

SUSTAINABLE MANAGEMENT OF ALASKA'S FISHERIES

A Primer

January 2008

Stephen T. Grabacki
Certified Fisheries Professional
GRAYSTAR Pacific Seafood, Ltd.

Table of Contents

Click on the links below to be redirected to the
selected section

<u>Introduction</u>	1
<u>Stock Assessment</u>	2
<u>Quota Establishment</u>	6
<u>Management Process</u>	9
<u>Jurisdiction and Collaboration</u>	13
<u>Management Methods</u>	16
<u>Bycatch Reduction</u>	18
<u>Habitat Protection</u>	20
<u>Regulatory Enforcement</u>	24

INTRODUCTION

The living marine resources in the ocean off Alaska are truly of world-class proportions. Demersal and pelagic, marine and anadromous, finfish and shellfish -- Alaska's resources are known around the world for their abundance and diversity.

These resources support commercial fisheries that have harvested millions of tons of finfish and shellfish every year for decades. Human use of Alaska's resources is sustainable, and history demonstrates that this is so. In fact, the principles and methods of fisheries management that are used in Alaska are, themselves, known worldwide as having long-term conservation and sustainable use as their overriding objective.

Alaska's fisheries are managed by agencies of the federal government, agencies of the state government, or by a cooperative arrangement between federal and state agencies. Such collaboration is perfectly routine -- both federal and state agencies have similar fisheries management principles, strategies, and methods. For example, they both employ the precautionary approach to fisheries management -- managing for maximum sustainable yield, as modified into Optimum Yield by environmental and economic factors. And they each have a clear and unbreakable separation of conservation from allocation.

Later in this document, there will be more details about the similarities, differences, and cooperation between federal and state management authorities. Until then, please note the names of these agencies:

- National Marine Fisheries Service ("NMFS", also called "NOAA Fisheries"): conservation and management of federally-managed species, such as groundfish
- North Pacific Fishery Management Council ("NPFMC" or "Council"): allocation of federally-managed species
- Alaska Department of Fish & Game ("ADFG" or "Department"): conservation and management of state-managed species, such as salmon
- (Alaska) Board of Fisheries ("BoF" or "Board"): allocation of state-managed species

STOCK ASSESSMENT

Every year, scientists from NMFS, in collaboration with scientists from the Council, universities, and ADFG collect data, and compile and update databases on catch, age and size composition, and survey biomass. They analyze the data and calculate estimates of key population parameters for all groundfish species under federal management. The data for these assessments come from scientific trawl surveys, acoustic surveys, fishery harvest monitoring, and other scientific studies. Contemporary stock assessment models are constructed to integrate the scientific information, except when information is not sufficient for model construction. The data are used to calculate estimates of yearclass abundance, spawning biomass, total biomass, weight-at-age, weight-at-age by year, and weight-at-age by sex. This is a comprehensive, quantitative process, which occupies the full-time attention of dozens of scientists year-round. This is the best scientific evidence available, and it forms the foundation of all groundfish fishery stock assessments.

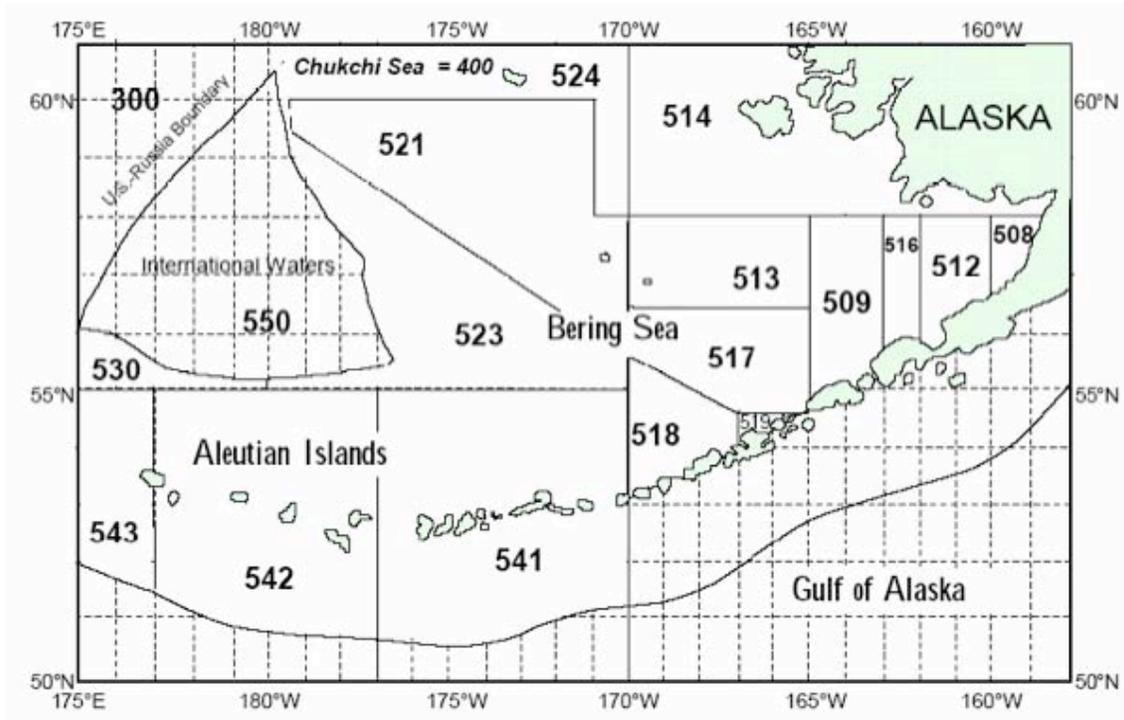


Figure 1: Bering Sea & Aleutian Islands Statistical and Reporting Areas

There is a Fishery Management Plan (FMP) for every federally-managed fishery. NMFS' guidelines for FMPs require that a stock assessment and fishery evaluation (SAFE) report be prepared and reviewed annually for each FMP. The SAFE summarizes the best available scientific information concerning the past, present, and possible future condition of the stocks, marine ecosystems, and fisheries that are managed under federal regulation. It provides information to the Council for determining annual harvest levels from each stock, documenting significant trends or changes in the resource, marine ecosystems, and fishery over time, and assessing the relative success of existing state and federal fishery management programs.

The stock assessment section of the SAFE reports are compiled by the Plan Team from chapters contributed by scientists at NMFS Alaska Fisheries Science Center (AFSC). Each chapter develops and evaluates several competing mathematical models of stock abundance, and then selects and recommends the model that best reflects actual stock conditions. These chapters include recommendations for overfishing levels (OFLs) and acceptable biological catch (ABCs) for each stock and stock complex managed under the FMP. The ABC recommendations are reviewed by the Scientific and Statistical Committee (SSC), which may confirm the Plan Team recommendations, or develop its own. This is one of the stages of peer review, through which these recommendations must pass.

The ABC recommendations, together with social and economic factors, are considered by the Council in determining total allowable catches (TACs) and other measures used to manage the fisheries. Neither the scientists, Plan Team, nor SSC recommend TACs; that is, the Plan Team's recommended ABCs are distinctly separate from, and are calculated prior to, any setting of TACs, or allocation of harvests.

The North Pacific Fishery Management Council maintains Fishery Management Plans (FMPs) for Bering Sea & Aleutian Islands (BSAI) groundfish, Gulf of Alaska (GOA) groundfish, and for crab, scallop, and salmon fisheries. As part of the FMP process, the designated Plan Teams produce annual SAFE reports for each species or species group. For the BSAI region, there are discrete SAFEs for Eastern Bering Sea pollock, Aleutian Islands pollock, Bogoslof Islands pollock, Pacific cod, sablefish, yellowfin sole, Greenland turbot, arrowtooth flounder, northern rock sole, flathead sole, Alaska plaice, other flatfish, Pacific Ocean perch, northern rockfish, other rockfish, shortraker/rougheye rockfish, Atka mackerel, skates & sharks, squid / octopus / sculpins, and grenadiers. For the GOA region, there are discrete SAFEs for pollock, Pacific cod, sablefish, flatfish / rex sole / Dover sole, arrowtooth flounder, flathead sole, Pacific Ocean perch, northern rockfish, shortraker & other slope rockfish, rougheye rockfish, pelagic shelf rockfish, demersal shelf rockfish, thornyhead rockfish, Atka mackerel, skates & sharks, and squid / octopus / sculpins.

The research and data collection performed by NMFS, as well as the FMPs and the supporting SAFEs, consider each stock unit over its entire area of distribution. These studies include research on the target resources, as well as research on climatic, environmental, and socio-economic factors. They are based on the best available scientific knowledge, plus local and traditional knowledge of the resources and their habitat.

The Stock Assessment and Fishery Evaluation is a thorough, quantitative process, based on timely, complete, and reliable statistics. The data underlying those statistics come from both NMFS' own scientific surveys, and from fishery-related monitoring. Each SAFE presents sound statistical analyses, and produces several competing mathematical models, or scenarios. NMFS scientists then select the scenario which best represents two stock-specific reference points --

- Stock-specific target reference point: called the ABC or Acceptable Biological Catch; this is a scientifically acceptable level of harvest based on the biological characteristics of the stock, and its current biomass level; it is associated with the F_{ABC} which is the mathematical rate at which the stock may be exploited, to achieve ABC

- Stock-specific limit reference point: called the OFL, or Over-Fishing Limit; this is a limiting catch level, higher than ABC, which demarcates the boundary beyond which the fishery is no longer viewed as sustainable; it is associated with the F_{OFL} which is the mathematical rate at which the stock may be exploited, to achieve OFL

Finally, each SAFE also considers the effects of the ecosystem on the stock, the effects of the fishery on the ecosystem, bycatch of non-target and other species (including marine mammals and sea birds), and fishery usage of habitat.

Each FMP and SAFE, as well as a wide variety of related analyses and reports, are readily available to the public, from the websites of NPFMC and NMFS, Alaska Region.

The Alaska Department of Fish and Game (ADFG) is the state counterpart to the federal NMFS. ADFG conducts research on the fisheries resources that are within state management authority. The most well-known of these is Alaska salmon, which is actually composed of five distinct species: king (chinook), red (sockeye), pink (humpy), chum (keta), and silver (coho).

A groundfish stock, such as BSAI pollock, can be considered to be one unit, and it can be studied and forecast as a unit. Salmon stocks, on the other hand, have unique population dynamics characteristics in each river to which they return to spawn. That is, each "run" of salmon in a particular river must be understood, forecast, and managed as a discrete unit, not related to other runs of salmon in that river, or in nearby rivers.

In the years since Alaska became a state (1959), ADFG has compiled comprehensive databases on salmon runs. Department scientists use those data, plus in-season assessments of run strength (numbers of fish), to set escapement goals for the fisheries. "Escapement" means the annual estimated size of the spawning salmon stock, that is, the numbers of salmon that escape capture in a fishery. The quality of the escapement may be determined not only by numbers of spawners, but also by factors such as sex ratio, age composition, temporal entry from the ocean into the river system, and spatial distribution within salmon spawning habitat. The escapement goal is a stock-specific reference point for fishery management.

By having escapement as its top priority, ADFG ensures the conservation of the target species, as well as the conservation of other species in the same ecosystem, which might be associated with the target species. All other considerations, such as harvests and allocation, are subordinate to the escapement goal. Long-term conservation and sustainable use are, therefore, ADFG's overriding objective. The Department seeks to maintain the quality, diversity, and availability of fishery resources for present and future generations.

In setting escapement goals, ADFG uses the best scientific evidence available, from its own research (*e.g.*, test fishing, aerial surveys), and from fishery-related data. Alaska has literally hundreds of salmon runs, and each run may be classified according to availability of data on historic escapements, and historic catches.

For stocks where there are no stock-specific data on escapements or catches, ADFG selects a watershed model or a stream-length model on which to base its estimates of run strength and escapement. Where there are little stock-specific data, ADFG uses a paleolimnology model for sockeye salmon, or a model relating spawning abundance to system production, for species such as chinook salmon. This usually leads to the development of a Sustainable Escapement Goal (SEG).

An SEG is a level of escapement, indicated by an index or an escapement estimate, that is known to provide for sustained yield over a 5 to 10 year period. It is used in situations where a BEG cannot be estimated because of the absence of a stock-specific catch estimate. The SEG is the primary management objective for the escapement, unless an optimal escapement or in-river run goal has been adopted. It is developed from the best available scientific information. The SEG is determined by ADFG, and is stated as a range that takes into account data uncertainty; the Department seeks to maintain escapement within the bounds of the SEG.

An SEG differs from a TAC in that an SEG is a range, while a TAC is a specific number. Stating an escapement goal as a range provides useful in-season flexibility to fisheries managers, as will be explained presently.

For stocks where there are many data on both escapements and catches, it is possible to calculate a Biological Escapement Goal (BEG). It takes into account stock-recruit data, and fishing power. A BEG is the escapement that provides the greatest potential for maximum sustained yield. BEG is the primary management objective for escapement unless an optimal escapement or in-river run goal has been adopted. It is developed from the best available biological information, and is scientifically defensible on that basis. The BEG is determined by ADFG, and is expressed as a range based on factors such as salmon stock productivity and data uncertainty. The Department seeks to maintain evenly distributed salmon escapements within the bounds of the BEG.

SEGs and BEGs can be thought of as stock-specific target reference points for salmon stocks. There is also a Sustained Escapement Threshold (SET), which is the threshold level of escapement, below which the ability of a salmon stock to sustain itself is jeopardized. In practice, the SET is estimated based on the lower ranges of historical escapement levels, for which the salmon stock has consistently demonstrated the ability to sustain itself. The SET is set lower than the lower bound of the BEG and SEG. The SET is established by ADFG, for salmon stocks of management or conservation concern. In other words, the SET is a stock-specific limit reference point.

QUOTA ESTABLISHMENT

Harvest control is one of the primary management measures with proven capability for preventing overfishing of fishery resources. The NPFMC harvest control system is complex and multi-faceted, in order to address issues related to sustainability, legislative mandates, and quality of information.

The first element is the specification of Optimum Yields (OY) for the groundfish complexes in the Bering Sea / Aleutian Islands (BSAI) and the Gulf of Alaska (GOA) as a range of numbers. The sum of the TACs of all groundfish species (except Pacific halibut) is required to fall within the range. The range for BSAI is 1.4 to 2.0 million mt; the range for GOA is 116 to 800 thousand mt. These aggregate, all-species TACs are never exceeded, regardless of whether the species-specific TACs might sum a greater total. Some people believe this OY limit has been the main reason that the fisheries in the BSAI have held up so well.

The second element is the specification of maximum permissible ABCs and of OFLs for each stock in the complex (usually individual species but sometimes species groups). NPFMC uses a "tier" system in fisheries management: the harvest control rule depends on the amount of information available. In Tier 1, information is abundant enough and compelling enough to determine the statistical distribution of maximum sustainable yield. In this Tier is only one stock: BSAI walleye pollock. Most of the larger and commercially important stocks are in Tier 3, which has sufficient information to determine $F_{40\%}$ and its corresponding biomass $B_{40\%}$. For these stocks, the spawner-recruit relationship is uncertain, so that MSY cannot be estimated with confidence. Hence, a surrogate based on $F_{40\%}$ is used, following findings in the scientific literature. A large number of the remaining stocks (generally of lower magnitude) are in Tier 5, in which natural mortality is the basis of the maximum permissible ABC. A few are in Tier 6, in which biomass and reference points cannot be determined, so that the rule is a function of average catch. These rules have become more conservative over time.

The TAC is an adjustment downward from ABC that takes into account social and economic factors and the OY range. In practice, NPFMC attempts to manage a fishery so that total catch (including all discards) is less than, but very close to, TAC.

In Tiers 1–3, sufficient information is available to determine a target biomass level, which would be obtained at equilibrium when fishing according to the control rule with recruitment at the average historical level. The control rule is a biomass-based rule, for which fishing mortality is constant when biomass is above the target and declines linearly down to a threshold value when biomass drops below the target. Fishing mortality is 0 below the threshold, which is currently set to 0.05 of the target biomass. In Tiers 4 and 5, a Biological Reference Point (BRP) cannot be determined, so fishing occurs at a constant fishing mortality, which is chosen to be conservative according to findings in the scientific literature. In Tier 6, such a fishing mortality cannot be determined, so catch is constrained to be 75% of the average historical catch.

The processes of stock assessment and harvest strategy development are interrelated. Stock assessment parameters are used in development of the harvest strategy, and the current NPFMC biomass-based harvest strategy uses the most recent biomass estimates in determining ABC,

OFL, TAC, and whether overfishing is occurring. Nevertheless, the goal of harvest strategy development is to provide a stable, quantitative set of control rules for operating the fisheries, and the goal of stock assessment is to use the best available scientific information to determine the status of the population in reference to the quantities that are inputs to the rules.

An annual process determines the values of ABC, OFL, and TAC. As previously explained, stock assessment scientists make recommendations about ABC and OFL in their Stock Assessment and Fishery Evaluation (SAFE) documents. A group of scientists also constructs an Ecosystem Considerations chapter. The BSAI and GOA Plan Teams (PTs) meet in September and November to review the SAFE documents. The two teams meet jointly to discuss common issues, and separately about the individual assessments. The major goal of the annual September meeting is to discuss general methodological issues and applications. The Statistical and Scientific Committee (SSC), Advisory Panel (AP) of industry representatives and interest groups, and the Council meet in October. The SSC discusses methodology, while the AP and Council set preliminary TACs based on the previous year. In December of each year, the SSC reviews the SAFEs and PT recommendations, and issues its recommendations about ABC and OFL. The AP recommends values of TAC that are lower than the ABC values of the SSC. The Council then sets final values of ABC, OFL, and TAC. The Council could recommend higher ABCs than those of the SSC, but in the almost 30 years of TAC-setting, the NPFMC has virtually never done so.

An interesting side note -- The American federal law that governs fisheries management is known as the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), which was first enacted in 1976. Among many other provisions, the original MSFCMA created a system of regional Fishery Management Councils, of which NPFMC is one. Since then, the Act has been modified and reauthorized a few times, most recently in 2006. In that 2006 reauthorization, the U.S. Congress mandated that all regional fishery management councils create and rely upon a Scientific and Statistical Committee, and establish a peer review process, in order to separate conservation decisions from allocation decisions. The interesting part is that the NPFMC has always had, and relied upon, its SSC, and the Council has always had a peer review process as an integral step in its decisions. That is, for more than 30 years, the North Pacific Fishery Management Council has had a clear, obvious separation between conservation decisions and allocation decisions. This is one way in which fisheries management in Alaska can be used as an example for fisheries management elsewhere.

The only Alaska fishery whose stock assessments and harvest policy are not determined by NMFS or ADFG is Pacific halibut. The International Pacific Halibut Commission (IPHC) is a bilateral, collaborative organization, composed of members from the United States and Canada. Every year, the IPHC conducts a resource survey, collects data from the commercial fleet, and produces a stock assessment for each regulatory area. Areas 2C, 3A, 3B, 4A, 4B, and 4CDE are off the coast of Alaska. Since 1986, the IPHC has used a constant harvest rate policy to determine annual catch limits, with the same rate applied to all areas. Recently, IPHC has recognized that halibut migrate eastward more than previously thought. In response to this new understanding, the IPHC has invoked the precautionary principle, and modified its harvest policy, by using different harvest rates in different areas, according to the abundance of the stock.

The IPHC is responsible for halibut stock assessment, and apportionment of that harvest among fishing areas. After the Commission releases its annual harvest policy, the allocation of that harvest is performed (in Alaska) by the NMFS and ADFG.

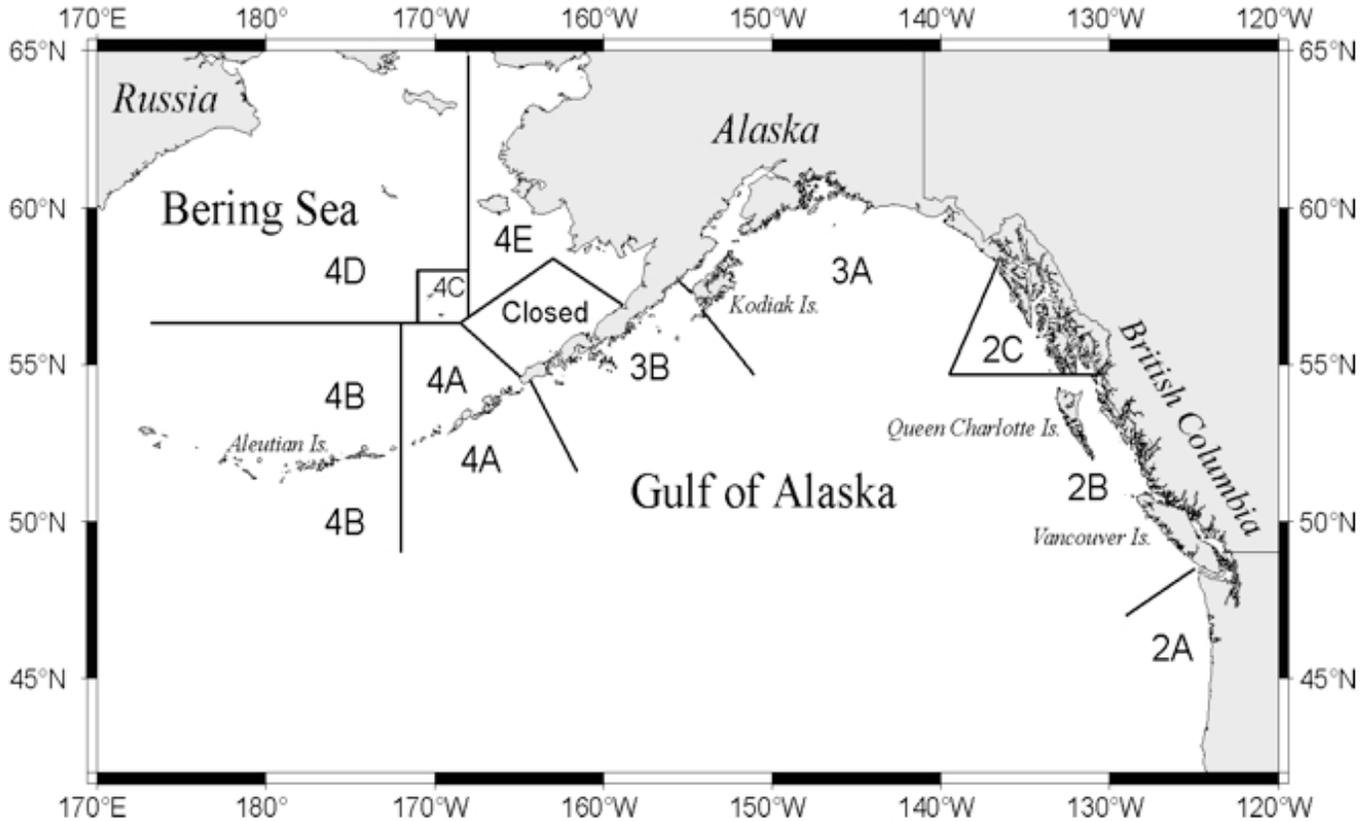


Figure 2: IPHC Statistical Areas

For the salmon fisheries, ADFG's main priority is escapement, which ensures that enough fish escape the fisheries, and spawn in their natal rivers. The total number of salmon returning to a given river (the "run" or "return") is usually much greater than the escapement level. That amount, over and above escapement, may be harvested by commercial, recreational, personal use, or subsistence fisheries. If the run of salmon is not greater than the escapement goal, then ADFG does not allow any harvest.

The allocation of salmon harvests among types of users is done by the Board of Fisheries, but only after ADFG sets the escapement goals. In this way, conservation decisions are clearly separate from allocation decisions. Long-term conservation and sustainable use of salmon is the Department's overriding objective.

MANAGEMENT PROCESS

The North Pacific Council is composed of 15 members: 11 voting and 4 non-voting. Seven of the voting members are appointed by the U.S. Secretary of Commerce upon the recommendation of the governors of Alaska and Washington. The governors must submit three names for each vacancy occurring on the Council and may indicate a preferred choice. The Governor of Alaska nominates candidates for five seats, the Governor of Washington two seats. Each member is appointed to a three-year term and may be reappointed, but may not exceed three consecutive terms. There are four mandatory voting members; they are the leading fisheries officials from the states of Alaska, Washington and Oregon, and the Alaska Regional Director for the National Marine Fisheries Service. The four non-voting members are the Executive Director of the Pacific States Marine Fisheries Commission, the Area Director for the U.S. Fish and Wildlife Service, the Commander of the 17th Coast Guard District, and a representative from the U.S. State Department.

The Stock Assessment and Fishery Evaluation (SAFE) reports for the groundfish fisheries managed by Council are compiled by the respective Plan Teams from chapters contributed by scientists at NMFS' Alaska Fisheries Science Center & and the Alaska Department of Fish and Game (ADF&G). There are 4 Plan Teams -- BSAI groundfish, GOA groundfish, BSAI crab, and scallop. Plan Teams are composed exclusively of scientists -- no harvesters or other stakeholders are involved in these conservation decisions.

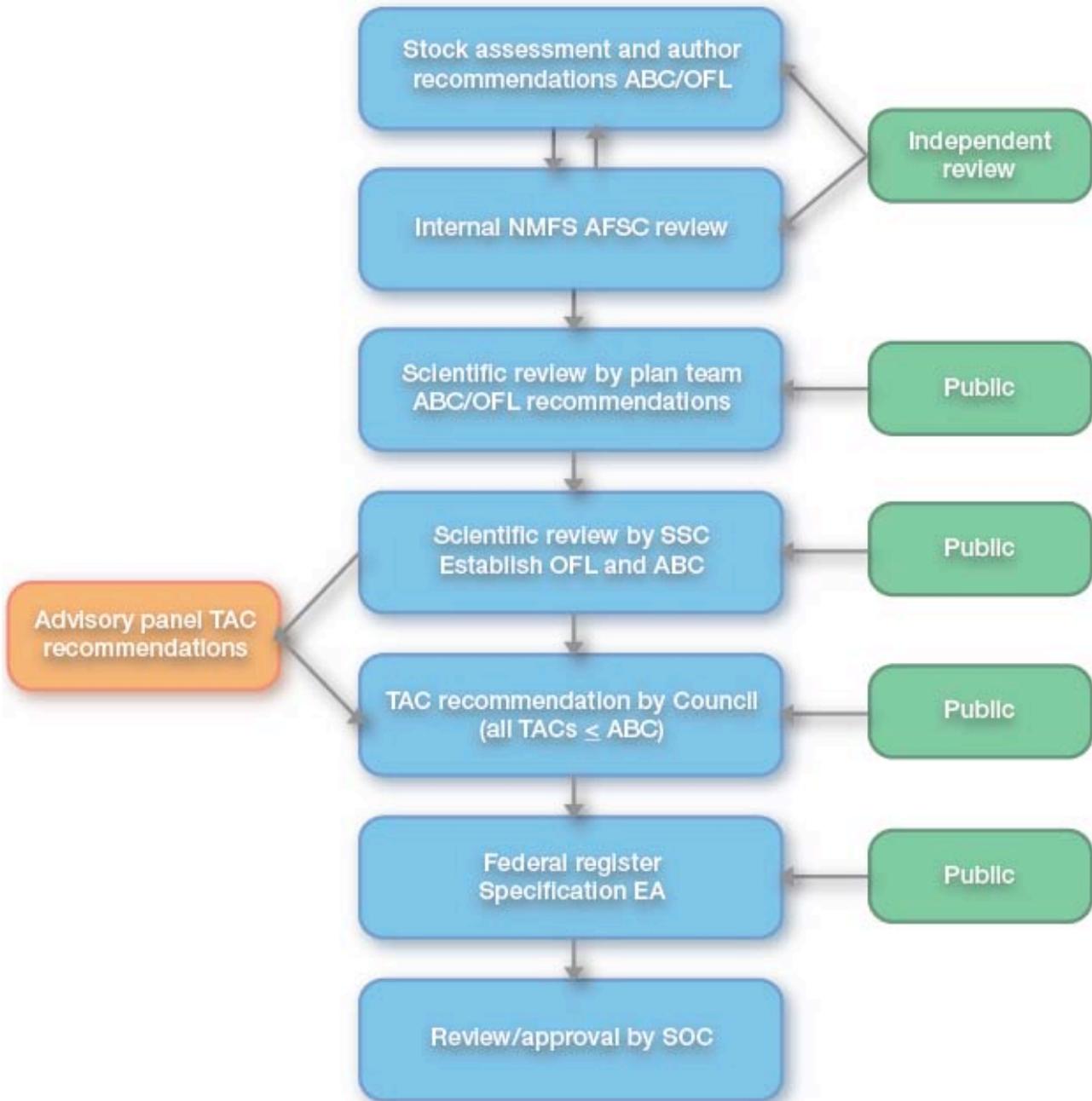
The ABCs, TACs, and other recommendations of the Plan Teams are first vetted by the Council's Scientific & Statistical Committee (SSC), a separate panel of biologists and economists. Then, the SSC's recommendations are reviewed by the Council's Advisory Panel (AP), a broad group of harvesters, processors, and other stakeholders. The AP is the first point at which users of the resource may comment on the harvest recommendations. The AP develops recommendations for allocation of the TACs. The recommendations of the SSC and the AP are forwarded to the Council, in plenary session. The Council is essentially the final decision-maker on ABCs, TACs, OFLs, and the allocation and management of harvests. Strictly speaking, the Council makes recommendations to the U.S. Secretary of Commerce, but the Secretary virtually never disapproves of any Council decision.

The Plan Teams and the SSCs make fisheries conservation decisions without input from users and stakeholders. After those decisions are made, the AP and the NPFMC make allocation and management decisions. The two steps of decision-making are clearly separate.

Stakeholders and members of the public may attend meetings of the Plan Teams and the SSC, but are very rarely permitted to offer opinions. On the other hand, the AP and the Council are arenas of comprehensive, vigorous public scrutiny and participation. Their decision-making processes are quite transparent, and they strive strongly to achieve timely, practicable solutions.

This multi-level "Council process" is an inclusive partnership of scientists, management professionals, and public and industry stakeholders. For more than 30 years, it has proven to be both conservative and effective.

Scientific Review Process for North Pacific Stock Assessments and Catch Specifications



Flow chart depicting the scientific review process for stock assessments and establishment of catch specifications in the North Pacific region. Catch specifications include the overfishing level (OFL), the acceptable biological catch level (ABC), and total allowable catch limits (TAC), where $TAC < ABC < OFL$.

Figure 3: NPFMC's Scientific Process of Setting Catch Specifications

The Alaska Board of Fisheries consists of seven members serving three-year terms. Members are appointed by the Governor of Alaska, and confirmed by the State Legislature. Members are appointed on the basis of interest in public affairs, good judgment, knowledge, and ability in the field of action of the board, with a view to providing diversity of interest and points of view in the membership. The Board of Fisheries' main role is to conserve and develop the fishery resources of the state. This involves setting seasons, bag limits, methods, and means for the state's subsistence, commercial, sport, guided sport, and personal use fisheries, and it also involves setting policy and direction for the management of the state's fishery resources. The Board is charged with making allocative decisions, and the Department is responsible for management based on those decisions. The Board of Fisheries meets four to six times per year in communities around the state, to consider proposed changes to fisheries regulations around the state. The Board uses the biological and socioeconomic information provided by the Alaska Department of Fish and Game, public comment received from people inside and outside of the state, and guidance from the Alaska Department of Public Safety and Alaska Department of Law when creating regulations that are sound and enforceable.

Advisory committees are the local "grass roots" groups that meet to discuss fisheries issues, and to provide recommendations to the Board. There are 81 committees throughout the state, each with expertise in a particular local area. Meetings are always open to the public and are generally attended by Department staff and members of the public who can offer background information on agenda topics. Advisory Committees are intended to provide a local forum on fishery issues. Their purpose as established by the legislature includes:

- Developing regulatory proposals
- Evaluating regulatory proposals and making recommendations to the Board
- Providing a local forum for fish conservation and use, including matters relating to habitat
- Advising the appropriate regional council on resources
- Consulting with individuals, organizations, and agencies.

The state ADFG is analogous to the federal NMFS, in that they conduct biological studies, and set either TACs or escapement goals, as appropriate to a fishery -- they make conservation decisions.

The State BoF is analogous to the federal NPFMC, in that they make allocation decisions, after the conservation decisions have been made. The Board and Council processes are very public, transparent arenas.

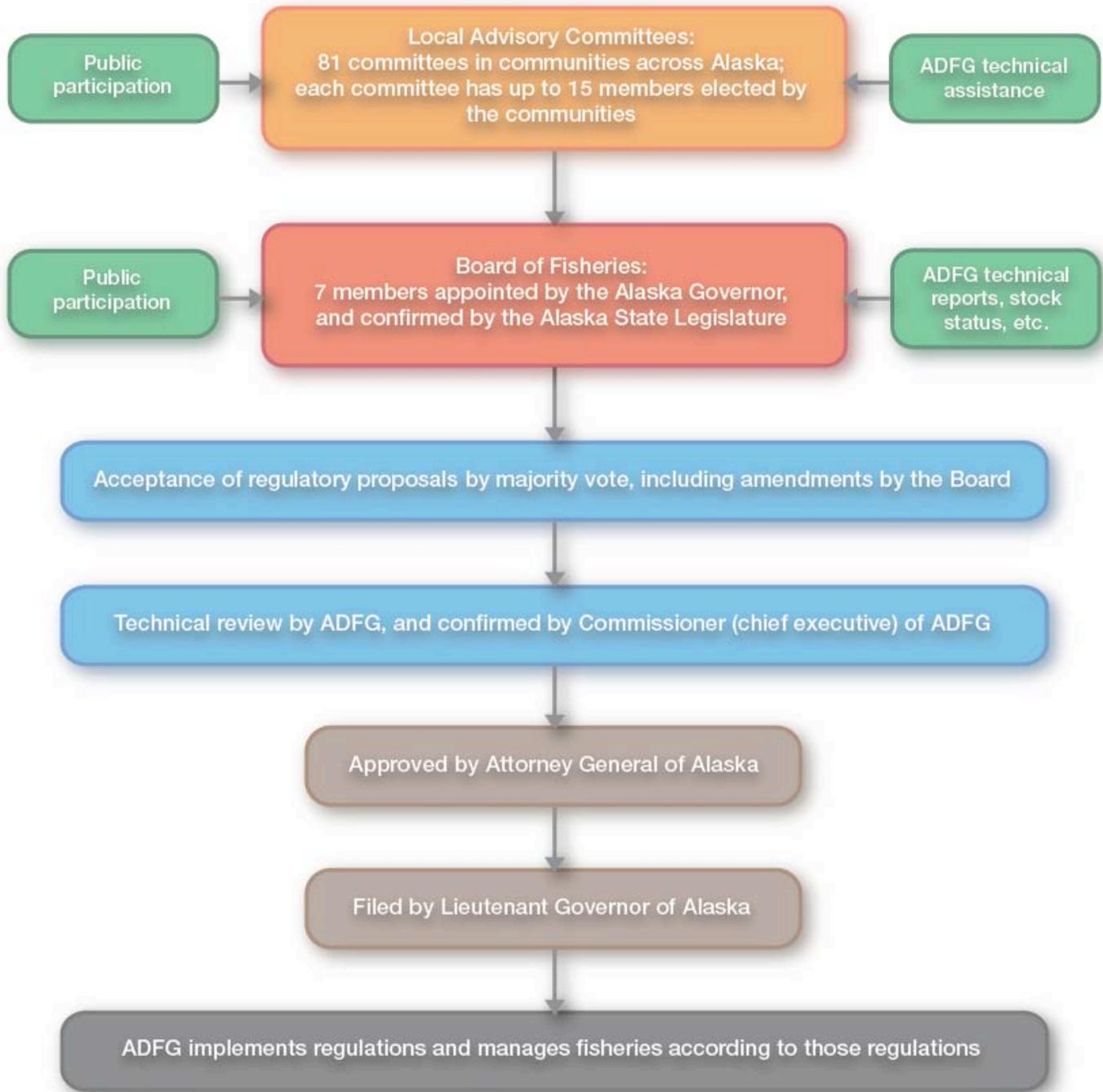


Figure 4: Alaska Board of Fisheries Regulatory Process

JURISDICTION AND COLLABORATION

The MSFCMA gives the United States federal government management authority over the fisheries in the American Exclusive Economic Zone (EEZ), which extends to 200 nautical miles from shore. The State of Alaska has fisheries management authority in "internal" state waters, which are generally within 3 nautical miles of the shoreline. And the waters beyond 200 miles, called the "high seas", are international.

Fish do not recognize the boundaries set by humans, and some traditional fishing practices occurred before these designations were set. Therefore, there are several ways in which the theoretical boundaries have been modified, in the interest of conservative and efficient fisheries management.

Some semi-enclosed bodies of water have customarily been considered to be state waters, even though they are much more than 3 miles wide. For example, Cook Inlet, near Anchorage, is termed "internal waters" of the State of Alaska, and ADFG (not NMFS) manages the salmon fisheries of Cook Inlet. In fact, ADFG and the Board manage all Alaska salmon fisheries, even those that take place well outside internal waters, such as the troll salmon fishery near Southeast Alaska.

The fisheries for king and snow crab take place well outside of state waters, but, until recently, they were managed by ADFG and the Board. Since the federal Crab Rationalization and Buyback legislation was enacted in 2005, those fisheries have been managed by a collaboration between federal and state agencies. NPFMC's BSAI Crab Plan Team, chaired by ADFG, sets the annual species-specific ABCs. ADFG, following the harvest strategy of the Board, sets the TACs, which must not be greater than the ABCs. ADFG also controls such parameters as season dates, fishing areas, and gear types. ADFG monitors the crab fisheries, and reports data to NMFS and NPFMC.

All groundfish fisheries (pollock, cod, flatfish, rockfish) are managed by the federal Council process, unless ADFG requests an allocation for a fishery in state waters. The species-specific TACs are set by the Council process, which was described earlier. A state waters groundfish allocation subtracted from that TAC, and that fishery is managed by ADFG, in accordance with BoF policy.

In fact, there is frequent collaboration between the federal NPFMC/NMFS process and the state BoF/ADFG process. For example, the Commissioner of ADFG has a permanent, voting seat on the Council. The Council and the Board hold a formal joint meeting at least once per year, and informal coordination is quite a matter of routine. Because of their strong mutual interests in fishery conservation, and their adherence to the precautionary principle of fishery management, both pairs of agencies view this cooperation as essential.

International cooperation in Alaska fisheries management is also a matter of course. The International Pacific Halibut Commission (IPHC) is composed of Canadian and American representatives. Every year, IPHC scientists set the TACs for the coming fishing season, and apportion those harvests to IPHC statistical fishing areas, based on productive capacity of the

stock in those areas. For halibut fisheries off the coast of Alaska, the allocation of those area-specific TACs is done by the Board and the Council.

In the Bering Sea between Russia and the USA is a zone of international waters known as the "Donut Hole". Many years ago, in response to increasing multi-national fishing pressure on Alaska pollock in the Donut Hole, combined with sharp declines in that stock, the two countries forged a treaty in which each agreed to prohibit their fleets from fishing in that zone. Harvesters of other nations are also prohibited from fishing there. There has been virtually no harvest of Alaska pollock from the Donut Hole for more than a decade. This international cooperation will, it is hoped, permit that stock to recover.

Federal agencies, the University of Alaska, and private business cooperate in the North Pacific Groundfish Observer Program, which was implemented in early 1990, and expanded since then. Under this program, NMFS provides the operational oversight of the program, certification training, definition of observer sampling duties and methods, debriefing of observers, and management of the data. The cost of managing the program is paid by NMFS. Training of the observers is conducted by the University of Alaska. The observers are employed by private observer companies, who are, in turn, engaged by the harvesters on whose boats the observers work.

STATE, FEDERAL AND INTERNATIONAL MANAGEMENT OF ALASKA'S FISHERIES

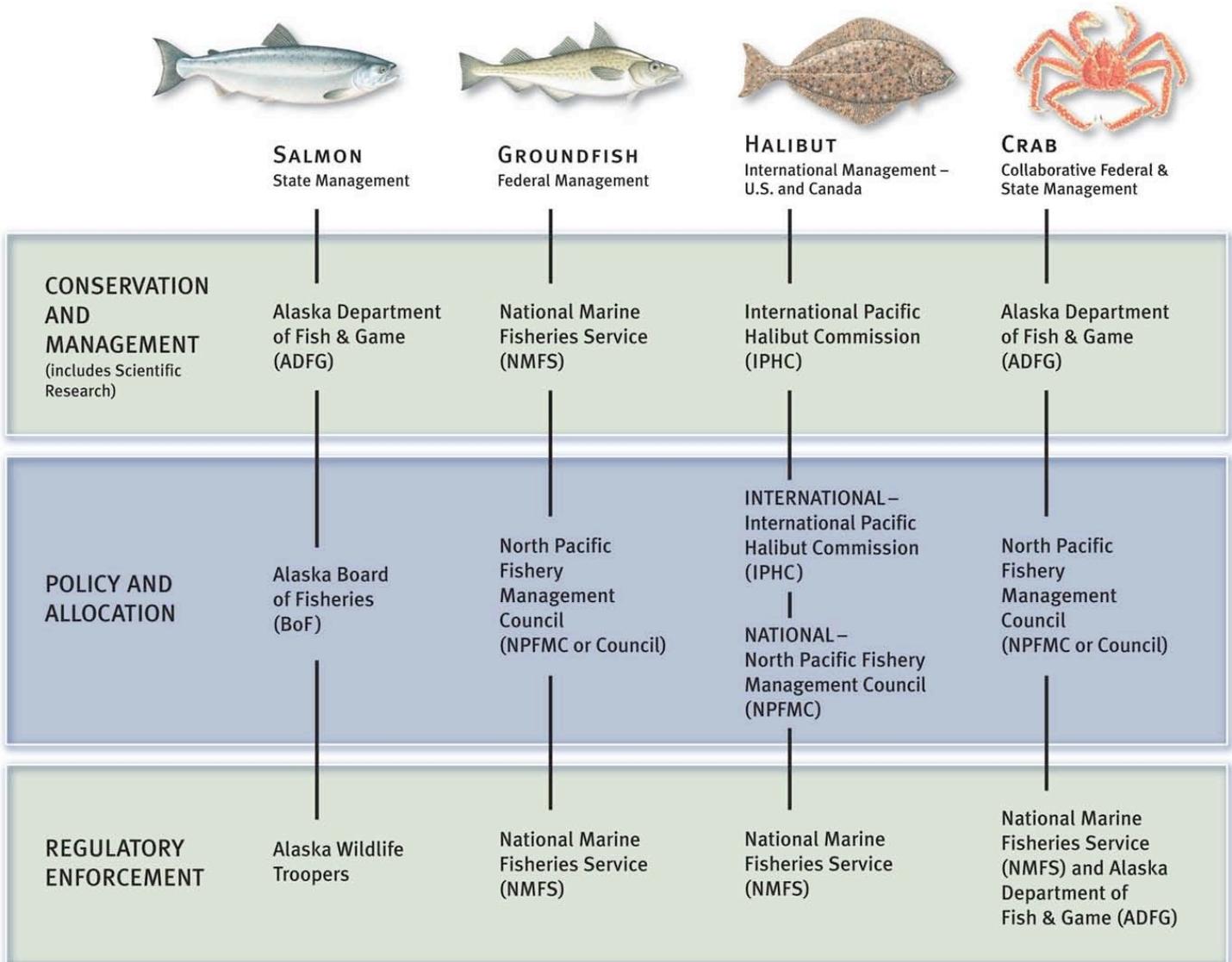


Figure 5: Three Levels of Collaboration

MANAGEMENT METHODS

After the TACs are set and allocations are made, the detailed work of fisheries management begins. NMFS and ADFG use a wide variety of fishery management methods and techniques.

The largest and most basic collection of fishery management techniques may be termed "regulated inefficiency". Over time, in every fishery in the world, the exploitative pressure on the stock tends to increase. Harvesters increase in number, and they improve in fishing skill. Boats become bigger, faster, and more powerful. Electronic fish-finding equipment becomes more sensitive and accurate. Fishing gear such as nets, winches, and ropes become stronger. In other words, fishing fleets tend to become more efficient in their catching power.

The problem is that the numbers of fish are finite. The finite nature of fish stocks, combined with the virtually infinite improvements in catching efficiency, almost always set the stage for overfishing.

In Alaska, one approach to a solution has been to regulate the efficiency of the harvesters, through such methods as:

- Time-and-area closures: these methods allow fishing during certain times or in certain areas, but not in others –
 - Time: this can be a start-to-finish fishing season (weeks or months), and it can also be certain periods (hours or days) within a season
 - Area: this method restricts where fishing may take place; also it is an important tool in restricting bycatch, as will be explained momentarily
 - These time-and-area restrictions are often gear-specific; for example, longline gear might be allowed in one area, while trawl gear is allowed in another area
- Restrictions on size of boats: certain fisheries have limits on the size of fishing boats; in the huge Bristol Bay salmon fishery, that limit is 32 feet, length-over-all (LOA)
- Restrictions on fishing gear: virtually every fishery has limitations on the fishing gear, for example –
 - Gillnets must be made of multi-filament mesh, not mono-filament
 - Gillnets and purse seines must be no larger than the length and depth specified for a given fishery
 - Drift gillnets must always be attached to the fishing vessel, rather than being allowed to drift freely
 - Gillnets are not permitted in any Alaska fishery under NMFS management
- Certain gear types are completely prohibited, such as pelagic longlines, sunken gillnets, fish traps

Another Alaska approach is to limit the number of harvesters in a fishery. Known widely as "license limitation", in Alaska it is termed "limited entry", because it limits who may enter a fishery. The Alaska Commercial Fisheries Entry Commission (CFEC) manages the license

limitation program for Alaska's salmon fisheries, and certain other fisheries. No one may harvest Alaska salmon without an Alaska "limited entry permit", which they must buy from a current permit holder. CFEC keeps track of these permit transactions. The Alaska limited entry salmon fisheries are protected from over-crowding, and thus are less difficult to manage than would be an unrestricted fishery. Similar license limitation programs exist for the federally managed Alaska scallop and Pacific cod fisheries.

The third major approach to fishery management is "Rationalization", which refers to economic rationalization -- the granting of ownership rights to a given fraction of an annual TAC. At present, some notable Alaska fisheries have been rationalized -- BSAI pollock, Pacific halibut, sablefish (blackcod), and most BSAI king and snow crab fisheries -- and several others are being considered for rationalization. All rationalization programs involve some sort of Individual Fishing Quotas for harvesters, and some of them involve quotas for processors. The practice of Alaska fisheries rationalization will be explained in detail elsewhere in this document. For now, please note that rationalization improves fisheries management by imposing strict limits on the amount of fish that each harvester may take.

Federal and state fisheries managers use a variety of other techniques, depending on the operations of a fishery. For example, there may be a requirement that all fishing vessels have their fish holds inspected before the start of a fishing season, which ensures that they have not started fishing before the season starts.

In addition to the fisheries management tools described above, state and federal managers have the ability to impose or modify the rules during the fishing season, rather than only between seasons. This "in-season" management ability means that fishery managers can modify the fishery, to adapt it to the realities of the stock, the weather, and other parameters. In federal fisheries, a fishery might be limited, modified, or stopped altogether, if a pre-determined level of incidental catch is reached. In the state-managed salmon fisheries, managers can open and close the fishery (start and stop fishing) in response to the daily "run strength", which is the numbers of salmon returning to their natal streams.

In-season management has been used in Alaska fisheries ever since Alaska became a State, and took over the management of its fisheries. It is a powerful management tool, which is being adopted by managers of other fisheries in other states and countries.

BYCATCH REDUCTION

Bycatch, also called "incidental catch" or "incidental harvest" means the unintended capture of non-target species, which might be other fish species, sea birds, or marine mammals. Significant, effective bycatch reduction programs are enforced in all Alaska fisheries, both federal- and state-managed.

In the groundfish fisheries, certain species have been designated as "Prohibited Species", and must not be retained on board a groundfish fishing vessel -- any species of salmon, Pacific halibut, Pacific herring, steelhead trout, any species of king crab, and any species of snow / Tanner crab. When a pre-determined amount of a prohibited species is taken, the fishery for the target species is closed, regardless of whether it has taken its own TAC. This strict rule provides a strong incentive for harvesters to "fish clean" -- to minimize bycatch of prohibited species. Over the years, the "PSC cap" (limit) has closed many groundfish fisheries before the TAC for the target species has been reached. These same rules apply to "state waters" ("internal waters") groundfish fisheries, as well.

NMFS' Protected Resources Division (PRD) is responsible for developing management and conservation programs for all but three species of marine mammals in Alaska, including:

- Dolphins & porpoises
- Steller sea lions
- Walrus, sea otter, polar bear
- Seals: harbor, ice, fur
- Whales

In administering provisions of the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), the Fur Seal Act, and the Magnuson-Stevens Fishery Conservation Act, the biologists and staff of the PRD work with other NMFS offices and the NPFMC to develop regulations and management measures to protect, conserve and restore marine mammal populations.

A few of the areas that the PRD is specifically involved in are managing commercial fishery interactions with marine mammals and seabirds, coordinating Steller sea lion recovery efforts, co-management of marine mammal subsistence harvests with Alaska Native organizations, coordinating the Alaska Marine Mammal Stranding Network, establishing responsible marine mammal viewing guidelines, and developing and distributing public information and educational materials about marine mammals in Alaska. The division also consults on permit requests for scientific research, capture of marine mammals for public display, and takes of marine mammals incidental to other activities. Additionally, PRD consults with Federal agencies under Section 7 of the Endangered Species Act to ensure that Federal agency activities do not adversely affect threatened or endangered marine mammal species or their critical habitat.

The Alaska staff of NMFS have been actively addressing seabird incidental take in longline (hook-and-line) fisheries off Alaska since 1989. In 1998, Alaska NMFS appointed a Seabird Coordinator to focus on seabird-related issues. NMFS' seabird-related responsibilities and activities include: consultations under the Endangered Species Act (ESA), data collection by fishery observers, public and industry outreach and education, research, regulatory action, and participation in the development of an international and national plan of action to reduce the incidental take of seabirds in longline fisheries. NMFS plays a proactive role in its coordination with local, regional, national, and international agencies, organizations, and experts in its efforts to reduce seabird incidental take in hook-and-line fisheries.

The ESA lists Steller sea lions are listed as "threatened", and NMFS and NPFMC have taken measures to prevent harmful interaction between sea lions and commercial fishing operations. Large areas of the Bering Sea, Aleutian Islands, and Gulf of Alaska have severe restrictions on the timing and type of fishing that may be conducted near sea lion habitat, and many areas are completely closed to commercial fishing.

In addition, all vessels using pot, hook-and-line, or trawl gear that are permitted to directly fish for Pacific cod, Atka mackerel or Alaska pollock must participate in NMFS' Vessel Monitoring System, which transmits each vessel's location, by satellite, to NMFS's Office of Law Enforcement. This requirement is necessary to monitor fishing restrictions in Steller sea lion protection and forage areas.

The presence of "free" food in the form of offal and bait attracts many birds to fishing operations. In the process of feeding, birds sometimes come into contact with fishing gear and are accidentally killed. For example, most birds taken during hook-and-line operations are attracted to the baited hooks when the gear is being set. These birds become hooked at the surface, and are then dragged underwater where they drown.

For most of Alaska's longline fisheries, the primary requirements are:

- Seabird avoidance gear must be onboard, made available for inspection upon request by specified persons, and must be used while hook-and-line gear is being deployed
- The fishing vessel must use of a line or lines ("bird scaring lines") designed to deter seabirds from taking baited hooks (paired streamer line, single streamer line, or buoy bag line)
- Offal discharge methods, including removal of hooks from any offal that is discharged
- Seabird Avoidance Plan – a new reporting requirement. Must be written, current, and onboard the vessel
- Collecting all seabirds that are incidentally taken on the observer-sampled portions of hauls using hook-and-line gear

HABITAT PROTECTION

Alaska is thousands of miles away from large sources of pollution that can contaminate the human food supply in other parts of the world. These distances, combined with the earth's patterns of circulation of water and air, help to ensure that Alaska's own waters are among the cleanest in the world.

Alaska's human population density is the lowest of any in the United States, and lower than most places in the world. Alaska has very little heavy industry, and development activities such as energy production, mining, road building, logging, and sewage treatment are subject to myriad protective regulations at the federal and state levels.

The federal Environmental Protection Agency (EPA) includes Alaska in its administrative Region 10. There, EPA's Office of Water and Watersheds enforces the Clean Water Act (CWA) and other federal statutes. The U.S. Army Corps of Engineers (CoE) enforces CWA sections 10 and 404, which regulate the navigability (which includes fish passage) of water bodies, and work in, or discharge of fill material into, navigable waters. EPA and CoE frequently consult with other federal agencies, such as National Marine Fisheries Service and Fish & Wildlife Service. All significant permits and actions are subject to the Environmental Impact Statement (EIS) process, which not only requires thorough review by scientists and agencies, but which also mandates thorough and comprehensive public information and transparency.

The State of Alaska's fish habitat protection statutes date back to statehood (1959), and reflect Alaskans' belief that fish species and habitats are assets that must be protected from unnecessary or inadvertent disturbance or destruction from human activities, in order to continue to produce social and economic benefits for generations to come.

The two primary fish-related laws enforced by the Alaska Department of Natural Resources Office of Habitat Management and Permitting (OHMP) are the Fishway Act and Anadromous Fish Act (both within Alaska Statute Title 41), which closely regulate activities within, near, or across a stream containing anadromous fishes (such as salmon), at any part of their life cycle. The location of specified anadromous waterbodies is contained in the "Catalog of Waters Important for the Spawning Rearing or Migration of Anadromous Fishes." The Catalog is updated annually after public review, and may be reviewed at:

http://www.sf.adfg.state.ak.us/SARR/FishDistrib/FDD_ims.cfm

The Alaska Department of Fish and Game (ADFG) enforces the provisions of Alaska Statute Title 16, which mandates the conservation and protection of Alaska fish and game. The Alaska Department of Environmental Conservation's (ADEC's) Division of Water establishes standards for water cleanliness, and regulates discharges to waters and wetlands. The federal EPA issues permits under the National Pollutant Discharge Elimination System (NPDES), and ADEC then certifies those NPDES permits.

Consultation among federal agencies, among state agencies, and between federal and state agencies is frequent and routine. Through these multiple layers of governmental regulatory oversight, Alaska's aquatic habitats and ecosystems are protected from the impacts of development activities.

Alaska's marine habitats are protected from the impacts of commercial fishing, as well. As the U.S. Congress noted in its 1996 renewal of the MSFCMA [section 2(a)(9)], "One of the greatest long-term threats to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats. Habitat considerations should receive increased attention for the conservation and management of fishery resources of the United States."

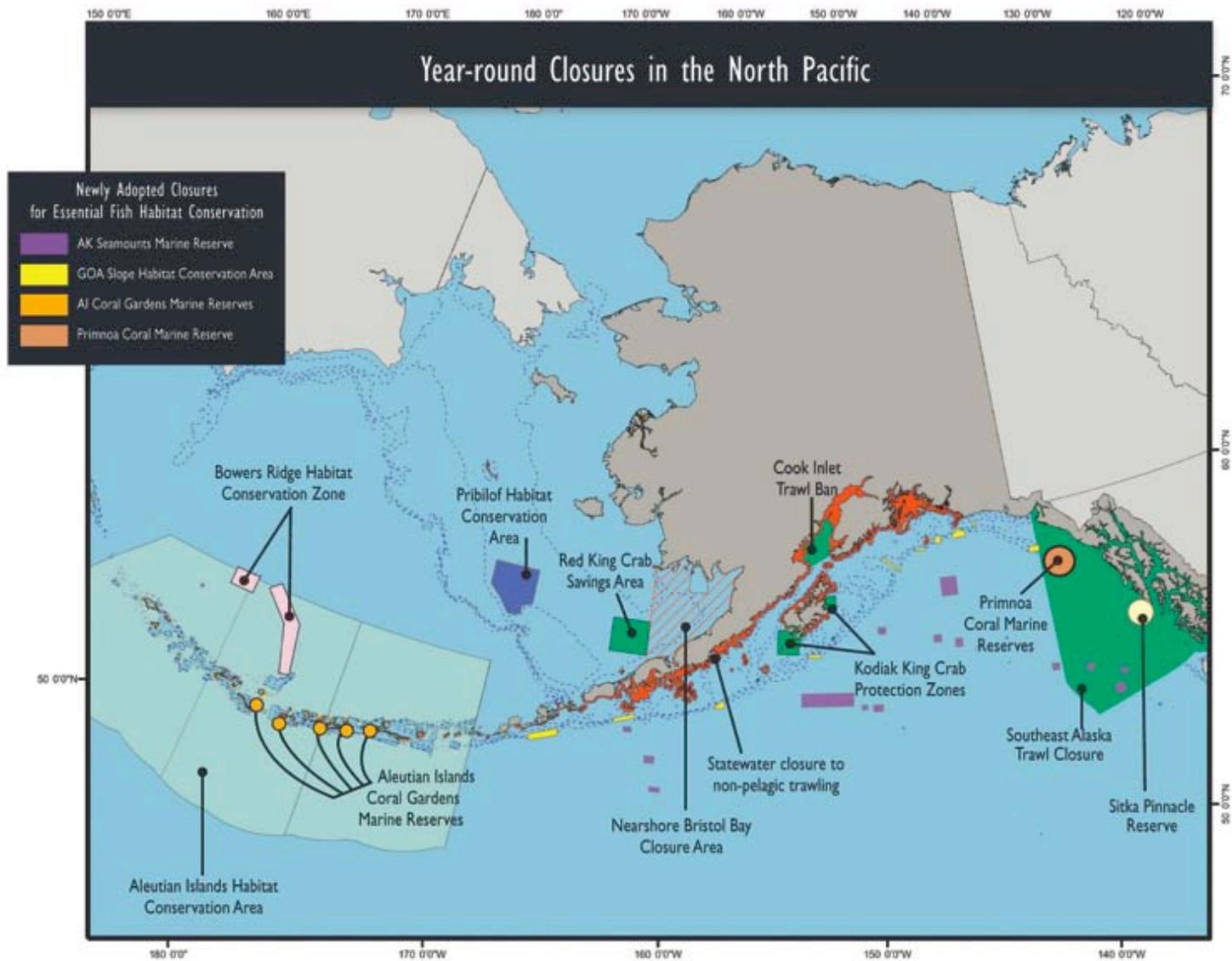
The MSFCMA mandated that each Fishery Management Plan describe and identify Essential Fish Habitat (EFH) for the fishery, minimize to the extent practicable the adverse effects of fishing on EFH, and identify other actions to encourage the conservation and enhancement of EFH. All federal agencies must consult with NMFS regarding any action they authorize, fund, or undertake that may adversely affect EFH, and NMFS must provide conservation recommendations to federal and state agencies regarding any action that would adversely affect EFH.

EFH means those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity. Waters include aquatic areas and their associated physical, chemical and biological properties. Substrate includes sediment underlying the waters. 'Necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. Spawning, breeding, feeding, or growth to maturity covers all habitat types used by a species throughout its life cycle.

The North Pacific Fishery Management Council took even further action in February 2005 to conserve essential fish habitat (EFH) from potential adverse effects of fishing. The EIS prepared for the action concluded that while fisheries do have long term effects on benthic habitat, these impacts were minimal and had no detrimental effects on fish populations. The Council adopted several new measures to minimize the effects of fishing on EFH in the Aleutian Islands and Gulf of Alaska.

The EFH EIS also evaluated a suite of alternatives for the eastern Bering Sea (EBS). Based on that analysis, the Council determined that additional habitat protection measures in the EBS were not needed right away, and that an expanded analysis of potential mitigations measures for the EBS should be conducted prior to taking action.

Large areas of ocean space have been closed to bottom trawling, while others have been closed to all commercial fishing.



Source: North Pacific Fishery Management Council

Figure 6: Year-Round Closures of Fishing Grounds

Habitat Areas of Particular Concern (HAPCs) are subsets of EFH. HAPCs highlight specific habitat areas with extremely important ecological functions and/or areas that are especially vulnerable to human-induced degradation. In 2006, the NPFMC designated five sectors of ocean floor as HAPCs: <http://www.fakr.noaa.gov/habitat/efh.htm> (Closure Area).

The term “Marine Protected Area” (MPA) refers to an area of the marine or coastal environment that is afforded some degree of legal protection for natural and/or cultural resources. MPAs have been used effectively both nationally and internationally to conserve biodiversity, manage natural resources, protect endangered species, reduce user conflicts, provide educational and research opportunities, and enhance commercial and recreational fisheries. Numerous MPAs are in effect in Alaska. For example, an area known as the Sitka Pinnacles, located off Cape Edgumbe in the Gulf of Alaska, has been closed to all bottom fishing and anchoring since 1999 to protect lingcod, rockfish, and corals.

MPA is a general term that includes a wide variety of levels of resource protection. Some people think MPAs are the same as marine reserves (no-take areas), but marine reserves are simply one type of MPA. Many MPAs are multiple-use areas where a range of human activities are allowed.

REGULATORY ENFORCEMENT

All fishery management regulations and management decisions must be enforced. The activities and operations of fish harvesters, seafood processors, recreational fishers, and other resource developers must be monitored and controlled in an appropriate fashion.

Alaska's state and federal fisheries-related agencies share a strong ecological awareness and a consciousness of conservation. They have developed and maintain a legal and regulatory framework for effective conservation, protection, and management of Alaska's living marine resources. Fisheries-related regulatory enforcement is performed by both state and federal agencies.

Within the Alaska Department of Public Safety is the Division of Wildlife Troopers. Their core mission is to protect Alaska's natural resources through regulatory enforcement. Through education, presence, and enforcement action, the Troopers are committed to enforcement of commercial fisheries, sport fisheries, and aquatic habitat regulations (among many other duties).

The Division uses significant resources in its missions:

Personnel Resources

- 91 commissioned AWT Troopers
- 21 Public Safety Technician II - Conduct dockside boardings of federal fisheries vessels under agreement with National Marine Fisheries
- 16 Public Safety Technician I – seasonal technicians that assist troopers with vessel operations and maintenance
- 14 Boat Operators – civilian employees permanently assigned to operations of larger vessels between 42 ft and 156 ft

Vessel Resources

- 45 vessels in total that are used for commercial fisheries enforcement
- Vessels range in size from 18 ft day skiffs to a 156 ft high seas enforcement vessel
- 156 ft vessel stationed in Dutch Harbor, 121 ft vessel and 65 ft vessel stationed in Kodiak, 69 ft vessel stationed in Ketchikan and 42 ft vessel stationed in Cordova
- Various 26 ft – 33 ft medium vessels stationed throughout Southeast Alaska, Prince William Sound, Kenai Peninsula, Kodiak Island and the Alaska Peninsula that are used for multi-day commercial fisheries patrols
- Larger vessels (42 ft -156 ft) fully equipped with pot pulling capabilities

Aircraft Resources

- 21 Piper PA-18 Super Cubs, 10 on floats
- 6 Cessna 185, 3 on floats
- Cessna 206
- 2 Cessna 208 Caravans
- 1 Beechcraft King Air equipped with infra-red photo equipment
- 3 Robinson R-44 helicopters, 2 on floats
- 1 turbine helicopter equipped with infra-red photo equipment

Patrol Missions

- In-river gill net salmon fisheries using smaller vessels, aircraft and land based viewing operations using photo equipment
- Near coastal gill net and seine salmon and herring fisheries using all sizes of vessels, aircraft and land based viewing operations using photo equipment
- Near coastal shrimp and crab (Dungeness, king and tanner) pot fisheries using aircraft, medium and large vessels.
- Off shore crab (king and tanner) fisheries using large vessels and infra-red equipped twin engine aircraft
- Off shore ground fish (halibut, pacific cod etc.) longline and pot fisheries using larger vessels and infra-red equipped twin engine aircraft
- Off shore trawl fisheries using large vessels and infra-red equipped twin engine aircraft
- Southeast Alaska salmon troll fisheries using all sizes of vessels and aircraft
- Herring pound fisheries using mostly medium sized vessels
- Rock fish jigging fisheries using any vessel class
- Dive fisheries (sea cucumber, sea urchin and geoduck) fisheries

Patrol Information

- 1,121 days at sea scheduled for medium and larger vessels (does not include use of day skiffs)
- Larger vessels travel throughout the state on extended patrols up to a month long
- Medium sized vessels patrol up to a week at a time
- Civilian captains and mates are all Coast Guard licensed
- Commissioned boat operators pass certification exams
- Calendar year 2005 had nearly 400 commercial fishing violations charged resulting in over \$750,000 in fines in addition to nets, pots and other equipment being forfeited
- Vessels used in committing the most egregious offenses are sometimes seized and forfeited to the state
- Patrols are often conducted in conjunction with the National Marine Fisheries Service and the U.S. Coast Guard

For fisheries under federal management, NOAA Fisheries (NMFS) Office for Law Enforcement (OLE) is dedicated to the enforcement of laws that protect and conserve our nation's living marine resources and their natural habitat. OLE's special agents and enforcement officers have specified authority to enforce over 37 federal statutes, as well as many treaties related to the conservation and protection of marine resources and other matters of concern to NMFS.

In the Alaska region (termed by NMFS the Alaska Division), about 35 special agents and enforcement officers conduct patrols and investigations across more than 900,000 square miles of open ocean and over 33,000 miles of Alaska coastline. OLE overcomes the challenges of Alaska's size and remoteness by:

- (1) establishing and monitoring Control Points at key fishing ports
- (2) requiring that vessels notify NMFS when and where they intend to offload product

- (3) working closely with Alaska Wildlife Troopers for dockside monitoring and compliance
- (4) community education and outreach

OLE special agents and enforcement officers conduct complex criminal and civil investigations, board vessels fishing at sea, inspect fish processing plants, review sales of wildlife products on the internet, and conduct patrols on land, in the air and at sea.

Most NOAA Fisheries Enforcement activities are conducted under one of these laws: the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), the Endangered Species Act of 1973 (ESA), the Marine Mammal Protection Act of 1972 (MMPA), the Lacey Act Amendments of 1981 (Lacey) and/or the Marine Protection, Research and Sanctuaries Act (MSA). The OLE also plays a key role in the enforcement of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as they relate to marine wildlife.

In the Alaska region NMFS OLE officers also work closely with the At-Sea Observer Program. These civilian scientific observers are certified by NMFS, employed by private contractors, and placed aboard fishing vessels under mandates from the North Pacific Fishery Management Council. The observers collect fisheries data, and they also report suspected regulatory violations to OLE. This results in roughly 300 investigations (affidavits) per year.

OLE has the power to seize and forfeit fishing vessels, fishing gear, and harvested product. Successful prosecutions based on OLE enforcement and investigations can result in penalties ranging from fines to imprisonment.

One example of OLE's monitoring programs is the Vessel Monitoring System (VMS), in which fishing vessels must carry an electronic device that automatically tells OLE where they are. All vessels using pot, hook-and-line or trawl gear that are permitted to directly fish for Pacific cod, Atka mackerel or pollock to have an operable VMS. This requirement is necessary to monitor fishing restrictions in Steller sea lion protection and forage areas.

NOAA Fisheries / National Marine Fisheries Service Office of Law Enforcement works very closely with the U.S. Coast Guard, in enforcing fisheries regulations. One of the Coast Guard's fundamental roles is protection of natural resources – to eliminate environmental damage and the degradation of natural resources associated with maritime transportation, fishing, and recreational boating. They fulfill this responsibility in three ways:

- (1) Protecting the U.S. Exclusive Economic Zone from foreign encroachment; in Alaska, this especially means conducting surveillance of the Bering Sea "Donut Hole"
- (2) Enforcing domestic fisheries law; the Coast Guard works closely with NMFS OLE and reports its activities to the NPFMC
- (3) International fisheries agreements; the Coast Guard works closely with the Department of State to develop and enforce international fisheries agreements; most notably, the Coast Guard enforces the United Nations High Seas Driftnet Moratorium in the North Pacific, where illegal driftnetters may catch U.S. origin salmon