THE OCEANS ALTERNATIVE:
A FISHERY ECOSYSTEM PLAN

The North Pacific is the place to move fisheries management into the 21st century by fundamentally shifting our approach to management. The Fisheries Management Plan SEIS provides an historic opportunity for the Fisheries Service to take the lead in the long-overdue shift to ecosystem-based fisheries management. We propose the Oceans Alternative below as a Fishery Ecosystem Plan that explicitly and systematically incorporates ecosystem considerations into practical management decisions. The Oceans Alternative infuses requirements for ecosystem consideration and protection into all aspects of fishery management. The Oceans Alternative provides a framework of principles, policies and practical management protocols that enables managers to achieve these goals and objectives in the operation of the fisheries.

Ecosystem Conservation and Management

The goal of ecosystem-based fisheries management is to put ecosystem principles into *practice*, a desire expressed in the U.S. Magnuson-Stevens Fishery Conservation and Management Act ("MSFCMA").[1] The existing MSFCMA definition of conservation and management recognizes the importance of protecting marine ecosystems,[2] and the definition of Optimum Yield authorizes reductions in fishing levels from the theoretical maximum allowable level to account for ecological factors.[3] Concerning ecological factors, MSFCMA, Sec. 301 (National Standards) give the Councils wide latitude to reduce the allowable fishing rates from the theoretical maximum level (NMFS 1998, 63 FR 24232).[4] In addition, the MSFCMA guidelines for essential fish habitat ("EFH") conservation in the EFH final rule require an ecosystem approach, where possible, in determining EFH of a managed species.[5] Similarly, the Marine Mammal Protection Act and Endangered Species Act mandate the conservation of ecosystems and habitats on which listed species depend. All the relevant laws support an ecosystem-based approach to the use of living marine resources.

The practical application of ecosystem principles requires explicit direction, guidelines and requirements in the fishery management plans, which constitute the policy framework, and accompanying regulations designed to achieve specified management goals for U.S. marine

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[1] Sec. 406. 16 U.S.C. 1882, tasked NMFS with convening a panel to develop recommendations "*to expand the application of ecosystem principles in fishery conservation and management activities*."

[2] MSFCMA, Sec. 3(5) expresses the intent of conservation and management to avoid irreversible or long-term adverse effects on fishery resources and the marine environment (16 U.S.C. 1802).

[3] MSFCMA, Sec. 3(28), 16 U.S.C. 1802.

[4] "*Examples are stock size and age composition, the vulnerability of incidental or unregulated stocks in a mixed-stock fishery, predator-prey or competitive interactions, and dependence of marine mammals and birds or endangered species on a stock of fish. Also important are ecological or environmental conditions that stress marine organisms, such as natural and manmade changes in wetlands or nursery grounds, and effects of pollutants on habitat and stocks*" (NMFS 1998a, 63 FR 24232).

[5] "*Ecological relationships among species and between the species and their habitat require, where possible, that an ecosystem approach be used in determining the EFH of a managed species. EFH must be designated for each managed species, but, where appropriate, may be designated for assemblages of species or life stages that have similar habitat needs and requirements*" (67 FR 2377, Section 600.815 (iv)(E)).

fisheries.[6] The Ecosystems Principles Advisory Panel (EPAP 1999)[7] concluded that existing federal FMPs are not sufficient to implement an ecosystem-based approach to fisheries management. The Oceans Alternative FMP framework remedies that shortcoming by including clearly stated goals, objectives, and guidance at the policy level requiring formal consideration and protection of the ecosystem as a binding, non-discretionary management obligation, as well as rules at the regulatory level to implement those requirements. The intent is to resolve fundamental conflicts between the usual goal of maximizing yields in marine fisheries management and the goals of national environmental mandates in the Endangered Species Act, Marine Mammal Protection Act, and National Environmental Policy Act among others.[8] Thus the existing MSFCMA definition of fishery sustainability based on achieving maximum sustainable yield for individual fisheries[9] must be expanded to address ecosystem considerations and objectives in the FMPs.

Fishery sustainability is hereby redefined in an ecosystem context as the levels and methods of fishing that are compatible with explicitly stated FMP objectives and requirements for preserving the productivity, nutrient dynamics, habitats, trophic structure, species richness, and resilience of the natural ecosystem. This definition is entirely compatible with the intent of MSFCMA and other relevant statutes.

The Oceans Alternative stipulates that a Fishery Ecosystem Plan will be adopted for each major ecosystem under Fisheries Service jurisdiction, incorporating explicit principles, policies, guidelines, requirements and implementing regulations for ecosystem-based management via the FMPs. Under these plans, conservation and management is defined as all the rules designed to:

1. Protect, maintain and restore healthy marine ecosystems, understood as ecosystems in which ecological processes, habitats, trophic levels, and productive capacity are comparable to an unexploited system, and the diversity of the native flora and fauna is preserved at the genetic, species and community level.
2. Rebuild, restore, and maintain exploited fish stocks at high levels relative to an unfished condition in order to preserve the ecological relationships between the exploited, dependant and related species in the food web.
3. Conserve fish and other wildlife habitats within a comprehensive plan for the protection of Essential Fish Habitat (EFH) of managed species, critical habitat of ESA-protected species, known important habitat of MMPA-protected species, and habitat of management-defined categories of non-target and unmanaged species.
4. Provide for commercial, recreational and non-consumptive uses of the marine environment within the framework of 1-3.
5. Avoid irreversible or long-term adverse effects on fishery resources and the marine environment.

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[6] NMFS 2001 Draft PSEIS 2.4, p. 2. The North Pacific Council's nine Comprehensive Fishery Management Goals also provide "targets" for future Council action. PSEIS 2.4, p. 2; Appendix G.
[7] EPAP. Ecosystem-Based Fishery Management, A Report to Congress, April 1999, p. 27.
[8] National Research Council. The Bering Sea Ecosystem. National Academy Press, Washington, D.C., 1996, p. 24.
[9] MSFCMA, Sec. 3(29), 16 U.S.C. 1802, defines MSY as "*a rate or level of fishing mortality that jeopardizes the long-term capacity of a stock to produce maximum sustainable yield on a continuing basis...*"

6. Transmit a legacy of healthy ecosystems to future generations.

These goals are established through the following policies, requirements and management measures.

Target Species Management: Overfishing in an Ecosystem Context

Policy Level:

Currently the North Pacific groundfish management plans define overfishing levels and sustainability with respect to the M-S Act standard of maximum sustainable yield (MSY), a simplified production theory which regards any fish production above the level required (in theory) to maintain spawning stock at a given target size as "surplus" for the fishery. PSEIS, ES-66. To compensate for the ecological deficiencies of MSY, overfishing guidelines must be modified to account explicitly for the roles of target species as prey for other fish, marine mammals and birds, as well as the unique life history characteristics, habitat needs and scientific uncertainties that make target species vulnerable to conventional MSY levels of fishing mortality.

Fishing levels should be set in a highly precautionary manner to preserve ecological relationships between harvested, dependent and related species. The TAC-setting process should contain procedures and requirements to reduce maximum allowable levels of fishing under the conventional "single-species" MSY rules to an Optimum Yield (OY) level that addresses both the cumulative effects of fishery-maximizing exploitation strategies that are designed to out-compete the other parts of the ecosystem, and local-scale impacts of spatial/temporal concentration of fishery catches.[10] Fishing for important forage species should be reduced to more precautionary levels to maintain the forage base for predators at high levels of abundance relative to the unfished condition as is done under the Convention for the Conservation of Antarctic Living Marine Resources (CCAMLR), which sets the harvest policy for important forage species such as krill (*Euphausia superba*) at $F_{75\%}$ in an effort to take the needs of predators into account.[11]

[10] Concerning ecological factors, the National Standard Guidelines give the scientific advisors and managers wide latitude to reduce the allowable fishing rates from the theoretical maximum level: "*Examples are stock size and age composition, the vulnerability of incidental or unregulated stocks in a mixed-stock fishery, predator-prey or competitive interactions, and dependence of marine mammals and birds or endangered species on a stock of fish. Also important are ecological or environmental conditions that stress marine organisms, such as natural and manmade changes in wetlands or nursery grounds, and effects of pollutants on habitat and stocks*" (NMFS 1998, 63 FR 24232).

[11] R.B. Thomson, D.S. Butterworth, I.L. Boyd, and J.P. Croxall. Modeling the Consequences of Antarctic Krill Harvesting on Antarctic Fur Seals. Ecological Applications, 10(6), 2000, pp. 1806-1819: "*The Commission for the conservation of Antarctic Marine Living Resources (CCAMLR) takes the needs of krill into account in an indirect manner when recommending the annual krill catch limit. This is done using a single species model to estimate the size of the krill population (relative to its pre-exploitation size) after a 20-yr period of harvesting at a given intensity. The level of harvesting intensity is adjusted until the median krill spawning biomass is predicted to be 75% of its median pristine size*."

Uncertainty factors should be incorporated systematically into ABC/TAC-setting to account for measurement errors (surveys, fishery observer data), process errors (stock assessment model simulations), and extrinsic ecological and environmental factors that act on fish population dynamics in unknown and/or unpredictable ways. The overall approach reflects a policy objective to *maintain a large margin of safety in recommending acceptable biological catches in an environment where uncertainty is all-pervasive and even the best available scientific information is frequently full of unknowns*.

Regulatory level:

Tiers 1-3 set target fishing rate at $F_{75\%}$ as an ecosystem proxy and set MSST spawning biomass at $B_{40\%}$ (or higher, depending on life history characteristics) for following:

- Important target prey species (e.g., pollock, Atka mackerel, cod)
- Species with K-selected life histories (e.g., rockfish, sablefish)
- Species for which life history and abundance information is available for stock assessment purposes but limited, uncertain and subject to large error bounds (e.g., natural mortality, growth rate, age of maturity, fecundity, reproductive rate, etc.)
- Rebuilding 'target' not less than $B_{75\%}$ (10-year max to rebuild or no fishing)
- TAC-Setting Uncertainty Buffer:
    - TAC < ABC < OFL
    - TAC = Catch + Bycatch
- Explicit spatial and temporal management of TACs to prevent localized depletion, serial overfishing by area, adverse local or regional impacts to species and habitats
- Optimum Yield = sum of TACs (reflecting current choices/tradeoffs)

Tiers 4-6 target species for which there is not adequate information to estimate biological reference points (BRPs) and minimum stock size threshold (MSST):

- No directed fishery TAC specified until data available to estimate biomass and values for $F_{X\%}$, $B_{X\%}$, F_{OFL}, MSST
- Tiers 4-6 designated to bycatch-only status
- Require full retention and utilization of bycatch species in Tiers 4-6[12]

When multiple species are grouped together and treated as one "stock" for purposes of setting a group TAC (assuming there is enough information to warrant directed fishing TACs), TAC or equivalent bycatch caps should be set at levels that protect the most vulnerable members of the group:

- Set ABC/TAC based on the least abundant species – if abundance data are available – to avoid overfishing of most vulnerable member of the group

[12] Note that this management measure does not imply endorsement of the existing IR/IU program as a means to meet the Magnuson Act's bycatch mandates. Rather, it is intended here as a data collection measure to improve target species management.

- Set ABC/TAC based on the species whose life history characteristics are most vulnerable to fishing mortality (e.g., species w/low reproductive rates)[13]

Uncertainty factors are incorporated systematically into ABC/TAC to account for measurement errors (surveys, fishery observer data), process errors (stock assessment model simulations), and extrinsic ecological and environmental factors that act on fish population dynamics in unknown and/or unpredictable ways:

- Factor species-specific survey coefficient of variation (CV, the error bounds around biomass point estimates) into calculation of ABCs, e.g., using average CV of survey biomass estimates in time series and compute lower 90% confidence interval as fraction by which to reduce maxF_{ABC}
- Set ABCs on lower 90% confidence limit of model estimate for $F_{X\%}$ rather than midpoint (50%) of the range of probability (i.e., *require higher confidence in ABC estimate*)
- Decision rules limiting fishing rate to *no greater than* $F_{75\%}$ for species w/key ecological roles, vulnerable life histories, and situations of high uncertainty
- $B_{40\%}$ (or higher, depending on life history characteristics) a limit rather than target (i.e., MSST) with linear reduction in F rate below $B_{50\%}$ to F = 0 @ $B_{40\%}$
- No directed fishing allowed for species for which no data exist to calculate BRPs and MSST
- Spatial and temporal dispersion of TAC employed to prevent localized depletion, serial overfishing by area, adverse local or regional impacts to species & habitats (See Spatial/Temporal Management of TACs below)
- Basin-wide network of marine protected areas (understood as areas managed primarily for the protection of fish and wildlife and their habitats that exclude commercial fishing, and may permit subsistence and/or personal use, and may in special circumstances include fully protected no-take reserves) and gear closure areas to prevent habitat damage and act as hedge against multiple uncertainties (see Habitat Protection Plan below)
- Expand research to obtain biological reference points, improve knowledge of species' life histories and habitat requirements, role in the food web, etc. (see Research Plan below)

Spatial/Temporal Management of TACs

Policy Level:

Fishery stock assessments do not assess the spatial distribution of stock biomass, the movement of fish over the course of the year, or the spatial and temporal effects of fishing. ABCs are set at the area-wide scale of the "stock as a whole" and on a start-of-year basis (PSEIS VIII, F-2-30), but fisheries concentrate effort in highly productive areas and times of high catch per unit of effort (CPUE), for economic reasons. Spatial/temporal concentration of fisheries increases the risk of overfishing and adversely impacting reproductive success of target stocks, their habitats, and dependent and related species. PSEIS IV, 5-15, 16; PSEIS II, 4.5-280; Appendix F-2, 3, 4. The TAC-setting process should include procedures to evaluate and address the spatial/temporal

[13] When multiple species are grouped together and treated as one "stock" for purposes of setting a group TAC, it is possible to overfish a vulnerable member of a stock complex. PSEIS IV, 4.10-4.

dimensions of fishing impacts explicitly, recognizing the limits and imprecision of available information:

- The FMPs will adopt an explicit policy of spatial and temporal management of TACs, based on mgmt objectives for target, non-target and protected species, and habitat protection

Regulatory Level:

Stock assessments should include all the relevant data to facilitate Plan Team evaluations and recommendations for spatial/temporal management of each target fishery:

- Each stock assessment will include distribution maps of fishing effort and catches by area and time of year using available Observer Program data, and information on the geographic and seasonal distribution of stock biomass from available survey data
- Each stock assessment will include an evaluation of how the distribution of the species and fishery have changed (or not) over time, and why these changes have occurred (e.g., environmental, socioeconomic, or regulatory factors that have affected spatial/temporal distribution of stock biomass and fishing effort)
- The stock assessments will include maps of EFH for the target species and evaluate fishing locations and catches relative to EFH, HAPC living habitat, and bycatch of non-target species
- The stock assessments will include relevant statistics on levels of catch in Steller sea lion critical habitat or other affected habitats of protected and vulnerable species, integrating data and advice from Office of Protected Resources, National Marine Mammal Laboratory, and the fishery Observer Program

A checklist of criteria should be employed to assess appropriate spatial/temporal management of each fishery, based on management objectives for target, non-target and protected species, and habitat protection. For example:

- How do local or regional fishing mortality rates compare with the target fishing mortality rate for "the stock as a whole"? Are disproportionately high catch rates (i.e., relative to the standing stock in the area) indicated or possible, based on available survey information, fishery CPUE data or vulnerable habitat type?
- Are patterns of serial depletion area by area indicated or possible due to concentrated fishing pressure on localized subpopulations of a stock in vulnerable EFH (e.g., spawning grounds)? Have changes in stock biomass distribution and fishery effort occurred over time, based on known historical distributions of the stock and fishery?
- How is fishing effort distributed relative to EFH (e.g., spawning, nursery, foraging habitat) and HAPC?
- Are localized depletions of important forage species indicated or possible due to fishery overlap with foraging areas of predators (e.g., SSL, NFS, whales, seabirds)?
- What is the fishery impact in regulated areas of critical habitat of protected species, by area and season?

- Are "hotspots" of high bycatch of non-target and Prohibited Species indicated in fishery Observer Program data?

Based on the evaluation of fishery data using these criteria, the groundfish Plan Teams will make recommendations for spatial and temporal management of the fishery along with ABCs, and identify critical information needs/gaps:

- Provide clear explanations of rationale and information used to apportion ABC by areas and seasons, or reasons for not doing so
- Include recommendations for gear restrictions, gear closure areas, bycatch-triggered closure areas, marine reserves or other measures that would address identified or potential impacts of concern
- Identify further research and survey information needed to address unknowns

In addition, inseason managers must have flexibility to act quickly to avoid harm and address problems that arise based on new information, including:

- Provide "Hot Spot" authority for managers to make timely inseason reductions to TAC Specifications as necessary to close a directed fishery, close areas of high bycatch, or otherwise modify a fishery to prevent overfishing, exceeding bycatch limits, or adversely impacting protected species and their critical habitats

Non-Target ("Bycatch") Species Taken Incidental To Fishing

Policy Level:

Literally hundreds of species are caught and killed incidentally in the groundfish fisheries, which catch a wide variety of species even when "targeting" a single species. PSEIS II, 4.1-31. The highest observed levels of non-target bycatch typically consist of species in the largest and least understood FMP species categories of "Other," "Forage," and "Non-specified," for which species-specific bycatch statistics are lacking because species-level identification is not required in the fishery Observer Program under the current FMPs. PSEIS IV, 4.9-231.

A bycatch reduction and avoidance plan is implemented to reduce or eliminate bycatch of non-target species in the FMP categories (e.g., Other, Forage, Non-specified), not simply to reduce regulatory discards as under the Improved Retention/Improved Utilization (IR/IU) program for target species pollock and cod. Bycatch limits are a principal tool for constraining bycatch of commercially valuable halibut, herring, salmon and crab in the North Pacific, but as conservation measures the bycatch caps are costly and information-intensive, requiring extensive independent survey and fishery observer data. They do not account for the uncounted crustaceans, mollusks, and other benthic life that are crushed or maimed by trawl gear and left on the seabed, or for the majority of non-targeted species caught, and therefore they understate the full impacts of fisheries; and they provide no protection to seabed habitat from trawl gear disturbance and damage. Fishing gear closures can serve as a conservation tool to reduce bycatch and protect foraging birds and mammals that also congregate in these zones. Gear allocations and catch

priorities to cleaner gear types should also be employed in conjunction with an integrated system of gear closure areas and marine reserves in order to reduce and avoid bycatch.

Regulatory Level:

For species in the "Prohibited Species" FMP category:

- Maintain existing BSAI Prohibited Species status for halibut, herring, salmon and crab, reduce PSC limits 10%/year over 5 years
- Extend Prohibited Species status to same species in GOA FMP, set PSC caps
- Establish PSC limits for currently designated HAPC living habitat, and future HAPC designations, set PSC caps

For species in the "Other," "Forage" and "Non-specified" species categories:

- Establish species-specific bycatch limits for non-target stocks (e.g., squid, octopus, skates, sharks, grenadiers, sculpins) as sufficient information becomes available
- Employ time/area gear closures and spatial/temporal management of TACs to address fisheries and areas of high bycatch
- Maintain existing trawl closure areas for nearshore crab habitat and bycatch-triggered closure zones (Bering Sea only)
- Integrate marine protected areas (understood as areas managed primarily for the protection of fish and wildlife and their habitats that exclude commercial fishing, and may permit subsistence and/or personal use, and may in special circumstances include fully protected no-take reserves) to avoid bycatch in sensitive and essential habitat areas
- Prohibit trawling for rockfishes, sablefish, Greenland turbot, Pacific cod and any other fishery that can be prosecuted with more selective ("cleaner") gear types that have less impact on habitat
- Phase out fisheries with high bycatch (e.g., >25% bycatch/discard rates)
- Establish and implement a harvest priority for cleaner gear types.

Habitat Protection Plan

Policy Level:

The Oceans Alternative Habitat Protection Plan provides comprehensive habitat protection in an integrated network of gear closure areas combined with marine protected areas, understood as areas managed primarily for the protection of fish and wildlife and their habitats that exclude commercial fishing, and may permit subsistence and/or personal use, and may in special circumstances include fully protected no-take reserves. Closure areas are intended to serve as protection for essential habitat types (spawning grounds, coral substrates, productive upwelling zones, etc.), as hedges against scientific uncertainty, and as scientific control areas to facilitate learning and informed adaptive management. The habitat protection plan encompasses all major types of benthic and pelagic ocean habitat in the action area. It includes protection of Essential

Fish Habitat and HAPC biota, as well as designated critical/essential habitats of protected mammal and bird species.

The Oceans Alternative Habitat Protection Plan employs a science-based approach while recognizing that the study of fishing effects on all types of habitat will remain uncertain for the foreseeable future. Scientific uncertainty about the effects of fishing on marine habitats is not a reason to delay habitat protection, rather a reason to increase it. (See Research Plan below.) This precautionary approach manages explicitly for habitat complexity *now*, while research on "essential" habitats continues.[14] Habitat protection measures can serve the cause of science and improve understanding by providing research control areas to study the effects of fishing while providing hedges against uncertainty and preserving options for the future.[15,16]

Regulatory Level:

- Provide detailed habitat maps and maps of fishery spatial/temporal distributions from Observer Program database (See Spatial/Temporal Management of TACs above)
- Integrate fishery Observer Program data and habitat maps into stock assessments for use in the TAC-setting process
- Zone and delimit fishing gear use in the action area, establishing areas where fishing is permitted, and allowing no expansion of destructive fishing without review and approval
- Establish a basin-wide network of marine protected areas (understood as areas managed primarily for the protection of fish and wildlife and their habitats that exclude commercial fishing, and may permit subsistence and/or personal use, and may in special circumstances include fully protected no-take reserves) encompassing at least 20-50% of fishable EEZ
- Designate spawning area closures to protect essential reproductive habitats of target species such as pollock, Pacific cod, rock sole, etc., which are fished intensively at spawning time
- Maintain existing trawl closure areas for nearshore crab habitat and bycatch-triggered closure zones
- Expand trawl closure areas to address areas of high bycatch and damages of chronic trawling to vulnerable essential fish habitats, including living coral habitat
- Prohibit trawling in all designated critical foraging habitat of the endangered Steller sea lion and address potential spatial/temporal redistribution of pollock trawl fishing effort in northern fur seal foraging habitat
- Identify areas of overlap between fisheries and habitats utilized by endangered whales and other marine mammals as migratory corridors and foraging grounds, by way of identifying habitat requiring protection measures

[14] Peter J. Auster, Les Watling, and Alison Rieser. 1997. Comment: The Interface Between Fisheries Research and Habitat Management. North American Journal of Fisheries Management 17: 591-595.
[15] Dayton, Paul K., Enric Sala, Mia J. Tegner and Simon Thrush. Marine Reserves: Parks, Baselines, and Fishery Enhancement. Bulletin of Marine Science, 66(3) 2000: 617-634.
[16] Daniel Pauly, Villy Christensen, Sylvie Guenettte, Tony J. Pitcher, U. Rashid Sumaila, Carl J. Walters, R. Watson and Dirk Zeller. Towards sustainability in world fisheries. Nature, Vol. 418, August 2002: 689-695.

- Cooperate with USFWS to address incidental fishing mortality and impacts to the habitats of other ESA-listed species (Short-tailed albatross, Steller's eider, Spectacled eider) and unprotected seabirds, with the goal of reducing seabird bycatch mortality to levels approaching zero
- Provide for traditional Alaska Native subsistence uses of fish and wildlife within protected areas

Catch Monitoring/Observer Program

Policy Level:

Observer coverage and Vessel Monitoring Systems (VMS) should be required for all sectors of the groundfish fleet, as part of the cost of doing business. Without fishery observer catch data and biological sampling for stock assessment purposes, fishery management has no way to monitor and assess fishery impacts. An equitable funding mechanism should be developed to support a robust Observer Research Plan that accomplishes the goals and objectives of the MSFCMA for total catch measurement and other data needs *necessary for the conservation, management, and scientific understanding of any fisheries under the Council's jurisdiction* (16 U.S.C. 1853 et seq.). Improvements in identification and enumeration in all FMP species categories should be prioritized and resources should be made available to accomplish those goals, including staff and funding levels. Observer Research Plan program design, objectives, sampling protocols and methods for improving data should be coordinated by NMFS.

Regulatory Level:

- 100% observer coverage on vessels >60' LOA
- 30% observer coverage on vessels <60' LOA
- Mandatory Vessel monitoring systems (VMS) on all groundfish vessels, as well as other monitoring tools (e.g., winch sensors, video equipment) where appropriate or feasible to enhance catch monitoring and measurement
- Vessel logbook catch reporting requirements to log catches in closed/open areas separately in order to assess compliance with maximum retainable bycatch limits inside areas closed to directed fishing or inside regulated areas of Steller sea lion critical habitat
- "Hotspot authority" to place observers and Observer Program staff aboard vessels in fisheries with high bycatch or other priority monitoring needs as determined by the program, based on statistically sound protocols
- Adequate resources and methods for improving identification and enumeration of fishery catches in all FMP species categories
- Whole-haul observer sampling on selected vessels to test assumptions of random sampling methodology, or as needed to improve total catch measurement and ensure that confidence in the data is high
- Requirement of motion-compensated scales to weigh all catches at sea
- Equitable and adequate funding mechanism to support program objectives, such as a fee-based funding mechanism based on: (1) a percentage of the unprocessed ex-vessel value of the fish and shellfish (such that smaller vessels with a smaller share of the catch are

not unfairly charged and larger vessels with a larger share of the catch pay into the system proportional to the benefits of the public resource that they enjoy); and (2) a percentage of the estimated processed value (such that fishing vessels do no bear the sole cost of the program and processors who reap the largest economic benefits pay their fair share)

Capacity Reduction and Limited Access Quota Allocation Plan

Policy Level:

Conservation problems have scientific, economic, and social components (Mangel et al. 1996), therefore an ecosystem-based framework of fisheries management must address not only protection of ecosystems but also economic and social aspects of fisheries to ensure that these are consistent with FEP goals and objectives and do not undermine the ability of ecosystems to produce goods and services on a sustainable basis across generations. Currently excess fishing and processing capacity exists in virtually every sector of the groundfish fleet. The economic sustainability of the fisheries is undermined by excess capacity, and the resulting race for fish between competing sectors of the groundfish industry leaves fishermen with little flexibility to respond to other priorities for conservation. Guiding principles for capacity reduction and alternative allocation schemes include:

- For fisheries to be sustainable and economically stable, capacity must be balanced with resource availability. [17]
- Should IFQ-based or community-based alternative allocations of groundfish quotas be developed, conservation standards must be included (see attachment) and it must be clear that a fishing quota is a privilege granted, not a right.
- NMFS must seek to prevent preemption of dependent fishing communities in Alaska and smaller, owner-operator participants who are most vulnerable to the effects of consolidation and accumulation of quota shares in other IFQ programs.

Sustainability requires limits on entry into fisheries as a first step, but the License Limitation Program (LLP) does nothing by itself to address the ills of overcapacity in the North Pacific groundfish fisheries since LLP would allow nearly twice as many vessels to fish as are now participating in the fishery every year. Limited access quota programs are no panacea for conservation, and additional programs should be examined as tools to end the race for fish, reduce the waste and bycatch associated with derby fisheries, improve compliance with other conservation regulations, improve vessel and crew safety, increase the value of the catch, and protect dependent fishing communities from pre-emption or consolidation of fishery benefits. Criteria for the design of limited access quota programs have been recommended by the Alaska Marine Conservation Council and Marine Fisheries Conservation Network (see attachment). These criteria must be included in any limited access quota program. In addition, should IFQs be considered, NMFS should assess the administrative and information costs of IFQ management

[17] NMFS 2001 Draft North Pacific Groundfish FMP-level PSEIS 4.9, p. 8.

and ensure that monitoring and enforcement programs can be adequately funded before approving such quota allocations.

Effort-based measures should also be employed as an alternative means of reducing capacity and protecting smaller participants from bigger competitors in instances where limited access programs are not feasible due to administrative costs, lack of resource survey information, lack of fishery observer data to estimate total catch, and lack of political support.

Regulatory Level:

- Maintain existing license limitations on new entrants to the groundfish fishery
- Should Individual Fishing Quotas be considered, include conservation standards, and ensure that program funding is adequate to cover the administrative costs of management, regular resource surveys, stock assessments, and observer reporting
- Establish community quota shares as a means of ensuring community access to fishing opportunities where such allocations are appropriate and simpler to administer as an alternative to individual-based quotas
- Encourage the development of fishing co-operatives in the absence of strict quota-based regimes
- Employ effort-based regulations, including vessel size and horsepower limits, gear size limits, trip limits, limits on tender vessels, seasonal exclusive area registration rules, etc., in instances where quota-based and community quota share systems are not feasible

Scientific Research and Monitoring Plan

The Oceans Alternative science and research approach is science-based while recognizing that research is not a panacea and scientific uncertainty about marine ecosystems will not be resolved by more research in most cases. The need for more information should, therefore, not be used as an excuse to delay precautionary protective measures to conserve ecosystem components while research continues. Scientific uncertainty about the effects of fishing on ecosystems is not a reason to delay environmental protection or ecosystem-based management, rather a reason to increase it. Basic precautionary principles guide this ecosystem-based management approach to science, research, and uncertainty:

- The management system is science-based but must have realistic expectations about the ability of scientific research to yield conclusive results or provide unequivocal management advice; marine science is likely to produce glimpses of underlying ecosystem mechanics rather than complete understanding for the foreseeable future[18]

[18] R.C. Ferrero and L.W. Fritz. Steller Sea Lion Research and Coordination: A Brief History and Summary of Recent Progress. NOAA Technical Memorandum NMFS-AFSC-129. June 2002. 34 pp.

- Fisheries science works with limited data of questionable reliability, makes many unverifiable assumptions about hidden states of nature, and provides probabilistic advice with low levels of confidence and large error bounds[19,20]
- Scientific uncertainty will not be eliminated from fishery management decisions, therefore the need for more information on ecosystem processes is no excuse for delaying efforts to protect ecosystem components in a precautionary, proactive manner while research continues[21]
- The burden of scientific proof must be shifted from the environment to fisheries; scientific uncertainties about the effects of fishing on marine ecosystems are reasons for more environmental protection, not less
- Any action must be taken in the face of uncertainty, guided by policy priorities and values in the FMPs that recognize high risks of error and leave large margins for safety
- Protective measures can serve the cause of science and improve understanding by providing research control areas to study the effects of fishing while providing hedges against uncertainty and preserving options for the future

The Oceans Alternative requires high levels of basic research, monitoring and data collection to approve high levels of fishing, in order to provide evidence that large-scale fisheries are not likely to have lasting adverse effects on the environment or incur high levels of risk of unintended consequences. Data needs for Target, Prohibited and Protected species management include:

- Calibration of stock assessment models requires, at a minimum, fishery catch data, independent survey abundance data, and basic life history data for target species[22]
- Expanded target species research is needed to obtain biological reference points, improve knowledge of species' life histories and habitat requirements, role in the food web, etc.
- Observer Program coverage is required to provide essential fishery data to estimate total catch and discard mortality, limited non-target species identification and enumeration, and collects some biological data (e.g., otoliths for age estimation); program underfunded and needs revamping
- Protected species management requires basic information, e.g., on Steller sea lion population trends, food habits, at-sea foraging distributions, studies of spatial/temporal fishery impacts on the local prey field, as well as Observer Program fishery data analysis and inseason fishery management for managed areas of critical habitat

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[19] Jon T. Schnute and Laura J. Richards. Use and abuse of fishery models. Can. J. Fish. Aquat. Sci. 58: pp. 10-17 (2001): "A fish population model typically contains many states that can never be observed directly, such as the abundance of fish."

[20] Daniel Goodman (chair), Marc Mangel, Graeme Parks, Terry Quinn, Victor Restrepo, Tony Smith, and Kevin Stokes. Scientific Review of the Harvest Strategy Currently Used in the BSAI and GOA Fishery Management Plans. Draft report prepared for the North Pacific Fishery Management Council, Nov. 21, 2002.

[21] Peter J. Auster, Les Watling, and Alison Rieser. 1997. Comment: The Interface Between Fisheries Research and Habitat Management. North American Journal of Fisheries Management 17: 591-595.

[22] Pamela M. Mace (Chair), Norman W. Bartoo, Anne B. Hollowed, Pierce Kleiber, Richard D. Methot, Steven A. Murawski, Joseph E. Powers, Gerald P. Scott. Marine Fisheries Stock Assessment Improvement Plan. Report of the National Marine Fisheries Service National Task Force for Improving Fish Stock Assessments, U.S. DOC/NOAA/NMFS, October 2001, p. 17.

Longer-term ecosystem monitoring is needed to collect baseline information, but existing research information from a variety of ongoing research initiatives is not being fully utilized at present. The Oceans Alternative Research Plan emphasizes better coordination of scientific research and better use of existing data, with a focus on interdisciplinary research integrating already available (and extensive) data from ongoing research at all levels of the federal, state and university institutions. The FMPs are already required to contain research recommendations that the Councils and NMFS view as necessary to carrying out their EFH management mandate, by law, including a schedule for obtaining information on the effects of fishing on habitat. Ecosystem monitoring, regular resource surveys, fishery observer data, and studies of the effects of fishing on habitat are baseline information needs and are included in the Fishery Ecosystem Plan as an ongoing obligation to improved implementation of ecosystem-based management and sustainable fisheries, including a schedule for obtaining information on the effects of fishing on marine ecosystems of the North Pacific. The Ecosystems Considerations appendix to the annual SAFE reports should be used as a vehicle in the TAC-setting process for collecting and compiling these data, identifying and reviewing research priorities, providing regular updates and evaluations of ongoing research as new information becomes available. This information should be integrated into stock assessments where relevant and employed by groundfish "Plan Teams" when making annual scientific recommendations for individual fishery ABCs:

- The Oceans Alternative research plan would include a specified research schedule for improving the description and identification of EFH and HAPC in the North Pacific, as well as a schedule for obtaining information on the impacts of fishing gear on marine habitat
- The Oceans Alternative ecosystem monitoring plan would include a specified research schedule for improving the description and understanding of ecosystems and ecosystem processes in the North Pacific, integrating existing research information from programs such as FOCI, SEBSCC, SSLRI, National Ocean Service, NOAA Office of Oceanic and Atmospheric research, Pacific Marine Environmental Laboratory, National Marine Mammal Laboratory, NMFS Fishery Observer Program, RACE resource surveys, Alaska Department of Fish and Game, EVOS-funded Gulf Ecosystem Monitoring (GEM) program, relevant university research programs, and other relevant research from outside the region
- Information should be compiled and updated on an ongoing basis in the Ecosystem Considerations appendix of the annual SAFE reports for use in stock assessments and the ABC and TAC-setting process
- Experimental fishing permits should be used where appropriate to evaluate methods for reducing bycatch, improving data collection of bycatch or testing hypotheses about the impacts of fishing on the environment
- Research efforts to improve knowledge of trophic interactions and predator-prey dynamics between exploited, dependent and related species should be reviewed and updated on a regular basis and utilized in stock assessment advice
- Fisheries Oceanography Coordinated Investigations (FOCI) and other long-term research should be funded to gather baseline data

- Traditional knowledge and observations of fishermen should be incorporated as additional sources of information and monitoring
- Ecosystem mapping capabilities should be enhanced

Alaska Native Subsistence And Co-Management Plan

Policy Level:

Recognition of traditional Native subsistence uses and cultural values of living marine resources should be an explicit feature of the FEP, including right of access to resources. Adverse impacts of the fisheries on species and habitats of cultural significance should be addressed.

Regulatory Level:

Co-management agreements and cooperative research designed to utilize traditional knowledge, including monitoring and data-gathering capabilities, should be encouraged and developed:

- Halibut and other groundfish
- Salmon and herring
- Seals, sea lions, cetaceans and seabirds