APPENDIX F

Overcapacity

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TABLES

ACRONYMS AND ABBREVIATIONS

AFA	American Fisheries Act
BSAI	Bering Sea/Aleutian Islands
CDQs	Community Development Quotas
CFEC	Commercial Fisheries Entry Commission
CFQs	Community or Group-Based Fishing Quotas
CRP	Comprehensive Rationalization Program
DAP	Domestic Annual Processing
EEZ	Exclusive Economic Zone
FAO	Food and Agricultural Organization
FMP	Fishery Management Plan
ft	Feet
GAO	Government Accounting Office
GOA	Gulf of Alaska
IFQ	Individual Fishing Quotas
IPOA	International Plan of Action
ITQs	Individual Transferable Quotas
kg	Kilograms
LLP	License Limitation Program
MFC	Management of Fishing Capacity
MSA	Magnuson-Stevens Fishery Conservation and Management Act of 1976
mt	Metric Tons
NRC	National Research Council
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NPFMC	North Pacific Fishery Management Council
PCC	Pollock Conservation Cooperative
PSC	Prohibited Species Catch
TAC	Total Allowable Catch
TALFF	Total Allowable Level of Foreign Fishing
U.S.	United States

Section 1 Overcapacity

This introductory section is divided into three parts. First, overcapacity is defined and an overview of how this problem develops in fisheries and its effects is presented. Second, the ability of various management tools to reduce excess capacity in fisheries is examined. Third, trends in overcapacity in the Alaska groundfish fisheries are described as well as and the management tools that have been applied to address overcapacity in these fisheries.

1.1 Definition of Overcapacity and an Overview of the Issue

Fishing capacity is defined as the ability of a vessel or fleet of vessels to catch fish (NMFS 1999).[1] This ability is a function of such factors as the number of fishing vessels in the fleet; the size of each vessel; the technical efficiency of each vessel (determined by factors such as on-board gear and equipment, fishermen's knowledge and techniques, and the size of the crew); and the time spent fishing (NFCC undated). Loosely speaking, overcapacity in a fishery occurs when the ability to catch fish exceeds what is needed to harvest sustainable yields.

Overcapacity is a consequence of the perverse incentive system confronting fishermen in an open access or regulated open access condition (Gréboval and Munro 1999).[2] Under this condition, the so-called "race for fish" induces fishermen to apply an excessive level of operating inputs (e.g., labor, fuel, time) and capital inputs (e.g., vessel and gear improvements) as they compete with each other for shares of the total allowable catch (TAC). If these additional inputs are not applied, the individual fisherman may find that he or she is unable to increase, or even maintain, their share of the TAC over a number of fishing seasons.

The many problems created by overcapacity have been summarized by Kirkley and Squires (1999):

> *[Overcapacity] generates intense pressure to continue harvesting past the point of sustainability in order to keep as much of the fleet working as possible. With revenues spread among many vessels operating under little or no profits, reductions in fleet size become politically and socially more difficult. Vessels are more vulnerable to changes in the resource base and regulations when they are only marginally viable because of excess capacity. Excess capacity encourages inefficient allocation and constitutes a major waste of economic resources. Overcapitalization and excessive use of variable inputs follow. Excess capacity also complicates the fishery management process, particularly in open access, frequently leading to detailed and comprehensive regulation. Excess capacity substantially reinforces the increasing tendency for management decisions to become primarily allocation decisions, i.e., decisions about the gainers and losers of wealth and profits (or losses) from alternative management choices over an overfished or even declining resource stock.*

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[1] Accurately measuring and monitoring capacity and capacity utilization in a particular fishery can be exceedingly complex (see, for example, Kirkley *et al*. 2002).

[2] Open access refers to a situation in which access to a fishery is unrestricted. In a regulated open access, fishery authorities restrict the total harvest without attempting to control the total fleet size (Gréboval and Munro 1999). In this paper, open access means regulated open access.

It is important to realize that the development of overcapacity is the result of rational investment by fishermen given the economic and other incentives that they face under open access conditions to increase capacity beyond levels which may be optimal for society as a whole (Cunningham and Gréboval 2001). It is equally important to note that, although the origin of excess fishing capacity stems from the widespread tendency of harvesters or processors to overinvest under open access conditions, government subsidies and other economic incentives can substantially contribute, directly or indirectly, to the build-up of excessive fishing capacity. In the United States, for example, government policies and programs have fostered growth in harvesting capacity in many ways (Hogarth 2001; see also Federal Fisheries Investment Task Force 1999). Domestic fishermen were encouraged to engage in fisheries that had previously been dominated by foreign vessels, including fisheries for species that were considered “underutilized” in the United States (U.S.) market. Investment tax credit provisions in the Internal Revenue Service code until 1986 stimulated spending on new vessel construction. Federal loans, loan guarantees, and tax deferral programs stimulated the purchase, repair, and refitting of fishing vessels. Direct grant programs, such as the Saltonstall-Kennedy Fishery Development Grants program, provided seed money for new product development and other projects. Foreign allocations and trade policies were linked through the so-called “Fish-and-Chips” initiative to promote foreign market opportunities for U.S. producers.

Overcapacity affects many fisheries throughout the world and has become an issue of international concern. In 1995, Articles 6 and 7 of the United Nations Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries directly addressed the issue of overcapacity, calling on nations “to take measures to prevent or eliminate excess fishing capacity” and to “reduce capacity to levels commensurate with the sustainable use of fishery resources” (FAO 1995). To this end, the FAO Committee on Fisheries adopted an International Plan of Action (IPOA) for the Management of Fishing Capacity (MFC) in 1999. The objective of the IPOA/MFC is for nations and regional fisheries organizations to achieve worldwide an efficient, equitable and transparent management of fishing capacity, preferably by 2003, but not later than 2005. The IPOA/MFC is not a binding agreement, but it is a strong sign that the economic and biological problems associated with overcapacity are receiving increasing attention in the international arena.

The United States was an active participant in the technical consultations and negotiations leading to the IPOA/MFC. Concerns about excessive fishing capacity in certain domestic fisheries began to emerge in the 1980s (Hogarth 2001). The National Marine Fisheries Service (NMFS or National Oceanic and Atmospheric Administration [NOAA] Fisheries) and Councils began to explore various forms of limited entry in many federally managed fisheries; direct grants for research and development declined; and various other domestic and international market promotion activities were curtailed or terminated. Congress passed the Commercial Fishing Vessel Anti-Reflagging Act of 1987 that placed more restrictive limits on foreign investments in U.S. documented and flagged fishing vessels.

Despite these initial efforts to constrain fishing capacity, the problem of overcapacity intensified in a number of major U.S. fisheries in the late 1980s and early 1990s (Hogarth 2001). Starting in 1994, the federal government began to purchase redundant vessels and/or permits in selected fisheries. Over the next six years the federal government provided $140 million to purchase fishing permits, fishing vessels and related gear from fishermen, thereby reducing the capacity of U.S. fishermen to harvest fish (Government Accounting Office [GAO] 2000). In 1996, the Sustainable Fisheries Act (Section 312 (b)-(e)) established the Fishing Capacity Reduction Program, the objective of which is to obtain the maximum sustained reduction in fishing capacity at the least cost and in a minimum period of time. To achieve this objective the program authorizes the use of both public and private resources to fund the removal of redundant vessels.

1.2 Management Measures Used to Address Overcapacity

As discussed previously, investment in increasingly higher levels of fishing inputs is an entirely rational response from the point of view of the individual fisherman given the set of economic incentives they face under open access conditions. However, the economic waste resulting from redundant capital and labor in the fishery and the dissipation of the net economic returns that fish harvesting might generate is "irrational" from society's point of view as well as from the perspective of the fishermen as a group. Management systems designed to end the “race for fish” and reduce overcapacity are said by economists to lead to "rationalization" of fisheries, i.e., toward an allocation of labor and capital between fishing and other industries that maximizes the net value of production from the economy as a whole (Anderson 1977). Fisheries management methods used to address the problem of overcapacity may be classified into two groups: input-based methods (also referred to as effort-based methods), which are those measures that attempt manage capacity by regulating input use; and incentive adjusting methods, which are those measures aimed at changing the incentive system itself (Cunningham and Gréboval 2000; Gréboval and Munro 1999).

Input-based methods include license limitation programs, gear and vessel restrictions, time and area closures and trip limits. The purpose of limited license programs is to impose a maximum on the number of fishing units operating in a fishery (Gréboval and Munro 1999). The licenses, which may be transferable or non-transferable, are issued (given or sold) to either the fishing unit or to the fisherman (or company).[3] Gear and vessel restrictions are designed to reduce and constrain the capacity of individual fishing units by limiting the type and amount of inputs employed. Area and time closures prohibit fishing at specified times and in specified areas, thereby restricting the way inputs can be used (Anderson 1986). Trip limits restrict the extent to which inputs can be used by imposing a catch ceiling for an individual fishing trip.

One major shortcoming of input-based methods is that they do not remove the incentives that lead to overcapacity in the first place (Cunningham and Gréboval 2001). In a continuing attempt to outdo their competition in the race for fish, fishermen will increase their ability to catch fish by substituting inputs that are not restricted. This problem is called input substitution or more colloquially “capital stuffing.” Even if the potential for input substitution is currently limited, the incentives will exist to increase input substitutability in the medium to long-term (Cunningham and Gréboval 2001). Even apparently simple management measures will be subject to input substitution. For instance, restrictions on fishing time in the form of closed seasons or days at sea restrictions will quickly lead fishermen to use the fact that there are different kinds of time (Cunningham and Gréboval 2001). They are likely to attempt to reduce travel time (using faster vessels, re-designed propellers, etc.) and gear manipulation time (switchover to mechanized gear handling, etc.) so as to be able to increase fishing time within the constraint imposed by the closed season.

Perhaps, an even more fundamental problem with input-based measures relates to the way they reduce capacity. Essentially, they are designed to increase the costs of fishing for individual fishing units by prohibiting certain cost-effective ways of operating (Anderson 1986). Yet, one approach to measuring excess capacity in an open access situation is in terms of cost. That is to say, excess capacity is measured by comparing the actual cost of harvesting with the costs that would prevail if the amount of capital employed was optimal. If this approach is taken, it is difficult to see how measures designed to increase costs artificially will improve a perceived excess capacity problem (Gréboval and Munro 1999).

[3] As of October 1999, there were 15 vessel moratoria and 11 license/vessel limitation programs in place in federally managed U.S. marine fisheries (Darcy and Matlock 2000).

Notwithstanding these problems with input-based measures, experience indicates that a license limitation program used in combination with restrictions imposed on a few key characteristics can severely constrain fishing capacity (Cunningham and Gréboval 2001). The introduction of such a system at an early stage of fisheries development makes it considerably easier to achieve this end. Typically, however, such schemes are introduced with rather unrestrictive conditions for initial license allocation in fisheries that already manifest evidence of excessive capacity. If overcapacity already exists in a fishery, a buyback of surplus vessels and/or permits is often required, as attrition of participating fishermen generally involves too slow a process of capacity reduction (Cunningham and Gréboval 2001).

As noted earlier, a number of buyback programs have been implemented in U.S. fisheries.[4] After assessing the three largest buyback programs (for the New England groundfish, Alaska pollock, and Washington State salmon fisheries), the (GAO 2000) concluded that the effectiveness of buybacks in fisheries can be hampered by the entry of buyback participants into other fisheries; the activation of latent fishing permits in buyback fisheries;[5] and the flow of capacity back into buyback fisheries as the fishermen who remain in the buyback fisheries increase their investments in gear, technology and other fishing inputs.

In contrast to input-based methods, incentive adjusting methods create an environment which removes incentives that lead to the creation of excess capacity and encourage industry-based capacity adjustments that tend to be more efficient and easier to implement (Cunningham and Gréboval 2001). The two incentive adjusting methods that will be discussed here are individual fishing quotas (IFQs) and community or group-based fishing quotas (CFQs).

IFQs allocate a certain portion of the annual TAC to individual vessels, fishermen or other eligible recipients based on initial qualifying criteria. Individual transferable quotas (ITQs) are transferable IFQs, i.e., quota shares that can be bought, sold or, in some cases, leased. CFQs allocate quota to communities, cooperatives or other groups, as distinct from vessel owners or fishermen. These two types of incentive adjusting methods are also referred to as "rights-based" methods, as the allocation of shares of the TAC to specific individuals or groups conveys an important form of property right.[6] Where property rights exist, there is no incentive for fishermen to invest in ever more elaborate vessels or equipment — or, to be more precise, to select anything but the lowest cost combination and deployment of fishing inputs (Crutchfield 1979; Scott 2000). In other words, rights-based management systems (in which rights are freely transferable) are "self-rationalizing" systems. Redundant capital is removed from the fishery as more efficient operations purchase the rights of less efficient operations. In economic theory, the less efficient operations, having sold their rights to participate, will exit the fishery and shift their labor and capital to some underutilized fishery or into an

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[4] Holland et al. (1999) present a comprehensive analysis of buyback programs around the world.

[5] Latent fishing permits are those held by potential participants who are currently inactive or active only at low levels, but who could suddenly actively participate if the resource stock, market conditions or regulations change. A large number of underutilized or inactive permits is often the result of generous initial allocations during the implementation of license limitation programs and attests to the socially or politically sensitive aspects of such programs (Gréboval and Munro 1999; see also Ginter and Muse 2002).

[6] The Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSA) refers to an IFQ as an exclusive "fishing privilege," rather than a right. In specific reference to authorizing IFQs or other limited access systems, MSA states that such an authorization, " (A) shall be considered a permit for the purposes of sections 307, 308 and 309; (B) may be revoked or limited at any time in accordance with this Act; (C) shall not confer any right of compensation to the holder of such individual fishing quota or other such limited access system authorization if it is revoked or limited; and (D) shall not create, or be construed to create, any right, title, or interest in or to any fish before the fish is harvested" (Sec. 303(d)(3)).

entirely different segment of the economy. The result is a net gain to society in the form of a reduction in costs and an increase in production.

IFQs have been used worldwide since the late 1970s and have been adopted in the following U.S. fisheries — halibut and sablefish (North Pacific), wreckfish (South Atlantic), surf clam/ocean quahog (Mid-Atlantic) and bluefin tuna (North Atlantic) (Wertheimer and Swanson 2000).[7] It is possible that IFQs would have been applied to other domestic fisheries had not Congress intervened through enactment of the Sustainable Fisheries Act of 1996, which established a moratorium on the implementations of new IFQ programs. With that legislation Congress also requested the National Academy of Sciences to study the social, economic, and biologic effects of IFQs and other limited entry systems and to make recommendations about existing and future IFQ programs. The National Academy of Sciences convened a Committee to Review Individual Fishing Quotas, which in its report to Congress (National Research Council [NRC] 1999a) identified the following advantages and concerns from the range of IFQ programs implemented in U.S. fisheries:

> *Advantages — IFQ programs are widely identified as being a highly effective way of dealing with overcapitalization in the fishing industry. Removing the race for fish has reduced the incentive to buy ever-larger vessels and more equipment and to fish during unsafe conditions. Consumers have been able to purchase fresh fish during longer periods of the year. Many fishermen testified that IFQs provided the opportunity to utilize better fishing and handling methods, reducing bycatch of nontargeted species and maintaining higher product quality. Gear conflicts may also be reduced by IFQs.*
>
> *Concerns — A number of problems were identified in operative IFQ programs during the committee's work. Prominent among them are concerns about the fairness of the initial allocations, effects of IFQs on processors, increased costs for new fishermen to gain entry, consolidation of quota shares (and thus economic power), effects of leasing, confusion about the nature of the privilege involved, elimination of vessels and reductions in crew, and the equity of gifting a public trust resource.*

The Committee concluded that, "IFQs should be allowed as an option in fisheries management if a regional council finds them to be warranted by conditions within a particular fishery and appropriate measures are imposed to avoid potential adverse effects. The issues of initial allocation, transferability, and accumulation of shares should be given careful consideration when IFQ programs are considered and developed by regional councils and reviewed by the Secretary of Commerce."

On September 30, 2002, Congress lifted the moratorium on the development and implementation of IFQ programs established by the Sustainable Fisheries Act. It is currently considering legislation to establish National Standards for the design and conduct of IFQ programs.

There has been somewhat less experience in implementing CFQs in U.S. fisheries. The community development quotas (CDQs) established in the 1990s for western Alaska communities are one form of such a system. Fisheries cooperatives may also function like CFQs. The 1998 American Fisheries Act allowed the creation of various cooperatives of Alaska pollock producers. Each cooperative is provided access to a fixed

[7] Shotton (2001a) provides a series of case studies of IFQ programs that have been implemented in various fisheries around the world, while Shotton (2001b) presents case studies of the effects of IFQs on fleet capacity and concentration of quota ownership.

portion of the pollock resource and, in turn, sub-allocates quota shares within the group. In 1997, a similar cooperative system was developed voluntarily by catcher processors participating in the Pacific whiting fishery in the Pacific Northwest (NRC 1999a).[8] Another way to implement CFQs is to modify existing legislation to allow communities or other groups to enter into the market for IFQs where they have been established. An example of such an approach is the measure the North Pacific Fishery Management Council (NPFMC) approved in 2002 that would allow eligible fishing villages in the Gulf of Alaska (GOA) to acquire IFQs for sablefish and halibut.

Input-based methods and incentive adjusting methods of reducing excess capacity in fisheries have been discussed separately here in order to compare the two methods. In reality, fishery management regimes can comprise both types of measures. For instance, license limitation programs may be a first step toward implementation of IFQs. Similarly, buybacks under a licensing scheme are unlikely to be very effective at reducing capacity, whereas under IFQs they may be a very helpful way of quickly decreasing it to the desired level (Gréboval and Munro 1999).

1.3 Trends in Overcapacity in Alaska Groundfish Fisheries and Applications of Management Tools

From 1976 until the late 1980s, a variety of federal laws and programs were developed to promote the "Americanization" of fisheries inside the U.S. Exclusive Economic Zone (EEZ), especially the rich groundfish resources of the Bering Sea (NMFS 2002a). A start towards this was made in the late 1970s and early 1980s with the advent of the "Fish-and-Chips" policy and enactment of the American Fisheries Promotion Act. These strategies increased the number of criteria upon which foreign fishing privileges in the U.S. EEZ were based to include the removal of trade barriers, the commitment to purchase the products of the U.S. seafood industry, the minimization of gear conflicts and the transfer of fishing and processing technology. A parallel program sponsored by NOAA Fisheries, the Fisheries Obligation Guarantee Program, guaranteed over $150 million worth of loans between 1977 and 1996 for the construction of U.S. catcher processors and inshore floating processors (NMFS 2002a).[9] This program lowered capital investment costs relative to competitive market rates, thereby encouraging capital investment in the North Pacific groundfish fisheries and other U.S. fisheries. The financial assistance offered under the program was extended to U.S. processing plants in 1983.

Furthermore, management measures promulgated under the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSA) were designed to promote the development of a U.S. offshore fleet through an allocation system that favored domestic vessels over foreign vessels and joint venture operations. Domestic processors were surveyed annually in the fall, prior to the setting of total allowable level of foreign fishing

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[8] While license limitation programs do not generally provide an incentive to fishermen to avoid overcapacity, the establishment of a cooperative in the Pacific whiting fishery is an example of how these programs can provide such an incentive (NRC 1999a). When the number of license holders in a particular fishery is restricted to a relatively small number and there is sufficient interaction between them, cooperative patterns of behavior may emerge. In particular, the license holders may agree to adopt their own management measures which remove the need to race for capacity.

[9] The Fisheries Obligation Guarantee Program has been known by many names over the years (Federal Fisheries Investment Task Force 1999). It grew out of the Fisheries Loan Fund in the Fish and Wildlife Act of 1956, became a mortgage insurance program, and then grew into the Fishing Vessel Obligation Guarantee Program. Later the program was expanded beyond fishing vessels and became the Fisheries Obligation Guarantee Program. The Sustainable Fisheries Act of 1996 renamed the program the Fisheries Financing Program and transformed it into a direct loan program that no longer financed new harvesting capacity additions.

(TALFF), to estimate the amount of domestic annual processing (DAP) for the year. Domestic processors were generally allocated the DAP from survey results if it was less than the TAC, whether or not domestic processors had a track record proving they could process that level of the TAC. The DAP directly reduced the TALFF. In addition to domestic processing priority, a domestic annual harvesting priority was created. If U.S. fishing vessels wished to participate in groundfish fisheries, they were also given a priority over TALFF, regardless of whether domestic processors were involved.

The period of rapid expansion of the domestic groundfish fisheries was accompanied by a flood of foreign capital into new vessels and processors (NMFS 2002a). Taking advantage of Norwegian lending and shipbuilding programs, and positioning aggressively within evolving management structures, one Norwegian-financed firm, American Seafoods, came to dominate the offshore sector (Federal Fisheries Investment Task Force 1999). After the passage of the Commercial Fishing Vessel Anti-Reflagging Act of 1987 fishing and processing vessels were required to have at least 50 percent U.S. ownership, but no similar ownership requirements were imposed on shoreside processors—all shoreside processors in Alaska were considered domestic regardless of the actual ownership of the facility. Most of the shoreside pollock processing capacity was built and owned by Japanese seafood companies.

Foremost within the overall rapid development of the pollock fishery was the at-sea processing sector (NMFS 2002a). Other sectors, including inshore processing plants and harvesting vessels, existed prior to the development of the domestic pollock fishery, but they were involved in other fisheries. By 1990, there were more than 50 catcher processors participating in the Bering Sea/Aleutian Islands (BSAI) pollock fishery, along with several motherships and four major shoreside plants. The new domestic catcher processor fleet alone brought enough capacity to the BSAI pollock fishery to catch and process considerably more pollock than allowed under the TAC. Estimates of harvesting capacity in the pollock fishery suggested that perhaps two or three times more capacity existed in the fishery than would be required to "efficiently" harvest the TAC (NMFS 2002a). Nearly a year round fishery in the early to mid-1980s, the pollock fishery opening shrank to less than 60 days by 1992, despite a steady, or slightly increasing, quota. It is estimated that half of the catcher processors operating between 1994–98 experienced financial difficulties resulting in bankruptcy or forced the sale of the vessel (NPFMC 2001).

Another groundfish fishery in which overcapacity quickly developed was the sablefish fishery. During the 1980s, the domestic fleet harvesting sablefish grew in number, size, and sophistication in vessels (Pautzke and Oliver 1997). From 1981 to 1988, the number of vessels longer than 50 feet (ft) grew tenfold and the number of smaller vessels grew by a factor of fourteen. Approximately 1,000 vessels were fishing for sablefish by 1992. There are several reasons for the large and rapid expansion of harvesting capacity within the sablefish fishery — sablefish was a relatively high-priced species, the larger vessels in the halibut fleet could enter the sablefish fishery at a relatively low cost, decreases in the length of the halibut fishing season provided an added incentive for those vessels to become more active in the sablefish fishery, and in addition to the hook and line gear similar to that used in the halibut fishery, pot gear could be used to harvest sablefish very effectively (NMFS 1996). As the fleet grew, the fishing season in the Gulf of Alaska, the area responsible for the majority of the catches, became progressively shorter (Sigler and Lunsford 2001). By the late 1980s, the race for fish caused season length to decrease to 1 or 2 months. In some areas, this open access fishery was as short as 9 days. For example, from 1984 to 1987, the season length decreased from 8 months to less than 2 weeks as the number of vessels increased fivefold in the West Yakutat region.

The race for fish resulted in a symmetrical race to process. Local markets for fresh fish are limited in Alaska and most fish must be processed and shipped to other markets. The concentration of harvest in short periods led to large investments by processors competing to process a greater share of the catch. Processing costs increased with the excessive capital investment. In addition, decisions about product mix and quality control tended to be dominated by a need to maximize profits per operating day rather than maximizing profit per unit of fish. In the pollock fishery, for example, replacing some surimi production with production of higher-valued fillets would have required sacrificing overall production to rival processors. For the same reason, maximizing recovery rates was uneconomical, particularly for the offshore processors that would then lose additional time steaming in to unload the low-grade product made with protein recovered from surimi wash water.

By 1992, the NPFMC came to realize that the rapid Americanization of the groundfish fisheries had created overcapitalized fisheries that generated all manner of management issues. In response, the NPFMC initiated a comprehensive rationalization program (CRP) and published the problem statement shown in the box below.

NPFMC Comprehensive Rationalization Program Problem Statement

Expansion of the domestic fleet harvesting fish in the EEZ off Alaska, in excess of that needed to harvest the optimum yield efficiently, has made compliance with the Magnuson Act's National Standards and achievement of the Council's comprehensive goals, adopted December 7, 1984, more difficult under current management regimes. In striving to achieve its comprehensive goals, the Council is committed to: (1) assure the long-term health and productivity of fish stocks, and other living marine resources of the North Pacific and Bering Sea ecosystem, (2) support the stability, economic well-being and diversity of the seafood industry, and provide for the economic and social needs of the communities dependent on that industry, and (3) efficiently manage the resources in its jurisdiction to reduce bycatch, minimize waste, and improve utilization of fish resources to provide the maximum benefit to the present and future generations of fishers, associated fishing industry sectors, communities, consumers, and the nation as a whole.

The Council's overriding concern is to maintain the health of the marine ecosystem to ensure the long-term conservation and abundance of the groundfish and crab resources. In addition, the Council must address the competing and oftentimes conflicting needs of the domestic fisheries that have developed rapidly under open access, fisheries which have become over-capitalized and mismatched, to the finite fishery resources available. Symptomatic of the intense pressures in the over-capitalized groundfish and crab fisheries under the Council jurisdiction off Alaska are the following problems:

1. Harvesting capacity in excess of that required to harvest the available resource.
2. Allocation and preemption conflicts between and in industry sectors, such as with inshore and offshore components.
3. Preemption conflicts between gear types.
4. Gear conflicts in fisheries where there is overcrowding of fishing gear due to excessive participation and surplus fishing effort on limited grounds.
5. Dead-loss such as with ghost fishing by lost or discarded gear.
6. Bycatch loss of groundfish, crab, herring, salmon, and other non-target species, including bycatch, which is not landed for regulatory reasons.

7. Economic loss and waste associated with discard mortality of target species harvested but not retained for economic reasons.

8. Concerns regarding vessel and crew safety, which are often compromised in the race for fish.

9. Economic instability in various sectors of the fishing industry, and in fishing communities caused by short and unpredictable fishing seasons, or preemption which denies access to fisheries resources.

10. Inability to provide for long-term, stable fisheries-based economy in small economically disadvantaged adjacent coastal communities.

11. Reduction in ability to provide a quality product to consumers at a competitive price, and thus maintain the competitiveness of seafood products from the EEZ off Alaska on the world market.

NPFMC Comprehensive Rationalization Program Problem Statement (cont.)

12. Possible impacts on marine mammals and seabirds, and marine habitat.

13. Inability to achieve long-term sustainable economic benefits to the Nation.

14. A complex enforcement regimen for fishers and management alike, which inhibits the achievement of the Council's comprehensive goals.

In the years following the initiation of the CRP, the NPFMC and NOAA Fisheries, whether intentionally or unintentionally, progressively limited the number of participants in the Alaska groundfish fisheries and the types of activities in which they can engage. Major regulatory actions that affected capacity in the groundfish fisheries included the following:

Sablefish and Halibut Longline Fishery IFQ Program

This IFQ program was approved by the NPFMC in 1991 and implemented by NOAA Fisheries in 1995 (GOA Fishery Management Plan [FMP] Amendment 20 and BSAI FMP Amendment 15). IFQs were allocated to vessel owners and lessors who landed fish in 1988, 1989, or 1990, and based on total landings in their best 5 of the 7 years from 1984 through 1990 (halibut) or best 5 of the 6 years from 1985 through 1990 (sablefish). Shares were allocated within separate management areas and for specific vessel size classes. In addition, quota shares issued in amounts less than 20,000 pounds of IFQ in the implementation years were issued as “blocks,” which are indivisible upon transfer. No such transfer restrictions exist for quota shares initially issued in amounts greater than 20,000 pounds of IFQ. Halibut and sablefish IFQs are marketable, but can be sold or traded only within each management area, within the same vessel size category, and with restrictions on the total amount and type of quota held. Although most original IFQ recipients can use hired skippers to fish their shares, new entrants must be onboard the vessel when their shares are caught.

Western Alaska Community Development Quota Program

The western Alaska CDQ program was created by the NPFMC in the context of allocations between the inshore and offshore sectors of the groundfish fisheries. As stated in the NPFMC’s FMP for BSAI groundfish, the purpose of the western Alaska CDQ program is “ to provide fishermen who reside in western Alaska communities a fair and reasonable opportunity to participate in the BSAI groundfish fisheries, to expand their participation in salmon, herring, and other nearshore fisheries, and to help alleviate the growing social economic crisis within these communities.” Initially, the western Alaska CDQ program relied on an allocation of 7.5 percent of the annual pollock TAC in the Bering Sea. This allocation, known as the CDQ reserve, was allocated among eligible western Alaska communities. Fishing under this CDQ program began in 1992. In 1993, the NPFMC extended the community development quota to halibut and sablefish. Western Alaskan communities were allocated 20 percent of the BSAI sablefish and various percentages of the halibut in Bering Sea management areas 4A through 4E. The multi-species CDQ allocations, adding all remaining BSAI groundfish, prohibited species and crab, were implemented in 1998. Bering Sea opilio, bairdi, and king crab were phased in at 3.5 percent in 1998, 5 percent in 1999, and 7.5 percent in 2000. The American Fisheries Act of 1998 (AFA) increased the pollock allocation for the western Alaska CDQ program to 10 percent.

Harvesting Vessel Moratorium

A moratorium on new harvesting vessels entering the groundfish fisheries was implemented in 1995 through GOA Amendment 28 and BSAI Amendment 23. The moratorium reduced the possibility of significant increases in the number of large-capacity harvesting vessels actively participating in the groundfish fisheries. Generally, a vessel qualified for a moratorium permit if it made a legal landing of any moratorium species during the qualifying period of January 1, 1988, through February 9, 1992.

North Pacific License Limitation Program

Final implementing rules for the NPFMC’s groundfish License Limitation Program (LLP) were published in 1998, and the first licenses were issued in 2000. The LLP also added the remaining groundfish species in the BSAI to the western Alaska CDQ program. The CDQ portion of the LLP was implemented in 1998. The LLP superceded the moratorium and further reduced the number of vessels eligible to participate in the groundfish fisheries. For general licenses, the base qualifying period established was January 1, 1988, through

June 27, 1992, approximately four months longer than the moratorium qualification period, in order to be consistent with the NPFMC's published cutoff date for qualification under the CRP. The LLP also established groundfish area and gear endorsements. Licenses under the LLP are generally transferable, but endorsements are not severable from the license. Licensed vessels can be replaced, but increases in the length of licensed vessels are limited in vessels under 125 ft and prohibited in larger vessels.

American Fisheries Act

In 1998, Congress passed the AFA which, among other things, limited the number of harvesting and processing vessels that would be allowed to participate in the BSAI pollock fishery.[10] Only harvesting and processing vessels that met specific requirements, based on their participation in the 1995 to 1997 fisheries are eligible to harvest BSAI pollock. At inception of the AFA, 21 catcher processors and 112 catcher vessels qualified, or were specifically identified as being eligible, to participate under the AFA guidelines. Nine other catcher processors were bought out through a combination of $15.2 million in federally appropriated funds and a $75 million federal loan to the fishing industry. The AFA also established the authority and mechanisms by which the remaining pollock fleet can form fishing cooperatives. Within each cooperative, each member company is contractually allocated a percentage share of the total cooperative allocation based on its historical catch (or processing) levels. In practice, the cooperative system is similar to an IFQ system. However, the distribution of fishing privileges and the system for trading, selling or enforcing them is decided by the members of the separate cooperatives. Both leasing and sale of harvesting privileges among members of the cooperative are allowed. The leasing and sale of harvesting privileges to an outside party are allowed only if the buyer agrees to abide by the rules set forth in the cooperative's contract. The buyer must also harvest and process the quota with one of the vessels already permitted or a replacement vessel that meets specified criteria. Finally, it should be noted that the AFA also restricts AFA-eligible vessels from shifting their fishing effort into other fisheries. "Sideboard" measures, as they have become known, prevent AFA-listed vessels from increasing their catch in other fisheries beyond their average 1995 to 1997 levels.

Sablefish and Halibut IFQ Shares for Communities

In 2002, the NPFMC approved a measure that would allow fishing villages in the GOA with fewer than 1,500 residents to acquire IFQs for sablefish and halibut. The measure allows 42 villages to buy IFQs and then lease them to resident fishermen. Combined village purchases can not exceed 21 percent of the GOA TACs for the two fish species. There is a limit of 50,000 pounds per user from a community, and leasing is restricted to residents of the community owning the quota shares.

[10] The MSA also revised U.S. ownership requirements for fishing vessels (increasing the required level of American ownership from 50 to 75 percent) and modified specific allocations of the BSAI pollock quota as follows - 10 percent to the western Alaska CDQ program, with the remainder allocated 50 percent to the inshore sector, 40 percent to the offshore sector, and 10 percent to the mothership sector.

Section 2 Analysis of Alternatives

The following four policy alternatives are under consideration by the NPFMC:

Alternative 1 Continue Under the Current Risk-Averse Management Policy: Under this alternative, the NPFMC would continue to manage the groundfish fisheries based upon the present conservative and risk-averse policy. This policy assumes that fishing does result in some adverse impacts to the environment and that, as these impacts become known, mitigation measures will be developed and appropriate FMP amendments will be implemented. With respect to overcapacity in the groundfish fisheries, an objective of this alternative is to continue to reduce excess fishing capacity, overcapitalization, and the adverse effects of the race for fish.

Alternative 2 Adopt a More Aggressive Management Policy: A less precautionary management policy (more aggressive harvest strategy) would be implemented based upon the concept that the present strategy is overly conservative and that higher harvests could be taken without threat of overfishing the target groundfish stocks. This strategy assumes that fishing at the recommended levels would have no adverse impact on the environment except in specific cases that are generally known. This alternative and its associated FMP framework would maintain the statutorily mandated programs to reduce excess capacity and the race for fish.

Alternative 3 Adopt a More Precautionary Management Policy: This policy would seek to accelerate the existing precautionary management measures through community or rights-based management, ecosystem-based management principles and, where appropriate and practicable, increase habitat protection and impose additional bycatch constraints. Under this FMP framework, additional conservation management measures would be taken as necessary to respond to social, economic, or conservation needs. Additional measures would be taken if scientific evidence indicated that the fishery was negatively impacting the environment, not just a population of a given species. Regarding the issue of overcapacity, this FMP framework would maintain the LLP program and further decrease excess fishing capacity and other adverse effects of the race for fish by eliminating latent licences and extending programs such as community or rights-based management to some or all groundfish fisheries; provide for adaptive management by periodically evaluating the effectiveness of rationalization programs and the allocation of property rights based on performance; and, to support fishery management, extend the cost recovery program to all rationalized groundfish fisheries.

Alternative 4 Adopt a Highly Precautionary Management Policy: This policy would require that the user of the resource demonstrate that the intended use would not have a detrimental effect on the environment before significant fishing could be allowed. The policy and its associated FMP framework would be to impose very restrictive conservation and management measures at minimum that would only be modified or relaxed when additional reliable scientific information became available. It would involve a strict interpretation of the precautionary principle. Management discussions would involve, and be responsive to, the public but decreased emphasis would be placed on industry and community concerns, and more emphasis would be placed on ecosystem concerns and principles, including the identification and incorporation of non-consumptive use values. The overall premise is that fishing produces adverse impacts on the environment, but, due to a lack of information and uncertainty, we know little about these impacts. A goal of this alternative, as expressed through its FMP framework, is to include the use of explicit allocative or cooperative programs to reduce excess capacity and allocate fish to particular gear types and fisheries.

Each of the policy alternatives outlined above, with the exception of Alternative 1, contains two bookends to a range of management measures that illustrate how the framework of each policy could be implemented. These bookends, referred to hereafter as FMP bookends, provide a level of detail that allows the effects of the alternatives on the environment to be compared. They also provide a basis for the NPFMC to commit to the goals and principles of a particular policy alternative, while allowing it, under the MSA, to adaptively manage the fishery through FMP amendments using the best scientific information available.

Section 3 Alternative 1: Continue under the Current Risk-Averse Management Policy

3.1 Overview of Overcapacity Management Measures of Alternative 1

This alternative would maintain current measures to reduce excess capacity and the race for fish in the Alaska groundfish fisheries. Current measures that address overcapacity include the LLP; the sablefish longline fishery IFQ program; the cooperatives established in the BSAI pollock fishery under the AFA; the western Alaska CDQ program; and the sablefish IFQ shares for communities. Descriptions of these measures are provided in the preceding section (Section 1.3). In this section we provide an overview of the success of these measures in attaining the goal of this alternative as it relates to the issue of overcapacity. The section that follows this one examines how the measures have affected relevant physical, biological, and socioeconomic environmental resources.

The 1995 moratorium allowed 4,144 unique vessels in the crab and groundfish fisheries, about 1,800 more than the current fleet but significantly less than the 15,709 unique vessels that participated in the fisheries since 1978 that had the potential to re-enter if no action was taken. The LLP, which superceded the moratorium, also did not provide significant limits on fishing capacity in Alaska groundfish fisheries, but that was not its intent (Ginter and Muse 2002). The allocation criteria were easily met, and the criteria allowed vessels to upgrade and were not combined with restrictive limits on gear or vessel characteristics other than length and processor status. The LLP does not set limits on the amount of harvest by an individual vessel. Nor does it limit the harvesting sectors to a small enough number of participants with a sufficient community of interest that negotiation of a voluntary rights-based management system is possible (NMFS 2002a). As a consequence, the intense competition, potential economic instability, and other adverse effects associated with excess capacity and the race for fish continue to occur in many Alaska groundfish fisheries. Nevertheless, the LLP has been successful in partially stabilizing the groundfish fisheries and defining the potential classes of persons eligible for individual or group-based fishing privileges under future rationalization programs.

The sablefish longline fishery IFQ program has been partially successful in reducing excess capacity in the fishery. The number of active vessels has declined every year since program implementation. In 2000, 416 vessels had landings of sablefish compared to 822 vessels in 1990. More than 400 transfers occurred in the first year of the program, which suggests that the market was relatively efficient with low transaction costs. Many of the fishermen who exited the fishery had not received sufficient quota shares during the initial allocation to fish economically (Hartley and Fina 2001a). On the other hand, overall capacity is still high in terms of how much fish the participating vessels could harvest if they were not constrained by their IFQs and by the TAC (Hartley and Fina 2001b). The number of quota share transfers has shown a declining trend, with 346 transfers in 2000.

There are a number of reasons why capacity in the sablefish fishery has not declined further, the primary reason being that the majority of participants view the sablefish fishery as a means of supplementing income from other major fisheries such as the halibut, salmon and crab fisheries (Hartley and Fina 2001b). Allowing fishers to choose when to harvest their IFQs has further established the halibut and sablefish fisheries as part-time fisheries. Fishermen now have greater choice of when to harvest their shares to avoid conflicts with other seasons. It is also likely that the speed of fleet adjustment has been influenced by the lack of earning opportunities for vessels outside of the fisheries in which they normally participate. Alternative uses for the excess vessels and labor in the sablefish longline fishery appear to be limited.

A second major reason that a large-scale reduction in the sablefish longline fleet has not occurred is that the IFQ program includes restrictions on the use, transfer, and accumulation of quota shares that were specifically designed to limit the degree of consolidation in the fishery (Hartley and Fina 2001a; Ginter and Muse 2002). However, by eliminating the race for fish, the IFQ program eliminated the perverse incentive to increase fishing capacity, it allowed the fisheries to operate much more efficiently given the remaining level of excess capacity and it eliminated the need for further direct actions to control fishing capacity in the sablefish longline fishery.

The AFA was implemented in phases beginning in 1999 and continuing into 2000. As noted earlier, the MSA allowed for the formation of cooperatives among catcher processors, among the catcher vessels that deliver to the catcher processors, among eligible motherships and catcher vessels in the mothership sector, and among eligible catcher vessels delivering fish to shoreside processors in the inshore sector of the BSAI pollock fishery. Cooperatives in the catcher processor sector began in 1999, while cooperatives for the inshore and mothership sectors were established in 2000. Since the AFA was enacted, all sectors of the BSAI pollock fleet have grown smaller as marginal vessels have been removed from the fishery through fishery cooperatives (NMFS 2002a). The buyout of the nine catcher processors resulted in nearly a one-third reduction in the size of the catcher processor fleet, although overall capacity in the catcher processor sector was reduced by a somewhat lesser amount because these nine vessels were among the smallest and least efficient vessels in the catcher processor fleet (NMFS 2002a). In 1999, five of the 21 catcher processors authorized to fish under the AFA chose not to fish during the A/B season and six chose not to fish during the C/D season. This pattern continued in 2000 and 2001 when four and three catcher processors were idle in the A/B season, respectively. Five of the catcher processors were idle in both 2000 and 2001 for the C/D season.[11] In addition, one catcher processor sold its catch history to the cooperative and left the fishery completely. The seven catcher vessels authorized to deliver to catcher processors have leased much of their TAC allocation for pollock to catcher processors (receiving as much or more per pound for leased quota as they had for delivered fish the previous year). Since 1999, none of the seven vessels have engaged in directed fishing for pollock. Other improvements in economic efficiency within the catcher processor sector have resulted from in-season transfers of allocations from one vessel to another within a company and between companies (e.g., small amounts of quota that did not warrant another trip are transferred to another vessel making a trip) (NMFS 2002a).

The AFA also authorizes three motherships to participate in the BSAI pollock fishery and 20 catcher vessels to deliver pollock to these motherships. In the year prior to implementation of the AFA the number of vessels delivering more than 10 metric tons (mt) of pollock to motherships was 31. In 2000, the first year in which a cooperative was operating in the mothership sector, the number of vessels delivering to motherships was 19, and the same number delivered fish in 2001. A reduction in fleet size has also occurred in the inshore harvesting sector. In 1998, 107 inshore catcher vessels delivered greater than 10 mt of pollock to inshore processors. That number decreased in 1999 to 100 vessels, decreased again in the 2000 roe fishery to 91 vessels and remained at 91 vessels in 2001. The boats that dropped out were probably less efficient due to either high fuel costs or high maintenance costs (e.g., converted oil rig supply vessels or "mud" boats). Other

[11] Some of the vessels idled in the pollock fishery continued to participate in the whiting fishery off Oregon and Washington (Felthoven 2002).

vessels that may have been eliminated from this sector include those for whom a few trips would not be sufficiently supported by the limited quota available due to their port location (e.g., Washington, Oregon, Kodiak) (NMFS 2002a). Industry sources suggest that additional catcher vessels are likely to retire from active participation in the BSAI pollock fishery. The catcher boats that are expected to exit the fishery are the smaller vessels with smaller horsepower and hold size and less capacity to fish offshore in adverse winter weather (NMFS 2002a).

The consolidation of harvesting capacity in the BSAI pollock fishery that has occurred since passage of the AFA seems to indicate that less efficient fishing and processing vessels were removed from the fishery so that costs could be reduced or a better/higher valued product could be produced (NMFS 2002a). It is notable that many of the vessels involved in the pollock fishery were voluntarily removed from the fishery despite the lack of alternative uses.

The western Alaska CDQ program was developed as a means of extending the economic opportunities of productive fisheries in the BSAI area to small, rural communities. Although the program was not designed to address overcapacity, it has had a number of important implications for efforts to control capacity in the Alaska groundfish fisheries. First, the CDQ program removed a portion of the groundfish harvest from the open access fishery and further restricted the possibility that additional harvesting capacity could erode the expected returns of currently participating vessels. Secondly, the CDQ program served to demonstrate how a TAC allocation to a sector of the fishery could rationalize that sector and lead to benefits of increased value of the harvest (Ginter and Muse 2002). Thirdly, the implementation of the CDQ program led to the development of many of the enforcement and monitoring procedures that would be applied to other measures to reduce excess fishing capacity in the groundfish fisheries. For example, data collection needs for the AFA are nearly identical to those of the CDQ pollock fishery (NMFS 2002a). Lastly, the CDQ program showed how a rights-based approach could be used for positive redistributive purposes, in this case the economic development of isolated communities in western Alaska with high levels of unemployment. Studies suggest that the CDQ recipients have been successful in using their quota allocations to meet the community development goals of the program (NRC 1999b; Northern Economics, Inc. 2002).

The program that established community quota shares for sablefish was also not intended as a means of reducing excess capacity in the Alaska groundfish fisheries. Rather, this measure was implemented solely to provide for the sustained participation of small, fishery-dependent, rural communities in the Gulf of Alaska in the IFQ sablefish and halibut fisheries. However, because eligible Gulf communities will be leasing their IFQs to local residents who will likely fish on smaller vessels or as a part-time operation, the program will help to reduce capacity in these fisheries. In addition, the allocation of sablefish IFQ shares to communities is similar to the western Alaska CDQ program in that it demonstrates how a rights-based approach can be used to protect the economic interests of certain groups.

In conclusion, the current management regime includes a variety of measures that have, at least in part, limited excess harvesting and processing capacity in Alaska groundfish fisheries. Yet, as indicated by recent problem statements prepared by the NPFMC, the measures have not been successful in eliminating excess capacity as one of the major management problems for the BSAI and GOA groundfish fisheries. A recent report by Felthoven et al. (2002) supports the Council's position that significant excess capacity remains in several Alaska groundfish fisheries. The study estimated the difference between the maximum amount of fish that could and would be caught by fishermen, given existing technological and economic constraints, if the limitations imposed by TACs were removed and the amounts of fish harvested in 2001. The study found that, conservatively, there was about 17 percent excess capacity in the Atka mackerel fleet, about 26 percent for flatfish, 35 percent for Pacific cod, 39 percent for pollock, 21 percent for rockfish, 24 percent for sablefish, and 30 percent for other groundfish. These estimates apply to the catcher vessel and catcher processor components of the fleet. Excess capacity for pollock may have declined since the study was completed as fishing operations take advantage of cooperative fishing arrangements under the AFA.

Under the current management regime Alaska groundfish fisheries are expected to continue to generate an important share of the total ex-vessel value of all domestic commercial fisheries. However, the use of the race for fish to allocate TACs and prohibited species catch (PSC) limits and the high levels of excess harvesting and processing capacity in many of the groundfish fisheries are expected to significantly decrease the net benefits to the Nation from these fisheries.

3.2 Effects of Overcapacity Management Measures of Alternative 1

3.2.1 Effects on Marine Mammals

Concentrated removal of key prey species of marine mammals has been a concern, especially with respect to effects of the pollock fishery on Steller sea lions. The fishery cooperatives established under the American Fisheries Act have increased the temporal dispersion of the pollock fishery and decreased the likelihood of localized depletion of Steller sea lion and northern fur seal prey (NMFS 2001a). This does not mean, however, that the catch has been spread throughout the year. Rather, when the fishery operates, there is no race among individual vessels or sectors, but seasonal peaks in fishing effort, such as during the roe season, still occur. While the pace of the pollock fishery is slower, the degree to which the change has reduced competition with Steller sea lions and northern fur seals is uncertain.

The establishment of cooperatives has also resulted in greater spatial dispersion of fishing effort to the extent that fishermen choosing to fish at different times of the year have located migrating schools of pollock in different locations. However, the overall spatial and temporal distribution of the pollock fishery is much more likely to be governed by the imposition of Steller sea lion protection measures. Nevertheless, to the extent to which the formation of fishery cooperatives has facilitated efforts to reduce the spatial and temporal concentration of fishing effort, Steller sea lion protection efforts have been enhanced (NMFS 2002a).

In addition, the emergence of fishery cooperatives provides managers and industry greater ability to manage fishing effort at the individual vessel level relative to the previous open access fishery (NMFS 2002a). For example, fishery cooperatives have demonstrated the ability to internally regulate the fishing activities of individual vessels in both the BSAI directed pollock fishery and in non-pollock sideboard fisheries. Under the open access regime in effect prior to 1999, pollock fishery management measures were bluntly applied in the aggregate to the inshore and offshore fleets, with no attempt or ability to regulate the individual fishing patterns of individual vessels. The increased management capacity since the establishment of cooperatives can only increase the ability of managers and industry to successfully implement Steller sea lion protection measures.

Implementation of the IFQ program in the sablefish longline fishery has contributed to a decline in interactions between this fishery and resident killer whale populations. Sablefish longline fishermen face depredation of hooked sablefish by killer whales. As fishermen retrieve their gear when fishing for sablefish, killer whales frequently pick sablefish off the hooks. The IFQ program has allowed fishermen to reduce the depredation of harvests by setting smaller amounts of gear that can be more quickly retrieved and moved when killer whales appear.

3.2.2 Effects on Seabirds

The incidental catch of seabirds is a potential problem in longline fisheries for sablefish and Pacific cod. Several factors are likely to affect the risk of seabird incidental catch, including fishing effort (e.g., number of hooks deployed), the distribution of effort by sub-area and season, the abundance and distribution of seabirds in the vicinity of fishing vessels and the use of seabird deterrents in longline fisheries (NMFS 2001a). The relative importance of these factors has not been fully studied. However, it is reasonable to assume that risk increases or decreases partly as a consequence of changes in fishing effort. Research suggests that the relationship between fishing effort and the number of birds hooked in the BSAI and GOA varies for different species groups. In both the BSAI and GOA northern fulmars are more likely to be taken with increased fishing effort than any of the other three seabird groups that are taken by longline gear. That is, as the number of hooks increases, so do the number of fulmars hooked. However, it appears that the amount of fishing effort does not play a key role in whether albatrosses, gulls, or shearwaters are taken (NMFS 2001a).

In the sablefish longline fishery, improved catching efficiency during IFQ management has reduced the number of hooks and days at sea necessary to catch the quota (Sigler and Lunsford 2001). During the period 1995 to 1998, IFQ management reduced the total number of hooks fished by 38 percent, from 263 million to 164 million, or about 25 million hooks per year. Based on this information, the number of fulmars taken is predicted to decrease under Alternative 1. The incidental take of other seabird species is not expected to change as a result of changing fishing effort. The impact of hook-and-line fishing effort cannot be predicted in detail because of unknown factors such as the seasons and locations of fishing as it relates to the abundance and distribution of seabirds and the effectiveness of the deterrent measures being used.

3.2.3 Effects on Target Groundfish Species

Compared to previous open access management, IFQ management increased sablefish longline fishery catch rates and decreased harvest of immature fish (Sigler and Lunsford 2001). Localized depletion and fishing in marginal areas also occurred less often. Fishery selectivity of the longline fleet favored larger, older fish with the transition from the open access to the IFQ fishery. The mature fraction improved by nine percentage points for female sablefish and one percentage point for males. Decreased harvest of immature fish improved the chance that individual fish will reproduce at least once. The analysis of spawning biomass per recruit showed that spawning potential was higher for the IFQ fishery compared with the open access fishery. Spawning biomass per recruit was 9.29 kilograms (kg) per recruit for the open access fishery and 10.0 kg per recruit for the IFQ fishery, a 9 percent increase.

Predicting when to close the open access sablefish fishery was difficult because of the speed and brevity of the fishery (Sigler and Lunsford 2001). The sablefish TAC frequently was exceeded in the GOA during open access management, but it has not been exceeded during IFQ management. It is also likely that the reduction of lost gear and sablefish mortality resulting from lost gear (deadloss) has allowed the sablefish TAC to remain higher than it would have been under the previous management regime (Hartley and Fina 2001b).

Cooperatives established under the AFA may result in a shift in the age distribution of the pollock catch. As the race for fish is lessened, fishermen may search longer for fish of a desirable marketing size. This could result in reduced catch of undersized pollock. Also, to the extent that fishing under AFA cooperatives has slowed the pace of the BSAI pollock fishery and distributed fishing effort over a wider area, the likelihood that the fishery could result in depletion of relatively distinct spawning populations not presently recognized under the current management system could be reduced (NMFS 2002a). Catch of non-pollock groundfish in the directed pollock fishery is negligible and sideboard measures restrict the participation of AFA vessels in other groundfish fisheries to some level of historic participation. Therefore, the effects on non-pollock target species are considered to be insignificant.

One potential negative effect of an IFQ system is that fisherman may have an incentive to “high-grade” the catch by discarding lower quality fish that count against the quota. High-grading can result in incorrect inferences from landed catch (NRC 1999a). Not only would actual mortality rates be higher than apparent mortality rates, but the age and size distribution of landed catch would be different from the size distribution of the initial harvest (prior to discards).

High-grading is generally less likely to occur in open access fisheries because the race for fish usually provides a substantial incentive for fishermen to deliver as much as they can catch as quickly as possible. However, a 1995 report from Fisheries Information Systems noted that, after IFQ implementation, groundfish discards in the sablefish longline fishery actually declined from 24 percent to less than 10 percent (Buck 1995). The discard rate in the fishery in 1999 was only 8 percent. Furthermore, preliminary comparison of the size distribution of sablefish in the commercial landings and catches in the NOAA Fisheries sablefish longline survey do not suggest widespread high-grading (NRC 1999a). The presence of NOAA Fisheries observers on larger vessels in the IFQ program undoubtedly restricts the opportunity to high-grade (Buck 1995). In addition, the relative rate of catch of low-value fish is thought to be high enough, and the price difference between low- and high-value fish is thought to be small enough, that the expense of replacing discarded low-value fish would result in little or no increase in net revenues to the fishermen. Fisheries in which high-grading is not a serious concern seem to be characterized by minimal price differentials among fish sizes and/or relatively high costs of catching replacement fish (NRC 1999a). The price differential for small sablefish is minimal, no more than 12.5 percent in 2000 (Sigler and Lunsford 2001).

3.2.4 Effects on Non-Target (Forage, Other, and Non-Specified) Species

Rights-based management systems such as the sablefish longline fishery IFQ program and the cooperatives established in the BSAI pollock fishery are designed to increase economic gains in fisheries by allowing reasonably paced and well-planned fisheries in areas where fishermen get more target species catch with less bycatch. Although there would be economic benefits to the fishery if bycatch of all undesired species were reduced across the board (more efficient processing, less handling time of nonmarketable animals, etc.), the reality of fishing is that bycatch of some kind is unavoidable; therefore, fishermen avoid the bycatch that is most detrimental and accept that which is least harmful to them economically. While there is considerable motivation to avoid catching non-target species, such as halibut or salmon, that can potentially constrain groundfish fisheries through PSC limits, there may be little incentive to avoid bycatch of non-constraining species. This point is underscored by the fact that the sablefish longline fishery has been managed under an IFQ system for the past several years, and yet this fishery still has very high grenadier (non-specified) bycatch (NMFS 2001a). In some years the catch of grenadiers may approach that of target species in this fishery.

3.2.5 Effects on Prohibited Species

The tools necessary to prevent bycatch from adversely affecting the stocks of the prohibited species themselves are in place. Therefore, the prohibited species catch in the groundfish fishery is principally not a conservation problem. Because prohibited species have catch limits that can constrain groundfish fisheries, there is considerable incentive to avoid catching these species. Experience with the cooperatives in the BSAI pollock fishery indicates that eliminating the race for fish under a rights-based management system may facilitate fishermen's efforts to reduce the catch of prohibited species. When the race for fish is eliminated, fishermen are able to fish more cleanly (i.e., minimize their bycatch), as they can fish in a less hurried fashion and avoid areas where prohibited species catch is high. Bycatch rates of all prohibited species are very low in the directed Bering Sea pollock fisheries, with the species of greatest interest being salmon and herring. Since the implementation of the AFA, both herring and other salmon bycatch rates have decreased while chinook salmon bycatch rates have increased but remain below historic levels (NMFS 2002a).

The AFA also facilitates collective efforts by industry to reduce prohibited species bycatch. In 2001, for example, the pollock intercooperative group composed of representatives of all catcher vessel and catcher processor cooperatives (co-ops) announced the development of an "other salmon" (primarily chum salmon) bycatch management program for the Bering Sea pollock fishery (NMFS 2002a). The goal is to implement a rate-based program for reducing chum salmon bycatch by restricting pollock harvest in areas of chum bycatch to vessels with low bycatch rates as an incentive to promote cleaner fishing practices. The pollock cooperatives are the key component of this program. By promoting bycatch reduction on a co-op by co-op basis, co-ops are given incentives to develop clean fishing practices.

In the sablefish longline fishery, prohibited species bycatch reduction was inherent in the IFQ program due to the close interaction between sablefish and halibut fisheries. Much of the longline bycatch of halibut occurred in the sablefish fisheries, and many fishermen fish for both species (and receive IFQ for both). To the extent sablefish fishermen have halibut IFQ, this halibut is now retained and counted against the target quotas, as opposed to being discarded (by regulation prohibited species bycatch has to be discarded unless donated to a food relief agency). This resulted in an immediate reduction of the annual GOA halibut prohibited species limit from 750 mt to around 150 mt (Pautzke and Oliver 1997).

The bycatch of many prohibited species has not been significantly affected by current measures related to overcapacity because the measures have not had an appreciable effect on the groundfish fisheries in which those species are caught (NMFS 2001a). The majority of halibut bycatch in the BSAI and GOA is taken in non-pollock trawl fisheries, specifically those targeting Pacific cod and flatfish. Longline fisheries targeting Pacific cod take the next largest proportion of halibut bycatch. Most of the bycatch of crab in the BSAI comes from the yellowfin sole, rock sole and other flatfish, and Pacific cod fisheries. Most of the bycatch of Tanner crab in the GOA comes from the Pacific cod pot fishery and the flathead sole trawl fishery.

3.2.6 Economic and Social Effects

Economic Impacts on Vessel Owners Including Owners of Catcher Processors

There is insufficient information to calculate the change in the overall profitability of the sablefish longline fishery that has resulted from implementation of the IFQ program. However, an increase in the profitability of this fishery is suggested by the fact that quota prices have increased substantially since 1995 (Hartley and Fina 2001a). In addition, some preliminary quantitative information on the costs and benefits to fishermen is available. Sigler and Lunsford (2001) estimated that IFQ management increased fishery catch rates in the GOA even though sablefish abundance was decreasing. Fishery catch rates by region and year averaged 0.24 kg per hook during the open access fishery and 0.39 kg per hook during the IFQ fishery (during summer). The improved catch rates are likely the result of less crowding on the most productive fishing grounds with longer seasons and a slower paced fishery. Since the IFQ program was implemented, the season length has changed, from as short as 10 days during open access to 8 months under IFQ management, with landings distributed broadly throughout the year. Because the catch now occurs over several months, vessels no longer are forced to fish side by side. In addition to higher catch rates, some fishermen have received a higher price for their fish because they are able to time their fishing to obtain the best price for their harvests (Hartley and Fina 2001b). In a survey of sablefish fishermen, 50 percent reported a price increase for their harvests (Knapp and Hull 1996).

Sigler and Lunsford (2001) also found that catching efficiency increased 1.8 times with the change from an open access to an IFQ fishery. IFQ management reduced the total number of hooks fished by 38 percent, from 263 million to 164 million, or about 25 million hooks per year. Moreover, the IFQ fishery required 3,000 fewer days at sea to catch the quota. Fewer days at sea reduce variable costs such as fuel, bait, and gear. The researchers estimated that for the 1995–1998 fisheries, fuel, gear, and bait costs decreased from $33 million to $20 million, or about $3.1 million per year. Compared with landed value, these fuel, gear, and bait costs decreased from 8 to 5 percent of landed value.

Private banks and government agencies have come to treat quota shares allocated under the IFQ program as having financial value that may allow them to serve as collateral for loans, for instance (Iudicello *et al.* 1999). By the end of 1997, banks had placed liens on 388 quota shares; private lenders, on 116 shares; the IRS, on 79 shares; and Alaska's child support program, on 26 shares.

The economic impacts of the AFA on the various types of vessels that comprise the BSAI pollock fleet have been discussed by government and industry reports (also see Felthoven 2002). According to NMFS (2002a), members of industry indicate that both the catcher processors and catcher vessels were more profitable under the cooperative structure in 1999 than they were under the old system that required them to race for fish. A GAO study of the catcher processor co-ops in operation in 1999 stated that the end of the race for fish has given catcher processors more time to search for the size of fish most conducive to the products processors want to produce (NMFS 2002a). The average haul size for catcher processors dropped by roughly 30 percent between the A seasons in 1998 and 1999. The daily catch rate for the group of catcher processors that fished in 1998 and 1999 declined by over 60 percent. Peak weekly catch rates declined substantially in 1999 and further yet in 2000. Whereas in 1998 the vast majority of the winter season catch was taken in 4 weeks, in 2000, the same percentage of the catch was spread out over 10 weeks.

With smaller haul sizes, more careful processing and the ability to search out fish of optimal size and roe content, the pollock catcher processor fleet was able to improve product quality, increase product utilization rate, and optimize product mix to market conditions. In particular, the quality and yields of roe increased and the fleet was able to produce more high-valued products in place of less valuable products. For example, catcher processors were able to respond to increased demand and rising fillet prices by increasing deep skin fillet production while decreasing surimi and mince production. In addition, the quality of single-freeze fillets coming from catcher processors is said to be higher than that of a few years ago because the vessels have sufficient time to handle catch more carefully (NMFS 2001b). Also attributable to the end of the race for fish is an increased product utilization rate, leading to more product per unit of fish caught (NMFS 2001b). Processors that are able to generate more product from a given amount of pollock are likely to increase their revenues. This also translates to increased profits for the firm if they are able to produce that product for less than the cost of production. The Pollock Conservation Cooperative (PCC) catcher processors estimated that their utilization rate increased 35 percent in 2000 over a 1998 (pre-AFA) baseline (NMFS 2002a). Their overall utilization rate in 2000 was just over 27 percent.

With regard to the effects of AFA on the mothership sector, Halvorsen *et al.* (2000) conclude that, while that sector's share of the TAC was decreased by approximately one-sixth and it did not receive any direct compensation for this decrease, it is expected to benefit from rationalization, but not by as much as the catcher processors. The offshore mothership sector slowed and smoothed out weekly production significantly in the 2000 winter season, prolonging the season by several weeks. This sector did not have fillet production capacity; therefore, there were no major shifts in production mix.

Halvorsen *et al.* (2000) could not rule out the possibility that the rules for inshore pollock cooperatives have actually hurt independent catcher vessel owners financially. While these rules give fishermen opportunities to move between processors, they cannot do so without costs (Ginter and Muse 2002). Fisherman who want to avoid an open access fishery must deliver to the same processor they delivered to last year, thus the position of processors with the fishermen is strengthened.[12] Due to these restrictions, it is unclear whether the efficiency gains from inshore cooperatives will be as great as those in the offshore sector. However, the pace of production and product mix in the winter season of 2000 suggest some immediate gains. For example, weekly processed catch was spread out as production was deliberately slowed down. In addition, the inshore sector increased their utilization rate of BSAI pollock after cooperatives were implemented. Members of the inshore sector increased their utilization rate about 2.3 percent from 1999 to 2000 (NMFS 2002a). Their overall utilization rate in 2000 was 36.6 percent. While their increase was not as great as that seen in the catcher processor sector, it still indicates they were able to produce about 4,000 mt more product in 2000 relative to what they would have produced had their utilization rate remained at the 1999 levels.

Unless vessels are scrapped, capacity reduction schemes may induce transfer of fishing effort to other fisheries which themselves exhibit overcapacity.[13] For example, the increased flexibility afforded to pollock catcher vessels by the creation of co-ops leads to increased opportunity for these vessels in other fisheries; a shift in fishing effort could create benefits for the catcher vessels, but could also indirectly create economic hardship in the form of reduced profitability for the fishermen already engaged in those fisheries. If the catcher vessels were to shift their effort to other fisheries, catch per unit effort and individual harvest for existing fishermen could decline substantially due to crowding and intensified fishing pressure on stocks. In anticipation of these potential problems, the AFA included provisions for the NPFMC to enact measures to protect non-AFA fisheries from adverse impacts resulting from the AFA and pollock fishery cooperatives. BSAI Amendment 61 contains various specific protective measures developed by the Council which limit the pollock industry's participation in other fisheries — these measures are referred to as "sideboards." AFA catcher vessels have been operating under groundfish sideboards since 2000. The management of sideboard fishing at an individual cooperative (and by extension, individual vessel) level has eliminated the potential for an increased race for fish in major sideboard fisheries (NMFS 2002a).

Impacts on Owners of Inshore Processing Plants

After implementation of the sablefish longline fishery IFQ program, existing processors found themselves burdened with excess capacity and a loss of bargaining power (Hartley and Fina 2001b). The processors

[12] The AFA requires members of a cooperative as a group to deliver 90 percent of their TAC to the processing firm associated with that cooperative. Catcher vessels that want to switch cooperatives must spend at least one year in the open access fishery.

[13] Under the provisions of the AFA, eight of the nine catcher processors that were bought out were required to be scrapped and the ninth vessel was permanently stripped of its U.S. fisheries endorsement and prohibited from fishing in the U.S. EEZ, or in foreign or international waters on any stock of fish that occurs within the U.S. EEZ.

operating prior to IFQs developed their businesses to accommodate the huge rush of fish that occurred with the short intense seasons. With IFQs, new niche processors catering to the fresh-market entered the fishery, and a number of the larger traditional processors found themselves with excess capacity. Moreover, with the additional competition to buy fish and disappearance of market gluts, some processors lost bargaining power as vessel owners were more able to search out buyers willing to the pay the highest price (Hartley and Fina 2001b; Iudicello *et al.* 1999).

By the time the AFA was being drafted, traditional inshore processors in Alaska recognized the consequences of IFQs and exercised their political power to prevent new IFQ systems that did not include provisions that protected the interests of processors (Hartley and Fina 2001b). The AFA and implementing rules require each catcher vessel that joins a cooperative and delivers inshore to bring a share of the TAC to that cooperative proportional to its historical catch. The vessels, in aggregate, have to agree to deliver 90 percent of their TAC to the processing firm associated with that cooperative. These inshore catcher vessel cooperatives were controversial (Ginter and Muse 2002). They appeared to give inshore processors control over rights to a part of the TAC, over and above the rights that accrued to them as vessel owners.

Inshore processors have also benefitted from the slower-paced pollock fishery under cooperatives. With the more moderate and regular landings by catcher vessels, processors have been able to increase their production of higher-value products. For example, the inshore processing sector increased production of higher valued fillets by over 50 percent and decreased surimi as a percentage of total production. However, total fillet production is still less than one-third of surimi production.

Impacts on Vessel and Processing Crews and Other Employees

A disadvantage of IFQ programs is that they can lead to a smaller fishing workforce and potentially increase unemployment (Buck 1995). Some crewmembers may be unable to find employment elsewhere, but those who find jobs may earn less. The most significant loss is likely to be part-time fishermen and deck hands. Under IFQ management, vessels will not need the high number of deck hands to participate in labor-intensive “derby”-style openings.

A survey of sablefish fishermen in the year following implementation of the IFQ program suggested that a slight decline in the number of crew occurred under the program (Knapp and Hull 1996). With IFQs and the resulting change from a race for fish, the number of crewmembers on a typical trip is believed to have fallen from a range of 3 to 6 to a range of 2 to 4 (including the skipper).

On the other hand, an anticipated advantage of a fishery managed under an IFQ program is that jobs for crewmembers who remain in the fishery may become more stable and permanent, replacing the short, temporary or seasonal jobs characteristic of many open access fisheries (Buck 1995). In turn, the longer fishing seasons and more stable employment can translate into higher income. Believing that crewing jobs would be better paid under an IFQ system, the Deep Sea Fisherman's Union of Seattle supported the creation of the sablefish IFQ program. It is in fact estimated that payments per individual crewmember have increased under the program. The decline in the number of active sablefish vessels and reductions in crew size after IFQ implementation is estimated to have increased average payments per individual crewmember from $3,165 in the pre-IFQ fishery to $8,342 in the IFQ fishery (Hartley and Fina 2001b).

As a form of compensation for the loss of employment opportunities, the NPFMC made the provision that the only persons who could purchase sablefish IFQ shares that were not initial recipients had to be “legitimate” crewmembers with at least 150 days of fishing experience. With this provision, crewmembers who might otherwise lose their jobs can establish themselves in the fishery, and because the owner of the quota shares is required to be onboard when the IFQs are fished, these crewmembers can guarantee themselves a position (Hartley and Fina 2001b). Moreover, crewmembers who purchase quota shares increase their value as crew, as their quota shares add to the overall harvest limit of the vessel on which they work (Ginter and Muse 2002). Approximately 850 crewmembers have invested in sablefish quota shares since the IFQ program was initiated (Gulf of Alaska Coastal Communities Coalition 2000).

Both crewmembers and vessel owners have been assisted in purchasing sablefish and halibut IFQ shares by the North Pacific IFQ loan program, a financing mechanism authorized by the MSA in 1996. The MSA specifies that 25 percent of the fees collected by NOAA Fisheries to manage the sablefish and halibut IFQ program must be deposited in a U.S. Treasury Department account and made available for appropriation to support the loan program. To date, however, the program has largely been supported by a Congressional appropriation. The MSA specifies that the loan program is to provide aid in financing the 1) purchase of individual fishing quotas in that fishery by fishermen who fish from small vessels; and 2) first-time purchase of individual fishing quotas in that fishery by entry-level fishermen. Currently, the program has approximately $5 million available for financing quota share purchases. In Fiscal Year (FY) 2002, 39 loans were issued, mostly to vessel owners and crewmembers who fish from small (< 60 ft length over-all) vessels.

Impacts on Communities

The harvesting and processing sectors of the fishing industry in Alaska and elsewhere are labor-intensive and often located in relatively isolated communities. IFQs could harm such communities, should a reduction in fleet size and fewer employees following IFQ implementation reduce the number of processors and demand for associated shoreside services (Buck 1995). These effects can disrupt economies of small communities that depend on commercial fishing, especially during the transition from open access to an IFQ program. These changes are one facet of the wealth distribution issue that typically accompanies the reduction of capacity under a rights-based management system (Gréboval and Munro 1999). Market forces are likely to lead to a certain degree of concentration and may also lead to the elimination of financially less efficient small-scale or community operations.

From the onset of implementing measures to control capacity in the groundfish fisheries, the NPFMC has included provisions that constrain individuals or entities from acquiring an excessive share of these fisheries. The LLP limits the number of groundfish licenses that any one person can hold to 10 licenses. A person is defined in Section 679.2 as, “any individual (whether or not a citizen of the United States), any corporation, partnership, association, or other entity (whether or not organized, or existing under the laws of any state).” In the development of the sablefish longline fishery IFQ program several restrictions on the use, transfer, and accumulation of quota were imposed to avoid excessive consolidation and maintain the pre-existing characteristics of the longline fleet as being comprised of relatively small-scale, owner-operator vessels (Hartley and Fina 2001b; Ginter and Muse 2002). The NPFMC recognized that maintaining the social and economic fabric of the fishery is important to the many coastal communities in which fishing vessels in the fishery are home ported (Ginter and Muse 2002).

There is a lack of consensus on whether the IFQ program has had an overall positive or negative impact on coastal Alaska communities and the fishermen residing in those communities (Pautzke and Oliver 1997). The Alaska Commercial Fisheries Entry Commission (CFEC) (1999) provides a detailed breakdown of changes in quota holdings and deliveries by census area, rural versus urban, state of residence, type of entity, etc.

There has been some consolidation of quota within communities and some movement of quota between communities, but trends in geographical consolidation of quota or deliveries are not clear.

While a lack of detailed socioeconomic data makes it difficult to characterize exactly how communities were affected by the implementation of the IFQ program, it appears that some Alaska communities have seen reductions in quota holdings by their residents and in local landings, whereas others have had increases. However, because overall sablefish landings declined, deliveries to many areas declined dramatically. For example, sablefish deliveries to Ketchikan/Prince of Wales, the Wrangell-Petersburg census area and the Skagway-Yakutat-Angoon census area fell by 70 to 75 percent between 1994 and 1998 (CFEC 1999). In 2000, the Gulf of Alaska Coastal Communities Coalition (2000) submitted a proposal to the NPFMC citing the disproportionate amount of quota share transfers out of smaller, rural communities as a symptom of the continuing erosion of their participation in the sablefish and halibut fisheries. Anecdotal evidence cited in the proposal suggests that the fishermen in these communities were not awarded sufficient quota shares during initial issuance to make it economically viable to continue fishing. In contrast, fishermen who received larger initial allocations were able to finance additional quota share purchases with the capital provided from their new asset base.

The Restricted Access Management office, which is the entity established by NOAA Fisheries to manage the IFQ program, and the CFEC have confirmed that: 1) the rate of decline of the amount of quota shares in the smaller communities is higher than that of the larger communities; 2) the bulk of the quota share consolidation has taken place in the smaller holdings; and 3) very few initial large quota share recipients reside in smaller coastal communities. A combination of several possible factors may explain the relatively low amount of initially issued quota shares and the subsequent transfer of quota shares out of the target communities. These factors include the lack of general infrastructure to support fisheries; the lack of financial wherewithal among community residents to buy vessels, equipment and quota shares; and the higher transportation costs associated with fishing in small, remote communities that are located further from the major markets.

To help ensure sustained participation of smaller, rural GOA communities in the sablefish and halibut fisheries, the IFQ program was amended to allow eligible communities to hold quota shares. Communities can create or identify an existing entity to purchase and manage halibut and sablefish quota shares, for lease to and use by qualified individual community members. Rural villages will likely use federal and state grants to purchase quota shares. By providing communities with an opportunity to increase participation in the IFQ fisheries, this modification of the IFQ program is expected to further overall economic development in participating communities, the majority of which have limited economic alternatives. Because this measure was only recently approved by the NPFMC in 2002, there is insufficient information to determine the direction or magnitude of these effects.

The western Alaska CDQ program has benefitted the small communities in the Aleutian Islands and on the Bering Sea that have traditionally been unable to participate in fisheries (Northern Economics, Inc. 2002). Communities granted quota shares have handled their shares in different ways. Some quota shares have been transferred annually to industry partners (CDQ shares can not be permanently transferred) in exchange for royalties and employment benefits while other shares have been used to directly develop fishing sectors within the communities. Since the inception of the program in 1992, the program has provided approximately 1,000 jobs annually for western Alaska residents and has created an excess of $8 million in wages annually since 1998. Over the duration of the CDQ program annual pollock CDQ royalties have consistently exceeded $13 million. In 2000, the CDQ communities received nearly $33 million in pollock CDQ royalties, while royalties from the multi-species program provided the communities an additional $7.4 million. The value of CDQ community assets in aggregate, including equity ownership in fishing vessels, on-shore development projects, loan portfolios and IFQ holdings, increased from nearly $15 million in 1992 to over $152 million in 2000.

In conclusion, constraints on the restrictions of the use, transfer, and accumulation of IFQs may prevent preemption of communities or fishery sectors. However, the social benefits of these measures should be weighed against the efficiency losses. The greatest increase in profits for the overall industry is likely to come from a system with a minimum of constraints on transferability and use of quota shares. For the industry as a whole, increases in profitability can be achieved by shifting harvesting and processing from less efficient operations to more efficient ones. Gains in economic efficiency may be made by concentrating production in fewer operations, especially if there are firms with excess harvesting or processing capacity as continues to be the case in most sectors of the Alaska groundfish fishery. Furthermore, it is possible, but by no means certain, that there are economies of scale that would favor larger firms and lead to greater concentration of the industry. At the same time, however, one must recognize that it is this potential for increasing profits by shifting and concentrating harvest and processing operations that poses the threat of preemption of sectors and communities.

Impacts on Consumers of Groundfish Products

Seafood consumers can benefit from a rights-based management system because fishermen are able to fish at different times and thus supply markets with a more continuous flow of high-quality product (Buck 1995). Prior to the implementation of the IFQ program in the sablefish and halibut longline fisheries, the abbreviated seasons limited the availability of fresh halibut to a very short period each year.[14] Under the IFQ program, fishermen have distributed their catch throughout the year. A survey of registered buyers in the first year of the program found that fresh halibut production rose 18 to 38 percent under the program, benefitting consumers and marketers of fresh fish. Furthermore, the slower pace of fishing in the halibut longline fishery resulted in better fish handling, and the overall quality of the catch has improved (Hartley and Fina 2001b).

On the other hand, IFQs can increase seafood costs because consumers will miss the low prices that occur during, and because of, the race for fish (Buck 1995). In the Alaska sablefish fishery, for example, prices have increased since IFQ implementation (Hartley and Fina 2001b).

Impacts on Fishing Vessel Safety

Because IFQs guarantee that one's allocated catch will be available later, they provide fishermen increased flexibility in choosing when to fish (Buck 1995). The option of choosing when to fish improves vessel safety, as fishermen can fish at a more leisurely pace and avoid fishing in dangerous weather or locations. In the sablefish longline fishery, the fishing season was converted to an eight-month season from March 15 to November 15. Fishermen have distributed their harvests across the entire season. The lowest harvests occur in the first few and last few months of the season, when the weather is the most threatening (Buck 1995). Nevertheless, market forces can reduce potential safety benefits if processors offer premium prices during

[14] Sablefish is usually frozen at sea.

inconvenient or less safe times. However, some fishermen may still choose to fish in bad weather if, for example, the best price for catch is offered during and immediately after storm periods.

Although some incentive may remain to fish in less than optimum conditions under an IFQ program, fewer personal injuries and fatalities and less gear destruction should occur than under comparable open access conditions. A 1995 report from Marine Safety Reserve, a liability pool, noted a substantial decline in the longline vessel accident rate (injuries per fishing day) following implementation of the sablefish IFQ program (Buck 1995). Safety statistics compiled by the U.S. Coast Guard show that, as the IFQ program progressed, a substantial drop in search and rescue missions for the sablefish and halibut fisheries occurred (Hartley and Fina 2001b; Woodley 2002). Furthermore, a survey of sablefish fishermen revealed that more than 90 percent reported weather as an important factor in determining when to fish quota (Knapp and Hull 1996).

Similar benefits in vessel safety have resulted from the operation of the AFA pollock cooperatives. While the slowing down of the BSAI pollock fishery and the flexibility offered by the quota systems has not had an impact upon fatality rates (the fatality rate has remained at zero since 1995), vessel owners from several of the Pollock Conservation Cooperative companies have reported an approximately 50 percent reduction in processing crew injuries (Woodley 2002). In addition, safety-enhancing features such as less competitive and slower paced operations are also found among vessels participating in some CDQ fisheries (Woodley 2002).

The risk to fishermen is expected to remain high in other groundfish fisheries under the current management regime. This is due, in part, to the continued use of the race for fish to allocate TACs and PSC limits among competing fishermen.

3.2.7 Effects on Ecosystem

Elimination of the race for fish may reduce local and temporal depletions that can be disruptive to ecosystems. Reduction in the number of hooks being used is also likely to reduce habitat effects of fishing longline gear (Sigler and Lunsford 2001). IFQ management of the sablefish longline fishery has shown to improve catching efficiency compared with open access management, to the point that the number of hooks necessary to catch the TAC was reduced. Invertebrates such as coral, anemones, and sea stars are often snagged and brought to the surface with longline gear; however, documentation of how longline gear affects the seafloor and associated species is limited, and these effects have not been quantified.

The AFA cooperatives have reduced effort in the BSAI pollock fishery and allowed the fishery to spread out in time and space. However, because pelagic trawl gear does not significantly impact the substrate and benthic habitat, the effects of this dispersal of fishing effort on the physical environment are expected to be insignificant (NMFS 2002a).

The amendment that allows eligible communities to purchase sablefish IFQs could have an effect on the location of the fishery if quota shares are purchased by remote communities from residents located in larger ports and fished in close proximity to the remote communities. That could result in a shift of some of the harvest from the areas surrounding the larger ports to more remote areas. This may be a positive effect in the context of local depletion concerns, but the level of effect is highly dependent on the amount of quota shares communities purchase and where residents of those communities choose to fish. At present, there is insufficient information to determine the direction or magnitude of these effects.

The effects on the substrate, water column, and benthic biota caused by fisheries that use bottom trawl gear have not been mitigated by current measures that address overcapacity. Bottom trawls are used to fish Pacific cod and various species of flatfish. Trawling on sea floor habitat and benthic communities in the GOA generally disturb sea floor habitats by displacing boulders, removing epifauna, decreasing the density of sponges and anthozoans, and damaging echinoderms (NMFS 2001a). However, the effects of this disturbance on fish and other living marine resources are not known.

3.2.8 Effects on Management and Enforcement

A rights-based management program can lead to increased costs for administration, monitoring, and enforcement. Both buyers and fishermen have stated that the sablefish longline fishery IFQ program imposes extra administrative burdens and costs on their operations (Hartley and Fina 2001b). To ensure that catch is monitored, fishermen are required to communicate to NOAA Fisheries by radio their approximate catch at least 6 hours before landing. The requirement is particularly troublesome for small vessels that make short day trips, as it forces some to approximate their catch before leaving the port. However, the requirement provides monitoring agents with the opportunity to be onsite at the time of landing. Dockside monitoring has also been simplified by requiring that all buyers be registered with NOAA Fisheries. Buyers are required to report all purchases to NOAA Fisheries through an automated system that records prices and weights of deliveries.

Substantial public funding was required at the outset of the IFQ program. Implementation and management costs for the Restricted Access Management office—the entity established by NOAA Fisheries to manage the program—and NOAA Fisheries enforcement costs were $4.6 million in the year of implementation (NRC 1999a). The MSA provides for cost recovery measures that can impose a fee on quota holders of up to 3 percent of the ex-vessel value of IFQ landings. Total fee collections cannot exceed the annual cost of management and enforcement. Such measures were implemented for the sablefish and halibut IFQ program in 2001. Seventy-five percent of fee payments are deposited in the Limited Access System Administrative Fund and made available to NOAA Fisheries to offset costs of management and enforcement of the halibut and sablefish IFQ program. Direct program costs remained almost the same for FY 2001 ($3,430,357) as for 2000 ($3,474,111) (NMFS 2002b). More pounds of halibut, and almost the same amount of sablefish, were landed in 2001 as compared with 2000. The FY 2001 fee percentage increased to 2.0 percent from 1.8 percent in the prior year due to a decreased ex-vessel value of fish in 2001.

The MSA also authorizes NOAA Fisheries to collect a fee to recover the costs directly related to the management and enforcement of a CDQ program. To date, no fees have been collected by NOAA Fisheries to administer the western Alaska CDQ program. However, the State of Alaska collects fees to defray the costs of administering this program.

IFQ programs have been criticized for increasing the incentive for fishermen to operate illegally (Buck 1995). For example, with an IFQ program, each fisherman personally benefits from quota busting (i.e., under-reporting the quantity of fish landed). While some reports of unreported catch have been received by enforcement agents for the sablefish IFQ program, the problem is believed to be minor (Matthews 1997). In addition, the program is thought to have increased fishermen's interest in fishery enforcement by NOAA Fisheries personnel who monitor IFQ landings and created some self-monitoring. Quota shareholders have an incentive to report on each other, since cheating directly harms individual quota holders. Fishermen now consider violations by other fishers as devaluing their interest in the fishery by reducing the TAC in future years (Matthews 1997). U.S. Coast Guard enforcement costs for vessels and aircraft for the IFQ program increased from $7.3 million in 1994 to $25.5 million in 1995 but declined to $10 million by 1997 (NRC 1999a). However, Coast Guard search and rescue operations for the halibut and sablefish fisheries decreased dramatically to about one-third the level prior to IFQ management (Hartley and Fina 2001b).

New catch accounting requirements established for the western Alaska CDQ program and AFA pollock cooperatives required an increase in observer coverage. At least two observers are required aboard each vessel. The cost of having two observers on board at all times probably exceeds $710 per day (2 x $355 per deployment day, not including food costs) for each vessel.

In addition to the additional observer coverage, flow scales and observer sampling stations equipped with motion-compensated platform scales are required of catcher processors participating in CDQ fisheries and AFA-eligible catcher processors. Recently, NOAA Fisheries estimated the purchase price of a flow scale to be about $45,000; a motion-compensated platform scale is about $4,000 (Alan Kinsolving, NOAA Fisheries, personal communication, January 2003). Annual service costs were estimated to be $2,000. If modification of the vessel is not necessary or minimal, the costs of installation would be around $4,000, with most or all of the work being done by crewmembers. If extensive reconfiguration of the vessel is necessary (e.g., shifting RSW tanks), installation costs could be up to $250,000, although NOAA fisheries indicates that costs should not exceed $30,000 in most cases. NOAA Fisheries also noted that the installation of scales might reduce vessel production, particularly if processing equipment has to be relocated, and that there is the potential for lost fishing time should the scales stop working.

Finally, during the implementation of a rights-based management program, public and private costs may be incurred adjudicating evidentiary and fairness issues to make the initial determination of who will be included. In the sablefish IFQ program, the importance of the initial allocation was increased because of restrictions on transferability of quota shares (Hartley and Fina 2001a). Yet, only 179 applicants—fewer than 3 percent of the total—appealed the decision made in the technical review. More than half of the appeals challenged determinations of eligibility for quota shares or challenged vessel ownership or lease interest conflicts. Only 10 of the appeals heard by NOAA have been subsequently appealed to the federal court system (Hartley and Fina 2001a).

Section 4 Alternative 2: Adopt a More Aggressive Management Policy

4.1 Overview of Overcapacity Management Measures of FMP 2.1

FMP 2.1 would eliminate the LLP and moratorium, maintain the AFA pollock cooperatives, repeal the CDQ except for pollock and crab, eliminate the sablefish longline fishery IFQ program, eliminate the sablefish IFQ shares for communities, and cease further work on rationalization in the groundfish fisheries. The AFA pollock cooperatives and CDQ for pollock and crab would be maintained because they are statutorily mandated.

Because FMP 2.1 eliminates some of the current management measures designed specifically to control overcapacity, it is expected to substantially increase the level of excess harvesting and processing capacity in certain groundfish fisheries. The only groundfish fishery in which measures to control excess capacity are retained under this FMP is the BSAI pollock fishery. The fishery most likely to experience a dramatic increase in fishing capacity is the sablefish longline fishery. With elimination of the IFQ program, the fishery would revert to an open access condition and catch would be allocated by the race for fish. Given the relatively strong market for sablefish, it is likely that many new vessels will enter the fishery. The increased competition, in turn, will cause harvesters to expand their capacity in an effort to maintain or increase their share of the catch.

The changes in fishing capacity that will occur as a result of elimination of the LLP are less certain. The considerable latent capacity in the groundfish fisheries since implementation of the LLP indicates that resource stocks, market conditions, the regulatory environment or other factors have discouraged some holders of LLP groundfish licenses from becoming active participants in the fisheries. On the other hand, some fishermen who are not license holders would likely find the fisheries an attractive proposition if the LLP program was eliminated and the cost of obtaining a license was removed. In particular, a significant number of vessels currently restricted to fishing in state waters because they do not hold an LLP license would likely be tempted to enter federally-managed Pacific cod trawl and pot fisheries in the GOA. These fisheries could represent an attractive alternative to these vessels given the high ex-vessel price for Pacific cod and the poor market for salmon. Similarly, a number of vessels currently restricted to fishing for crab may be tempted to enter Pacific cod fisheries due to the decline of crab resources. Other groundfish fisheries could also experience an increase in fishing effort. For example, current participants in non-trawl Pacific cod fisheries, as well as any new entrants in those fisheries, may decide to upgrade their vessels in order to participate in the GOA pollock trawl fishery. In addition, some of the larger trawl vessels with area endorsements to harvest Pacific cod in the GOA are likely to shift part of their fishing effort to the BSAI fishery. Finally, elimination of the BSAI cod endorsement for fixed gear vessels is likely to result in an increase in effort in the relatively lucrative BSAI Pacific cod fishery. Owners of head-and-gut trawlers, for example, may be tempted to refit their vessels and enter the fishery during periods when trawling activity is slow. In summary, elimination of the LLP would probably result in an overall net increase in fishing effort in the groundfish fisheries, but it is difficult to quantify the likely increase in capacity.

4.2 Effects of Overcapacity Management Measures of FMP 2.1

4.2.1 Effects on Marine Mammals

FMP 2.1 would increase the total fishing effort in the Bering Sea and GOA groundfish fisheries, with incidental take of marine mammals expected to rise accordingly. However, the entanglement of marine mammals in derelict fishing gear does not have significant population level effects (NMFS 2001a), and this conclusion is not expected to change as a result of increases in fishing effort of the magnitude resulting from this FMP bookend.

Elimination of the IFQ program in the sablefish longline fishery is likely to increase interactions between this fishery and resident killer whale populations. Sablefish longline fishermen face depredation of hooked sablefish by killer whales. As fishermen retrieve their gear when fishing for sablefish, killer whales frequently pick sablefish off the hooks. A resumption of the race for fish is expected to restrict the ability of fishermen to adopt fishing practices (e.g., setting smaller amounts of gear) that reduce the depredation of harvests by killer whales.

An increased level of marine mammal prey disturbance is likely to occur under this FMP bookend. The impact on those marine mammals that utilize groundfish as prey species is a function of the target species, the amount of fishing activity, and the concentration of fishing activity in space and time (NMFS 2001a). Most notably, the race for fish that ensues under this FMP would decrease the temporal distribution of certain groundfish fisheries relative to FMP 1. A temporal concentration could, in turn, result in the local depletion of certain groundfish species. However, the species most likely to be affected (e.g., sablefish and Pacific cod) are of less consequence to marine mammals, as they comprise a small percent of their diet.

Other forms of disturbance to marine mammals that could result from increased fishing effort are largely unknown. Vessel traffic, nets moving through the water column or underwater sound production may all represent perturbations that could affect foraging behavior (NMFS 2001a). Data do not exist to determine the severity of any potential effects. Anecdotal evidence suggests that fisheries disturbance-related events are unlikely to be of consequence to the Steller sea lion population as a whole. For instance, vessel traffic and underwater sound production have long been features of the Bering Sea and GOA, at least over much of the twentieth century. Such circumstances prevailed before and after the decline of Steller sea lions, suggesting no obvious causal link (NMFS 2001a). Steller sea lions also appear to be tolerant of at least some anthropogenic effects, as noted by their attraction to fish processing facilities and gillnets, as well as their distributions in proximity to ports. Further, the eastern stock of Steller sea lions is increasing, despite anthropogenic activities throughout its range on the west coast of north America and particularly in southeast Alaska (NMFS 2001a).

4.2.2 Effects on Seabirds

Under FMP 2.1, longline effort is predicted to increase in the GOA. Consequently, an increase in the incidental take of northern fulmars in the GOA is predicted. However, this increase is likely to be small given the effectiveness of current measures to reduce the mortality of seabirds in longline fisheries. The incidental take of albatrosses, shearwaters, and gulls is not likely to change under this FMP bookend, as it appears that the amount of longline fishing effort does not play a key role in whether these species are taken (NMFS 2001a).

Annual trawl effort in the BSAI and GOA is predicted to increase under this FMP bookend. Consequently, it is anticipated that trawl incidental catch of alcids, gulls, and northern fulmars would increase relative to FMP 1.

The overlap of trawl and pot gear fisheries and Steller's eider critical habitat is relatively small and in limited geographic areas (NMFS 2001a). The effects of these gear types on the benthic habitat in these areas are not known, but an increase in fishing effort would not be expected to affect the Steller's eider at a population level.

4.2.3 Effects on Target Groundfish Species

In principle, FMP 2.1 could increase the degree of spatial and temporal concentration of groundfish catches because it expands the race for fish. For example, the removal of selected measures constraining capacity, as prescribed in FMP 2.1, could lead to excessive local harvest rates within a region. This is most likely to occur in the GOA, where the groundfish fisheries are primarily shore-based and the fleets are less likely to venture to distant regions to explore for alternative fishing locations. With the constant increase of new entrants in the sablefish longline fishery, fishing seasons will degenerate to several short seasons each year. Localized depletion and fishing in marginal areas will occur more often. In addition, the speed and brevity of the fishery will make it more difficult to predict when to close the fishery. In the eastern Bering Sea, the large shelf area, coupled with the AFA pollock cooperatives, would reduce the race to maximize shares of the seasonal TAC allocations, and incidences of localized depletion are less likely to occur.

4.2.4 Effects on Non-Target (Forage, Other, and Non-Specified) Species

An increase in fishing effort in the Pacific cod longline fishery in the BSAI would be expected to result in increases in skate and sculpin bycatch. Economic incentives to reduce the catch of these species would not change under this alternative.

4.2.5 Effects on Prohibited Species

Under this FMP bookend, the race for fish is expected to accelerate in some fisheries and be reinstated as the method of allocation in others. Consequently, prohibited species catch would be expected to increase, since fishermen will fish less cleanly if they are forced to fish in a hurried fashion and in areas where prohibited species catch is high. Catches of halibut, in particular, are expected to increase as effort increases in the Pacific cod and sablefish longline fisheries.

4.2.6 Economic and Social Effects

Impacts on the Fishing Industry

Under FMP 2.1, the BSAI and GOA groundfish fisheries are expected to continue to provide high and relatively stable levels of seafood products to domestic and foreign markets. However, FMP 2.1 will reimpose the use of the race for fish to allocate the annual TAC among competing fishermen in the sablefish fishery and possibly accelerate the race for fish in other groundfish fisheries by removing the LLP. The expected result is lower ex-vessel values due to a decrease in: 1) retention rates; 2) product utilization rates; 3) product quality; and 4) the ability of fishermen to take fuller advantage of seasonal demand for some seafood products to prevent seasonal market gluts or to take advantage of seasonal differences in product quality. In addition, the race for fish is expected to increase both fixed and variable harvesting costs substantially by compelling fishermen to compete for the fish through applications of additional effort.

The overall impact of FMP 2.1 on the level of excess fishing and processing capacity will vary by fishery. The fishery most likely to be negatively affected is the sablefish longline fishery. FMP 2.1 will eliminate incentives to reduce excess capacity in the sablefish fishery. Therefore, we expect an increase in capacity in the long-term and a return to the former level of excess capacity (or beyond). The end result will be a sablefish longline fishery exhibiting numerous overcapitalization problems such as multiple, compressed fishing seasons, gear conflicts, market gluts, declining revenues, increasing fixed and variable costs, and an overall reduction in benefits to fishery participants. Other groundfish fisheries will experience these negative economic effects to the extent that FMP 2.1 creates or exacerbates overcapacity in those fisheries.

The economic impacts of FMP 2.1 may vary over time and across fishery participants. The first new entrants in the fisheries affected are likely to experience an increase in income (otherwise they would not enter the fisheries), while the fishermen already engaged in those fisheries will experience an income reduction due to the increased competition. As additional fishermen enter the fisheries, the race for fish will force fishermen to apply additional effort and costs will increase accordingly. In addition, competition for productive fishing locations would increase and catch rates will likely fall, translating into less harvesting revenue for any given effort level. Enterprises with high operating costs would be the first to feel the cost-revenue squeeze. Over the longer run, operations with high fixed costs would be disadvantaged by the reduced contribution margin of each fishing trip made. These negative economic effects are likely to cause some fishermen to exit the affected fisheries.

Impacts on Consumers

By expanding the race for fish, FMP 2.1 would impede the continuous flow of high-quality groundfish products, which, in turn, would prevent some potential consumer benefits from being attained.

Impacts on Communities

The impacts on communities from eliminating the sablefish longline fishery IFQ program are unclear because there is a lack of consensus on whether this rights-based system has had an overall positive or negative impact on coastal Alaska communities and the fishermen residing in those communities (Pautzke and Oliver 1997). However, the potential economic instability created in the affected fisheries will likely have an adverse effect on some fishing communities.

The repeal of the CDQ for species except for pollock and crab will clearly have a negative effect on the western Alaska communities participating in the CDQ program. The CDQ shares that would be lost represent about 25 percent of the total shares that were allocated to these communities in 2001. In 2000, the percentage of the total royalties generated by non-pollock and non-crab species was about 10 percent, or about $4 million.

Impacts on Fishing Vessel Safety

The safety risk to fishermen is expected to increase under this FMP 2.1. The expanded use of the race for fish to allocate TACs among competing fishermen will contribute to the pressure on fishermen to operate farther from shore or in areas and seasons with more hazardous weather conditions.

4.2.7 Effects on Ecosystem

The effects of FMP 2.1 on the ecosystem are uncertain. The increase in fishing effort expected under this FMP and the consequent acceleration of the race for fish may increase the risk of local and temporal depletions that can be disruptive to ecosystems. However, specifying the increased level of risk or the impacts on the ecosystem is not possible with the information currently available.

4.2.8 Effects on Management and Enforcement

The elimination of the sablefish longline fishery IFQ program and LLP will lead to reduced costs for administration, monitoring, and enforcement. In addition, buyers and fishermen will experience a decrease in administrative burdens and costs on their operations.

4.3 Overview and Effects of Overcapacity Management Measures of FMP 2.2

FMP 2.2 is identical to FMP 1 in terms of measures to reduce overcapacity. Consequently, the predicted effects on the human environment are the same.

Section 5 Alternative 3: Adopt a More Precautionary Management Policy

5.1 Overview of Overcapacity Management Measures of FMP 3.1

FMP 3.1 expands the use of rights-based management for groundfish fisheries through programs such as individual or group-based (e.g., community or cooperative) quota systems. This expansion occurs on a fishery-by-fishery basis as needed. The sablefish longline and BSAI pollock fisheries currently operate under rights-based management in the form of the IFQ program and the AFA cooperatives. Thus, the effects of FMP 3.1 in terms of managing capacity in those fisheries would be the same as the effects of FMP 1.

One of the primary reasons for expanding the use of rights-based management is to prevent the build-up of excess harvesting and processing capacity or reduce excess capacity that already exists (NMFS 2001a). Excess capacity both contributes to and is the result of the race for fish, with its associated potential negative impacts on profitability, product quality, and safety. Rights-based systems, whether they allocate shares of the catch to individuals or groups, are incentive adjusting methods, in that they attempt to control capacity by creating economic incentives for owners of vessels to decrease their use of labor and capital rather than by directly regulating the level of fishing effort.

The implementation of additional IFQ programs that end the race for fish and allow transfer of quota shares would be expected to lead to some consolidation of quota to fewer vessels. The degree of consolidation would vary depending on the level of excess capacity, economies of scale and scope in harvesting, and rules that restrict transfer and accumulation of quota shares (NMFS 2001a)[15]. Similar consolidation could occur with expanded use of cooperatives or community quota programs. Some excess capacity (in the sense of an ability of vessels and processors to catch and harvest TACs in less time than a maximum season length would allow) could be expected to persist regardless of what type of additional rights-based measures are put in place. This is generally the case for a number of reasons: it is often not economically efficient to operate at maximum possible production levels; there are typically certain times of the year when it is more efficient and profitable to harvest and process fish; and alternative uses for fishing and processing capital are limited (NMFS 2001a).

5.2 Effects of Overcapacity Management Measures of FMP 3.1

5.2.1 Effects on Marine Mammals

FMP 3.1 focuses on enhancing the decision-making power of fishermen through expanded use of rights-based management systems, which inherently means they will modify their actions according to the prevailing circumstances (e.g., the abundance and distributions of fish in space and time). The experience with AFA cooperatives in the pollock fishery and IFQs in the sablefish longline fishery shows that fishing may be spread out temporally as a result of rights-based systems (NMFS 2001a). This can be expected to reduce the potential for local depletions of fish stocks and the associated negative impacts on marine mammals and other species.

[15]It is also important to note National Standard 4 of the MSA addresses the issue of concentration of quota by requiring that Councils allocate fishing privileges "in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges."

Changes in the spatial pattern of fishing effort under an expanded rights-based management system could also be positive from the standpoint of protecting marine mammals if those changes disperse the fleets or move them away from important foraging areas (NMFS 2001a). Conversely, the changes could result in adverse impacts if they concentrate effort in space, coincident with foraging marine mammals. Overall, the degree of spatial concentration is expected to decrease because the opportunity costs associated with exploring alternative fishing grounds would be reduced relative to FMP 1.

5.2.2 Effects on Seabirds

To the extent that an expanded rights-based management system decreases fishing effort (e.g., reduction in number of hooks or trawl-hours per year) in the BSAI and GOA, a decrease in the incidental take of seabirds is predicted relative to FMP 1.

5.2.3 Effects on Target Groundfish Species

Experience with the AFA pollock cooperatives, sablefish IFQ program, and western Alaska CDQ program has demonstrated the benefits of such programs in preventing catch from exceeding annual TACs, particularly when a TAC is subdivided into smaller allowances by time and area (NMFS 2001a).

An expansion of rights-based management will likely disperse the groundfish fisheries over space and time. This could increase protection to target species by reducing the potential for localized depletion. Under IFQs or group-based quota systems, less fishing would occur in marginal areas and during less-than-optimal times, thus increasing protection to target species if less fishing results in lower catches of small fish. Exceeding the quota would be less likely with a cooperative or IFQ program than in the fast-paced, open access fishery. This would reduce the risk of overfishing target species. However, the way in which fisheries might be distributed in time and space under a cooperative or IFQ program is unknown (NMFS 2001a).

A potential negative effect of an IFQ system is that fisherman may have a heightened incentive to high-grade — by throwing less valuable fish overboard they can save their quota for more valuable fish. High-grading can result in incorrect inferences from landed catch (NRC 1999a). Not only would actual mortality rates be higher than apparent mortality rates, but the age and size distribution of landed catch would be different from the size distribution of the initial harvest (prior to discards). The occurrence of high-grading will depend on the conditions in each fishery. Fisheries in which high-grading is a concern seem to be characterized by substantial price differentials among fish sizes and/or relatively low costs of catching replacement fish (NRC 1999a).

Implementing rights-based systems, whether IFQs or group-based quota systems, presents special difficulties for fisheries in which multiple species are often caught together (NMFS 2001a). However, it also offers an opportunity to address the problem of target species discards in those fisheries provided individual quotas on bycatch are established (see discussion below on effects on prohibited species). If the ability of vessels to determine the species make-up of their catch is limited or costly, it will be necessary to have a flexible system in place that will prevent discard of fish for which the individual does not have sufficient quota or hold the individual accountable for the total catch. One option is to allow individuals to fish only when they hold sufficient quota for all of the species that might possibly be taken on a given trip. This, however, may be needlessly restrictive and might make it impossible for the fleets to take the entire TAC of some jointly caught species unless there are provisions for transfer of quota shares with minimum transactions costs (NMFS 2001a).

Several options have been used in multi-species fisheries elsewhere with varying success (NMFS 2001a). The primary method used in New Zealand is to allow vessels to land catch for which they do not hold quota and forfeit it for a price set high enough to make it worthwhile for them to bring it in to port but low enough that they make no profit on it. This system is referred to as a deemed value system. One of the main objectives of this program in New Zealand is to assure fuller accounting of catch, but it also prevents waste of potentially valuable fish that might otherwise be discarded.

A second option would be for the authorities to set aside or purchase some share of the overall quotas of various species at the beginning of the season and allow individuals to lease quota shares at the time of landing for fish they land in excess of their quota landings. Still another option would be to allow individuals to buy or lease quota on the open market after landing fish. This should work well if the market for quota shares is flexible with minimum transaction costs. However, trades or leases of quota shares in small blocks would have to be allowed, which would complicate administration of the system (NMFS 2001a).

5.2.4 Effects on Non-Target (Forage, Other, and Non-Specified) Species

Experience with the cooperatives in the pollock fishery shows that reductions in bycatch can be achieved more easily than in a competitive TAC fishery because vessels are more willing to accept the reductions in target species catch rates that they may incur by moving to areas with lower bycatch rates or by using fishing techniques that reduce bycatch (NMFS 2001a). The penalty for reduced catch rates is lessened in two ways. First, reduced catch rates will no longer equate with a smaller share of total catch as they did under the race for fish since the vessel is assured of its “right” to catch a given quantity of fish. Second, vessels are likely to fish slower and catch less fish per tow in some fisheries in order to optimize the rate of flow of raw fish for the processing plant and/or to improve the quality of the fish.

However, the implementation of rights-based management systems may not necessarily result in a reduction in the bycatch of non-target species. If net returns can be increased by fishing in areas where catches of non-target species are high there is little economic incentive for fishermen to alter their fishing behavior. The individual fishermen reaps the full benefits of such fishing practices, while the environmental costs are spread across all members of society. These environmental costs are external to fishermen’s account of costs in the sense that they do not appear in their ledgers and, therefore, are not considered when fishermen calculate whether a particular fishing strategy is profitable.

On the other hand, rights-based management systems that include individual quotas on bycatch provide strong economic incentives to reduce bycatch because they “internalize” the external costs of that bycatch in the private returns of individual fishermen. Consequently, it would be worthwhile for each fisherman to take steps to reduce bycatch rates. There remains, however, the problem of estimating the annual TAC for a given non-target species. The population structure, reproductive rate, and other biological characteristics of a non-target species may be insufficiently known to determine what level of fishing mortality that species can tolerate without harm. To further complicate matters, this threshold may not be uniform from region to region or over time, depending on the species in question. The effects of individual quotas on bycatch are discussed in more detail in the following prohibited species section.

5.2.5 Effects on Prohibited Species

Rights-based management systems could allow for more slowly paced fisheries, which could reduce the temporal concentration of prohibited species bycatch relative to FMP 1. In addition, incentives to avoid prohibited species bycatch might encourage fishermen to leave areas of high bycatch, thus potentially reducing spatial concentration relative to FMP 1.

However, because these are indirect effects of a rights-based management regime, it is difficult to predict the magnitude of change relative to FMP 1. Changes in the temporal or spatial concentration of the fisheries may do little to reduce prohibited species bycatch if prohibited species are widespread. Individual or group-based quotas for the target species may change the nature of the fishery little unless a rights-based management system to take specific amounts of prohibited species is also implemented. The structure of these bycatch rights would most probably mirror the structure of target species rights. They would be granted to individuals (or possibly cooperatives or community groups) in proportion to the quota shares they held and the expected relative bycatch rates associated with various species.[16] With individual bycatch quotas, the costs to society of bycatch would be internalized by the individuals responsible for those costs and, therefore, it would be worthwhile for those individuals to take steps to reduce bycatch rates. The end result is an increased proportion of catch taken in the respective target fishery and correspondingly lower discard rates (NRC 1999a).

If bycatch of prohibited species could be reduced, total catches, and consequently revenues, would increase for some species where take of prohibited species had constrained fisheries. As with quotas in a multi-species fishery, there would likely have to be some contingency system for cases where quota holders still held target species quota but insufficient bycatch quota to match it. Vessels might be prohibited from fishing unless they held sufficient bycatch quota or they might be allowed to purchase bycatch quota after the fact or pay a fee in relation to the level of bycatch (NMFS 2001a).

5.2.6 Economic and Social Effects

Overview of Impacts on the Fishing Industry

The level and distribution of the benefits and costs of expanded rights-based management will vary by fishery and sector (NMFS 2001a). The extent of the gains will depend on the degree to which the race for fish had been leading harvesters and processors to sacrifice quality, produce lower value products, use more costly production processes, endure higher bycatch rates, or maintain excess capital and labor in order to increase production. Experience with rights-based programs in some Alaska groundfish fisheries and the continuing presence of a profit-dissipating race for fish in other fisheries suggest that improvements in the economic performance of the groundfish fisheries due to increased value and reduced costs may be substantial.

An extension of rights-based management to other groundfish fisheries is expected to increase the value of production for a variety of reasons (NMFS 2001a). Some increases in value can be expected as a result of the improved quality that can be achieved by more careful harvesting and handling practices (in a race for fish these time-consuming practices may be neglected because the opportunity costs are too high). For example, vessels may choose to make shorter tows to reduce the crushing of fish in the codend or may spend more time

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[16]Individual bycatch quotas are expressly permitted in Alaska groundfish fisheries under Sec. 313(2)(A) of the MSA, which states, "Notwithstanding Section 303(d), and in addition to the authority provided in Section 303(b)(10), the North Pacific Council may submit, and the Secretary may approve, conservation and management measures which provide allocations of regulatory discards to individual fishing vessels as an incentive to reduce per vessel bycatch and bycatch rates in fishery, provided that (i) such allocations may not be transferred for monetary consideration and are made only on an annual basis; and (ii) any such conservation and management measures will meet the requirements of subsection (h) and will result in an actual reduction in regulatory discards in the fishery."

searching for larger, more valuable fish. Quality can be increased and costs reduced by better organization of deliveries of fish to plants to reduce delays in unloading. The value of production will also increase because processors have the time and incentive to make products of higher value, where previously they had focused on products that could be produced quickly or with lower quality fish. For instance, fillet production could replace of round or headed and gutted product. Further increases in the value of production will be achieved as the harvest volume increases in fisheries (e.g., flatfish fisheries) that were previously constrained by PSC limits. Increases in harvest volume will be most notable if individual quotas on bycatch are established.

The costs of harvesting and processing are also expected to fall for a variety of reasons (NMFS 2001a). Individual vessels and processing facilities will have the opportunity to select the lowest cost combination of fishing and processing inputs. At the industry level, costs will fall because production is expected to shift over time toward the most cost effective harvesting and processing operations. Fixed costs will be reduced by consolidating harvesting and processing operations and retiring or selling off vessels and processing equipment. The cost savings will depend both on the constraints put on the transfer and consolidation of harvesting and processing rights and on the level of excess capacity prior to implementation of remedial measures.

Impacts on Vessel Owners Including Owners of Catcher Processors

While either of the two (individual or group-based) categories of rights-based systems may benefit vessel owners, current vessel owners as a group are likely to benefit most from an IFQ program that allocates freely transferable and leaseable quota shares to vessel owners on the basis of catch histories. The overall increases in profitability for vessel owners will vary from fishery to fishery but are expected to be substantial in most cases.

Not all vessel owners will benefit equally and the relative benefits will depend on the formula that relates catch history to allocations (NMFS 2001a). If a substantial portion of the initial quota shares in an IFQ program is allocated to other groups (e.g., crew, processors, or community groups), vessel owners could potentially suffer an initial financial loss since they would have to purchase quota to undertake their historical level of fishing. Whether or not other gains in cost reduction or increased prices might offset the costs of acquiring quota could only be determined after the structure of the IFQ program and the allocation formula were determined, and even then it would be difficult to assess.

Cooperatives can also be expected to provide net benefits to vessel owners as a group. It appears that the AFA catcher processor cooperative has generated benefits similar to those of an IFQ program. However, the rules governing cooperatives will be very important in determining the distribution of benefits between catcher vessels and processors. It has been argued by catcher vessel owners in the BSAI pollock fishery that the rules for AFA inshore cooperatives have actually hurt independent vessel owners financially. A report by Halvorsen *et al.* (2000) could not rule out this possibility. As this report explains, variations on the current rules of cooperatives that would allow smaller groups of catcher vessels to form cooperatives and easier movement between plants would tend to shift the balance of market power to catcher vessel owners. This shift, in turn, would increase their share of any net benefits resulting from increased efficiency and product value that might occur as a result of cooperative-driven rationalization. The overall gains to vessel owners that might be expected in terms of increasing the value of catch and decreasing harvesting costs are likely to be smaller with cooperatives than with IFQs if the ability of vessel owners to form and transfer between cooperatives, to sell or lease catch rights, and to freely choose their point of delivery is limited. Such limitations would inhibit consolidation and transfer of harvest and processing activities to the most efficient operations.

The impacts of community quota programs on vessel owners are even less clear. Some vessel owners might gain if communities, in turn, grant them catch rights that enable them to slow down and choose fishing times; however, there is the potential that others might be harmed financially if their current ability to harvest resources is curtailed and they need to buy or lease catch rights from communities. Even if a community grants catch rights at no charge, the profitability of the vessel owners could still be undermined if their freedom to choose which buyers they sell their fish to is limited by the community.

Impacts on Owners of Inshore Processing Plants

Owners of processing plants other than catcher processors have not been granted allocations of shares in prior rights-based fishery management programs in the United States, although such allocations may be granted under the Alaska crab fisheries rationalization program. Arguments have been made (e.g., Matulich and Sever 1999) that IFQ programs may lead to expropriation of quasi-rents from processors.[17] This could result if excess processing capacity exists and there are no alternative uses for processing equipment. It is also possible that plant owners would share in the overall economic gains that could be made through fishery rationalization. The degree to which that would be true would depend on the level of excess capacity and the degree to which plant owners are engaged in competition with each other to gain market share. If processors are somehow guaranteed shares, they would naturally be more likely to benefit or less likely to suffer harm from implementation of an IFQ program (NMFS 2001a).

The structure of cooperatives can also affect the benefits that accrue to owners of processors from rights-based management (NMFS 2001a). Rules for cooperatives in the inshore BSAI pollock fishery currently restrict the ability of vessels to transfer between cooperatives and require members of a cooperative as a group to deliver 90 percent of their catch to one processor. Compared with cooperative rules that would allow for free movement of vessels between cooperatives, the present inshore cooperatives shift the balance of power in price negotiations toward the processors. In general, processors can be expected to benefit more from this type of cooperative structure, though the absolute distribution of profits created by the move to cooperatives in any particular fishery is not clear.

[17] Quasi-rent is the difference between the selling price and the variable costs of a product.

Community fishery quotas might also provide protection to processors in small communities if the communities restrict the landing locations of their quotas (NMFS 2001a). However, if the program worked similarly to the current western Alaska CDQ program, communities could lease out quota to operations that processed elsewhere and local processors might be preempted.

In summary, rights-based systems have the potential to reduce the competitiveness of markets and shift the balance of market power between harvesters and processors (NMFS 2001a). Care must be taken to minimize threats to competitive markets and to avoid, or at least be aware of, shifts in market power that may result in income transfers between sectors. Ex-vessel markets for fish are already quite thin in most Alaska groundfish fisheries. Consolidation of harvest and processing sectors will make these markets thinner yet. The number of buyers competing for fish may be reduced to a few or a sole buyer in some cases if restrictions were to be placed on where fish can be delivered. The possible result would be a shift in income from harvesters to processors.

On the other hand, without restrictions on where or to what plants fish can be delivered, income transfers may move in the other direction (NMFS 2001a). The temporal spreading of fishing may cause processors to bid up prices in attempt to lower average costs by increasing the amount and duration of their processing. As Matulich and Sever (1999) points out, there is the potential under certain conditions that the quasi rents of processors may be expropriated by harvesters in this process. The possibility also exists that harvesters with sufficient shares of a given TAC might have enough market power to make monopoly profits by reducing output below the TAC. However, the danger of monopolistic practices is low, as groundfish are sold largely in international markets.

Impacts on Vessel and Processing Crews and Other Employees

Prior rights-based systems in Alaska and elsewhere in the United States have not allocated initial quota shares to vessel crews or other employees of fishing or processing companies. If any of these individuals were allocated shares under an IFQ program, they would be expected to make financial gains similar to those made by vessel owners receiving shares (NMFS 2001a).

If crewmembers are not allocated shares, it is uncertain whether they could expect their long-term earnings to rise or fall with an IFQ program (NMFS 2001a). In the halibut and sablefish IFQ fisheries, crewmembers have sometimes been expected to contribute toward the cost of quota shares used, but increases in the value of production have led to higher crew incomes. Whether crewmembers and other seafood industry employees are likely to share in the net gains in profitability that result from an IFQ program or other rights-based system will depend on the supply and demand for labor, and this is likely to vary by fishery and area.

One impact that is likely in any type of rights-based system is a decrease in the number of crewmembers and processing workers employed and an increase in the term of employment of the individuals who remain in the fishery. This is a natural consequence of the consolidation of fishing and processing activities to fewer vessels and plants that operate over a longer period of time.

Impacts on Communities

Rights-based systems can be expected to have some positive impacts on fishing communities, particularly those in Alaska (NMFS 2001a). Ending the race for fish should increase the economic stability of the fishing industry. If fishing is spread out more evenly over the year, short-term seasonal jobs that were often filled by out-of-state workers are likely to be replaced with more steady, sometimes year-round, employment opportunities that can provide a living for individuals and families that wish to live in Alaska year-round.

On the other hand, rights-based systems could lead to the preemption or reduction of fishing, processing, and shoreside support activities in some traditional fishing communities unless restrictions are implemented to inhibit or prohibit a geographic redistribution of landings (NMFS 2001a). This would be a natural consequence of consolidation in the industry as excess capital is scrapped or allowed to degenerate without replacement and production is shifted to more efficient operations. Even if reductions in harvesting and processing capacity were uniform across communities, one would expect a decrease in economic activities in fishery support sectors due to reductions in harvesting and processing capital. IFQ programs and cooperative programs can be designed to reduce or prevent this. Doing so could entail some sacrifice in overall efficiency gains, but this must be weighed against the social benefits of preserving traditional fishing communities.

Granting quota shares to community groups would be an alternative and more transparent way to assist traditional fishing communities in remaining involved in the fisheries or in providing them financial resources to develop new industries. Moreover, group-based systems may lead to a more optimal concentration and reallocation of quota shares in the sense that broader social considerations could be internalized (Gréboval and Munro 1999).

Impacts on Consumers of Groundfish Products

Rights-based systems can be expected to lead to increases in the average quality of a variety of fishery products originating from the Alaska groundfish fisheries (NMFS 2001a). The total catch of some species and the catch taken in target fisheries where discards rates are lower is also likely to increase as a result of decreased bycatch rates. There may be increases in fresh products relative to frozen products in some fisheries but probably to a much smaller degree than occurred in the halibut fishery under the IFQ program. Assuming that demand is not perfectly elastic, increasing the value of production leads to gains in consumer surplus that will accrue to seafood consumers in the United States. Changes in consumer surplus will also depend on the demand for different product forms if there are changes in product mixes. Consumers could be negatively affected if a rights-based system leads to a decrease in the competitiveness of markets. Such a decrease could result in higher seafood prices without accompanying increases in quality which, in turn, would reduce consumer surplus. The likelihood of this occurring depends both on the level of consolidation that might occur and the elasticity of demand for the particular species (NMFS 2001a).

Impacts on Fishing Vessel Safety

Rights-based systems of any kind are expected to improve safety by reducing the pressure to fish under dangerous conditions (NMFS 2001a). The race for fish creates incentives to fish farther from shore or in areas and seasons with more hazardous weather conditions and requires crewmembers to work for long stretches with little rest or sleep. Rights-based systems should slow down the rate of fishing and reduce the financial penalty incurred by opting to stop fishing under unsafe conditions. The most important benefit of improved safety will be a decrease in fishery related injuries and loss of life. Other benefits include savings from not having to replace lost vessels and gear. Finally, significant improvements in safety, if they occur, should result in decreased insurance costs for industry (NMFS 2001a).

At the same time, it is important to recognize that rationalized fisheries do not necessarily guarantee improvements in safety for fishermen. Under an IFQ program, for example, market opportunities may still encourage fishermen to fish at times or in places that are unsafe.

Distribution Issues with Expanded Rights-Based Management

The economic and social impacts of expanded use of rights-based management in the groundfish fisheries will be largely determined by the initial allocation of quota shares. Whether shares of TACs are allocated to individuals, cooperatives, or communities, the basis for determining the allocation will undoubtedly be controversial (NMFS 2001a). The allocation mechanisms are likely to vary significantly, depending on the type of rights-based system or systems implemented.

If IFQ programs are expanded to additional fisheries, a wide variety of allocation mechanisms and formulas should be considered. Although past IFQ programs in the United States have allocated quota shares to vessel owners based on catch histories, other options should also be examined, such as those that attempt to incorporate objectives that maximize net benefits to society. For example, the criteria for initial allocation of quota shares could include a vessel's acceptance of conservation goals (NRC 1999a). Further, retention of shares could be contingent on the vessel's ability to pass a regular performance review. When allocating quota shares it is important to bear in mind that granting shares to individuals free of charge is likely to result in those individuals receiving substantial windfall gains (NMFS 2001a). These windfall gains may be construed as a transfer of wealth from the public to certain individuals since exclusive withdrawal rights to publicly owned resources are being gifted. Whether and to whom this wealth should be gifted is an important question that should be carefully considered.

It has been argued that vessel owners have invested their labor and risked their capital (and often their lives) to develop fisheries, and in return they should be given preferential access to those resources (NMFS 2001a). The problem with this position is that vessel owners as a group are only one element of a diverse collection of stakeholders who might be viewed as possessing a "right" to benefit from resources harvested in federally-managed fisheries (or from other resources directly or indirectly affected by those fisheries). Possible other stakeholders include, but are not limited to, skippers who are not vessel owners, vessel crew (on-board processing crew as well as fishing crew), processors, and individuals in communities that support fishing and processing operations. The NPFMC should consider whether and how these other stakeholders might be included in initial allocations of IFQ shares. Furthermore, the MSA requires the Council to consider the allocation of a portion of the annual harvest in a fishery for entry-level fishermen, small vessel owners, and crewmembers who do not hold or qualify for individual fishing quotas.

While recognizing that the MSA may currently restrict such actions, the NPFMC should also consider whether some or all of the IFQ shares should be sold or auctioned to allow the public to capture all or a share of the windfall gains created by the IFQ system (Macinko and Bromley 2002). A variety of tax mechanisms could also be used to capture a portion of the net economic returns that fish harvesting might generate and place them in the public coffer.

If cooperatives are expanded to other groundfish fisheries, the cooperatives themselves would likely be responsible for allocating quota shares among their individual members. However, a method of allocating among cooperatives is still required. The model used for AFA inshore cooperatives is to allocate catch shares based on the combined catch histories of the cooperative's members.

If quota shares are granted to communities, allocations might be based on the historic landings made in those communities and/or the pooled catch histories of the communities' residents. A variety of other formulas might be developed to meet particular social and economic objectives. Under the western Alaska CDQ program, allocations to CDQ groups are not fixed in order to allow flexibility in directing benefits and achieving community development goals. In such an arrangement, it is of paramount importance that the process for allocating community quotas be stable and transparent (NRC 1999b).

Whether quota shares are allocated to individuals, cooperatives or communities, it may be prudent to put in place mechanisms that will allow the nature of the fishing privileges to be altered (NMFS 2001a). A stable set of privileges and responsibilities with an extended timeframe is important to promote the efficiency and stability of the fishery, but it is also important to maintain administrative flexibility for unforeseen eventualities that may oblige changes in the distribution of quota shares. One such mechanism discussed by the NRC (1999b) is referred to as the Australian drop-through system. In this system initial entitlements are defined and fixed for a long but finite period—30 years in certain Australia fisheries. Periodically, perhaps every ten years, a comprehensive review of these entitlements takes place and changes can be made to the set of rights and obligations. Shareholders can switch to this new set of entitlements (whatever is currently on offer) any time before the term of their old entitlements expired, at which time they would automatically exchange entitlements for the current set on offer. Switching to the new entitlement package locks in the right to guard those entitlements for the remaining life of that entitlement. Other systems of balancing stability with flexibility are possible—what is important is to strike the proper balance to protect the health and prosperity of the fishery and the authority of regulators to make appropriate management decisions in the best interest of the public (NMFS 2001a).

5.2.7 Effects on Ecosystem

The main predator/prey-related effects of FMP 3.1 would be to spread out the removal of either predators or prey over space and time due to the elimination of the race for fish. Fishing practices, such as the use of larger mesh sizes, might also be used to decrease the catch of less desirable (smaller) sizes of fish. This would tend to increase the removal of larger, more predatory fish from the system relative to FMP 1, potentially reducing any possible competition for prey with other predators (NMFS 2001a). Presumably, species that prey on adult groundfish would have a more stable population from which to draw food, potentially resulting in less extreme predator/prey population cycles. Lower catches of small fish would impact the amount of juvenile fish available to the ecosystem. Under FMP 3.1, more juvenile fish could interact in the predator/prey cycle. Shifts in these interactions are difficult to predict given the complex nature of food webs (NMFS 2001a).

Large changes in species composition would not be expected in the ecosystem because variability in affected groundfish species appear to be more driven by recruitment variability (NMFS 2001a). Reduced energy flow at higher trophic levels, which would shorten the food chain and decrease the lifespan of organisms (both of which may occur from fishery selectivity toward older fish), would be indicators of a more stressed, less mature ecosystem according to Odum (1985). No quantitative measures are available of the extent to which these processes would be affected. However, the magnitude of this change relative to environmentally driven recruitment changes suggests that there would not likely be a large ecosystem impact in this regard.

FMP 3.1 might reduce the number of vessels participating in groundfish fisheries, but it could also spread the fishing effort over space and time. Consequently, FMP 3.1 may not provide any additional protection from the introduction of non-indigenous species relative to FMP 1.

It is also important to note that rights-based management systems can be structured in a variety of ways to achieve ecological objectives. Under these systems, individual users can be held accountable for resources they use and the costs, including some ecological costs, they impose. For example, individual bycatch quotas might be established in selected groundfish fisheries to reduce the catch of benthic invertebrates such as corals and sponges. Thus, FMP 3.1 could potentially internalize certain ecosystem costs that are not fully borne by fishermen. By holding fishermen accountable for ecosystem effects and imposing monitoring mechanisms to ensure that accountability, FMP 3.1 could also improve the response time to observed ecosystem changes relative to the current management system, which relies on the time-consuming process of regulatory amendments. The effects of individual quotas on bycatch are discussed in more detail in the previous section, which describes effects on prohibited species.

5.2.8 Effects on Management and Enforcement

Experience with the IFQ and western Alaska CDQ programs and AFA pollock cooperatives suggests that expansion of rights-based systems to other fisheries is likely to result in substantial increases in the costs of monitoring, enforcement, and administration. As rights-based systems are extended to other fisheries, NOAA Fisheries will be required to manage increasingly small blocks of fish. It will be necessary to obtain precise and reliable estimates of the quantities of target and non-target catches of individual vessels. To do this adequately requires the use of increasingly sophisticated catch-monitoring tools, such as observer coverage, electronic reporting, vessel monitoring systems, and at-sea scales. Though these tools increase the quantity, quality, and timeliness of the data available for fisheries management, they also increase the demands on management staff to effectively make use of a larger and more complex data system.

For vessels delivering unprocessed fish to shore plants, monitoring catches poses potentially fewer but different problems than for catcher processors. The monitoring program for halibut provides a model for how this might be done. Vessels could be required to notify monitoring authorities several hours in advance of landing so that unloading could be observed, quantities measured and quota shares debited appropriately. This would require substantial increases in monitoring infrastructure and personnel, but it is difficult to quantify the levels without first deciding on both the specific structure of the rights-based program itself and also the monitoring scheme.

Enforcement of bycatch quotas is likely to be more difficult than target species quotas, especially if they are at the individual level, because there is no incentive for the catch to be brought to port unless discarding is difficult and costly. It seems likely that higher observer coverage would be required to monitor or discourage discarding, and current sampling procedures would have to be improved to provide more accurate and reliable estimates of bycatch. In addition to the added cost of paying observers (expected to be about $355 per deployment day, not including food costs), some smaller vessels may have difficulty in providing berths for observers.

Vessels that process fish at sea pose additional problems since the product landed does not correlate exactly with the amount of raw fish caught. One way to accurately monitor catches of these vessels is to increase observer coverage so that accurate, officially sanctioned catch levels are recorded for each tow made by each entity. This requires having at least two observers aboard each vessel as is done with the western Alaska CDQ program and the AFA pollock cooperatives. The cost of having two observers on board at all times probably exceeds $710 per day (2 x $355) for each vessel.

In addition to the additional observer coverage under a rights-based management system, vessels would probably be required to install flow scales and observer sampling stations equipped with motion-compensated platform scales. Recently, NOAA Fisheries estimated the purchase price of a flow scale to be about $45,000; a motion-compensated platform scale is about $4,000 (Alan Kinsolving, NOAA Fisheries, personal communication, January 2003). Annual service costs were estimated to be $2,000. If modification of the vessel is not necessary or minimal, the costs of installation would be around $4,000, with most or all of the work being done by crewmembers. If extensive reconfiguration of the vessel is necessary (e.g., shifting RSW tanks), installation costs could be up to $250,000, although NOAA Fisheries indicates that costs should not exceed $30,000 in most cases. NOAA Fisheries also noted that the installation of scales might reduce vessel production, particularly if processing equipment has to be relocated, and that there is the potential for lost fishing time should the scales stop working.

An expansion of rights-based management systems would require additional agency resources to develop the process through which fishing rights are assigned; to adjudicate appeals about the assignment of fishing rights to individuals or groups; to administer the annual assignment of catch amounts and transfers of fishing rights; and to penalize people violating regulations. Efforts to develop individual quotas for non-target species face the problem of estimating an annual TAC. The development of TACs for additional species would require specific information about stocks that can be difficult and costly to obtain.

Cost recovery fees imposed on industry could partly offset management costs that would otherwise be publicly funded. While the MSA contains strict limitations on fees that can be levied on the fishing industry, Section 304(d) of the MSA authorizes NOAA Fisheries to collect a fee to recover the costs directly related to the management and enforcement of an IFQ or CDQ program. The fee can not exceed 3 percent of the ex-vessel value of fish harvested under any such program.

Cost recovery fees have been applied in the sablefish longline fishery IFQ program and may be developed for the western Alaska CDQ program. In addition, the AFA authorized a $75 million loan to reduce fishing capacity in the BSAI pollock fishery, and NOAA Fisheries established an inshore fee system as the means of repaying the loan.[18] The proceeds of the loan partly paid the cost of removing nine catcher processors (which the AFA specified) from all commercial fishing in the U.S. EEZ. Presumably, similar methods of implementing cost recovery fees could be applied to new rights-based systems whether quotas were given to individuals or groups.

A key issue to resolve under an expanded rights-based management system will be the management of State of Alaska parallel fisheries – fisheries within state jurisdiction that are opened concurrent with the federal season to allow vessels to harvest federal quota within state waters. For many of the groundfish fisheries this concurrent opening is necessary for their effective prosecution. A potential problem is that the state constitution may prohibit the enforcement of federal regulations within state waters. Furthermore, the state may be unable to delegate management authority over fisheries within state jurisdiction to NOAA Fisheries. Legal clarification of these potential constraints has been requested from the state.

5.3 Overview and Effects of Overcapacity Management Measures of FMP 3.2

[18] In exchange for an increased share of the pollock quota, the inshore sector agreed to help pay the costs of decommissioning the vessels, with the inshore sector paying 6 cents for each pound of pollock it harvested (Felthoven 2002).

FMP 3.2 closely resembles FMP 3.1 in terms of overcapacity measures, except the timing of implementing rights-based management systems is accelerated. The timing of implementation is an extremely important issue in expanding rights-based programs to other fisheries; whether to implement rights-based system for all groundfish species and TAC groupings at once or in an incremental fashion. Huppert *et al.* (1992) recommended setting allocations for all stocks at once to avoid cascading spillovers of effort and capacity into fisheries that are not subject to rights-based management. If this is not done, a complex system of sideboards will likely be required as it was for the AFA. The accelerated approach to implementing rights-based management systems adopted by FMP 3.2 is likely to mitigate these spillover effects and reduce the need for sideboard measures.

Section 6 Alternative 4: Adopt a Highly Precautionary Management Policy

6.1 Overview of Overcapacity Management Measures of FMP 4.1

FMP 4.1 includes all of the capacity reduction measures of FMP 1 plus effort-based measures (also referred to as input-based methods) to further reduce fishing capacity. These effort-based measures may include limits on trips, gear size, vessel size or vessel horsepower, or seasonal exclusive area registration. All of the effort-based measures attempt to control capacity by directly regulating the character, amount, or usage of various fishing inputs. Gear and vessel restrictions limit the type or quantity of those particular inputs. Seasonal exclusive area registration prohibits individual fishing units from operating outside a specified area each season, thereby restricting where inputs can be used. Trip limits restrict the extent to which inputs can be used by imposing a catch ceiling for an individual fishing trip. Trip limits are often accompanied by a limit on the frequency of landings, which restricts the duration of use of inputs.

Obviously, such measures would have to be associated with a restriction on the number of fishermen; otherwise, it is clear that no control is placed on total potential effort. The number of participants in the Alaska groundfish fisheries is currently capped by the License Limitation Program. But even if the number of fishermen is restricted, effort-based measures do little towards mitigating the race for fish, and fishermen will continue to have an incentive to fish harder in order to maintain or increase their share of the TAC. Moreover, while the measures considered here can severely restrict the type, amount or use of fishing inputs, experience in fisheries worldwide shows that, given time to adjust, fishermen will often find ways of increasing their fishing effort by substituting inputs that are not controlled. Consequently, FMP 4.1 may have little effect on the long-term dynamics of over-investment.

6.2 Effects of Overcapacity Management Measures of FMP 4.1

A wide array of possible measures may be implemented under FMP 4.1. Consequently, it is difficult to provide details on the types or magnitude of effects on the human environment. Given the uncertainty about what combination of measures might be implemented, illustrative examples of possible measures and their expected effects are provided.

6.2.1 Biological and Physical Effects

Seasonal exclusive area registration may increase the risk of local depletion of target species by requiring vessels to expend their entire fishing effort in a single defined area. On the other hand, trip limits may decrease the risk of local depletion of target species by spacing out catches over time. However, trip limits can also lead to an increase in discards of target species. As with IFQs, trip limits heighten the incentive to high-grade catches since fishermen want to ensure that only the highest-priced portion of the catch is landed and counted against the limit. Furthermore, fishermen will be required to discard target species when their catch exceeds the trip limit (NRC 1999a). The level of discards can exceed those under an IFQ program, as discarding of excess catch would occur during every trip rather than once per year.

6.2.2 Economic and Social Effects

Fishermen can expect to face increased costs under FMP 4.1, as effort-based methods are designed to increase the cost of producing effort for individual fishing units by prohibiting certain cost-effective ways of operating (Anderson 1989). To adust to these imposed inefficiencies, fishermen will continue to increase their outlays on doing whatever is permitted to maintain or increase their share of the catch. These permitted adjustment costs may include expenditures not only on vessel and gear improvements or storing fish on board longer, but also on re-equipping their vessels to make them usable in other fisheries (Scott 1979).

While it is difficult to generalize about the impacts of effort-based measures on other sectors of the fishing industry, the predicted effects of some measures can be easily identified. A trip limit, for example, would be expected to extend the supply of fish to processing plants (and consumers) through a greater part of the year like an IFQ fishery (NRC 1999a).

Effort-based measures are often redistributive, that is, they tend to be protective of certain groups (Scott 1979). Vessel and gear restrictions may, in fact, be designed to protect the economic position of the small-boat fleet by reducing gear conflict and catch competition between small, owner-operator fishing enterprises and those that are highly capitalized. Other measure may have unintentional distribution effects. For example, if trip limits are uniform across the fishery, they may have negative distributional consequences for larger vessels (NRC 1999a).

Because effort-based measures require fishermen to use inefficient fishing methods and do little to reduce their impulse to intensify their fishing operations by, for example, operating farther from shore or in areas and seasons with more hazardous weather conditions, the safety risk to fishermen is expected to remain high under FMP 4.1.

Effort-based measures can be relatively simple to design and enforce (NRC 1999a). The problem is that they must be made progressively restrictive over time in an attempt to counter the effects of intensified fishing. Given time to adjust, fishermen can often make technological improvements or modify fishing methods to get around the input restrictions. Therefore, to keep effort at specified levels, further restrictions will be necessary. Fishery management can thereby become a race between the fishermen to circumvent induced inefficiencies and the managers to impose further inefficiencies (Anderson 1986).

6.3 Overview and Effects of Overcapacity Management Measures of FMP 4.2

By setting the TAC for all groundfish species initially at zero, FMP 4.2 would effectively cause current industry participants to reach the most extreme point of overcapacity. Obviously, if no fish are available for harvest, any labor or capital allocated to the groundfish fisheries would result in excess capacity.

If the people and equipment that are displaced under FMP 4.2 shift to some underutilized fishery, or into an entirely different segment of the economy, society will not lose part of its productive capacity (Anderson 1986). However, some of the displaced effort may be transferred into a fishery already suffering from overexploitation or overcapacity. Furthermore, while mobility among fisheries can be high, alternative uses for fishing vessels are quite limited (Cunningham and Gréboval 2001). These effects would prevail until each Alaska groundfish fishery was subjected to an environmental review and, based on the results of that review, permitted to operate under strict guidelines. Only fisheries certified by NOAA Fisheries to have no significant adverse effects on the environment would be authorized to operate in the EEZ off Alaska. Such a review and certification process would likely take up to two years based on the length of a recent environmental review of the Alaska pollock fishery conducted by an international organization.

Section 7 Opportunities for Quantification

The following numerical data would support the analysis of the effects of the alternatives as they relate to overcapacity in the Alaska groundfish fisheries. Historical data are needed to compare the status of various fisheries before and after implementation of existing overcapacity reduction measures. This data would also provide a benchmark that would allow before-and-after comparisons if alternative measures are implemented. The five programs and their currently available data are outlined below.

License Limitation Program

- Number of participants in groundfish fisheries by vessel and processor class, 1992-2001.
- Estimate of current excess capacity in groundfish fisheries by vessel class and target species.
- Estimate of current latent capacity of inactive vessels by vessel designation, length category, gear type and area endorsement.
- Average sale price of groundfish license by vessel designation, length category, gear type and area endorsement, 1995-2001.

Sablefish Longline Fishery IFQ Program

- Number of holders of sablefish IFQs by size of holding in pounds (less than 5,000; 5,001 - 10,000; 10,001-25,000; greater than 25,000) by FMP area, 1995-2001.
- Number of sablefish IFQs sold/leased, 1995-2001.
- Number of crewmembers who have qualified and number who have obtained sablefish IFQs, 1995-2001.
- Number of unique longline vessels that have reported landings of sablefish by FMP area, 1995-2001.
- Average sale price of sablefish IFQs and average lease rate of sablefish IFQs, 1995-2001.
- Ex-vessel price of sablefish, 1992-2001.
- Groundfish discard rate and non-target discard rate.
- Quantitative measure of spatial and temporal distribution of fishing effort (or catch), 1992-2001.

AFA Cooperatives

- Average lease rate of catcher vessel co-op IFQs, 1999-2001.
- Average lease rate of catcher processor vessel co-op IFQs, 1999-2001.
- Product utilization rate for catcher processors, 1992-2001.
- Quantitative measure of spatial and temporal distribution of fishing effort (or catch), 1992-2001.

Western Alaska CDQ Program

- CDQ allocation percentages by species and CDQ group, 2001-2002.
- CDQ allocation amounts by species and CDQ group, 2001.
- CDQ group revenues, expenses and net income, 1992-2000.
- CDQ group royalty income, 1992-2000.
- CDQ employment and wages for all CDQ groups, 1992-2000.

Sablefish Longline Fishery Community Quota Shares

Comparison of quota share holdings in eligible Gulf communities and larger Gulf communities at initial issuance and year-end 2000.

Section 8 Data Gaps and Information Needs

Accurately measuring and monitoring harvesting and processing capacity in a particular fishery can be complex. Additional information is needed on the quantities of capital equipment purchased and maintained by plants and vessels, their activity levels in various fisheries, and variable input use (for items such as labor, fuel fishing gear, and other essential inputs).

There is insufficient data to comprehensively assess the economic consequences of existing or expanded measures to control excess harvesting and processing capacity. While detailed data on the distribution of catch and processing are available, baseline information on the current economic performance of the fisheries is lacking. The types of economic data that would be necessary include disaggregate cost and employment information from harvesting and processing firms. No data on the costs of production and very little data on employment levels are routinely collected. Without information about costs, it is not possible to determine whether the industry is making a profit or a loss, much less the magnitude of the profit or how it has been, or might be, affected by management measures related to overcapacity. The absence of employment data means that it is not possible to state the number of individuals who are employed in the fishery, their earnings, or how they are affected by management measures.

Mandatory reporting of cost and employment information is important whether measures to control overcapacity are expanded or not. However, implementation of additional measures, is likely to result in substantial changes in the overall profitability of Alaska fisheries and in the distribution of benefits. Observing those changes is important in judging the success of overcapacity reduction measures and in identifying, and potentially ameliorating, undesirable outcomes. Moreover, simply monitoring capacity in a given fishery requires cost data that is not currently being collected. Typically, the analysis of harvesting or processing capacity and capacity utilization is based on the cost structure of vessels or shoreside processing plants and examines whether the observed level of fish caught or processed coincides with the lowest-cost level given the capital stock (NMFS 2002c).

Also directly linked to the issue of capacity reduction is the level of industry consolidation that may occur after a rationalization program is implemented. At present, insufficient vessel and processing facility ownership data are being collected to monitor structural changes not reflected directly in performance- or profit-based measures, such as changes in concentration of domestic and foreign ownership in the harvesting and processing sectors, the structure of ownership (including proprietorships, publicly traded corporations and privately held corporations) and the relationships both within firms (i.e., the amount and nature of vertical and horizontal integration) and among firms (NMFS 2002c).

Section 9 Comparative Analysis of Alternatives

Table 1 summarizes the anticipated effects of different approaches toward managing harvesting and processing capacity in the Alaska groundfish fisheries as described in the associated FMP bookends.

The following table summarizes the effects of each policy alternative in terms of managing harvesting and processing capacity in the Alaska groundfish fisheries as determined by analyses of each alternative's associated FMP framework.

Alternative 1: With respect to overcapacity in the groundfish fisheries, an objective of this alternative is to continue to reduce excess fishing capacity, overcapitalization, and the adverse effects of the race for fish. Under this alternative, a Licence Limitation Program for groundfish vessels over 32 ft length over-all (with certain jig gear exceptions) and a moratorium on entry into the groundfish fisheries is in place for the BSAI and the GOA. An IFQ program is in place for sablefish in the BSAI and GOA, which includes provisions for community purchase of quota share. In the BSAI, the directed fishery for pollock is organized into cooperatives as authorized under the American Fisheries Act. A multi-species CDQ program apportions 7.5-10 percent of all BSAI groundfish quota to 65 eligible western Alaska communities. However, considerable excess capacity is expected to remain in some groundfish fisheries under this alternative

Alternative 2: This alternative and its associated FMP framework would maintain the statutorily mandated programs to reduce excess capacity and the race for fish. Under FMP 2.1, the federally-mandated effort limitation program enacted under the American Fisheries Act would remain in place, with its adjunct CDQ allocation, but all other effort limitation programs (such as the sablefish longline fishery IFQ program and the Licence Limitation Program) would be repealed. Elimination of the sablefish IFQ program under FMP 2.1 is expected to result in a return to pre-program levels of fishing capacity or higher. Elimination of the LLP is predicted to result in a significant increase in fishing effort in some groundfish fisheries, but the increase in capacity is uncertain. The effects of FMP 2.2. on overcapacity are identical to those of Alternative 1.

Alternative 3: Regarding the issue of overcapacity, this FMP framework would maintain the LLP program and further decrease excess fishing capacity and other adverse effects of the race for fish by eliminating latent licences and extending programs such as community or rights-based management to some or all groundfish fisheries; provide for adaptive management by periodically evaluating the effectiveness of rationalization programs and the allocation of property rights based on performance; and, to support fishery management, extend the cost recovery program to all rationalized groundfish fisheries. FMP 3.1 would effectively reduce excess harvesting and processing capacity in selected fisheries through programs such as individual or group-based quota systems. By setting individual or group allocations for all stocks at once, FMP 3.2 would avoid spillovers of effort into fisheries not subject to rights-based management.

Alternative 4: A goal of this alternative, as expressed through its FMP framework, is to include the use of explicit allocative or cooperative programs to reduce excess capacity and allocate fish to particular gear types and fisheries. FMP 4.1 would supplement current measures to control capacity with effort-based regulations. However, the effectiveness of such regulations in further reducing excess capacity may be limited because they do not remove the incentives that lead to overcapacity in the first place. By setting the TAC for all groundfish species at zero until such time that fisheries are certified as having no significant adverse effects on the environment, FMP 4.2 would effectively cause current industry participants to reach the most extreme point of overcapacity. Some of the displaced effort may be transferred into a fishery already suffering from overexploitation or overcapacity.

Table 1. Summary of the effects of the alternatives on overcapacity.

Alternative 1	Alternative 2		Alternative 3		Alternative 4	
Fishery Management Plan (FMP) 1	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
Ecosystem						
No effect Fishing activities currently managed under the existing Fishery Management Plans (FMP) are not expected to greatly reduce the structural integrity and complexity of the benthic habitat.	**Potentially adverse effect** Since areas presently closed to bottom trawling would be opened, there could be localized areas of disturbance as a result of concentrated fishing effort.	**No effect** Fishing activities currently managed under the existing FMPs are not expected to greatly reduce the structural integrity and complexity of the benthic habitat.	**No effect** Fishing activities currently managed under the existing FMPs are not expected to greatly reduce the structural integrity and complexity of the benthic habitat.	**Beneficial effect** Since more area will be closed to bottom trawling and a greater percentage of the fishable area will be designated as no-take marine reserves, fewer impacts on the substrate will be realized as compared to the current FMPs.	**Beneficial effect** This FMP closes additional deeper areas to trawling, and provides for a higher percentage of no-take marine reserves. Therefore, there should be less impact on the physical environment across a wider range of depths and habitats.	**Potentially adverse/ beneficial effect** There would be no negative effects from fisheries on the physical environment while fishing is suspended. Only those fisheries that have no adverse effects on the environment will be allowed to resume. Displaced fishing effort could have indirect adverse effects.

Table 1 (cont.). Summary of the effects of the alternatives on overcapacity.

Alternative 1	Alternative 2		Alternative 3		Alternative 4	
Fishery Management Plan (FMP) 1	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
Biological Environment						
Beneficial effect Decreased fishing effort in sablefish longline fishery will continue to decrease interactions with marine mammals and seabirds. Increased dispersal of fishing effort in sablefish longline fishery and Bering Sea and Aleutian Islands (BSAI) pollock fishery may decrease marine mammal prey disturbance. The decreased risk of total allowable catch (TAC) overruns and localized depletion of target species in sablefish longline fishery is expected to continue.	**Adverse effect** Increased fishing effort in sablefish longline fishery may result in increased interactions with marine mammals and seabirds. An increased level of marine mammal prey disturbance is likely due to concentration of fishing effort. There may be increased risk of TAC overruns and localized depletion of target species in some fisheries.	Same effects as FMP 1.	**Beneficial effect** Decreased fishing effort in rationalized fisheries is expected to result in decreased interactions with marine mammals and seabirds. Increased dispersal of fishing effort may decrease marine mammal prey disturbance. Decreased risk of TAC overruns and localized depletion of target species is expected. Discards can be decreased if all target species catch is counted against individual quotas and individual bycatch quotas for non-target species are implemented. Positive ecosystem effects could result if fishing effort becomes more dispersed over time and space.	Same effects as FMP 3.1 but implementation of comprehensive rights-based management system is accelerated.	**Potentially adverse/ beneficial effect** Effort-based measures to further reduce fishing capacity will not eliminate incentives to maintain excess capacity. Seasonal exclusive area registration may increase risk of local depletion of target species by requiring vessels to expend their entire fishing effort in a single defined area. However, trip limits may decrease risk of local depletion of target species by spacing out catches over time. Trip limits can heighten the incentive to high-grade catches since fishermen want to ensure that only the highest-priced portion of catch is counted against the limit.	**Potentially adverse/ beneficial effect** There would be no negative effects from fisheries on the physical environment while fishing is suspended. Only those fisheries that have no adverse effects on the environment will be allowed to resume. Displaced fishing effort could have indirect adverse effects.

Table 1 (cont.). Summary of the effects of the alternatives on overcapacity.

Alternative 1	Alternative 2		Alternative 3		Alternative 4	
Fishery Management Plan (FMP) 1	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
Economic and Social Effects						
Beneficial/ adverse effect The relatively efficient allocation of capital and labor is expected to continue in the sablefish longline fishery and BSAI pollock fishery but some groundfish fisheries will remain overcapitalized . Increased profitability in the sablefish longline fishery and BSAI pollock fishery is expected to continue due to decreased costs and/or increased revenues. There may be fewer crew jobs in the sablefish longline fishery, but remaining jobs are likely to be more stable. Reductions in sablefish QS and landings may occur in some Alaska communities, but increases may occur in others. The improved vessel safety in the sablefish longline fishery is expected to continue.	**Beneficial/ adverse effect** The profitability of some groundfish fisheries is expected to increase (at least in the short run) but the profitability of the sablefish longline fishery and possibly other groundfish fisheries will decrease. Consumers may experience a decrease in the availability of some fresh groundfish products. Safety risk to fishermen is expected to increase.	Same effects as FMP 1.	**Beneficial/ adverse effect** A more efficient allocation of capital and labor between fishing and other industries is expected. The profitability of rationalized fisheries is expected to increase due to decreased costs and/or increased revenues. Consolidation of fishing and processing activities may result in fewer jobs, but remaining jobs are likely to be more stable. Possible changes in market power between harvesters and processors may result in income transfers. Possible reductions or increases in landings may occur in some Alaska communities. Increases in the quality and availability of some groundfish products are expected, along with improvements in vessel safety.	Same effects as FMP 3.1 but implementation of comprehensive rights-based management system is accelerated.	**Beneficial/ adverse effect** Fishing costs are expected to increase, as effort-based methods prohibit certain cost-effective ways of operating. A trip limit would be expected to extend the supply of fish to processing plants (and consumers) through a greater part of the year. Effort-based measures tend to be protective of certain groups. For example, vessel and gear restrictions may be designed to protect the economic position of the small-boat fleet.	**Adverse effect** If the people and equipment that are displaced by the closure shift to some underutilized fishery, or into an entirely different segment of the economy, society will not lose part of its productive capacity. However, some of the displaced effort may be transferred into a fishery already suffering from overcapacity. All revenues, employment and income generated by the groundfish fisheries will be lost until such time that certified fisheries begin operating.

Section 10 References

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