FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

INDEX/SUMMARY
Amendment 8 to the Northern Anchovy Fishery Management Plan

DECEMBER 1998

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1.0 Background

The Northern Anchovy Fishery Management Plan (FMP) was implemented in 1978 (43 FR 40868, September 13, 1978). The notice of availability of the Final Environmental Impact Statement was published on April 28, 1978 (43 FR 18249). Advances in scientific information concerning the size and potential yield of the northern anchovy population led to a revision of harvest strategies and other aspects of the FMP in Amendment 5. At that time, a Supplemental Environmental Impact Statement was prepared, and a notice of availability published on February 3, 1984 (49 FR 4257).

The Pacific Fishery Management Council (Council), at its meeting of March 4-7, 1997, decided to reevaluate the need to include other coastal pelagics species (CPS) in the FMP and began to review the changes that had occurred in the fishery, primarily in regard to the resurgence of Pacific sardine, which had been at extremely low biomass levels since the late 1950s and early 1960s. A public meeting of the Council's Coastal Pelagic Species Advisory Subpanel (CPSAS) on June 18, 1997 reviewed a report on the status of the sardine fishery prepared by the California Department of Fish and Game, and the Council decided at its meeting of June 23-25, 1997 to proceed with an amendment to the FMP which would include Pacific sardine, Pacific (chub) mackerel, jack mackerel, and market squid. A series of public meetings were held to identify the issues and develop proposed options. Seven public meetings of the Coastal Pelagic Species Plan Development Team (CPSPDT) were held between July 30, 1997, and February 19, 1998. Five public meetings of the CPSAS were held between July 31, 1997, and February 25, 1998. At its meeting of September 3-12, 1997, the Council added additional members to the CPSAS to fairly represent the industry in the current fishery. At its meeting of November 3-7, 1997, the Council adopted a control date for the fishery and directed the CPSAS to develop limited entry options for south of 39° N latitude. At its meeting of March 10-13, 1998, the Council directed the CPSPDT to increase the number of options for limited entry. A notice of intent to prepare an environmental impact statement for Amendment 8 was published on March 23, 1998 (63 FR 13833).

This Final Supplemental Environmental Impact Statement relies on analysis contained in Appendices A-E of the CPS FMP. As such, this document contains references to the Appendices where further analysis and detail can be found for each issue.

2.0 Purpose and Need for Action (Appendix B, Section 1.2)

Amendment 8 is intended to provide comprehensive management of CPS in response to rapid development in harvests, primarily because of a resurgence of Pacific sardine along the Pacific coast and an increase in the market demand for squid. Warming ocean temperatures have led to an increase in abundance of Pacific sardine, which are now found off Mexico, California, Oregon, Washington, and Canada, placing management of this species beyond the authority of any individual state. The collapse of the historical sardine fishery in the 1950s was due to overcapitalization and resulting overfishing at a time of unfavorable environmental conditions. If action is not taken, 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. Federal management can best control overall harvests and bycatch in the multispecies fishery, facilitate international cooperation, and make the most efficient use of federal and State administrative and scientific resources. For more detail on the purpose and need for action, refer to Appendix B, Section 1.2.

3.0 Alternatives

3.1 Limited Entry (Appendix B, Section 3.0)

Options for managing the coastal pelagic fishery include:

Option 1: **Status Quo (Open Access Management)**: This option avoids the additional regulations and costs associated with limited entry, and avoids restrictions on operations and individual vessels and firms in the fishery.

Option 2: Limited Entry: The Council recommends limited entry for coastal pelagic species finfish.

The Council also considered Individual Transferable Quotas in this fishery, but they are not currently an option due to a Congressionally-imposed moratorium until October 1, 2000. The Council chose limited entry. The Council recognized that vessels currently participating in the CPS finfish fishery are capable of harvesting more CPS finfish than is available under current biomass conditions, and that excess harvesting capacity is expected to increase due to newcomers into the fishery, attracted by limitations in other fisheries and expanding biomasses of some CPS stocks. In the Pacific Coast CPS finfish fishery, excess harvest capacity is likely to result in an increasing number and complexity of regulations. Accordingly, in an open access situation, 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. For these reasons, the Council has chosen a limited entry program for CPS finfish (Appendix B, Section 3.4).

Suboptions of Limited Entry: 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. The options for these issues are presented below. Full analysis can be found in Appendix B, Section 3.0.

Species

Option 1: Establish a limited entry program for finfish only (northern anchovy, Pacific [chub] mackerel, jack mackerel, and Pacific sardine). This would not include squid.
Option 2: Establish a limited entry program for finfish and squid.

The Council chose Option 1. There are no estimates of the size of the squid resource. The California Department of Fish and Game has implemented a vessel moratorium and a research program to obtain the data needed for effective management. Large vessels harvest finfish and squid; however, as the size of the vessel declines, specialization in either finfish or squid increases, which creates a basis for separate limited entry schemes for finfish and squid (Appendix B, Section 3.8.1).

Geographic Scope of Limited Entry

Option 1: Establish a coastwide CPS finfish fishery limited entry program.

Option 2: Establish a CPS finfish limited entry program for the fishery south of 39° N latitude (approximately Point Arena, California).

The Council chose Option 2. Under Option 2, any 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. Limited entry for the entire Pacific coast was considered, but during both the heyday of the sardine fishery and in recent years, more than 99% of CPS finfish and squid taken coast wide 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 permit full utilization at high biomass levels, allowing other fishers to obtain benefits under favorable environmental conditions. When the biomass of CPS declines, the resources move south of 39° N latitude (Appendix B, Section 3.8.2).

Area Specific Endorsements South of 39° N Latitude

The state of California currently 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 Point 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 Point 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. There is recognition of distinct northern and southern fleets in the CPS finfish fishery.

Option 1: No area specific endorsements south of 39° N latitude.
Option 2: 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. The Council prefers no area-specific endorsements, which were considered as a way to allocate the resource to users along the coast. Area-specific endorsements involve 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 eliminate harvesting options for some vessels and reduce their operational flexibility, which could make them less efficient in their overall harvesting operations (Appendix B, Section 3.8.3).

Exclude Small Catches from Limited Entry

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: Do not distinguish between exempted and non-exempted landings (all landings of CPS finfish require limited entry permits).
Option 2: Define 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: Define 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: Define 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: 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. Small quantities of CPS finfish species are taken incidentally by vessels targeting other species or engaged in other fisheries, and by some vessels targeting CPS finfish for high value, low volume specialty markets. The CPS finfish limited entry program could distinguish between exempted and non exempted landings of CPS finfish based on an exempted trip limit which excludes certain levels of catches from limited entry requirements south of 39° N latitude (i.e., allow small 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 during fishing for other species and to accommodate those vessels that land small amounts of dead bait and provide fish for small specialty 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 (Appendix B, Section 3.8.4).

Exclusion of Recreational Fishing from Limited Entry

Option 1: Include recreationally caught CPS finfish in a limited entry program.
Option 2: Exclude recreational anglers from CPS finfish limited entry; recreational harvest could still be restricted by quotas, area closures or any other type of management measure.

The Council chose Option 2. 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.

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 (Appendix B, Section 3.8.5).

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

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 principle 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.

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

The Council chose option 1. The live bait fishery is a low-volume, high value fishery that is not currently overcapitalized and is not expected to become overcapitalized. It is already highly restricted by the amount of sportfishing that takes place in a certain area (Appendix B, Section 3.8.6).

Target Fleet Size

The options 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: A limited entry fleet consisting of those vessels accountable for 80% of total CPS finfish landings during the window period.
Option 2: A limited entry fleet consisting of those vessels accountable for 85% of total CPS finfish landings during the window period.
Option 3: A limited entry fleet consisting of those vessels accountable for 90% of total CPS finfish landings during the window period.
Option 4: A limited entry fleet consisting of those vessels accountable for 95% of total CPS finfish landings during the window period.
Option 5: A limited entry fleet consisting of those vessels accountable for 99% of total CPS finfish landings during the window period.

The Council's preferred options were Option 4 and Option 5. 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 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 future attrition in fleet size that would occur gradually through the limited transferability of permits as described in Appendix B, Section 3.8.14.

Limiting Effort Beyond the Number of Vessels

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. Capacity in this fishery is also limited by the trip limit provisions discussed below.

Option 1: No limits on fleet harvest capacity beyond the number of vessels.
Option 2: 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. 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 net tonnage from entering the fishery (Appendix B, Section 3.8.8).

Window Period

The window period establishes a time frame during which potential permit holders would be qualified based upon total CPS finfish landings. 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.

Option 1: A five-year window period (January 1, 1993 through November 5, 1997).
Option 2: 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 (Appendix B, Section 3.8.9). The choice of a window period was thought to 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 Qualifying Criteria

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.

Option 1: 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: 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: 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.

The Council chose Option 1 (Appendix B, Section 3.8.10).

Trip Limits

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.

Option 1: A trip limit no larger than 125 mt;
Option 2: A trip limit no larger than 100 mt;
Option 3: A trip limit no larger than 75 mt;
Option 4: No limit on the amount of CPS finfish carried, landed, transported or delivered.

The Council chose Option 1. 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.

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 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 (Appendix B, Section 3.8.11).

Second Generation Permit Owners

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).

Option 1: Place no restrictions on "second generation" permit holders.
Option 2: 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. These options were developed assuming a limited entry program with unrestricted transferability of permits. However, given the Council's recommendations on limiting transferability of permits, the options relating to second generation permit holders would only be applicable during the first year of the program and in certain circumstances beyond the first year (Appendix B, Section 3.8.12).

Permit Renewal Criteria

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.

Option 1: No renewal criteria for limited entry permits
Option 2: Impose performance criteria for permit renewal permit (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 (Appendix B, Section 3.8.13).

Permit Transfers

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.

Option 1: Allow CPS finfish limited entry permits to be transferred without constraints.
Option 2: Prohibit the transfer of limited entry permits.
Option 3: 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: Allow permit transferability (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, which was a combination of Options 1 and 3. Under 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, permit transfers are allowed once. Option 4 represents a compromise between full transferability and completely restricted transferability. This option was chosen in conjunction with the vessel fleet size option (Appendix B, Section 3.8.7) 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 on transferability allows some modernization to occur while limiting growth of fishing capacity in the long term (Appendix B, Section 3.8.14).

Procedures for Issuing New Limited Entry Permits in the Future

The need to issue new limited entry permits in the future could arise with a substantial increase in the abundance of CPS finfish resources together with substantially enhanced markets. In this case, the limited entry fleet would increase beyond its current size. It might be desirable to make such permits temporary to accommodate subsequent contractions in the fishery.

Option 1: 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: Allow issuance of additional permits to replace only those permits lost to attrition.
Option 3: No 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" (Appendix B, Section 3.8.15).

Vessels Under Construction, Conversion or Contract for Purchase

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.

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: Upon review of the specific circumstances, allow an exception for vessels under construction, conversion or contracted for purchase during the window period.

The Council chose Option 1. Since limited entry permits will be fully transferable in the first year of the program, an owner of a vessel under construction has the opportunity to purchase a limited entry permit (Appendix B, Section 3.8.16). Also, if the owner has an older vessel that is being replaced, the permit may be transferred to the new vessel.

3.2 Management Strategies (Appendix B, Section 2.1.2)

Active Versus Monitored Management

Option 1: Divide management resources equally among all CPS.
Option 2: Create two management categories for CPS fish stocks: "Active" management and "Monitored" management.

The Council chose Option 2. Under Option 2, "Active" management is for stocks and fisheries with significant levels of catch, or biological or socioeconomic considerations requiring relatively intense harvest management procedures (e.g. harvest guidelines, quotas, research surveys, and stock assessments). 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 efforts because catches are not significant or the stock is not understood well enough to be Actively managed.

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. For more details on Active and Monitored management, refer to Appendix B, Section 2.1.2.

Decisions about which stocks are in the Actively managed and Monitored categories would be reviewed annually (Appendix B, Section 2.1.2). At the outset of the FMP, the species are proposed to be divided as follows:

Active Management	
Pacific sardine	*Sardinops sagax*
Pacific (chub) mackerel	*Scomber japonicus*
Monitored	
Northern anchovy	*Engraulis mordax*
Market squid	*Loligo opalescens*
Jack mackerel	*Trachurus symmetricus*

3.3 Optimum Yield, MSY Control rules and Overfishing Definitions (Appendix B, Section 4.0)

All preferred options for harvest management in the CPS fishery under Amendment 8 involve a definition of optimum yield (OY, Appendix B, Section 4.0.1); allowable biological catch (ABC); maximum sustainable yield (MSY) control rules (Appendix B, Section 4.0.2); definitions of overfishing (Appendix B, Section 4.0.3); and definitions of overfished stocks (Appendix B, Section 4.04). Rebuilding programs may be an implicit part of the MSY control rule or developed independently if stocks become overfished (Appendix B, Section 4.0.5).

MSY control rules are the most important elements in harvest management under Amendment 8. The Council adopted specific MSY control rule specifications for Pacific sardine and Pacific (chub) mackerel, which will

be Actively managed at the outset of the FMP. Generic or "default" specifications were adopted for jack mackerel, northern anchovy and market squid, which will be Monitored at the outset of the FMP. Options for both Actively managed and Monitored species are compatible with the federal guidelines and the Magnuson-Stevens Act (Appendix B, sections 4.1.2 and 50 CFR 600.310).

Pacific Sardine Harvest Policy (Appendix B, Section 4.2)

For Pacific sardine, MSY control rule options are 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. Results are used to find MSY control rules and control rule parameters that give good results for most measures of performance.

Options for Pacific sardine and Pacific (chub) mackerel are based on the general formula (Appendix B, Section 4.0):

$$H=(BIOMASS-CUTOFF) \times FRACTION$$

where H is the harvest level, BIOMASS is the estimated stock biomass, CUTOFF is the lowest level of estimated biomass at which directed harvest is allowed and FRACTION is an exploitation rate parameter. In some cases, it is useful to define a maximum harvest level (MAXCAT) so that total harvest never exceeds MAXCAT. MSY control rule parameters might be constant from year to year or might change, depending on environmental conditions or conditions in the fishery. Most CPS are transboundary resources distributed off Mexico, the U.S. and Canada. It is therefore necessary to adjust harvest levels for U.S. fisheries in proportion to the biomass in U.S. waters. This is typically done by multiplying the overall ABC from the MSY control rule by an estimate of the percentage of the stock in U.S. waters (Appendix B, Section 4.1.3).

The options and performance measures for sardine MSY control rules are listed in Table 1. The Council chose option J because it gives biomass and catch levels comparable or better than the deterministic equilibrium F_{MSY} under Option L and because it has a CUTOFF of 150,000 mt. Options with CUTOFF = 50,000 mt might not include an implicit rebuilding program (in the event that sardine become overfished) that meets the ten years to MSY biomass requirement in the National Standards. Option J was chosen because it best achieves the FMP goals and objectives of preventing overfishing, providing adequate forage for dependent species, and promoting stability of catch.

TABLE 1. MSY control rule options for Pacific Sardine. All options evaluated in a stochastic model. Option J was chosen by the Council.

	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
%Years Biomass>400	61%	64%	70%	73%	79%	81%	90%	92%	84%	96%	79%	84%	93%
%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

MSY Control Rule for Pacific (Chub) Mackerel

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 18,200 mt tons is applied. If the biomass is below 18,200 mt, commercial fishing in the U.S. stops. 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.

Option 1: Status Quo: U.S. harvest based on a CUTOFF of 18,200 mt and FRACTION of 30% with no limit set when stock biomass exceeds 135,000 mt.

Option 2: Target harvest level for the whole stock (US and Mexico) based on a CUTOFF of 18,200 mt and a FRACTION of 30%. The U.S. portion of the target harvest level would be prorated based on the portion of the stock biomass in U.S. waters. MSY control rule would be applied and harvest level limited at all stock biomass levels.

The Council chose Option 2. The advantages of Option 2 are that it is more conservative but still 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. However, Option 2 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 (Appendix B, Section 4.3).

Harvest Policies for Monitored Stocks (Appendix B, Section 4.4)

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

The default MSY control rule is a conservative benchmark approach designed to help managers make decisions based on a framework process about when to promote stocks to an Active management status. The default MSY control rule (intended primarily for a stocks that are monitored only) 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. ABC in U.S. waters is prorated based on the portion of the stock biomass in U.S. waters. The technical definition of overfishing occurs and a point of concern mechanism is triggered whenever the total catch (U.S., Mexico, Canada, and international fisheries) exceeds ABC based on the default MSY control rule for the stock or whenever fishing occurs at a rate that is high enough to jeopardize the capacity of the stock to produce MSY.

Overfishing definitions as well as catch and biomass estimates used to calculate ABC and OY based on default MSY control rules are summarized below.

Recommended ABC levels and overfishing definitions for monitored only 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

Northern Anchovy-Central Subpopulation (Appendix B, Section 4.4.1)

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. The recommended default MSY control rule gives an ABC for the entire stock equal to 25% of 123,000 mt or 31,000 mt. 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. Under the default MSY control rule, overfishing and a point of concern would exist for Northern Anchovy in the central subpopulation when total catch exceeds or is projected to exceed (within two years) ABC.

Northern Anchovy-Northern Subpopulation (Appendix B, Section 4.4.2)

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 in 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 estimates from the Smith Larva Method (with adjustments described in Appendix A, Section 1.1.6) are 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 estimates of spawning biomass.

Jack Mackerel (Appendix B, Section 4.4.3)

Although there is little evidence of subpopulations, small jack mackerel (10 cm 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 (50-60 cm FL and 16 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 (EEZ) off southern California.

Estimates of average potential yield are ranges stratified by area and age (Appendix B, Section 4.4.3). 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 were calculated by age/area from mid-range potential yield values. About 65% of the stock is resident in U.S. waters, and the ABC in U.S. waters was prorated accordingly.

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

Market Squid (Appendix B, Section 4.4.4)

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 in U.S. waters cannot be calculated at this time.

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.

The Council makes decisions about Active and Monitored management for CPS annually based on socio-economic framework management procedures (CPS plan, Section 2.1.3). 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 (CPS plan, Section 2.1.2).

3.4 Essential Fish Habitat (Appendix B, Section 2.2.2.1.2 and Appendix D)

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. 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. Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, the proposed FMP amendment defines Essential Fish Habitat (EFH).

Option 1: No Definition of EFH (Status Quo).

Option 2: Define CPS EFH as follows: 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 EEZ and above the thermocline where sea surface temperatures range between 10° - 26° C. The southern boundary is the U.S.-Mexico maritime boundary. The northern boundary is more dynamic, and is defined as the position of the 10° C isotherm, which varies seasonally and annually.

Option 3: Define CPS EFH to include the entire EEZ.

The Council chose Option 2. Option 2 bases the definition of EFH 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. This 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. Option 3, defining CPS EFH as the entire EEZ, would have included a broader area than the waters necessary for spawning, breeding, feeding, or growth to maturity. For more detail on EFH, please refer to Appendix B, Section 2.2.2.1.2 and Appendix D in whole.

In addition, the National Marine Fisheries Service (NMFS) guidelines require FMPs to identify management measures, if there is evidence that a fishing activity is having an identifiable adverse effect on EFH. The proposed FMP amendment provides a range of potential management measures to minimize adverse effects on EFH from fishing, though currently, there is not evidence that a fishing activity is having an identifiable adverse effect on CPS EFH.

Additionally, NMFS guidelines require that FMPs should identify habitat areas of particular concern. At this time, there are no habitat areas of particular concern, because the species in this plan are pelagic and not found in association with any particular habitat area.

4.0 Affected Environment (Appendix A, Sections 1.6 - 1.8, and Appendix D)

Management Area (Appendix A, Section 1.6)

The California Current is one of the world's four major eastern boundary currents characterized by coastal upwelling, high nutrient levels and high productivity. High nutrient levels result from an influx of high-nutrient, subarctic water plus upwelling of nutrient-rich water within the system. Pelagic fish species dominate the exploitable biomass of the system, with major concentrations close to the coastline. The offshore boundary for pelagic fishes is best described by the mean position of the summer wind stress maximum at about 200 km from the continental margin. In the southern California region, the offshore boundary is defined by the western coasts of the Channel Islands. The California Current ecosystem is essentially a region of divergence and upwelling.

The most intense upwelling is centered near Cape Mendocino in northern California during the spring and summer. The cool core of upwelled water near the coast is most pronounced in summer, when it occurs from near Cape Blanco along the northern and central California coasts and extends in a plumelike structure to the southwest of Point Conception. A secondary upwelling zone occurs off Baja California, with a springtime, local maximum near Punta Baja.

The combined effects of the southerly surface currents and coastal upwelling result in cool sea-surface temperatures over most of the northern part of the California Current. Winter sea-surface temperatures off Vancouver Island average 8° C and increase southwards to 22° C in southern Baja California. Summer sea-surface temperatures in the region of maximum upwelling, from Cape Blanco to Point Conception, are particularly cool. July sea-surface temperatures in the nearshore areas of northern California average less than 12° C, which is slightly colder than the July sea-surface temperatures in the northernmost Gulf of Alaska. Mean summer sea-surface temperatures are above 14° C in the region between Cape Blanco and Vancouver Island.

Seasonal and interannual environmental variability within the California Current ecosystem are associated with variations in the Pacific Basin atmospheric pressure systems, which control the local winds and Ekman transport, and affect flows of the equatorward California Current, the poleward undercurrent and the inshore countercurrent. Variations on time scales of several years are associated with alterations in the tropical pressure system, i.e., the El Niño/Southern Oscillation phenomenon. El Niño events markedly increase temperature and alter the flow of currents in the California Current.

The California Current comprises four relatively distinct, though related, ecological components: the pelagic, the littoral, the demersal, and the anadromous. The pelagic, which encompasses the offshore surface water layer and the species therein, including coastal pelagic fish and squid. Most of the forage produced in the California Current ecosystem (i.e., phytoplankton and zooplankton) comes from the pelagic component.

As in the other major eastern boundary currents, anchovy, sardine, whiting, jack mackerel, and Pacific (chub) mackerel achieve the largest populations. These populations are key to the trophic dynamics of the entire California Current ecosystem; anchovy and sardines are the only fishes in the ecosystem that consume large quantities of primary production (phytoplankton), and all five of the species are significant consumers of zooplankton. All five species, particularly mackerels and whiting, are important predators of the early stages of other fishes. The juvenile stages of all five species, and in many cases the adults, are important as forage for seabirds, pinnipeds, cetaceans, and other fishes.

Trophic interactions between CPS and higher-trophic-level fishes are poorly understood, and it is unknown if populations of individual predaceous fishes are enhanced or hindered by large populations of CPS. It is not known if the value of CPS as forage to adult predators outweighs the negative effects of predation by CPS on predator's larvae and juveniles plus competitive removal of phytoplankton, zooplankton, and other fishes. For more detail on the California current ecosystem, refer to Appendix A, Section 1.6.

Essential Fish Habitat (Appendix D, Section 2.0)

In determining EFH for CPS, the estuarine and marine habitat necessary to provide sufficient production to support MSY and a healthy ecosystem were considered. Using presence/absence data, EFH is based on a thermal range bordered within the geographic area where a managed species occurs at any life stage, where the species has occurred historically during periods of similar environmental conditions, or where environmental conditions do not preclude colonization by the species. The specific description and identification of EFH for CPS finfish accommodates the fact that the geographic range of all species varies widely over time in response to the temperature of the upper mixed layer of the ocean, particularly in the area north of 39° N latitude. This generalization is probably also true for market squid but few data are available. Adult 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. Spawning is most common at 14° C to 16° C. For more detail on EFH, refer to Appendix D, Section 2.0.

Marine Mammal Predators (Appendix A, Section 1.7)

CPS are eaten by a number of marine mammals, their dependence on CPS varying from predator to predator. A great deal of information is available about the diets of marine mammals, and the total amount of CPS eaten per year has been estimated for a few. It is not currently possible, however, to estimate the total amount of CPS used as forage by all marine mammals in the California Current ecosystem or the size of CPS populations necessary to sustain predator populations. Some of the species, such as the northern fur seal and Steller's sea lion are listed as depleted. For more detail on marine mammals as predators, refer to Appendix A, Section 1.7.

Seabird Predators (Appendix A, Section 1.8)

Pelagic schooling fish are key components of marine food webs and primary prey of many seabirds. CPS are important to seabirds, because of their abundance near the sea surface, relatively small size, fusiform shape, and dense concentration. Seabird populations of the California Current system and other eastern boundary currents are large relative to areas not driven by large-scale coastal upwelling.

CPS are consumed by a large number of seabirds off the coasts of California, Oregon, and Washington. Availability of anchovies is known to directly affect the breeding success of pelicans, terns, gulls, and auks. It is likely that many predators of anchovies will also eat sardines when the population increases. Owing to their size and occurrence near the surface, Pacific (chub) mackerel are likely to be important to seabirds, especially in southern California. Pacific (chub) mackerel have been observed in the diet of pelican. Jack mackerel are probably not important to seabirds because of their large size and relatively deep schooling habits. Studies of seabird diet during autumn, however, when small jack mackerel are near shore and more available, may indicated their seasonal importance as forage. Recent increased abundance of sardines off southern California was followed by increased breeding success and abundance of brown pelicans. For more detail on Seabird Predators, refer to Appendix A, Section 1.8.

Fishery Interactions With Non-CPS Species (Appendix A, Section 2.2)

The CPS fishery could involve the "taking" (incidental mortality) of birds, fish and marine mammals that may be threatened, endangered or sensitive species. This interaction occurs in CPS fishing because anchovy, sardine and squid are forage for many predators (including threatened or endangered species) that may feed on CPS while fishing gear is deployed, become entangled or captured and drown. The problem is reduced somewhat by the fact that fishing gear used to harvest CPS (mostly purse seines made of small mesh) does not tend to entangle and drown predators although they may be captured within the net as the purse seines are closed. Available information about take of birds, fish and marine mammals during CPS fishing is summarized below. Data are limited, however, because there have been no observer programs in the CPS fishery.

Details on fishery interactions with marine mammals, birds and salmonids are included in Appendix A, Section 2.2. NMFS is engaging in informal consultation with the U.S. Fish and Wildlife Service (USFWS) and to determine if the actions in this FMP are likely to adversely affect listed species or critical habitat. Under the

terms of the Marine Mammal Protection Act, the California purse seine (CPS) fishery is "Category II." Category II fisheries are characterized by incidental mortality of marine mammals at levels less than 50% of the PBR (potential biological removal) level. State and federal biologists indicate that the most significant interaction (in terms of impacts on the marine mammal stock) may be between pilot whales, which are relatively rare along the West Coast, and the squid fishery.

5.0 Environmental Consequences of Fisheries Actions

5.1 Goals, Objectives and Framework Management (Appendix B, Section 2.0)

Amendment 8 includes a "framework management" process that makes it possible for Council to change and modify management procedures in a timely and efficient manner without amending the FMP (Appendix B, Section 2.2). Framework management procedures are well defined in the FMP and build consideration of environmental impacts directly into the decision making process. They include explicit goals and objectives (Appendix B, Section 2.1) focused on concern about environmental impacts (i.e. ecosystem based principles of resource management, provide adequate forage for dependent species, prevent overfishing, and foster research).

The only known alternatives to a framework approach involve amending the FMP whenever management measures changed significantly. This alternative is impractical because of the costs involved and because biological and fishery conditions change rapidly in the CPS fishery.

With respect to environmental consequences and framework management, the most important elements in Amendment 8 are the "point of concern" framework (Appendix B, Section 2.2.1.2) and the distinction between species that are "actively managed" and "monitored only" (Appendix B, Section 2.1.2). The point of concern framework authorizes Council to act quickly and directly to address resource conservation and ecological issues.

Active management is for CPS stocks with significant levels of catch that could become overfished. Monitored management is for stocks where fishing is insignificant and for stocks that are not well enough understood to be intensively managed. The distinction between Active and Monitored management allows managers to concentrate their efforts on stocks and fishery segments where greatest attention is required (Appendix B, Section 2.1.1). Species assigned to the Actively managed and Monitored categories would be reviewed by Council on an annual basis under the framework management process. Stocks can be moved from one category to the other more rapidly under the point of concern framework (Appendix B, Section 2.1.1).

Direct, Indirect, and Cumulative Impacts

Impacts of framework management are mainly procedural and not environmental. The framework management process for CPS is similar to approaches used by the Council in FMPs for other fisheries on the west coast. The framework process is expected to protect the environment as well as or better than current approaches. Direct, indirect and cumulative environmental effects from the framework approach are therefore expected to be neutral or positive.

Conflicts Between Objectives

The goals and objectives for the FMP (Appendix B, Section 2.1) are shared by all state and federal agencies involved in managing CPS fisheries. The framework management process is designed to help Council make choices that balance conflicting goals and objectives in an efficient manner.

Management Resources

The framework management process involves no known irreversible commitments of energy or management resources. It is designed to help managers make efficient use of management resources (an important element in the goals and objectives). Costs (summarized in Appendix C) are essentially the same as status-quo.

Urban, Historical and Cultural Resources

Goals and objectives behind the framework management procedure include consideration of current participants who reside mostly in urban areas. Historical and cultural resources associated with the CPS fishery are well known and described in the FMP (Appendix A, sections 2-3).

5.2 Limited Entry (Appendix B, Section 3.0)

Limited entry and open access management were both options for managing fishing effort in the CPS fishery (Appendix B, Section 3). The Council also initially considered individual transferrable quota (ITQ) systems for managing fishing effort. ITQ options were not developed, however, because they are difficult to enforce and monitor, and would greatly increase management costs. In addition, the Magnuson-Stevens Act imposes a moratorium on ITQs until October 2000 .

As a fishery (particularly an open access fishery) becomes overcapitalized and fishing effort increases, economic efficiency is reduced and pressure to over harvest stocks usually increases. Resource depletion often results. Fishing effort in the historical open access sardine fishery grew rapidly, for example, in the 1930s through the 1950s to levels that could not be supported by CPS stocks and overfishing occurred.

Direct, Indirect and Cumulative impacts

Effects of limited entry and open access management are primarily socioeconomic although some environmental effects may arise if the tendency to overfish in open access fisheries is reduced by limited entry. Thus, any environmental effects from limited entry are likely to be beneficial. Open access is status quo so environmental impacts are expected to be neutral unless fishing effort increases and overfishing occurs.

Conflicts Between Objectives

The goals and objectives for the FMP (Appendix B, Section 2.1) are shared by all state and federal agencies involved in managing CPS fisheries. With respect to goals and objectives, limited entry would increase the complexity of management but this might be offset by long term benefits from controlling fishing effort.

Management Resources

A limited entry program would commit the Council and federal authorities to maintaining the program at an estimated annual cost of about $7,000 (Appendix C, Section 1.4). There are no other known irreversible commitments of energy or management resources.

Urban, Historical and Cultural Resources

There are no known impacts on historical or cultural resources associated with the CPS fishery (Appendix A, sections 2-3) from either limited entry or open access management. All existing sectors are accommodated in both options. Limited entry is not expected to result in substantial restructuring of the fishery in the foreseeable future.

5.3 Optimum Yield, MSY Control rules and Overfishing Definitions (Appendix B, Section 4.0)

MSY control rules are the most important elements of harvest management under Amendment 8 (Appendix B, Section 4.1). Species specific MSY control rules were adopted for Pacific sardine and Pacific (chub) mackerel, which will be actively managed at the outset of the FMP. Generic or "default" specifications were adopted for jack mackerel, northern anchovy and market squid, which will be monitored only at the outset of the FMP.

The Council selected Option J for Pacific sardine from a range of 13 options (Appendix B, Section 4.2). All options were reviewed based on extensive simulation analyses. All of the recommended options gave relatively high biomass levels (Appendix B, Table 4.2.5-1) compared to the deterministic equilibrium F_{MSY}

option (Option L) and the status-quo option (Option A), but Option J was thought to provide the greatest stability to the fleet, the sardine resource, and the predators that may depend on sardine for forage.

The Council chose an MSY control rule for Pacific mackerel (Appendix B, Section 4.3) that is similar to the status quo but more conservative because harvest levels are reduced in proportion to the estimated fraction of the stock biomass in U.S. waters. The only alternative considered for Pacific (chub) mackerel is the status quo. Both the status quo and preferred options were based on published simulation analysis.

The Council's preferred "default" MSY control rule used primarily for monitored only species sets harvest for U.S. fisheries equal to 25% of the best estimate of the MSY catch level for U.S. fisheries (Appendix B, Section 4.1.1). Other options were not considered because the default MSY control rule is conservative and expected to be used primarily when catches are not significant. Stocks with catch levels in excess of the default MSY control rule level will normally be promoted to the actively managed category.

Direct, Indirect and Cumulative Impacts

Harvest of forage fish like sardine involves direct, indirect and cumulative impacts on the environment. Impacts may be particularly important for forage species like Pacific sardine and northern anchovy. Species specific options recommended for Pacific sardine and Pacific (chub) mackerel minimize environmental impacts to the extent possible. The default MSY control rules recommended for northern anchovy and jack mackerel (which are underutilized species with low levels of catch) are conservative and likely involve no impacts on the environment. There is not enough information available to evaluate impacts of the default MSY control rule for market squid because squid are not well understood. As information accumulates, approaches to harvest management for market squid and other CPS will be refined.

Conflicts Between Objectives

The goals and objectives for the FMP (Appendix B, Section 2.1) are shared by all state and federal agencies involved in managing CPS fisheries. Recommended options for the sardine and anchovy MSY control rules balance the conflicting goals of promoting full fishery utilization while providing adequate forage for dependent species.

Management Resources

Recommended MSY control rules and harvest management options commit state and federal authorities to periodic stock assessments for actively managed stocks and (at minimum) monitoring of catches for all CPS. Annual costs ($2.8 million for science plus $1.3 million for monitoring) are essentially status quo (Appendix C). Costs are minimized for stocks that are monitored only.

Urban, Historical and Cultural Resources

There are no known impacts on urban, historical or cultural resources associated with the CPS fishery (Appendix A, sections 2-3) from recommended options for harvest management.

5.4 Bycatch, Incidental Catch and Allocation (Appendix B, Section 5.0)

"Bycatch" is defined in the Magnuson-Stevens Fishery Conservation 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. Options for managing incidental catches in Amendment 8 (Appendix B, Section 5.1) deal primarily with CPS as incidental catch. However, many non-CPS species (bird, fish, and marine mammal predators in particular) may be taken in fisheries that target CPS, but this problem does not seem to be significant at this time (Appendix A, Section 2.2). A variety of management measures are authorized in the FMP (Appendix B, Section 2) including closed areas, closed seasons and gear restrictions that can be used to address bycatch of predators and other non-CPS species if problems arise.

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 directed harvest guideline is met, and may be changed inseason to avoid premature attainment 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 the FMP.

Management and monitoring of bycatch and incidental catch is less important for CPS than other fisheries. Incidental catches tend to be low for CPS because they are harvested mostly in relatively pure schools near the surface where fish are easily identified. Environmental impacts will be few as long as options for managing incidental catch result in relatively accurate estimates of total catch. Harvest levels include adjustments for incidental catches so the overall level of harvest should be unaffected as long as relatively accurate estimates of incidental catches are available.

Environmental impacts from management of and incidental catches are most likely to be important when stocks are overfished or at low biomass levels. Sardine, for example, were taken as bycatch in the Pacific (chub) mackerel fishery during the 1980s while sardine abundance was low and mackerel abundance was high. Options for managing incidental catch in the CPS are more restrictive for overfished stocks at low biomass levels (Appendix B, Section 5.1) than for stocks at higher biomass levels (Appendix B, Section 5.2).

Allocation is authorized under framework procedures in the FMP (Appendix B, Section 2) and allocation could potentially affect coastal communities dependent on the CPS fishery. The only option for direct allocation in Amendment 8 assigns one-third of the annual sardine harvest to fishers north of Point Piedras Blancas (35° 40' N latitude) and two-thirds to fisheries south of Point Piedras Blancas (Appendix B, Section 5.2). This allocation is a status quo measure that extends current California state law with no environmental impacts.

Direct, Indirect and Cumulative Impacts

As described above, there are no direct, indirect or cumulative impacts from any of the recommended options for managing incidental catch or allocation in Amendment 8.

Conflicts Between Objectives

The goals and objectives for the FMP (Appendix B, Section 2.1) list goals and objectives shared by all state and federal agencies involved in managing CPS fisheries. There are no conflicts among goals related to options for managing incidental catch or allocation.

Management Resources

Recommended incidental catch and allocation options commit managers (primarily in the State of California) to monitoring costs at status-quo levels estimated to be about $1.3 million per year (Appendix C, Section 1.2.2).

Urban, Historical and Cultural Resources

There are no known impacts on urban, historical or cultural resources associated with the CPS fishery (Appendix A, sections 2-3) from recommended options.

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(408) 648-9033

Mr. Jerry Spratt
California Department of Fish and Game
20 Lower Ragsdale Drive Suite 100
Monterey, CA 93940
(408) 649-2880

Ms. Julie Walker
Pacific Fishery Management Council
2130 SW Fifth Avenue, Suite 224
Portland, OR 97201
(503) 326-6352

7.0 List of Agencies, Organizations, and Persons Receiving Statement

Alaska Department of Fish and Game
California Department of Fish and Game
Conservation Organizations
Environmental Protection Agency
Idaho Department of Fish and Game
Grays Harbor Regional Planning Commission
National Marine Fisheries Service Alaska Fisheries Science Center
National Marine Fisheries Service Law Enforcement
National Marine Fisheries Service Northwest Region
National Marine Fisheries Service Pacific Environmental Group
National Marine Fisheries Service Southwest Fisheries Science Center
National Marine Fisheries Service Southwest Region
National Oceanic and Atmospheric Administration Northwest Region General Counsel
National Oceanic and Atmospheric Administration Southwest Region General Counsel
News Media
Northwest Indian Fisheries Commission
Oregon Department of Fish and Wildlife
Oregon State Police Department
Oregon State University
Other Organizations and Individuals
Pacific States Marine Fisheries Commission
Port Authorities
Recreational Fishing Organizations
Sea Grant Agencies
Washington Department of Fish and Wildlife
U.S. Coast Guard 11th District
U.S. Coast Guard 13th District
U.S. Coast Guard Pacific Area Training Team
U.S. Department of State
U.S. Fish and Wildlife Service
University of Alaska
University of California