Executive Summary
Groundfish Bycatch Programmatic EIS

1.0 The Proposed Action

The Pacific Fishery Management Council and National Marine Fisheries Service propose to establish a program to minimize bycatch in the West Coast groundfish fisheries to the extent practicable, minimize the mortality of unavoidable bycatch, and ensure that bycatch is reported and monitored as required by law. The proposed action would establish the policies and program direction to achieve this purpose.

1.2 Purpose of the Proposed Action

As identified by the Council's ad hoc Environmental Impact Statement Oversight Committee (Committee), the purposes (objectives) of the proposed action include the following:

- **account for total fishing mortality by species**
- **establish monitoring and accounting mechanisms to keep total catch of each groundfish stock from exceeding the specified limits**
- **reduce unwanted incidental catch and bycatch of groundfish and other species**
- **reduce the mortality of animals taken as bycatch**
- **provide incentives for fishers to reduce bycatch and flexibility/opportunity to develop bycatch reduction methods**
- **monitor incidental catch and bycatch in a manner that is accurate, timely, and not excessively costly**
- **reduce unobserved fishing-caused mortalities of all fish**
- **gather information on unassessed and/or non-commercial species to aid in development of ecosystem management approaches**.

1.3 Need for the Proposed Action

The proposed action is needed to (1) reduce waste, discard, and collateral damage to marine plants and animals by groundfish fishing activities on the Pacific coast, (2) collect and report appropriate and adequate information to support the groundfish fishery management program, and (3) balance these needs with environmental and social values (i.e., need to allow for fishing).

1.4 Selecting and Implementing a Preferred Alternative

The Council and NMFS will consider how each alternative addresses the purpose and need for action. While six alternatives have been proposed, there are a variety of management measures that could be included (or excluded) from any alternative. The Council and/or NMFS may find that by revising an alternative they may be able to achieve greater benefits or better mitigate anticipated negative effects. Finally, the Council and NMFS will determine if and how each

alternative reduces bycatch to the extent practicable and, for bycatch that cannot be avoided, reduces bycatch mortality to the extent practicable.

The Council will review this preliminary draft EIS at its November 2003. NMFS will consider any Council comments on the preliminary draft and will prepare a final draft EIS (DEIS) in early 22004. NMFS expects to make the DEIS available for public comment in January 2004 and provide an extended comment period through April 2004. The Council will review the DEIS during the comment period and identify its preferred alternative at its April 2004 meeting. NMFS will prepare the Final EIS after the public comment period when it has received the Council's final recommendations.

1.5 How The EIS is Organized

This EIS follows the standard organization established by the CEQ regulations. Chapter 1 identifies the issue of bycatch reduction and reporting as the focus of the proposed action and describes why action is needed. Previous Council and NMFS actions relating to bycatch are described to help set the context for the proposed action. Chapter 1 also lays out the criteria the Council and NMFS will use for making their final decision.

Chapter 2 presents the six alternatives to reduce bycatch and bycatch mortality, and to establish a standardized reporting methodology. It describes how the alternatives were developed, and provides a summary of the anticipated environmental impacts of the each alternative. It briefly describes the management "tools" available to the Council and NMFS for reducing bycatch and for monitoring the effects and effectiveness of the various tools, and how the alternatives apply the tools. It identifies the direct, indirect and cumulative impacts so the decision-makers can make a reasoned and informed decision, and the public can understand the conclusions and how they were reached.

Chapter 3 describes the affected environment as it pertains to incidental catch, bycatch, bycatch mortality, and catch reporting/monitoring. The factors related to bycatch are identified and described: co-occurrence in time and space; species behavior; fish body size and shape; and types of fishing gears and methods used. Chapter 3 describes the current human environment as it relates to incidental catch, bycatch and bycatch mortality. The current condition of particularly important groundfish and other species of marine animals are described, and how they are directly affected (that is, bycaught) in groundfish fisheries. The social and economic conditions relating to bycatch, bycatch reduction methods, and bycatch monitoring are also described.

Chapter 4 presents the analysis of environmental impacts. The basic relationship between catch and effort, gear selectivity, and species abundance are described. Bycatch mitigation tools work through changing effort levels, gear selectivity/effectiveness, or by restricting access to areas of species abundance. Chapter 4 describes the capture methods of the various fishing gears, including selectivity features and placement factors (that is, where and in what conditions they can be used). Potential mitigation tools are described, that is, the available management measures and adjustments to control incidental catch and bycatch and to achieve other objectives. Regulations not related to fishing gears are identified and described: harvest

specifications, allocation, retention limits, catch/ mortality limits, time/area management, and limiting effort (reducing fleet size). Collectively, these management measures are identified as the "bycatch mitigation toolbox." Potential effects of each tool are described and the effects and effectiveness of each tool are ranked. Next, those ranks are applied to each alternative. This stepwise process provides the basis for modifying any alternative to better achieve the intended goals, taking into account the costs associated with any changes.

2.0 The Alternatives

Chapter 2 presents the alternatives that have been developed to resolve bycatch issues and to ensure the FMP complies with the bycatch reduction mandates of the Magnuson-Stevens Act. Each alternative describes a bycatch management program and includes all the parts of the program: the overall objectives, the methods to achieve the objectives, and the reporting and monitoring requirements that would be required. The six alternatives represent a variety of policies, approaches, and methods to reduce bycatch. The alternatives range from the current (2003) methods of reducing bycatch (Alternative 1, no action or the "status quo") to more aggressive and comprehensive bycatch reduction policies and methods.

Section 2.1.1 presents the bycatch mitigation "toolbox," that is, the variety of regulatory measures available to the Council and NOAA Fisheries to implement a bycatch monitoring, reporting and reduction program. Each tool is described in terms of its usefulness, effectiveness, effects, etc.

Section 2.1.2 describes how the alternatives are structured so they can be compared and understood more clearly. Sections 2.2.1-2.2.6 describe each alternative in detail. Section 2.3 summarizes the anticipated effects or impacts or each alternative in comparison to current conditions.

Alternative 1 reduces incidental catch and bycatch through a combination of indirect measures: Optimum Yield (OY) specifications, area closures, gear restrictions, variable trip limits and bag limits, seasons and other measures. High priority is given to minimize cost of catch monitoring. Vessel trip limits are calculated using a computer model and incidental catch ratios from past years.

Alternative 2 would reduce groundfish bycatch by increasing the size of trip limits. This would be achieved by reducing the trawl fleet by 50%; the goal of maintaining a year-round fishery would continue. The focus on fleet reduction is based on the Council's *Strategic Plan for Groundfish*. This alternative includes the area/depth management and modeling approach of Alternative 1.

Alternative 3 would reduce groundfish bycatch by increasing the size of trip limits. This would be achieved by eliminating the goal of maintaining a year-round fishery and establishing a short season or series of seasons. This alternative includes the area/depth management and modeling approach of Alternative 1.

Alternative 4 would reduce bycatch by establishing catch limits for various fishery sectors in addition to vessel landing/retention limits. A portion of the overall allowable harvest would be held in reserve for those individuals with the lowest bycatch rates. This alternative includes the area/depth management and modeling approach of Alternative 1.

Alternative 5 would reduce bycatch by establishing groundfish catch quotas for individual commercial fishers and other qualified entities. Monitoring would be focused at the individual vessel level rather than at the sector level. Fishing restrictions might be relaxed to all vessels more flexibility to develop individual bycatch reduction methods.

Alternative 6 would reduce bycatch to near zero by (1) closing large areas, (2) establishing individual vessel catch allowances (caps), (3) requiring each commercial vessel to carry an onboard observer at all times the vessel fishes, and (4) requiring increased retention (limited discard) of groundfish.

3.0 The Affected Environment

Chapter 3 describes various components of the coastal marine ecosystem and how people and communities use and rely on the groundfish resources of this region. The groundfish FMP and management regime covers groundfish stocks off Cape Flattery, Washington to the California border with Mexico. Hundreds of plant and animal species occur along the West Coast and groundfish-related bycatch may affect many of them.

The chapter begins with a brief description of the physical environment, including marine geology, climate and currents. Basic biology of selected species, including important groundfish species, protected species, and other relevant fish and shellfish species, is provided. Species given special emphasis are identified: nine overfished groundfish species and protected marine species including Pacific salmon, marine birds, marine mammals and sea turtles. Other species are also described.

Fishing activities, gears and patterns are described. Important interactions among species, gears and fisheries are also described, as well as types of management tools and their application to bycatch issues. Chapter 3 also describes the human uses of West Coast groundfish stocks, and how these activities relate to other fishing activities in the region. The commercial and recreational fisheries, commercial fish buyers and processors, and coastal communities where groundfish-related activities occur are described.

4.0 Impacts of the Alternatives

Bycatch mitigation effects fall into four broad categories:

- Avoid catching fish that will not be kept and other animals
- Reduce the mortality of fish and other animals that are caught and released
- Reduce the waste of fish that are caught and are dead or will die as a result of being caught

- Avoid unobserved mortality of fish and other animals that directly results from fishing gear.

The highest priority of bycatch mitigation is to reduce the capture of any marine plant or animal that is unintended or unwanted. The goal is to harvest desired fish with the minimum impact on all other fish and animals. The second priority is to minimize damage to fish and animals that should or would not be caught in a perfectly selective fishery.

The amount of catch of any fish or other animal is related to the amount of effort, the selectivity of the gear, and the number of animals present. To reduce catch, any or all of these three factors can be modified.

The complicated relationships among these factors becomes evident when one considers more than one species at a time. No gear is equally selective for two species because of differences, however small, in species shape, size and behavior. Also, species abundance and distribution are never identical. This means that with any amount of fishing effort, the catch of two species will never be the same. The extent of geographic overlap affects the co-occurring catch, as does the degree of similarity in size and shape.

Capture methods of the various fishing gears are described, including selectivity features and placement factors. Non-gear related regulations are identified and described, such as harvest specifications, allocation, retention limits, catch/mortality limits, time/are management, and limiting effort (reducing fleet size). Collectively, these management measures are called the "bycatch mitigation toolbox." Potential effects of each tool are then described and ranked according to their effects and effectiveness. Then those ranks are applied to each alternative.

Section 4.1.2 describes the critical comparative methods used to analyze the effects of the various bycatch mitigation tools and the six alternatives. Section 4.1.3 identifies the available mitigation tools, and Section 4.1.4 describes the effects and effectiveness of the tools. The effects and effectiveness of each tool are ranked, and then ranks applied to each alternative. In this stepwise process, we provide the basis for modifying any alternative to better achieve the intended goals, taking into account the costs associated with any changes. Direct and indirect effects are described in Sections 4.2 through 4.11 Impacts to ecosystem and biodiversity are outlined in section 4.2. Impacts of the six alternatives are described in section 4.3. Section 4.5 summarizes impacts of each alternative proposed monitoring program. Section 4.6 summarizes impacts to the biological environment. Section 4.7 describes socioeconomic impacts. Effects on catch and bycatch distribution are discussed in section 4.8. Cumulative effects are summarized in section 4.9 and irreversible and irretrievable effects are discussed in Section 4.10. Impacts to management and environmental management issues are discussed in section 4.11.

5.0 Agency Preferred Alternative and the Environmentally Preferred Alternative

This chapter will be drafted when a preferred alternative has been identified, which may not be until April 2004. Chapter 5 will describe the decisions that went into the agency's choice of a preferred alternative. It will also identify the environmentally

preferred alternative. If the preferred alternative is not the environmentally preferred alternative, this chapter will explain how and why they differ.

Table 2.2 Bycatch reduction methods (bycatch mitigation tools) included in the alternatives.

Goals and Objectives	**Alternative 1** Control bycatch by trip (retention) limits that vary by gear, depth, area; long season	**Alternative 2** Reduce bycatch by decreasing effort and permitting larger or more flexible trip limits (reduce commercial trawl fleet)	**Alternative 3** Reduce bycatch by reducing effort and permitting larger or more flexible trip limits (reduce commercial season)	**Alternative 4** Reduce all groundfish bycatch by establishing sector catch/ mortality caps	**Alternative 5** Reduce all groundfish bycatch by establishing individual catch limits (individual quotas) for groundfish species	**Alternative 6** Reduce all bycatch by large area closures and gear restrictions, individual bycatch caps, and increased retention requirements
FISHERY MANAGEMENT TOOLS						
Harvest Levels						
ABC/OY based on ratios/estimated joint catch rates ("bycatch model")	Y	Y	Y	Y	Y	Y
Set **overfished groundfish catch caps** by **fishing sector**	N	N	N	Y	N	Y
Use **trip limits** to control groundfish bycatch, ratios similar to expected species encounter rates, adjusted to discourage fishing in certain areas	Y	Y	Y	Y*	N	N
Use **catch limits** to control groundfish bycatch	N	N	N	Y	Y	Y
Set individual vessel/permit catch caps for overfished groundfish species	N	N	N	N	Y	Y
Set groundfish **discard caps** (require increased retention)	N	N	N	N	Y	Y
Establish **IQs** for other groundfish	N	N	N	N	Y	Y
Establish bycatch **performance standards**	N	N	N	N	Y	Y
Establish a reserve for fishers who achieve performance standards	N	N	N	Y	N/Y	Y
Gear Restrictions						
Rely on **gear restrictions** to reduce expected or assumed bycatch rates	Y	Y	Y	Y	N	Y
Time/Area Restrictions	Y	Y	Y	Y	Y	Y
Establish **long term closures for all groundfish fishing**	N	N	N	N	N/Y	Y
Establish **long term closures for on-bottom fishing**	N	N	N	N	N/Y	Y
Capacity reduction (mandatory)	N	Y(50%)	N	N	N	N
Monitoring/Reporting Requirements						
Trawl logbooks	Y	Y	100%	Y	??	??
Fixed-gear logbooks	N	N	100%	Y	??	??
CPFV logbooks	N	N	N	Y		
Commercial **port sampling**	Y	Y	Y	>Y	N/Y	Y
Recreational port sampling	Y	Y	Y	>Y	Y	>>x
Observer coverage (commercial)	10%	10%	10%+logbook	60%?	100%	100%
CPFV observers	N	N	N	Y	Y	100%
VMS	Y	Y	Y	Y	Y	Y
Post-season observer data OK	Y	Y	Y	Y/N	N	N
Inseason observer data required	N	N	N	Y/N	Y	Y
Rely on fish tickets as the primary monitoring device for groundfish landings inseason	Y	Y	Y	Y	N	N

* Trip limits may be required for some sectors to prevent "derby fishing".

Table 4.1.1 Effect of tool on regulatory and non-regulatory bycatch, habitat, and monitoring, and rationale for the effect.

	Effect				
	Reduce Regulatory Bycatch	*Reduce Non-regulatory Bycatch*	*Reduce Bycatch Mortality*	*Reduce Habitat Impacts*	*Increase Accountability*
Harvest Levels					
ABC/OY	Low OYs often require management measures such as low cumulative landing limits under some alternatives that made lead to discard. On the other hand, higher OYs may result in higher levels of effort and catch. Depending on alternatives, higher discard may also result.	Many species limited by markets do not reach OY limits, due to the market limit and other constraints placed on fishery by overfished species OYs.	If OY's are reduced, regulatory bycatch mortality may increase for some species if trip limits are reduced. If overall effort is reduced due to restrictions, overall bycatch and bycatch mortality may be reduced.	Lower OY's should reduce fishing effort. Reducing effort should result in reduced habitat impacts.	Lower OYs required for rebuilding of some species may make it difficult to accurately track total catch under some alternatives.
Sector allocations 1/	Distributed OY may have a postive effect in reducing bycatch. Risk and consequences of encountering a "disaster tow" can be spread out among several boats within the sector.		Under a given OY, catch is allocated and distributed to fishery sectors in some alternatives. Distributed OY may have a postive effect in reducing bycatch mortality to the degree risk of bycatch can be spread and managed by the sector.		Sector allocations would work best with a robust monitoring program. With increased monitoring, There would be less incentive to discard allocated fish as it would count against the allocation.
Trip (landing) limits 2/	If landing limit increases, bycatch is reduced. Studies have shown that as trip limits decline or cumulative limits are approached, bycatch increases. As cumulative limits are reached there are stronger incentives to keep higher valued fish and discard species that are close to the limit in order to continue fishing for species having more cumulative limit remaining.	Economic factors such as price, demand, and minimum fish size needed for processing often determine market limits on the amount of fish landed. These factors can lead to discarding of fish after a market limit is reached.	If bycatch is reduced due to increased landing limit, bycatch morality is also reduced. If limits are increased due to larger OYs, bycatch and bycatch mortality may increase due to higher harvest levels.		If landing limits increase, regulatory induced discard is reduced. Reducing discard increases accuracy of estimating total catch at lower levels of fishery monitoring.
Catch limits	Vessel catch limits reduce bycatch when fishing ceases and/or there is a retention requirement. Effect is enhanced when limit is on individual boat, when applied to all groundfish, and monitoring is robust.	If all groundfish catch is retained (alternative 6), vessel catch limit will have no market induced bycatch.	Vessel catch limits should reduce bycatch mortality as there is less need to compete to catch fish (no derby fishery). Same pattern of effect as with regulatory bycatch.	Vessel catch limits may reduce hours trawled through incentives and efficencies to maintain strict catch caps under some options. Reducing trawl hours should reduce habitat impacts.	Catch limits may provide more flexibility by relaxing or eliminating landing limits and reducing discarded catch of those species that are not market limited. Thus, accountability is improved, if full retention is required and/or observer coverage is significantly

Table 4.1.1 (continued). Effect of tool on regulatory and non-regulatory bycatch, habitat, and monitoring, and rationale for the effect.

	Effect				
	Reduce Regulatory Bycatch	*Reduce Non-regulatory Bycatch*	*Reduce Bycatch Mortality*	*Reduce Habitat Impacts*	*Increase Accountability*
Gear Regulations 4/	Regulatory induced bycatch may be reduced by allowing modified gear or alternative gear types that are more selective for non-overfished species and less selective for overfished species.	Allowing modified or alternatives gears that are more selective for marketable species may reduce market induced bycatch. Gear changes to select against overfished species may interact with market induced bycatch both positively and negatively.	Making gears less efficient or more selective may result in some species or sizes being avoided, thus reducing bycatch mortality.	Gear modifications may reduce impacts to habitat. Smaller roller gear requires fishers to avoid high relief habitat. Other alternatives allow use of fixed gear to take unused portions of OY. In the latter case, habitat interactions are different, but likely reduced.	Flexible gear regulations may permit experimentation, and use of alternative and more selective gears to access unused portion of OY. Coupled with observers, species selective gears should reduce discarded fish and improve accountability.
Time/area restrictions 5/	Time/area closures eliminates regulatory bycatch within the closed area by eliminating fishing effort. Unless effort is reduced outside the closed area, regulatory bycatch could increase outside the closure.	Time/area closures eliminates non-regulatory bycatch within the closed area by eliminating fishing effort. Unless effort is reduced outside the closed area, non-regulatory bycatch could increase outside the closure.	Bycatch mortality would be reduced within the closed area. Bycatch mortality could increase outside of the closed area if fishing effort increases.	Habitat impacts would be reduced or eliminated within closed areas. Habitat impacts could increase outside of closed areas if effort increases outside the closure.	Accountability would be increased through VMS verification of fishing location
Capacity Reduction	Capacity reduction could occur through a buyback program or through sales of IQs. Reduced effort should allow more flexibility in vessel landing limits that would likely reduce regulatory induced bycatch.	If overall effort is reduced as a consequence of capacity reduction, bycatch of species with low or no value would be reduced. Fewer boats may induce buyers to relax market limits (supply and demand response) and effort could increase. Non-marketable or low valued fish would still contribute to bycatch.	Reduced effort should have a positive impact in reducing bycatch mortality. Fewer boats could result in increased hours fished however, offsetting positive effects.	Reduced effort should have a positive impact in reducing habitat impacts Fewer boats could result in increased hours fished however, offsetting positive effects.	

Table 4.1.1 (continued). Effect of tool on regulatory and non-regulatory bycatch, habitat, and monitoring, and rationale for the effect.

	Effect				
	Reduce Regulatory Bycatch	*Reduce Non-regulatory Bycatch*	*Reduce Bycatch Mortality*	*Reduce Habitat Impacts*	*Increase Accountability*
Data Reporting					
Logbooks					
Observers					Increased observer coverage under some alternatives would increase accountability by ensuring retention, if required, or accurately accounting for discarded fish.
Vessel monitoring system 6/	VMS can directly reduce regulatory bycatch. Compliance with area closures to protect overfished species, for example, would be assured.		VMS can directly reduce regulatory bycatch mortality. Compliance with area closures to protect overfished species, for example, would be assured.		VMS increases accountability by verifying fishing location.
Enforcement					

1/ PFMC, 2003d.
2/ Pikitch, 1988, Methot, 2000.
3/ Larkin, 2003.
4/ Hanna, 2003 and Davis, 2003.
5/ PFMC, 2001.
6/ PFMC, 2003e.

Table 4.1.2 Effects and rationale for the indirect effects of the application of management measures (tools) designed to reduce bycatch and improve accountability.

	Effect			
	Change Abundance	*Change Habitat Availability*	*Change Spatial and Temporal Concentrations of Bycatch*	*Change Socioeconomic Factors*
Harvest Levels				
ABC/OY	Abundance of overfished species should increase as stocks are rebuilt, those a above MSY could be reduced. *Any changes in population abundance and structure may affect forage available for other animals (birds, mammals, etc.).*			
Sector allocations				
Trip (landing) limits 1/	Present trip limit management attempts to maintain ratios of species in some sectors of the multi-species groundfish fishery. Ratio management may reduce discard but might result in long-term changes in abundance of individual species.		Present trip limit management attempts to maintain ratios of species in some sectors of the multi-species grounfish fishery. Ratio management may result in effort shifting, increasing and/or decreasing bycatch of individual species.	
Catch limits			Catch limits provide flexibility and accountability to manage bycatch. A reduction in derby style fishing should allow fishers to more effeciently pick fishing times and locations to minimize take of species with small catch or bycatch limits.	
Individual quotas 2/			Similar effect as described above under catch limits, but with more flexibility if IQs can be purchased.	

Table 4.1.2 (continued). Effects and rationale for the indirect effects of the application of management measures (tools) designed to reduce bycatch and improve accountability.

	Effect			
	Change Abundance	*Change Habitat Availability*	*Change Spatial and Temporal Concentrations of Bycatch*	*Change Socioeconomic Factors*
Gear Regulations 3/	Allowing modified or alternatives gears that are less selective for overfished or other groundfish (undersized fish for example) should contribute to increased abundance of target species. If these changes also allow increased selection and catch per unit effort on non-overfished species, abundance of these species could decrease.	Gears modified to reduce bycatch of target species may have different impacts on habitat. The direction of impact is unknown.	Gear restrictions may have a positive impact at reducing regulatory bycatch of overfished species. If effort and target fishing increases on healthier stocks, bycatch of non-overfished species may increase.	Some gear modifications will make fishing gear less efficient, increasing cost per unit of value of catch.
Time/Area Closure 4/	Abundance (biomass) inside area closures should increase through growth. To the degree density dependence occurs, recruitment may be limited inside but increase outside of reserves.	Incentives for fishing outside of closed areas may result in effort shifts. Effort shifting may free up some kinds of habitat from impacts but increase those impacts elsewhere.	Area closures could result in effort shifting. While overfished species bycatch might be reduced, bycatch of market limited species might be increased, depending on alternatives.	
Capacity Reduction	Longer term, capacity reduction, if it results in reduced effort, contributes to a reduction in overall mortality and bycatch mortality which will in turn increase abundance.	Response to capacity reduction would be to reduce habitat interactions with fishing gears. Latent capacity exists even with a 50% reduction in fleet size. Thus, there is the potential for effort increase even though capacity is reduced. This would tend to offset any benefit and gear impacts on habitat could rebound.	Reduced effort should have a positive impact in reducing bycatch mortality. Fewer boats could result in increased hours fished however, offsetting positive effects. Less effort may allow more flexibility in choice of fishing location - reducing spatial or temporal concentrations of bycatch.	

Table 4.1.2 (continued). Effects and rationale for the indirect effects of the application of management measures (tools) designed to reduce bycatch and improve accountability.

	Effect			
	Change Abundance	*Change Habitat Availability*	*Change Spatial and Temporal Concentrations of Bycatch*	*Change Socioeconomic Factors*
Data Reporting				
Logbooks				
Observers	Increased observer coverage may reduce fishing behaviors that lead to regulatory induced discard. This would have a positive indirect effect in reducing bycatch, reducing unaccounted for fishing mortality, and positively influencing abundance. Increased observer coverage should increase the quality of data used in stock assessments. Estimates of abundance should therefore be improved.	Increased observer coverage may provide better information on habitat - especially if observers collect data on bycatch of benthic invertebrate communities.	Increased observer coverage should provide more accurate data on distributional changes in bycatch.	Increased observer coverage will add to cost of management and fishing operations.
Vessel Monitoring Systems (VMS) 5/		VMS ensures compliance with fishing locations. Habitat protection within closed areas would be enhanced.		VMS add to cost of fishing and management operations. To the degree compliance and catch accounting are improved, future fishing opportunities and economic stability should be preserved.
Enforcement				

1/ Hastie, 2003.

2/ Larkin, 2003.

3/ Hanna, 2003 and Davis, 2003.

4/ PFMC, 2001.

5/ PFMC, 2003e.

Table 4.5.1 Monitoring tools and effects on improving accountability and cost impacts of each tool. Effects scaled as follows: Y (definitely, substantially), y (probably, moderately), n (probably not, minor), and N (no, none); L = lower cost, M = moderately higher cost, H = highest cost.

Monitoring/Reporting Requirements	Alternatives	Program	Identify fishing locations	Identify fishing depths	Provide tow by tow data	good data quality	Increase quantity and timeliness of data	Identify groundfish discards	Provide groundfish biological data	Provide non-groundfish data	Provide other non-finfish data	Provide mammal and seabird data	Ease of enforcement	Administrative Costs	Compliance Costs (to industry)
fish tickets	1-6	state	N	N	N	y	Y	N	N	y	N	N	Y	L	L
logbooks	1-2,4-6	state	y	y	y	y	n	N	N	N	N	N	Y	M	M
logbooks	3	federal	y	y	y	y	y	y	N	N	N	N	Y	M	M
observers															
commercial 10%	1-3	federal	Y	Y	Y	Y	n	Y	Y	Y	Y	Y		H	M/H
commercial 60%	4	federal	Y	Y	Y	Y	y	Y	Y	Y	Y	Y		H	M/H
commercial 100%	5,6	federal	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		H	M/H
CPFV	4-5	(state)	Y	y	-	Y	Y	Y	Y	Y	Y	y		H	M/H
sport		n/a			-		-							HH	
port sampling															
commercial	1-6	state	y	y	N	Y		n	y	N	N	N		M	L
CPFV	1-6	state	y	y	-	Y		n	y	y	N	N		M	L
sport	1-6	state	y		-				y?	y?				M/H	L
VMS	1-6	federal	Y	y	N	Y	Y	N	N	N	N	N	Y	L	M
mandatory retention	5,6	federal				Y	Y	y	y	n	n	N	N	H/M	M/H
Enforcement cost			H	H	H			H		H	H				

Table 4.5.2 Monitoring alternatives and rank of effects on improving accountability, and cost impacts of each alternative.

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**	**Alternative 6**
RELATIVE RANK OF ALTERNATIVES BY EFFECTIVENESS AT IMPROVING ACCOUNTABILITY, EASE OF ENFORCEMENT, REDUCING COMPLIANCE COSTS	10% Commercial observer coverage, commercial and recreational port sampling, catch projections based on fishtickets and pre-season estimates of discard, no in-season commercial observer data, VMS.	10% commercial observer coverage, commercial and recreational port sampling, catch projections based on fishtickets and pre-season estimates of discard, no in-season commercial observer data, VMS.	10% commercial observer coverage, commercial and recreational port sampling, catch projections based on fishtickets and pre-season estimates of discard, no in-season commercial observer data, 100% log coverage, log verification, VMS.	60% commercial and recreational (CPFV) observer coverage, increased commercial and recreational port sampling, catch projections based on fishtickets and some in-season estimates of discard and in-season observer data, VMS.	100% commercial and recreational (CPFV) observer coverage, commercial and recreational port sampling, catch projections based on fishtickets and some in-season estimates of discard and in-season observer data, VMS.	100% commercial and recreational (CPFV) observer coverage, commercial and increased recreational port sampling, catch projections based on fishtickets and some in-season estimates of discard and in-season observer data, VMS.
Indentify fishing locations (VMS)	1	1	1	1	1	1
Identify fishing depths (VMS)	1	1	1	1	1	1
Provide tow by tow data	2	2	1	1	1	1
Provide good quality data	4	4	3	2	1	1
Increase quantity of data	5	4	3	2	1	1
Allow inseason use of data	3	3	3	2	1	1
Identify groundfish discards	5	4	3	2	1	1
Provide groundfish biological data	6	5	4	3	2	1
Provide non-groundfish biological data	3	3	3	2	1	1
Provide non-finfish biological data	3	3	3	2	1	1
Provide mammal and seabird data	3	3	3	2	1	1
Ease of enforcement	5	4	3	2	1	1
Keep administrative costs low	2	3	4	5	6	6
Keep industry compliance costs low	2	3	4	5	6	6
Rank of location	2	2	1	1	1	1
Rank of quality, quantity, timeliness	5	4	3	2	1	1
Rank of groundfish biological data	6	5	4	3	2	1
Rank of non-groundfish biological data	3	3	3	2	1	1
Rank of ease of enforcement	5	4	3	2	1	1
Rank of cost	1	2	3	4	5	5
Number of first place scores	2	2	4	4	15	17
Number of last place scores	15	8	5	0	3	3
Overall Rank	6	5	4	3	2	1

Table 4.6.1 Relative rank of bycatch reduction methods (tools) for each alternative used to reduce bycatch and bycatch mortality, and address accountability issues.

RELATIVE RANK OF ALTERNATIVES BY BYCATCH REDUCTION TOOL TYPE	**Alternative 1** Control bycatch by trip (retention) limits that vary by gear, depth, area; long season	**Alternative 2** Reduce regulatory bycatch by increasing trip limits (reduce commercial trawl fleet)	**Alternative 3** Reduce regulatory bycatch by increasing trip limits (reduce commercial season)	**Alternative 4** Reduce all groundfish bycatch by establishing sector caps	**Alternative 5** Reduce all groundfish bycatch by establishing individual catch caps (rights-based) and individual quotas for non-overfished species	**Alternative 6** Reduce all bycatch by large area closures and gear restrictions, individual bycatch caps, and increased retention requirements
FISHERY MANAGEMENT TOOLS						
Harvest Levels						
ABC/OY based on ratios/estimated joint catch rates ("bycatch model")	1	1	1	1	1	1
Set **overfished groundfish catch caps** by **fishing sector**	2	2	2	1	2	2
Use **trip limits** to control groundfish bycatch, ratios similar to expected species encounter rates, adjusted to discourage fishing in certain areas	4	2	3	2	1	1
Use **catch limits** to control groundfish bycatch	3	3	3	2	1	1
Set individual vessel/permit catch caps for overfished groundfish species	3	3	3	3	2	1
Set groundfish **discard caps** (require increased retention)	2	2	2	2	1	1
Establish **IQs** for other groundfish	2	2	2	2	1	1
Establish bycatch **performance standards**	3	3	3	2	1	1
Establish a reserve for fishers who achieve performance standards	3	3	3	2	1	1
Gear Restricitons						
Rely on **gear restrictions** to reduce expected or assumed bycatch rates	2	2	2	2	3	1
Time/Area Restrictions	3	3	3	3	2	1
Establish **long term closures for all groundfish fishing**	3	3	3	3	2	1
Establish **long term closures for on-bottom fishing**	2	2	2	2	1	1
Capacity reduction (mandatory)	3	1	3	3	2	2
Monitoring/Reporting Requirements						
Trawl logbooks	2	2	1	2	2	2
Fixed-gear logbooks	2	2	1	2	2	2
CPFV logbooks	2	2	2	1	1	1
Commercial **port sampling**	3	3	3	2	1	1
Recreational port sampling	3	3	3	1	2	1
Observer coverage (commercial)	5	4	3	2	1	1
CPFV observers	3	3	3	2	2	1
VMS	1	1	1	1	1	1
Post-season observer data OK	3	3	3	2	1	1
Inseason observer data required	3	3	3	2	1	1
Rely on fish tickets as the primary monitoring device for groundfish landings inseason	2	2	2	2	1	1
Discount fish ticket records of overfished species landings due to the low likelihood they accurately reflect actual catch and mortality.	2	2	2	1	1	1
Number of first place scores	2	3	4	5	16	22
Number of last place scores	23	20	18	12	3	3
Overall Rank	5	4	4	3	2	1

* Trip limits may be required for some sectors to prevent "derby fishing".

Table 4.6.2 Alternatives ranked by their effectiveness at reducing bycatch, enforcing and monitoring bycatch measures, and reducing compliance costs to industry.

RELATIVE RANK OF ALTERNATIVES BY POTENTIAL BYCATCH REDUCTION, EASE OF ENFORCEMENT AND COST	**Alternative 1** Control bycatch by trip (retention) limits that vary by gear, depth, area; long season	**Alternative 2** Reduce regulatory bycatch by increasing trip limits (reduce commercial trawl fleet)	**Alternative 3** Reduce regulatory bycatch by increasing trip limits (reduce commercial season)	**Alternative 4** Reduce all groundfish bycatch by establishing sector caps	**Alternative 5** Reduce all groundfish bycatch by establishing individual catch caps (rights-based) and individual quotas for non-overfished species	**Alternative 6** Reduce all bycatch by large area closures and gear restrictions, individual bycatch caps, and increased retention requirements
Reduce catch in excess of vessel limits?	5	4	5	3	2	1
Reduce proportion of overfished species?	5	3	4	2	1	1
Reduce encounters with overfished	5	3	4	2	1	1
Reduce fishing in high relief seafloor	5	3	4	2	2	1
Reduce catch proportion of on-bottom	5	3	4	3	2	1
Reduce catch proportion of off-bottom	6	4	5	3	2	1
Reduce catch proportion of small fish?	3	3	3	3	2	1
Reduce catch of unwanted finfish species?	3	3	3	3	2	1
Reduce potential for "ghost fishing"?	1	1	1	1	1	1
Reduce catch of marine mammals?	2	1	2	2	2	2
Reduce catch of seabirds?	2	1	2	2	2	2
How easily enforced/ monitored?	5	4	3	2	1	1
Compliance Costs (to vessel)	1	2	3	4	5	6
Rank of Groundfish Bycatch Reduction	6	4	5	3	2	1
Rank of Other Bycatch Reduction	2	1	2	2	2	2
Rank of Enforcement	5	4	3	2	1	1
Rank of Cost	1	2	3	4	5	6
Number of first place scores	2	3	1	1	4	10
Number of last place scores	11	2	4	4	2	3
Overall Rank	6	4	5	3	2	1