessels for 99% of total finfish catch, Table 3.8.7-1) are substantially smaller than numbers of vessels based on finfish plus squid landings (62 vessels for 95% and 89 vessels for 99% of total CPS finfish catch, Table 3.8.10-1). The differences are 21 vessels (for 95% of total finfish catch) and 19 vessels (for 99% of total finfish catch) or 51% and 27% of the recommended limited entry fleet. Most of the additional vessels operate primarily around Ventura/Santa Barbara counties where the squid fishery is intense and finfish markets are limited. Most are recent entrants to the CPS fishery attracted by strong markets and high prices for market squid. As described elsewhere, the CPS fishery for finfish is already overcapitalized and there is more than enough current harvest capacity to take quantities of CPS finfish likely to become available. There appear to be no benefits to increasing the size of the CPS finfish limited entry fleet by including squid in landings criteria used to qualify initial limited entry permits.

Using squid and CPS finfish landings to initially allocate CPS limited entry permits for finfish roughly doubles the amount of landings necessary to qualify for a CPS limited entry permit. Higher landings criteria with squid may exclude some vessels that harvest CPS finfish consistently. For example, if the CPS limited entry fleet were identified as vessels required to take 99% of CPS finfish landings during the window period, then either 70 vessels (based on finfish only, Table 3.8.7-1) or 89 vessels (based on finfish plus squid, Table 3.8.10-1) would receive permits. The qualifying criteria would be either 100 mt of finfish or 261 mt of finfish plus squid. Thus, at least two vessels operating in the San Francisco area and one boat operating in the San Diego county area, that would get permits based on CPS finfish only, would be excluded if permits were allocated based on CPS finfish plus squid.

Using CPS finfish plus squid landings for qualifying criteria without the requirement that CPS finfish landings be greater than zero would increase the number of vessels that qualify at the 95% and 99% proportion of total landing level by 75% and 44 % respectively from the case based on CPS finfish landings only during the five-year window period (Table 3.8.10-2).

The more vessels receiving limited entry permits, the greater the competition for the available quota. As competition intensifies, the greater the incentive for vessels to increase their harvesting capacity or fishing power in different input dimensions. This compromises the efficiency objective by encouraging excess harvesting capacity.

TABLE 3.8.10-1. Number of vessels (640) landing CPS finfish by landing area and minimum qualifying tonnage for different size CPS finfish limited entry fleets based on **CPS finfish (finfish > 0 mt) plus squid** landings south of 39° N latitude for the **five-year** window period, 1993 to 1997 (1997 preliminary).

		Total Number of Limited Entry Vessels					
		36	42	49	62	89	640[1]
Prinicipal Landing Area		Number (%) by Principal Landing Area					
Washington		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (<1%)
Oregon		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	9 (<1%)
N. California		0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	8 (<1%)
San Francisco		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	114 (18%)
Monterey/SantaCruz		5 (14%)	7 (17%)	8 (16%)	11 (18%)	19 (21%)	119 (19%)
San Luis Obispo		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	18 (3%)
Ventura/Santa Barbara		15 (42%)	18 (25%)	21 (43%)	26 (42%)	34 (38%)	75 (12%)
Los Angeles/Orange		16 (44%)	17 (70%)	20 (41%)	25 (40%)	35 (39%)	200 (31%)
San Diego		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	92 (14%)
Other California		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (<1%)
% Total Landings of Finfish + Squid, 1993 to 1997 (523,711 mt)[2]		80%	85%	90%	95%	99%	100%
% Total Landings of Finfish, 1993 to 1997 (225,986 mt)[2]		85%	88%	91%	95%	99%	100%
Minimum Finfish + Squid Landings (MT), 1993 to 1997		5,007	4,039	3,053	1,588	261	.01
Vessels with no Squid landings, 1993 to 1097		0 (0%)	0 (0%)	0 (0%)	1 (2%)	2 (2%)	475 (74%)
Vessels with Squid Landings < 10 (MT), 1993 to 1997		0 (0%)	0 (0%)	0 (0%)	1 (2%)	5 (6%)	526 (82%)
Vessels with Finfish Landings < 10 (MT), 1993 to 1997		3 (8%)	4 (10%)	5 (10%)	7 (11%)	12 (14%)	505 (79%)
Number of vessels	1997	36 (100%)	42 (100%)	47 (96%)	58 (93%)	77 (87%)	266 (42%)
Whose Last Year	1996	0 (0%)	0 (0%)	1 (2%)	2 (3%)	8 (9%)	99 (15%)
with Finfish and/or	1995	0 (0%)	0 (0%)	1 (2%)	1 (2%)	2 (2%)	79 (12%)
Squid Landings was:	1994	0 (0%)	0 (0%)	0 (0%)	1 (2%)	2 (2%)	100 (16%)
	1993	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	96 (15%)

1/ The number of vessels having any CPS finfish landings during the window period, and therefore, accounting for 100% of the CPS finfish landings for the period.
2/ For the 640 vessels with finfish landings during the 1993 to 1997 period.

TABLE 3.8.10-2. Number of vessels (811) landing CPS finfish or squid **(finfish or squid landings can be 0)** by landing area and minimum qualifying tonnage for different size CPS finfish limited entry fleets based on **CPS finfish plus squid** landings south of 39° N latitude for the **five-year window period** 1993 to 1997 (1997 preliminary).

		Total Number of Limited Entry Vessels					
		40	47	56	72	101	811[1]
Principal Landing Area		Number (%) by Principal Landing Area					
Washington		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	6 (<1%)
Oregon		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	11 (1%)
N. California		0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	13 (1%)
San Francisco		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	148 (18%)
Monterey/SantaCruz		7 (18%)	8 (17%)	8 (14%)	12 (17%)	19 (19%)	142 (18%)
San Luis Obispo		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	38 (5%)
Ventura/Santa Barbara		16 (40%)	20 (43%)	25 (45%)	35 (48%)	47 (47%)	121 (15%)
Los Angeles/Orange		17 (42%)	19 (40%)	23 (41%)	25 (35%)	34 (33%)	235 (29%)
San Diego		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	96 (12%)
Other California		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (<1%)
% Total Landings of Finfish + Squid, 1993 to 1997 (546,158 mt)[2]		80%	85%	90%	95%	99%	100%
% Total Landings of Finfish, 1993 to 1997 (225,986 mt)[2]		88%	90%	92%	96%	98%	100%
Minimum Finfish + Squid Landings (MT), 1993 to 1997		4,617	3,400	2,353	1,387	279	.01
Vessels with no Squid landings, 1993 to 1997		0 (0%)	0 (0%)	0 (0%)	1 (2%)	2 (2%)	541 (67%)
Vessels with Squid Landings < 10 (MT), 1993 to 1997		0 (0%)	0 (0%)	0 (0%)	1 (2%)	4 (6%)	640 (79%)
Vessels with no Finfish landings, 1993 to 1997		0 (0%)	0 (0%)	2 (4%)	7 (10%)	14 (14%)	171 (21%)
Vessels with Finfish Landings < 10 (MT), 1993 to 1997		3 (8%)	5 (10%)	10 (18%)	22 (30%)	26 (26%)	676 (83%)
Number of vessels	1997	40 (100%)	45 (96%)	52 (93%)	66 (92%)	86 (85%)	314 (39%)
Whose Last Year	1996	0 (0%)	1 (2%)	2 (3%)	3 (4%)	10 (10%)	134 (17%)
with Finfish and/or	1995	0 (0%)	1 (2%)	2 (3%)	2 (3%)	3 (3%)	106 (13%)
Squid Landings was:	1994	0 (0%)	0 (0%)	0 (0%)	1 (1%)	2 (2%)	129 (16%)
	1993	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	128 (16%)

1/ The number of vessels having any CPS finfish landings during the window period, and therefore accounting for 100% of the CPS finfish landings for the period.

2/ For the 811 vessels with finfish and/or squid landings during the 1993 to 1997 period.

3.8.11 Trip Limits

Background

An alternative to restrictions on inputs in limiting harvest capacity in the CPS finfish fishery beyond the number of vessels is trip limits, which are restrictions on outputs. Trip limits would guard against rapid expansion in the harvest capacity in the CPS fishery by transfer of CPS limited entry permits to much larger vessels (e.g., factory trawlers). Transfer of permits to much larger vessels could further expand capacity in the CPS fishery beyond the productive capacity of fully utilized CPS stocks, induce economic inefficiency, and preclude fishing by current participants. However, trip limits would not prevent vessels in need of modernization or replacement from doing so.

In this context, a trip could be defined as any activity (e.g., catching, landing, transporting or delivering) by a vessel that harvests CPS finfish with or without a limited entry permit; (i.e., a possession limit that applies to harvesting operations only). Also in this context, a trip limit should not be confused with trip limits used in other fisheries (e.g., groundfish) to lengthen the season without exceeding harvest guidelines or to manage bycatch.

Options

There are four options. Option 1 is a trip limit no larger than 125 mt; Option 2 is a trip limit no larger than 100 mt; Option 3 is a trip limit no larger than 75 mt; and Option 4 is no limit on the amount of CPS finfish carried, landed, transported or delivered. The trip limit would be defined in round weight equivalent units so that, for example, a vessel could not carry CPS products weighing less than 75 mt if they were derived from more than 75 mt of CPS in a fresh, round weight condition. There is no limit to the number of trips that might be made in one day; the time at which a trip starts and stops is not relevant. Trip limits would apply to management of the CPS fishery at the outset of limited entry because the trip limit could be changed later under the FMP framework process.

The Council chose option is Option 1.

Analysis

The Council has already decided not to place restrictions on permits and permit transfers based on vessel size, hold capacity, etc. at this time (see Section 3.8.8). A trip limit can be viewed as an output, rather than an input (e.g., vessel length) based approach to placing some limits on expansion of the limited entry fishery for CPS finfish. In lieu of more complex options involving hold capacity or vessel length limits, the trip limit approach is a low cost, objective, and easy means of discouraging growth in harvest capacity. In this situation, trip limits would inhibit inefficiencies related to harvesting capacity expanding along other input dimensions. However, to the extent vessels make more lower volume trips under a trip limit approach, there may be inefficiencies associated with suboptimal utilization of a vessel's harvest capacity.

Table 3.8.11-1 (below) shows the number of CPS finfish and squid trips, and amounts of CPS and squid landed, for trips in five trip size categories: one mt to 25 mt, 26 mt to 50 mt, 50 mt to 75 mt, 75 mt to 100 mt, and 100 plus mt per trip. The data shown are for landings during 1997 by 41 vessels with total CPS finfish landings that accounted for 95% of the total CPS finfish landings during 1993 to 1997. The 41 vessels represent the CPS limited entry fleet under the 95% of total landings, for the five-year window period criteria. For all species and species groups, the data show significant numbers of trips and landings in the one mt to 25 mt, 25 mt to 50 mt, and 51 mt to 75 mt trip sizes. In contrast, the number of trips and amounts of landings in trips of 75 to 100 and 100 plus mt per trip are very small. Thus, it appears that a trip limit of either 75 mt or 100 mt would have little impact on current operation in the fishery. However, a trip limit set too low might hinder renovation and the purchase and construction of new vessels. If more vessels were included in Table 3.8.11-1, then the number and fraction of trips in the small trip (zero mt to 25 mt) categories would probably increase but tons and fraction of tons landed would remain about the same because trips by vessels other than the 41 vessels in the table land small amounts of CPS.

Trip limits would not preclude development of offshore fisheries for underutilized species such as jack mackerel, because experimental and exploratory fishing is allowed (see above). Another advantage is that development of fisheries for underutilized species (e.g., jack mackerel) could be undertaken in a controlled way and with a reduced likelihood for allocation of harvest guidelines for fully utilized stocks (such as sardine and Pacific [chub] mackerel) between onshore and offshore sectors. Because a trip limit would be a possession limit that applies to harvesting operations only it would not effect motherships, that process but do not catch CPS finfish.

The purpose of these trip limits is to prevent sudden and large increases in the capacity of the CPS limited entry fishery. Unlike in other fisheries, they are not intended to lengthen the season or to manage bycatch. More restrictive trip limits could be implanted in the CPS fishery if required for similar purposes although this is unlikely because year-round fishing operations are not a goal of the CPS FMP. CPS fisheries are naturally seasonal and bycatch is seldom a problem. In addition, incidental catch is commonly managed in CPS fisheries using incidental catch allowances specified as an allowable fraction of total landings.

TABLE 3.8.11-1. Amounts of CPS finfish and squid landed per trip in California during 1997 by 41 vessels. The 41 vessels used to form the table landed had the highest CPS finfish landings and, as a group, accounted for 95% of total CPS finfish landings during 1993 to 1997.

SPECIES	TRIPS	%TOTAL TRIPS	LANDINGS (MT)	%TOTAL LANDINGS
ANCHOVY				
1-25 mt	161	65%	1,604	31%
26-50 mt	67	27%	2,442	47%
51-75 mt	20	8%	1,193	23%
All	248	100%	5,239	100%
SARDINE				
1-25 mt	519	40%	6,542	16%
26-50 mt	574	44%	20,872	52%
51-75 mt	173	13%	10,138	25%
75-100 mt	26	2%	2,088	5%
>100 mt	3	0%	314	1%
All	1,295	100%	39,954	100%
MACKEREL				
1-25 mt	528	63%	4,288	24%
26-50 mt	236	28%	8,547	48%
51-75 mt	69	8%	4,144	23%
75-100 mt	8	1%	645	4%
>100 mt	2	0%	207	1%
All	843	100%	17,830	100%
SQUID				
1-25 mt	607	49%	6,522	20%
26-50 mt	484	39%	16,846	52%
51-75 mt	124	10%	7,417	23%
75-100 mt	10	1%	801	2%
>100 mt	5	0%	823	3%
All	1,230	100%	32,409	100%
CPS FINFISH				
1-25 mt	1,208	51%	12,434	20%
26-50 mt	877	37%	31,861	51%
51-75 mt	262	11%	15,475	25%
75-100 mt	34	1%	2,733	4%
>100 mt	5	0%	520	1%
All	2,386	100%	63,023	100%
CPS FINFISH+SQUID				
1-25 mt	1,815	50%	18,956	20%
26-50 mt	1,361	38%	48,707	51%
51-75 mt	386	11%	22,892	24%
75-100 mt	44	1%	3,534	4%
>100 mt	10	0%	1,344	1%
All	3,616	100%	95,433	100%

3.8.12 Second Generation Permit Owners

Background

Second generation permit holders are people that obtain CPS limited entry permits from their original holders (i.e., persons or corporations that receive them initially based on CPS finfish landings during the window period). The purpose of this option would be to maintain and increase the percentage of owner-operators and reduce the level of permit ownership in the CPS limited entry fishery by corporations and partners.

Options

Option 1 would place no restrictions on "second generation" permit holders. Option 2 would require second generation permit holders to be on board CPS vessels when CPS finfish are landed, and to sign the resulting fish ticket (provisions would be made for skippers hired by second generation permit holders in the case of an emergency).

The Council chose Option 1.

Analysis

These options were developed assuming a limited entry program with unrestricted transferability of permits, as evidenced in the following analysis. However, since the Council chose a limited entry program that limits transfer of permits after the first year of the limited entry program, the options relating to second generation permit holders would only be applicable during the first year of the program.

Option 1 would allow the most flexibility in the transfer and use of limited entry permits. Unconstrained use by second generation permit holders would provide the greatest potential for efficiency gains in the fishery.

The scope of Option 2 is very broad because it would prevent or hinder (1) leasing of CPS permits by second generation permit owners; (2) use of hired skippers by second generation permit owners; (3) purchase of second generation permits by corporations and partnerships; (4) ownership of more than one permit; and (5) vertical integration in the fishery (corporations owning both vessels and processing equipment). The option would not affect use of permits by first generation owners (e.g., hired skippers could be employed) except that permit sales and changes to owners of corporations and partnerships would be restricted. Some provisions would be made for skippers hired by second generation permit holders in the case of an emergency.

Option 2 would probably reduce the value of a CPS limited entry permit as an asset or collateral, because transferability would be restricted. CPS limited entry permits would still have some value as a collateral, however, because a bank or corporation could be a second generation owner but would not be able to use the permit. In other words, a bank or corporation could own but not use a CPS limited entry permit.

During the period of transition to full ownership of limited entry permits by owner-operators, there would be two classes of permit holders: (1) initial recipients of CPS limited entry permits who could own multiple permits operated by hired skippers; and (2) second generation owners who purchased a permit from initial recipients and who must be on board a vessel at all times while fishing for CPS finfish (except as allowed under emergency conditions).

The definition of a "change" in the identity of a corporation or partnership may be important because many CPS vessels are owned by partners and some are owned by corporations. The following definition and language (originally developed for a West Coast ITQ sablefish fishery) may also be suitable for CPS.

> *"a change in the identity of a corporation or partnership will be deemed to occur with a change in the corporate or partner membership, except a change caused by the death of a member providing the death did not result in any new members. Additionally, membership is not deemed to change*

if a member becomes legally incapacitated and a trustee is appointed to act on his behalf, nor is membership deemed to have changed if the ownership of shares among existing members changes, nor is membership deemed to have changed if a member leaves the corporation or partnership. Changes in the ownership of publicly held stock will not be deemed changes in the ownership of the corporation."

If Option 2 were adopted, it will likely be necessary to amend the goals and objectives for the CPS plan to include the goal of increasing the number of owner-operators and avoiding vertical integration.

3.8.13 Permit Renewal Criteria

Background

Reducing the size of the limited entry fleet for CPS finfish through permit renewal criteria may be useful if the number of limited entry permits in the fishery is much larger than the number of vessels required or currently used to harvest the resource. Such options will be less useful if the limited entry fleet is of an appropriate size initially.

Options

Option 1 would not subject limited entry permits to renewal criteria. Option 2 would impose performance criteria for permit renewal (e.g., minimum landings, numbers of trips, or some other performance measure). Permitted vessels that fail to meet performance criteria for renewal would have their permits retired.

The Council chose Option 1.

Analysis

Option 1 does not ensure that vessels in the fleet stay active in the fishery. If permits were transferable, inactive vessels could transfer permits to vessels that become highly active, leading to a sudden surge in effort production and competition in the fishery. This could set off a proliferation of new, redundant investment in the fishery. However, since transfers are limited after the first year of the program, inactive vessels will not be able to transfer their permit to more active vessels. This scenario is intended to result in gradual attrition of the fleet size.

Option 2, the "use it or lose it" approach, was considered by Council for groundfish but rejected on the grounds that it might encourage additional fishing effort due to vessels fishing to avoid losing their permits. Another potential disadvantage of Option 2 is that development of performance criteria for renewing permits will likely be difficult and controversial whether undertaken at the outset of the limited entry program or at some later date. It is unlikely that vessels qualifying for limited entry permits under any of the proportion of total CPS finfish landings criteria and are currently active in the fishery would fail to meet renewal criteria. Thus, the number of vessels that might lose permits under Option 2 would likely be small, and significant efficiency gains due to fleet attrition from failing to meet performance criteria are doubtful.

Under both options, vessel owners would still be required to send in forms to renew permits as specified in section 3.5.2.

3.8.14 Permit Transfers

Background

Limited entry programs are primarily designed to address economic problems associated with excess harvest capacity or overcapitalization in open access fisheries. Nonetheless, the limited entry program proposed for the CPS finfish fishery has multiple objectives. In most cases significant economic benefits are realized by allowing unconstrained transfer of limited entry permits if the the initial allocation of permits is suboptimal. However in some cases, there may be social, income distributional, or other benefits of greater importance that can be realized by constraining permit transfer to maintain the initial allocation. In the latter cases, the initial allocation may be optimal in terms of preserving a particular pattern of fishing operations, or fishing community structure.

Options

Option 1 would allow CPS finfish limited entry permits to be transferred without constraints. Option 2 would prohibit the transfer of permits. Option 3 would fix the limited entry permit to the vessel and not allow transfer to another vessel except (1) if the permitted vessel is stolen, lost or no longer able to participate in a federally managed commercial fishery, provided application for the permit originates from the vessel owner who must place it on a replacement vessel of the same or less net tonnage within one year of disability of the permitted vessel, or (2) the permit is placed on a replacement vessel of the same or less net tonnage provided the previously permitted vessel is permanently retired from all federally managed commercial fisheries for which a permit is required. Option 4 would make permits fully transferable (as in Option 1) for one year following implementation of limited entry. After one year, transferability would be restricted as described for Option 3.

The Council chose Option 4: The limited entry permit is issued to the vessel. After the first year of the limited entry program, transfer of a permit to another vessel is not allowed unless the original permitted vessel is stolen, lost or no longer able to participate in a federally managed commercial fishery. Application for the permit transfer to a replacement vessel originates from the vessel owner who must place it on a replacement vessel of the same or less net tonnage within one year of disability of the permitted vessel. During the first year of the program, each permit may be transferred once.

Analysis

Without constraints on transfer, no one is prohibited from becoming a fisher. Under an open market for limited entry permits, permits would tend to be sold to fishers who use the most efficient harvesting techniques. Fishers who use the most efficient harvesting technology will be able to outbid less efficient competitors. Over time this should lead to efficiency gains and increased profitability through a reduction in fleet harvesting costs. A transferable permit can become a highly valued asset to its holder

Nontransferability or constrained transfer of permits may provide social benefits by maintaining existing patterns and conditions in the fishery. It would prevent consolidation of permits and the concentration of vessel ownership, and therefore, undue market power. Nontransferability can lead to ossification of the fleet if there are no opportunities to replace or sell vessels. Conversely, nontransferability could lead to more rapid attrition of the fleet. Nontransferability reduces the value of a permit as an asset.

Option 4 represents a compromise between full transferability and completely restricted transferability. This option was chosen in conjunction with the vessel fleet size option (see Section 3.8.7, above) for a fleet of 70 vessels. While the Council chose the fleet size option allowing 70 permits to accommodate current participants in the CPS fishery, it is clear that this fleet size is larger than required to efficiently harvest CPS finfish. Option 4 allows some modernization to occur while limiting growth of fishing capacity in the long term.

Option 4 constrains permit transfers by limiting the transfer of a permit to situations where the original vessel is lost, stolen, or no longer able to participate in federal fisheries. The replacement vessel must be of equal or lesser net tonnage. This prevents a large influx of larger, higher powered vessels into the fishery. However, Option 4 does allow permit holders to modernize and upgrade the permitted vessels. This fosters reduced operating costs through improved technology without an undue increase in fleet harvest capacity, and could lead to improvements in product quality.

Also under Option 4, permit transfers are allowed once in the first year of the program. Permit transfers during the first year may lead to improvements in economic efficiency due to purchase of permits by the most efficient operators, modernization and upgrading.

3.8.15 Procedures for Issuing New Limited Entry Permits in the Future

Background

The need to issue new limited entry permits in the future could arise if the number of permits becomes too low due to attrition, or in the case of a substantial increase in the abundance of CPS finfish resources and substantially enhanced markets. In this case, the limited entry fleet could increase beyond its current size. It might be desirable to make such permits temporary to accommodate subsequent contractions in the fishery.

Options

Option 1 would allow for issuing additional permits in the future under a framework that would be created when the process of developing options is initiated. Option 2 would allow issuance of additional permits to replace only those permits lost to attrition. Option 3 would not allow the issuance of additional permits in the future.

The Council chose Option 1, but changed the wording to "Allowance for issuance of new permits consistent with the parameters of a framework that may be developed in the future."

Analysis

Under Option 1, the fleet could be expanded to any desirable size through the issuance of new permits, and could include more vessels than initially qualify for limited entry permits. Under Option 2, new permits would only replace those lost to attrition and, therefore, the fleet could not expand beyond its initial size.

Under Options 1 and 2, any need for additional harvesting capacity in the form of more vessels, could likely be met without substantial new vessel construction. Tables 3.8.7.1, 3.8.9-1, 3.8.10-1, and 3.8.10-2 indicate a great degree of excess harvest capacity in the fishery. Thus, additional vessels could be brought into the fishery without incurring significant capital costs. However, the fishery would experience increased fixed and variable costs associated with additional vessels. Unless these added costs are offset by increased revenues from expanded resource availability and market demand, net revenues will decrease.

Transferability of CPS limited entry permits would have made procedures for issuing new limited entry permits less desirable. In that case, vessels that wanted to leave the CPS limited entry fishery could be expected to sell their permit to a vessel that wishes to participate in the limited entry fishery. However, the limited transferability provisions of the limited entry program make it important that there is a mechanism in the FMP to issue new permits in the future if there is a substantial increase in the CPS resource or extreme attrition in the fleet size.

3.8.16 Vessels under Construction, Conversion or Contract for Purchase

Background

Vessels intended for use in the CPS finfish fishery that were under construction, conversion or contracted for purchase during the window period might not qualify for a limited entry permit due to insufficient landings. Unlike vessels that were already participating in the CPS finfish or other fisheries, these vessels, because of their state of physical preparedness, may not have had an opportunity to participate in the CPS finfish fishery and make the necessary landings to qualify for a limited entry permit.

Options

Option 1 would not waive CPS limited entry landings requirements for vessels under construction, conversion or contracted for purchase during the window period. Option 2 would, upon review of the specific circumstances, allow an exception for vessels under construction, conversion or contracted for purchase during the window period.

Under Option 2, the owner of a vessel constructed or converted for use in the CPS finfish fishery qualifies for a CPS limited entry permit if the owner:

1. Submits, along with the application for a permit, receipts showing that $100,000 or more was invested during the window period for purchase or towards the conversion or construction of a vessel with a purse seine net having mesh size 1-3/8 inches or less, power blocks, and a seine winch; and

2. Uses the newly constructed or converted vessel before [insert notice date] to land coastal pelagic finfish species.

Analysis

The Council chose Option 1. Since limited entry permits will be transferable in the first year of the program, an owner of a vessel under construction may purchase a limited entry permit (Appendix B, Section 3.8.16).

Under the window period and landings options discussed above, the likely number of vessels that would qualify for a CPS finfish limited entry permit is known, and the corresponding harvest capacity could be ascertained. At this point the number of vessels that were under construction, conversion or contracted for purchase during the window period is unknown. Therefore, under a provision that would exempt vessels under construction, conversion or contracted for purchase during the window period from meeting CPS finfish minimum landings requirements, the ultimate limited entry fleet configuration is less certain, as would be fleet harvest capacity. Option 2 is likely to result in smaller efficiency gains than would be realized under Option 1.

3.9 Benefit-Cost Analysis

Benefit-cost analysis demonstrates that measurable economic benefits would accrue from a license limitation system that maintains capacity in the CPS finfish fishery at current or reduced levels. These benefits would be due to avoiding fixed costs associated with additional boats that would enter the fishery if availability of CPS, particularly sardine, improves. Fixed costs are for items such as maintenance, insurance, taxes, and moorage that stem from owning a vessel used in the CPS fishery. Fixed costs tend to be proportional to the number of vessels rather than to time spent fishing or landings. A problem arises if vessels participate in fisheries other than the CPS fishery. Fixed costs can be joint, or common in nature; (i.e., an input is a fixed cost, and is used to produce multiple outputs) (Terry et al. 1996). In this case, the annual cost of preparing a vessels to fish in the CPS fishery and other fisheries is a joint cost, which evokes the question of how much of this cost should be allocated to the CPS fishery.

License limitation may generate additional economic benefits not reflected in the benefit-cost analysis. Lack of cost data made it difficult to estimate economic benefits of license limitation in the CPS finfish fishery but benefits undoubtedly exist. Overcapitalization is only one way in which economic rent is dissipated in open access fisheries. Increases in fleet size also result in (1) decreased revenue per boat, as an increasing number of boats compete for a fixed allowable harvest, and (2) increased variable costs per boat as a result of increased congestion and excess mobility on the fishing grounds. As indicated by Wilen (1988), "the short-run fishing, moving and searching activities can be just as important as long-run capital configuration decisions in dissipating potential rents."

The benefit-cost analysis for this FMP focuses on fixed costs in operating existing boats. Additional costs would be incurred, and economic efficiency possibly reduced, if new boats were built for use in the CPS fishery.

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4.0 OPTIMUM YIELD, MAXIMUM SUSTAINABLE YIELD CONTROL RULES, AND OVERFISHING DEFINITIONS FOR THE COASTAL PELAGIC SPECIES FISHERY

This section analyzes options related to harvest regulation in the Coastal Pelagic Species (CPS) fishery. The options include definitions of optimum yield (OY), maximum sustainable yield (MSY) control rules, definitions of overfishing, and definitions of overfished stocks. These criteria must be defined and linked to measurable indicators of stock status (e.g., exploitation rates and biomass levels) for any CPS stock that is Actively managed under this fishery management plan (FMP). Requirements for Monitored stocks are similar.

A framework process and criteria for choosing between Active management and Monitored management are described in Section 1.2 of this appendix. Active management is for stocks with significant fisheries that might be overfished without regulation of harvest levels and periodic stock assessments. Monitored management is for stocks not regulated by harvest guidelines or quotas, because they are lightly exploited and at little risk of overfishing, or not well enough understood to Actively manage. As described in Section 2 of this Appendix, Pacific sardine and Pacific (chub) mackerel will be Actively managed at the outset of this FMP while northern anchovy, jack mackerel, and market squid will be Monitored.

The distinction between Actively managed and Monitored stocks enables managers and scientists to concentrate their efforts on stocks and segments of the CPS fishery that need the greatest attention and where greatest benefits are expected. Complete stock assessments are not necessary at this time for northern anchovy and jack mackerel and not currently possible for market squid. In addition, stock specific MSY control rules, overfishing and overfished stock definitions are also not needed (i.e., anchovy and jack mackerel); because fishing mortality is low, or technically difficult (i.e., market squid); because too little is known about the stock. As explained in Section 2 of this Appendix, this approach is compatible with the goals and objectives of the CPS FMP. In particular, it prevents overfishing, fosters effective monitoring, and uses resources spent on management of CPS efficiently.

4.0.1 Definition of Optimum Yield

As defined in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), OY is a decisional mechanism for resolving multiple conservation, social, and economic goals. According to the Magnuson-Stevens Act, OY must be less than or equal to MSY. Determination of OY involves consideration of ecological, economic, and social factors; but biological factors and sustainability are most important.

OY for a CPS stock is defined to be the level of harvest which is less than or equal to acceptable biological catch (ABC) estimated using a MSY control rule, consistent with the goals and objectives of this FMP, and used by the Council to manage the stock. ABC is a prudent harvest level calculated based on an MSY control rule (see below). As described below, MSY control rules for CPS must provide levels of stock biomass that are the same or higher than traditional F_{MSY} constant harvest rate MSY policies, while also supplying relatively high and consistent levels of catch. OY based on ABC and an MSY control rule for CPS will always be at least as effective in maintaining a healthy stock and fishery as catches from the F_{MSY} policy, because the F_{MSY} policy, among all candidate MSY control rules, is a lower bound.

This definition of OY provides the Council with maximum flexibility for setting harvest levels consistent with the Magnuson-Stevens Act and good fishery management practices, because catch levels can be set at any level between zero and the ABC from the MSY control rule. Flexibility in defining and specifying OY is important, because of the numerous and potentially conflicting conservation, social, and economic goals for management of CPS. An alternative would be to define OY as being equal to MSY, but this would prevent the Council from reducing harvest levels to accommodate ecological or economic factors not included in the MSY control rule used to calculate ABC.

This definition of OY is consistent with the Magnuson-Stevens Act and the goals and objectives of the CPS FMP. In particular, it promotes full fishery utilization based on ecosystem-based principles while achieving maximum benefits.

4.0.2 Definition of Maximum Sustainable Yield, MSY Control Rules and Acceptable Biological Catch

MSY is a central theme in the Magnuson-Stevens Act and important in specifying and developing harvest policies and MSY control rules for the CPS fishery.

The original theoretical definition of MSY as a constant level of catch should not be applied in the CPS fishery, because biomass and productivity of most CPS change in response to environmental variability on annual and decadal time scales. For example, the theoretical, deterministic equilibrium MSY catch level for Pacific sardine under favorable environmental conditions may be greater than the biomass of an unfished stock under unfavorable environmental conditions (Jacobson and MacCall 1995). Any reasonable level of MSY as a constant catch will result in low biomass levels and risk to the stock during unproductive periods when abundance tends to decline.

The more modern definition of MSY as a level of catch obtained from multiplying current biomass times a fishing mortality rate F_{MSY} is more applicable to CPS, because catch is increased when biomass is high and decreased when biomass is low. F_{MSY} is the theoretical fishing mortality rate that provides the highest level of average catch over the long term. Linking catches with biomass (i.e., catches reduced when biomass falls) reduces risk to the stock and increases biomass and catch over the long term. The definition of MSY in the National Standards for the Magnuson-Stevens Act (Sec. 600.310.c.1) as the "largest long-term average catch or yield that can be taken under prevailing ecological and environmental conditions" is similar.

For CPS, an MSY control rule is defined to be a harvest strategy that provides biomass levels at least as high as the F_{MSY} approach while also providing relatively high and relatively consistent levels of catch. By definition, candidate MSY control rules for CPS take the F_{MSY} policy as a lower bound in terms of biomass and catch. This means that any candidate MSY control rule must provide biomass levels that are at least as high as those from the F_{MSY} policy while also providing relatively high and consistent levels of catch.

The definition of an MSY control rule for CPS is compatible with National Standard 1, but more conservative and more general. According to National Standard 1 (50 CFR §600.210) an MSY control rule is "a harvest strategy which, if implemented, would be expected to result in a long-term average catch approximating MSY." Similarly, MSY stock size in National Standard 1 "means the long-term average size of the stock or stock complex, measured in terms of spawning biomass or other appropriate units, that would be achieved under an MSY control rule in which the fishing mortality rate is constant." The definition of an MSY control rule for CPS is more general, because it includes the definition in National Standard 1. The definition for CPS is more conservative, because the focus for CPS is oriented primarily towards stock biomass levels at least as high as the MSY stock size. In the definition for CPS, "relatively high and consistent catch levels" are important, and MSY is used as a lower bound. The primary focus on biomass, rather than catch, is appropriate for CPS, because most species (Pacific sardine, northern anchovy, and market squid) are very important in the ecosystem for forage. MSY control rules for CPS (e.g., for sardine) are superior to the F_{MSY} approach in economic, social, and ecological terms. However, the F_{MSY} approach serves as a lower bound (with respect to biomass and catch) in their definition, and adjustments can be made to account for stock biomass, precision of biomass estimates and data, statistical characteristics in recruitment patterns (e.g., runs of years with good or bad recruitment), and other characteristics of the stock and fishery.

The MSY control rule, definition of overfishing, definition of overfished stocks, and rebuilding programs (see below) are integral parts of the harvest policy and MSY control rules for CPS. All parts of the harvest policy should be based on terms and variables that are objective and measurable. In addition, MSY control rules for CPS should normally include a rebuilding program for stocks that may become overfished (see below).

As described in the framework section of the CPS FMP, all aspects of harvest policies for CPS including the MSY control rule, definition of overfishing, definition of overfished stocks, and rebuilding criteria can be modified using framework procedures without amending the FMP.

The approach to defining MSY as ABC calculated using an MSY control rule is consistent with the Magnuson-Stevens Act, goals and objectives of the CPS FMP, and the best available science and data for CPS stocks. In particular, it promotes full fishery utilization based on ecosystem based principles, helps achieve OY, provides adequate forage for dependent species, prevents overcapitalization during periods of high ecosystem productivity, and provides rebuilding during periods of lower ecosystem productivity.

4.0.3 Definition of Overfishing

By definition, overfishing occurs in a CPS fishery whenever fishing occurs over a period of one year or more at a rate that is high enough to jeopardize the capacity of the stock to produce MSY on a continuing basis if applied in the long term. Overfishing in the CPS fishery is "approached" whenever projections indicate that the overfishing will occur within two years. The definition of overfishing is in terms of a fishing mortality or exploitation rate. Depending on the exploitation rate, overfishing can occur when CPS stocks are at either high or low abundance levels. According to National Standard 1 and the Magnuson-Stevens Act, the Council must take action to eliminate overfishing when it occurs and avoid overfishing when exploitation rates approach the overfishing level.

In operational terms, overfishing occurs in the CPS fishery whenever catch exceeds ABC by a significant amount and overfishing is approached whenever projections indicate that fishing mortality or exploitation rates will exceed the ABC level within two years. The definition of an overfished stock should be an explicit part of the MSY control rule for CPS stocks.

As described above, the ABC exploitation rate based on an MSY control rule will be at least as conservative as F_{MSY} so that ABC harvest rates (or harvest rates in slightly in excess of the ABC harvest rate) will be less than the definition of overfishing and will not lead to overfishing.

As described in the framework section of the CPS FMP, definitions of overfishing for CPS can be modified using framework procedures without amending the FMP.

The definition of overfishing for CPS is compatible with the Magnuson-Stevens Act and with the goals and objectives of the CPS FMP. In particular, it promotes full fishery utilization based on ecosystem based principles, helps achieve OY, provides adequate forage for dependent species, and prevents overfishing.

4.0.4 Definition of an Overfished Stock

By definition, an overfished stock in the CPS fishery is a stock at a biomass level low enough to jeopardize the capacity of the stock to produce MSY on a continuing basis. An overfished condition is approached when projections indicate that stock biomass will fall below the overfished level within two years. Council must take action to rebuild overfished stocks (i.e., rebuilding programs, see below) and to avoid overfished conditions in stocks with biomass levels approaching an overfished condition.

The term "overfished" is somewhat misleading for CPS stocks, because low biomass conditions may result from either overfishing, unfavorable environmental conditions, or both acting in concert. Experience with CPS stocks around the world indicates that overfished low biomass conditions usually occur when unfavorable environmental conditions and high fishing mortality rates occur at the same time. Management measures for overfished CPS stocks do not, however, depend on whether low biomass was due to excess fishing or unfavorable environmental conditions, because reductions in fishing mortality are required in either case.

The definition of an overfished stock will normally be an explicit part of the MSY control rule for CPS stocks. As described in the framework section of the CPS FMP, definitions of overfished stocks for CPS can be modified using framework procedures without amending the FMP.

The definition of overfished stocks for CPS is compatible with the Magnuson-Stevens Act and with the goals and objectives of the CPS FMP. In particular, it promotes full fishery utilization based on ecosystem-based principles, helps achieve OY, provides adequate forage for dependent species, and prevents overfishing.

4.0.5 Rebuilding Programs

Management of overfished CPS stocks must include a rebuilding program that can, on average, be expected to result in recovery of the stock to MSY levels in ten years. It is impossible to develop a rebuilding program that would be guaranteed to restore a stock to the MSY level in ten years, because CPS stocks may remain at low biomass levels for more than ten years even with no fishing. The focus for CPS is, therefore, on the average or expected time to recovery based on realistic projections. If the expected time to stock recovery is associated with unfavorable ecosystem conditions and is greater than ten years, then the Council and U.S. Secretary of Commerce (Secretary) may consider extending the time period as described in National Standard 1.

Rebuilding programs for CPS will normally be an integral part of the MSY control rule and are designed to reduce the risk of overfishing, but they may be developed or refined further in the event that biomass of a CPS stock reaches the overfished level.

As described in the framework section of the CPS FMP, rebuilding programs for CPS can be modified using framework procedures without amending the FMP.

This definition is from the Magnuson-Stevens Act and compatible with the goals and objectives of the CPS FMP. In particular, it promotes full fishery utilization based on ecosystem-based principles, helps achieve OY, provides adequate forage for dependent species, and prevents overfishing.

4.1 Maximum Sustainable Yield Control Rules

As specified in the Magnuson-Stevens Act and described above, MSY control rules are used to calculate ABC for CPS stocks. To conform to requirements of the Magnuson-Stevens Act, harvest policies and MSY control rules for CPS must include an upper bound for harvest rates that serves as a definition of overfishing. MSY control rules for CPS must also include a biomass threshold that triggers reductions in fishing mortality rates when biomass declines to low levels. In addition, MSY control rules or harvest policies for overfished CPS stocks should include a rebuilding program that is expected to result in recovery of overfished or depressed stocks to levels that can support MSY within ten years (on average). The definitions of overfishing and overfished status must be explicit and based on objective and measurable criteria. MSY control rules for CPS must be explicitly risk-averse and designed to minimize the probability of low biomass conditions that jeopardize the stock's capacity to produce MSY. Greater uncertainty regarding a stocks status should result in more conservative harvest levels.

MSY control rules in the CPS fishery may vary depending on the nature of the fishery, management goals, assessment and monitoring capabilities, and available information. Under the framework management approach used for CPS, it is not necessary to amend the CPS FMP in order to develop or modify MSY control rule or definitions of overfishing.

Many CPS stocks are important as forage (e.g., Pacific sardine and northern anchovy) for a wide range of predators including other fish, birds, and marine mammals. Ecosystem considerations are important elements of the goals and objectives for the CPS FMP. MSY control rules for CPS should, therefore, help reduce the frequency of low biomass conditions and overfished stocks and facilitate recovery of overfished stocks to the extent possible. Biomass criteria are particularly important in developing MSY control rules for CPS such as Pacific sardine and northern anchovy which are key forage species in the California Current ecosystem.

The main use of an MSY control rule for Actively managed stocks is to provide managers with a tool for setting and adjusting harvest levels on a periodic basis while preventing overfishing and overfished stock conditions. All Actively managed stocks must have stock-specific MSY control rules, a definition of overfishing, and a definition of an overfished stock.

The main use of an MSY control rule for a Monitored stock is to help gauge the need for Active management. MSY control rules and harvest policies for Monitored CPS stocks may be more generic and simple than those for Actively managed stocks with significant fisheries. Any stock supporting catches approaching the ABC or MSY level should be Actively managed unless there is too little information available or other practical problems.

As described in the framework section of the CPS FMP, MSY control rules for CPS can be modified under the framework procedures without amending the FMP.

4.1.1 Default Maximum Sustainable Yield Control Rule and Overfishing Specifications

The Council may develop stock-specific MSY control rules and overfishing specifications for Monitored stocks as described in the framework section of this FMP, or it may use the default definition given below. The default MSY control rule is intended to be flexible, because the best choice for a Monitored stock will depend on the circumstances of the fishery, importance of the stock as forage, and data available. The default MSY control rule itself can be modified under framework management procedures to accommodate new procedures, changes in the nature of the fisheries, or new data.

The default MSY control rule (intended primarily for a stocks that are Monitored) sets ABC for the entire stock (U.S., Mexico, Canada, and international fisheries) equal to 25% of the best estimate of the MSY catch level. Overfishing occurs whenever the total catch (U.S., Mexico, Canada, and international fisheries) exceeds ABC for the stock by a significant amount or whenever fishing occurs at a rate that is high enough to jeopardize the capacity of the stock to produce MSY. Overfishing of a Monitored CPS stock is "approached" whenever projections or estimates indicate that the overfishing will occur within two years.

In making decisions about Active management, Council may choose to consider ABC in U.S. waters. ABC in U.S. waters is ABC for the entire stock prorated by an estimate of the fraction of the stock in U.S. waters (see below). There may be no benefits to Actively managing the U.S. segment of a CPS fishery if fishing mortality in the U.S. is small and while fishing is occurring outside the jurisdiction of U.S. authorities. Active management may not be effective if U.S. catches are small and overfishing is occurring in Mexico, Canada, or in international waters outside the jurisdiction of federal authorities.

The default definition of an overfished stock in the CPS fishery is a stock at a biomass level low enough to jeopardize the capacity of the stock to produce MSY on a continuing basis. An overfished condition is approached when projections indicate that stock biomass will fall below the overfished level within two years. Council should take action to rebuild overfished stocks (i.e., rebuilding programs, see below) and to avoid overfished conditions. However, as described above, Active management may not be effective if U.S. catches are small and overfishing is occurring in Mexico, Canada, or in international waters outside the jurisdiction of federal authorities.

4.1.1.1 Analysis

The MSY control rule and overfishing specifications applied to Monitored stocks (default or otherwise) are intended to be conservative benchmarks used to manage stocks with small fisheries at very little risk of overfishing. They function as conservative benchmarks that help managers make decisions under the framework management process about moving stocks to the Actively managed category (if catches increase or are projected to increase to significant levels) or to the Monitored category (if catches decrease or are projected to decrease to low levels). Of course, managers might promote a stock to the Actively managed category for reasons other than increased harvest levels.

As described in the framework section of the FMP, the Council should promote monitored stocks to Active management whenever overfishing (according to the conservative default benchmark) occurs or is projected to occur. In this context, "overfishing" implies that a stock likely requires an Active management approach. It does not necessarily imply that harvest levels that are too high, because the MSY control rule used for Monitored stocks will normally be conservative.

The general approach, default MSY control rule, and default overfishing specifications for Monitored stocks are compatible with the Magnuson-Stevens Act and with the goals and objectives of the CPS FMP. In particular, they achieve OY, prevent overfishing, and use resources spent on CPS efficiently.

4.1.2 MSY Control Rule and Overfishing Specifications

The principal MSY control rule utilized for the California CPS fisheries was developed for Pacific (chub) mackerel, and it was designed to continuously reduce the exploitation rate as biomass declines (Parrish and MacCall). The general formula used is:

$$H = (\text{BIOMASS-CUTOFF}) \times \text{FRACTION}$$

H is the harvest target level, CUTOFF is the lowest level of estimated biomass at which directed harvest is allowed and FRACTION is the fraction of the biomass above CUTOFF that can be taken by the fishery. BIOMASS is generally the estimated biomass of fish age one or more at the beginning the season. The purpose of CUTOFF is to protect the stock when biomass is low. The purpose of FRACTION is to specify how much of the stock is available to the fishery when BIOMASS exceeds CUTOFF. It may be useful to define any of the parameters in this general MSY control rule so they depend on environmental conditions or stock biomass. Thus, the MSY control rule could depend explicitly on the condition of the stock or environment.

The formula generally uses the estimated biomass for the whole stock in one year (BIOMASS) to set harvest for the whole stock in the following year (H), although projections or estimates of BIOMASS, abundance index values, or other data might be used instead. BIOMASS is an estimate only, it is never assumed that BIOMASS is a perfect measure of abundance. Efforts to develop a harvest formula must consider probable levels of measurement error in BIOMASS which typically have CVs of about 50% for CPS.

The general MSY control rule for CPS (depending on parameter values) has a number of important characteristics that tend to make it compatible with the Magnuson-Stevens Act and useful for CPS that are important as forage. If the CUTOFF is greater than zero, then the harvest rate (H/BIOMASS) declines as biomass declines (Figure 4.1.2-1). By the time BIOMASS falls as low as CUTOFF, the harvest rate is reduced to zero. The CUTOFF provides a buffer of spawning stock that is protected from fishing and available for use in rebuilding if a stock becomes overfished. The combination of a spawning biomass buffer equal to CUTOFF and reduced harvest rates at low biomass levels means that a rebuilding program for overfished stocks may be defined implicitly. Moreover, the harvest rate never increases above FRACTION. If FRACTION is approximately equal to F_{MSY}, then the MSY control law harvest rate will not exceed F_{MSY}.

The general MSY control rule formula given above contains constant F policies like F_{MSY} (set FRACTION=F_{MSY} and CUTOFF=0) as special cases. The formula also contains constant escapement policies as special cases (set FRACTION=1 and CUTOFF to the desired level of escapement). Thus the general formula for MSY control rules in CPS includes policies used to manage most of the world's fisheries.

CPS stocks may be distributed over very large areas when abundant, and it may be difficult to obtain biomass estimates for the entire stock when abundance is high. Under these conditions, BIOMASS may be a regional estimate. When BIOMASS is a regional estimate, parameters in the MSY control rule have the same meaning, but adjusted values may be required.

The CUTOFF may also be used to define overfished stocks in the CPS fishery, but other or additional biomass thresholds may also be used. Recovery of the stock to biomass levels above the definition of overfishing should be relatively rapid, because there is no directed fishing on overfished stocks. In addition, biomass levels less than CUTOFF should be rare, because no directed fishing is generally allowed for stocks with biomass below the CUTOFF.

In addition to the CUTOFF and FRACTION parameters, it may be advisable to define a maximum harvest level parameter (MAXCAT) so that total harvest specified by the harvest formula never exceeds MAXCAT. MAXCAT is used to guard against extremely high catch levels due to errors in estimating biomass, to reduce year-to-year variation in catch levels, and to avoid overcapitalization during short periods of high biomass and high harvest. MAXCAT also prevents the catch from exceeding MSY at high stock levels and spreads the catch from strong year classes over a wider range of fishing seasons. Although catch from the general MSY control rule for CPS increases with biomass, the harvest rate itself will decline as biomass increases to high levels (Figure 4.1.2-2).

As described above, overfishing occurs whenever the catch exceeds ABC calculated using the MSY control rule by a significant amount. A stock is overfished whenever the biomass falls below some other threshold (see below). The biomass threshold used to define overfishing may be equal to or different from CUTOFF.

Other general types of control rules may be useful for CPS, and this FMP does not preclude their use as long as they are compatible with National Standards and the Magnuson-Stevens Act.

4.1.2.1 Analysis

The general MSY control rule for setting harvest levels in the CPS fishery is simple and flexible and can be modified to suit the conditions in any particular fishery. It is similar to formulas currently used by the State of California to manage Pacific (chub) mackerel (MacCall et al. 1985) and Pacific sardine (Hill et al. 1997) as well as by the Council to manage anchovy and Pacific whiting (similar in life history to CPS).

The general formula makes sense for highly variable stocks like CPS, because high harvest rates take advantage of periods when biomass and productivity are high. When biomass and productivity are low, in contrast, low harvest rates protect long term productive capacity and help to rehabilitate the stock.

The MSY control rule accommodates definitions of overfishing for overfished stocks since overfishing is defined as catches that exceed ABC. The general rule is compatible with requirements to identify overfished stocks, because fishing can be precluded at any biomass level. The general rule implicitly defines rebuilding programs for stocks that are overfished or at low biomass levels, because exploitation rates decline (and approach zero) as biomass fall to the CUTOFF or definition of overfishing (whichever is higher).

4.1.3 Harvest Levels for U.S. Fisheries

Management of transboundary stocks is one of the most difficult problems in management of CPS. Ideally, transboundary CPS stocks would be managed cooperatively by the U.S., Canada, and Mexico on the basis of common policy. Effective management of CPS may be difficult without a cooperative agreement, because total catch levels are likely to be too high. At present, there are no indications that a cooperative management agreement with Mexico or Canada will be established.

In the absence of a cooperative management agreement, the default approach in the CPS FMP sets harvest levels for U.S. fisheries by prorating the total target harvest level according to the portion of the stock resident in U.S. waters or estimating the biomass in U.S. waters only. In practice, this approach is similar to managing the U.S. and Mexican portions of a stock separately since harvest for the U.S. fishery in a given year depends ultimately on the biomass in U.S. waters.

Other approaches that may be developed in future are not precluded by this default. If the portion of the stock in U.S. waters cannot be estimated or is highly variable, then other approaches may be used. It may be more practical, for example, to use a high CUTOFF in the MSY control rule to compensate for stock biomass off Mexico or Canada.

Depending on circumstances, there are a number of ways in which harvest levels for U.S. fisheries could be calculated. The approaches differ mainly in the order of calculations. For example, if CUTOFF is 100,000 mt, FRACTION is 20%, the current total biomass is 200,000 mt and the portion of the stock in U.S. waters is 35%, then the total target harvest level would be 0.2 x (200,000 - 100,000) = 20,000 mt, and the harvest level for the U.S. fishery would be 0.35 x 20,000 = 7,000 mt. If biomass in U.S. waters only (measured by a special survey confined to U.S. waters) was 100,000 mt, then total biomass could be estimated as 100,000 / 0.35 = 286,000 mt, and harvest levels calculated as before. Other essentially equivalent approaches are also possible.

4.1.3.1 Analysis

The primary advantage of prorating the total target harvest level to obtain harvest guidelines or quotas for U.S. fisheries is that U.S. fisheries can be managed unilaterally in a responsible manner that is consistent with the Magnuson-Stevens Act. Mexican landings are not considered explicitly when harvest levels for U.S. waters is determined, so U.S. fishers are not penalized directly for Mexican harvests. Harvest in U.S. waters does, however, depend on current biomass, so U.S. harvest will be reduced if the stock is depleted by fishing in either Mexico or the U.S.

A disadvantage in prorating total harvest by the portion in U.S. waters is that biomass estimates, based on U.S. and Mexican fishery data, for the whole stock may be required. It is possible that Mexican fishing data might not be available at some future date, but experience indicates that serious problems with data availability are unlikely.

The most serious disadvantage in prorating ABC for the stock in U.S. waters is that the portion of each stock in U.S. waters has to be estimated. Portion in U.S. waters may be more difficult than total biomass to estimate, because the portion of CPS stocks in U.S. waters varies with season and is affected by a number of variables. During the winter and spring, water temperatures are cool, and stocks move south to spawning areas off southern California and Mexico. During the summer and fall, when water temperatures are highest, CPS move north and away from Mexico. The amount of seasonal movement depends on the species, environmental conditions (warm water encourages movement to the north), biomass levels (sardine may undertake northern feeding migrations when biomass is high), and age composition (large old fish tend to move farther north).

If it proves too difficult to estimate the portion in U.S. waters, then other approaches to adjusting ABC for stock biomass outside of U.S. waters may be employed. For example, it may be more practical to use an MSY control rule with a high CUTOFF than to try and estimate the portion of the stock in U.S. waters. It is also possible that surveys could be conducted in U.S. waters to estimate the biomass actually occurring there.

It is likely that estimates of the portion of CPS stocks in U.S. waters will be controversial. Managers and scientists may decide to choose, as a matter of policy and based on limited information, a season on which to base estimation of portion in U.S. waters and calculation of harvest levels for U.S. fisheries. A number of different estimates of the portion in U.S. waters may have to be reconciled, and the decision about which estimate to use or how estimates are to be combined may result in a policy decision. Managers may choose estimates of the portion in U.S. waters strategically if bilateral discussions about allocating CPS between the U.S. and Mexico develop. If the U.S. and Mexico do not agree on the portions in U.S. and Mexican waters for a particular stock, then too much harvest may occur.

Prorating total harvest by the portion in U.S. waters will not protect CPS stocks against high combined U.S. and Mexican harvest rates if harvest rates are too high in Mexico, but harvest in U.S. waters will automatically decrease if biomass decreases. In any given year, combined U.S. and Mexican harvest rates may be higher than desirable, and biomass and fishery yields may be reduced due to too much fishing. Another disadvantage is that U.S. fisheries may be preempted by large scale fisheries in Mexican waters since relatively conservative management of U.S. fisheries may result only in higher Mexican harvests.

4.1.3.2 Portion in U.S. Waters and Available Data

Estimates of the portion in U.S. waters for most stocks will likely be based on California Cooperative Fishery Investigation (CalCOFI) and fish spotter data. CalCOFI data are quantitative collections of eggs and larvae made during the spawning season at a regular grid of sampling stations from 1951 to the present time (Hewitt 1988). Surveys made during the spawning season when adults are generally at the southern end of their distribution, therefore, have a south bias. The current sampling pattern is confined to the California Bight, but a more extensive sampling pattern that extended farther north and into Mexican waters was carried out during 1951 through 1985. From time to time, cooperative transboundary surveys are conducted by U.S. and Mexican scientists that provide useful information about CPS eggs, larvae, and spawning biomass on both sides of the border (Arenas et al. 1996). Fish spotter data are collected by pilots in small planes that are employed by the fishery to locate fish schools (Lo et al. 1992). Fish spotters fly over Mexican waters during the summer while searching for tuna, but seldom fly north of Pt. Conception.

Estimates of the distribution of CPS larvae between the U.S. and Mexico based on CalCOFI larval data for 1951 through 1985 are given below. CPS spawn mostly during the winter and spring, so portions from CalCOFI data are treated as winter-spring estimates of the portion of CPS stocks in U.S. waters.

CalCOFI (Winter-Spring) Larval Distribution

Species	United States	Mexico
Pacific (Chub) Mackerel	55%	45%
Jack Mackerel	54%	46%
Pacific Sardine	31%	69%
Northern Anchovy	65%	35%

The portions are based on larval abundance north and south of CalCOFI line number 100, which corresponds approximately to the U.S.-Mexican border and are subject to the following caveats:

1. The seasonal and spatial distribution of CalCOFI sampling effort has varied over the years in response to changes in survey objectives and budgets (Hewitt 1988). During years of diminished sampling effort, surveys have generally concentrated in those months and areas where spawning activity was most likely to occur. The estimates of larval distribution described above were based on raw rather than seasonally adjusted data, and it is not known whether this results in any systematic bias.

2. The portions probably underestimate the true proportion of jack mackerel larvae in U.S. waters, because (a) CalCOFI surveys have generally not extended far enough north or offshore to cover the full range of the jack mackerel resource. The offshore range of jack mackerel tends to diminish as one moves from the northern to southern end of the range, so the surveys probably "missed" a larger proportion of the larvae present in U.S. waters than in Mexican waters; and (b) An unknown portion of the larvae sampled in Mexican waters likely originated in U.S. waters, since jack mackerel larvae exhibit a marked tendency to drift southward on the California Current.

3. The Pacific sardine distribution described in the table pertains to years during which the biomass was very low. The proportion of sardine larvae and spawning biomass in U.S. waters would be higher in medium to high biomass years. Results, for example, of a cooperative U.S./California/Mexico daily egg production survey indicated that most of the biomass of spawning sardine was in U.S. waters during 1994 (Lo et al. 1996). Sardine biomass was much higher in 1994 then when historical CalCOFI data were collected.

4. CalCOFI data for U.S. and Mexican waters from surveys off both countries were collected primarily before the late 1970s when water conditions were cool and most CPS had a more southerly distribution. Water temperatures along the coast increased after the late 1970s (MacCall and Prager 1988) and have remained high (Roemmich and McGowan 1995). It is likely that proportions of CPS in U.S. (and Canadian) waters have increased as proportions in Mexican waters have decreased.

Estimates of the portion of CPS stocks in U.S. waters from CalCOFI data are probably reliable for the central stock of northern anchovy and Pacific (chub) mackerel during the winter and spring when spawning occurs. Portions for jack mackerel and Pacific sardine, as indicated above, likely underestimate the portion in U.S. waters under current biomass and environmental conditions.

Estimates of the average distribution of CPS between the U.S. and Mexico based fish spotter data for 1964 through 1992 are given below. Fish spotters seldom enter Mexican waters during the winter and spring when CPS are most abundant in southern areas and search effort in Mexican waters has been limited in recent years. Portions in the table are, therefore, best thought of as summer-fall estimates.

Fish Spotter (Summer-Fall) Distribution

Species	United States	Mexico
Pacific (Chub) Mackerel	84%	16%
Jack Mackerel	75%	25%
Pacific Sardine	87%	13%
Northern Anchovy	98%	02%

Portions based on fish spotter data were obtained by calculating average relative abundance for each CPS in each of six regions using log-normal linear models (Lo et al. 1992). The boundary between regions 2 and 3 in the north and region 5 in the south corresponds approximately to the border between the U.S. and Mexico.

Following the notation and approach in Lo et al. (1992), average relative abundance in region r (Ir) is:

$$I_r = d_r\, P_r\, A_r$$

where Ir is relative abundance in region r, dr is the density in positive flights, Pr is the proportion of positive flights, and Ar is the area searched. The terms for density (dr) and proportion positive (Pr) were calculated from main effects for regions estimated using the log-normal linear models. Interactions between season and region (which would account for seasonal migration) were not included, because insufficient data were available to estimate all of the required interaction parameters. Area searched (Ar) was approximated as the number of unique blocks searched by fish spotters during 1963 to 1992. Corrections to eliminate bias due to log transformation in Lo et al. (1992) were not used in order to simplify calculations. Regions 5 and 6 were combined, because there was too little data to obtain parameter estimates for region 6 from the log-normal linear models. The portion of each CPS stock in U.S. waters shown in the table above was calculated as the sum of Ir for region one through three (U.S. only) divided by the sum of Ir for region one through region six (Mexico+U.S.).

Portions based on fish spotter data are subject to the following caveats:

1. The portions probably underestimate the proportion of jack mackerel in U.S. waters, because fish spotters do not sample the entire northern and offshore range of jack mackerel.

2. The Pacific sardine distribution described in the table pertains mostly to years during which biomass was very low. The proportion of sardine in U.S. waters would be higher in medium to high biomass years.

"Best" estimates of portions of most CPS in U.S. waters during the whole year are averages of the CalCOFI estimates for winter through spring and the fish spotter estimates for summer through winter (see below). The best estimates for Pacific sardine (87%) are based on fish spotter data only since the average for fish spotter and CalCOFI (59%) seems too small for the stock as a whole under current conditions. The State of California assumed that the portion of sardine in U.S. waters was 59% in setting California quotas for 1998, but the proportion was applied to a regional biomass estimate that included sardine off the area between Baja California and San Francisco only. The 59% figure is probably a reasonable estimate of the fraction of sardine biomass in U.S. waters based on the region surveyed.

It is not possible at the present time to estimate the portion of any CPS in U.S. waters on an annual basis, and it is unlikely that estimates of portion of CPS in U.S. waters could be updated frequently.

Best Estimates of Average Distribution

Species	United States	Mexico
Pacific (Chub) Mackerel	70%	30%
Jack Mackerel	65%	35%
Pacific Sardine[1]	87%	13%
Pacific Sardine[2]	59%	41%
Northern Anchovy	82%	18%

1/ Whole stock.
2/ Southern region only.

The best estimate for the central stock of northern anchovy based on CalCOFI and fish spotter data (82%) is larger than the 70% value assumed in the Northern Anchovy Fishery Management Plan (Council 1983) which was based on CalCOFI data only. These estimates should be refined as additional data become available or conditions in the fishery change. In particular, the estimate for Pacific sardine should be reevaluated if the biomass of the stock continues to increase or declines, and the best estimate for jack mackerel should be reevaluated if a significant fishery develops. Both should be reevaluated if new data become available. The southern stock of northern anchovy does not enter U.S. waters, and the northern stock does not enter Mexican waters.

4.1.4 Analysis of MSY Control Rules by Simulation

As described below for Pacific sardine, MSY control rule options are best analyzed using a species and fishery-specific simulation model. The general approach is to simulate the stock and fishery over a long period of time and using a large number of MSY control rule parameter values (e.g., CUTOFF, FRACTION, and MAXCAT). The purpose of the simulations is generally not to find the combination of CUTOFF, FRACTION, and MAXCAT that is "optimal" (Ruppert et al. 1984). Instead, results are typically used to find MSY control rules and parameters that give good results for most measures of performance (MacCall et al. 1985).

Simulation models used to explore MSY control rule options should be as realistic as possible. Each model should be based on results and parameter estimates from recent stock assessments and include a realistic degree of density dependence and year-to-year variability in production or recruitment. Simulated biomass estimates should include realistic amounts of measurement error. Current conditions in the fishery can be used to initialize simulations.

4.1.4.1 Measures of Performance

A number of measures of performance are useful in simulation analysis of MSY control rule options for CPS (see below). The value of each performance measure can be computed for each MSY control rule option or combination of control rule parameters based on simulation results. The list of performance measures given below is not exhaustive, and other performance measures may be desirable in any given situation. In addition, not all measures may be useful in all analyses.

Performance Measure

1. Average catch.
2. Standard deviation of catch.
3. Average biomass.
4. Standard deviation of biomass.
5. Percent of years with no catch.
6. Percent of years with biomass > specified level.
7. Average log catch.
8. Median catch.
9. Average log midyear biomass.
10. Median biomass.

Average catch is used as a traditional measure of long-term fishery performance (e.g., MacCall et al. 1985). Catches in any given year might be much larger or smaller than average. Catch variance, catch standard deviation, and catch coefficient of variation (CV) are measures of expected variability in annual landings over many years (Hall et al. 1988). Catch standard deviation is the expected difference in biomass units between the average catch and catch in any given year. Catch CV is the expected difference in between the average catch and catch in any given year expressed as a percentage of average catch. Average midyear biomass and percent years with biomass greater than some specified level may be included, because some CPS (i.e., anchovy and sardine) are important as forage for fish, mammals, and birds (including the endangered brown pelican and least tern). Average midyear biomass measures average abundance of forage for CPS predators. Percent of years with no catch measures the frequency of years in which target harvest is expected to be zero, because biomass was below the CUTOFF.

Average log catch and average log midyear biomass are "risk averse", downward curving (or convex, Figure 4.1.4.1-1) measures of fishery performance. Convex performance measures like log catch or log biomass are called "risk averse," because a manager who believes in them won't try to increase catch (or biomass) if there is an equal chance that it will actually decrease by the same amount as a result of his or her actions (Keeney and Raiffa 1976). Median catch and biomass are the catch and biomass levels that are "in the middle" in the sense that they are larger than 50% and smaller than 50% of catch or biomass levels that occur during all years. Log catch or median catch and log biomass of median biomass are similar and correspond if log catch is normally distributed (back-transformed average log catch equals median arithmetic catch if log catch is normally distributed). Average log catch is often used in fisheries to measure the performance of harvest policies and management options (Deriso 1985; Hightower 1990; Hilborn 1985; Mendelssohn 1982; Parma and Deriso 1990), but is more difficult to understand than median catch.

Average log catch or midyear biomass and median catch or biomass are all useful measures of fishery performance over both the long and short term. Logarithms fall off rapidly as catch or biomass declines (Figure 4.1.4.1-1) so low levels of catch and biomass get a very low performance score. Thus, a harvest policy that gets a high score for average log catch, median catch, average log biomass, or median biomass must result in relatively high catch or biomass levels that are fairly constant over the long term. Over the short term, risk averse measures like log catch reflect the fact that fishery profits eventually level off or fall as catches increase due to lower prices and increasing costs. Similarly, log biomass reflects the fact that ecological benefits of increased biomass eventually fall off as predators become satiated.

From another point of view, median biomass or catch might be of interest to managers and members of the fishing industry who are more concerned with keeping biomass or catch high in most years than with high average catch. It is possible to have high average catches when the catches in most years and median catch are low. The following simple example illustrates the potential differences between mean and median catches and the choices managers must make in choosing policies that have high average or median catch.

Year	Catch for Policy 1	Catch for Policy 2
1	100	20
2	0	20
3	0	20
Median	0	20
Average	33	30

In the example, three year simulations gave an average catch of 33 for policy 1 and 30 for policy 2. Yet, a manager might choose policy 2 (with a lower mean catch), because the catches were more consistent from year to year (i.e., median catch is higher for policy 2).

There are mathematical relationships between the median, average, and average of log transformed catch or biomass values under some circumstances. Average log catch and median catch, for example, would correspond exactly if log catch was normally distributed (back-transformed average log catch equals median arithmetic catch if log catch is normally distributed). Similarly, median catch and average catch would correspond exactly if catches were normally distributed. However, neither log catch nor catch are normally distributed under most MSY control rules (e.g., because of MAXCAT). The relationship between median, average and mean log transformed values is therefore distorted (Figure 4.1.4.1-2).

4.2 Pacific Sardine

Pacific sardine have recently increased in abundance (Deriso et al. 1996) after collapsing to very low levels in the 1960s (MacCall 1979; Murphy 1966). Sardine are a variable stock that undergoes extended periods of low and high biomass even in the absence of fishing (Soutar and Isaacs 1968; Baumgartner et al. 1992).

Considerable effort has recently gone into developing indices of abundance for sardine and new stock assessment models that use all available data (Barnes et al. 1992; Deriso 1983; Deriso et al 1996). As a result, credible stock assessment models (but with some problems described below) and biomass estimates are available. The precision of sardine biomass estimates for the most recent year tends to be low with coefficient of variations (CVs) of about 50%.

4.2.1 Current Management

Pacific sardine are currently managed by California Department of Fish and Game (CDFG) with technical assistance and data from National Marine Fisheries Service (NMFS). State regulations allow a directed sardine fishery in years when sardine spawning biomass exceeds 18,200 mt (20,000 short tons). In recent years, California sardine quotas have been set using a formula identical to the preferred option in *Amendment 7 to the FMP for Northern Anchovy* (which was rejected by NMFS) and is also included in this amendment as a status quo option (see below).

One third of the total California sardine quota is allocated to boats operating north of San Simeon Point (San Luis Obispo County, California), and two thirds is allocated to boats operating to the south. On October 15, the total remaining state-wide quota is reallocated 50/50 to the northern and southern areas. Tolerance limits for sardine (similar to incidental catch allowances in this FMP) are used to manage incidental catch and may be, by law, 15% to 45% by weight in each delivery.

4.2.1.1 Special Issues in Sardine Management

The sardine stock has increased since the early 1980s while the U.S. fishery was tightly regulated. Mexican harvests have recently increased, however, and may be sufficient to eliminate the sardine recovery even in the absence of a U.S. fishery. A small sardine fishery has developed recently in British Columbia, but is conservatively managed and unlikely to result in overfishing.

Sardine are important as forage to a large number of birds, marine mammals, and fish predators (including endangered species) although few data are available, because of the scarcity of sardine, until recently. Decisions about harvest formula options and the definition of overfishing for sardine must, therefore, consider sardine as forage. Forage and ecosystem-related goals and objectives are included in this FMP.

Of all CPS, sardine productivity is most strongly affected by environmental variation. Favorable and unfavorable periods or “regimes” for sardine tend to occur in cycles of about 60 years (Baumgartner et al. 1992). This means that periods of low abundance for sardine are probably inevitable, even in the absence of a fishery. Sensitivity to environmental regimes makes choice of MSY control rule parameters, especially CUTOFF and FRACTION, more difficult.

Monitoring and assessment efforts in recent years have been hampered by a new problem that is, ironically, a product of success in rehabilitating the sardine stock. As biomass of the sardine stock has increased, its range (which currently extends from Baja California to British Columbia) has grown beyond the fishery and survey monitoring programs in the Southern California Bight. The stock has, literally, begun to "outgrow" resources available to managers for data collection and monitoring. The most recent stock assessment for sardine (Hill et al. 1998) includes speculative estimates of sardine abundance outside the range of the surveys and fishery that are comparable to the estimated biomass within the area covered by the surveys and fishery. This means that recent stock assessments likely underestimated coast wide sardine biomass.

Use of Pacific sardine and northern anchovy for bait in West Coast fisheries makes management of CPS fisheries more complex. Fisheries for live and dead bait are small and market-limited, but essential to valuable recreational party and charter boat fisheries (and some private boats) on the West Coast that target gamefish, rockfish, and salmon. No fishtickets are collected when live bait is "landed" (estimates of landings are extrapolated from voluntary logs kept by a subset of live bait catchers). The live bait fishery generally takes less than 5,000 mt per year (mostly northern anchovy, but with increasing amounts of Pacific sardine in recent years) and is strictly market-limited, because the party and charter boat fishery is market limited. Sardine tend to be rare when anchovy are abundant and vice versa. Thus, the live bait catch is expected to be mostly sardine when sardine are abundant and mostly anchovy when anchovy are abundant. Based on this information , it is reasonable to assume that 2,000 mt per year is an upper bound on the amount of anchovy or sardine that would be caught and marketed as live bait under low biomass conditions.

Fishtickets are available for dead bait landings, but there is uncertainty about disposition (e.g., there is considerable inaccurate and misreporting so that it is difficult to distinguish between landings for human consumption, other uses, and dead bait). In the late 1980s and early 1990s, nonreduction anchovy landings averaged less than 2,000 mt per year. It seems likely, therefore, that less than 2,000 mt of CPS (anchovy and sardine) are landed and used on the West Coast each year as dead bait. Live bait is not exported and cannot be held in storage for extended periods of time. Dead bait, in contrast, is exported and can be kept in freezers for extended periods of time.

4.2.2 Simulation Model

The simulation model used to evaluate MSY control rules for sardine is described in Jacobson and Parrish (in prep.). A summary of its essential features is given below.

For MSY control rule analysis, the performance measures listed above were computed for each control rule and set of FRACTION, CUTOFF, and MAXCAT parameters over 1,000 simulated years. Each thousand year simulation was begun from the estimated stock biomass in 1996. Random numbers affecting errors in simulated biomass estimates, sea surface temperatures, and sardine recruitment were the same in all simulations. This means that random elements in the simulation were the same for all MSY control laws and parameter sets tested.

The model was based on a simple biomass dynamic model for sardine age one and older (Jacobson et al. 1994). The assumed instantaneous natural mortality rate M was 0.4 yr^{-1} and the instantaneous growth rate G was 0.1 yr^{-1} . The growth rate G was a biomass at age weighted average of $G_a=\ln(w_{a+1}/w_a)$ for ages one through five. The weights used to compute the average were proportional to the equilibrium biomass at age with zero fishing mortality. Recruits to the simulated stock at age one were assumed to weigh 80 g. All sardine age one and older were assumed to be fully vulnerable to the fishery and sexually mature.

The simulation model used a Ricker (1975) recruitment model based on sardine spawning biomass and mean sea surface temperatures at Scripps Pier, California (Jacobson and MacCall 1995). Natural variability in the stock-recruitment relationship was included by assuming log normally distributed random errors in the spawner-recruit relationship with standard deviation 0.91 (equal to the standard deviation of residuals from the Ricker model fit to actual data). Temperature data and reproductive success in the simulations were related functionally and autocorrelated so that years of good and bad recruitment success occurred in regimes of approximately a decade. The lag 1 correlation in the simulated temperature data (0.75) was approximately the same as in the actual three season temperature data (0.71). In addition, a weak 60-year cycle in simulated three season temperatures was included, because scale data for sardine indicates cycles in abundance of about 58 years (Baumgartner et al. 1992). Simulated mean three season temperature data were realistic and similar to actual data.

Simulated biomass estimates used to set quotas in the model were imprecise. Measurement errors for biomass estimates used in the simulations to set quotas were lognormally distributed with arithmetic scale CV equal to 60%. Recent sardine biomass estimates for 1997 had an arithmetic scale CV of about 50% (Hill et al. 1998), so a CV for errors in biomass estimates from stock assessments of 50% was assumed in simulations.

Catches in the simulation model were determined by applying the MSY control rule to the biomass estimate. The "quota" catch (based on the MSY control rule) was assumed to be taken exactly by U.S. and Mexican fisheries except when biomass fell to such a low level that a fishing mortality rate larger than 1.0 yr^{-1} would have been required. In addition to the quota catch, 2,000 mt of sardine per year were assumed to be taken as live bait as long as the estimated stock biomass was at least 50,000 mt (50,000 mt was treated as a default definition of an overfished stock). Biomass was never allowed to fall below five mt (a crude estimate of minimum stock size during the 1960s), and recruitment was never allowed to exceed 45 million one-year-old sardine (roughly twice the maximum estimated number of sardine recruits). The constraints on minimum biomass and maximum recruitment had little effect on results.

Changes in growth and fecundity of sardine in response to changes in biomass and environmental factors were not included in the simulation, because too little information was available. This omission was unfortunate, because recent work (Deriso 1993) indicates that variation in growth and fecundity is dramatic in sardine and effects trends in biomass. Recent growth rates, for the period when sardine biomass was low and increasing, were used in simulations. The simulation sardine stock may be more resistant to overexploitation than the real sardine stock, because relatively high recent growth rates were assumed constant over time in simulations.

The simulation model was "validated" by comparing simulated biomass levels to actual biomass estimates for 1935 through 1990. Actual landings, growth rate, and temperature data were used in the historical simulations. Historical biomass estimates and simulated biomass trajectories were similar. In addition, 1,000 year series of simulated biomass levels with no fishing were examined and appeared reasonable.

Results from the simulation model for sardine seemed to be reasonable, but results should not be regarded as precise. The model is most useful for finding patterns in simulated results that can be used to find good MSY control rule options and to evaluate the relative difference among options (e.g., mean catch is higher for option 1 than for option 2). It is not useful for estimating or predicting exact quantities (i.e., biomass next year or average catch over the next decade).

4.2.3 Simulation Model Results

Two types of MSY control rules were investigated for sardine. The first type of MSY control rules used constant FRACTIONs (i.e., FRACTION did not change from year to year). In the second type, FRACTION was a time varying estimate of the MSY exploitation rate estimated from sea surface temperature data (see below) that changed over time. For comparison, a deterministic equilibrium estimate and a stochastic estimate of F_{MSY} were also calculated.

4.2.3.1 Deterministic Equilibrium F_{MSY}

Deterministic equilibrium F_{MSY} was a "lower bound" for the set of potential MSY control rules for Pacific sardine. Deterministic equilibrium F_{MSY} is a traditional approach in which the F_{MSY} fishing mortality rate (or the associated harvest rate) is found that maximizes catch in a hypothetical deterministic stock at equilibrium. In this context, "deterministic" means no stochastic variation in recruitment, constant (i.e., average) spawner recruit parameters and no errors in biomass estimates. "Equilibrium" means after many years when the catch and stock biomass has come to equilibrium and stopped changing.

An estimate of the deterministic equilibrium F_{MSY} for Pacific sardine was calculated by running the simulation model for 1,000 years with a series of constant FRACTIONS between 0.0 and 0.6, with CUTOFF fixed at zero, MAXCAT equal to 100 million tons (effectively infinite), constant average sea surface temperatures at Scripps Pier (17.0° C), and no stochastic variation in biomass estimates or recruitment. The catch and biomass after 1,000 years were the equilibrium values associated with the FRACTION level. The FRACTION level with the highest catch was the harvest rate associated with deterministic equilibrium F_{MSY}.

As described above, the harvest rate associated with deterministic equilibrium F_{MSY} harvest rate was estimated in the simulation model with stochastic variation "turned off." We evaluated its potential performance in a stochastic sardine stock, however, by calculating performance measures (e.g., average catch and biomass) for the deterministic equilibrium F_{MSY} in the simulation model with stochastic variation "turned on."

As shown in Figure 4.2.3.1-1, deterministic equilibrium F_{MSY} for sardine corresponds to a harvest rate (FRACTION) of 8.8% yr^{-1}. Based on the (unrealistic) deterministic model used for calculations, equilibrium catch is 82 thousand mt yr^{-1} and equilibrium biomass is 933 thousand mt. Performance of the deterministic equilibrium F_{MSY} control rule in a more realistic stochastic model is described below.

4.2.3.2 Stochastic F_{MSY}

Stochastic F_{MSY} was the value of FRACTION that maximized average catch in the stochastic simulation model with a CUTOFF of zero and MAXCAT equal to 100 million tons (effectively infinite). Stochastic MSY was calculated by determining the average catch over a thousand years for a series of constant FRACTION values between 0.0 and 0.6. The FRACTION level with the highest catch was the harvest rate associated with stochastic F_{MSY}.

As shown in Figure 4.2.3.1-1, stochastic F_{MSY} for sardine corresponds to a harvest rate (FRACTION) of 12% yr^{-1}. Based on the stochastic model, the average catch at the FRACTION for stochastic F_{MSY} is 180 thousand mt yr^{-1} and the average biomass is 1,408 thousand mt. The differences between the deterministic equilibrium estimate (F_{MSY}=8.8% yr^{-1} with a catch of 82 thousand mt yr^{-1} at a biomass of 933 thousand mt) and stochastic estimate (F_{MSY}=12% yr^{-1} with a catch of 180 thousand mt yr^{-1} at a biomass of 1,408 thousand mt) illustrates the importance of considering stochasticity in management of Pacific sardine.

4.2.3.3 Simulation Model and Results for MSY Control Rules With Constant FRACTION

Simulations with constant (the same during all simulated years within a run) control rule parameters were run with FRACTION ranging from zero to one and with CUTOFF and MAXCAT ranging from zero to 1 million mt. Figures 4.2.3.3-1 to 4.2.3.3-10 give performance measures over the range of FRACTION and CUTOFF levels for MAXCAT values of 100 to 1,000 million mt in steps of 100 thousand mt.

FRACTION was the most important parameter in simulations with the default MSY control rule and most parameter values. Results also show that CUTOFF and MAXCAT can also be important, however, particularly when FRACTION is high. There were wide ranges of parameter values that gave similar results for most parameter values. For example, with MAXCAT=100 in Figure 4.2.3.3-1, there was a wide range of CUTOFF and FRACTION levels that gave average catches between 100 thousand mt and 150 thousand mt per year. Relationships among the performance variables were complex and illustrate the tradeoffs Council must make in choosing a MSY control rule to manage sardine.

MSY is central to Magnuson-Stevens Act requirements. It is, therefore, useful to identify and compare performance of MSY control rule options for sardine that maximize average catch, average log catch, median catch, and minimize the fraction of years with no catch. These options can also be compared to the performance of the status quo control rule used currently for sardine (FRACTION=20%, CUTOFF=50 thousand mt, MAXCAT=400 thousand mt), the deterministic equilibrium F_{MSY} (FRACTION=8.8%, CUTOFF=0, MAXCAT not defined) and stochastic F_{MSY} (FRACTION=12%, CUTOFF=0, MAXCAT not defined) control rules (Table 4.2.3.3-1).

One very surprising result from the simulation model for sardine is that control rule policies that maximize catch, and median catch are "pulse fishery" scenarios that have high FRACTIONs (45% to 100%), high CUTOFFs (975 thousand mt to 1000 thousand mt), and MAXCATs that range from moderate to large (300 thousand mt to 1,000 thousand mt). These options give the highest average catch, but shut the fishery down, (because estimated biomass < CUTOFF) during 37 years to 47 years out of a hundred and give highly variable catches. They are called pulse fishery scenarios, because the fishery operates intensively during pulses that are separated by years with no fishing. Thus, these policies maximize catch, but are not "sustainable" in the sense that the fishery must be often closed. They are of little interest to managers who require some fishing in every year to stabilize revenues and costs.

An important result is that the status quo control rule currently used for sardine performs relatively poorly in terms of both catch and biomass variables. Poor performance in simulations with the status quo control rule is due to the relatively high FRACTION in combination with the relatively low CUTOFF and high MAXCAT.

TABLE 4.2.3.3-1. Performance variables for various MSY control rules with constant FRACTION values. Biomass values are in thousand mt. All control rules except deterministic equilibrium F_{MSY} were evaluated in a stochastic model (see Table 4.2.5-1).

	Maximum Average Catch Policy ("Pulse Fishery")	Maximum Average Log Catch Policy	Maximum Median Catch Policy	Minimum Percent Years With No Catch Policy	Status Quo Policy	Deterministic Equilibrium F_{MSY} Policy in a Deterministic Model (Unrealistic)	Stochastic F_{MSY} Policy
MSY Control Rule Parameter							
FRACTION	45%	10%	100%	many	20%	8.8%	12%
CUTOFF	1,000	0	975	many	50	0	0
MAXCAT	1,000	300	300	many	400	Infinite	Infinite
Performance Variable							
Average Catch	208	159	173	many	151	170	176
Standard Deviation Catch	306	98	142	many	137	153	180
Average Biomass	1,307	1,754	1,675	many	936	1,756	1,332
Std. Dev. Biomass	15	45	30	many	27	44	38
Average Log Catch	3.19	4.79	3.74	many	4.33	4.78	4.66
Average Log Biomass	6.97	7.17	7.16	many	6.24	7.21	6.76
Percent Years With Biomass >400K mt	94%	91%	94%	many	61%	93%	80%
Percent Years With No Catch	47%	0%	37%	0%	5%	0%	0%
Median Catch	16	142	298	many	103	127	123
Median Biomass	1,049	1,449	1,324	many	598	1,499	1,049

4.2.3.4 Simulation Model and Results with FRACTION Dependent on Temperature

It is important to remember that sardine productivity changes substantially in response to long term environmental variation. Favorable conditions for sardine are characterized by warm sea surface temperatures in the Southern California Bight while unfavorable conditions are characterized by cold sea surface temperatures (Barnes et al. 1992). This means that the best MSY control rule in a particular year might depend on ocean conditions. Any single MSY control rule that seems to perform well for sardine over the long term or under "average" condition might actually be too aggressive (too much catch) during periods with unfavorable conditions and too conservative (too little catch) during favorable periods.

In principle, it is possible to adjust MSY control rules for sardine (including all parameters, the definition of overfishing, and the definition of an overfished stock) to account for variations in productivity and carrying capacity due to climate variability. As shown above, FRACTION is probably the most important harvest policy parameter for sardine. Jacobson and MacCall (1995) fit spawner-recruit models to sardine data and estimated F_{MSY} (similar to FRACTION) as a function of average three season sea surface temperatures. The policies explored in this section are based on Jacobson and MacCall (1985) and include FRACTION levels that depend on average three season sea surface temperatures.

The sardine simulation model was modified to evaluate options for making the MSY control rule for sardine depend on ocean conditions. The same basic MSY control rule formula was used in the modified simulation model (i.e., H = (BIOMASS-CUTOFF) x $FRACTION_t$ with H < MAXCAT), except that $FRACTION_t=F_{MSY,t}$ where $F_{MSY,t}$ was the deterministic equilibrium F_{MSY} corresponding to the mean three season sea surface temperature for year t. Thus, $FRACTION_t$ changed in each year as a function of the temperature that affected recruitment to the fishery in that year.

Deterministic equilibrium $F_{MSY,t}$ values were calculated for a range of average three-season sea surface temperatures at Scripps Pier. The calculations were based on the spawner-recruit relationship in Jacobson and MacCall (1995) and the same assumptions as in the sardine simulation model. To conform without simulation model and current sardine biology, $F_{MSY,t}$ calculations were based on 1+ sardine biomass and recruitment at age one (rather than 2+ biomass and recruitment at age two as in Jacobson and MacCall 1995). Results (Figure 4.2.3.4-1) confirm the estimate of deterministic equilibrium F_{MSY} at average sea surface temperatures described above. In addition, they support the hypothesis in Jacobson and MacCall (1995) that the deterministic equilibrium F_{MSY} is zero under cold water conditions.

For convenience in simulations, the mathematical relationship between $F_{MSY,t}$ and average three surface temperatures between 16.6°C and 18.0°C ($F_{MSY,t} < 0$ at lower temperatures) was approximated by a regression equation (R^2=100%, Figure 4.2.3.4-2):

$$FMSY = 0.248649805\ T^2 - 8.190043975\ T + 67.4558326$$

where T is the average three-season sea surface temperature at Scripps Pier, California during the three preceding seasons. The range of predicted $F_{MSY,t}$ for 16.6°C to 18°C was 0-0.62 yr^{-1}. In simulations, $F_{MSY,t}$ at temperatures < 16.6°C were zero. The warmest observed three-season temperature at Scripps Pier was 18.1°C which corresponds to $F_{MSY,t}$=0.88 yr^{-1}. In simulations, $F_{MSY,t}$ never exceeded this value.

Average temperatures in years t-1 to t-3 were used in the simulations to estimate $F_{MSY,t}$ and FRACTION in year t, because managers could not know the temperature for the same year in which a harvest guideline or quota was being set. This type of "measurement error" in sea surface temperature data is unavoidable likely unimportant, because average three-season temperatures tend to be similar from one year to the next. Another type of error due to using an equilibrium estimate of $F_{MSY,t}$ in place of FRACTION may be more important, because environmental conditions in the simulation model and actual stock vary over longer periods of time (see above). In practice, the exploitation rate used by managers will always be wrong to the extent that environmental conditions change as cohorts age. These are topics for future research,

As described above, the range of $F_{MSY,t}$ values based on historical temperature data was 0-0.88 yr^{-1}, and the corresponding range of observed average three-season sea surface temperatures was 16.1°C to 18.1°C. Based on historical temperature data, temperatures and $F_{MSY,t}$ values might range from maximum to minimum values over periods as short as a decade (Figure 4.2.3.4-3). To eliminate drastic swings in FRACTION (which could be disastrous to the fishing industry) and to avoid very large short term harvests during productive periods with high biomass (that might result in overcapitalization), $F_{MSY,t}$ harvest rates in simulated control rules were constrained to two alternate ranges. In one set of simulations, the range for $F_{MSY,t}$ (ten percent to 30%) was centered on the status-quo FRACTION=20%. In the second set of simulations, the range for $F_{MSY,t}$ (five percent to 25%) was centered on 15%, which is close to the stochastic F_{MSY}=0.12 yr^{-1} described above. The ranges used to constrain $F_{MSY,t}$ and FRACTION values were, in effect, additional parameters in the control rules that we evaluated by simulation.

Potential advantages in using a temperature-dependent FRACTION were evaluated by comparing performance over a range of CUTOFF and MAXCAT values for FRACTION = 20% and $FRACTION_t = F_{MSY}$ ($F_{MSY,t}$ constrained to ten percent to 30%, graphs not shown). For most performance measures, there were combinations of CUTOFF and MAXCAT where FRACTION=20% outperformed $FRACTION_t$=F_{MSY} and vice-versa. Control rules with $FRACTION_t$=F_{MSY} tended to perform better than control rules with FRACTION=20% as the harvest rule became more aggressive (i.e., had lower CUTOFF and higher MAXCAT values). Over the range of MAXCAT and CUTOFF values generally considered for sardine, results for control rules with $FRACTION_t$= $F_{MSY,t-1}$ were almost always better.

Control rule options for sardine can also be compared by plotting average catch versus average biomass, and median catch versus median biomass for all three types of control rules (constant FRACTION in the range five percent to 30%, temperature-dependent FRACTION in the range ten percent to 30%, and temperature-dependent FRACTION in the range five percent to 25%). For each type of control rule, runs with a wide range of other control rule parameter values (CUTOFF zero mt to 400 thousand mt and MAXCAT zero mt to 400 thousand mt) were plotted (Figure 4.2.3.4-4). Results suggest a very wide range of options for MSY control rules that would provide both high catches and relatively high sardine biomass.

4.2.4 Ancillary Options

Options not directly linked to the MSY control rule for sardine (including options for defining an overfished sardine stock and handling the live bait fishery) are described below.

4.2.4.1 Biomass Threshold Definition for Overfished Stocks

These options specify operational definitions of an overfished sardine stock. The operational definitions are all in terms of biomass thresholds. The underlying conceptual definition of an overfished stock based on National Standard 1 is given in Section 4.0.4.

Option 1 does not define a biomass threshold for sardine. Fishing at the ABC level calculated using the MSY control rule (or a reduced level designed to rebuild the stock) is allowed at all biomass levels.

Option 2 defines an overfished sardine population as one with an 1+ stock biomass on July 1 of 50,000 mt or less. No directed fishing is allowed in any year or season while the stock is overfished. The Council is required to minimize fishing mortality on an overfished stock to the extent practical and to undertake a rebuilding program which may be implicit to the MSY control rule or explicit.

Option 3 defines an overfished sardine population as one with an 1+ stock biomass on July 1 of 100,000 mt or less. No directed fishing is allowed in any year or season when the stock is overfished. The Council is required to minimize fishing mortality on an overfished stock to the extent practical and to undertake a rebuilding program which may be implicit to the MSY control rule or explicit.

4.2.4.1.1 Options and Analysis

The Council chose Option 2. The operational definition of an overfished stock in Option 2 (50,000 mt) is the same as the CUTOFF parameter in the control rule currently used by California to manage the sardine fishery. Thus, Option 2 is essentially status quo.

The 50,000 mt threshold definition of an overfished stock should have little effect on expected catches or biomass, because the MSY control rule options for sardine (see below) have CUTOFF parameters with 50,000 mt as a lower bound (see below). Thus, fishing is expected to be precluded at estimated stock biomass levels as low as 50,000 mt based on the MSY control rule alone. The 50,000 mt threshold does, however, provide an extra margin of protection for the stock, because the MSY control rule could not be changed to allow fishing at lower biomass levels without changing the definition of overfishing.

The 50,000 mt threshold definition for an overfished sardine stock is more conservative than required under the Magnuson-Stevens Act. A 100,000 mt threshold definition of an overfished stock is more conservative yet and would preclude even small amounts of catch at biomass levels that have supported the California fishery in recent years while the stock was increasing at about 40% per year, on average.

None of the overfished stock options would not be enough, in themselves, to ensure rebuilding of an overfished stock in less than ten years on average. Rebuilding programs would be implemented implicitly in the MSY control rule or explicitly by the Council when a stock becomes overfished.

Both the 50,000 mt and 100,000 mt thresholds are biomass levels that can be measured to a reasonable level of precision by a variety of methods.

4.2.4.2 Live Bait Harvest Between the Definition of Overfishing and CUTOFF

These options concern operation of the small but important live bait fishery for sardine at biomass levels between the definition of an overfished stock and the CUTOFF. The options are relevant only if the Council adopts a threshold definition for an overfished sardine stock and a CUTOFF that is higher than the overfished stock threshold. The question addressed by these options is whether the live bait fishery should be allowed to operate when estimated biomass falls below the CUTOFF (and other directed fishing is precluded), but is still above the definition of an overfished stock.

Option 1 does not allow the live bait fishery to harvest sardine when the estimated sardine biomass is lower than the CUTOFF, but above the threshold definition of overfishing.

Option 2 allows the live bait fishery to harvest sardine when the estimated sardine biomass is lower than the CUTOFF, but above the threshold definition of overfishing. This option does not prevent the Council from undertaking any measure authorized under this FMP that may be necessary to manage the live bait fishery and sardine stock. The live bait fishery could, for example, be managed by harvest guideline or quota, season or gear restrictions at any point under the framework management process.

4.2.4.2.1 Options and Analysis

The Council chose Option 2. As described above, the live bait fishery is small, but economically important, because it supplies necessary bait to valuable recreational fisheries along the West Coast. The live bait fishery is market limited and is unlikely to increase in size. Sardine catch in the live bait fishery is expected to be less than 2,000 mt per year and is likely to be much smaller when stock biomass is low and other species (e.g., anchovy) are available. Option 2 does not preclude the Council's ability to close or manage the live bait fishery under normal procedures or any conditions if the need arises. All of the MSY control rule options discussed below were simulated assuming a constant live bait catch of 2,000 mt per year.

4.2.5 Maximum Sustainable Yield Control Rule Options for Sardine

There were an infinite number of options that would meet the requirements of the Magnuson-Stevens Act. A number of secondary considerations were, therefore, used to narrow the range of potential options for further consideration. In particular, options for the sardine MSY control rule for sardine were chosen to :

1. Give comparable or higher biomass and catch than the status quo and deterministic equilibrium F_{MSY} control rules (this is a restatement of a key requirement in the Magnuson-Stevens Act and National Standards). Biomass and catch were measured in terms of both averages and medians.
2. Give an expected or "average" time of ten years or less for rebuilding an overfished stock (this is a restatement of a key requirement in the Magnuson-Stevens Act and National Standards).
3. Minimize the percentage of years with no catch due to estimated biomass less than the CUTOFF (in simulations, CUTOFF was assumed to be larger than or equal to the threshold definition of an overfished stock).
4. Minimize changes in control rule parameters from the status quo.
5. Have relatively low CUTOFF and high FRACTION values.
6. Have MAXCAT high enough to allow substantial harvests and revenues in the U.S. fishery when sardine are abundant without risk to the stock, without generating extreme variability in ABC levels, and without encouraging overcapitalization during short periods of very high catch levels.

In priorities 1 through 3 listed above, biomass gets higher priority than catch, because sardine are a key forage species in the California Current Ecosystem utilized extensively by fish, bird, and marine mammal predators that include endangered and threatened species.

Priorities 4 through 6 address priorities suggested by the CPS Advisory Subpanel. They stem from an interest in maintaining a predictable and consistent flow of catch and revenues over time. The pulse fishery control rule that maximized average catch (see above) was excluded as an option on this basis, because the variance in catch and percent years with no fishery were unacceptably high, and the median catch was very low.

Thirteen options (options A through M) for the sardine MSY control rule were developed (Table 4.2.5-1, Figures 4.2.5-1 and 4.2.5-2). In all options, sardine biomass used in the control rule to specify harvest levels in season t beginning July 1 is the estimated biomass at the beginning of season t-1.

TABLE 4.2.5-1. MSY control rule options for Pacific Sardine. All options evaluated in a stochastic model.

	Option A (Status Quo)	Option B	Option C	Option D	Option E	Option F	Option G	Option H	Option I	Option J	Option K	Option L (Stochastic F_{MSY})	Option M (Determ. Equil. F_{MSY} in a Stochastic Model)
Overfishing Definitions													
Overfishing Rate	Catch> ABC	Catch> ABC	Catch> ABC	Catch> ABC	Catch> ABC	Catch> ABC	Catch> ABC	Catch> ABC	Catch> ABC	Catch> ABC	Catch> ABC	Catch> ABC	Catch> ABC
Overfished Threshold (mt)	50	50	50	50	50	50	50	50	50	50	50	50	50
Control Rule Parameters													
FRACTION	20%	F_{MSY} (10-30%)	20%	F_{MSY} (10-30%)	F_{MSY} (10-30%)	F_{MSY} (5-25%)	F_{MSY} (5-15%)	F_{MSY} (5-15%)	F_{MSY} (5-25%)	F_{MSY} (5-15%)	F_{MSY} (10-30%)	12%	8.8%
CUTOFF	50	50	100	100	100	100	100	100	100	150	50	0	0
MAXCAT	400	400	400	400	300	400	400	300	300	200	200	Infinite	Infinite
Performance Measure													
Average Catch	151	159	165	171	165	177	179	169	169	145	141	180	170
Std. Dev. Catch	137	140	140	143	113	143	133	105	112	67	72	180	153
Mean Biomass	936	964	1,073	1,091	1,280	1,216	1,543	1,665	1,400	1,952	1,516	1,408	1,784
StdDev Biomass	27	27	29	28	34	32	39	42	37	49	43	39	43
Mean Log Catch	4.33	4.46	4.44	4.54	4.64	4.62	4.77	4.80	4.70	4.76	4.65	4.72	4.77
Mean Log Biom	6.24	6.37	6.50	6.59	6.75	6.74	7.06	7.15	6.89	7.34	6.87	6.89	7.24
Percent Years Biomass>400	61%	64%	70%	73%	79%	81%	90%	92%	84%	96%	79%	84%	93%
Percent Years No Catch	5%	2%	7%	4%	3%	2%	1%	0%	1%	0.5%	1%	0%	0%
Median Catch	103	104	119	121	148	131	140	156	158	182	188	128	127
Median Biomass	598	600	700	748	898	850	1,248	1,349	1,048	1,648	1,099	1,500	1,049

4.2.5.1 Analysis

As described above, the control rule that maximizes average catch is a pulse fishery approach with a very high CUTOFF, MAXCAT, and FRACTION that was not included as an option, because the percentage of years with no catch was very high (47%). To develop options that were not pulse fisheries, but gave relatively high catch and biomass levels, it was necessary to reduce the CUTOFF and MAXCAT levels. In addition, it is necessary to reduce FRACTION and/or make it temperature-dependent (Figures 4.2.5-1 and 4.2.5-2).

The deterministic equilibrium F_{MSY} Option M (with parameters chosen based on a deterministic model) performed surprisingly well in the more realistic stochastic model. It had nearly the highest average biomass and relatively high average catch levels. Median biomass was also high, but median catch was relatively low. Option M performed well in terms of biomass, because of the low FRACTION (8.8% per year).

As described above, deterministic equilibrium F_{MSY} (Option M) is the lower bound on the family of acceptable MSY control rules for sardine. The goal was to find options that performed as well or better in terms of biomass and catch levels. Based on these criteria, options A through F (which include the status quo Option A and several variations on the status quo) are not recommended. Options G through L, which include stochastic F_{MSY} (Option L) and temperature-dependent control rules seem to give biomass and catch levels that are comparable to deterministic equilibrium F_{MSY} levels. Two factors make it difficult to choose amongst options G through L in terms of performance (but see discussion of the CUTOFF below). The first factor is uncertainty in results from the simulation model. The second factor is uncertainty about which performance variables are most important to policy makers (e.g., average biomass or median biomass). Options G through L are, in effect, designed to maximize different performance variables or combinations of performance variables.

In making decisions about MSY control rules for sardine, it is important to remember that results from the simulation model may overstate potential benefits of a temperature-dependent MSY control rule, because the nature of the relationship between the environment and sardine productivity is uncertain in the real world, but assumed known with certainty in the simulation analyses. This is a topic for future research.

4.2.5.2 The CUTOFF for Sardine

The simulation model demonstrates that it is possible to obtain good results "on average" with a CUTOFF of 50 thousand mt, but it is important to remember sardine productivity changes substantially in response to decadal scale environmental variation. An ABC harvest rate based on any MSY control rule might be too high in some years during unproductive conditions and too low in some years during productive conditions. The CUTOFF parameter used in MSY control rules for sardine and options for adjusting FRACTION based on environmental conditions tend to mitigate this problem, because the ABC harvest rate (catch/biomass) is reduced as biomass declines. These benefits from CUTOFF increase with larger CUTOFF values.

In considering the importance of the CUTOFF parameter in simulations for sardine, it is important to remember that (1) simulation and other analyses (Jacobson and MacCall 1995; Soutar and Isaacs 1974) indicate that low sardine biomass levels may occur even in the absence of a fishery; and (2) the simulation analysis assumed that the <u>whole</u> stock is managed according to the MSY control rule (i.e., harvests in U.S. and Mexican waters do not exceed the ABC harvest level calculated using the MSY control rule). CUTOFF levels in the sardine fishery may be very important in the short term while sardine biomass is low or if lack of cooperative management with Mexico or Canada results in over harvest and increased frequency of low sardine biomass levels.

A simple compound interest model is one way to appreciate the importance of CUTOFF for sardine, particularly in rebuilding overfished stocks. During 1983 through 1996, a period of favorable environmental conditions, sardine biomass increased at an average rate of about 30% per year. The actual rate of biomass production was probably higher (about 40%), because some fishing occurred. Spawning biomass in 1983 was about 5,000 mt, and biomass in 1997 was about 500,000 mt. The average biomass under MSY control rule options G through L in Table 4.2.5-1 are all around 1.5 million mt. For the sake of discussion, assume that the MSY biomass for Pacific sardine is about 1.5 million mt.

Results (Table 4.2.5.2-1) from the simple compound interest simulation model assuming various levels of biomass in 1983 and a compound interest rate of 40% show how much larger current biomass (estimated to be about 500 thousand mt in 1997) might have been if a management measure similar to CUTOFF had been used in managing the historical sardine fishery.

The compound interest model analysis (Table 4.2.5.2-1) also shows how important CUTOFF is in rehabilitation programs for overfished sardine stocks. Note that a stock starting at five thousand mt (in effect, CUTOFF=5,000 mt) is not rebuilt to its MSY biomass level after fourteen years under high productivity conditions with no fishing. In contrast, stocks starting at 50, 100, and 400 thousand mt are rebuilt in ten, eight, and four years. The model demonstrates that "seed stocks" of 50,000 mt to 100,000 mt are likely required to achieve MSY biomass levels for sardine in ten years, even under very productive conditions. CUTOFF and threshold overfishing levels of 50,000 mt to 100,000 mt or higher would probably have increased the probability of a ten-year period of recovery in the actual sardine stock. Given that some fishing would occur as a real sardine stock was rebuilt, a CUTOFF of at least 100,000 mt might be necessary to accommodate the ten years to MSY biomass requirement in the National Standards.

4.2.5.3 Recommended Options

The CPS FMP Development Team recommends Options G through K in Table 4.2.5-1, because they give biomass and catch levels comparable or better than the deterministic equilibrium F_{MSY} Option L, and because they all have CUTOFFs greater than 50,000 mt. Options with CUTOFF = 50,000 mt might not include an implicit rebuilding program for overfished stocks that meets the ten years to MSY biomass requirement in the National Standards. As shown in the compound interest rate simulation model (see above), ten years might be required to rebuild the sardine stock from a 50,000 mt CUTOFF with no fishing. More than ten years might be required if fishing is carried out while the stock is rebuilding. It is important to remember, however, that an implicit rebuilding program is not required under the Magnuson-Stevens Act nor the National Standards. If an option with CUTOFF=50,000 mt were adopted and if the stock became overfished, it would still be possible for Council to develop an explicit rebuilding program that would meet all legal requirements.

TABLE 4.2.5.1-1. Simple compound interest model for sardine assuming 40% increase per year. The assumed MSY biomass levels are in ***italics and bold.***

	Start at 5,000 mt	Start at 50,000 mt	Start at 100,000 mt	Start at 400,000 mt
1983	5,000	50,000	100,000	400,000
1984	7,000	70,000	140,000	560,000
1985	9,800	98,000	196,000	784,000
1986	13,720	137,200	274,400	1,097,600
1987	19,208	192,080	384,160	***1,536,640***
1988	26,891	268,912	537,824	
1989	37,648	376,477	752,954	
1990	52,707	527,068	1,054,135	
1991	73,789	737,895	***1,475,789***	
1992	103,305	1,033,052		
1993	144,627	***1,446,273***		
1994	202,478			
1995	283,470			
1996	396,857			
1997	555,600			

4.3 Pacific (Chub) Mackerel

Pacific (chub) mackerel are a mainstay of the current CPS fishery and are fully utilized by fisheries in the U.S. and Mexico. Recent biomass estimates for Pacific (chub) mackerel are uncertain, because reliable indices of relative abundance are not available for tuning virtual population analyses used to assess the stock (Jacobson 1993). In contrast, historical estimate of Pacific (chub) mackerel biomass at low and moderate biomass levels (Yaremko et al. 1997) are reliable, because of convergence in virtual population analysis abundance estimates (Pope 1972). Work is currently underway to develop indices of abundance for Pacific (chub) mackerel and refine assessment models.

4.3.1 Current Management

Pacific (chub) mackerel are currently managed by the state of California. If the estimated biomass is greater than 135,000 mt, then the U.S. commercial catch is not restricted by a quota. If the biomass is between 18,200 mt and 135,000 mt, then a quota for U.S. fishers equal to 30% of the biomass above 18,000 short tons is applied. If the biomass is below 18,200 mt, commercial fishing in the U.S. stops. Thus, the status quo for Pacific (chub) mackerel is similar to a CUTOFF of 18,200 mt and FRACTION of 30%. Current regulations focus on U.S. harvests because they were developed when Mexican catches of Pacific (chub) mackerel were insignificant. In the last few years, however, catches in the U.S. and Mexico have been roughly equal and the same stock is exploited by fisheries in both countries.

4.3.2 Options

The only option for MSY control rule parameters in the Pacific (chub) mackerel fishery is a modification of the status quo. The net effect of the modification, which involves allocating total harvest between the U.S. and Mexico and limiting catches at high biomass levels, is a more conservative harvest policy. An essentially status quo approach is recommended, because the current approach is based on an analysis of historical biomass estimates (MacCall et al. 1985) that is still considered valid. It is not possible to substantially improve the analysis of historical data at this time, because recent biomass estimates are uncertain, and because staff time to conduct the analysis is not available. Improvements should be possible once a satisfactory index of relative abundance and stock assessment model are developed.

4.3.3 Recommended Option

A CUTOFF and definition of overfishing at 18,200 mt and FRACTION of 30% are recommended for Pacific (chub) mackerel. Under this option, overfishing is defined as any fishing in excess of ABC calculated using the MSY control rule. An overfished stock is defined to be one whose estimated or projected biomass is 18,200 mt or less. Fishing mortality must be reduced to the extent practical in overfished stocks. No MAXCAT is defined, because MAXCAT was not included in MacCall et al.'s (1985) simulation analysis, and because the U.S. fishery appears to limited to about 40,000 mt per year by markets. The option differs from the status quo in that a target harvest level is defined for the entire stock (not just the U.S. portion), and the target harvest level is defined for biomass levels above 135,000 mt. The recommended definition of overfishing for Pacific (chub) mackerel (18,200 mt) is lower than for sardine, because mackerel are not important as forage and there is little need to maintain a forage reserve.

The advantages of this option are that it is consistent with current management and provides a good balance between the fishery and protecting the long term productivity of the stock. A disadvantage is that harvest guidelines or quotas for U.S. fishers will be lower than recent quotas set by CDFG after harvest levels are prorated by the portion in U.S. waters. Total target harvest levels, U.S. harvest levels, and annual exploitation rates over a range of biomass levels are given in Table 4.3.3-1.

The option recommended for Pacific (chub) mackerel is consistent with the goals and objectives listed in the FMP. In particular, it attempts to manage CPS throughout their range (despite the lack of a management agreement with Mexico), achieves OY, prevents overfishing, and uses resources spent on management of CPS efficiently.

TABLE 4.3.3-1. Summary of total harvest, U.S. harvest, and annual exploitation rates for a range of Pacific (chub) mackerel biomass levels under the recommended MSY control rule and definition of overfishing option. Biomass and harvest levels are in mt. The annual exploitation rate differs from FRACTION (25%), because FRACTION is applied to the biomass minus the CUTOFF.

Biomass	Total Harvest	U.S. Catch*	Annual Exploitation Rate
10,000	0	0	zero percent
20,000	540	378	three percent
30 000	3,540	2,478	12%
40,000	6,540	4,578	16%
50,000	9,540	6,678	19%
60,000	12,540	8,778	21%
70,000	15,540	10,878	22%
80,000	18,540	12,978	23%
90,000	21,540	15,078	24%
100,000	24,540	17,178	25%
200,000	54,540	38,178	27%
400,000	114,540	80,178	29%
500,000	144,540	101,178	29%
600,000	174,540	122,178	29%

* Assuming 70% of stock in U.S. waters

4.4 Monitored Stocks

Northern anchovy (northern and central subpopulations), jack mackerel, and market squid will be Monitored at the outset of the CPS FMP. Default MSY control rule and overfishing specifications are recommended for use with these Monitored stocks.

MSY catch and biomass estimates used to calculate ABC and overfishing definitions based default MSY control rule parameters are summarized below. Details are given on a species-by-species basis in the sections that follow. As for other CPS, MSY catch should be viewed as a rough indicator of stock productivity and long-term average harvest potential rather than as a management goal, because stock size and potential catches may vary dramatically from year to year (Beddington and May 1977).

Recommended ABC levels and overfishing definitions for Monitored species based on the default MSY control rule

Species and Stock	ABC for Entire Stock	ABC in U.S. Waters
Northern Anchovy (Northern Subpopulation)	25% of MSY catch (MSY catch not available)	not available
Northern Anchovy (Central Subpopulation)	31,000 mt yr^{-1}	25,000 mt yr^{-1}
Jack Mackerel	48,000 mt yr^{-1}	31,000 mt yr^{-1}
Market Squid	25% of MSY catch (MSY catch not available)	not available

The recommended ABC and overfishing definitions for CPS stocks that are Monitored are compatible with the Magnuson-Stevens Act and with the goals and objectives of the CPS FMP. In particular, they promote full fishery utilization based on ecosystem based principles, help achieve OY, provide adequate forage for dependent species, and prevent overfishing.

4.4.1 Northern Anchovy-Central Subpopulation

MSY for northern anchovy in the central subpopulation is estimated to be 123,000 mt per year at a total biomass level of about 733,000 mt (Conrad 1991). The recommended default MSY control rule gives an ABC for the entire stock equal to 25% of 123,000 mt or 31,000 mt.

Data in Section 4.1.3.2 indicate that about 82% of the stock is resident in U.S. waters. ABC in U.S. waters is, therefore, 82% of 31,000 mt or 25,000 mt.

Northern anchovy (central subpopulation) support negligible amounts of fishing at this time, but the stock is important as forage for many predators. A stock assessment model, catch (U.S. and Mexico), and abundance data (from CalCOFI surveys and fishspotters) are available (Jacobson et al. 1994). It would, therefore, be advisable to assess the status of the central subpopulation of northern anchovy on some periodic basis.

4.4.2 Northern Anchovy-Northern Subpopulation

The northern subpopulation of anchovy ranges from San Francisco north to British Columbia with a major spawning center off Oregon and Washington that is associated with the Columbia River plume. The northern subpopulation supports small, but locally important, bait fisheries and is likely an important source of forage to local predators, including depleted and endangered salmonid stocks.

The recommended default MSY control rule gives an ABC for the entire stock equal to 25% of MSY catch, but MSY catch has not been estimated. The portion of the northern subpopulation of northern anchovy resident in U.S. waters is unknown. It is likely that some biomass occurs in Canadian waters off British Columbia. ABC is U.S. waters cannot be calculated at this time.

Spawning biomass estimates for an area off Oregon and Washington during 1975 through 1976 based on the "Smith Larva Method" (Smith 1972) ranged from 737,000 mt to 1,005,263 mt (Richardson 1981). These estimates, based on abundance of anchovy larvae, are too high, because anchovy were erroneously assumed to spawn only once per season. Estimates of spawning biomass from the Smith Larva Method for the central subpopulation during 1964 through 1966 (Smith 1972), were about 8.6 times larger on average than more recent estimates (Lo and Methot 1989). Thus, an educated guess for spawning biomass in the northern subpopulation during 1975 through 1976, based on estimates from the Smith Larva Method and a correction factor of 8.6, is 87,000 mt to 116,000 mt. Landings of anchovy in Oregon and Washington are small (generally less than 60 mt/year) and small relative to the revised estimates of spawning biomass. However, anecdotal information and limited published accounts (Bentley et al. 1994) indicate that biomass of anchovy in the northern subpopulation may have declined in recent years.

Given the likely importance of northern anchovy in the northern subpopulation to predators, it is recommended studies currently underway to estimated biomass and productivity be continued.

4.4.3 Jack Mackerel

Although there is little evidence of subpopulations, small jack mackerel (10 cm to 30 cm FL, and up to eight years of age) are most abundant in the Southern California Bight, where they are often found near the mainland coast and islands and over shallow rocky banks. Ages 0.5 through eight are harvested by the inshore fishery off southern California. Older, larger fish (50 cm to 60 cm FL and 16 years to 30 years) range from Cabo San Lucas, Baja California, to the Gulf of Alaska, where they are generally found offshore in deep water and along the northern coastline. Large fish rarely appear in southern inshore waters. Fish of intermediate lengths (30 cm to 50 cm TL; nine years to 15 years of age) were recently found in considerable numbers around the 200-mile limit of the U.S. exclusive economic zone off southern California (SWFSC 1991).

Estimates of average potential yield (a proxy for MSY, see Gulland 1970 and MacCall and Stauffer 1983) are ranges stratified by area and age. Potential yield of jack mackerel is not meant to be an estimate of sustainable harvest but, rather, an interim limit for catches while data sufficient for management are accumulated.

Recommended ABC levels for jack mackerel was calculated by age/area from mid-range potential yield values. Data in Section 4.1.3.2 indicate that about 65% of the stock is resident in U.S. waters and ABC in U.S. waters was prorated accordingly. If jack mackerel catches increase and become significant, managers will have to decide whether to address management of different age groups and areas independently. The question does not need to be addressed at this time, because catches are low (generally less than 2,000 mt per year since 1990).

Ages (Years)	Potential Yield (thousand mt)	ABC (thousand mt)	ABC in U.S. Waters (thousand mt)
0-8	95-191	36	23
9-15	22-45	8	5
16-30	11-24	4	3
Total	128-260	48	31

4.4.4 Market Squid

The recommended default MSY control rule gives an ABC for the entire stock equal to 25% of MSY catch, but MSY catch has not been estimated. The portion of the market squid stock resident in U.S. waters is unknown. It is likely that some biomass occurs in Mexican waters off Baja California and Canadian waters off British Columbia. ABC is U.S. waters cannot be calculated at this time.

Monitored management is the preferred option for market squid, because of variability and recent low landings, current conditions in the fishery, and uncertainty about squid productivity. Historically, market squid landings in California were modest and too small to affect abundance (Appendix A, sections 1.5.4-1.5.5). Squid landings increased briefly to record levels in the late 1990s as new markets with higher prices developed in Asia, but declined to current low levels following the 1997/1998 El Niño and onset of poor economic conditions and markets in Asia. It is not known whether the markets are likely to recover in the near future and support a significant fishery for market squid.

Basic information about life history and fisheries biology is not yet available for market squid (Appendix A, Section 1.5). Biologists have no information about the stock's size and productivity. In addition, there is no reliable information about growth and maturity that could be used to manage yield or spawning biomass per recruit. Fishing grounds in shallow water (50 m) spawning grounds are known, but the total area of squid spawning grounds (which extend to over 800 m depth) is uncertain so that the potential benefits of area closures are impossible to gauge. With no information about current biomass or productivity and uncertain markets, it is impossible to judge potential benefits of arbitrary precautionary limitations on catch levels that are recommended by Restrepo et al. (In press).

Scientific research currently underway, improvements to squid port sampling, and the moratorium on new squid permits under California state law (Appendix A, Section 1.5.5) constitute a plan for stock assessment and close monitoring of fishing effort that will make it possible to manage the market squid fishery if conditions change and Active management is required. CDFG is using funds provided by industry under the state license moratorium plan to develop port sampling programs and to coordinate a focused and intensive three year research program involving state, federal, and academic biologists. Studies underway involve port sampling, age and growth, reproductive biology, stock structure, distribution and habitat utilization, location of fishing areas, characteristics of spawning areas, and means to measure and track trends in squid abundance. State law directs CDFG to develop and recommend fishery management options to the state legislature for the squid fishery management in the year 2001.

Council makes decisions about Active and Monitored management for CPS annually based on socioeconomic framework management procedures (Section 2.2.1.2). State managers under state law and federal managers under this FMP can be expected to manage the fishery intensively when sufficient data indicate a need.

Council and state authorities will continue to monitor squid landings while research continues. If landings increase or a biological risk to the stock develops, Council can be expected to promote squid to Active management quickly under the "point of concern" framework management procedures (Section 2.2.1.2).

Figure 4.1.2-1. General MSY control rule formula for CPS with no MAXCAT (CUTOFF=10% Virgin Biomass, FRACTION=20%). Note that harvest rate is always less than FRACTION and declines with biomass.

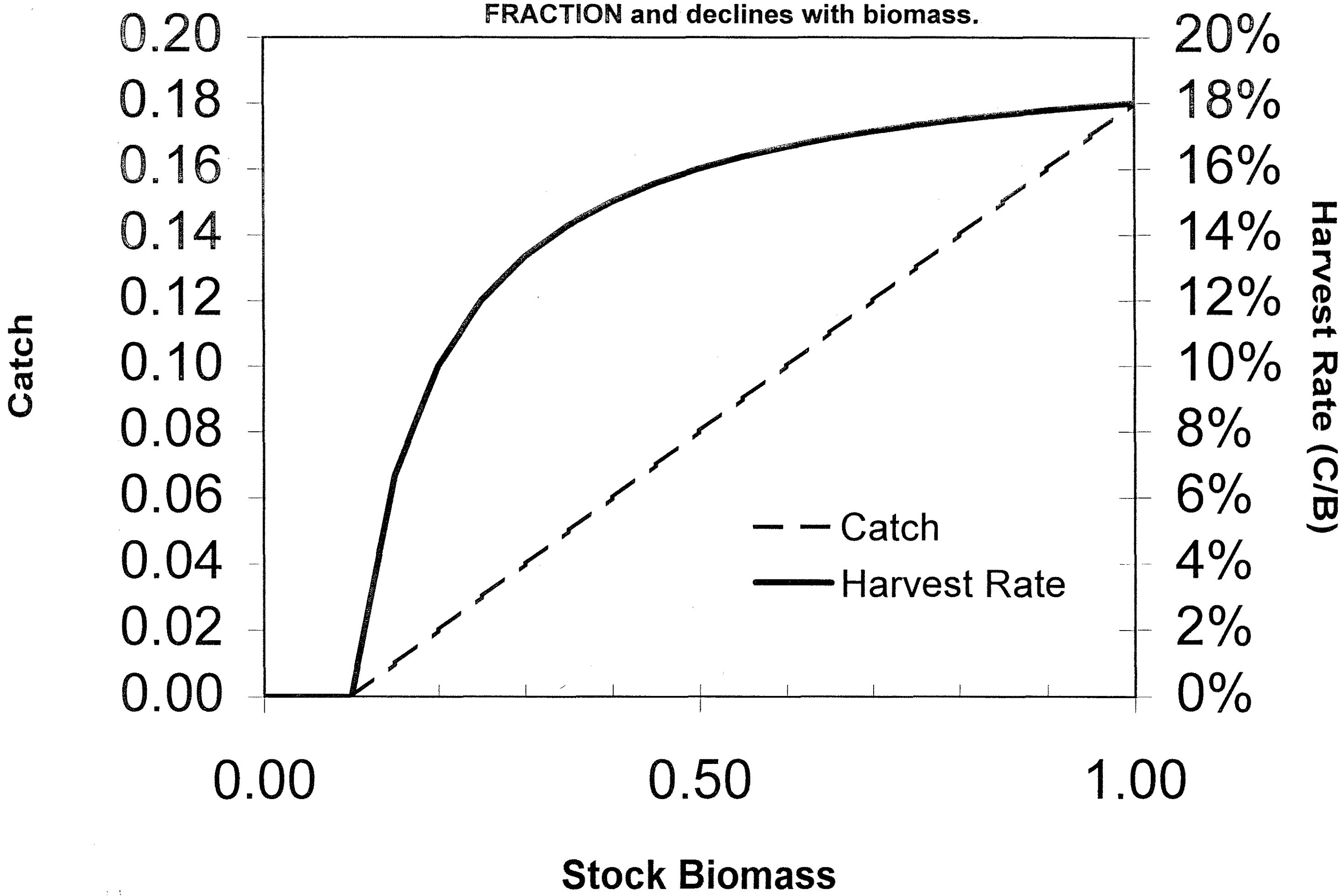


Figure 4.1.2-2. General MSY control rule formula for CPS with MAXCAT=0.10. Note that catch increases with biomass up to MAXCAT, the harvest rate is always less than FRACTION and declines at both high and low biomass levels.

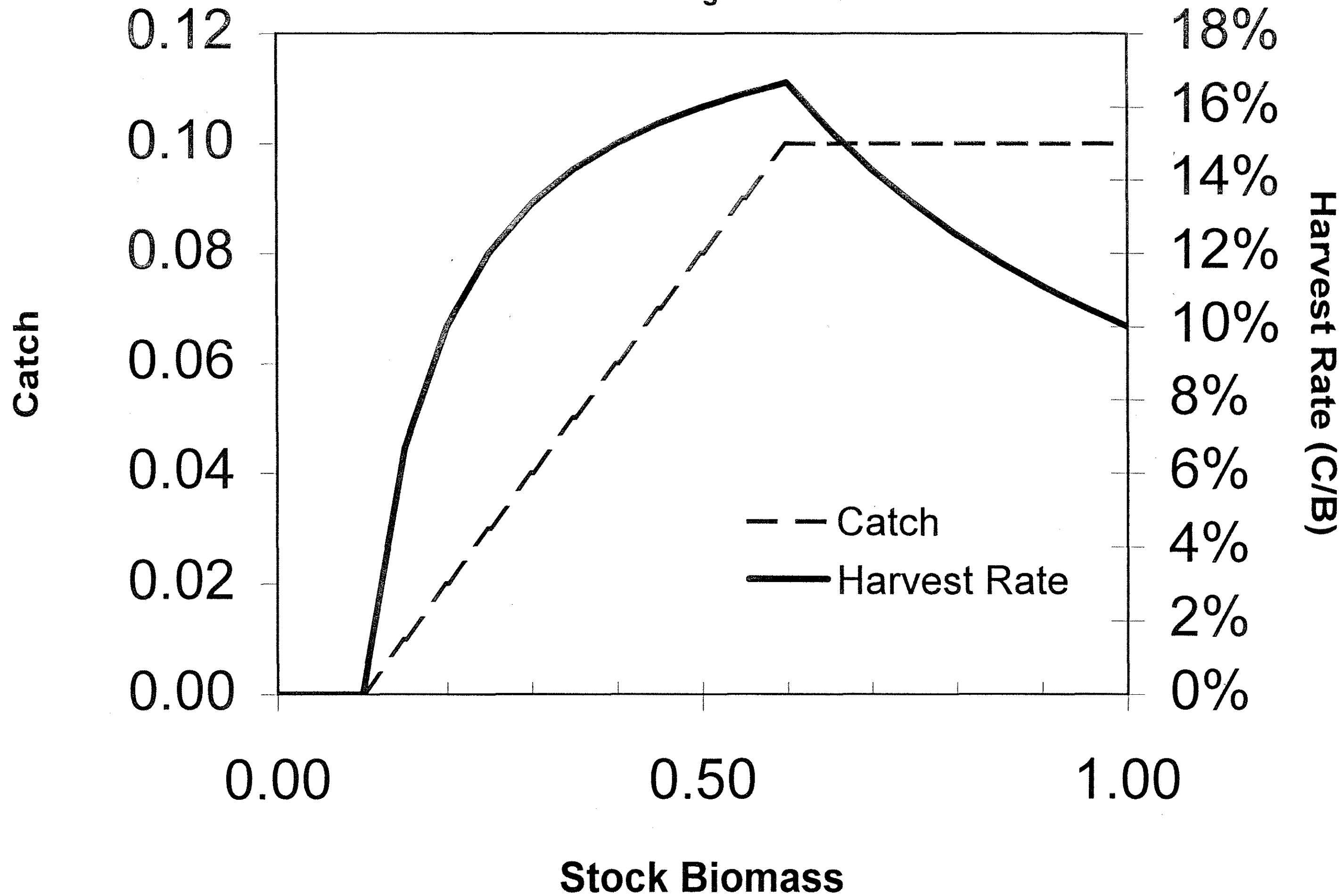


Fig. 4.1.4.1-1. Log catch and log biomass are "convex", risk averse performance measures.

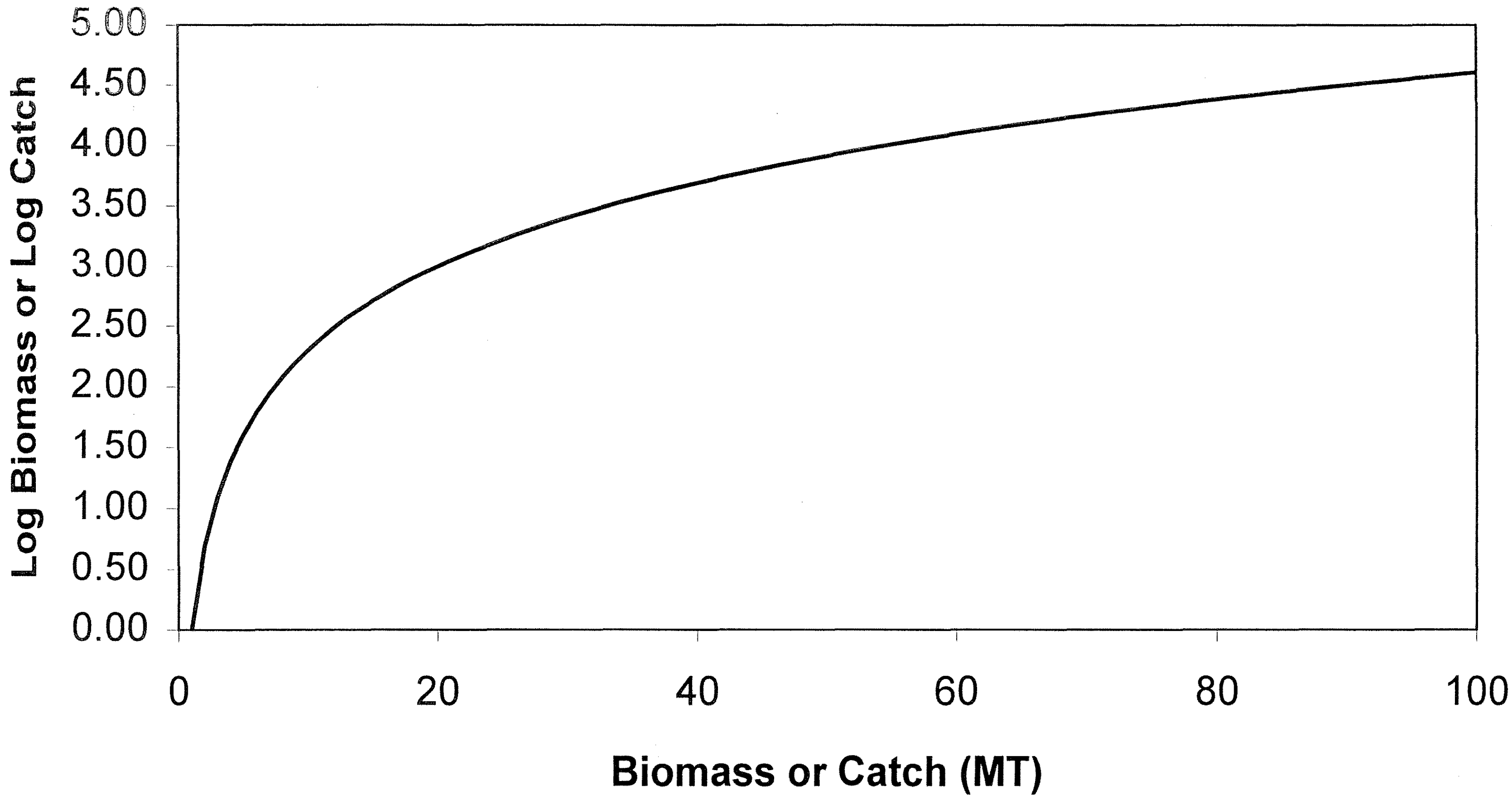


Figure 4.1.4.1-2. Simulated Catches from an MSY Control Rule

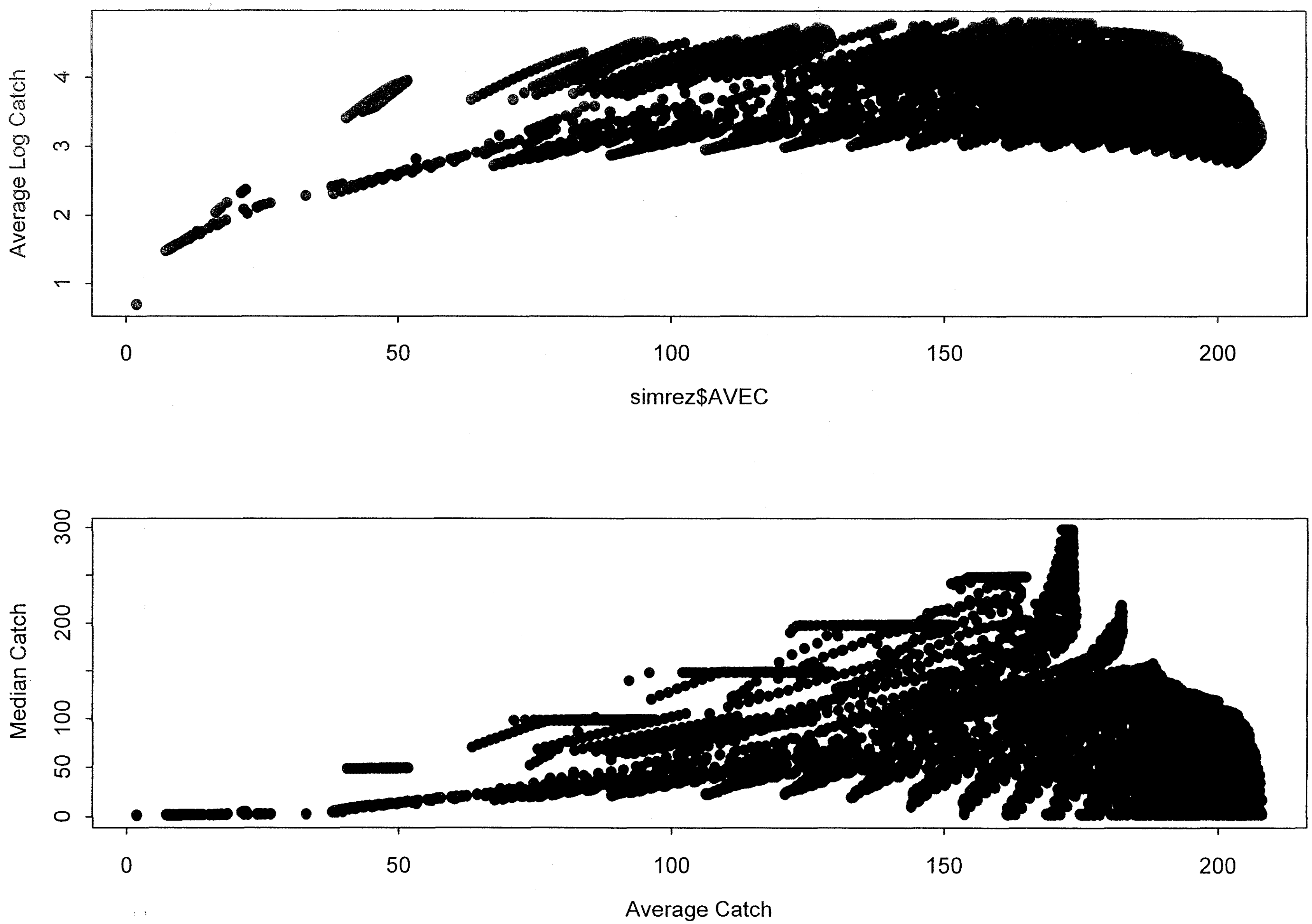


Figure 4.2.3.1-1. Deterministic equilibrium Fmsy (evaluated in a deterministic model) and stochastic Fmsy (evaluated in a stochastic model) for Pacific sardine.

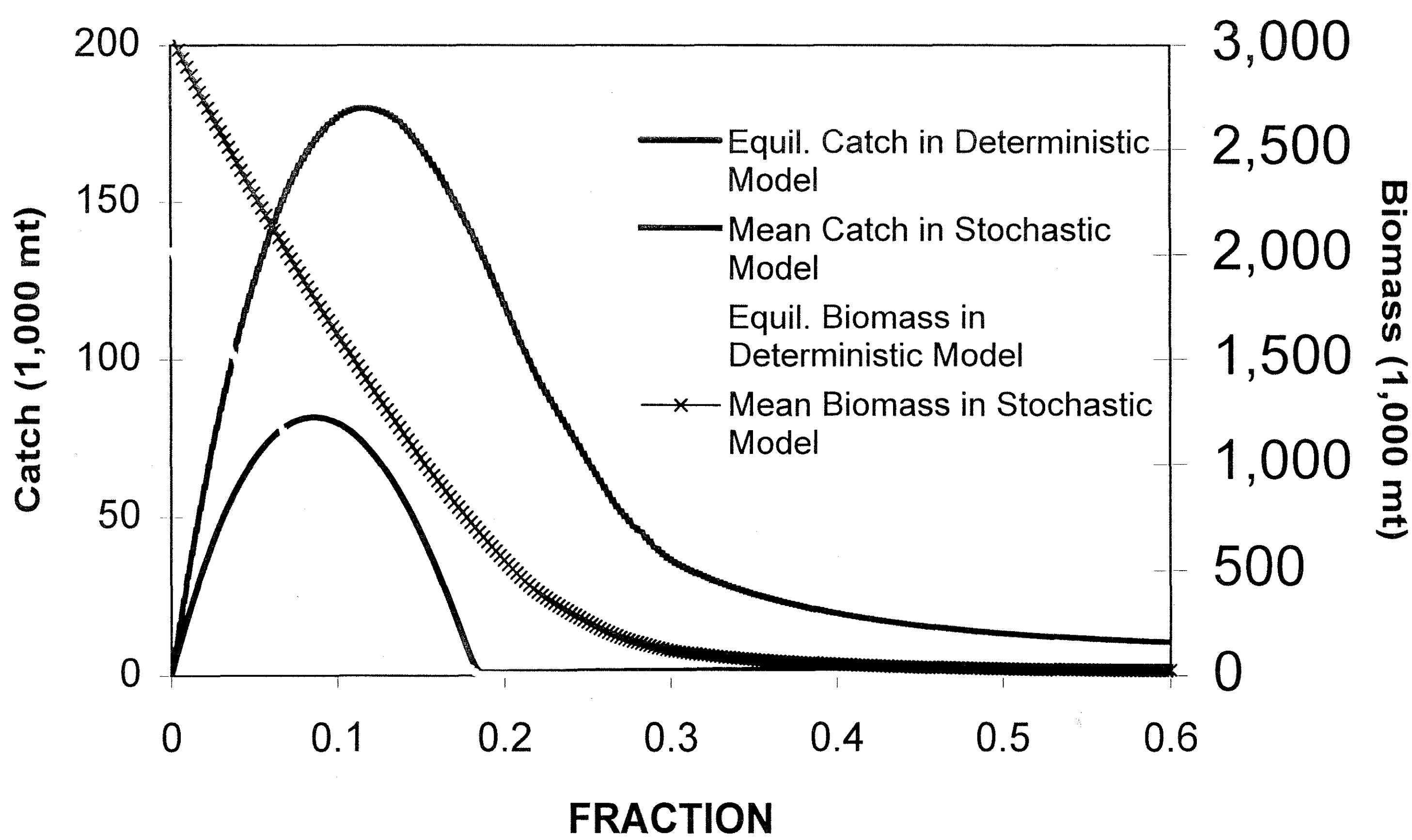
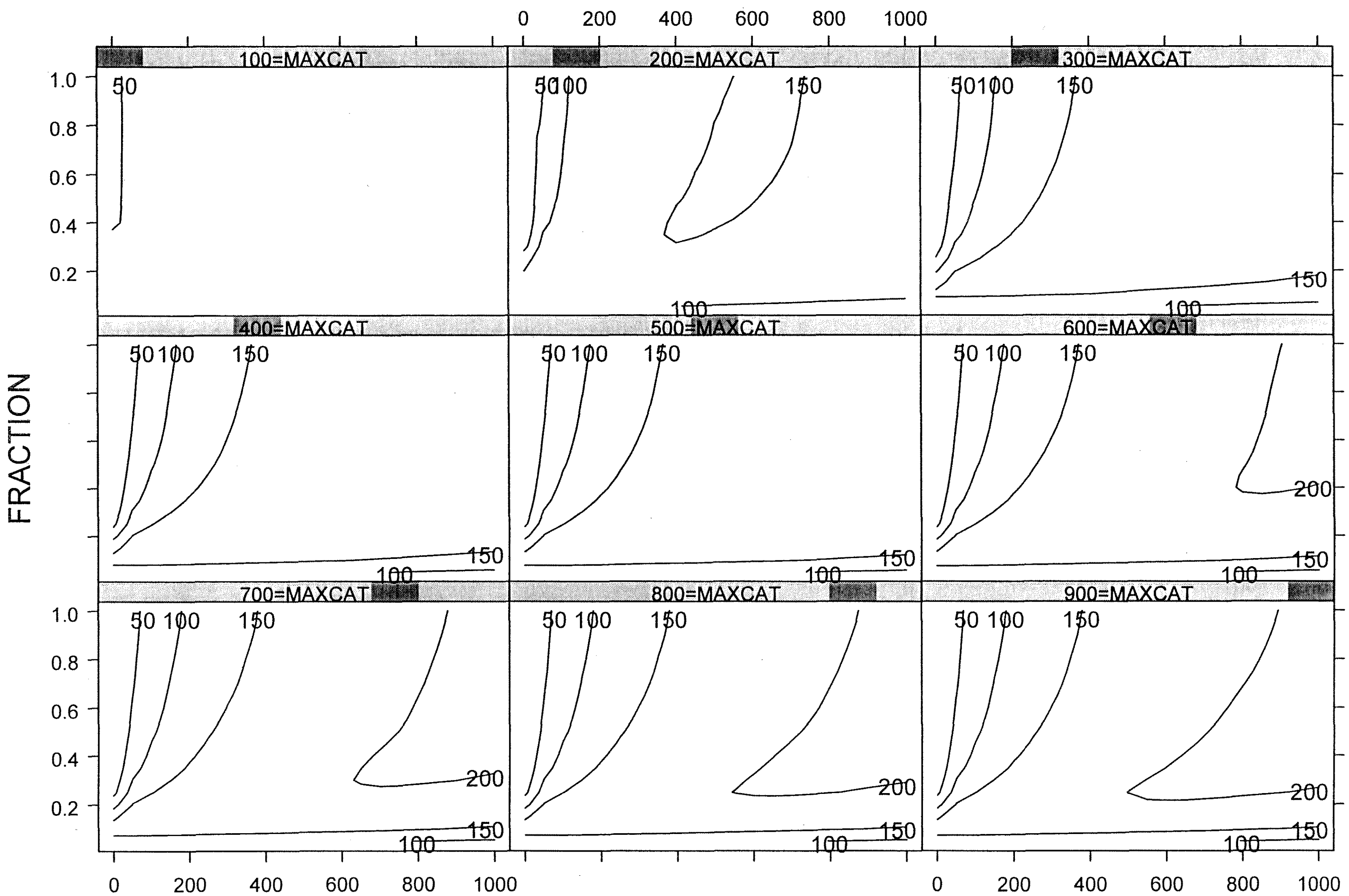


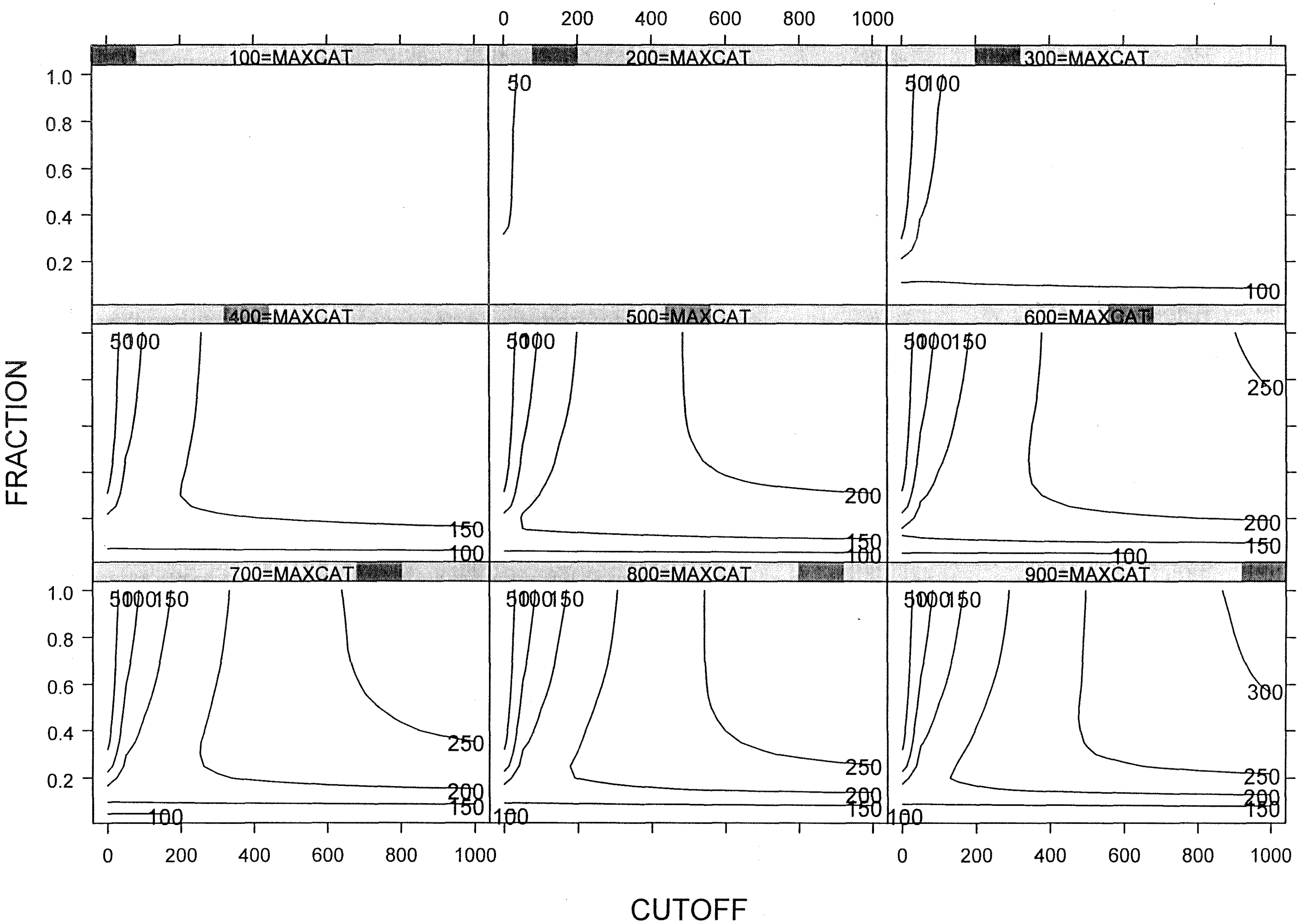
Fig. 4.2.3.3-1. Average Catch - Constant Fraction MSY Rule



CUTOFF

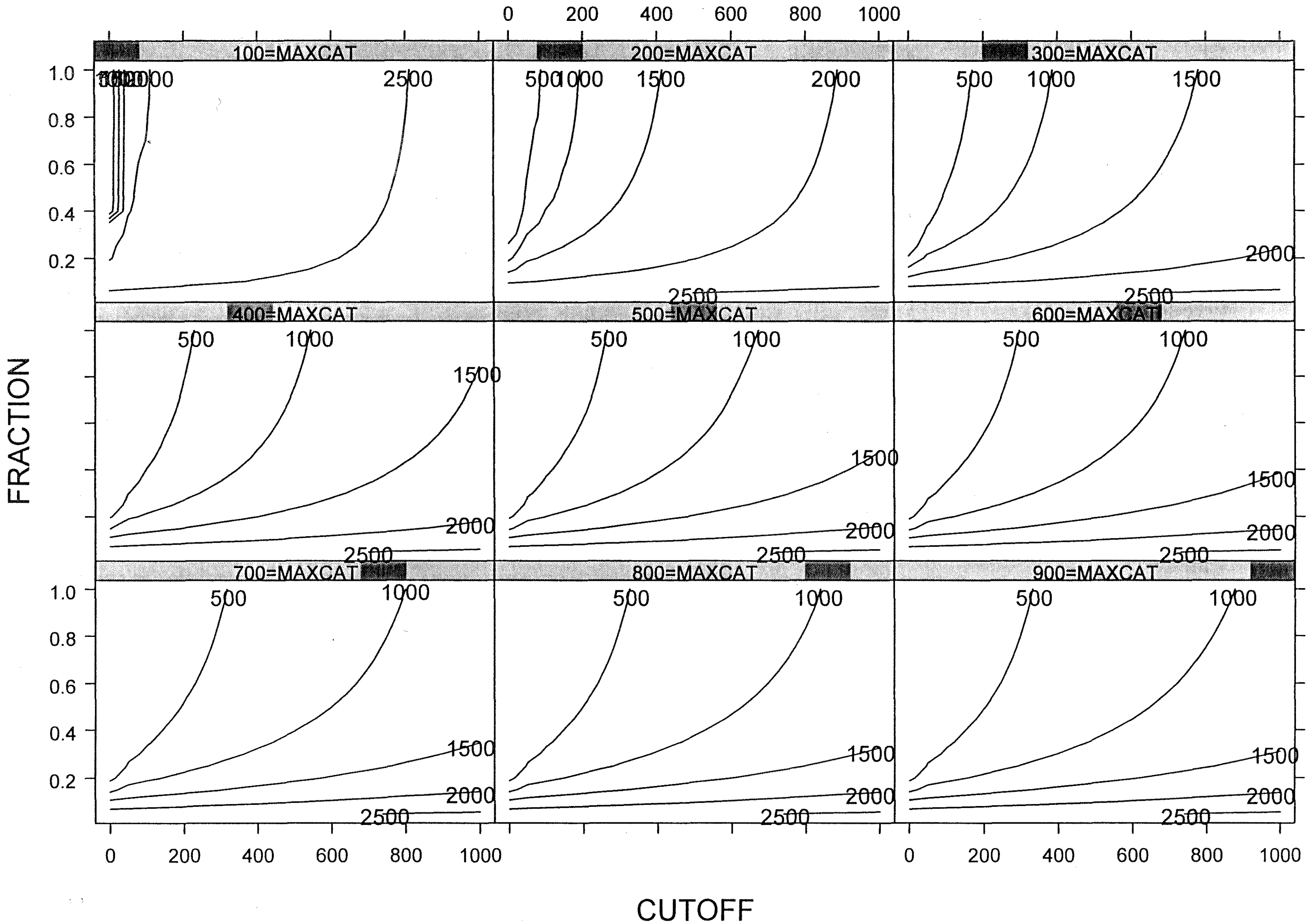
(For A Series of MAXCAT Values)

Fig. 4.2.3.3-2. Standard Deviation of Catch - Constant Fraction MSY Rule



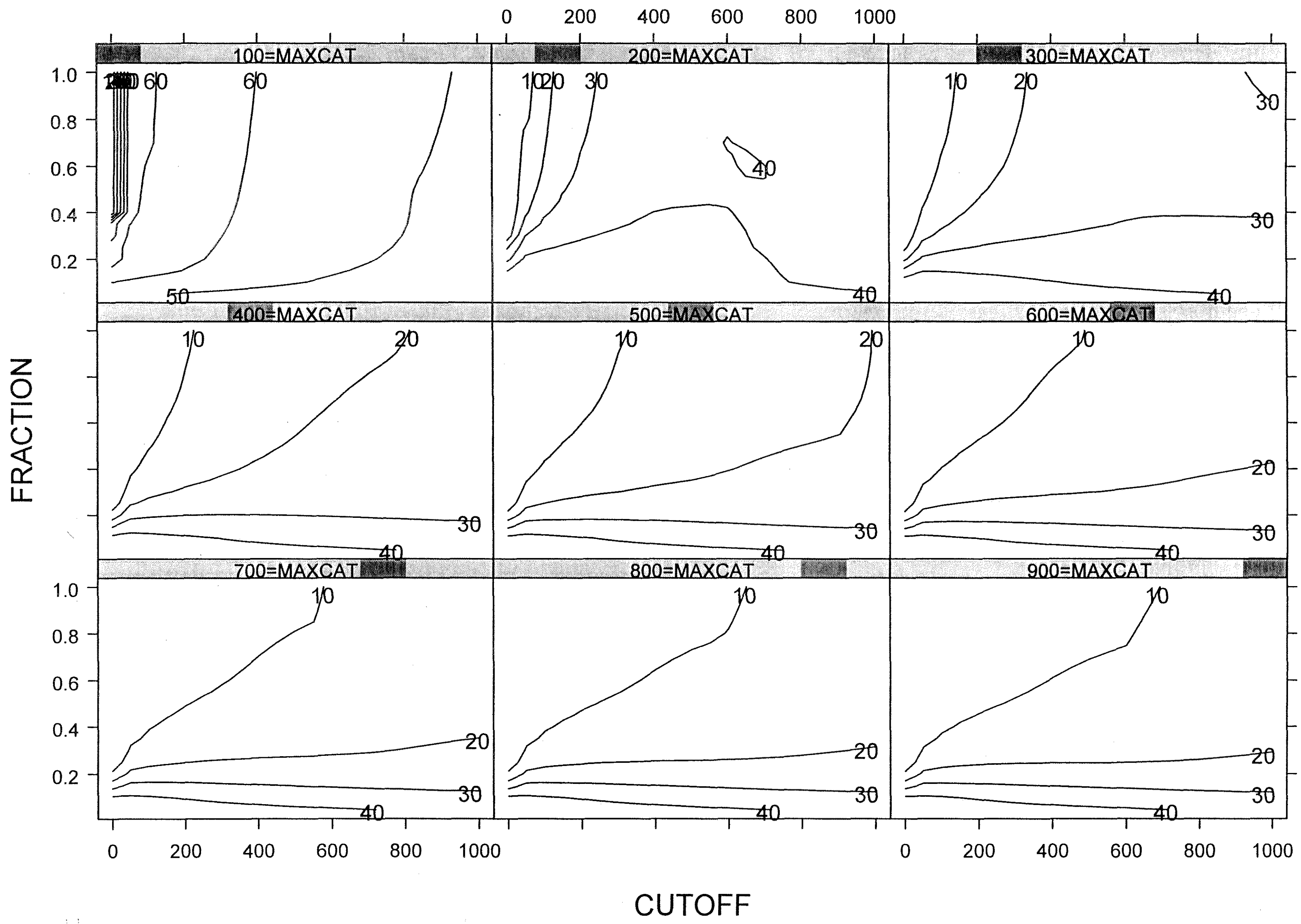
(For A Series of MAXCAT Values)

Fig. 4.2.3.3-3. Average Biomass - Constant Fraction MSY Rule



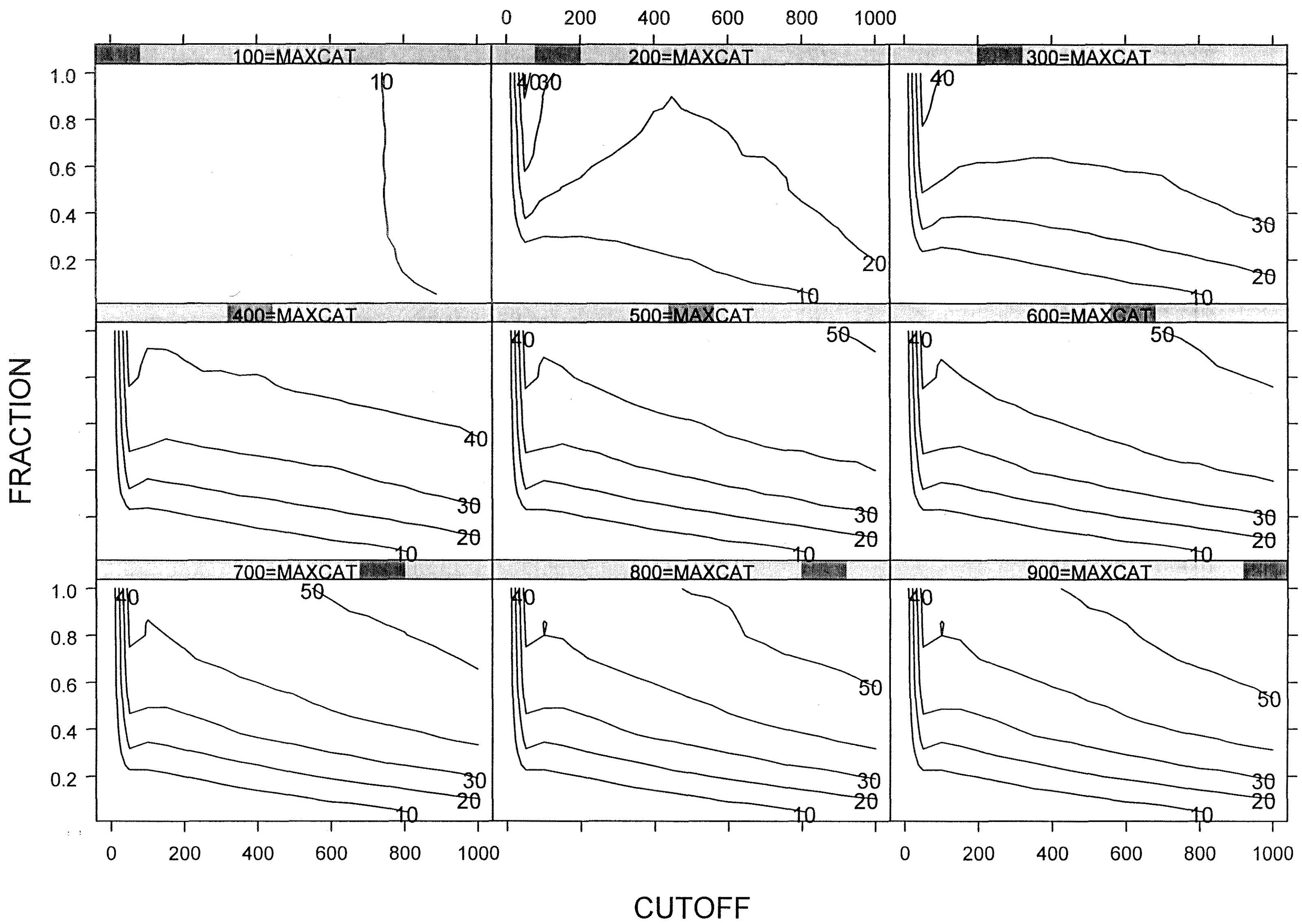
(For A Series of MAXCAT Values)

Fig. 4.2.3.3-4. Std. Deviation of Biomass - Constant Fraction MSY Rule



(For A Series of MAXCAT Values)

Fig. 4.2.3.3-5. % Years w/No Catch - Constant Fraction MSY Rule



(For A Series of MAXCAT Values)

Fig. 4.2.3.3-6. % Years Biom>400K - Constant Fraction MSY Rule

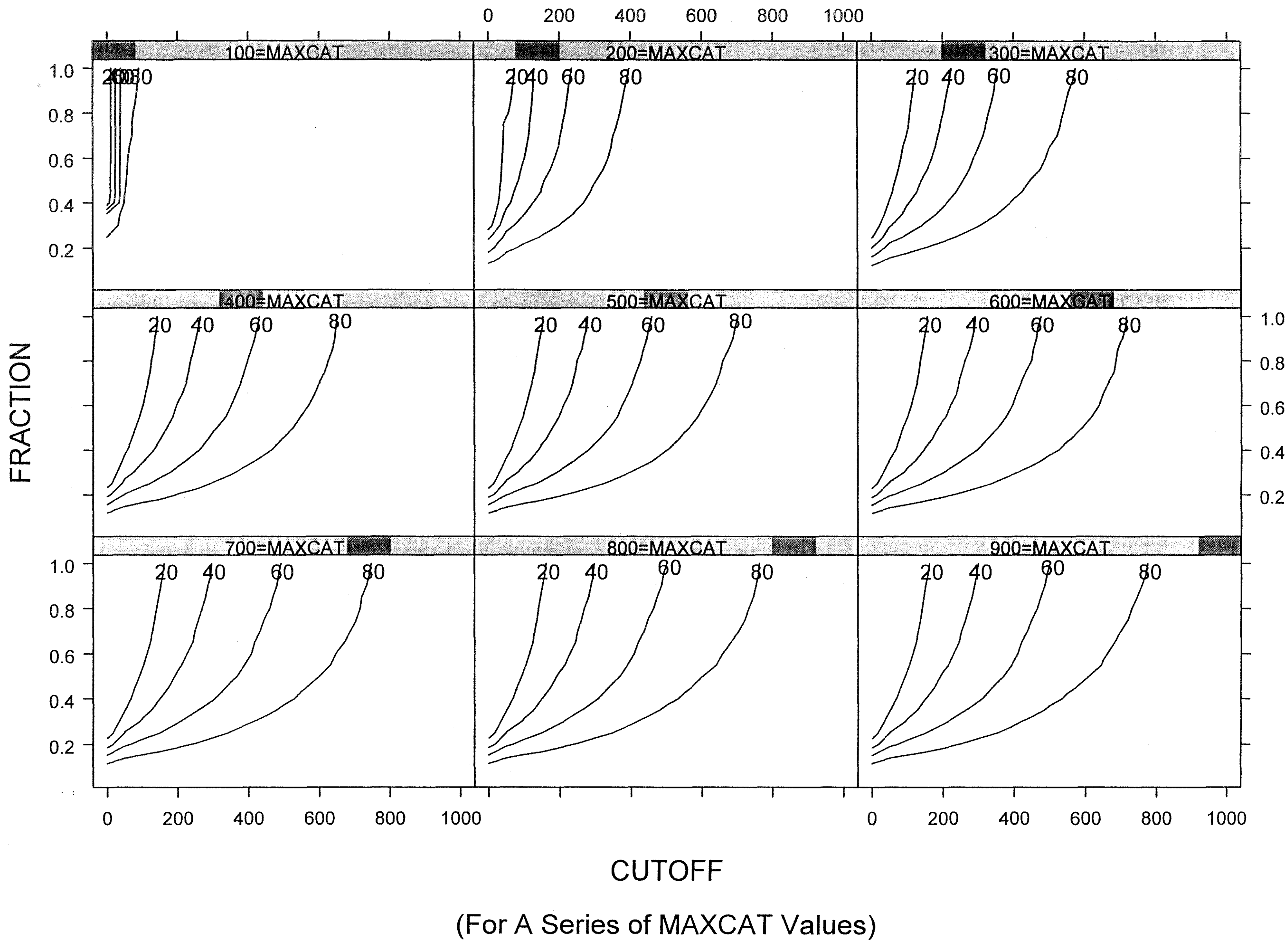
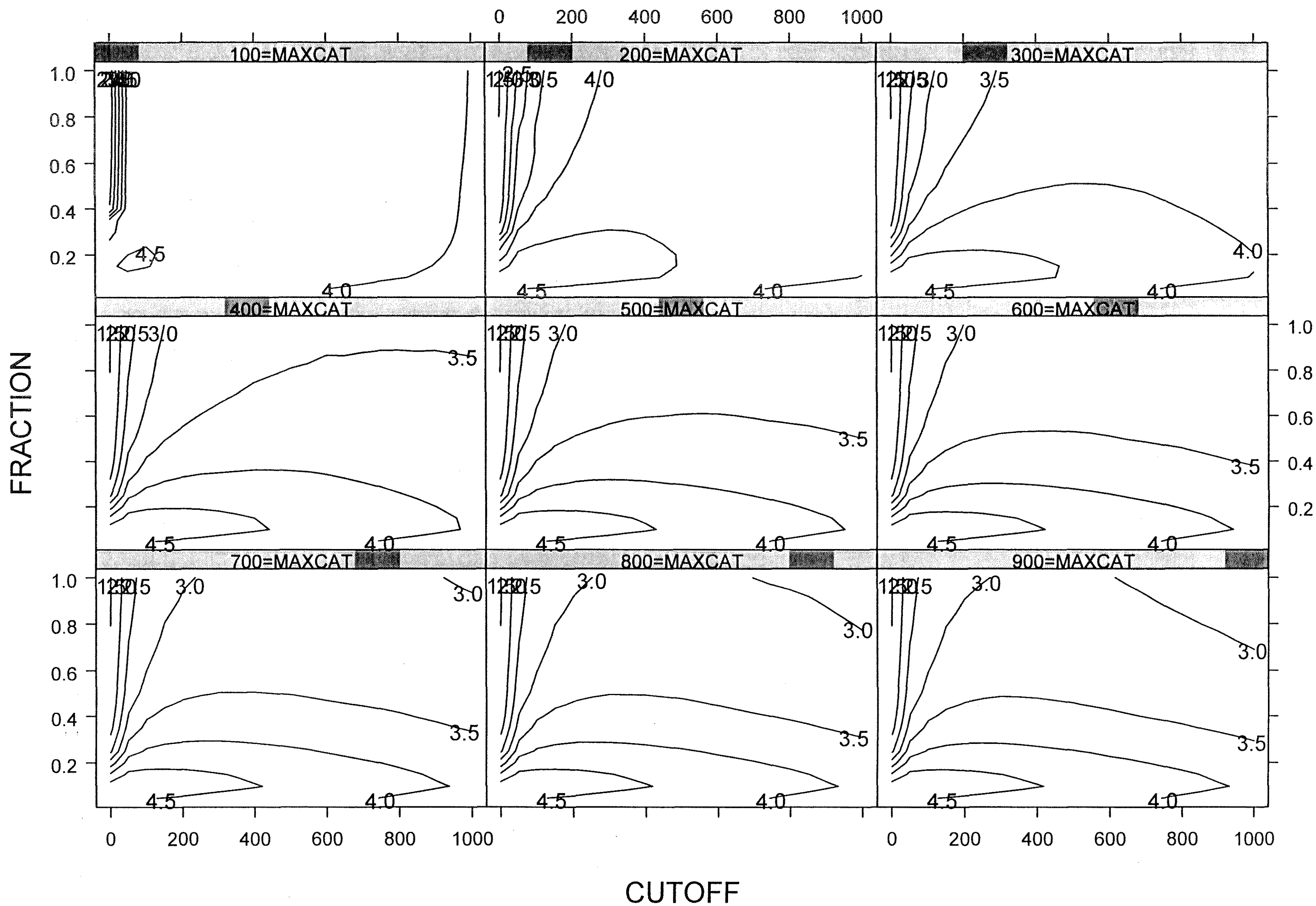
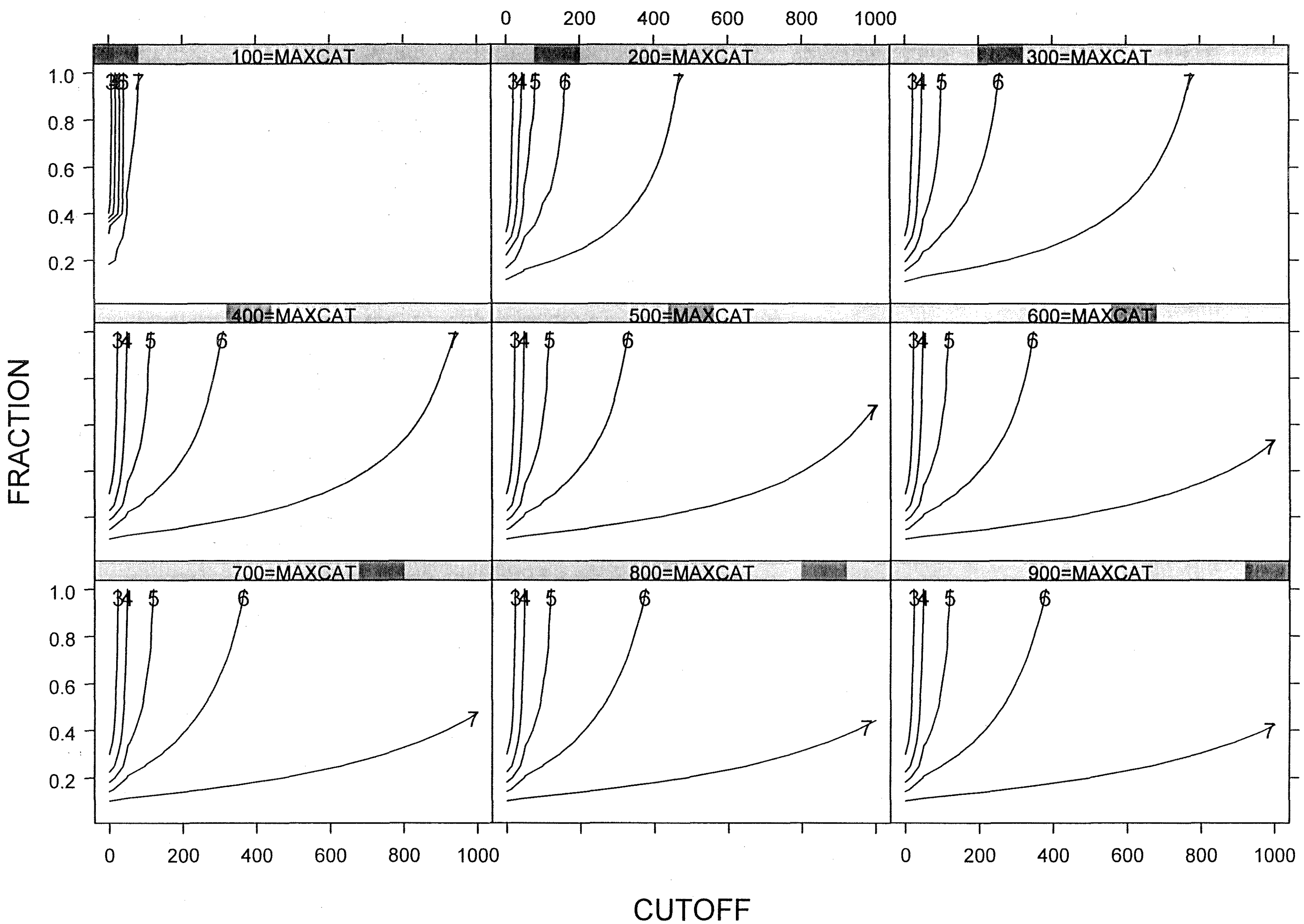


Fig. 4.2.3.3-7. Average Log Catch - Constant Fraction MSY Rule



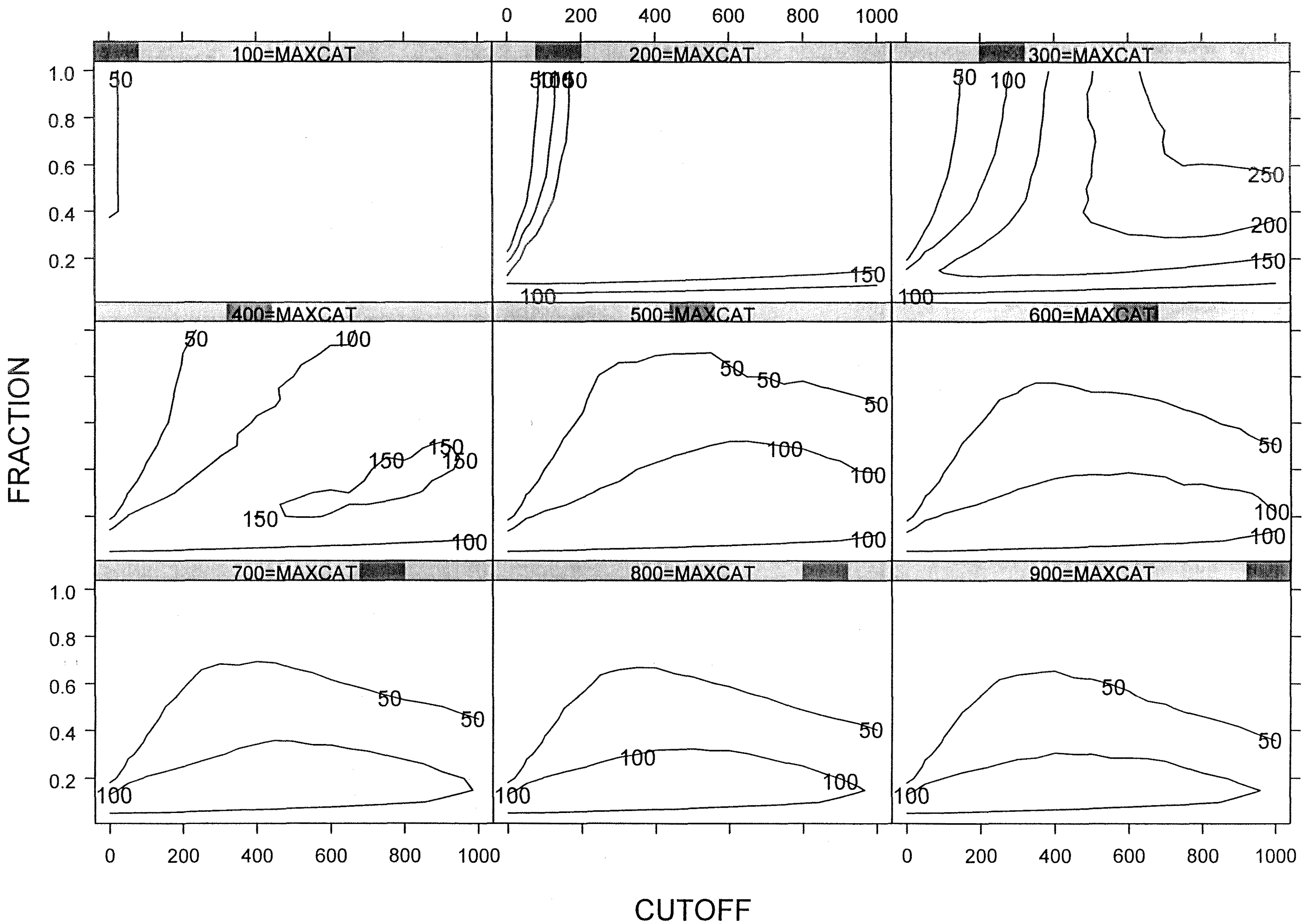
(For A Series of MAXCAT Values)

Fig. 4.2.3.3-8. Log Biomass - Constant Fraction MSY Rule



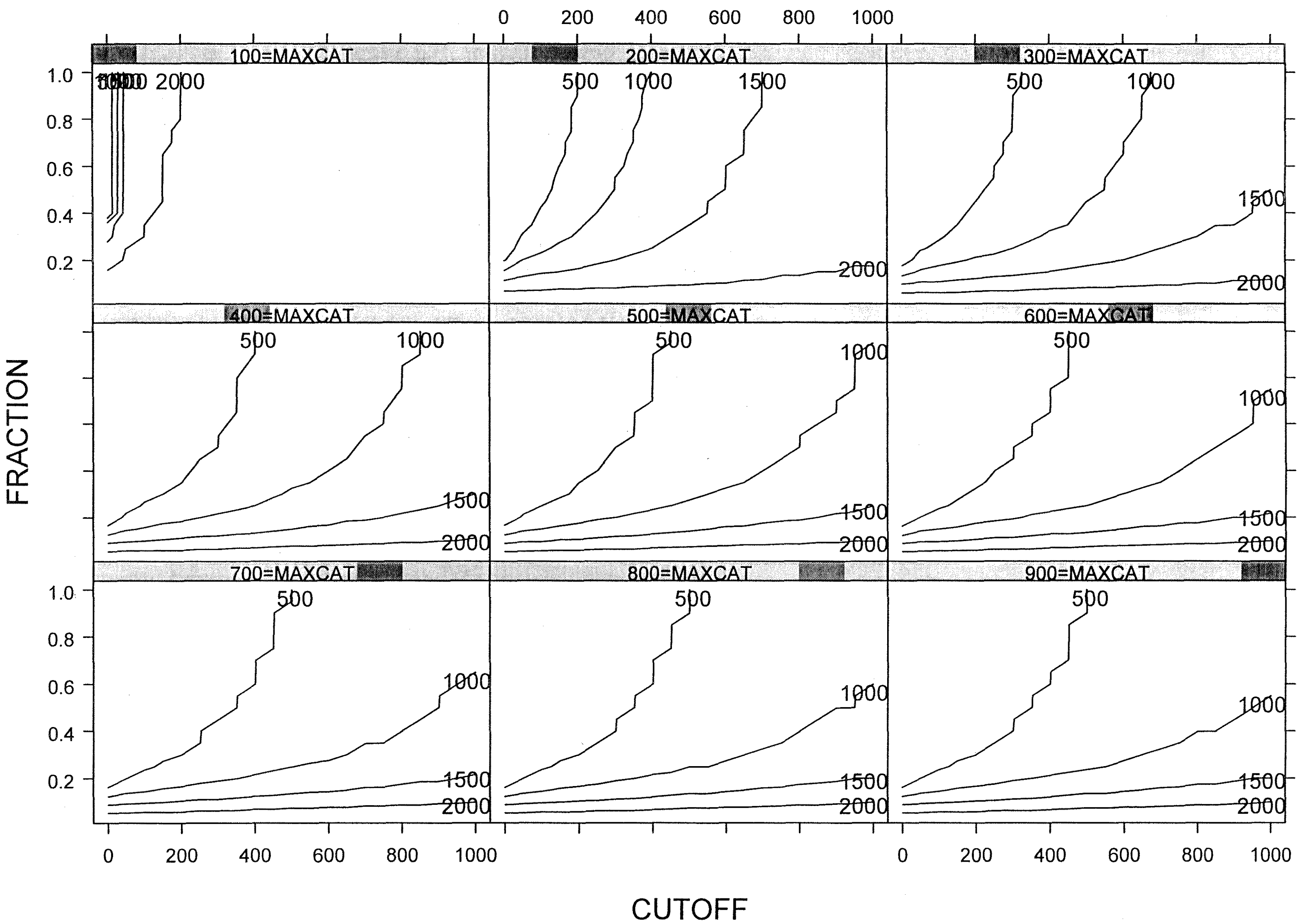
(For A Series of MAXCAT Values)

Fig. 4.2.3.3-9. Median Catch - Constant Fraction MSY Rule



(For A Series of MAXCAT Values)

Fig. 4.2.3.3-10. Median Biomass - Constant Fraction MSY Rule



(For A Series of MAXCAT Values)

Figure 4.2.3.4-1. Deterministic Equilibrium MSY vs. Average Scripps Pier Sea Surface Temperature

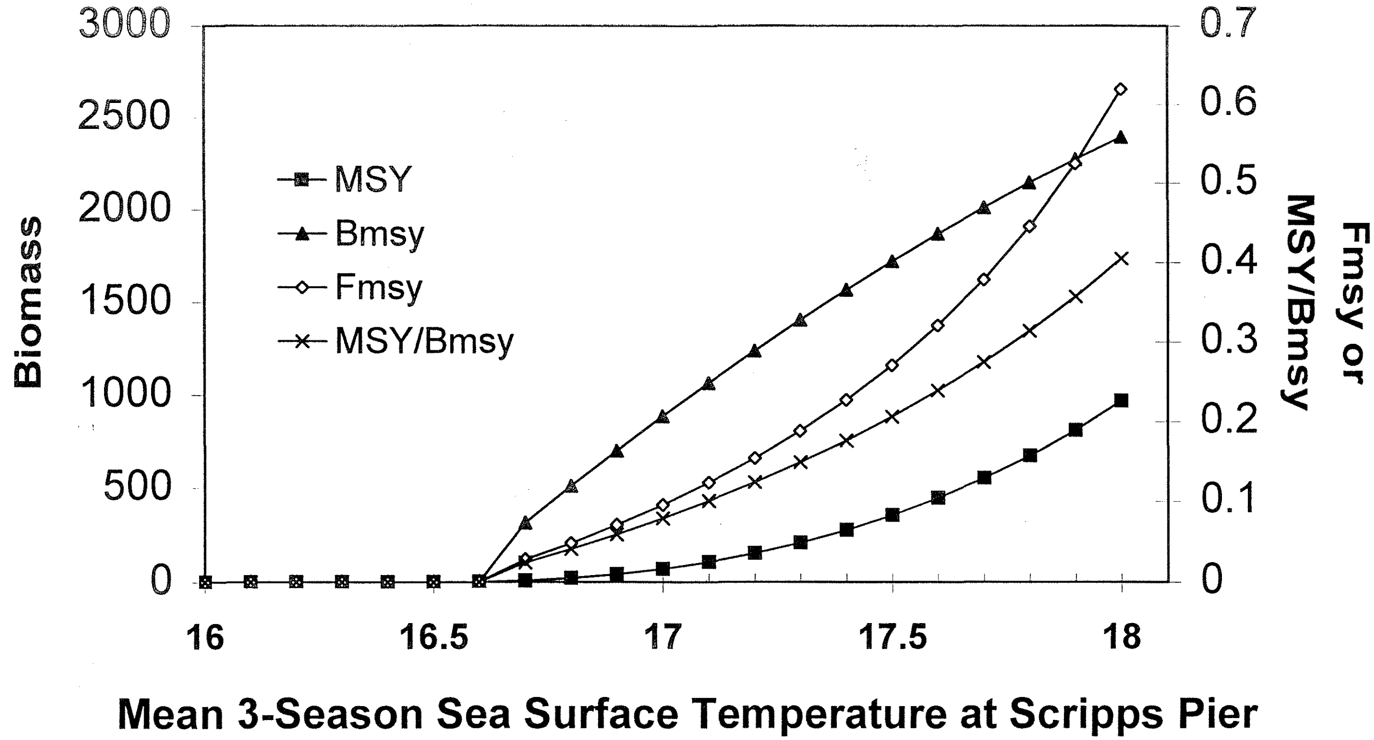


Figure 4.2.3.4-2. U=MSY/Bmsy vs. Average Scripps Pier Sea Surface Temperature

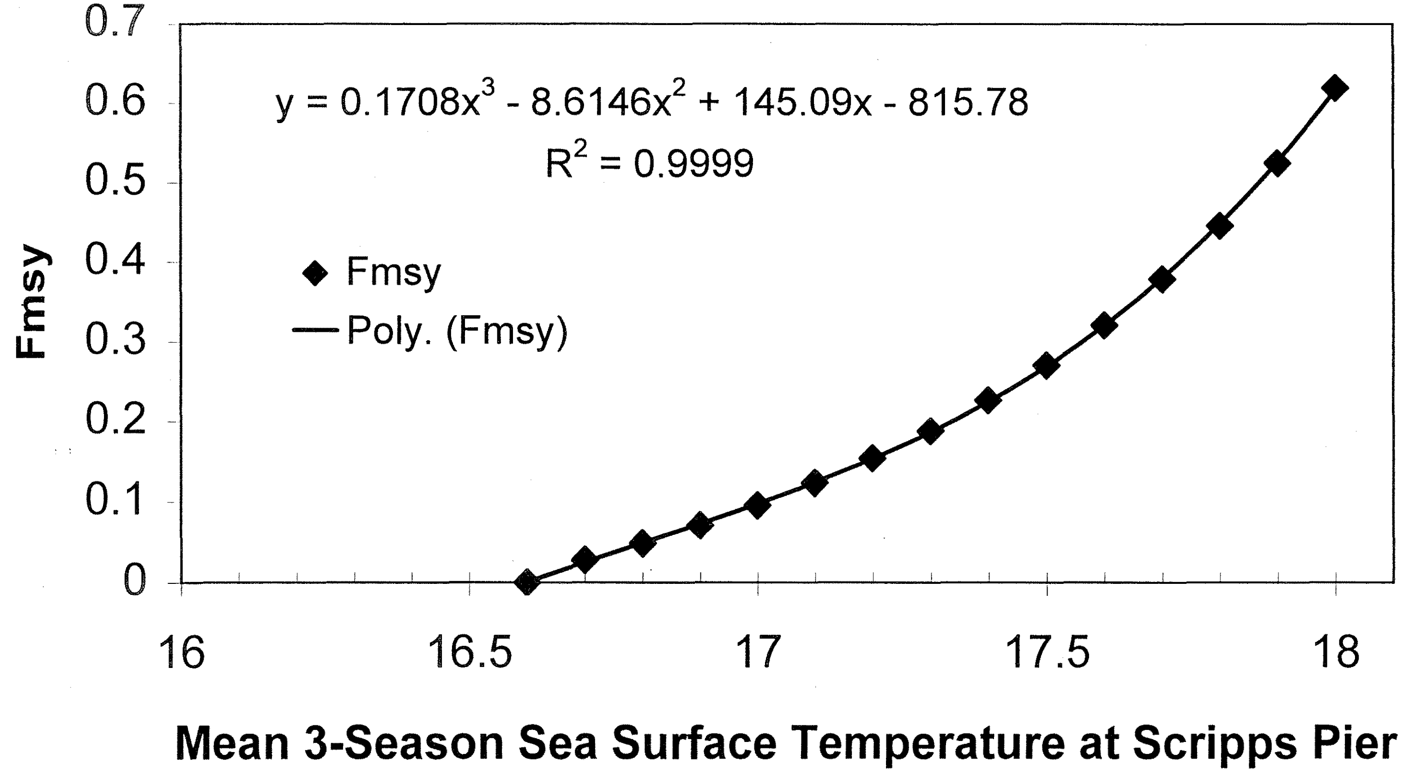


Figure 4.2.3.4-3. Average Three Season Temperature Data and Predicted Deterministic Equilibrium Fmsy for Sardine

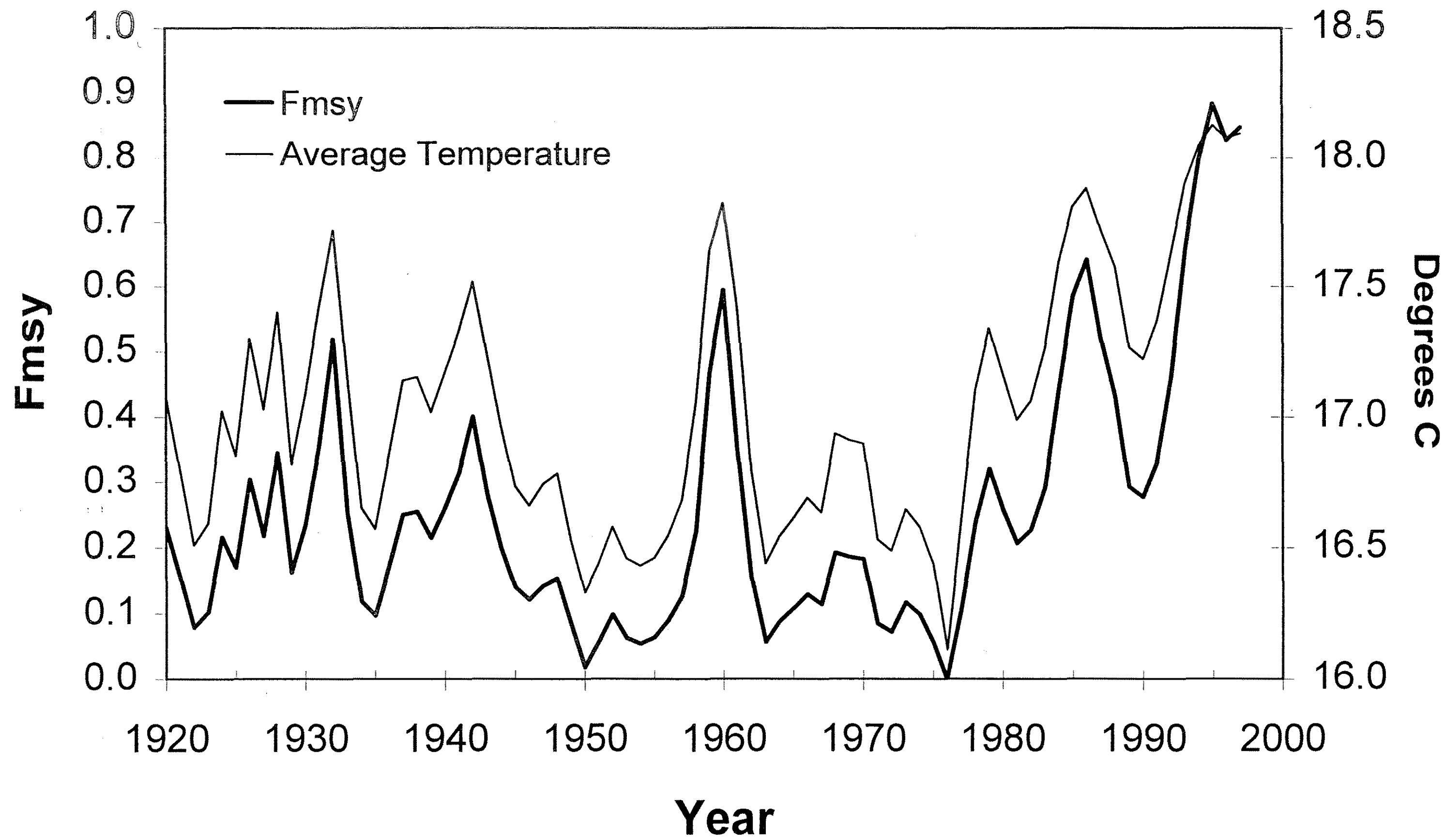


Figure 4.2.3.4-4. Mean catch vs biomass (top) and median catch vs biomass (bottom) for 3 types of sardine control rules.

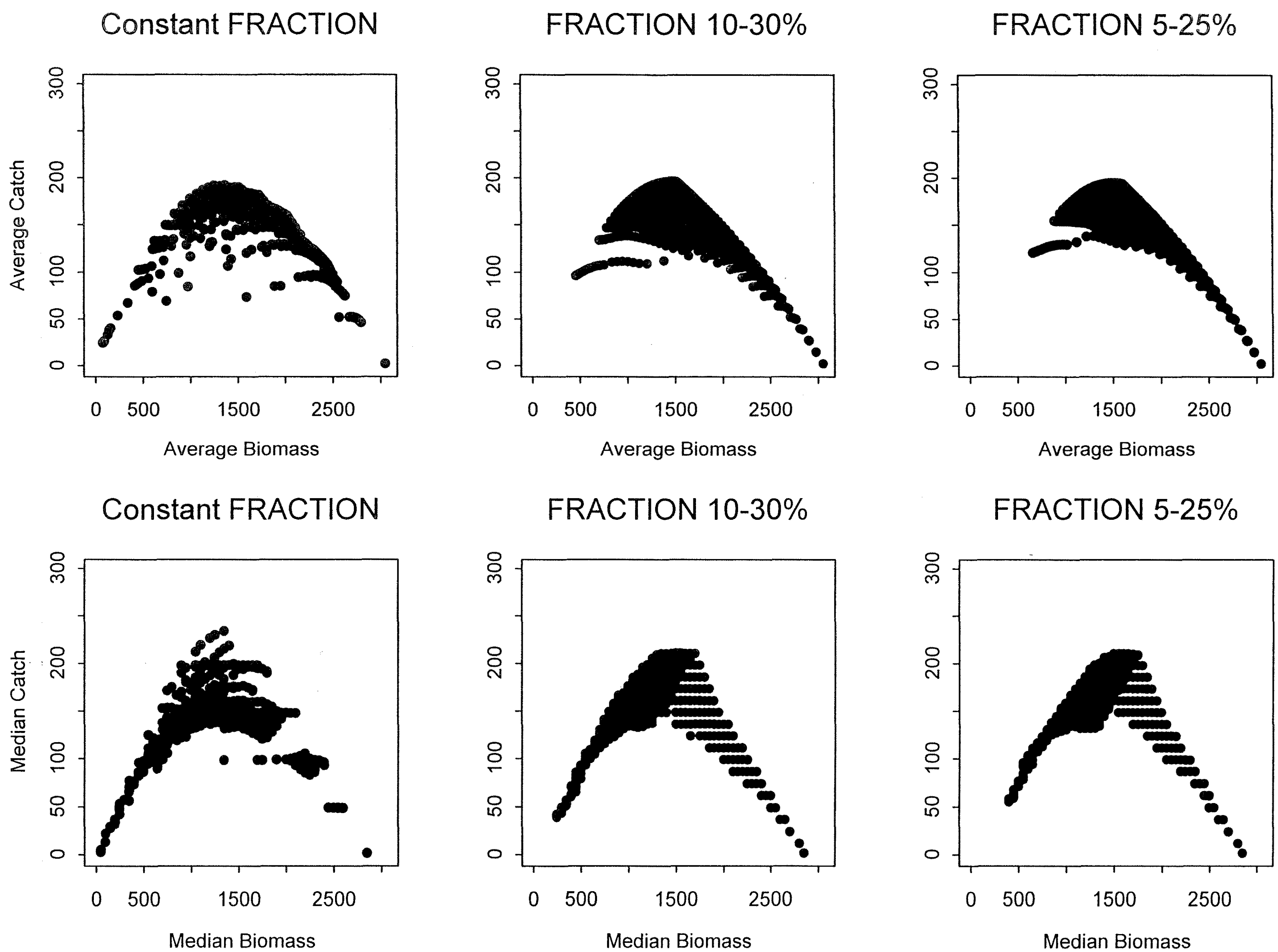


Figure 4.2.5-1. Average catch and average biomass for sardine MSY control rule options.

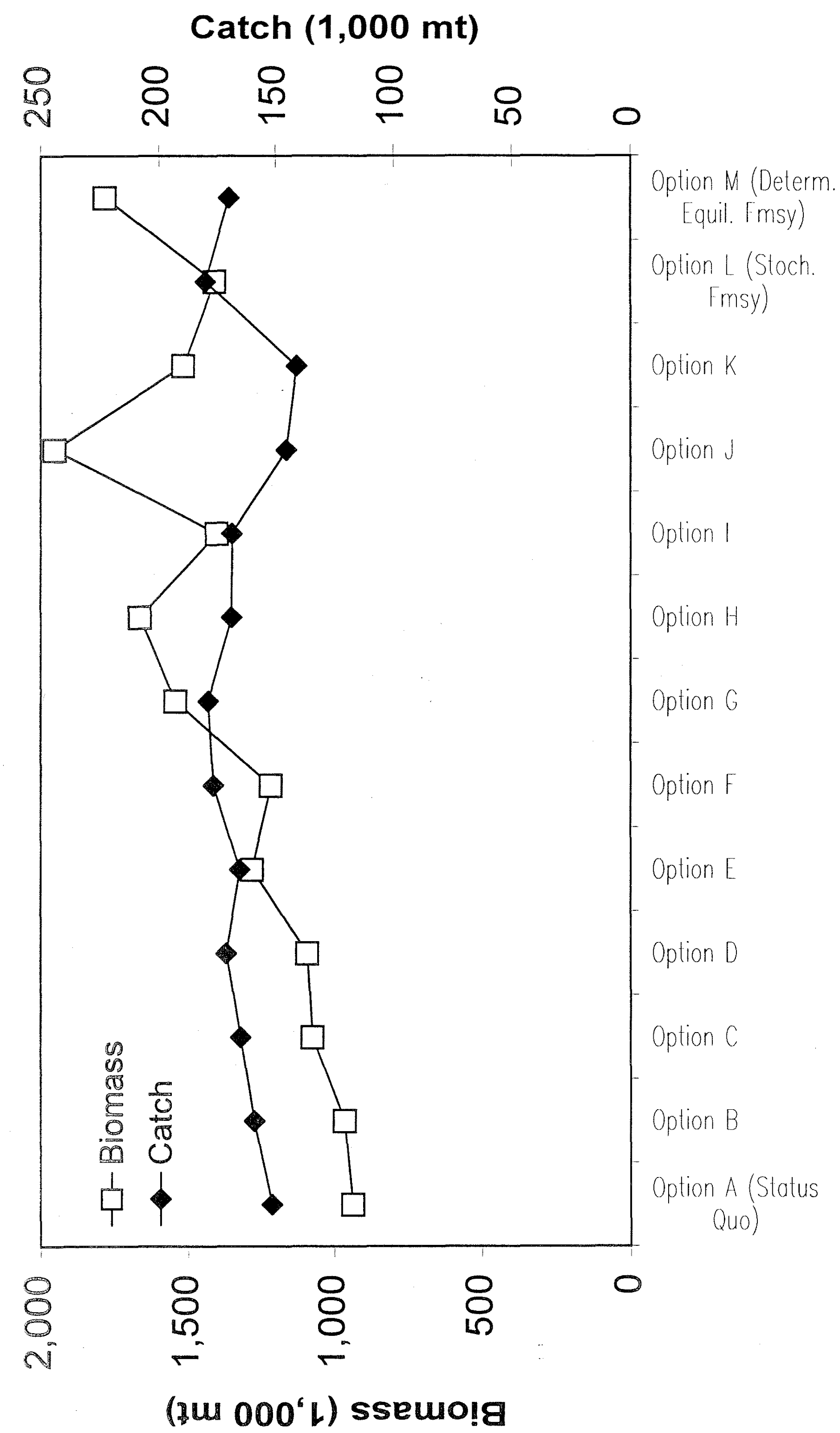
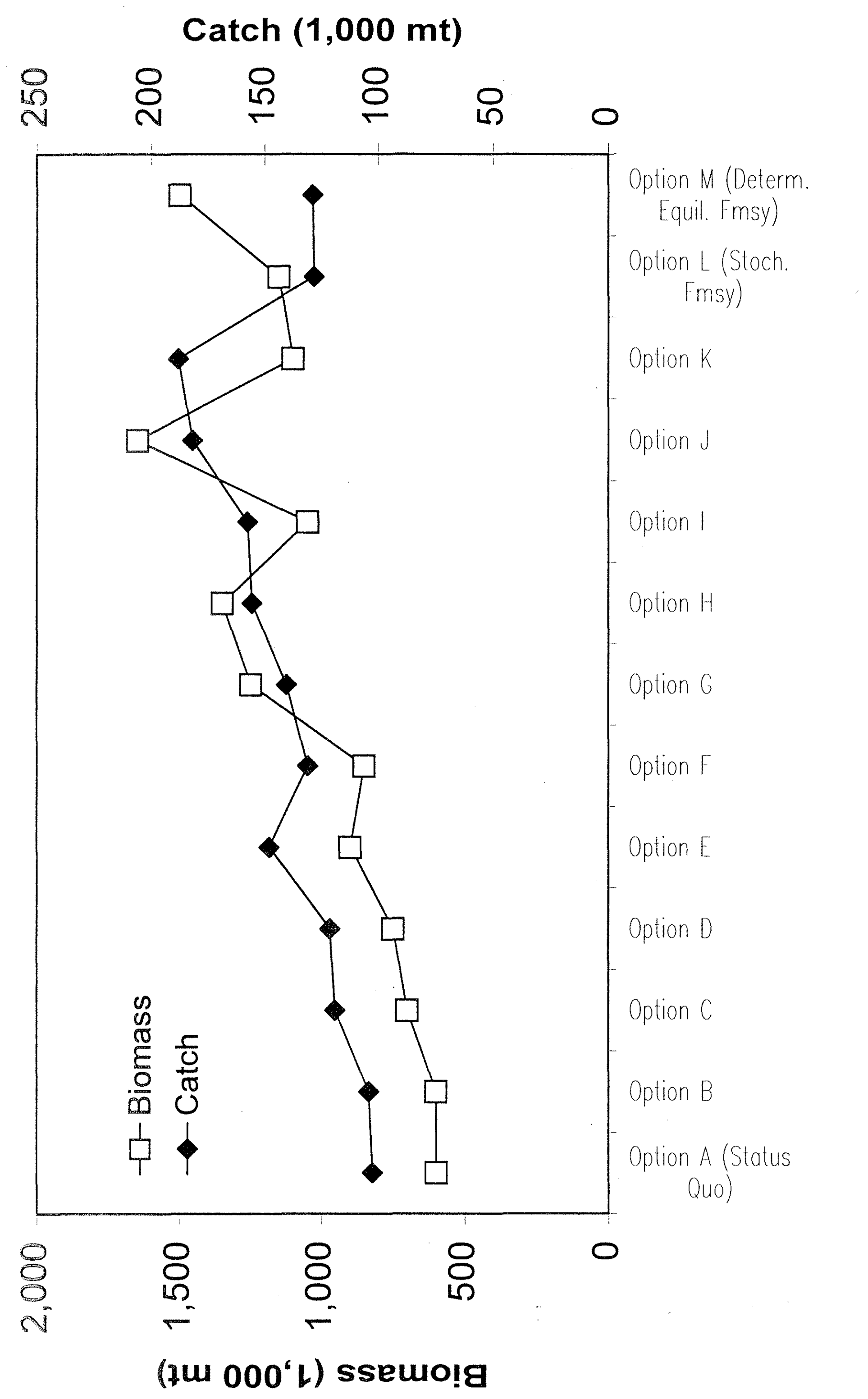


Figure 4.2.5-2. **Median catch and average biomass for sardine MSY control rule options.**



5.0 BYCATCH, INCIDENTAL CATCH, AND ALLOCATION FOR COASTAL PELAGIC SPECIES

This Fishery Management Plan (FMP) establishes incidental catch allowances for coastal pelagic species (CPS) and a geographic allocation for Pacific sardine.

5.1 Incidental Catch Allowances

"Bycatch" is defined in the Magnuson-Stevens Fishery Conservation and Management Act as "fish which are harvested in a fishery, but not sold or kept for personal use and includes economic discards and regulatory discards". In the CPS fisheries, fish are caught and sold incidental to catching other species, because they sometimes school together. Incidental catch allowances permit fishermen to land a certain percentage of fish that would otherwise be considered bycatch. Incidental catch allowances are percentages of catch, landings, or deliveries. For CPS, incidental allowances are normally measured in units of weight rather than numbers of fish or other units, but additional approaches may be used depending on circumstances.

Incidental catch allowances are applied when a stock is overfished or a harvest guideline is met, but may be employed under other conditions as well to avoid, for example, premature filling of a harvest guideline due to incidental catch. Loads of fish that exceed incidental catch allowances for overfished species or species with no harvest guideline cannot be delivered or sold. The Council will recommend incidental catch allowances according to guidelines described in this FMP.

Incidental catch allowances are normally applied to fish as they are landed (i.e., off loaded from a fishing vessel). However, incidental catch could be recorded or measured when fish are first caught, brought on deck, delivered, sold, or at any point that is appropriate and practical.

Incidental catch allowances will normally be recommended by the Council at the same time as harvest guidelines. Estimates of incidental catch and incidental catch rates will be considered in setting harvest guidelines and quotas (Section 4). Incidental catch allowances can be changed annually based on the socioeconomic framework, or more frequently, under the points-of-concern framework.

Incidental catch allowances are the primary method for managing bycatch in the CPS fishery. Other management approaches, such as fishing seasons or area restrictions, might also be required to reduce bycatch or incidental catch. These allowances do not exclude the possibility of trip limits or other regulations imposed to reduce incidental catch, prolong the directed fishery, or for other purposes.

5.1.1 Incidental Catch Allowances When Stocks are Overfished

When a stock is overfished according to the definition of overfishing in this FMP, incidental catch allowances for commercial fishing shall be set at zero percent to 20% of landed weight, as determined by the Council and/or the National Marine Fisheries Service (NMFS) Regional Administrator.

5.1.2 Incidental Catch Allowances When Stocks are Not Overfished

When a stock is not overfished according to the definition of overfishing in the FMP, incidental catch allowances for commercial fishing shall be set at zero percent to 45% of landed weight, as determined by theCouncil and/or the NMFS Regional Administrator.

5.1.3 Pacific (chub) Mackerel Landed Incidentally

When the Pacific (chub) mackerel resource is not overfished, and total landings established under a harvest guideline have been caught, the Council may set an allowable trip limit of one mt or lower according to guidelines described in Section 5.1.6.

5.1.4 Incidental Catch Allowances for Live Bait When Stocks are Overfished

When a stock is overfished according to the definition of overfishing in the FMP, incidental catch allowances for live bait fishing shall be set to no more than 15% of landed weight.

5.1.5 Incidental Catch Allowances for Live Bait When Stocks are Not Overfished

When a stock is not overfished according to the definition of overfishing in the FMP, no restrictions are placed on live bait harvest.

5.1.6 Guidelines and Criteria For Setting Incidental Catch Allowances

In setting incidental catch allowances, the Council will consider existing regulations, goals and objectives of this FMP, best available data, scientific and management advice available, guidelines given below, and other policies established by the Council. Decisions about incidental catch allowances will be made based on consultation between the Council Chair, the NMFS Regional Administrator, Director of the California Department of Fish and Game, Coastal Pelagic Species Management Team (CPSMT), Coastal Pelagic Species Advisory Panel, other representatives appointed by the Council, and interested parties as appropriate.

5.1.6.1 Overfished Stocks

In order of priority, the goals in setting incidental catch allowances for overfished stocks should be to (1) minimize fishing mortality on overfished stocks, and (2) minimize discards of overfished stocks. Incidental catch allowances for overfished stocks should approximate rates of incidental catch when fishing is conducted in a manner that minimizes catch of the overfished stock.

The Council must set incidental catch allowances for all overfished stocks. Once set, incidental catch allowances for overfished stocks remain in force until they are changed. Incidental catch allowances for overfished stocks can be revised during the fishing season if conditions warrant or new information becomes available.

5.1.6.2 Stocks Not Overfished

Incidental catch allowances for stocks that are not overfished are enforced once a harvest guideline has been reached, and the directed fishery has been closed. The goals in setting incidental catch allowances for stocks that are not overfished should be to (1) avoid unnecessary discard, (2) ensure that optimum yield is taken, but not exceeded, and (3) promote efficiency and profitability in the fishery. Estimates of total incidental catch (based on past or current incidental catch rates, incidental catch allowances, harvest guidelines and other conditions in the fishery) are normally considered when harvest guidelines are set. Thus, incidental catch allowances should be set at the same time and in concert with harvest guidelines.

Incidental catch allowances are meant to accommodate catches that are difficult to avoid during normal fishing directed at other species. Therefore, incidental catch allowances should be set at levels that approximate incidental catch rates during normal fishing activities.

5.2 North-South Allocation for Directed Fishery

This FMP authorizes allocations of Pacific sardine harvest guideline to participants by northern and southern areas (defined below). Nothing in this FMP precludes additional allocations based on other geographic areas or other factors developed under the authority of this FMP.

5.2.1 Definition of Northern and Southern Fishery Segments

The division between northern and southern areas for the U.S. Pacific sardine fishery is Point Piedreas Blancas (35°40' N latitude). Landings (or catches if their location is known) north of Point Piedreas Blancas apply to the northern area. U.S. landings (or catches if their location is known) south of Point Piedreas Blancas apply to the southern area.

5.2.2 Formulas for Allocating Pacific Sardine

The northern area allocation is 33% of the of Pacific sardine harvest guideline, and the southern area allocation is 66% of the of Pacific sardine harvest guideline. Nine months after the start of the fishing season, any uncaught portion of the harvest guideline will be totaled and reallocated with 50% of the total allocated to the northern area and 50% of the total allocated to the southern fishery area. Reallocation will be carried out by the NMFS Regional Administrator in consultation with the CPSPDT as an automatic management action.