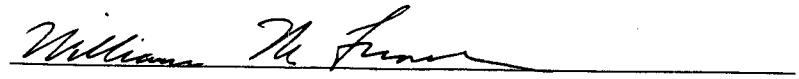
AN ABSTRACT OF THE THESIS OF

John W. Reisenweber for the degree of Master of Arts in Interdisciplinary Studies in Political Science, Marine Resource Management, and Philosophy presented on April 2, 1997. Title: Individual Transferable Quotas (ITQ) in the Pacific Halibut Fishery: Applications to the Magnuson Act

Abstract approved: 

William M.. Lunch

The Pacific halibut has supported a major commercial fishery on the West coast of the United States for over 100 years. In the past, the halibut fishery was managed by a policy of open access which led to an overcapitalized fishery and raised concerns about overfishing, fishing safety, and deteriorating product quality. In order to address these problems, the North Pacific Fishery Management Council implemented an individual transferable quota program for the halibut fishery in the Spring of 1995.

The new quota regulations will provide some benefit to the severely overcapitalized halibut fishery. However, the ITQ program may threaten resource sustainability by providing fishermen with an incentive to exceed their quota and high grade their catch. In addition, the quota consolidation, job loss, and costs that will result from the new system will raise several ethical concerns regarding the ideas of social equity, efficiency, and stewardship. Based on traditional conservation ethics as well as more modern ideas, the envirocentric ethical approach to quota management can be used to address some of these environmental and ethical problems.

Fishing quotas have had an interesting political history which has been evolving for the past 20 years. The quota issue spurred intense debate in Congress during the re-authorization of the Magnuson Act in 1996 and divided the fishing industry while pitting environmental groups against each other. With the Magnuson Act being amended, environmental groups were able to lobby Congress to include in the rewrite a 4-year moratorium on new quota programs.

The NPFMC did a commendable job with an overwhelming task by creating an ITQ plan which could be used as a prototype for future quota management. Although the halibut system adequately addresses several difficult issues, it will also produce its own problems, the full extent of which may not be realized for years to come. This research suggests that not only do ITQs provide some benefits, but also that much caution should be exhibited when allocating fishery resources in this manner.

Individual Transferable Quotas in the Pacific Halibut Fishery: Applications to the Magnuson Act

by

John W. Reisenweber

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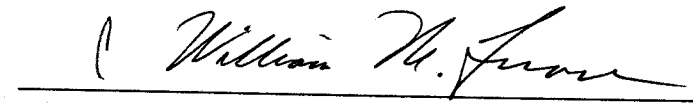

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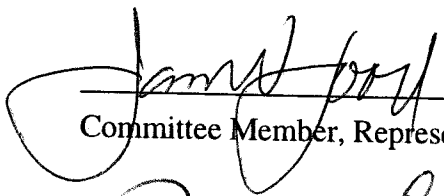

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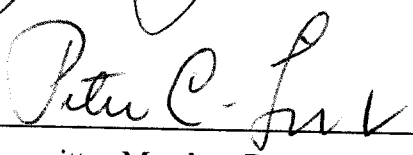

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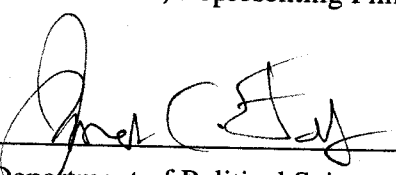

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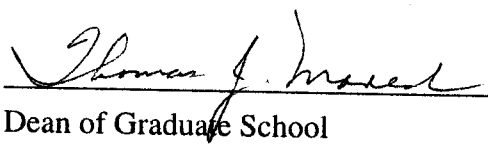

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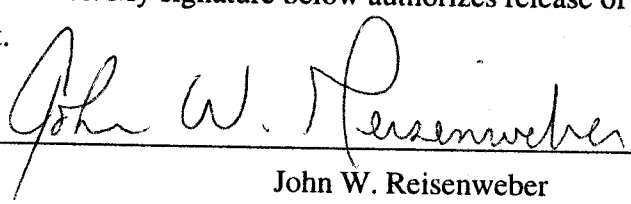

John W. Reisenweber

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THE PACIFIC HALIBUT FISHERY

The Pacific halibut has supported a major commercial fishery on the West coast of the United States for over 100 years. The majority of Pacific halibut are caught in the Gulf of Alaska and the Bering Sea, however, the commercial fishery extends from Alaska to Northern California. In 1993, fishermen caught roughly "60 million pounds of halibut at a value of about $170 million (IPHC 1993) and (Terry 1993).

Several governing bodies have jurisdiction over the management of the Pacific halibut fishery. The North Pacific Fishery Management Council (NPFMC) makes fishery management recommendations while the International Pacific Halibut Commission (IPHC) sets catch limits for both the United States and Canada. The National Marine Fisheries Service (NMFS) is responsible for monitoring and enforcing fishery regulations.

History of the Fishery

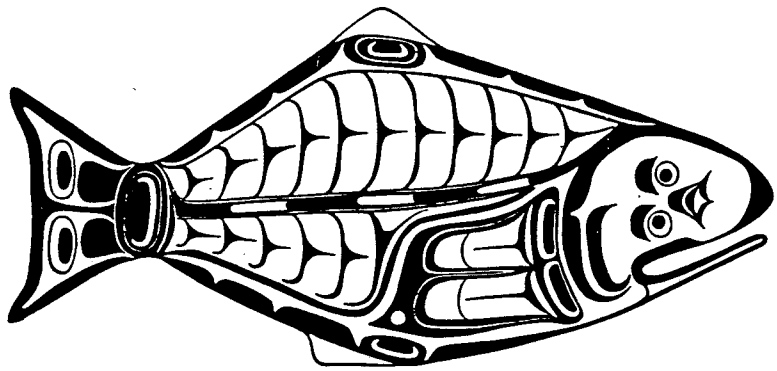
Halibut fishing on the West coast of the United States was first done by Native American tribes for the purpose of subsistence. During the late 1800's, a commercial halibut fishery developed with sailing vessels and steamers deploying smaller dories to catch the fish. Today, much of the commercial catch is landed and processed aboard large freezer vessels .

Native American Fishery

The Pacific halibut was first fished on the West coast by Native American aboriginal tribes long before the United States was ever settled. "Archaeological evidence indicates that the aboriginals of the western coasts of North America had consumed halibut from time immemorial" (Bell 1981). Although tribes from California were known to fish halibut, most of the aboriginal halibut fishing occurred north of Cape Flattery in Washington state.

Several native tribes in the Northwest utilized the halibut for food as well as for trade. "The Makah tribe of Cape Flattery, the Nootka of Vancouver Island, the Kwagiutl and Haida tribes from the Queen Charlotte area, the Tsimshian of British Columbia, and the Tlingit of Southeastern Alaska were some of the Native American tribes that fished for halibut" (Bell 1981). Most of the tribal halibut fishing took place in Southeastern Alaska with the "Metlakatla, Kake, Hoonah, and Angoon tribes all participating" (Bell 1981). Because the halibut was such an important resource for these communities, the Native American tribes symbolically used the halibut in their ceremonies and their culture. The halibut was even considered sacred and was often carved into totem poles while its image was found painted on their houses. Figure 1 depicts a halibut crest which serves as the halibut commission's logo. It is adapted from designs used by the Tlingit, Tsimshian and Haida tribes.

Figure 1. Halibut Crest



The fishing methods employed by the Native American tribes were rather primitive but also quite effective. A hook and line system dangled from a canoe was the preferred method of capture. The hooks were usually made of wood with a barbed end carved from bone. The hooks were attached to "lines made from either twisted wood fiber, animal sinews, or giant kelp" (Bell 1981). A stone sinker was attached to the hook end of the line while a buoy made of animal bladder or skin was attached to the other end. These lines were dangled from canoes in shallow water fairly close to shore. The fish was taken to

shore and then typically smoked to preserve the meat and prevent it from spoiling. In addition to smoking, the natives also used salting as a means to preserve the fish.

The Commercial Fishery

The commercial halibut fishery began in the late 1880's with sailing sloops catching fish around Vancouver Island and transporting it as far south as San Francisco. The typical sloop carried a dory or two, a small crew, and could carry about 3000 pounds of fish.

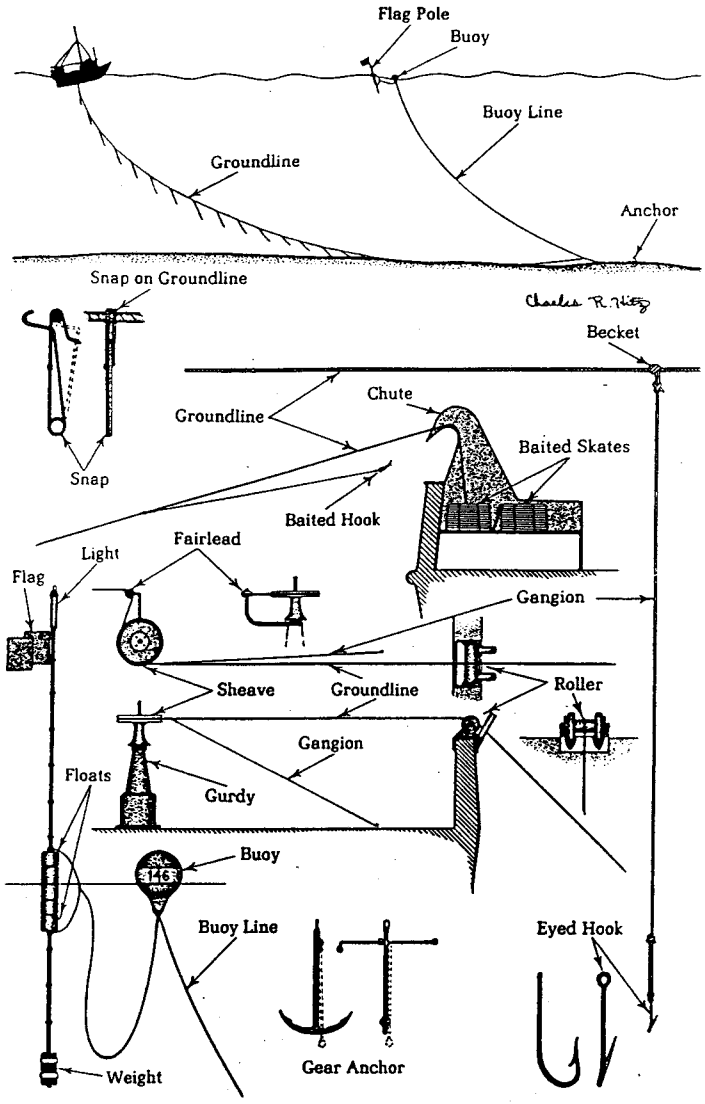
Because of the difficulty in navigating the rocky harbors and fjorded coastlines of the Northwest, steamer ships soon displaced sailing sloops as the primary vessel in the halibut fishery. In addition to improved navigability, the extra power also allowed the fish to be landed quickly in port for the long journey to the major markets on the East coast. The typical steamer, modeled after those off New England, "ranged in size from 81 to 117 tons and carried up to six dories and a crew of 14" (Bell 1981). These ships dominated the fishery until 1920 when their use became impractical due to depleted stocks, high operating costs, and the manpower problems caused by World War I.

Schooner-type vessels emerged in the halibut fishery as a solution to the problems of declining stocks and limited manpower. They were smaller and usually made of wood, as compared to the large, ironclad steamers. This made them lighter and required fewer crewmembers. An internal combustion engine propelled by petroleum provided greater speed and better maneuverability. This allowed them to withstand the severe weather of the North Pacific and tap the abundant halibut stocks off Alaska.

Today, the halibut fishery consists of small and medium sized schooner-type catcher boats, as well as larger freezer vessels that catch and process the fish on board. "In 1990, the 4000 boats participating in the fishery ranged in size from under 35 feet to more than 120 feet" (Terry 1993). The majority of these vessels fish the waters of Alaska for their halibut catch. "The Gulf of Alaska and Bering Sea regions support the richest halibut fishing grounds, accounting for roughly 70% of the annual catch in 1992" (IPHC 1992).

The methods of commercial fishing for halibut have changed significantly over the years. Dory fishing was the original method used to catch halibut. These smaller boats were equipped with hook and line gear and then deployed from a larger vessel to catch the fish. As stocks declined in the 1920's and dory fishing hazards became apparent, longlining became the preferred method to catch halibut. A longline is basically a line of baited hooks attached at intervals and placed on the ocean bottom. (Fig. 2)

Figure 2. Halibut Fishing Gear



Although longlining remains the primary method of commercial halibut fishing, the fishery is considered a "fixed gear" fishery. Fixed gear is defined as all hook and line fishing gear which includes longlines, jigs, handlines, and troll gear.

Because of the demersal nature of the Pacific halibut, trawl gear was once used in the commercial fishery. A trawl is simply a large net dragged along the ocean floor, catching everything in its path. However, trawl gear was known to destroy the benthos and also catch mostly smaller fish that had not reached sexual maturity. "These concerns prompted the Halibut Commission to prohibit the use of trawl gear in 1944" (Bell 1981). The elimination of trawl gear and its subsequent replacement by longlining had several

advantages for the health of the halibut stocks. Nursery areas and important benthic resources were now spared by the damages of the trawl. In addition, hook and line gear is species and size selective which means it catches the proper size of halibut as well as only halibut. This eliminates the "conflict of interest between species such as occurs in a multi-species trawl fishery, which makes that type of fishery practically impossible to manage rationally" (Bell 1981).

The Sport Fishery

Although sport fishing for halibut does occur off the coasts of Washington, Oregon, and California, the majority of the sport catch is concentrated in the Gulf of Alaska. "The Gulf of Alaska, particularly the port of Homer on the Kenai peninsula, accounts for roughly 60% of the coastwide halibut sport catch" (IPHC 1992). The halibut catch by sport fisherman has doubled in recent years, "increasing from 3.5 million pounds in 1987 to about 7 million pounds in 1991" (IPHC 1992). This 1991 figure is equivalent to about 12 % of the 60 million pounds of halibut caught commercially. Table 1 shows the halibut sport catch from 1989 to 1993.

Table 1. Halibut Sport Catch from 1989-1993

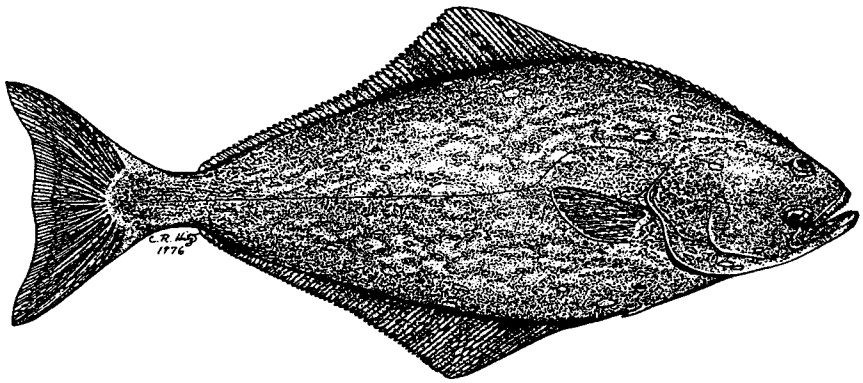
Area	1989	1990	1991	1992	1993[1]
2A	327	197	158	250	246
2B	635	762	584	579	657
2C	1,559	1,330	1,654	1,668	1,811
3	3,005	3,638	4,236	3,899	5,265
4	24	40	74	40	72
Total	**5,550**	**5,967**	**6,706**	**6,436**	**8,051**

Few regulations govern the halibut sport fishery. "Marine anglers can retain halibut of any size, except off Oregon and California where the limit is 32 inches" (IPHC 1992). Off the coast of Washington, a bag limit is in effect which "allows fishermen to possess one halibut of any size plus an additional halibut of 40 inches or greater" (IPHC 1992).

Pacific Halibut Biology

The Pacific halibut, *Hippoglossus stenolepis*, belongs to the flounder family, called Pleuronectidae (IPHC 1987). The Pacific halibut ranges from Northern California to the Bering Sea and Gulf of Alaska, where it is found in highest abundance. Halibut prefer cold, deep water and "have been found at depths of 1000 meters" (Nielson et. al. 1993). Pacific halibut may reach "lengths of over 200 cm. and attain 40 years of age" (Schmitt and Skud 1978). "The average weight of a commercially caught halibut is 25-30 pounds, however, a 629-pound halibut measuring over 9 feet has been confirmed" (Bell 1981). Resembling a typical flounder, halibut are demersal flatfish with both eyes on its darkly-colored right side. (See Figure 3).

Figure 3. The Pacific halibut, *Hippoglossus stenolepis*



Reproduction and Development

The Pacific halibut spawn synchronously from "November through March along the edge of the continental shelf at depths of 900 to 1300 feet" (Best 1977, St.Pierre 1984, and IPHC 1990). Females spawn annually and are considered partial spawners which means they release eggs as they ripen. "Females mature between ages 8 and 16 years, whiles males mature between ages 6 and 12 years" (IPHC 1990). A mature female can produce "2-3 million eggs per year, which once fertilized, remain in the pelagic larval stage for about 6 or 7 months before residing permanently on the bottom" (IPHC 1990 and St.Pierre 1989).

Young juvenile halibut under two years of age usually live in shallow coastal areas. The warmer, shallow water harbors the necessary food for these developing fish and also allows for maximum growth. As the juveniles grow older, "they move to deeper water on the flats, camouflaging themselves on the edge of shoals to surprise prey as well as avoid predators" (IPHC 1990). Juvenile halibut abundance is "greatest around 350 feet and decreases with deeper water" (Bell 1981). Although conditions are optimal in these areas, the juveniles are also "more vulnerable to incidental catch by fishing trawlers" (Best 1977).

Migration and Feeding

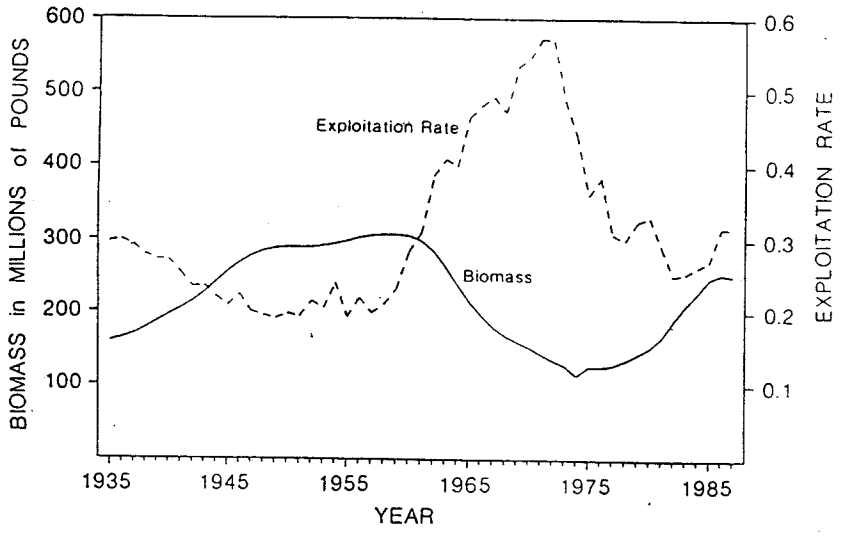
Migration plays an important role in the life of the Pacific halibut as they are known to school together at all ages. As juveniles, "halibut undergo extensive migration to counteract the drift of eggs and larvae and thus maintain the geographic location of the stocks" (St.Pierre 1989). Both juvenile and adult halibut migrate to shallow areas of the shelf to feed in the summer, returning to deeper waters to spawn in the winter" (Best 1977).

Studies of halibut feeding preferences have not been widely conducted and offer no comprehensive results. However, it is known that Pacific halibut are omnivorous, opportunistic feeders that will eat almost anything available. "Halibut have large mouths and sharp teeth, enabling them to feed on fishes, crabs, clams, squids, and invertebrates" (Bell 1981 and IPHC 1990). Because of its existence in cold, deep water and its powerful swimming ability, the Pacific halibut does not have many natural predators. However, the Stellar sea lion does prey upon the halibut for food.

Stock Assessment

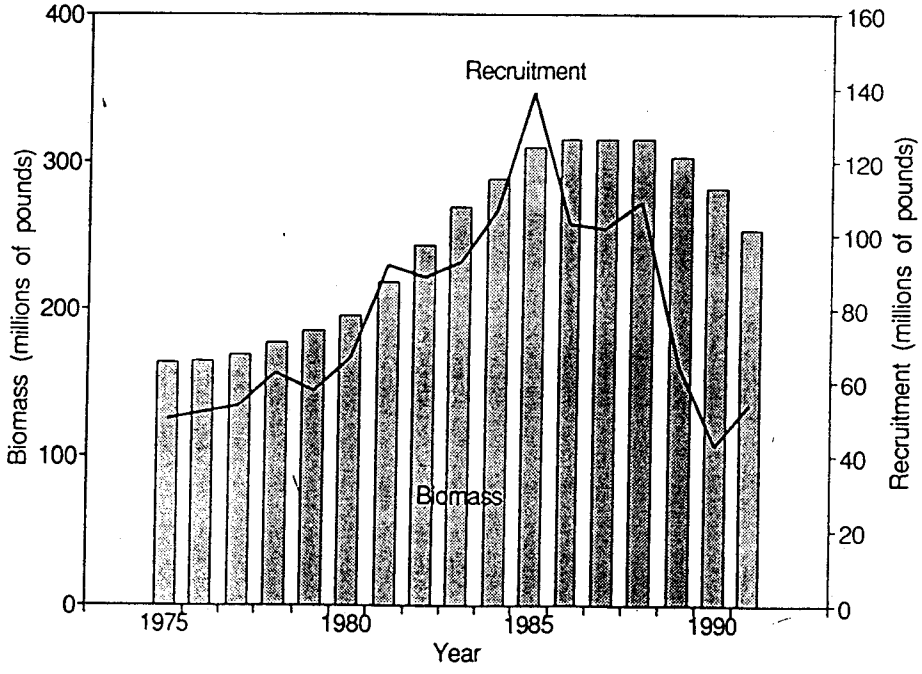
Pacific halibut stocks have fluctuated over the years with variations depending on rates of recruitment as well as exploitation. Figure 4 shows the historical trends in biomass estimates and exploitation rates. Increases in biomass in the 30's and 40's is associated with high recruitment and low exploitation (IPHC 1987). Exploitable biomass reached a low of 114 million pounds in 1974 which was probably due to previously high catch rates and low recruitment.

Figure 4. Historical Trends in Halibut Biomass and Exploitation



Since that time, measures of exploitable biomass increased until the mid 1980's and are now experiencing annual declines of between 5 and 10 % (Fig 5). In addition, there has also been a recent decreasing trend in recruitment to the fishery which means that the "stock may continue its 5-10% annual decline for the next several years" (IPHC 1992).

Figure 5. Halibut Biomass and Recruitment from 1975-1991



Decreasing biomass as well as a decrease in recruitment may lead to future changes in the exploitation rate. For the past few years, the Commission has used an exploitation rate of 0.35, which means catch limits are set so that the total take will not exceed 35% of the exploitable biomass (IPHC 1992). The Commission has recommended an exploitation rate of 0.30 for the next few years.

According to a report published in September of 1996 by the National Marine Fisheries Service, Alaska groundfish stocks are healthy and effectively managed. Rollie Schmitten, director of NMFS, said that "since 1976, the Alaska groundfish resource has been managed by a risk-averse approach of conservative fish quotas and prudent bycatch quotas that has allowed the fishery to stay environmentally and economically viable for the long-term" (Smullen 1996).

Governing Bodies

Several governing bodies have jurisdiction over the Pacific halibut fishery. The International Pacific Halibut Commission, the North Pacific fishery Management Council, and the National Marine Fisheries Service all have roles in the management of the halibut fishery. The Alaska Department of Fish and Game also plays a small part in the management of the fishery in Alaskan waters.

The International Pacific Halibut Commission

The International Halibut Commission (IPHC) is a management cooperative established in 1923 by a convention between the United States and Canada. The purpose of the Commission is to preserve the halibut fishery of the North Pacific Ocean and the Bering Sea. "The convention was the first international agreement providing for the joint management of a marine resource" (IPHC 1987).

The president of the United States appoints three commissioners, while the governor general of Canada also appoints three. The commission's expenses are equally shared by the two countries with the headquarters being located on the University of Washington campus in Seattle. The director, appointed by the commissioners, oversees the activities of a scientific and administrative staff.

The Commission has several important management duties designed to ensure the sustainability of the halibut fishery. The main duty of the Commission is to divide the waters into management areas and set the total allowable catch (TAC) for each of these areas. The Commission also has "jurisdiction over season closures, vessel licenses, and gear specifications" (Bell 1981). The Commission also conducts research and collects statistics on the life history of the halibut which is used to better mange the fishery.

The North Pacific Fishery Management Council

The North Pacific Fishery Management Council (NPFMC) is a "panel of 11 voting and 4 non-voting members, supported by a staff of 11" (NPFMC 1992). The regional fishery councils were set up under the Magnuson Act in 1976. The Council makes management recommendations about the halibut fishery and submits these recommendations to the Secretary of Commerce for final approval. These recommendations are based on input from the industry as well as the scientific community. The Council may "implement more restrictive regulations providing they are not in conflict with Halibut Commission regulations" (McCaughran and Hoag 1992).

The NPFMC recommended an IFQ program for the halibut fishery in December of 1991. After public comments, the council submitted the plan to the Secretary of Commerce who approved it in November of 1993. The Council also developed a community development quota (CDQ) program that establishes a portion of the TAC in certain areas be reserved for small communities that are dependent on halibut for subsistence purposes.

The National Marine Fisheries Service

The National Marine fisheries Service (NMFS) is a government agency within the National Oceanic and Atmospheric Administration (NOAA) that "conducts biological research, implements and enforces all federal fisheries regulations, and monitors the in-season fisheries" (NPFMC 1992).

With the new IFQ program for the halibut fishery, NMFS is now responsible for addressing inquiries, issuing quota shares, and monitoring quota landings and transfers. The Service also established an observer program aboard halibut fishing vessels to prevent fisherman from violating their quotas.

HALIBUT ITQ PROGRAM

Introduction

Commercial fishery management has undergone many changes in the last 30 years. Initially, most countries utilized the concept of "open access" as the primary management tool. Under this regime, entry to the fishery was not highly regulated or limited which often resulted in an overcapitalized fishery and concerns about overfishing. Overcapitalization occurs when too much fishing effort, usually in the form of too many boats, is being used to harvest a limited fishery resource. Various methods of fishery management such as area closures, season closures, and gear restrictions were used to address these concerns. Over time, many of these management practices evolved to include measures that also controlled access to the fishery. An individual transferable quota (ITQ) is one example of access limitation which allocates the right to harvest a certain percentage of the total allowable catch (TAC).

In the Spring of 1995, an individual transferable quota (ITQ) program was introduced in the Pacific halibut fishery of the Gulf of Alaska and Bering Sea. The North Pacific Fishery Management Council (NPFMC), with approval from the Secretary of Commerce, implemented the program in order to tackle the problems of an overcapitalized fishery. These problems include fishing safety, poor product quality, and resource sustainability. The basic idea behind the program was to allocate a portion of the total allowable catch (TAC) to individuals who had a demonstrated history in the halibut fishery. The Council implemented an innovative quota management system with a wide array of regulations that attempted to address the current problems of the fishery as well as deal with those arising from the new quota program.

The halibut ITQ program will have both advantages and disadvantages. Some of the advantages of the program are better safety, higher product quality, increased economic benefits, and conservation. Some of the foreseen disadvantages include high-grading, quota consolidation, mis-reported landings, limited monitoring ability, and high start-up costs.

History of Fishing Quotas

The United States first utilized fishing quotas for the Atlantic surf-clam and ocean quahog fishery in 1990. In the Spring of 1995, the U.S. instituted ITQs for the fixed gear halibut and sablefish fisheries off Alaska. Although the halibut ITQ program is a progressive quota system, the U.S. has benefited from experimentation by other countries with fishing quotas. Canada, Iceland, Norway, and New Zealand first pioneered the use of fishing quotas in the 1960's and 70's.

Canada

Canada began using individual quota (IQ) management in 1972 regulating the fisheries of Lake Winnipeg. Since that time, the Canadian Department of Fisheries and Oceans has established quota programs for over 20 commercial fisheries. While limited entry was introduced to curb proliferating harvest capacity and provide some degree of conservation, it was soon clear that this would not solve the problematic "race for fish". Fishermen began using larger boats and crews, more gear, and longer fishing times to harvest more fish. This race for fish compromised safety, increased fishing costs, sacrificed quality, and threatened future resource sustainability. In addition to these problems, "the ability to mange the annual TAC was becoming increasingly difficult as indicated by the fact that the catch exceeded the TAC eight of the ten years prior to 1991" (DFO 1993). These factors led Canada to create an IQ management program for the halibut fishery in 1991. Although Canada has experienced both success and failure with quota management, "the Pacific halibut fishery is largely considered a success story" (Canadian DFO 1993).

Canada's halibut ITQ program was considered a success for several reasons. The system was designed to be simple yet flexible and take into account input from all sectors of the fishery. Quotas were allocated to individual vessels and based on recent catch histories. While other quota fisheries in Canada allowed shares to be transferred, the halibut program began with a two-year trial period in which quota transferability was prohibited in order to avoid the concentration of quota shares. Strict monitoring and enforcement were also important components of the new system which contributed to the success of the program.

Iceland

In addition to Canada, Iceland was also an early user of fishing quotas to manage their fisheries. As an island country, Iceland relies heavily on the demersal groundfish fishery for support. Although Iceland introduced fishing quotas in the herring fishery in 1966, it was not until ten years later that their use became widespread. "This was mainly due to Iceland's extension of fisheries jurisdiction to 200 miles, which virtually eliminated foreign fishing in Icelandic waters" (Arnason 1993).

As of 1990, Iceland has implemented quota programs in all of their commercial fisheries. Iceland, like Canada, has instituted vessel quotas which are percentages of the TAC and have also subjected quota share holders to a small fee that helps defray enforcement and monitoring costs. However, Iceland has allowed their quotas to be perfectly divisible and freely transferable.

While it is difficult to assess the overall effectiveness of a quota program, economics professor Ragnar Arnason at the University of Iceland believes that the fishing quotas in Iceland have been successful. "According to estimates, the vessel quota system appears to have reduced demersal fishing effort by 37 %, reduced fishing costs, improved product quality, and increased economic rents" (Arnason 1993).

Norway

Norway also greatly expanded their use of fishing quotas after extending their fisheries jurisdiction to 200 miles in the mid 1970's. "About 80 % of Norway's fisheries are currently managed by some sort of license limitation or vessel quotas" (Norwegian Authorities 1993). Quotas in Norway are allocated to vessels as a portion of the total catch for the fishery. They are based on vessel size, capacity, and gear class and are not transferable. Norway has elected not to adopt a transferable form of quota management because of industry opposition, fears of quota concentration, and concerns about resource sustainablitity.

New Zealand

New Zealand formally introduced an ITQ system in 1986 in order to make legal an informal program that had been in operation since 1983. The ITQ program, which applies

to 32 species in 10 management areas, was implemented to address the problems of overfishing as well as to reduce the amount of foreign fishing in New Zealand's waters (Falloon 1993).

Quotas in New Zealand are allocated as a portion of the TAC and are fully transferable. Mechanisms for monitoring and enforcement were also included in the program. In addition, the New Zealand government also addressed Maori aboriginal concerns by purchasing 10 % of the quotas and transferring it back to them. The ITQ program in New Zealand has resulted in some economic benefits and also has helped to curb bycatch problems by providing a more relaxed fishing pace (Falloon 1993). However, there has been some concentration of quotas, a degree of high grading, and increased management costs (Falloon 1993, Monk and Hewison 1994).

Initial Allocation Guidelines

The NPFMC designed the halibut ITQ system to mirror the current demographics of the fishery. One goal of the program was to retain the current character of the industry without displacing too many fisherman. In order to accomplish this, several important guidelines were established to determine who would get the initial allocations as well as the amount of each quota.

Eligibility

In order to qualify for the quota share allocation, one must be a legal citizen of the United States. In addition, the person must have either owned or leased a vessel that made legal, verifiable landings of halibut in 1988, 1989, or 1990. Because the Council is using three years to determine quota shares, more people will be receiving quotas then the number who actually fished during any one of those years. "In November of 1994, the NMFS began issuing quota shares for halibut to roughly 5500 fisherman" (NMFS 1995). Because the majority of vessel owners are Alaskan residents and the majority of halibut landed was also caught by Alaskans, "87% of quota recipients and 72% of ITQ poundage will go to Alaskans" (NPFMC 1992). These restrictions on initial quota allocation will help to ensure that the character of the fishery remains fairly similar.

Individuals interested in obtaining quota shares must submit permit applications to NMFS in order to be considered for quota shares. After the application is completed

without corrections or discrepancies, the application goes to technical review with notification of permit approval given within 45 days. Each applicant's share is then added to the total pool for each area. After this process is completed, the TAC is set and the shares are allocated.

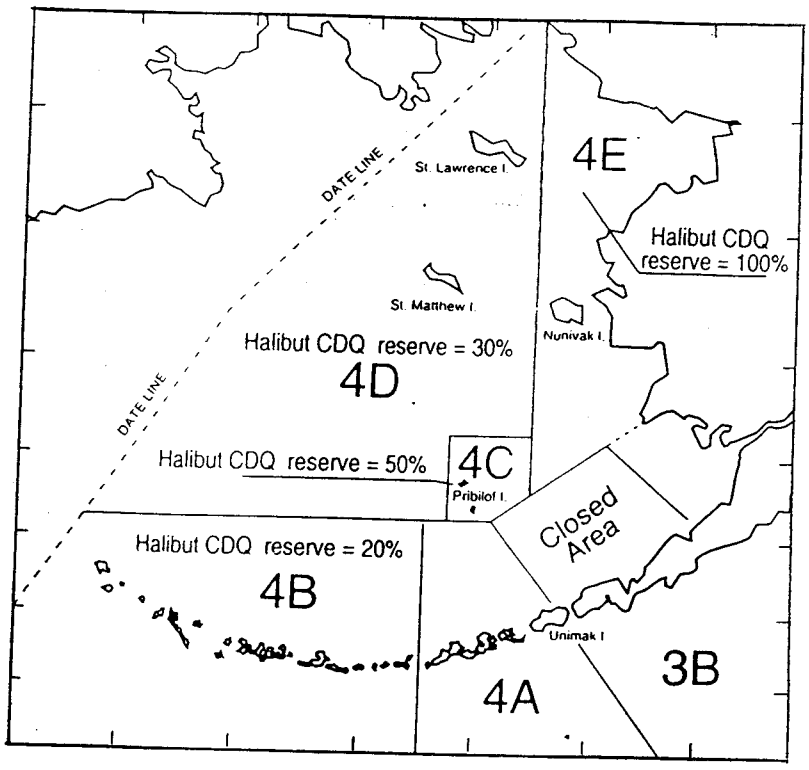
Although the Council attempted to include as many people as possible in the initial allocation process, not everyone involved in the fishery will be eligible. Vessel owners are not eligible if their boat was leased and the landings were made by a renter. Crew members were not eligible for initial allocation. However, only crew members with at least 150 days of harvesting experience are eligible to receive quota by transfer or lease.

Share Determination

The number of quota shares is directly reflective of one's history in the fishery. The best five years of halibut landings between 1984 and 1990 will be added together and considered shares. These shares are then divided by the total quota share pool for each area. The ratio of shares to the total is multiplied by the TAC to get the actual ITQ. Quota shares are allocated according to vessel class, regulatory area, and block status. Initial quota shares will be somewhat smaller than normal in certain areas because a portion of the TAC for these areas is allocated to the Community Development Quota (CDQ) program. With a portion of the TAC now being reserved for the CDQ program, a less than normal amount of the harvest will be available to shareholders in these areas. This means that fishermen will be getting less quota in these areas then they would if the CDQ program was not in effect. Figure 6 shows the percentage of quota shares reserved for the CDQ program in each area.

The CDQ program was developed to ensure that a certain percentage of the halibut quota shares go to residents of Western Alaskan communities. The majority of residents in these communities are of Native Alaskan descent who employ traditional fishing methods and utilize the resource only for subsistence.

Figure 6. Halibut CDQ Reserves



Transferability Limits

Limits on transferability are necessary in order to preserve the current make-up of the fishery. Once a quota share is transferred, either by sale, gift, or lease, the rights to future quota shares are also transferred. For those who do not receive initial quota shares, they can be either leased or bought provided the transferee has crew member status.

Transfer applications must be completed by both the shareholder and the recipient in order to receive a Transfer Eligibility Certificate (TEC). If an individual receives quota shares, that person must be on board while the quota is being harvested. Shares cannot be transferred between vessel classes or regulatory areas. Catcher boat quota share holders can only lease 10% of their shares during the first three years of the program. Finally, all transactions must be approved by NMFS and must fall within ownership caps.

The Council also incorporated transfer regulations to solve the problem of quota consolidation in the hands of the few. Vessel classes, regulatory areas, ownership caps, and block restrictions are components of the system designed to accomplish these tasks.

Several other regulations have been implemented in order to further monitor the fishery and enforce compliance with the quota limits and the TAC. These regulations include buyer permits, overages and underages, landing reports, and vessel clearances.

Vessel Classes

In order to preserve the character of the fishery, the council issued quota shares according to various vessel classes. The transfer of quota shares between the vessel classes will be prohibited. The quota shares issued for a particular vessel class will always remain in that class, regardless of the number of times they are transferred. The vessel classes are based on the overall length of the boat. Vessel class A will consist of freezer vessels of any length. Class B includes any catcher vessel greater than 60 feet in length while vessel class C will consist of catcher vessels greater than 35 feet but less than or equal to 60 feet. Finally, catcher vessels equal to or less than 35 feet will be assigned to class D.

To determine the appropriate vessel class to which one's quota will be assigned, NMFS will look at the last vessel used during the years between 1988 and 1991. If a fisherman made landings with more than one boat during the most recent year, and these boats are from different vessel classes, quota shares will be assigned to each vessel class according to the proportion of landings made by each vessel. If any fish were processed or frozen during the most recent year, the quota shares will be issued in vessel class A.

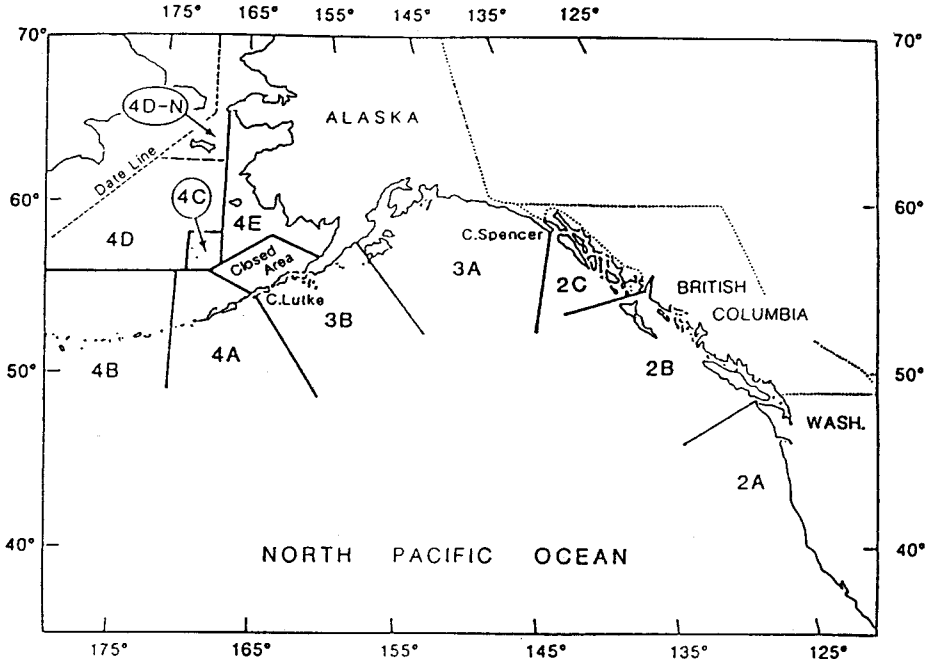
Regulatory Areas

Like vessel classes, quota shares will also be issued according to various regulatory areas. Quota shares will not be allowed to be transferred between these areas. This will also help to keep the character of the fishery in tact. The IPHC sets the TAC for each halibut management area. Fishermen will receive quota shares based on their historical landings from each area. If fish were landed in more than one area, quota shares will be assigned in proportion to the amount of fish landed in each area. Once quota shares have been assigned to a particular area, they can only be harvested in that specific area.

Although 10 halibut management areas exist, only 8 of them will be covered by the

new ITQ program. Area 2B, which includes all waters off British Columbia, is already managed by Canada's IVQ program. Area 2A, which includes all waters off the coasts off Washington, Oregon, and California, will not be subject to ITQ management. Only the waters of Alaska will come under ITQ management. Southeast Alaska is covered by area 2C. The Gulf of Alaska is considered areas 3A and 3B, extending from Cape Spencer to Cape Lutke. The waters around the Aleutian Islands will be covered by areas 4A and 4B. The Bering Sea will include areas 4C, 4D, and 4E. A large portion of these areas in the Bering Sea will be reserved for the CDQ program. Figure 7 illustrates the various halibut regulatory areas.

Figure 7. Halibut Management Areas



Ownership Caps

Ownership caps were included into the program in order to avoid quota consolidation into the hands of the few. Basically, no one person, company, or group may

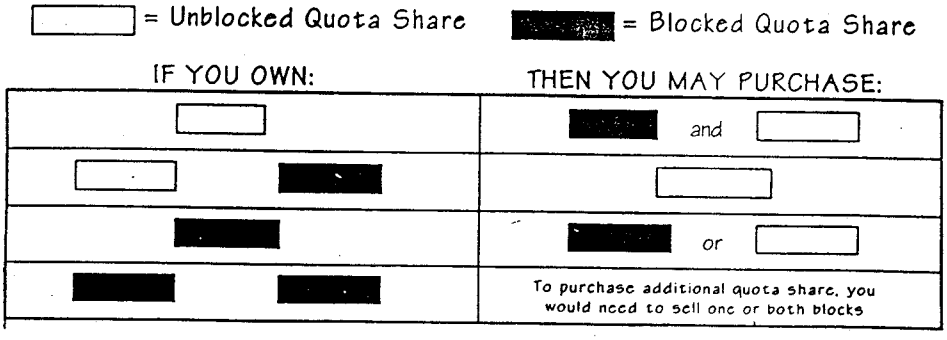
own more than a small percentage of the quota share for a particular area. For areas 2C, 3A, and 3B, nobody may own more than 1/2 of 1 % of the total halibut quota share for the combined areas. The same limit applies to the combined regions of area 4. Individuals may exceed ownership caps if the amount was part of an initial quota share allocation. In addition to ownership caps, vessel harvest caps limit the number of IFQ pounds a vessel may land in one year.

Block Amendments

Along with ownership and vessel harvest caps, the Council also included block restrictions to help ensure against the consolidation of quota shares. Any quota share allocation resulting in more than 20,000 pounds of IFQ will be considered unblocked. These quota shares can be bought transferred in any amount. Any allocation resulting in less than 20,000 pounds will be blocked. These blocks cannot be divided up into smaller units and can only be bought or transferred in their entirety.

Ownership restrictions allow for an individual to own up to two blocks of quota shares per area, provided you own no unblocked shares in that area. If you have unblocked shares in an area, you may then hold only one block of quota shares for that area, but you can buy more unblocked shares. This system makes sure that small blocks of quota shares will always be available and not controlled by large companies or a few individuals. Figure 8 provides a good diagram to help explain the block restrictions.

Figure 8. Block Restrictions



Finally, a sweep-up provision allows for the combination of small blocks into one larger block, provided the total of the new block does not exceed 1000 pounds of IFQ.

The sweep-up provision allows for small blocks that would otherwise not cover operation costs to be combined into a fishable amount.

Other Regulations

Anyone who receives IFQ halibut from the fisherman must have a registered buyer permit, which is issued annually and not transferable. Each processing plant, processing vessel, tendering vessel, fish buyer, fish market, and fish broker must have a registered buyer permit in order to receive or transfer IFQ halibut.

Overages and underages are designed to penalize those that exceed their quota while rewarding those who do not. An overage is an amount of landed halibut that exceeds one's quota. The amount of the overage is deducted from next year's allocation. If the overage exceeds 10 % of your annual quota, the entire overage will be forfeited. An underage of up to 10 % of your annual quota may be credited toward your allocation for next year. An underage greater than 10 % will be forfeited at the end of the year.

Another way of monitoring the catch is through landing and reporting requirements. Notice of a landing must be provided by a vessel operator to NMFS at least six hours prior to the actual landing. Landings may begin between 6 A.M. and 6 P.M. Alaska time and must be reported to NMFS by a registered buyer within 6 hours after landing the fish. Reported information includes buyer number, vessel number, fish ticket number, areas fished, and the total pounds landed.

Advantages of ITQs

The advantages of the IFQ system are several-fold. The primary reasons for introducing the IFQ program were to provide safe fishing grounds, increase product quality, increase economic benefits, reduce gear loss, improve conservation, and to provide fishermen with more control over the resource.

Fishing Safety

Because the IFQ system will eliminate open access, the fishing season will no longer need to be regulated by season closures. A longer fishing season will eliminate the race for fish and provide the fisherman with much safer fishing conditions. Fishing will

proceed at a much more leisurely pace as fisherman will not have to disregard safety measures because they now can schedule their effort. It will no longer be necessary to race for the fish because the fisherman will now have plenty of time to meet their quota. The likelihood of many boats being in one area at the same time will be greatly reduced which is especially advantageous near port.

In addition, there will be no need to overload the boat with excess gear, crew, and fish because there will be time to return to port for repairs, to rest the crew, or land the fish. Also, fishing in bad weather will no longer be a factor because boat captains will be able to schedule their effort around a storm. This solves the problem of risking one's life to avoid missing an entire two-day season because of bad weather.

Product Quality

Another advantage of the IFQ system will be an increase in the quality of fish products at the market. A longer fishing season will ensure fresher seafood at the market for a longer period of time during the year. Fisherman will now be able to respond to consumption demands by getting fresh fish to the market when it is desired. Quality will also increase because there will be plenty of time to properly process the fish. The fish will spend less time in cold storage and get to market faster because there will not be delays due to the large concentration of landings associated with a short fishing season. Fresh fish will be available throughout the year as fisherman will now be landing fish year-round and not freezing the fish for long periods of time. Some argue that the quality of fish may decrease under the IFQ program because of longer fishing trips, however, the fisherman will now be able to control trip length which should ultimately result in better quality fish at the market.

Economic Benefits

Increased dock prices are also expected with the advent of an IFQ program. "Fresh halibut costs processors 32 cents per pound less than frozen halibut that is kept in cold storage for 6 months"(NPFMC 1992). Although fresh fish would lower processing costs, there is a higher market demand for fresh fish as opposed to frozen fish. Prices will increase because consumers are more willing to pay higher prices for fresh fish. It is difficult to accurately assess the effect and extent of IFQs on price, but experience with

other countries indicate that price will increase. "In British Columbia, halibut prices jumped 50 cents to one dollar per pound after quotas were implemented" (NPFMC 1992).

Gear Loss

The IFQ system would also have a tremendous impact on the costs associated with gear loss. The amount of gear would be greatly reduced which would thereby reduce the amount of gear that becomes damaged or tangled. There would also be more time to properly set the gear as well as retrieve lost or damaged gear. IFQs would "eliminate the current gear losses that occur because fishermen set more gear than they can retrieve before the end of the brief halibut openings" (Terry 1993).

Fishermen would also be allowed to fish in areas and weather conditions that do not adversely affect the gear being used. This will also help to reduce gear conflicts because there will be less fishermen on the grounds at one time. The need for redundant gear will also be greatly reduced. Instead of having to take along extra gear because of time constraints, fishermen will be able to get by with less backup gear. Now there will be plenty of time to repair gear or return to port for backup gear.

With the introduction of IFQs, there will also be "less harvest foregone due to the fishing mortality caused by lost gear" (Terry 1993). When gear is lost or cut loose when snagged, it continues to catch fish. However, these fish are left on the bottom with the lost gear and not harvested. "The IPHC estimated that lost gear needlessly killed 2 million pounds of halibut in 1990 and more than 2.5 million pounds in 1991. The estimated value of these fish was between $2.4 million and $4 million" (NPFMC 1992). The realized cost would be much greater due to the cost of gear replacement.

Conservation

The IFQ program should also help to conserve the resource and provide long-term sustainability. Fishery biologists were alarmed by the ever-increasing harvest rates in the halibut fishery and genuinely concerned about the stock's ability to respond to these high rates of harvest. Because there is now a limit on the amount of fish that can be harvested by each individual, the future viability of the fish stocks should improve. Although IFQs are not designed strictly as a conservation measure, they do help to ensure that the TAC is

not exceeded. "In Canada, halibut catch had exceeded the TAC eight out of ten years prior to 1991" (DFO 1993).

High bycatch rates and the loss from cut gear as well as discards due to quality problems indicate that conservation was a driving force behind the council's decision to implement IFQs. The reduction in fear loss will also reduce the deadloss of fish from this lost or cut gear. Fish mortality from bycatch should also decrease because there will now be plenty of time to properly handle sub-legal size halibut. Fishermen could also use their quotas to land their halibut bycatch instead of discarding it. In addition, incentives, such as more quota shares, could be given to those who demonstrate low bycatch rates.

Flexibility

The ITQ program will also provide fishermen with more flexibility. The longer seasons will allow fishermen to schedule their fishing around bad weather. It will also allow them to fish when prices are at an optimum. They will also now be able to participate in other fisheries that previously had conflicted with the brief halibut openings. In addition, fishermen can now land their halibut bycatch by using quota shares while they fish for other species.

Fishermen will also have more bargaining power as a result of the ITQ system. Because they now essentially "own" a portion of the resource, they have options to buy or sell while having the time to look for the best price for their harvested quota. This bargaining power may also give them more leverage in negotiating any new fishery regulations. On the whole, the increased flexibility provided by the ITQ program allows the fishermen to be more in control of the resource and hence their livelihood.

Disadvantages of ITQs

Although there are many benefits associated with the implementation of an IFQ system, the program will not solve all of the problems facing the industry. In fact, the quota program may cause some new problems of its own. Some of the expected disadvantages of the IFQ program are high-grading, consolidation of quota shares, mis-reported landings and quota busting, monitoring and enforcement problems, and increased administrative costs.

High Grading

High grading is one of the main concerns of the IFQ program. High grading is the discarding of fish and substituting them with larger, better quality fish. The idea is to ensure that only the highest priced portion of a catch is actually landed. "By so doing, the returns to the fishermen from their quotas will be increased provided that the costs of catching additional larger size fish to fill their quotas is less than the market price differential between the large and small fish" (Geen et. al. 1993). This may be particularly severe if "initial quota allocations are lower than previous catch patterns and fishermen are trying to maintain their incomes by engaging in high-grading" (Geen et. al. 1993).

In a report on New Zealand's quota system, commercial fisherman expressed great concern over the discard problem. "The primary resource-related problem, identified by 66% of the commercial fisherman interviewed, was the high rate of fish discarding" (Dewees 1989). High grading is also a big problem in the TAC and quota management system used by the European Union. " The TAC system encourages fishermen to retain the larger and more valuable fish in order to maximize the economic benefits from their quotas" (Karagiannakos 1996). In addition, "the targeting of high value fish inevitably produces more by-catch not only of other species but also of the target species, when the fish are small or are damaged by the gear used" (Karagiannakos 1996). High-grading also "occurred in the southern bluefin tuna fishery where, following the introduction of ITQs, fishermen changed their fishing patterns to target larger tuna" (Geen et. al. 1993).

Although high-grading is prohibited under the guidelines for the halibut fishery, it will be difficult to enforce. It is hoped that because now the fishermen have a long-term interest in the resource, they will be less likely to cheat. Strict monitoring will be necessary in order to prevent the practice of high-grading.

Quota Consolidation

Consolidation of quota shares into the hands of the few has been a big concern with the ITQ program, particularly among small fishermen and Native Alaskan communities. By using their new quota shares as collateral, larger fishing operations now had the financial resources to buy out smaller fishing operations. In addition, significant job loss within the industry usually results from consolidation.

This problem has been documented in several other fisheries around the world. In Iceland, a growing concentration of quota ownership with the bigger companies has

resulted in a redistribution of wealth and power within the industry. (Eyrthorsson 1996). Quotas were transferable during the first two years of the New Zealand ITQ program, resulting in a significant concentration of quota into fewer and fewer hands (Clark 1991). Although it was intended to facilitate transfer, quota trading is now left to an informal market with a limited number of people. A similar trend has been reported in the Atlantic surf clam and ocean quahog fisheries in the United States. "By 1995, nine firms controlled 82% of the ITQ for surf clams and 10 firms controlled approximately half of the ITQ for ocean quahogs" (McCay et. al. 1995). In Australia, the ITQ system in the southern bluefin tuna fishery resulted in a relatively small number of corporate operators gaining a vast majority of the quota (Geen et.al. 1993).

The Council was very much aware of this concern and incorporated several controls into the system in order to avoid excessive consolidation. These controls include the community development quota program (CDQ), block restrictions, ownership caps, and limits on transferability. The CDQ program reserves a certain percentage of quota shares in each area for western Native Alaskan communities. This provision ensures that these communities will be able to continue to harvest the fish upon which they subsist. Block restrictions basically ensure that small blocks of quota shares will always be available while ownership caps prohibit any individual from owning a large percentage of the quota shares. However, if consolidation occurs to a maximum under these ownership caps, the number of fishermen participating in combined areas 2C, 3A, and 3B could be reduced to 200 fishermen. Because the same cap limit exists for area 4, a similar reduction in the number of participants could occur in this area. Even with the ownership caps in place, quota consolidation could reduce the 4000 boats that currently participate in the fishery to about 400 boats. This represents a significant amount of quota consolidation which could theoretically reduce participation in the fishery by as much as 90 %. In addition to these regulations, the Council imposed fairly strict transfer limits on quota shares. shares cannot be transferred between vessel classes or between regulatory areas. Although quota consolidation has been a problem in many ITQ fisheries, hopefully these provisions will prevent an inordinate amount of consolidation within the halibut fishery.

Mis-reported Landings

ITQ programs may result in the intentional mis-reporting of landings. ITQ systems provide an incentive for fishermen to engage in quota busting, which is catching a larger amount of fish than the quota allows (Copes 1986). If this occurs, fishermen are almost

certain to underreport their landings to avoid detection. Mis-reporting can have disastrous conservation effects because of the resulting difficulty in determining accurate measures of stock biomass and optimum yield. "During a halibut opening, an individual fisherman or processor has little incentive to underreport landings because the landings reported will have little effect on whether there will be another opening since the season is already extremely short. However, because a fisherman will have to use some of his IFQ for each pound of halibut he lands, the fisherman would have a greater incentive to have his landings underreported" (Terry 1993). The problem of mis-reporting has also been a huge problem for the quota management system in the European Union. "The Commission has estimated that a significant discrepancy exists of up to 60% between the reported figures for catches and the real ones" (Karagiannakos 1996).

Eliminating this problem depends on several factors. "The actual incentive to under-report landings would depend on ex-vessel price, the price of ITQs, harvesting costs, and the effectiveness of the monitoring and enforcement programs" (Terry 1993). In addition to these variables, others have stressed the cooperation of fishermen and a penalty system as important factors. "The extent of compliance with quota limits will be influenced by such factors as individual conscience, community culture and social sanctions, effectiveness of monitoring and enforcement, severity of penalties on conviction for infractions, and the extent of gain from cheating on quotas" (Copes 1986). Although the level of mis-reporting in the halibut fishery is difficult to assess, those that have under-reported in the past may be penalized during the initial allocation procedure because it is based on historical landings.

Monitoring and Enforcement

Monitoring and enforcement are two primary ways to ensure compliance with the halibut ITQ regulations. Monitoring the fishery falls on the shoulders of NMFS and will be conducted by a four-pronged approach. NMFS, with the help of the Coast Guard, will engage in patrols of the fishing grounds to catch people exceeding quotas and to watch for high-grading and discard activity. NMFS will also monitor landings and transshipments both regularly and at random. In addition, NMFS will also audit records and investigate complaints.

In order for the smooth functioning of the ITQ system, industry cooperation is essential. Ideally, information will be submitted in an accurate and timely fashion. There is also a call for the industry to cooperate with NMFS by helping to identify and prosecute

those who do not follow the regulations of the program. It is believed that the fishing industry will provide the necessary cooperation because they now have a vested interest in the operation of the fishery.

Administrative Costs

The administrative costs the new ITQ regulations will be somewhat expensive. Initial start-up costs as well as monitoring and enforcement costs will be the largest budget expenditures in the budget. "The analysts estimate that it will cost about $2 million to gear up for the ITQ system, and about $2.7 million per year to enforce" (NPFMC 1992). This money will be used to hire fishery enforcement personnel and also to establish a computer data base of information which will keep track of quota holdings and transfers.

The Council has proposed requesting the initial quota share holders to pay a small fee to help defray some of these start-up and enforcement costs. Exercising these fees has been provided for in the legal framework of the Magnuson Act. This is probably not an unreasonable request being that the fishermen do not have to pay to harvest the resource.

Conclusion

The North Pacific Fishery Management Council has recently completed the long and arduous task of establishing an ITQ program for the halibut fishery. The main objective of the program is to reduce the problems of an overcapitalized fishery caused by open access management. These problems include safety, product quality, economic benefits, and conservation. The ITQ system should help solve some of these problems, however it will also have some disadvantages as well. The disadvantages of an ITQ system include high grading, quota consolidation, mis-reported landings, enforcement issues, and high start-up costs. After the program has been in effect for a few years, a determination about the plan's effectiveness can be made by examining pre and post ITQ conditions. The remainder of this report will analyze the halibut ITQ program from a political, environmental, and ethical perspective.

POLITICAL ANALYSIS

The politics of fishing quotas has evolved in the United States over the last 20 years. Through a series of legislative acts and court decisions beginning in 1976, the United States established jurisdiction over its fisheries and produced a legal framework which made fishing quotas possible. The increasing political activity surrounding fishing quotas can be traced to various interest groups. IFQs have divided the fishing industry while even pitting environmental interest groups against each other. Much of this activity has directly influenced the provisions about fishing quotas in the recently passed Sustainable Fisheries Act of 1996.

Relevant Legislation

In each of the last three decades, the U.S. has passed pieces of legislation that have had a direct impact on the establishment of IFQs in the halibut fishery of Alaska. In 1976, Congress passed the Fishery Conservation and Management Act (FCMA), also called the Magnuson Act named after Senator Warren Magnuson from Washington state. The Northern Pacific Halibut Act of 1982 paved the way for fishing quotas, while amendments to the Magnuson Act, renamed the Sustainable Fisheries Act, limited their use.

Fishery Conservation and Management Act (FCMA)

The FCMA, passed as the Magnuson Act in 1976, established U.S. fisheries jurisdiction to 200 miles from the coast. Several events of historical significance led to the passage of the Magnuson Act. President Harry Truman issued a proclamation in 1945 claiming jurisdiction over the natural resources of the continental shelf adjacent to U.S. waters. In light of the Truman Proclamation, "Chile and Peru first established the 200 mile claim in 1947 to prevent the Japanese from further exploiting their whaling grounds. In 1952, Ecuador followed suit by extending their domain to 200 miles" (Kalo et. al. 1994).

Because of this move towards more national sovereignty, the International Law Commission with sponsorship from the United Nations General Assembly drafted four law of the sea treaties. "The first U.N. Conference on the Law of the Sea (UNCLOS I) met in Geneva in 1958 to consider these proposals, which were later adopted by the more than

80 nation delegation" (Kalo et. al. 1994). Although the Geneva Convention contained wording on fisheries jurisdiction and recognized the Truman Proclamation, the "conference failed to settle the issues of territorial sea breadth and fishery management authority" (Jacobsen and Davis 1983). Because the U.S. was already the supreme naval power, the U.S. wanted the territorial sea to remain at 3 miles, while other countries supported the extended 200 mile limit. These issues remain unresolved even after a second Law of the Sea Conference (UNCLOSII) held in Geneva in 1960.

A third Law of the Sea conference (UNCLOS III) began discussions in 1973 and eventually adopted a treaty in 1982. The treaty established an exclusive economic zone (EEZ) of 200 miles for coastal nations. Although the U.S. did not sign the UNCLOS III treaty, President Reagan eventually adopted the 200 mile EEZ in 1983. The Magnuson Act had already established fisheries jurisdiction to 200 miles while Reagan's executive order included all other marine resources. In fact, the United States did not sign UNCLOS III because of deep-sea mining provisions that were not advantageous to U.S. interests. The U.S. was also concerned about treaty provisions that affected strait passage, navigation, and innocent passage for warships.

Around the time UNCLOS III began discussions in 1973, the "IPHC was showing great concern about increasing trawling activity in the Gulf of Alaska and Bering Sea by Russian and Japanese fishermen" (IPHC 1975). The Commission, believing that the foreign trawl fishery was a threat to the health of the halibut stock, proposed trawling restrictions to reduce the incidental catch of halibut. Japanese fishermen adopted the proposals, but the Russians were much more hesitant. This increase in foreign fishing coupled with a cloudy international agreement on ocean jurisdiction prompted Congress to pass the Magnuson Act. Although U.S. fishermen had an abundant resource near its coastlines, "the domestic harvest remained stable while the foreign harvest increased tremendously, resulting in a significant fish trade deficit" (Jacobsen and Davis 1983).

Aside from claiming fisheries jurisdiction to 200 miles, the "FCMA also established a management scheme designed to regulate fishing within the fishery conservation zone (FCZ) through the development of fishery management plans for the various fisheries" Jacobsen and Davis 1983). Eight regional management councils draft the fishery plans with input from federal, regional, state, and local interests. These management plans must conform to seven National Standards and be approved by the Secretary of Commerce. The seven National Standards are:

1. Conservation and management shall prevent overfishing while achieving the optimum yield from the fishery.

2. Conservation and management shall be based upon the best scientific information available.

3. To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks shall be managed as a unit or in close coordination.

4. Conservation measures shall discriminate between residents of different states. Allocations shall be fair and equitable, promote conservation, and prevent any entity from acquiring excessive shares.

5. Conservation measures shall promote efficiency and not have economic benefit as its sole purpose.

6. Conservation management shall take into consideration variations in fisheries resources and catches.

7. Conservation measures shall minimize costs and avoid unnecessary duplication. (Standards summarized from the 50 CFR 602.10-602.17).

These seven National Standards form the basis of the management plans authorized by the Magnuson Act. The act, which authorized the Council and the Secretary to impose permit requirements and to establish limited access systems, laid the foundation for the use of IFQs as a fishery management tool.

The Northern Pacific Halibut Act

Because the U.S. and Canada had recently established 200 mile EEZs, the IPHC found it necessary to amend their 1953 convention with a protocol in 1979. The 1979 Protocol provided authority to: "establish regulatory areas and seasons, limit catch quantity, regulate vessel departure, license vessels, regulate gear, and close nursery grounds" (Hoag et. al. 1993).

In addition to these provisions, the Protocol abolished halibut fishing privileges between the two countries. The provision displaced many Canadian fishermen from the fishery in favor of U.S. fishermen, greatly reducing Canada's percentage of the landings. "Canadians landed an average of 24.3 million ponds annually during 1960-1978, which amounted to almost 50 % of the average coast-wide harvest. Following the phase-out of Canadian fishermen in U.S. waters, Canadian landings averaged only 9.1 million pounds during 1981-1990 or 17 % of the average coast-wide harvest" (McCaughran and Hoag 1992). With this displacement, U.S. vessels entered the fishery at an unregulated rate,

focusing more vessels and more technology on the fishery. More vessels and improved efficiency greatly reduced the number of days necessary to take the annual catch.

Passed in 1982, the Northern Pacific Halibut Act was the "U.S. enabling legislation that gave effect to the Protocol and provided authority to the Secretary and the Regional Councils to develop regulations which are not in conflict with IPHC regulations" (Hoag et. al. 1993). The Act also gave the Secretary the authority to allocate fishing privileges among U.S. fishermen and also provide a fishery to coastal villages in the Bering Sea. These aspects of the Halibut Act provided the necessary authority for the NPFMC to establish an IFQ management regime for the halibut fishery. In addition, the Council now had authority to establish the CDQ program for Western Alaska coastal communities. The Halibut Act also specified requirements for U.S. representation on the Commission and also defined penalties for violations, funding, and enforcement.

The Sustainable Fisheries Act

Legislation to amend the Magnuson Act was introduced in both chambers of the 104th Congress on January 4, 1995. The House of Representatives passed their version of the bill with strong bi-partisan support on October 18, 1995. The House version included a 5-year moratorium on new quota programs and called for a thorough study of the issue. In the Senate, the ITQ issue prompted a standoff between Alaskan and Washington state senators which delayed the bill for months. A compromise on ITQs was eventually reached in the Senate, however, the deal upset key members of the House including Don Young of Alaska and George Miller of California. The delay pushed the final vote in the House very close to election time and both chambers wanted to get the legislation passed before the election. In addition, the senators from Washington state threatened to kill the bill by filibuster if members of the House altered the compromise and sent the bill back to the Senate. Because of the Senate delay, the threat of filibuster, and the desire to get the bill passed before the election, the House was basically forced to accept the Senate version of the bill which included the brokered compromise. President Clinton signed the Sustainable Fisheries Act (SFA) into law on October 11, 1996, making it Public Law No: 104-297. Aside from the quota issue, the SFA also included several environmental provisions designed to reduce bycatch, prevent overfishing, reduce fishing capacity, and provide fisheries disaster relief.

One amendment of the SFA prevents the Councils and the Secretary from implementing any new IFQ programs until after September 30, 2000. The moratorium

only applies to quota programs approved after January 4, 1995, therefore, the halibut IFQ program would still be allowed to proceed. In the meantime, the National Academy of Sciences (NAS), in concert with the Secretary, Councils, and others, must submit an IFQ report to Congress by October 1, 1998. The report must consider domestic and foreign IFQ programs already in place as well as alternative management strategies. The report must also address "quota transferability, foreign ownership, processor quotas, enforcement, economic impacts, and capital gains revenue" (Internet 10/27/96). The amendments requires the Secretary to allow the Councils to impose up to a 3 % fee on the annual ex-vessel value of IFQ fish harvested to pay for management costs. The Councils may reserve up to 25 % of these fees to pay for loan obligations for quotas for small vessel operators and new entrants to the fishery. The NPFMC must use the full 25 % for these purposes in the halibut and sablefish IFQ programs. The amendments also require the Secretary to collect fees to pay the actual costs directly related to the management and enforcement of any IFQ program (Internet 2 1996).

Although the SFA restricts new quota programs, provisions of the act clearly indicate that industry will be required to pay for IFQ implementation. Management and enforcement costs, as well as small vessel loans will be paid for through a series of fees and taxes. These fees and taxes will help offset the SFA spending provisions required to administer the Magnuson Act through the year 2000. Once the quota moratorium expires in the year 2000, this system of fee collection will still be in place.

Under the SFA, the "average annual authorization for all fisheries during this time period is roughly $150 million per year" (Internet 2 1996). Implementation and enforcement costs of the halibut and sablefish IFQ programs will reach an annual figure of about $ 4.5 million. Two units of the NMFS, "the Restricted Access Management (RAM) Division and the Office of Administrative Appeals (OAA), spent over $1.5 million in 1995 for initial implementation of the halibut/sablefish IFQ program" (NMFS 1996). Table 2 shows the change in implementation costs from 1993 to 1995. Enforcement and start-up costs for the NMFS will be just over $3 million, with the annual recurring cost being about 2.7 million for enforcement (NMFS 1996). Table 3 illustrates the breakdown of enforcement costs. Part of this money will be used to place observers aboard halibut vessels to monitor the catch and ensure regulatory compliance.

Table 2. ITQ Implementation Costs

Expense Category	FY93	FY94	FY95
Personnel (1)	18.0	433.4	567.1
Travel (2)	2.4	41.4	87.5
Printing		17.7	18.4
Mailing/freight (3)		46.2	73.5
Telephone (4)		50.0	60.0
Office Supplies (5)	2.1	50.0	40.0
Equipment (6)			
Office (computers, furniture, etc.)		98.6	11.1
Transaction Terminals			275.0
Contractual Services			
Computer Programming (7)	57.1	329.2	322.2
Appeals Officers (8)			87.2
Totals by Fiscal Year	**79.6**	**1066.5**	**1542.0**

Table 3. ITQ Enforcement Costs

$2,500,000. - salaries and benefits
$ 250,000. - stations, equipment, vehicles
$ 200,000. - initial training and travel
$ 82,000. - patrol and investigative costs
$ 20,000. - general admin.
$3,052,000. - total (recurring and start up)

In addition to IFQs, amendments to the SFA also call for the establishment of the Harold Sparck Memorial Community Development Quota (CDQ) program for western Alaskan communities. The purpose of the CDQ program is to ensure that rural native villages have the opportunity to participate in the groundfish harvest in the Bering Sea. This will include the halibut fishery as well as any other fishery in the Bering Sea. A portion of the halibut TAC is set aside for the villages that meet the criteria developed by the Governor of Alaska and approved by the Secretary. These villages are small communities that use the halibut for subsistence purposes and do not require a large portion of the TAC.

Differences between the House and Senate versions of bill 39 with respect to IFQs illustrate the political volatility of the quota issue as well as the power of the

environmental movement around election time. By amending Section 303 of the Magnuson Act, the House authorized the Councils and the Secretary to establish IFQ programs. With the passage of the Pacific Halibut Act in 1982, Congress had already given authorization to the NPFMC to establish the halibut ITQ program. The House bill called for an extensive study of the issue and prohibited any new quota programs until the study was complete. The bill called for a "fair and equitable allocation of IFQs, adequate enforcement, and the minimization of social and economic impacts to local communities" (H.B. 39, 104th Congress October 19, 1995). Many of these quota provisions in the bill were modeled after the halibut ITQ program. When allocating quotas, the Council had to consider issues of: conservation, present participation, economics, and the cultural and social framework of fishing communities.

The house bill was sponsored by Resources Committee Chairman Don Young, a pro-development, anti-environmental Republican from Alaska. Ranking Committee Democrat George Miller from California also supported the bill because of the strong environmental language. Miller wanted the bycatch reduction measures and was also fearful of the domination of industrial interests. Miller got an amendment passed which prohibited the sale, transfer, or lease of quota shares. The bill drew criticism from Washington state's congressional delegation because they contended that the conservation measures and the quota provisions would favor Alaska's fishing industry over the Seattle based factory trawler fleet. All 9 of the Washington representatives originally voted against the bill. Young, normally against environmental protection, ironically had to agree with Miller on the bill because of his concerns for the fishing industry in Alaska. "Young sponsored the bill, but is no fan of regulation in general and environmental regulation in particular" (Palmer 1995). Don Young has historically been skeptical of anything that limits state jurisdiction in favor of federal control. Young knew that trawling operations were decimating Alaskan fisheries, particularly halibut, because of large bycatch and discard. Young also knew that without tight restrictions on quota transferability, the Alaskan shore-based processors would lose out to the Seattle factory trawlers once ITQs became more widely used. During his introduction of bill 39 to the House chamber, Young cited the "inclusion of stronger language addressing the bycatch issue and the unique needs of certain rural Alaskan fishermen" (CR 1/4/95).

Normally in favor of development interests over environmental or Native American concerns, Young reversed his usually pro-development stance during the Magnuson re-authorization. Young insisted on amendments to Magnuson that addressed environmental issues like overfishing, bycatch reduction, and habitat protection. In addition, Young also gathered support for the CDQ program which set aside portions of various fisheries for

Native Alaskan communities. With a small voting population in Alaska and Young often in close re-election races, Young found himself trying to appease as many voters as possible by supporting both environmental and Native American issues. By protesting ITQs while supporting the CDQ program and the environmental provisions of the Magnuson re-authorization, Young looked favorable to a wide array of Alaskan interests which helped to secure his re-election.

The Senate initially took a similar approach to fishing quotas in their draft of the bill. Originally, Alaskan Senator Ted Stevens suggested a five-year moratorium on new quotas as well as further study of the issue. Stevens said that "the proposal would offer the middle ground on the controversy and allow the bill to move forward" (Glass 1996). Stevens wanted to get Magnuson re-authorized to help his re-election chances in 1996. As a member of the Senate Appropriations Committee, Stevens had been very busy during the legislative session with budget issues. Stevens won re-election in 1996 and in 1997 became Chairman of the Appropriations Committee, one of the most powerful positions in the Senate.

In addition to Stevens, Alaska Senator Frank Murkowski, normally an ardent supporter of economic interests, also expressed his concerns about the impact of ITQs on Alaskan communities. Murkowski also wields some power on Capital Hill as Chairman of the Senate Energy and Natural Resources Committee. In a letter of response to a fisherman from Kodiak, Murkowski said the risks of the ITQ program were too great for his approval. Murkowski went further in the letter by saying that "shifts in landing patterns or a loss of jobs through too-rapid consolidation could have disastrous impacts in small communities where economic well-being can be seriously affected by these changes" (Murkowski 1992).

Senators from other coastal states, also in need of a boost for their re-election campaigns, supported the 5-year quota moratorium. "Senator John Kerry of Massachusetts, one of Magnuson's biggest players, is also facing a tough re-election and wants to use Magnuson as a notch on his legislative belt" (Glass 1996).

However, because of concerns expressed by Senators Gorton and Murray from Washington, a compromise on the quota issue had to be negotiated. The standoff between Alaskan and Washington state fishermen over how to divide the fish supply delayed the bill for months (Freedman 1996). One point of controversy involved crab quotas. Currently, Washington's trawler fleet harvests the majority of crab in Alaskan waters. Stevens believed that Seattle's trawlers were taking too much of the crab catch while damaging benthic habitat in the process. Stevens wanted some of the crab harvest left for Alaskans, but Gorton objected. Under threat of a filibuster, Stevens and Gorton worked

out a compromise on the crab quotas. The deal required Washington state crabbers to set aside 7.5% of their catch for Alaskans, but this level would be phased in over three years.

Expanding the use of ITQs also caused heated debate during Magnuson re-authorization. *Congressional Quarterly* reported that "a deep difference remained on the issue of whether Congress should employ the concept of transferable quotas" (Carney 1996). They further reported that "the concept provokes passionate debate and could lead to a filibuster led by Washington Republican Senator Slade Gorton" (Carney 1996). Gorton, hoping to appease Seattle's factory trawler fleet, proposed an amendment to speed up resumption of the quota program in 3 years instead of 5, but the proposal was rejected. In the end, however, a compromise on the quota moratorium was also reached. Because of objections by Gorton and Murray, Stevens agreed to shorten the quota moratorium from 5 to 4 years. Without these compromises, the bill to re-authorize Magnuson may have been dead on the Senate floor. Because of the bill's popularity and the debate that delayed the bill until near election time, Gorton and Murray were able to get their language into the bill before it passed.

Although the bill unanimously passed the Senate and overwhelmingly in the House, members of the House were extremely upset over the watered down quota provisions in the Senate version of the bill. Miller and Young both expressed their dissatisfaction with the quota provisions in the Senate bill. Miller cited the environmental and small business implications of the Senate quota provisions and eventually voted against it. Young was equally pessimistic but ended up supporting Stevens and voted for it. "Frankly, I'm not enthused, but I think Senator Stevens did all he could against tremendous odds" (Freedman 1996). The Washington state House delegation reversed their earlier positions, voting for the Senate version because of the compromise worked by Gorton and Murray.

Industry representatives also expressed concern over the late inning tactics used in the Senate. Zeke Grader, executive director of the Pacific Coast Federation of Fishermen's Associations, preferred the House version because the Senate amendments weakened the bill. "The House let themselves be rolled by the Senate...their bill was better than the Senate version" (Waterman 1996). Others felt that the politicians were catering to special interests which changed the national focus of the bill. John Dunnigan, director of the Atlantic states Marine Fisheries Commission, said the micro-management on the part of Congress was a bad sign (Waterman 1996).

The SFA got the traditional support from Democrats on the left wanting to protect the environment as well as support from Republicans on the right wanting to safeguard commercial fishing. The environmental movement, particularly fisheries concerns, has provided a common ground for bi-partisanship. With re-election in the near future, the

SFA enjoyed bi-partisan support as members of both houses were eager to cast their "green" vote of the session for this important piece of environmental legislation. Many of the new House members were genuinely concerned about environmental issues. According to sources, "many of the freshmen reps were apparently influenced by the arguments of environmental groups" (Glass 1995). The bi-partisan passage of the SFA illustrates how the environmental movement can influence Congress, while the quota provisions in both versions of the bill indicate the controversy over ITQs.

Environmental legislation no longer has to come at the expense of the economy. This is due to the widespread realization within the fishing industry that the harvest depends directly upon the health of the stock. Re-newable resources like agriculture and forestry could also make similar claims that environmental protection through regulation also provides economic stability. In order for fishermen to make money, they also have to be conservationists. The existence of this common ground will be the basis for any future compromises on fishery management and policy. The common ground may also be the only way to conserve depleted stocks and ensure jobs in the fishing industry at the same time.

Interest Group Activity

Greenpeace, with 5.2 million members worldwide, recently hung a banner over Yaquina harbor in Newport, Oregon to protest the use of fishing quotas in the groundfish and crab fisheries. Smaller groups like "Defenders of wildlife even boast over 100,000 members" while the "National Geographic Society claims to have supported over 5,000 explorations and research projects since it began in 1890" (DeSilvestro 1995 and NGS 1995). Budgets for some of these environmental groups can be in the tens of millions of dollars. Environmental interest groups have used active memberships along with their subsequent budgets to influence policy since the late 1960's.

Recently, much of the environmental movement has been directed at the fishing industry. While many fishing industry members as well as politicians have suggested ITQs as a solution to the problems of an overcapitalized fishery, green groups have expressed their reservations about fishing quotas. Fears and concerns about conservation, privatization, quota consolidation, and implementation costs led environmental groups to testify against fishing quotas at a hearing before the House Subcommittee on Fisheries Management. The strength of the environmental movement, when allied with some sectors of the fishing industry, was obvious to Congress as the House version of the bill restricted

quota transferability while the Senate version went further and imposed a moratorium on new quotas.

Ideology and Activism

One strength of an environmental interest group lies in the activity of its members, many of whom are responding to intense feelings about specific ideals. Active membership can be characterized by door to door grass-roots lobbying or protests, such as the one in Newport. Because many of the factors motivating these groups are purposive rather than material, their members are often acting on intensity. Emotion plays a large role. James Q. Wilson argues that "the dramatic increase in the membership of civil rights, environmental, and feminist organizations that occurred in the 1970's could not be explained entirely or even largely by the ability of such groups to exert social pressure or supply selective benefits...to some extent, members were responding to purposive appeals" (Wilson 1995).

In addition to emotion, the writings of early environmental philosophers also influenced the ideology of the environmental movement. The "Laws of Ecology" in the Greenpeace Declaration of Interdependence seem to follow the ideas Aldo Leopold's *Land Ethic*. Leopold believed in the "interrelatedness of nature and its intrinsic value thereby making it worthy of protection from anthropocentric domination" (Leopold 1949). Leopold also said that a land action is right "if it tends to preserve the integrity, stability, and beauty of the biotic community" (Leopold 1949). The laws also stress that the stability of an ecosystem increases as it becomes more diverse.

Along with emotion and philosophy, Martin Lewis suggests "ruralism" as another motivating factor of the radical environmental movement. "Suspicious of the city, dismissing industrialism, and disparaging trade, most radical environmentalists hope to recreate a rural, agrarian society" (Lewis 1992). Technology has drastically changed the fishing industry. On-board computers can tell a ship captain exactly where a school is located. The technology explosion during the 1980's in the halibut fishery allowed fishermen to harvest the ocean at an increased rate. Harvest rates began to increase in the mid 1980's, only to decrease in the early 1990's. (IPHC 1993). Technology is seen as hastening the destruction of our natural resources. According to Greenpeace, "industrialized fisheries are also seen as a cause of overfishing because of their use of improved fishing and processing technologies and of marketing strategies to develop a global market" (Anderson 1995).

Memberships and Budgets

Although emotion and ideology are the primary factors that motivate members of environmental groups, these groups also generate large budgets that help them to further exert their influence. The National Geographic Society has about 10 million members which can obviously support a large budget. With 1.6 million members in the United Sates alone, Greenpeace claims an annual budget of $37 million. (Roberts 1996). Although budgets of this size could probably directly buy political clout through campaign donations, Greenpeace does not endorse political candidates and does not accept corporate donations. However, industry groups usually have much larger budgets than environmental groups and often use their resources to support political candidates.

Lately, much of the Greenpeace budget has been directed at marine issues. In 1996, Greenpeace spent about "$5.5 million on Magnuson re-authorization, roughly 15 % of its annual budget." (Roberts 1996). In addition, the 1992 Greenpeace Financial Report indicates that their ocean ecology program constitutes the largest line item expenditure in the budget. (Greenpeace 1992). With this kind of financial backing, environmental groups can sustain intense grass roots lobbying efforts as well as lobbying on Capitol Hill in order to influence Congress. In addition to lobbying, these groups can also fund scientific research and stage public protests.

Environmental groups and the Media

The standing of environmental organizations in public opinion and their coverage in the press are essential to their maintenance and success. Large memberships and big budgets allows for these groups to reach more people through advertisements and mailings. In addition, because of their influence, their actions are quick to receive press coverage. Free media attention can have a huge impact by exposing large numbers of people to a particular environmental issue. A recent protest by Greenpeace in Seattle's Lake Union resulted in extensive television and print coverage. Inge Andreasen, Director of operations for American Seafoods, who opposed the protest, had to concede that the Greenpeace action achieved victory because of the publicity they received. According to Andreasen, "they came for the publicity and they got it" (Swenson 1995).

Although press coverage is nothing new to environmental groups, many still disagree as to the extent that the media, especially television, influence public opinion. David Ricci states in his book, *The Transformation of American Politics*, that "public

opinion is not necessarily shaped by the intent of a news broadcast, but also by the way the television conveys information" (Ricci 1993). The biases of the reporter can have an effect on the viewer. Distortion of information by the media is a problem for the environmental movement. The general public is already at a disadvantage when it comes to scientific information and this can be exacerbated by media misunderstanding or misrepresentation. This is especially true of fishery information because it is not an exact science and may be passed to the public through the television thereby creating a cloudy picture of the real situation. For example, the media may portray the tactics used by environmental groups as being too radical or based solely on emotion and not fact. This can have a negative impact on the environmental movement by alienating those in the mainstream who may otherwise be supportive of the cause. However, the environmental movement usually receives a fairly positive response from the media because the general public, for the most part, supports environmental causes.

Opposition to Fishing Quotas

The political power of the environmental movement can also be traced to the relationships between environmental interest groups. By working with each other, these groups can effectively pool their resources to accomplish an objective. "The Marine Fish Conservation Network, a coalition of nearly 100 fishing and conservation groups, worked with Greenpeace to protest IFQs during the recent Congressional hearings on Magnuson re-authorization" (DeSilvestro 1995 and Greer 1995). The views of environmental groups with regard to fishing quotas range from strong support to strong opposition.

Greenpeace has been the most outspoken environmental critic of fishing quotas. They oppose the idea of "privatizing a common resource and think that the government cannot maintain its stewardship duties if the resource is in private hands" (Anderson 1995). They also believe that "fishing quotas do not have conservation oriented objectives because they are largely profit driven" (Greer 1995) Greenpeace also argues against quotas on the basis of fairness because large corporations will have more financial resources to buy fishing rights. They further believe that this situation will cause "fleet consolidation, job loss, and lower wages to occur mostly at the expense of small scale operations if quotas are implemented" (Anderson 1995). The group is also concerned about policies that reward "dirty fishing" and promote waste. "Greenpeace has long argued that quota-share systems will reward dirty vessel owners who have racked up big catch histories without worrying about bycatch. The group also contends that ITQs

encourage high-grading and over-exploitation of higher yield fishing grounds" (Warren 1995).

Although Greenpeace actively opposes ITQs, other groups like the Center for Marine Conservation (CMC) and the World Wildlife Fund (WWF) take a more centrist position with regards to fishing quotas. According to Anderson, "the WWF and the CMC advise prudence, caution, and cooperation in the implementation of ITQs" (Anderson 1995). They also believe that conservation should be the main objective of any management strategy and feel that the recipients of quotas should pay for implementation through taxes. These groups also express concern about the 5th amendment takings issue if the quotas are reduced or the program is scrapped. Although the CMC has expressed caution towards fishing quotas, they have openly expressed opposition to ITQs when soliciting donations. The CMC explains privatization of our oceans and then states, "that's why the CMC urgently needs your help to stop ITQs now. We need your gift-- the most generous you can possibly make" (Anderson 1995).

Proceeding along the ITQ continuum, the National Coalition for Marine Conservation (NCMC) takes a more positive look at ITQs by focusing on the potential conservation benefits of the program. "They believe access control measures should be considered along with other types of management and if they address conservation issues, they should be considered for adoption" (Anderson 1995). The NCMC acknowledges the problems of quota management, but are not overly concerned about establishing rights to the fishery if they help achieve conservation goals. They also recommend a tax on quotas to help pay for management costs. They also state that the "rights must be exclusive, defensible, enforceable, transferable, and flexible if they are to provide conservation incentives to the owners" (Anderson 1995).

Aside from quota opposition from environmental groups, several fishing industry interest groups also oppose ITQs. Most of these groups protest fishing quotas because of fears about corporate takeover, higher costs, and environmental concerns. The Deep Sea Fishermen's Union (DSFU), the oldest organization of skippers and crewman in the North Pacific founded in 1912, believes that the halibut quota program has "no concrete measures under consideration that would serve to protect the fishermen themselves from bearing the potential long-term social and economic costs of the proposed action" (Petterson 1992). The union does not oppose the allocation procedure of the quota program because they believe they are entitled to a permanent appropriation of the fishery. However, they contest the program because the future entitlement costs will be realized by the "crew share" or the fishermen, not the investor or vessel owner. The crew share is basically the portion of money generated from the fishing trip that is paid to the crew

members. If costs increase under the ITQ program, the quota share holder may compensate himself for these increases by giving less of the profit to the crew. "A declining crew share would, in turn, threaten the economic welfare of the fishermen, the social fabric of the fishing community, the health and safety of future fishermen, and the very viability of their union" (Petterson 1992).

The North Pacific Fisheries Protection Association (NPFPA), a group founded to protest ITQs, "issued several press releases alleging that any corporation could fashion sales agreements that would really be complex lease agreements, and thereby end up controlling the fishing fleets" (Matsen 1995). In a 1992 letter of response to Secretary of Commerce Barbara Franklin regarding the quota program environmental impact statement (EIS), the NPFPA cited inadequate consideration of alternatives as well as environmental impacts as reasons not to implement the ITQ program. Also in 1992, the United Fishermen's Marketing Association wrote a letter to NMFS Director Steve Pennoyer saying that the quota EIS did not sufficiently address the economic, social, or biological impacts of the halibut ITQ proposal. They further stated that the ITQ proposal would "transfer wealth far in excess of $100 million and should be considered a major rule under Executive Order 12291" which requires a more thorough environmental impact statement (Stephan 1992).

The processing sector has also expressed opposition to the current ITQ program. This opposition comes from shore-based processors who fear losing out to at-sea processors because these operations also harvest as well as process fish and will be given quota shares for their harvest portion. These quota shares can be used as capital for the purpose of investment. Because shore-based processors will not receive quota shares, they may not be as competitive. "The at-sea processors, with their new collateral, will have a competitive advantage in securing loans to buy quota shares that would have been processed by the shore-based sector" (Rettig 1993). Because of this situation, many shore-based processors are calling for some type of "processing right" that will ensure that they have fish to process. One solution would be to grant an "individual processing quota (IPQ) which would give the processor access rights to harvest fish. This would require that harvesters could only sell their catch to processors holding IPQ" (Rettig 1993). However, a provision for processing quotas was not included in the halibut ITQ program.

Anglers have also expressed opposition to ITQs because of high entry costs and corporate takeover. Russell Cleary, Director of the Commercial Anglers Association, suggests that "ITQs spell the end of the smaller-scale coastal fisherman and will result in the corporate takeover of the resources on which smaller-scale, environmentally benign, fishing operations are dependent" (Cleary 1996).

Even the fishermen's wives have joined in the ITQ protest. Angela SanFilippo of the Gloucester Fishermen's Wives Association says "fishing rights should not be sold to those who do not care about conservation and only care about their bottom line profit" (Warren 1995). She also went on to say that quotas may men the end of fishing communities like Gloucester.

Support for Fishing Quotas

Although most environmental groups either oppose quotas or express caution towards them, the Environmental Defense Fund (EDF) supports ITQs because of the incentives that quotas provide for conservation. They say that "ITQs can improve conservation by eliminating the race for fish, ensure TAC compliance, increase discard survival, and by creating economic incentives for the fishermen to increase the productivity of the fishery" (Anderson 1995). The EDF also notes that the "problems of quota programs such as high-grading, enforcement, and mis-reporting are present with all forms of fishery management" (Anderson 1995). The EDF, like other groups, also wants the beneficiaries of quotas to pay for start-up and management costs. In addition, the EDF also addresses the takings issue by saying that if the quota program is implemented with the understanding that the quota can be revoked, modified, or terminated, then the takings claim is not valid.

Much of the support for fishing quotas comes directly from the fishing industry, particularly those who fished halibut during the qualifying years and stand to make a profit. Many of the letters of support for ITQs written in response to the EIS conducted by NMFS came from individual fishermen. Most of these fishermen believe that fishing quotas will provide fishing safety and help to conserve the resource. "Proponents reckon a quota-share system could halt the race for fish that results in short seasons, dangerous fishing conditions and a wasteful rush to outfish rivals even at the cost of lost gear and heavy bycatch" (Warren 1995). Supporters also believe that quota shares are necessary as an "economic survival kit for vessel owners who are beset by sheer overcrowding and the resulting drop in their earning power" (Warren 1995).

The American Factory Trawler Association has been supportive of ITQs as well. In a recent handout, they stated that "the corporate takeover was the laudable and inevitable result of commercial consolidation and economic efficiency" (Swenson 1995). Jeffrey Pike of United Catcher Boats, a vessel-owner association in Seattle that supports ITQs, recently said that the "proposed limits on quota transferability would be a poison

pill for any fishery that wants to get an ITQ" (Glass 1995). Food companies have also been supportive of ITQs. In a letter to the Secretary of Commerce, Wendell Gilbert of Tonka Seafoods cited "product quality, safety, and resource waste as justification for the ITQ program in the halibut fishery.

Support for the ITQ program has even come from non-traditional sources who would not normally have an interest in fisheries. Jeffrey Moormeier, a financial consultant with Merrill Lynch, supports the quota system as a source of income and investment for financial companies that provide money to help "broker" quota deals.

Litigation

Two court cases, Sea Watch International vs. Mosbacher and the Alliance Against IFQs vs. the Secretary of Commerce and the NPFMC, have been litigated in federal court to contest the legality of ITQs.

In 1991, a United States District judge heard arguments brought by Sea Watch International who claimed that the ITQ program for the surf clam and quahog fishery exceeded statutory authority. They also stated that no precedent for limited access was reflected in the administrative record. In addition, the plaintiffs argued that the ITQ program violated the National Standards under the Magnuson Act. The Court dismissed the plaintiff's suit on the grounds that the Secretary did not exceed statutory authority and also on the grounds that a precedent for IFQs had been set by the Magnuson Act.

In 1995, the Alliance Against IFQs brought suit against the Secretary of Commerce and the Director of the NPFMC charging that the ITQ program for the halibut fishery in Alaska was arbitrary and capricious and violated the statutory authority. The plaintiffs appealed the District judge's decision which sent the case to the Ninth Circuit Court of Appeals. The Circuit judge upheld the ruling of the District court and dismissed the plaintiff's suit against the government. The suit was dismissed on the grounds that the quota regulations implemented by the Secretary and the NPFMC for the halibut fishery were not arbitrary and capricious, or in violation of the law.

Sea Watch International vs. Mosbacher

In 1990, the Secretary of Commerce approved Amendment 8 to the FMP for the surf clam and ocean quahog fisheries of the Mid-Atlantic region. The Mid-Atlantic

Regional Fishery Management Council proposed the amendment for several reasons. The Council was greatly concerned about the "overcapitalization in the surf clam fishery as well as the movement of effort from the clam fishery to the quahog fishery which resulted in a significant increase in the quahog harvest" (Kalo et.al. 1994). Amendment 8 established an ITQ management system for these fisheries. The ITQs were allocated according to vessel catch histories as well as the boat's dimensions.

Because of the new regulation, a group of fishermen and processing companies brought suit claiming that the quotas would cause them severe economic hardship. They stated that "the ITQ system exceeded the defendant's statutory authority and that the decision to limit access to the quahog fishery was unsupported by the administrative record" (Kalo et. al. 1994). They also believed that Amendment 8 violated the National Standards under the Magnuson Act.

The plaintiffs claim that the ITQ system would privatize the resource which is unauthorized by the Magnuson Act and "in conflict with an express prohibition on the assessment of fees in excess of costs" (Kalo et.al 1994). Unfortunately for the plaintiffs, the Magnuson Act did authorize the Council and the Secretary to use permits and quotas for the purpose of access limitation. The quotas do not transfer property rights to the fishermen as they remain under the control of the federal government and can be altered at any time. As for the claim regarding the fees in excess of costs, the statutory prohibition is designed to "prevent the government from using quotas as a revenue-raising measure" (Kalo et. al. 1994). The court found that the transferability of the quotas did not conflict with this purpose. Although fishermen may find that buying quota from other fishermen may prevent their entry into the fishery, this does not mean that the government is generating revenue in excess of costs through the sale of fishing quotas.

The plaintiffs also claim that the ITQ system violates National Standard 4. They contend that the issuance of fishing quotas is arbitrary and capricious under Standard 4 because it "treats similarly situated fishermen unequally, rewards violators of prior regulations, and discriminates against smaller fishing fleets" (Kalo et. al. 1994).

The first concern regarding unequal treatment stems from how the allocations were calculated. The plaintiffs felt that using vessel catch histories instead of individual catch histories ignored the vessel turnover rate in the fishery. This only served to reward those without a history who recently purchased a vessel while excluding those who recently sold their boat. Although they provide a genuine concern, Standard 4 does not require allocation based on individual catch histories.

The plaintiffs also argue that an allocation based on catch history would reward those who cheated on their landing reports. Defendants dismiss this claim by saying that

cheating was so widespread that it was impossible to determine who was in violation of the previous regulations. They also say that this "unfairness is offset by the fact that 20 % of the allocation was based on vessel size, not catch history" (Kalo et.al. 1994).

As for the plaintiff's claim about disadvantages to smaller fishing fleets, the court found that the Council's plan was not intentionally unfair. The defendants contend that small fishermen may have substantial allocations, and that transferability offers some compensation. They also further state that "inherent in an allocation is the advantaging of one group to the detriment of another" (Kalo et.al. 1994).

In addition to the general arguments previously mentioned, the plaintiffs also claim that the inclusion of the quahog fishery in the ITQ program "lacks support in the administrative record and also violates applicable National Standards" (Kalo et.al. 1994). The plaintiffs argue that the Council was wrong to include the quahog fishery in the quota program on the basis that the overcapitalization of the surf clam fishery would eventually occur in the quahog fishery. In order to not be considered arbitrary and capricious, the Council must have an independent and rational basis for its inclusion. The defendants countered by showing that the administrative record indicated that the Council's Scientific Committee suggested several years ago to include the quahog fishery in the ITQ scheme. This inclusion was based on several conservation factors.

Aside from concerns over the administrative record, the plaintiffs also argue that Amendment 8 violated National standards 4, 5 , and 7 with regards to the quahog fishery. National Standard 4 prohibits the consolidation of excessive shares. "Although the defendants acknowledge that increased efficiency due to consolidation was one of the objectives of Amendment 8, the Act contains no definition of excessive shares" (Kalo et.al. 1994). The court rejected the plaintiff's notion because the Council considered the problem by allowing for an annual review of consolidation. The real issue is whether or not this annual review is sufficient to preclude a violation of Standard 4. The plaintiffs also suggest that limiting access to the quahog fishery was in violation of National Standard 5 because its inclusion was based solely on economics. However, the record indicates that the Council had previously expressed conservation concerns about the quahog resource, thereby prompting the Court to reject this notion also. "Finally, the plaintiffs argue that the limited access scheme violates National Standard 7, which states that 'conservation measures shall minimize costs and avoid unnecessary duplication'" (Kalo et.al. 1994). The Secretary is "not required by law to conduct a formal cost/benefit analysis when making a decision on the practicability of a fishery management amendment" (Kalo et.al. 1994). The court rejected the plaintiff's argument because the record shows that the Council did consider the costs and benefits of the quota program for the quahog fishery.

Alliance Against IFQs vs. Secretary of Commerce and the NPFMC

In 1996, the Ninth Circuit Court of Appeals in San Francisco heard arguments from the Alliance Against IFQs who brought suit against the Secretary of Commerce and the NPFMC. The plaintiffs contend that the implementation of the FMP for the halibut fishery in Alaska was arbitrary and capricious and also in violation of statutory authority. They believe that the Secretary failed to take into account the present participation in the fishery when allocating the quotas. "They also point out that the Secretary did not comply with the statutory timetable for issuing regulations" (Internet 1 1996). They also claim that the Secretary's allocation method violated National Standard 4 which mandates that allocations should be fair and equitable.

In order to obtain quota shares for the ITQ program in the halibut fishery, a person must have either owned or leased a vessel that landed halibut during any year from 1988 to 1990.The plaintiffs base their argument on the fact that the final rule was not published until 1993, yet the cutoff year for initial quota allocation was 1990. They believe that this fails to take into account those who fished only in 1991, 1992, or 1993. However, the Council gave reasons for the 1990 cutoff date. They said that the main reason was that extending the cutoff date would "provide an incentive both for additional fishermen to enter the fishery and for previous entrants to adopt extreme fishing methods in order to increase their quota share if the plan was implemented" (Internet 1 1996). This activity would have had a tremendous impact on the race for fish and also made it more difficult and expensive to calculate quota shares.

In addition to this concern, the plaintiffs also argue that the Secretary did not follow timetable guidelines. Although the Secretary was supposed to publish the proposed regulations within 15 days of receipt of the plan, he waited 39 days. The Secretary also only allowed for 38 days of public comment when 60 days was required under the statute. The final rule was promulgated 379 days after the receipt date when it should have been done within 110 days. The plaintiffs "do not contend that these procedural violations deprived the Secretary of jurisdiction to adopt the plan, rather, they argue that the violations pushed what was supposed to be present participation further into the past" (Internet 1 1996). However, the Court dismissed this notion on the grounds that Congress did not explicitly define "present participation" and listed it as only one of the many factors that had to be considered. The Court further said that the entire process , including the EIS, had to take a substantial amount of time and that "present participation cannot therefore prudently be contemporaneous with the promulgation of the final regulations" (Internet 1 1996).

In addition to these concerns, the plaintiffs also argue that the initial quota allocation violates National Standard 4 which states that the allocation must be "fair and equitable to all fishermen". The argument is based on the fact that crew members were excluded from the initial allocation which violates the fair and equitable standard for all fishermen. The plaintiffs believe that the crew members are just as much fishermen as the vessel owners. Although fairness was one criterion for allocation, several other factors including overfishing, efficiency, and conservation also had to be considered. Because of the discrepancies among these objectives, it was necessary to sacrifice each goal to some extent in order to meet others. The Council believed that the allocation was fair because the "vessel owners and lease holders were the participants who supply the means to harvest fish, suffer the financial and liability risks to do so, and direct the fishing operations" (Internet 1 1996). They further state that the "vessel owners and lease holders have a capital investment in the vessel and gear that continues as a cost after the crew is paid from a fishing trip" (Internet 1 1996). Because disadvantaging one group in favor of another is inherent in any allocation, the regulations state that "an allocation may impose a hardship on one group if it is outweighed by the total benefits of another group" (Internet 1 1996). The Court dismissed the plaintiff's notion regarding fairness of allocation and said that the Secretary had authority to sacrifice the interests of some for the benefit of the whole.

Conclusion

The political framework that established the authority to use ITQs for fishery management in the U.S. has evolved over the last 20 years. This framework includes a variety of legislation, interest group activity, and litigation in the court system. Although the Magnuson Act established the statutory authority to implement limited access regimes, there was still some uncertainty with regards to the halibut fishery because it was managed under an international agreement. The Northern Pacific Halibut Act provided the NPFMC with the authority to implement an ITQ system for the halibut fishery. In 1990, ITQs were introduced in the surf clam and ocean quahog fishery in the Mid-Atlantic region. In the Spring of 1995, the NPFMC began using ITQs to manage the halibut fishery. Many felt that some provisions of these quota programs were in violation of the Magnuson Act which resulted in the ITQ issue ending up in federal court. The litigation against the government was dismissed on the grounds that the quota regulations were not in violation of the statute. With the Magnuson Act coming up for re-authorization in the 104th

Congress, the United States now had the opportunity to establish a national policy on ITQs.

Interest group activity played an important role during Magnuson re-authorization. For the most part, environmental groups, small fishing operations, and shore-based processors opposed ITQs while the trawler fleets and larger fishing operations, as well as some environmental groups came out in support of fishing quotas. The division among those in the fishing industry and the environmental movement illustrates the volatility of the quota issue. In addition, the moratorium on new quotas included in the SFA shows how influential the environmental movement can be when it is allied with some sectors of the fishing industry.

Unfortunately, the moratorium on new quota programs will delay the establishment of a national policy on fishing quotas. However, the delay will give the government the opportunity to study the issue further and have more knowledge on which to base a national ITQ policy. The ITQ debate is far from over and will certainly be just as controversial once the moratorium expires and Congress has to re-examine the issue.

ENVIRONMENTAL ANALYSIS

Introduction

Although conservation was not a primary motivation for the halibut ITQ program, quota systems do have several important environmental ramifications. The purpose of this analysis is to determine what conservation effects the halibut ITQ program will have on the environment. Discard mortality has probably been the most often cited conservation concern of quota management. Another environmental issue involves "quota busting" and the impact of ITQs on the TAC. In addition, the safety of the fishing environment will be greatly improved by the use of fishing quotas.

The ITQ program's degree of environmental impact will depend largely on the level of industry cooperation as well as the effectiveness of monitoring and enforcement. The environmental effects of ITQs spurred intense debate on Capitol Hill during the re-authorization of the Magnuson Act, prompting lawmakers to put a moratorium on any new ITQ programs. Aside from the moratorium on new quotas, the SFA also included stronger language on overfishing, habitat protection, and bycatch reduction.

Discard Mortality

Discard mortality is an often reported environmental concern associated with ITQs. Discard mortality can be simply defined as the loss of harvest due to fish being thrown away for one reason or another. Discard mortality can result from several sources. High grading is one of the most common forms of discard mortality. Lost or abandoned gear can also be a source of discard mortality, while bycatch also results in lost harvest.

High Grading

High grading is a source of discard mortality and one of the most serious environmental concerns associated with ITQ management. High-grading is the discarding of lesser value fish for higher value fish once the fisherman's quota has been caught. Depending on prices and demand, fishermen may substitute larger fish for smaller fish or vice versa. If a certain size fish is more in demand and getting a higher ex-vessel price,

fishermen may have an incentive to high-grade in order to maximize the value of their quota (Copes 1986).

Unfortunately, it will be quite difficult to stop the practice of high grading. Under the halibut ITQ program regulations, it is illegal to discard legal sized fish (32 in.) from a vessel when the fisherman still has IFQ available for that area. With the extended fishing season, fishermen now have the time to high grade either small or large halibut to meet price demand. However, unless an enforcement officer is on board, this will be difficult to detect. The IPHC does not have information on how frequently high grading occurs in the halibut fishery.

The degree of high grading is largely dependent on the demand for a certain size fish. The most highly demanded size will get the highest price, therefore fisherman have an incentive to high grade with a price differential. Although the IPHC may not have figures on high grading, prices for halibut under the ITQ program were conducive to the practice. In August, ex-vessel offers for halibut were hovering well above $2.00 per pound, with fish over 60 pounds fetching around $3.15 per pound (Ess 1996). This demand for larger fish clearly presents the fisherman with an incentive to high grade one's catch. If his quota is filled with mostly 60 pounders, he will get a higher ex-vessel price for his catch. Because of the lack of data on high grading, it is impossible to tell what effect the ITQ program has had on the practice even though the incentive to high grade does exist.

High grading has been reported in other ITQ fisheries. In New Zealand, the practice of high grading has been documented in the snapper fishery (Dewees 1989). Others have suggested that the Task Force responsible for managing New Zealand's fisheries has not adequately considered the high grading problem (Monk and Hewison 1994). The TAC and quota management system in the European Union encourages the practice of high grading, which inevitably produces even more bycatch (Karagiannakos 1996). The Australian southern bluefin tuna fishery has also suffered from the problem of high grading (Geen et.al. 1993).

Canada's halibut ITQ program has had mixed results with regards to high grading. Reports indicate that halibut buyers have not been differentiating between sizes, however they also say that the fresh market in Canada prefers smaller fish (Turris 1994). Although Turris does not express this conclusion, it can be assumed from these reports that the incentive to high grade is present to those fishermen targeting the fresh halibut market.

Canada uses a variety of evolving quota programs to manage their other fisheries. Multi-species fisheries are included in these programs and different types of allocations are done for different harvesting sectors. In the groundfish IQ fishery off Nova Scotia, high grading is occurring at the same or higher rates than in the previous competitive quota

fishery (O'Boyle et.al. 1994). In other words, while the various quota schemes used in Canada do promote some high grading, the Nova Scotia IQ system has certainly not improved this problem and, in some cases, has even made it worse. The degree of high grading is probably unknown, however, ITQs clearly have provided some Canadian fishermen with the incentive to do so.

Gear Mortality

Lost or abandoned gear is also a source of discard mortality in the halibut fishery. The ITQ program has been successful in significantly reducing the mortality from lost and/or abandoned gear. The IPHC has collected information on this since 1985. Before the introduction of ITQs in the halibut fishery, mortality from lost/abandoned gear was over 1 million pounds. This figure fell to 355,000 pounds following the introduction of the ITQ system in 1995. (Table 4). In 1994, wastage from lost halibut gear represented from 1 to 3 % of the total removals whereas in 1995, it represented less than 1% (Gilroy et.al. 1996).

Table 4. Halibut Mortality from Lost/Abandoned Gear (000 lbs.)

YEAR	Regulatory Area					
	2B	2C	3A	3B	4	TOTAL
1991	72	347	1,143	418	245	2,225
1992	53	245	643	181	126	1,248
1993	96	192	341	63	113	805
1994	69	228	845	39	107	1,288
1995	58	63	146	26	42	335

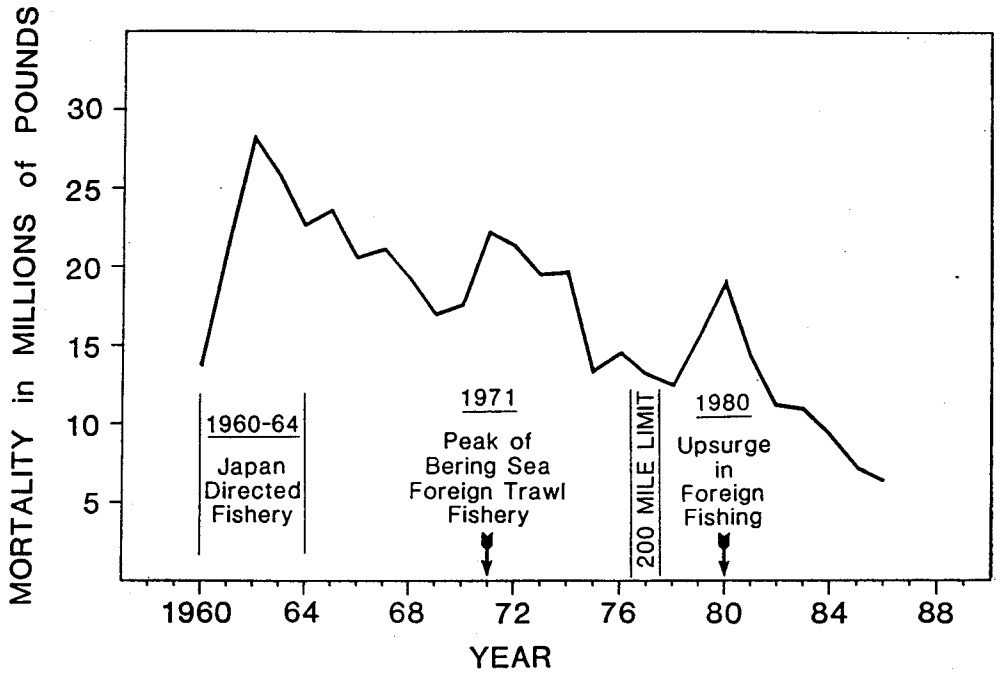
Several reasons can be given for the success in reducing gear mortality. Because of the extended season under ITQs, fishermen can prevent gear problems by avoiding bad weather. Gear conflicts were also reduced under ITQs because of less crowded fishing grounds. Now there is also plenty of time for gear repair or a return to port for backup gear. Because of the short season, gear was often abandoned or cut loose when conflicts arose because there was not time to repair or retrieve it. Unfortunately, when gear is abandoned it still continues to snag fish on the bottom which are ultimately wasted. This reduction in gear mortality due to the ITQ program provides a great conservation benefit

to the halibut stock. In addition, the cost of foregone harvest is saved as well as the cost of gear replacement.

Bycatch

From an environmental standpoint, bycatch is one of the most important fishery issues. Bycatch includes all types of discards and can be defined as the inadvertent take of any species that is not the intended target of the fisherman. The bycatch of groundfish species occurs in the halibut fishery while halibut is a bycatch species in many other fisheries. Trawl and setline fisheries are mostly responsible for the majority of halibut bycatch. Figure 9 shows the historical trends in halibut bycatch. Bycatch mortality peaked at 28 million pounds in 1962, dropped to 7 million pounds by 1985, and has since increased to 16 million pounds in 1994 (IPHC 1995). This obviously represents a large percentage of the total halibut catch.

Figure 9. Halibut Bycatch Mortality



Although the mortality rate of bycatch depends on the gear used and the amount of time taken to release the fish, previous estimates indicate that 25 % of fish die on setline gear with much higher percentages for trawl gear (IPHC 1987).

Several problems arise when trying to compare the effect of ITQs on bycatch rates. Estimates of halibut catch rates in the groundfish fisheries are available from the Observer program, but estimates of halibut discards are not available. Halibut can now be retained in these fisheries, therefore, it is difficult to determine halibut bycatch. For these reasons, it is difficult to determine if the ITQ program has had an effect on halibut bycatch in other fisheries. These bycatch rates probably would not be affected by halibut ITQs anyway. However, if ITQs are eventually extended to other fisheries, a change in halibut bycatch may be seen.

ITQs for the halibut fishery should have an effect on the bycatch of groundfish and sub-legal size halibut. Ideally, the bycatch rate should drop in the halibut fishery because of the more relaxed fishing pace under the ITQ system. Fishermen would now have time to carefully release bycatch species as well as sub-legal halibut, so as not to injure them. However, the IPHC does not have adequate information to make a comparison of bycatch rates in the halibut fishery between 1994 and 1995. IPHC surveys do collect some information on other species landed in the halibut fishery, but distinctions would have to be made between groundfish discarded and groundfish retained (Gilroy et.al.1996). Because of this, the effect of the ITQ system on groundfish discards in the halibut fishery cannot be determined.

TAC Effects

ITQs can have several effects on the TAC. Quota busting has been reported as a potential environmental effect associated with ITQs. Quota busting occurs when fishermen exceed their respective quotas. If this practice is widespread, the TAC for the fishery can be exceeded which could have very negative impacts on the stock. In addition, it has been shown in some quota fisheries that fishermen have often exerted pressure to increase the TAC. The preliminary data on the halibut ITQ does indicate some effect on the TAC, however, it is still too early to establish a trend.

Quota Busting

Quota busting has been suggested as a problem of ITQ management. Quota busting is simply when fishermen exceed their individual quotas. Some argue that quotas actually encourage or provide incentives to overharvest. (Copes 1986, Dewees 1989). The practice of quota busting can lead to overfishing and resource collapse. The tremendous environmental impacts that can result from quota busting defeats the whole purpose of setting a TAC in the first place.

In the first year of the halibut ITQ fishery, the overall catch was significantly below the TAC. Only 86% of the TAC was harvested in 1995. (ACFEC 1996). Although 14% of the possible catch was lost revenue to the fisherman, it is also a large portion of the catch that remained in the ocean. It has been demonstrated through mathematical models that ITQs will have the effect of truncating catches at the quota limit, with the actual catch smaller than the quota (Clark 1985). If realized, this will probably be the most important environmental benefit attributed to ITQs. Although it is too early to tell if this trend will continue in the halibut fishery, it is a good sign that the TAC was not exceeded.

Enforcement data from the NMFS indicates that some degree of quota busting did occur during the first year of the halibut program. During the first year of the program, there were 602 investigations of violations with 60% of those being overages (NMFS 1996). This means that 360 incidents of quota busting were investigated during the first year. NMFS does note that the problem was not widespread and that overall compliance was good. Although the number of investigations may seem high, the problem was not too extreme judging by the unharvested quota.

Actual reports of quota busting are inconclusive on the issue. The Canadian Halibut fishery has had success with TAC compliance while problems have been reported under the New Zealand quota system. TAC management in the Canadian halibut fishery has greatly improved. For the first time since 1979, the Canadian halibut fleet landed less than the TAC, leaving 250,000 pounds in the ocean in 1991 (Turris 1994). The catch was also below the TAC in 1993 and 1994 (IPHC 1995). The New Zealand ITQ fishery system is a different story. Quota busting was reported in the New Zealand quota system. (Dewees 1989). In New Zealand, the incidence of quota busting has recently heightened concerns about the extent of illegal fishing and the effectiveness of enforcement measures (Monk and Hewison 1994). These differences between Canada and New Zealand with regards to quota busting could be attributed to several things such as prices or the differences in monitoring and enforcement. Although some quota busting has been

observed, it appears that both the U.S. and Canadian halibut quota programs have had similar success with overall TAC enforcement.

Pressure on the TAC

Fishermen managed by ITQs have been known to exerted pressure to increase the TAC. Because ITQs essentially privatize the resource, fishermen with their "quasi property rights" now want to have a greater role in management decisions. Fishermen argue that not only do they benefit from the fishery, but they also suffer the consequences during the bad years. Fishermen suffer the costs if the government reduces the TAC and feel they should be compensated for it. They may argue that a "takings" occurred due to the economic harm caused by the government lowering the TAC. Fishermen may further justify the increase in TAC by saying that now because they have a stake in the resource, they will have incentive to manage it soundly.

This has been a problem in New Zealand because the quota system there provides for compensation to the fishermen when the government reduces the TAC. The threat of large compensation claims by quota holders against the New Zealand government has acted as an impediment to reductions in TACs in major fisheries (Monk and Hewison 1994). Orange roughy and snapper fisheries both suffer from excessively high TACs in New Zealand which has led to these stocks being overfished (Monk and Hewison 1994).

Pressure to increase the TAC could occur in the halibut fishery. Because of the unique management co-op for the halibut fishery between the U.S. and Canada, conflicts may arise over the resource when the TAC is reduced. Both countries manage the halibut fishery with ITQs yet the TAC is set jointly for both countries by the IPHC. With ITQs, fishermen from the U.S and Canada both have these informal property rights to the halibut fishery and may claim compensation if the TAC is reduced. In 1991, the Conference Board wanted to raise the Area 2B catch limit to compensate the fleet for quota reductions due to bycatch (ACFEC 1996). In 1991, only the halibut fishery in Canada was under quota management and Area 2B is the management area off British Columbia. Created in 1931, the Conference Board is an advisory panel of commercial fishers and vessel owners that presents industry management recommendations to the IPHC. Although the IPHC rejected the Conference Board suggestion in 1991, the situation does indicate that quota management may present instances where fishermen are exerting pressure to increase the TAC in order to compensate previous quota reductions. Like the situation in New

Zealand, increasing the TAC beyond sustainable levels could lead to overfishing in the halibut fishery.

Data from the first year of the halibut ITQ program has not identified any additional pressure to increase the TAC (ACFEC 1996). Although this problem is worth mentioning because of the environmental consequences that could result, it does not, however, appear to be a big concern in the halibut fishery. The IPHC considers several factors when setting the TAC and the system seems to have enough checks and balances to prevent it from occurring (ACFEC 1996).

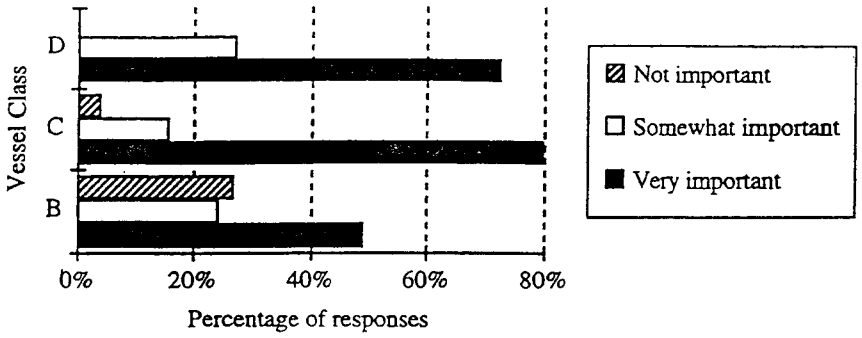
Safety

The safety of the fishing environment will also be affected by the halibut ITQ program. It was hoped that the reduction in fishing effort that results from ITQs would provide fishermen with safer fishing grounds. ITQ management signifies the end to derby style fishing and greatly extends the length of the halibut season. This will provide safety benefits because less boats will be concentrated on the fishing grounds at the same time and fishing trips can now be scheduled around inclement weather. Under open access, the two-day halibut openings resulted in many boats on the same grounds at the same time and often in bad weather. ITQ management will put an end to this problem.

The halibut ITQ program reduced the number of vessels that landed halibut in 1995. The number of vessels was down in most areas and was the lowest since in the six year period from 1990 to 1995 (ACFEC 1996). Drops in the number of vessels from the previous year ranged from 20% in Area 4A to 45% in Area 4C, with a 26% reduction average for all areas (ACFEC 1996). The safety of the fishing environment will benefit from the reduction in the number of boats in the fishery. With less boats concentrated on the fishing grounds coupled with an extended fishing season, fishermen will have a much safer work environment.

ITQs allow fishermen to schedule their fishing trips around bad weather which also contributes to a safer fishing environment. This is particularly important for the smaller vessel classes as weather will adversely affect smaller boats more so than larger ones. Roughly 75 % of Class D and almost 80 % of Class C vessels reported that weather conditions were very important in deciding when to fish for halibut (Knapp and Hull 1996). This figure drops to about 50 % for Class B vessels. See Figure 10.

Figure 10. Importance of Weather when Halibut Fishing



By examining the U.S. Coast Guard search and rescue (SAR) report for the halibut fishery, one can see that the ITQ program has resulted in safety benefits for the fishermen. Table 5 indicates the decrease in search and rescue cases in 1995 as compared to other derby years in the halibut fishery.

Table 5. U.S. Coast Guard Search and Rescue Statistics

YEAR	TIME	NUMBER OF SAR CASES
1992	08-09 JUN	7
	07-09 SEP	13
	05-07 OCT	3
		TOTAL 23
1993	10-11 JUN	15
	08-10 SEP	11
		TOTAL 26
1994	06-07 JUN	14
	12-14 SEP	19
		TOTAL 33
1995	15 MAR - 15 NOV	15
		TOTAL 15

In addition, no deaths were reported in 1995 and only one fisherman was injured (ACFEC 1996). The Coast Guard reports that the drop in cases indicates that fishermen have been choosing periods of fair weather to fish which confirms that the ITQ system provides a framework where fishermen have control over safety issues. The ITQ program

allows consideration for such variables as market conditions, vessel size, experience of crews, and the weather forecast when planning fishing trips (ACFEC 1996).

Degree of Impact

The degree of environmental impact from ITQs will depend on several factors. The sense of stewardship among the fishermen will dictate their level of cooperation with quota regulations. In addition, the effectiveness of monitoring and enforcement programs will provide fishermen with incentives to follow environmental guidelines.

Stewardship

Stewardship is the notion that fishermen should harvest the resource in a long-term, sustainable manner that promotes conservation of the resource. In order for a quota system to be successful, fishermen must consider what effect their fishing methods will have on the environment. It has been shown that ITQ systems do instill a greater sense of stewardship towards the fishery because quotas give fishermen a stake in the resource which necessitates that they fish with conservation in mind (Pearse and Walters 1982, Dewees 1989, Turris 1994, McCay 1995, and Hanna 1995). Likewise, it has also been demonstrated that ITQ programs provide fishermen with an incentive to cheat on their quotas which could seriously impede stewardship towards the resource (Copes 1986, Dewees, 1989, O'Boyle et.al. 1994, Monk and Hewison 1994, McCay 1995, Hanna 1995, and Karagiannakos 1996).

In regards to the halibut ITQ program, it appears that stewardship has not been a significant benefit after the first year. Although overall compliance with regulations was considered good during the first year, fishermen did commit some violations. It is still too early to tell if the ITQ program will actually have a positive effect on stewardship in the halibut fishery. A better sense of stewardship may evolve in the halibut fishery once the industry adjusts to the new quota program. This issue is further discussed in the ethical section of this analysis.

Monitoring and Enforcement

The environmental effects of the ITQ program will also be dependent on the system of monitoring and enforcement that is put into place. An effective monitoring and enforcement program will not only act as a deterrent to breaking the rules, but may also help to promote a greater sense of stewardship among the fishermen.

The Council included several mechanisms into the ITQ program to provide adequate monitoring and enforcement of the quota regulations. The task of enforcement falls on the shoulders of both the Coast Guard and the NMFS. The Coast Guard is responsible for monitoring at-sea activity while the NMFS will conduct shoreside enforcement.

The monitoring and enforcement plan consists of several parts which include patrol, monitoring, audits, investigations, and education. Shoreside patrol is conducted by Fishery Patrol Officers (FPO) who are expected to check landing and processing locations as well as shipping and marketing centers. The Coast Guard also patrols the fishing grounds and may board vessels at random in order to detect any illegal activity such as high-grading. Monitoring will consist of inspecting landings and shipments as well as checking vessels that are required to get clearance for transshipment. Processing operations will also be monitored. Verification of compliance can also be obtained by performing an audit of fishing activity. Audits may be conducted either on a scheduled basis or at random and may be done on a single vessel or an entire processing plant. Although an audit may be an effective way to detect illegal activity, they are costly and time consuming which will prevent their widespread use. Investigations of illegal activity will also be performed to ensure compliance. Ownership cap violations, illegal shipping or sale of ITQ fish, and fraudulent applications for shares will all be investigated to make sure the program runs smoothly. Education will also be used to enforce regulations and to help promote voluntary compliance within the industry. This will be accomplished through public workshops and town meetings as well as through a policy of explanation and fixing mistakes when they arise.

Violations of environmental regulations can result in a downward adjustment of next year's quota or possibly a revocation of the quota in its entirety. The Secretary does have the authority to revoke quota shares if it is deemed necessary. High-grading and quota busting are both considered violations which warrant a penalty response. Although difficult to detect, high-grading may result in financial penalties or even sacrificing future quota shares. Quota busting also has a similar result. Exceeding one's quota, called an overage, will result in a downward adjustment of next year's quota equal to the amount of

the overage. The majority of violations during the first year of the halibut program were overages (ACFEC 1996). As the halibut ITQ program continues and the fleet adjusts to the new rules, a better assessment of regulatory compliance will become available.

Magnuson Re-authorization

The environmental effects of ITQs also played a role in the way Congress dealt with the quota issue during the recent Magnuson Act re-authorization. The Magnuson Act was re-authorized as the Sustainable fisheries Act and included several provisions regarding ITQs. In addition, the SFA also addressed other environmental issues associated with the fishing industry such as overfishing, bycatch reduction, and habitat protection.

Much of the environmental concern regarding fishing quotas stems from the fear that major harm will come to the environment once ITQs are extended to the trawl fisheries. These fisheries have the highest bycatch and discard rates and also damage essential fishery habitat (Tkacz 1994). "A popular argument against IFQs is that even with all year to fish, boats would still have to race to catch their quota before the bycatch caps were hit" (Gay 1994). These environmental concerns prompted Congress to impose a 4-year moratorium on any new quota programs. In the meantime, Congress also called for a comprehensive study of the ITQ issue to be conducted by the National Academy of Sciences.

In addition to the quota provisions, Congress also included into the SFA stronger language on overfishing, bycatch reduction, and habitat protection. The SFA guidelines established a new definition of overfishing which reads as the "rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis" (Internet 2 1996). The act also requires fishery management councils to create stock rebuilding plans within one year after overfishing has been identified. The act also requires the councils to define bycatch and identify ways to reduce it as well as to define and protect essential fish habitat. The SFA only provides broad environmental guidelines and puts the real task of conservation on the shoulders of the regional fishery councils.

Conclusion

From an environmental perspective, it is very difficult to accurately assess the impacts of an ITQ program on the sustainability of a fishery. The halibut ITQ program will probably provide some conservation benefits to the fishery, however, it remains to be seen if these benefits will be offset by other negative environmental effects.

One of the primary conservation benefits of the halibut ITQ system is the overall compliance with the TAC. The TAC, based on the best available scientific information, is set conservatively and complying with it is one of the best ways to ensure long-term resource sustainability. ITQs may also have environmental benefits by helping to reduce bycatch mortality because of the more relaxed fishing pace. In addition to this advantage, the ITQ program will also provide a much safer fishing environment by eliminating the race for fish. Although some have argued that ITQ systems will benefit the environment through stewardship because it gives fishermen a stake in the resource, the data on this is conflicting and provides no clear-cut answers.

The negative environmental effects of ITQs suggest precaution should be employed when managing with quotas. The main concern about ITQs is the effects they will have once they are extended to the trawl fisheries. The trawler fleet has high bycatch rates and also wreaks havoc on fishery habitat. The factory trawler fleet also has the collateral to buy up quota shares and consolidate fishing effort which will make their harmful fishing practices all the more widespread. The practice of high-grading will be a problem with ITQ management and has been documented in other quota fisheries. In addition, the price conditions that provide incentive to high-grade were also reported in the halibut fishery during 1995. Unfortunately, the ITQ system also gives fishermen an incentive to bust their quota, mis-report their landings, and to exert pressure to increase the TAC.

Assessing the environmental effects of ITQs is a very difficult task and so far has provided contrasting results with regards to its advantages and disadvantages. Clearly, no system is perfect and the halibut ITQ program is no exception. The volatility of the issue is evident in the long implementation process of the NPFMC as well as the moratorium on new quotas imposed by Congress. This analysis provides some insight into these issues, however, much more study needs to be conducted in order to determine the effects of ITQs on the environment.

ETHICAL ANALYSIS

Ethical views and belief systems have played an important role in the way humans have managed their fishery resources in the United States. From the Native Aboriginals using primitive fishing methods to the high-tech longliners of the halibut fleet, the history of management in the halibut fishery is reflective of our changing ethical attitudes towards the environment. Fishery management evolved alongside these changing environmental ethics, often precipitating ethical change or even occurring as a consequence of it.

Until recently, a belief pervaded the fishing industry that open access was a way to manage the ocean commons. Open access in the halibut fishery led to problems of overcapitalization and fears of resource exhaustion. As this management regime began to fail, the Council discarded the open access approach and began looking for alternatives.

The Council suggested ITQs as a way to solve the problems of open access. However, others in the fishing community were skeptical that the ethical concerns inherent to quota management would be overlooked. Several problems of equity have surfaced in the wake of ITQ management. These equity issues include unfair allocations, job loss, and quota consolidation which results in the concentration of wealth and power within the industry. In addition to these concerns, stewardship and efficiency are also important ethical issues that arise with new ITQ regulations. Debate over these ethical concerns prompted the Council to include several provisions into the new halibut quota program, making it the most complex form of fisheries management in existence today.

Environmental Ethics

Environmental ethics have undergone several fundamental evolutionary changes since we first began exploiting our fishery resources. From the early expansionists and the concepts of John Locke to the utilitarian approach and the subsequent ideological revolution of Aldo Leopold, our ethical beliefs about conservation have changed according to the degree of our resource exploitation. As the population grew and our fish stocks became depleted, there came a need for management that placed an even greater emphasis on conservation. Although this increasing need for conservation is reflected in the writings of environmental philosophers, new ethical problems of quota management have emerged which require an envirocentric ethical approach to solve them.

Subsistence Ethic

Before the United States was first settled, fishery resources were plentiful and mainly used for the purposes of subsistence. Small Native American villages caught fish to satisfy their basic needs and seldom took more than they could eat or trade. "Archeological evidence indicates that aboriginals on the western coasts of North America had consumed halibut from time immemorial" (Bell 1981). Originally, the halibut fishery was not used by Native Americans for commercial purposes and no buying or selling was involved. However, Native Americans did use the halibut for ritual ceremonies and it was often commemorated on totem poles and in clan crests (Bell 1981).

The subsistence ethic is deeply rooted in the religious beliefs of Native Americans. A genuine love and respect for the natural world formed the foundation for much of their religious beliefs. Native Americans understood the interconnectedness of all things and felt that these things lived in harmony as parts of the community. Human beings were merely another part of this community, dependent upon it, not dominant over it. "Nature was to them a great, interrelated community including animals, plants, human beings,....the Indian did not define himself as autonomous, but as a part of a whole" (Hughes 1983). Native Americans exhibited an environmental ethic of subsistence towards their natural environment. They respected their natural surroundings while having a reciprocal relationship with the earth and its inhabitants

Native Americans only took from this community what they could use because doing otherwise would upset the balance of nature. They understood the concept of conservation, only killing out of necessity and using all that was taken. "Care not to waste the usable parts and care in the disposal of unusable animal and plant remains were also aspects of the respectful relationship with fellow members of the land community" (Callicott 1989). These beliefs illustrate that the notions of conservation and preservation are inherent to the Native American religion. They lived by the rules of generosity and sharing and were void of greed. "American Indian ethics in regard to nature is, therefore, protective and life-preserving. It is a combination of reverence for life and affirmation to life" (Hughes 1983).

Much of their holistic relationship to nature was based on their belief that nature was sacred and that the individual parts of the community possessed spirits. To the Native American, even inanimate objects were espirited. "To the Indian in his native state, everything had life or spirit; the earth, the rocks, trees, ferns, as well as birds and animals" (Clark 1953). They further believed that these spirits were united as one. "Not only does

everything have a spirit, all things are related together as members of one universal family" (Callicott 1989).

As westward expansion into Indian territory occurred in the United States, conflicts over fishery resources arose between Native Americans and the new settlers. Native Americans made claims to fishing rights based on their history of customary use. Pacific Northwest Indian tribes have had some success in securing harvesting rights, resulting in the inclusion of their concerns into fishery management practices. "In 1854 and 1855 the US Government negotiated a series of six treaties whereby Indian tribes gave up lands in return for compensation and the right to continue harvesting fish". The Boldt decision of 1974 went further by allowing Indian tribes to take up to 50% of harvestable fish from their customary fishing grounds (Valencia and VanderZwaag 1989). This decision applied to a variety of marine species of fish. In 1986, the IPHC set aside a portion of the halibut catch for four Indian tribes. Although Pacific Northwest tribes have had some success, Alaskan Native peoples also claim sovereign rights over the offshore, but have lost major court battles in this regard (Valencia and VanderZwaag 1989). However, the inclusion of the CDQ program into the recent Magnuson Act re-authorization will set aside a portion of the catch of several fish species for Native Alaskan communities.

Expansion Ethic

As the United States was settled, those expanding westward were lured by the agrarian myth. The agrarian myth of the West, likened to the Garden of Eden, was based on the idea that westward expansion offered a utopian society with boundless land for cultivation and endless resources there for the taking. "The master symbol of the garden embraced a cluster of metaphors expressing fecundity, growth, and blissful labor in the earth" (Smith 1950). The vastness of the West represented a freedom that would provide an escape from the tiresome workings of the urbanized East. "The West is, grandly and abstractly, a place where afflicted humanity raises her drooping head; where conscience ceases to be a slave, and laws are no more than the security of happiness" (Smith 1950).

This expansion ethic which stressed the concept of inexhaustible resources in the West explains the pattern of thought that drove the early years of commercial fishing. According to Frederick Jackson Turner, "the existence of an area of free land and the advance of American settlement westward explain American development" (Smith 1950). In the 1880's, the halibut fishery in the Pacific Northwest was initially developed with the

agrarian notion that the resource was abundant and endless. "The inexhaustibility of resources was the dominant American myth a century after independence" (Nash 1989). At this time, conservation was not an important concern and would only impede resource development.

With the dawn of the industrial revolution, large steamer ships equipped with combustion engines entered the halibut fishery. The expansion ethic, rooted in the agrarian idea of an inexhaustible resource, pervaded these early years of the commercial halibut fishery. A seemingly endless resource, coupled with more powerful boats, enabled fishermen to catch large volumes of halibut without concern for the future health of the stock. "Progress seemed synonymous with growth, development, and the conquest of nature. The idea of living ethically and harmoniously with nature was incompatible with 19th century priorities" (Nash 1989).

The expansion ethical approach towards resource extraction was also influenced by religious beliefs as well as economic principles and by John Locke's ideas of private property. These early forms of environmental ethics have been described as developmental or egocentric (Miller and Kirk 1992, Merchant 1994).

The development ethic is the anthropocentric ethical belief that the environment exists for human purposes. "The development ethic has been perhaps most visible in Judeo-Christian tradition and encouraged an aggressive exploitation of the environment from the time of the pilgrims until the end of the 19th century" (Miller and Kirk 1992). The domination of man over nature is evident in the first few pages of the bible. "And God blessed them, and God said to them, Be fruitful and multiply, and fill the earth and subdue it: and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth" (Genesis 2:28). The development ethic also describes conflict between man and nature as "formidable opponents in a fair contest" (Miller and Kirk 1992). This ethic, rooted in Christian religious authority, guided the early years of fishery management in the United States and clearly placed the needs of humans above those of the environment.

According to Carolyn Merchant, the ethical attitude that pervaded during the early years of commercial fishing was the egocentric ethic. Similar to the development ethic, the egocentric ethic is "the ethic that pertains to individual fishers, or fishing companies, taking fish from the rivers and sea" (Merchant 1994). Merchant bases the egocentric ethic on the assumptions of *laissez-faire* economics, one of which is the idea that what is good for the individual is also good for society. Like the expansion ethic, other assumptions included the idea that the fishery was inexhaustible and that fish were inferior objects to be used by humans.

A final assumption of Merchant's egocentric ethic supposes that humans have rights of ownership over fish and fish become private property of the fisherman once he expends his labor to catch them. This assumption is based on the concept of private property put forth by John Locke over three centuries ago. "Whatsoever, then, he removes out of the state that nature hath provided and left in it, he hath mixed his labor with, and joined to it something that is his own, and thereby makes it his property" (Locke 1690). Locke believed that the environment was held in the commons for everyone until somebody put one's labor with it, thereby creating a property right.

During the early 20th century, the unchecked expansion of the halibut fishery resulted in a decline in stock abundance (Bell 1981). This problem can be directly traced to the pervading ethical beliefs of the time. Expansion ethics, based on an inexhaustible resource, led fishermen to think that they could catch unlimited numbers of fish. The development and egocentric ethics with their roots in religion and economics also influenced the way fishermen viewed the resource. These ethical systems provided a mechanism for resource depletion and contributed to the "tragedy of the commons" that still plagues the halibut fishery today.

Until the recent introduction of the ITQ program, many of these expansionist ethical concepts were still prevalent in the open access management policy of the halibut fishery. Because there were no limits on entry to the fishery, it soon became overcapitalized with too many boats, resulting in a fishery that was unmanageable. As technology expanded, the expansion ethic and Locke's ideas about the commons were no longer applicable as the finite nature of the resource was now apparent.

Proposed by Garrett Hardin in 1968, the "tragedy of the commons" is the classic problem associated with using open access to manage a fishery. Although Hardin illustrated his point with the example of cattle grazing, the concept is applicable to the problems of open access fishery management. Because the utility of entering the fishery is positive to the individual fisherman and the negative aspect of overfishing is only a fraction to him because it is shared by all, there is always an incentive to enter the fishery. Because the commons approach places no limit on entry yet fish stocks themselves are limited, this tragedy of the commons puts the fishery on a course for destruction. Hardin states that the oceans still suffer from the philosophy of the commons. "Maritime nations still respond to the shibboleth of the freedom of the seas. Professing to believe in the inexhaustible resources of the oceans, they bring species after species of fish and whales closer to extinction" (Hardin 1968). Hardin also comments on the idea that resource problems are a function of our outdated laws and ethical belief systems. Although the ITQ program is now in effect for the halibut fishery, the long-time build-up of boats in the fishery has

made the implementation of the ITQ system a very difficult task from an ethical point of view. Many fishermen have grown to expect the benefits of the halibut fishery and some of them depend solely upon it. Ethically, quota allocation will be difficult because it is inherent that the ITQ program will exclude some from the fishery.

Utilitarian Conservation Ethic

At the turn of the 20th century, it became apparent that the current ethical belief system present in fishery management was indeed failing and in need of change. With halibut stocks in decline, concerns over salmon stocks and other general fishery management problems also began to surface (Merchant 1994). These issues contributed to the evolution of several new ethical systems that could be used to guide fishery management.

To address these new resource management problems, Gifford Pinchot proposed the resource conservation ethic. This ethic was based on modern classical science as well as the concept of utilitarianism formulated by Jeremy Bentham and John Stuart Mill (Callicott 1991). In reference to fishery resource ethics, Pinchot's conservation ethic has also been referred to as a homocentric ethic. The homocentric ethic also stems from utilitarianism and gives preference to humans over fish (Merchant 1994).

Jeremy Bentham and his younger follower John Stuart Mill formulated their principles of utilitarianism during the late 18th century and early 19th century. They believed "that when the interests of various persons conflicted, the best choice was that which promoted the interests of the greater number" (MacKinnon 1995). The best choice was the one that produced the greatest net utility, where utility was defined in terms of happiness or pleasure to conscious beings.

Pinchot utilized this philosophy by stating that "conservation meant the greatest good to the greatest number for the longest time" (Pinchot 1910). The resource conservation ethic expressed the idea of wise use and contained three basic moral principles. The first two moral principles of this ethical approach involved the issues of equity and efficiency, both being of equal importance (Callicott 1991). Equity is considered the just or fair distribution of natural resources among present and future generations (Callicott 1991). Pinchot indicates the idea of efficiency by saying that "conservation stands for the prevention of waste" (Pinchot 1910).

The third principle of Pinchot's resource conservation ethic makes reference to both resource development as well as resource preservation. Pinchot states this third

principle as: "the natural resources must be developed and preserved for the benefit of the many, and not merely for the profit of the few" (Pinchot 1910). Pinchot's inclusion of preservation into his conservation ethic illustrates the influence of John Muir's nature philosophy and his belief that some of our natural resources were being consumed at an alarming rate.

Gifford Pinchot wanted nature to be developed with conservation in mind and was successful in furthering his cause. The resource conservation ethic with its philosophy of wise use was a politically popular idea. It was adopted as an informal 'constitution' when the government created the U.S. Forest Service, of which Pinchot was the first chief forester (Callicott 1991).

Preservation Ethic

The idea of preservation also began to evolve alongside the conservation approach suggested by Pinchot. John Muir, an older contemporary of Pinchot and often contrasted in ideology, introduced a preservation ethic that was based on a love of nature and a desire to preserve it for more aesthetic, spiritual, and recreational uses. "Muir made the Romantic-Transcendental nature philosophy of Emerson and Thoreau the basis of a national moral campaign for the appreciation and preservation of wilderness" (Callicott 1991). This naturalist ethical approach was illustrated by the romantic affection for nature found in their writing. "A lake is the landscape's most beautiful and expressive feature. How peaceful the phenomena of the lake. Nothing so fair, so pure, and at the same time so large, as a lake, perchance, lies on the surface of the earth" (Thoreau 1854)

The idealistic view of nature found in romanticism and transcendentalism, rather than modern science, was the foundation of John Muir's philosophy. Muir wanted much of western lands preserved in their natural state of wilderness, rather than developed. Muir suggested that nature in its wild state could be used for spiritual purposes, recreation, or to just get away and relax. "In God's wildness lies the hope of the world---the great fresh, unblighted, unredeemed wilderness. The galling harness of civilization drops off, and the heal ere we are aware" (Muir 1954).

Muir's preservation ethic has also been referred to as the compassionate ethic. The compassionate ethic stems from the understanding that the environment is vulnerable and needs some degree of protection from humans (Miller and Kirk 1992). The compassionate ethic includes a form of stewardship, giving humans the responsibility of maintaining the environment.

Although Gifford Pinchot and John Muir were at odds with each other philosophically, Muir also had similar success with his cause. Muir influenced the government with his preservation ethic to establish the National Park Service in 1916 (Miller and Kirk 1992). Muir also founded the Sierra Club which remains today as one of the largest and most successful nature organizations in the world.

The issues of conservation and preservation also influenced policy management in the halibut fishery at this time. As halibut stocks began to decline in the early part of the 20th century, international concern over the future health of the stock resulted in the first ever international agreement for the joint management of a marine resource. In 1923, The U.S. and Canada established the IPHC to manage, conserve, and preserve the halibut fishery. The pervading ethical beliefs towards resource management at this time were reflected in the signing of this international agreement between the two countries. With the ideas of conservation and preservation gaining acceptance at the time, the U.S. and Canada were compelled to find a new management regime for the halibut fishery that would address the problem of stock decline. The adoption of other conservation measures like legal size limits and season closures also illustrate how the evolving conservation ethics influenced the halibut fishery.

The ethical belief systems of conservation and preservation are no longer applicable, by themselves, to the management problems faced by the fishing industry today. Although conservation and preservation are necessary components of fishery ethics and exhibit a degree of evolution in thought, the moralities expressed by Pinchot, Muir, and others also have inherent flaws of their own. All of the aforementioned ethical structures place human needs above those of fish and their habitat. These views of the environment are anthropocentric in approach and put man in the role of ruler over the earth and its inhabitants. Ethics at the turn of the century did not extend basic rights of consideration to all components of the environment. The environment was only to be conserved or preserved for the benefit of the human race. Both conservationists and preservationists believed that "only people possess intrinsic value, while nature possesses merely instrumental value; and both regard human beings or human interests as the only legitimate ends and non-human natural entities and nature as a whole as means" (Callicott 1992). There was no understanding that all parts of the environment are interconnected and necessary for the proper functioning of all other parts, including humans. Although these ethical approaches did recognize that the earth really was finite and that resources could be depleted, the foresight espoused by the conservationists and preservationists was actually limited in scope and usually did not extend beyond a few generations. Booming world populations and the resulting strain on our resources was not really a concern to

them at the time and therefore did not warrant a great deal of concern beyond these few generations. The agrarian myth lasted well into the 20th century, as ideas of expansion and development continued to govern our natural resources.

Ocean Ethic

The emergence of ecology as a new scientific field of study signaled an end to the ethical approaches of conservation and preservation (Callicott 1992). Ecology showed that there was more to Pinchot's idea of nature as just a collection of parts organized into a hierarchy of usefulness to humans. Leading the ecological revolution was Aldo Leopold, who formulated his ideas into what he called the Land Ethic. Leopold's land ethic can also serve as the basis for an ocean ethic which can be applied to the management of our marine resources.

With his knowledge of ecology, Leopold understood the inter-relatedness of the natural community and proposed a land ethic that "simply enlarged the boundaries of the community to include soils, waters, plants, and animals" (Leopold 1949). Leopold believed that "nature is a vast, intricately organized and tightly integrated system of complex processes" (Callicott 1992).

Leopold formulated his land ethic because there was no current conservation ethic that dealt with man's relationship to the land and its inhabitants. He believed that extending an ethic to this relationship was an "evolutionary possibility and an ecological necessity" (Leopold 1949). By enlarging the boundary of the land community to include the soil as well as the biological components, Leopold showed that every part of the environment was critical to its proper functioning.

Leopold was also pragmatic in his approach to resource management. He understood that nature could be utilized by humans, but also stressed the need to consider each part of the ecosystem as valuable to the whole when altering it for human use. "A land ethic of course cannot prevent the alteration, management, and the use of these resources, but it does affirm their right to continued existence, and, at least in spots, their continued existence in a natural state" (Leopold 1949). The central theme of the land ethic involves man's use of the environment. Leopold wanted ethics and aesthetics as well as economics to play a role in man's land use practices. "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold 1949). This idea was a revolutionary approach to natural resource management.

Although Leopold discussed water, he was mainly concerned with the terrestrial and aquatic processes of nature. "Waters, like soil, are part of the energy circuit. Industry, by polluting waters or obstructing them with dams, may exclude the plants and animals necessary to keep energy in circulation" (Leopold 1949). This statement indicates that Leopold was concerned with the role that fresh waters play in the energy cycle, but he does not really make reference to the marine environment. Although this may just be an oversight on Leopold's part, the ever emerging understanding of the ocean's influence on the land makes it worthy of discussion.

Much in the same way Leopold formulated his land ethic, a similar reasoning can be applied to the ocean. Because the land and the ocean are quite different media but also inextricably linked, one can also use Leopold's land ethic as the basis for an ocean ethic. The basis for an ocean ethic can also be seen in the writings of other environmental thinkers. In 1950, Rachel Carson wrote *The Sea Around Us*, stressing the need for ocean conservation and protection of the marine environment from pollution. In 1967, Wesley Marx reiterated many of the same ideas in his book, *The Frail Ocean*.

The growing concern about the ocean environment was also expressed by Congress in 1966 with the creation of the Stratton Commission. The Stratton Commission was formed to put forth recommendations for the management of our ocean resources. The Commission wanted to reduce fishing capital, establish national priorities for the development of marine species, and improve fisheries research technology (Mangone 1988). The Stratton Commission also led to the establishment of NOAA in 1970 followed by the creation of the NMFS. These events opened the door for more efforts in Congress that would serve to protect the ocean. In 1972, Congress passed the Coastal Zone Management Act (CZMA) and the Marine Mammal Protection Act (MMPA). These laws were later followed by the passage of the Magnuson Act in 1976.

As scientific technology moves forward, one can begin to understand the complexity of the ocean and the important role it plays. Scientists now know that the ocean not only serves as a temperature buffer, but is also the driving mechanism for wind and weather patterns on land. The ocean also acts as a sink by sequestering large amounts of atmospheric carbon dioxide, a potent greenhouse gas. In addition to providing an increasing amount of the world's food supply, the ocean is also necessary for international trade and as a popular source for recreation and leisure. These instrumental uses alone make the ocean worthy of ethical consideration while its own intrinsic qualities further justifies an "ocean ethic".

By doing as Leopold did and expanding the ethical boundaries to include the ocean, its processes and its inhabitants, an ocean ethic can be formulated to guide the way

we manage our marine resources. The ocean, like the land, is also a complex environment made up of many integral parts. In fact, the ocean is probably even more complex because of the fluid medium and its effects on organisms and processes. In addition, the marine environment is unique because even in a boat humans cannot sustain themselves for long periods of time in the ocean like they can on land. Humans are, in fact, terrestrial organisms who only use the ocean but reside elsewhere. This makes them more like a guest or perhaps even an intruder when they enter the marine environment. These aspects of our relationship to the ocean even further justifies the need for an ocean ethic as part of the land ethic.

The ocean ethic extends moral consideration to all parts of the marine environment. For example, the basis of the entire marine food chain lies in the upper few millimeters of water in the ocean. Small, microscopic, photosynthetic organisms found at the surface use nutrients in the water as well as the sun to fix energy the same way that terrestrial plants do. These organisms are the food source of larger organisms which are, in turn, fed on by others. This very simplistic representation of the ocean food chain illustrates the point that Leopold was also making for the land. If this process is interrupted or significantly altered in any way, the whole food chain could be affected. By giving moral consideration to the organisms involved as well as the chemistry of this process, the basis of the ocean ethic is established.

Our management of the ocean must consider these complex processes. Although current ocean management often focuses on "marquee animals" like dolphins, whales, and sea turtles, we must expand our management objectives to account for current scientific understanding. Science indicates that everything in the ocean depends on a multitude of factors for its survival. The ability of humans to quickly alter any one of these factors necessitates an ocean ethic which can be used to properly manage the marine environment.

With Leopold's land ethic established, others have proposed a similar ethical structure that gives moral standing to members of the marine community. "The ecocentric ethic is based on the idea that fish are equal to other organisms, including human beings, and therefore have moral consideration" (Merchant 1994). The ecocentric approach is rather similar to what has been called the "holothetic ethic". The holothetic ethic states that "it is the interdependence among biotic and inanimate components of the environment which is to be respected" (Miller and Kirk 1992). Like Leopold's ideas, both the ecocentric and holothetic positions stress the idea that humans are members of the community rather than rulers. These views are primarily biocentric and give consideration to non-human things in the environment.

The system of environmental ethics in the fishing industry has undergone a significant evolution since the United States first began fishing commercially. However, many of the old ethical principles based on economics and the idea of an endless resource have contributed to the demise of the fishing industry. Overfishing and overcapitalization in the halibut fishery have resulted from a policy of open access management, much of which can be directly tied to these outdated beliefs. These concerns have, in turn, warranted new management regimes, such as the ITQ program. Using an ITQ system to solve these problems raises many inherent ethical concerns of its own. Equity, stewardship, and efficiency are very important ethical problems that stem from the halibut ITQ program. The Council has included provisions to address these issues, however, many feel they are inadequate.

Equity

Several problems of equity have surfaced in regards to the halibut ITQ program. For the purposes of this study, equity will be defined in terms of social fairness. "Equity is the just or fair distribution of natural resources among present and also future generations" (Callicott 1991). Social equity will mainly focus on who benefited and who lost when the ITQ regulations were implemented in the halibut fishery. Equity will refer to matters such as the fair distribution of quota shares, privatization and the resulting concentration of wealth as well as the effects on individual fishermen and fishery dependent communities. "Among the social implications of ITQs in fisheries are job losses, changing social relationships of production, changing social structures within communities, and increased concentration of rights, power and wealth within an industry" (McCay 1995). These equity issues have caused great controversy within the fishing industry and presented the Council with many concerns from all sides that have to be addressed.

The halibut ITQ program raises equity concerns because the negative effects of the program appear to be concentrated among the smaller fishing operations. By applying John Rawls' second theory of justice to a definition of equity, the moral implications of this mal-distribution become apparent. In discussing the distribution of wealth and income, Rawls believes that "while the distribution need not be equal, it must be to everyone's advantage" (Rawls 1971). Rawls goes even further by saying that the "advantages of persons with greater endowments are to be limited to those that further the good of the poorer sectors of society" (Rawls 1971). Because the ITQ program may result in a mal-

distribution of wealth and a severe disadvantage to the small fishing operations, one could make an argument based on Rawls' philosophy that ITQs have serious equity implications.

Initial Allocation

One of the most controversial equity problems associated with the halibut ITQ program involves the initial allocation of quota shares. The quota allocation will essentially establish "quasi" private property rights to a common property resource. To qualify for initial quota shares, one must have either owned or leased a vessel that made verifiable landings. Unfortunately, this method left out crew members who neither owned or leased a vessel but worked hard aboard a boat to catch fish. It also awarded shares to many vessel owners who did not even do the actual fishing. The Council justified this method of allocation because of the financial risk assumed by vessel owners and those leasing boats. Evidence to determine the extent of this problem is scant, however, about two-thirds of quota share holders said they were both an owner as well as a captain of the boat that harvested ITQ (ACFEC 1996). Figures on the number of crew members left out of the initial allocation are not available. Although many crew members will lose their jobs because of the ITQ program, the Council did include provisions that only allowed qualifying crew members the opportunity to buy or lease quota shares as they become available. This will prevent outsiders from getting quota shares instead of those who have worked in the fishery.

The initial allocation was also based on historical participation in the fishery. Although the program did not go into effect until 1995, one must have made landings in either 1988, 1989, or 1990 to qualify for the initial allocation. This clearly left out those who entered the fishery after this time but awarded quota to some who were no longer fishing for halibut when the program actually began. These left-out operations accounted for 18% of the aggregate halibut harvest during the 1991-1994 period (ACFEC 1996). Although most of these operations only participated during one of the gap years, over 2,000 vessel owners who participated during these gap years in some area did not receive quota shares for that area (ACFEC 1996). In addition, some of those who were not active during the gap period received quota shares. The proportion of the total shares issued in an area that was issued to entities not active during this time ranges from 12% in Area 2C to 57% in area 4E (ACFEC 1996). This indicates that a significant portion of the quota shares were allocated to individuals who were no longer even fishing for halibut.

Many initial recipients also complained because their gap year harvests were not considered for the initial allocation. This is probably due to the fact that they had higher catch rates during these gap years. Over 1300 initial recipients received allocations that were substantially lower than their performance during the gap period (ACFEC 1996). It was substantially lower if their proportion of the total area quota share allocation was less than or equal to half of their proportion of the area harvest for the gap period.

Although a significant equity problem clearly exists with the initial allocation procedure, some of these effects are partially offset by other factors. For example, initial recipients did exhibit greater multiple-year participation during the gap years than did those who were left out. In addition, some of those left out for initial allocation in a specific area did receive quota shares in other areas. Also, a majority of these left out operations did generate a large portion of their earnings from other fisheries. However, these offsetting factors are rather small and do not fully compensate those for their losses due to the initial allocation process.

Quota Consolidation

Consolidation of quota shares into the hands of the few is another contentious equity problem of an ITQ system. The consolidation of quota shares can result in the concentration of wealth and power within the fishery. Quota consolidation has been documented in many other ITQ fisheries (Duncan 1994, McCay 1995, Geen et.al. 1993, Eythorsson 1996, Palsson and Helgason 1995, Clark 1991) Statistics indicate that there has been a significant amount of consolidation during the first year of the halibut ITQ program.

Reductions in the number of both people and vessels making landings in 1995 indicate that consolidation in the halibut fishery has definitely occurred as a result of the ITQ program. Drops in the number of people with landings ranged from 10% in Area 2C to 44% in Area 4C. Drops in the number of vessels ranged from 20% in Area 4A to 45 % in Area 4C (ACFEC 1996).

The number of quota share holders in the smaller vessel classes dropped between 8% and 10% in most areas (ACFEC 1996). In freezer vessel Class A, the number of quota holders increased. However, the smallest vessel class, Class D, experienced the largest percentage drop in the number of quota holders. For each larger vessel class, the percentage drop decreases. This indicates that quota consolidation is definitely occurring, and is further proof that it is most prevalent among smaller fishing operations. (Table 6).

Table 6 Halibut Quota Share Holders by Area and Vessel Class

Management area	Vessel category	Initial QS holders	Year-end 95 QS holders	Change in QS holders	Percent change in QS holders	Initial % of area QS holders	Year-end 95 % of area QS holders
2C	Freezer-processor	31	30	-1	-3	1	1
	Catcher: Over 60 feet	138	125	-13	-9	6	6
	Catcher: 36 to 60 feet	1,138	1,019	-119	-10	48	48
	Catcher: up to 35 feet	1,094	984	-110	-10	46	46
3A	Freezer-processor	35	37	2	6	1	1
	Catcher: Over 60 feet	296	274	-22	-7	10	10
	Catcher: 36 to 60 feet	1,477	1,349	-128	-9	48	49
	Catcher: up to 35 feet	1,283	1,163	-120	-9	42	42
3B	Freezer-processor	19	20	1	5	2	2
	Catcher: Over 60 feet	210	195	-15	-7	20	20
	Catcher: 36 to 60 feet	549	511	-38	-7	53	53
	Catcher: up to 35 feet	283	253	-30	-11	27	26
4A	Freezer-processor	15	17	2	13	3	4
	Catcher: Over 60 feet	140	136	-4	-3	27	28
	Catcher: 36 to 60 feet	143	135	-8	-6	27	28
	Catcher: up to 35 feet	237	200	-37	-16	45	42
4B	Freezer-processor	7	7	0	0	5	5
	Catcher: Over 60 feet	81	78	-3	-4	54	54
	Catcher: 36 to 60 feet	35	34	-1	-3	23	23
	Catcher: up to 35 feet	27	27	0	0	18	19
4C	Freezer-processor	1	1	0	0	1	1
	Catcher: Over 60 feet	29	29	0	0	36	36
	Catcher: 36 to 60 feet	20	20	0	0	25	25
	Catcher: up to 35 feet	31	31	0	0	39	39

In addition to this problem, prices for quota shares tended to be higher for larger vessel classes (ACFEC 1996). This compounds the problem for smaller fishing operations because they are getting less money for their quota than are the larger operations. (See Table 7).

Table 7. 1995 Halibut Quota Share Prices

Area	Vessel class	Price for QS sold with all IFQs ($/IFQ-$/QS	Price for QS sold with no IFQs ($/IFQ - $/QS)	Price for QS leases ($/IFQ - $/QS)
2C	freezers	C		1.04 - 0.16
	large catcher	8.17 - 1.23		
	medium catcher	7.78 - 1.17	na - 1.09	
	small catcher	6.80 - 1.02	na - 0.70	
3A	freezers	C		0.80 - 0.09
	large catcher	7.77 - 0.84	na - 0.79	
	medium catcher	7.23 - 0.78	na - 0.71	C
	small catcher	6.99 - 0.75	na - 0.70	
3B	freezers			C
	large catcher	6.87 - 0.47	C	
	medium catcher	6.28 - 0.43	na - 0.49	
	small catcher	C	C	
4A	freezers			C
	large catcher	6.35 - 0.83	C	
	medium catcher	5.47 - 0.72	C	
	small catcher	5.96 - 0.78	C	
4B	freezer			C
	large catcher	C		
	Medium catcher	C		

Note: The first price in each cell is in dollars per IFQ and the second price is in dollars per QS.

Although quota consolidation has occurred during the first year of the halibut ITQ program, the Council took great pains to minimize the problem. However, the Council stressed the fact that advantages and disadvantages do occur during an allocation. "The advantaging of one group to the detriment of another is inherent in an allocation" (FR 1993). The Council included block restrictions, ownership caps, as well as class and area limits to reduce the amount of quota consolidation. A block was any quota share resulting in less than 20,000 pounds of halibut. It was deemed unblocked if it resulted in more than 20,000. Blocks can not be broken up and sold in smaller units. A person can hold up to two blocks, but a person holding two cannot hold unblocked shares. This ensures that smaller blocks of quota should always be available for smaller fishing operations. This is further aided by the fact that blocked quotas tended to sell for less than unblocked quota, making them more affordable for the smaller operations (ACFEC 1996). In addition,

blocks below 1,000 pounds can be combined into a larger block. Although consolidation is evident, these block restrictions have helped to slow it somewhat.

Class and area limits were imposed to prevent larger operations from swallowing smaller ones. Quota shares cannot be transferred between vessel classes or regulatory areas. However, those receiving quota through CDQ compensation (small quota awarded because they received less due to CDQ program) can swap these and only these compensation shares to another catcher vessel class. This does not apply to freezer class A vessels. Unfortunately, much of this CDQ compensation quota has migrated from smaller class D vessels to larger class B vessels. On the whole, class limits have also helped to prevent too much consolidation.

Ownership caps were also incorporated into the program to keep larger operations from overtaking smaller operations. These ownership caps limit the percentage of the total quota share pool for an area which any one entity may own. For the entire combined areas 2C, 3A, and 3B, nobody may own more than one half of one percent of the total quota pool for those areas. The same limit hold for combined areas 4A,B,C,D and E. However, these caps do not apply if the quota was received upon initial allocation. This exception serves to safeguard the few large operations that own a significant portion of quota in a particular area. 140 people or corporations received initial allocations of between 1% and 10% in individual areas. 14 quota share holders received between 5% and 10% of an area's quota, however nobody received more than 10% for any area (ACFEC 1996). This provision may seem unfair in that it gives an obvious advantage to large fishing operations who probably already have an advantage to begin with due to their financial resources.

Although quota consolidation has been a big problem of ITQ management, the Council introduced several innovative techniques to prevent it in the halibut fishery. These provisions have not been attempted in other ITQ regimes. As the program continues, more data will be available to properly assess the effectiveness of these provisions.

Job Loss

As expected, many fishermen lost their jobs during the first year of the halibut quota program. This job loss results from the aforementioned consolidation of quota shares that also occurred during the first year of the program. Consolidation reduces the number of fishing operations and, hence, the number of jobs.

Of quota share holders who fished on the same vessel in the same area in both 1994 and 1995, 53% reported that the number of people on board went down, while 43%

said this number stayed the same (Knapp and Hull 1996). Overall, the average crew size for all vessels declined by 18%. (Figure 11 and Table 8 illustrate these trends).

Figure 11. Change in the Number of People on Board

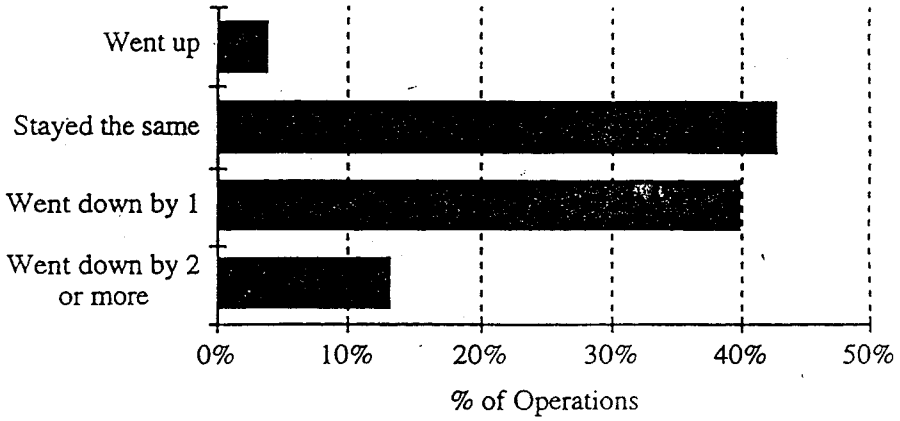


Table 8. Average Number of People on Board

Vessel class	1994	1995	Change	% Change	Number of survey responses
A	4.45	4.27	-0.18	-4%	5
B	5.81	4.72	-1.09	-19%	15
C	3.63	2.94	-0.69	-19%	23
D	2.86	2.43	-0.43	-15%	7
Total	3.68	3.03	-0.66	-18%	50

Source: Responses to question 17, weighted to all operations. Includes only responses of quota share holders who fished in the same area on the same vessel in 1994. ISER file: Mean number on board.

Because the number and size of boats was not constant from 1994 to 1995, this figure of 18% may not be sufficient to determine overall changes in total employment. However, 18% is a relatively large number and indicates that significant job loss occurred during the first year of the program.

One interesting aspect of this job loss concerns the vessel classes from which this job loss occurred. Very little job loss occurred in Class A, the freezer vessel fleet. However, the smaller vessel classes all exhibited job losses ranging from 19% to 15%. (See Table 8). This is further indication that the negative aspects of the program are

concentrated in the smaller fishing operations. In addition, the smallest class, class D, also has the smallest percentage of crew members who are also employed in other fisheries (See Table 9).

Table 9. Fishermen Working in Other Fisheries

Vessel class	1994	1995	Number of survey responses
A	90%	89%	5
B	81%	68%	14
C	89%	93%	17
D	53%	64%	6
Total	79%	81%	42

With a 15% decline in number of people on board, job loss in this class will be especially hard because many of them may not have other fishery jobs to fall back on. All of these factors will be compounded because job loss will probably decline even more as the fleet further consolidates in the next few years.

Aside from the controls on quota consolidation, there is probably little the Council can do about the problem of job loss within the industry. However, new entrants range from 3% in area 4B to 6% in areas 2C and 3A. Although relatively significant, these figures also include those that may be new to a particular area and not to the program and, therefore, are not reflective of new opportunities for those that have lost their jobs.

Other factors also inhibit displaced crew members from advancing. Those losing their jobs most likely do not have the financial resources to buy new quota shares. Although eligible for new shares, they would be competing against other quota share holders who are using their initially allocated shares as collateral to buy new quota.

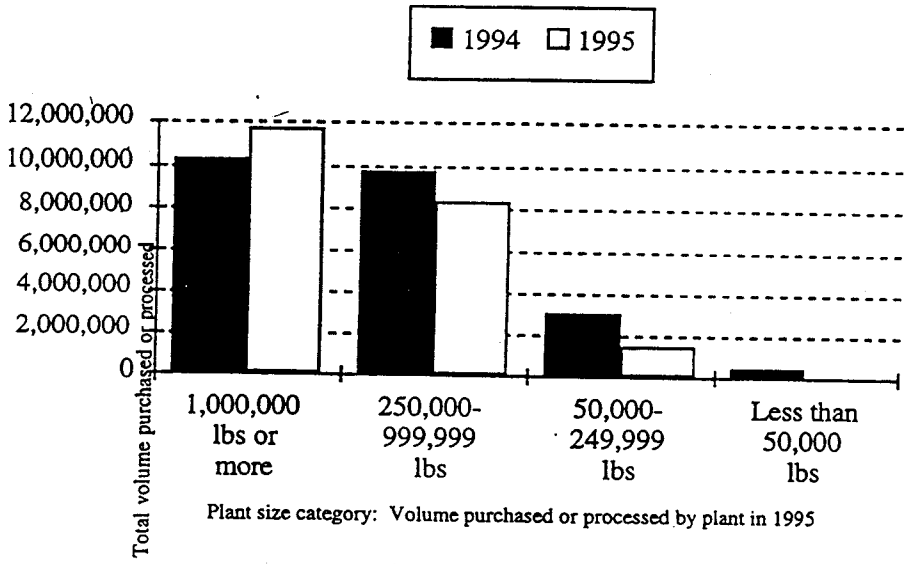
Community Effects

Community effects of ITQ systems have not been widely studied. The effects of consolidation will be concentrated in the small, fishery dependent communities of Alaska. Small fishing and processing operations that form the backbone of these small communities will receive the brunt of quota consolidation. These fishery dependent

communities will probably be most likely to experience job loss and processing plant closures, whereas larger, more diverse areas will be better able to absorb these effects.

On average, only large processing operations experienced an increase in production. Large operations were those processing a million pounds or more of halibut per year. All other size categories of processors experienced a decrease in production on average. (See Figure 12). These figures indicate the migration of production from small processing operations to the larger operations. This effect will be most severe in the smaller communities that are made up of these smaller operations.

Figure 12. Change in Halibut Production from 1994 to 1995



Other factors of the ITQ program may also cause problems for smaller communities. For example, many small towns like Seldovia (pop. 316) were not considered one of the 16 primary ports in Alaska. Vessel clearance to land quota outside an ITQ regulatory area can only be obtained at one of these 16 primary ports. Gerald Willard, Mayor of Seldovia, wrote a letter to NMFS expressing opposition to the quota program for several reasons. Not being designated as a primary port will influence deliveries of halibut to other nearby primary ports such as Homer or Kodiak. Seldovia relies heavily on commercial fishing and the "ITQ program may lead to a continuous shift in the ownership of the fishery resource to individuals outside the Seldovia community" Willard 1992). The data indicates that this may just be occurring. Shore processing plants

in the South-central region, of which Seldovia is part, experienced a decrease in harvest volume after the first year while those in the Kodiak region had a large increase. (Knapp and Hull 1996). In addition to the South-central region, Alaska Peninsula and Bering Sea census districts also received smaller percentages of landings (Knapp and Hull 1996). Communities in these districts, many of which depend heavily upon the halibut fishery, will certainly suffer the effects of these decreases in landings.

The effects of ITQ management systems on communities has not been well studied, however, a few instances have been documented. "In the surf clam and ocean quahog fisheries, the selling of ITQ by a large firm resulted in the complete cessation of clamming and processing for one major coastal community of New Jersey for at least a year" (McCay et.al. 1995). The ITQ system also contributed to a significant reduction in the cod landings of the eastern and central areas of Nova Scotia (McCay et.al. 1995).

The community effects of the halibut quota program have not been well studied, however, the Council did consider the issue during the initial allocation. In order to deal with this problem, the Council allocated a portion of the TAC from each area to be set aside for the CDQ program which is reserved for the communities of western Alaska. These communities are inhabited principally by Native Alaskans. The CDQ program will help these economically disadvantaged communities generate income from the halibut fishery. As the halibut ITQ program continues, there will be more opportunity for further study of this issue.

Efficiency

Efficiency is often described in economic terms of costs and benefits. The main efficiency problem of the halibut fishery is that it is overcapitalized. The halibut fishery suffers from too much harvesting capacity. Basically, there are too many boats trying to catch a set number of fish. By implementing the ITQ program, the Council wanted to achieve the TAC with a much reduced amount of fishing effort. "Efficiency is gained by reducing capital and labor expenditures" (McCay et.al. 1995). "Efficiency is the cost-effectiveness of a management process in achieving a stated objective" (Hanna 1995).

For the purposes of this analysis, the efficiency of the program will be judged by its success in achieving three objectives. One objective of the quota system is to utilize the TAC with a reduced amount of fishing effort. A second objective will be cost reduction while a final goal will be the improved quality of the product.

TAC Utilization

Utilizing the TAC to its full potential is one measure of efficiency. The TAC is based on scientific information and designed to achieve an optimum yield from the fishery. One objective of the ITQ program was to meet the TAC but with a significantly reduced amount of capital or fishing effort.

The ITQ system was successful in reducing the amount of capital in the fishery. The number of persons with landings and the number of vessels used to make landings was down in most areas in 1995 from the previous year (ACFEC 1996). This illustrates the reduction in fishing effort accomplished by the ITQ program. (See Table 10).

However, only 86% of the TAC was harvested in 1995. (ACFEC 1996). Table 11 shows the harvest as a percentage of the TAC from 1990 to 1995. Although the TAC had been underharvested in the past, the unharvested portion in 1995 was much higher than normal. Even with a significantly reduced TAC from 1994 to 1995, the unharvested portion was still much greater than usual. This data indicates that the halibut ITQ program has not corrected this efficiency problem of open access management. In fact, from the efficiency standpoint of TAC utilization , the problem has gotten worse. The fishermen lost some earnings because 14% of the TAC went unharvested.

Under-utilization of the TAC has been reported in other quota systems. In the European Union, unused quotas amounted to 5% when the quotas were first introduced in 1983. The rate rose to 16% by 1988, dipped slightly to 15% in 1989, and then ballooned to 27% in 1990 (Karagiannakos 1996).

Although this data is significant, the underharvest of the halibut TAC may be corrected as the fleet adjusts to the new regulations. The stock should less likely be overharvested with the reduced capital that results from ITQ management. With less boats in the fishery, the underharvest in 1995 may be a reflection of this reduction process underway. From the standpoint of conservation, it is better for the stock to be underharvested than overfished. The stock will probably benefit from the extra fish. Changes in efficiency from TAC utilization can be further analyzed as the program continues in years to come.

Cost Reduction

Several cost indicators suggest that fishermen gained some advantage from the quotas while the processing sector bore most of the cost increases of the program.

Table 10 Summary of Halibut Landings from 1990-1995

Area	Year	Harvest (Pounds)	Persons With Landings	Vessels With Landings	Vessel Landing Days	Person Landing Days	Pounds Per Vessel	Pounds Per Person	Persons Per Vessel
2C	90	9,705,514	1,525	1,489	2,605	2,638	6,518	6,364	1.02
	91	8,686,934	1,831	1,805	2,927	2,967	4,813	4,744	1.01
	92	9,816,892	1,786	1,775	3,255	3,273	5,531	5,497	1.01
	93	11,289,516	1,563	1,562	2,575	2,586	7,228	7,223	1.00
	94	10,378,542	1,468	1,461	2,373	2,386	7,104	7,070	1.00
	95	7,708,414	1,319	1,105	2,922	3,210	6,976	5,844	1.19
3A	90	28,844,296	2,457	2,348	4,349	4,415	12,285	11,740	1.05
	91	22,926,430	2,306	2,231	3,393	3,443	10,276	9,942	1.03
	92	26,781,876	1,985	1,924	3,263	3,291	13,920	13,492	1.03
	93	22,737,512	1,554	1,529	2,292	2,308	14,871	14,632	1.02
	94	24,843,824	1,735	1,712	2,693	2,699	14,512	14,319	1.01
	95	17,747,126	1,537	1,145	2,730	3,122	15,500	11,547	1.34
3B	90	8,694,295	406	383	537	546	22,701	21,415	1.06
	91	11,934,312	624	602	874	882	19,824	19,126	1.04
	92	8,622,283	485	478	642	642	18,038	17,778	1.01
	93	7,855,357	406	401	535	537	19,589	19,348	1.01
	94	3,860,240	328	320	499	499	12,063	11,769	1.03
	95	3,147,300	436	332	464	553	9,480	7,219	1.31
4A	90	2,503,281	155	153	188	189	16,361	16,150	1.01
	91	2,254,990	237	237	257	257	9,515	9,515	1.00
	92	2,699,027	197	190	326	326	14,205	13,701	1.04
	93	2,560,741	166	165	196	196	15,520	15,426	1.01
	94	1,803,462	178	176	229	230	10,247	10,132	1.01
	95	1,570,898	180	140	210	246	11,221	8,727	1.29
4B	90	1,332,988	65	61	133	136	21,852	20,508	1.07
	91	1,513,422	84	81	182	182	18,684	18,017	1.04
	92	2,317,361	85	82	261	261	28,261	27,263	1.04
	93	1,962,364	67	65	132	132	30,190	29,289	1.03
	94	2,017,108	75	74	229	229	27,258	26,895	1.01
	95	1,247,323	60	57	77	79	21,883	20,789	1.05
4C	90	529,481	54	51	158	160	10,382	9,805	1.06
	91	678,093	53	51	165	165	13,296	12,794	1.04
	92	792,925	68	62	315	329	12,789	11,661	1.10
	93	831,018	63	58	344	368	14,328	13,191	1.09
	94	714,882	66	64	320	329	11,170	10,832	1.03
	95	299,642	37	35	127	130	8,561	8,098	1.06
4D	90	1,005,291	24	24	25	25	41,887	41,887	1.00
	91	1,436,533	48	48	49	49	29,928	29,928	1.00
	92	727,423	26	26	27	27	27,978	27,978	1.00
	93	836,160	19	19	22	22	44,008	44,008	1.00
	94	710,901	40	39	117	118	18,228	17,773	1.03
	95	430,815	30	27	28	30	15,956	14,361	1.11
4E	90	60,355	133	129	273	276	468	454	1.03
	91	104,297	64	64	156	156	1,630	1,630	1.00
	92	66,818	41	41	146	146	1,630	1,630	1.00
	93	64,235	47	47	223	223	1,367	1,367	1.00
	94	120,226	75	74	451	453	1,625	1,603	1.01
	95	0	0	0	0	0	0	0	0

* CDQ harvest has been excluded.

Table 11 Comparison of Halibut TAC and Harvest by Area and Year

Area	Year	TAC	Harvest	Harvest Minus TAC	Harvest as Percent of TAC
2C	90	9,500,000	9,705,514	205,514	102.2
	91	7,400,000	8,686,934	1,286,934	117.4
	92	10,000,000	9,816,892	-183,108	98.2
	93	10,000,000	11,289,516	1,289,516	112.9
	94	11,000,000	10,378,542	-621,458	94.4
	95	9,000,000	7,708,414	-1,291,586	85.6
3A	90	31,000,000	28,844,296	-2,155,704	93.0
	91	26,600,000	22,926,430	-3,673,570	86.2
	92	26,600,000	26,781,876	181,876	100.7
	93	20,700,000	22,737,512	2,037,512	109.8
	94	26,000,000	24,843,824	-1,156,176	95.6
	95	20,000,000	17,747,126	-2,252,874	88.7
3B	90	8,500,000	8,694,295	194,295	102.3
	91	8,800,000	11,934,312	3,134,312	135.6
	92	8,800,000	8,622,283	-177,717	98.0
	93	6,500,000	7,855,357	1,355,357	120.9
	94	4,000,000	3,860,240	-139,760	96.5
	95	3,700,000	3,147,300	-552,700	85.1
4A	90	1,800,000	2,503,281	703,281	139.1
	91	1,700,000	2,254,990	554,990	132.6
	92	2,300,000	2,699,027	399,027	117.3
	93	2,020,000	2,560,741	540,741	126.8
	94	1,800,000	1,803,462	3,462	100.2
	95	1,950,000	1,570,898	-379,102	80.6
4B	90	1,900,000	1,332,988	-567,012	70.2
	91	1,700,000	1,513,422	-186,578	89.0
	92	2,300,000	2,317,361	17,361	100.8
	93	2,300,000	1,962,364	-337,636	85.3
	94	2,100,000	2,017,108	-82,892	96.1
	95	1,848,000	1,247,323	-600,677	67.5
4C	90	600,000	529,481	-70,519	88.2
	91	600,000	678,093	78,093	113.0
	92	800,000	792,925	-7,075	99.1
	93	800,000	831,018	31,018	103.9
	94	700,000	714,882	14,882	102.1
	95	385,000	299,642	-85,358	77.8
4D	90	600,000	1,005,291	405,291	167.5
	91	600,000	1,436,533	836,533	239.4
	92	800,000	727,423	-72,577	90.9
	93	800,000	836,160	36,160	104.5
	94	700,000	710,901	10,901	101.6
	95	539,000	430,815	-108,185	79.9
4E	90	100,000	60,355	-39,645	60.4
	91	100,000	104,297	4,297	104.3
	92	130,000	66,818	-63,182	51.4
	93	120,000	64,235	-55,765	53.5
	94	100,000	120,226	20,226	120.2
	95	0	0	0	0

Fishermen received higher dockside ex-vessel prices from processors in 1995 than in previous years (See Table 12). Fishermen also reported a decrease in the cost of boat repairs, gear replacement and insurance (Figure 13). Safety and fewer gear conflicts are often reported as benefits of quota systems and are probably responsible for these reduced costs mentioned here. Fishermen also reported some cost increases in 1995. Figure 13 also shows the increases in costs per pound of fuel and ice in 1995. Fishermen also cited an increase in administrative costs during 1995 (Knapp and Hull 1996). This is due to the increase in paperwork and other administrative burdens of the new regulations. These problems may be corrected in the near future but probably never totally eliminated.

The processing sector also experienced several changes during 1995. Although most were paying higher dockside prices, most processors also reported receiving higher wholesale prices for finished product which led to higher sales (ACFEC 1996). However, one third of processors reported that their gross margins went down under the ITQ program (ACFEC 1996). Processors accounting for 67% of halibut landings said the ITQ program caused an increase in their halibut production costs (ACFEC 1996). Most said the program caused an increase in total employee hours, increased labor costs per pound, but also reduced overtime hours (ACFEC 1996). Processors, like fishermen, also reported an increase in administrative costs. (ACFEC 1996)

It is rather difficult to analyze the efficiency of the program from these early cost indicators. However, it appears that the ITQ program caused an increase in costs for much of the processing sector in 1995. Some of these costs are partially offset by higher wholesale prices. However, the customer will also see this at the store and end up absorbing many of these negative costs to the processing sector. From an efficiency perspective, the ITQ program caused an increase in costs for many involved in the halibut fishery. The few efficiency gains attributed to the ITQ system for the fishermen are minimal and do not seem to adequately offset other, larger increases in costs to processors and consumers.

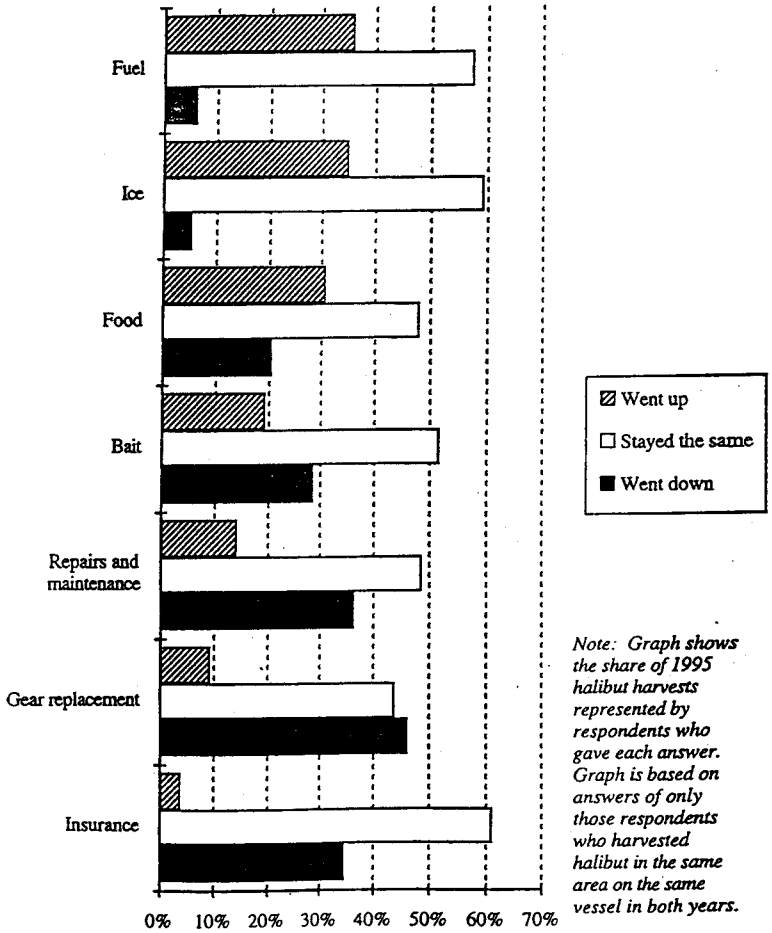
Product Quality

The quality of a product can also be a measure of its efficiency. One can argue that a more efficient process will produce a better quality product. Data from the ITQ program indicates that this has occurred. Product quality in the halibut fishery depends on the amount of harvest that ends up in the fresh sector and how much in the frozen food sector. Fresh product represents better quality and is reflected in higher ex-vessel prices for fresh halibut when compared to frozen. The share of fresh halibut doubled between 1994 and

Table 12. Summary of Ex-Vessel Prices by Region

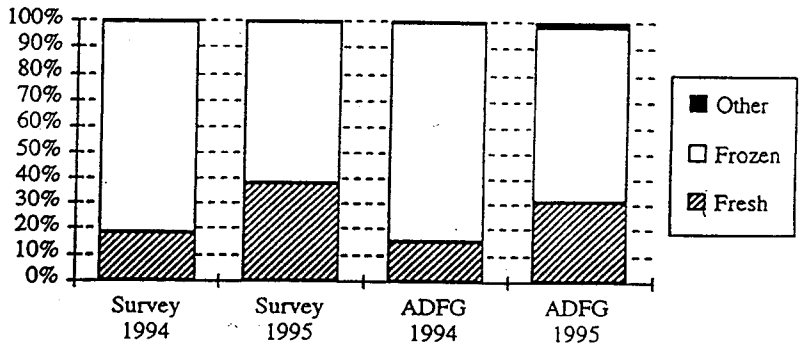
	Region				
	Southeast	Southcentral	Western*	Multiple/At-Sea*	Total
Number of responses					
1994	10	6	14	2	32
1995	12	8	14	3	37
Both years	10	6	14	2	32
1994 prices**					
Lowest	$1.85	$1.76	$1.25	$1.83	$1.25
Average	$1.97	$1.95	$1.87	$2.04	$1.92
Highest	$2.10	$2.25	$2.50	$2.24	$2.50
1995 prices**					
Lowest	$1.88	$1.93	$1.75	$1.94	$1.75
Average	$2.04	$2.10	$1.93	$2.04	$2.01
Highest	$2.23	$2.25	$2.21	$2.18	$2.25
Change in price**					
Lowest	-$0.08	$0.00	-$0.40	-$0.06	-$0.40
Average	$0.05	$0.15	$0.06	$0.03	$0.07
Highest	$0.20	$0.36	$0.50	$0.11	$0.50

Figure 13. Changes in Costs per Pound Harvested from 1994 to 1995



1995 from 18% to about 38%. This increase was to be expected with the introduction of the ITQ program. However, frozen halibut still accounted for 62% of total production in 1995. (See Figure 14). This increase in fresh product illustrates a gain in efficiency that can be attributed to the ITQ program.

Figure 14. Estimated Share of Halibut Production



By considering efficiency, it is difficult to determine if the ITQ program has been successful. Although the fleet has been reduced, much of the TAC was left un-harvested. If this trend continues, the inherent inequities of ITQ allocation were unnecessary. In addition, several costs have risen following the introduction of quotas. Production and labor costs have increased, while ex-vessel prices to fishermen have risen only marginally. The increase in supply of fresh halibut to the market has been one positive efficiency gain from the ITQ program. However, from these measures of efficiency, it appears that the ITQ program has not accomplished its goals. The length of time the program has been in effect must be considered. Although some negative trends have surfaced during the first year, the system is brand new and will require an adjustment period.

Stewardship

In the context of fishery management, stewardship is the idea that fishermen should harvest the resource in a prudent, non-wasteful manner that promotes long-term sutainability. In addition, fishermen should comply with regulations themselves while self-enforcing them among others. By employing sustainable harvest practices, fishermen can

be considered stewards of the sea much in the same way that farmers are stewards of the land. The ITQ system has been shown to have both positive and negative effects on stewardship.

Proponents of ITQ management suggest that quotas promote a sense of stewardship among the fishermen. Because ITQs essentially "privatize" a public resource, it is argued that fishermen will act more responsibly because they now have a vested interest in the fishery. "In New Zealand, quota holders have begun to cooperate in areas of monitoring, enforcement, and resource management because they see the benefits of cooperation to protect the integrity and value of their rights" (Pearse and Walters 1992). Others have also acknowledged that these "property rights" do contribute to a sense of stewardship. "Fishermen interest greater compliance, increased willingness to underwrite monitoring, enforcement, and research costs as well as an increased interest in adopting conservation measure" (McCay 1995). McCay reports that ground fishermen in Nova Scotia self-adopted conservation measures after the introduction of ITQs. Quota systems also instill stewardship because of time factors. "Because an access right creates an expectation of tenure, an incentive is provided to maintain the stock in a healthy condition" (Hanna 1995). In addition, ITQs establish a property right that can be sold which gives the fisherman the asset of increased retirement security. (Dewees 1989).

Although ITQs have been shown to promote stewardship in a few instances, it is also argued that a quota system will prevent stewardship by encouraging harmful fishing practices such as cheating, illegal landings, and discarding. In the European Union quota program, "the TAC system encourages fishermen to retain larger and more valuable fish in order to maximize the economic benefits from their quotas" (Karagiannakos 1996). Mis-reporting has also been a primary administrative problem. In New Zealand's ITQ system, 35% believed that under-reporting would increase because of incentives to cheat, higher prices, low quotas, and scarcity. (Dewees 1989). Others have cited quota busting, high grading, and data fouling as problems inherent to ITQ management. (Copes 1986, Hanna 1995, McCay 1995).

Initial analysis of the halibut ITQ program provides no conclusive evidence that it has promoted a higher sense of stewardship among the fishermen. During the first year, 602 investigations of violations were opened, of which, 60% were overages, 20% were reporting errors, and 11% were permit violations (NMFS 1996). These figures indicate that one in five participants in the ITQ fishery were in violation of regulations during 1995 (NMFS 1996). Application fraud and gross overages were the most serious violations. Data on discard rates are not yet available for the first year of the program, however, it has been suggested but not significantly documented. This could be due to the fact that

discarding at sea would be difficult to monitor and enforce in such a large fishery. While these figures indicate problems of stewardship, NMFS has stated that overall compliance was good in 1995. However, with one in five fishermen in violation and high grading a possible problem, stewardship does not appear to be a large benefit during the first year of the ITQ program. A better sense of stewardship may be realized in the future as the program adjusts to the new regulations.

The Envirocentric Ethic

Although the Council included measures to tackle the environmental and ethical problems associated with ITQ management, these provisions do not go far enough to adequately address the issues. These problems necessitate a more modern form of conservation ethics. An envirocentric ethic is needed to guide this and other forms of fishery management. The envirocentric ethic will be based on the best scientific information available and will use past management success and failures as well as the current conservation ideology to address the ethical issues of fishing quotas. However, new ethical concerns require that this philosophy be broadened even further. Based on the ocean ethic which is a modification of Leopold's land ethic, the envirocentric ethical approach will provide a framework in which to address the problems of quota management.

The envirocentric ethic is an amalgamation of concepts taken from past forms of conservation ethics, combined with a more contemporary and inclusive view of the environment. This philosophy will draw from the subsistence beliefs of Native Americans as well as the ideas of deep ecology which grew out of the environmental awareness and resulting legislation of the 1970's. Because the land and ocean affect each other in many ways, the envirocentric ethic will combine both Leopold's land ethic and the ocean ethic proposed earlier. Every part of the environment will be given consideration. This is done in a practical manner and does not mean that natural resource use will be entirely stopped because of the seemingly most insignificant part of the system. Every aspect will be considered as a necessary part of the whole and be allowed a continued existence. While this also considers humans as well as other parts of the system, human action into the environment must be justified and include measures that help sustain the ecosystem. Human's ability to alter the environment requires us to act as responsible stewards of our natural environment. Real compromises must be made for things like pollution prevention and habitat preservation, which can only be done with universal consideration.

By extending moral consideration to all parts of the ecosystem, the envirocentric ethic may seem to have some rather radical implications. However, this is not the case and the envirocentric ethic does not have to be an "all or nothing" idea. The envirocentric ethic stresses that every part needs to be considered, not that every part has to remain unaffected. Because of the necessity of all parts, any one part cannot be continuously ignored or overly exploited. In addition, the envirocentric ethic should be applied with a realistic understanding of the biological and political limits of the system. To do otherwise may not be practical. For example, it may not be practical to limit the crab catch because halibut feed upon them or put a fishery observer aboard every longliner to monitor high grading. However, it must be understood that some of the crab catch has to be left in the ocean for other non-human uses. In addition, some observers must be employed in order to discourage wasteful fishing practices and enforce fishery regulations. With the proper degree of temperance and understanding, the envirocentric ethic can be a useful tool for resource managers.

The envirocentric ethic will be based on the notions of conservation, preservation, and wise use as well as the new and emerging concepts of sustainability, risk assessment, and adaptive management. These notions develop the envirocentric ethic with a sense of scientific reality as well as political pragmatism.

Adaptive management has been defined as the "use of nature as an experiment from which we learn in order to better manage resources in the future" (Lee 1995). Any action that affects the environment has to be considered from all aspects. Sustainabiltiy will consider the needs of future generations while risk assessment will allow us to consider the effects of an action before it takes place. Adaptive management will base future decisions on the successes and failures of past management techniques. Finally, environmental concerns and ethical issues such as equity, efficiency, and stewardship will also be given the same consideration as economic interests. Any action should not overly stress any one of these notions, but rather consider all of them equally.

The envirocentric ethic can be applied to all forms of natural resource management. This is due to the fact that most natural resource sectors suffer from the same ideological problems. The ideology is rooted in outdated ethics and is reflected in our environmental laws. "The laws of our society follow the patterns of ancient ethics, and therefore are poorly suited to governing a complex, crowded, changeable world" (Hardin 1968). The inclusive nature of the envirocentric ethic will provide decision makers and resource managers with a framework in which to address the environmental and ethical problems of resource management.

Although there is currently a moratorium in the U.S. on new quota programs until the year 2000, it appears that their use will soon become more widespread in the next millennium. The problems of quota management will be magnified once they are extended to the trawl fisheries. Trawl fisheries are often comprised of several non-target species that interact with the target species as well as each other. This will result in complex allocations in which fishermen will probably be required to hold quota for several species in order land their target fish and any non-target bycatch. Fishery managers can use the envirocentric ethical approach to deal with the environmental issues that may arise from these types of allocations.

The halibut fishery was the ideal candidate for ITQ management because of the extensive scientific research that has been conducted on the fishery by the IPHC. The IPHC has logged all kinds of data on the halibut fishery for almost 75 years, making it one of the most meticulously documented fisheries in the world today.

By using the envirocentric ethic which is based on hard science, fishery managers will have to consider several factors when allocating quotas. The envirocentric ethic also calls for precaution in the absence of scientific information. Species interactions should be assumed while allowances should be made for other things like spawning seasons, nursery grounds and fishery habitat. The ocean ethic extends the boundary to include these aspects of the marine ecosystem and we now understand their relationship to the proper functioning of the ocean as a whole.

By employing the concept of risk assessment, the envirocentric ethic also identifies the threat to sustainability posed by high grading and quota busting. Through the process of adaptive management, these past problems can be addressed by implementing measures into the regulations that discourage and/or penalize those who engage in these wasteful practices.

Like environmental issues, the envirocentric ethic can also be used to deal with the ethical concerns of equity, efficiency, and stewardship that invariably arise from ITQ management. Quota consolidation and job loss are equity risks that have been assessed in other quota fisheries. The envirocentric ethic can be used to illustrate the need for more stringent ownership caps that prevent significant consolidation and job loss. In addition, fishery managers can learn from the halibut program and adopt initial allocation guidelines that are more reflective of true fishery participation. In these ways, the envirocentric ethic can be used to craft more equitable quota allocations. The envirocentric ethic will also provide fishermen with knowledge about how ITQ regulations will affect efficiency costs and allow them to prepare accordingly instead of forcing them to "take it on the chin".

In order to foster a sense of stewardship towards the resource, the envirocentric ethic must be extended to the fishermen themselves. Fishermen must understand and respect the finite nature of the resource as well as the dynamic processes involved in the fishery. High grading, quota busting, and mis-reporting indicate that some fishermen do not act as stewards of the resource. One purpose of the envirocentric ethic is to change this way of thinking and make fishermen realize that they are responsible for the health of the fishery. By employing an envirocentric ethical approach, fishermen will be able to make a living while also providing resource sustainability to fellow fishermen and the generations of fishermen that will follow. To be fishermen, they must also be concerned about the overall health of the marine environment. To do otherwise would sacrifice their livelihood as well as the livelihood of others who depend on the fishery.

Many of the basic fundamental concepts of the envirocentric ethic were utilized by the NPFMC when they implemented the halibut ITQ program. The Council did a great job addressing many difficult issues, however the problems that have arisen from the new program indicate that no system is perfect. The envirocentric ethic recognizes this and tries to facilitate solutions through change by identifying risks and incorporating this knowledge into future management decisions. Applying the lessons learned from the halibut ITQ program to other quota fisheries is the envirocentric ethical approach in progress.

CONCLUSION

In the Spring of 1995, the NPFMC implemented an ITQ program for the severely overcapitalized halibut fishery. Because of intense fishing effort, the halibut fishery became a "fishing derby" which resulted in poor product quality, compromised safety and fears of resource collapse. The Council accomplished a significant task that greatly improves upon the only previous ITQ program that had existed up until this time in the United States. Although the new quota regulations will provide some benefits to the fishery by reducing fishing effort, the program will also raise several ethical and environmental issues of its own. The ITQ issue sparked intense debate on Capitol Hill during the recent Magnuson Act re-authorization. The issue divided the fishing industry along regional lines while pitting environmental groups against each other. The controversy resulted in a 4-year moratorium on new quota programs which effectively delays the establishment of a national ITQ policy until after the year 2000. To deal with many of these concerns, an envirocentric ethical approach to ITQ management can be used to provide suggestions for future quota programs.

The ITQ program will provide several benefits to the halibut fishery. The new quota regime will improve safety by extending the fishing season which gives fishermen the time fish cleanly and schedule around bad weather. The longer fishing seasons will also increase product quality because more fish will be available to the frozen market than under derby fishing. In addition, fishermen will get higher prices for these fresh fish while processors will get higher prices for finished product. The ITQ regulations will also benefit the stock by ensuring that the overall TAC is not exceeded. Because of the quota's transferability, it provides the holder with a greater sense of security and a chance for retirement.

Unfortunately, the ITQ program may also cause some unwanted problems. ITQs may give fishermen an incentive to high grade their catch or exceed their individual quotas. These practices, if widespread, could seriously affect the health of the stock and jeopardized long-term sustainability. In addition to this, the initial allocation procedure was not reflective of true participation, excluding some while awarding some who no longer fish for halibut.

Significant quota consolidation could also occur under the ownership caps currently in place under the new system. In addition, consolidation appears to be mostly affecting the smaller, more rural fishing operations. This disproportionate type of job loss

and economic displacement that comes from quota consolidation raises several moral objections to ITQs based on the ideas of equity and fairness. The quota regulations will also raise operating and administrative costs for many fishing operations while also excluding processors from the program altogether.

The volatility of the quota issue was illustrated during the re-authorization of the Magnuson Act in Congress. ITQs divided the fishing industry by putting the small fishing operations against the larger ones while forcing the shore based processors against the factory trawlers. In addition, the issue divided Congress along regional lines with the Washington state delegation arguing with Alaska about who gets how much of the fish supply. The controversy resulted in a quota moratorium and a delay in establishing a national ITQ policy. The U.S. has adopted two ITQ programs while the NPFMC has been discussing the quota option for the halibut fishery since 1983. Unfortunately, election year politics has even further delayed a decision on ITQs that is long past due. The delay will allow for further study of the issue which hopefully will benefit the fishing industry in the future.

Several suggestions that arise from applying the envirocentric ethic can be made to improve upon the form of ITQ management that is currently used in the United States today. The first suggestion involves the use of scientific information. In order to provide sustainability, resource management must strive for better science and incorporate this knowledge as it becomes available. The NPFMC was able to look at other ITQ fisheries around the world to determine what was effective and what was not. Unfortunately, much of the literature that illustrates the problems of ITQs was not available 5 years ago when the halibut program was approved. New science indicates that ITQ management may also have some problems associated with it like high grading or excessive consolidation. These concerns necessitate a different approach than what was used in the halibut fishery. As science improves, fishery managers will be able to apply the information to solve new problems. A better understanding of the various interactions in the ocean will be necessary to use ITQs effectively, especially once they are extended to the multi-species trawl fisheries.

New ITQ programs should also attempt to include as many interested parties as possible. The NPFMC took great pains to ensure that everyone had an opportunity to express their opinions about the program. The Council tried to be fair to all involved and, for the most part, did a good job in this respect. However, some concerns were overlooked. The shore based processing sector was left out of the program and many of them reported being disadvantaged by the new regulations. The at sea processors got

some quota shares because they also harvest fish, however, the shore based sector was not included in the initial allocation.

The initial allocation procedure was not reflective of true fishery participation and needs to be improved. Many who participated in the fishery during the gap years received less than expected or were excluded altogether while some who do not even fish for halibut any longer were given quota shares. In addition, because the allocation was based on past catch records, the program awarded those with high catch rates who may have fished uncleanly in the past. Fortunately, a portion of the TAC was reserved for Native Alaskan communities that depend on the fishery for their existence.

The transferability limits may also have to be tightened in order to prevent excessive consolidation. The Council imposed several restrictions designed to prevent too much consolidation, however, significant consolidation could still occur under these caps. Under these caps, each management area could be reduced to 200 vessels which amounts to an almost 60 % reduction in the number of vessels in the program. Although the fish stock may benefit from this type of reduction, allocations that displace this much effort create significant problems. A vessel buy-out program could be introduced alongside an ITQ system in order to offer some compensation to those who may be disadvantaged by the regulations and are stuck with a boat that they cannot afford to operate.

Monitoring and enforcement programs must be adequate enough to detect illegal practices like high grading and quota busting. These wasteful fishing practices can seriously affect the stock biomass and also result in poor TAC setting which could lead to resource depletion. Monitoring and enforcement guidelines have to be strict enough to discourage the practice and also punish those who commit violations. Without a strict enforcement program, the regulations may not be adhered to by the industry. It is acknowledged within the industry that the fishing business is not the "cleanest" industry in the world. This necessitates an effective monitoring and enforcement program.

In concert with the previous suggestion, ITQ management needs to foster a greater sense of stewardship among those in the industry. This can be accomplished by encouraging all sectors to participate in the rule-making process. If everyone is involved in the procedure, then a program can be crafted that considers all sides and is fair to everyone. ITQs may foster stewardship because the fishermen now have a vested interest in the long-term health of the resource. In addition, an industry sponsored monitoring and enforcement program may also help to foster this sense of stewardship and give the industry more input into the process.

Finally, ITQ programs must promote sustainability as the primary goal instead of quick-fix economic benefit. Many of the objectives of the halibut ITQ program targeted

economic issues like efficiency and overcapitalization. ITQ programs should encourage conservation by including measures that prevent wastage and encourage cleaner fishing. This can be done by allocating bycatch quotas, awarding less quota initially to those with "dirty" fishing records, or allocating less in the future as a penalty for high grading. Bycatch quotas will allow for full retention and utilization of the catch while allocation restrictions will encourage cleaner fishing. This will be particularly important once the trawl fisheries implement ITQs because these fisheries have many species interactions and high bycatch rates.

Although the NPFMC did a great job crafting the new halibut ITQ program, some new problems may arise from the regulations. Several ethical and environmental concerns associated with ITQ management need to be addressed before quotas become more widely used. The current quota moratorium in the United States will provide an opportunity to further address these issues and implement an ITQ strategy that promotes sustainability and is fair to everyone in the industry.

BIBLIOGRAPHY

Alaska's Commercial Fisheries Entry Commission (ACFEC). 1996. Changes Under Alaska's Halibut IFQ Program, 1995. Juneau: Part of IFQ Research Team Report Submitted to NPFMC.

--------1996. Participation in the Alaska Halibut and Sablefish Fisheries 1991-1994. Juneau. Gap Report Submitted to NPFMC.

Anderson, L.G. 1995. A Commentary on the Views of Environmental Groups on Access Control in Fisheries. *Ocean and Coastal Management* 28: Nos. 1-3: 165-188.

Arnason, R. 1993. Icelandic Fisheries Management. *The Use of Individual Quotas in Fisheries Management.* Paris: Organization for Economic Cooperation and Development Document.

Bell, F.H. 1981. *The Pacific Halibut: The Resource and the Fishery.* Anchorage: Alaska Northwest Publishing Company.

Bergman, B.J. 1995. Leader of the Pack. *Sierra* 80: No.6: 50-54, 71-73.

Best, E.A. 1977. Distribution and Abundance of Juvenile Halibut in the Southeastern Bering Sea. Sci. Rep. 62. Seattle: IPHC.

Callicott, J.B. 1991. Conservation Ethics and Fishery Management. *Fisheries* 16: No.2: 22-28.

--------1982. Traditional American Indian and Western European Attitudes Toward Nature: An Overview. *Environmental Ethics* 4: 293-320.

Canadian Dept. for Fisheries and Oceans, 1993. IQ Management: Canada's Experience Featuring the Pacific Halibut Fishery. *The Use of IQs in Fisheries Management.* Paris: Org. for Econ. Coop. and Dev. Document.

Carney, D. 1996. Changes Approved in Fisheries Act. *Congressional Quarterly* 3/30/96: 879.

Carson, R. 1950. *The Sea Around Us.* New York: Oxford University Press.

Christie, D.R. 1994. *Coastal and Ocean Managment Law.* St. Paul: West Publisihng Co..

Christy, F.T. 1977. The Fishery Conservation and Management Act of 1976: Management Objectives and the Distribution of Benefits and Costs. *Washington Law Review: Symposium on the Fishery Conservation and Management Act of 1976* Vol. 52: No.3: 657-680.

Clark, C.W. 1985. The Effect of Fishermen's Quotas on Expected Catch Rates. *Marine Resource Economics* 1: No. 4: 419-427.

Clark, I.N. 1991. New Zealand's ITQ System for Fisheries Management. Tokyo: Paper Presented at the JIFRS/IIFET/ZENGYOREN Symposium on Fishery Management.

Cleary, R.E. 1996. Lets Get Rid of ITQs. Letter to the Editor. *National Fisherman* 76:12: p.5.

Congressional Record. 1/4/95. Senate Bill 39. S233-249.

-------1995. Extension of Remarks by Don Young 1/4/95. E9.

-------1995. Extension of Remarks by Jennifer Dunn 10/24/95. E2008.

Congressional Quarterly. 3/23/96. Committee Guide: Players, Politics, and Turf of the 104th Congress. *Congressional Quarterly*. Vol: 54. Supplement to No.12.

Copes, P. and Cook, B.A. 1982. Rationalization of Canada's Pacific Halibut Fishery. *Ocean Management* 8: 151-175.

Copes, P. 1986. A Critical Review of the IQ as a Device in Fisheries Management. *Land Economics* 62: No.3: 278-291.

--------1992. Individual Fishing Rights: Some Implications of Transferability. Paris: *Proceedings from the 6th Biennial Conference of the International Institute of Fisheries Economics and Trade.*

Coull, J.R. 1993. *World Fisheries Resources*. London: Routledge.

DeSilvestro, R. 1995. Are We Headed Towards a Fishless Ocean. *Defenders*: Spring 26-33.

Dewees, C.M. 1989. Assessment of the Implementation of ITQs in New Zealand's Inshore Fishery. *North American Journal of Fisheries Management* 9: No.2: 131-1 39.

Duncan, L. 1994. ITQs: A Critical Appraisal. Washington: Greenpeace.

Ess, C. 1996. Do IFQs Spur Boat Investments. *Pacific Fishing*. 17: No.12: 24-25.

Eythorsson, E. 1996. Theory and Practice of ITQs in Iceland: Privatization of Common Fishing Rights. *Marine Policy* 20: No.3: 269-281.

Falloon, R. 1993. Individual Transferable Quotas: The New Zealand Case. *The Use of IQs in Fisheries Management.* Paris: Org. for Econ. Coop. and Dev. Document

Federal Register. 11/9/93. Vol. 58: No. 215: 59375-59413.

Freedman, A. 1996. Fate of Fisheries Revamp Could Rest With House. *Congressional Quarterly:* 2587-2589.

--------1996. Fisheries Bill Hinges on House After Smooth Senate Sailing. *Congressional Quarterly*: 2659-2660.

--------1996. Fisheries Bill Clears House. *Congressional Quarterly*: 2753.

--------1996. Alaska Delegation Looks To Flex Muscle. *Congressional Quarterly*: 3388-3389.

Fullilove, J. and Pollack, S. 1995. Congress Flirts With Major Changes. *National Fisherman* 76: No.1: 6-7.

Gay, J. 1994. Rock Sole Fishery. *Win-Win Bycatch Solutions*. Seattle: National Fisheries Conservation Center.

--------1996. Magnuson-Stevens Law Bodes Change. *Pacific Fishing* 17: No.12: 26-28.

Geen, G., Nielander, W., and Meany, T.F. 1993. Australian Experience with ITQ Systems. *The Use of IQs in Fisheries Management*. Paris: Org. for Econ. Coop. and Dev. Document.

Gilroy, H., Sullivan, P.J., Lowe, S.M., and Terry, J.M. 1996. Preliminary Assessment of the Halibut and Sablefish IFQ Programs In Terms of 9 Potential Conservation Effects. Report of IFQ Research Planning Team Submitted to NPFMC.

Ginter, J.C. 1995. The Alaska CDQ Fisheries Management Program. *Ocean and Coastal Management* 28: Nos. 1-3: 147-163.

Glass, P. 1995. Magnuson Bill Posts Big Changes. *National Fisherman* 76: No.8.

--------1996. New ITQ Plans may be on Hold. *National Fisherman* 76: No.12.

Gordon, H.S. 1954. The Economic Theory of a Common Property Resource: The Fishery. *Journal of Political Economy* 62: 2: 124-142.

Greenpeace. 1992. Greenpeace Annual Fund and Financial Statement.

--------1992. Greenpeace Declaration of Independence.

--------1994. Statement on ITQs to Fisheries Subcommittee of House Merchant Marine and Fisheries Committee. Washington: Greenpeace.

Greer, J. 1995. *The Big Business Takeover of U.S. Fisheries: Privatizing the Oceans Through ITQs.* Washington: Greenpeace.

Hanna, S.S. 1990. The Eighteenth Century English Commons: A Model for Ocean Management. *Ocean and Shoreline Management* 14:155-172.

--------1995. User Participation and Fishery Management Performance within the Pacific Fishery Management Council. *Ocean and Coastal Management* 28: Nos.1-3: 23-44.

Hardin, G. 1968. The Tragedy of the Commons. *Science* 162: 1243-1248.

Hoag, S.H., Peltonen, G.J. and Sadorus, L.L. 1993. Regulations of the Pacific Halibut Fishery, 1977-1992. Tech. Rep. 27. Seattle: IPHC.

Hughes, J.D. 1983. *American Indian Ecology.* The University of Texas at El Paso: Texas Western Press.

Information Please Almanac. 1997. New York: Houghton Mifflin. p. 73.

International Pacific Halibut Commission (IPHC). 1975. Annual Report 1974. Seattle.

-------1987. The Pacific Halibut : Biology, Fishery, and Management. Tech. Report No. 22.

-------1987. Annual Report 1986. Seattle.

-------1988. Annual Report. 1987. Seattle.

-------1990. Annual Report 1989. Seattle.

-------1991. Annual Report. 1990. Seattle.

-------1992. Annual Report. 1991. Seattle.

-------1993. Annual Report. 1992 Seattle.

-------1995. Annual Report 1994. Seattle.

Internet 1. 1996. 9th Circuit Court of Appeals: Alliance Against IFQs vs. Commerce Secretary, NPFMC, and others. Filed 5/22/96. Web Address Unknown.

Internet 2. 1996. 104th Congress. Senate Bill 39. 3/28/96. S:\WPSHR\LEGCNSL\XYWRITE\OCEANS\MAGNUSON.7

Jacobsen, J. and Davis, K., eds. 1983. *Federal Fisheries Management: A Guidebook to the Fishery Conservation and Management Act*. Published for National Sea Grant Program by Oregon State University and the University of Oregon.

Kalo, J.J., Hildreth, R.G., Rieser, A., Christie, D.R., and Jacobson, J.L. 1994. *Coastal and Ocean Law*. Houston: The John Marshall Publishing Company.

Karagiannakos, A. 1996. TAC and Quota Management System in the European Union. *Marine Policy* 20: No.3: 235-248.

Knapp, G. and Hull, D. 1996. The First Year of the Alaska IFQ Program: A Survey of Halibut Quota Share Holders. Anchorage: Institute for Social and Economic Research.

--------1996. The First Year of the Alaska IFQ Program: A Survey of Halibut Registered Buyers. Anchorage: Institute for Social and Economic Research.

Kowalski, D. 1995. Questions Abound as IFQs Debut in Alaska. *National Fisherman* 76: No.2: 14-16.

Langdon, S.J. and Miller, M.L. 1984. *Social and Cultural Characteristics of North Pacific Halibut Fishermen*. Anchorage: North Pacific Fishery Management Council Document # 25.

Laubstein, K. 1993. Socio-Economic Aspects of Fisheries Management: The Canadian Experience. Brussels: Paper presented at 5th Annual Conference of European Association of Fisheries Economists (EAFE).

Lee, K. 1993. *Compass and Gyroscope*. Washington: Island Press.

Leopold, Aldo. 1949. *A Sand County Almanac*. New York: Oxford University Press.

Lewis, M. 1992. *Green Delusions*. Durham: Duke University Press.

MacKinnon, B. 1995. *Ethics: Theory and Contemporary Issues*. San Francisco: Wadsworth Publishing Company.

Magnuson Fishery Conservation and Management Act. 1976. 16 USC 1801-1882.

Major, P. 1994. ITQs and Quota Management Systems: A Perspective from the New Zealand Experience. *Limited Access to Marine Fisheries: Keeping the Focus on Conservation*. Washington D.C: CMC and WWF.

Mangone, G. 1988. *Marine Policy for America*. New York: Taylor and Francis.

Marx, W. 1967. *The Frail Ocean*. New York: Coward-McCann, Inc..

Matsen, B. 1995. Caterpillar Buys Quota at Bankruptcy Auction. *National Fisherman* 76: No.1: p.8.

--------1996. Budget Logjam Tops '96 Agenda. *National Fisherman* 76: No.11.

McCaughran, D.A. and Hoag, S.H. 1992. The 1979 Protocol to the Convention and Related Legislation. Technical Report No. 26. Seattle: International Pacific Halibut Commission.

McCay, B.J., Creed, C.F., Finlayson, A.C., Apostle, R., and Mikalsen,K. 1995. ITQs in Canadian and U.S. Fisheries. *Ocean and Coastal Management* 28: Nos.1-3: 85-115.

McCay, B.J. 1995. Social and Ecological Implications of ITQs: An overview. *Ocean and Coastal Management* 28. Nos.1-3: 3-22.

Merchant, C. 1994. Fish First! The Changing Ethics of Ecosystem Management. Sun River: Paper Presented to the Oregon Chapter of the American Fisheries Society.

Miller, M.L. and Kirk, J. 1992. Marine Environmental Ethics. *Ocean and Coastal Management* 17: 237-251.

Monk, G. and Hewison, G. 1994. A Brief Criticism of the NZ Quota Management System. *Limited Access Management: Keeping the Focus on Conservation*. Washington D.C: CMC and WWF.

Moormeier, J. Letter To Secretary Franklin. Included in EIS. See NMFS 1992.

Morgan, G.R. 1995. Optimal Fisheries Quota Allocation under a TQ Management System. *Marine Policy* 19: No.5: 379-390.

Murkowski, F.H. Letter from Senator Murkowski to Mr. and Mrs. Phil Robbins of Kodiak. Included in EIS. See NMFS 1992.

Nash, R.F. 1989. *The Rights of Nature*. London: The University of Wisconsin Press.

National Marine Fisheries Service (NMFS). 1992. EIS for the IFQ Management Alternative for Fixed Gear Sablefish and Halibut Fisheries. Report as Required by with NEPA. U.S. Dept. of Commerce. Washington D.C..

--------1994. The IFQ Program: Insights and Updates. Juneau: pp.1-16.

--------1995. The IFQ Program Underway. Juneau: pp.1-19.

--------1996. Implementation of the Halibut IFQ Program. Report prepared by RAM Division. Alaska Region. Part of IFQ Research Team Report Submitted to NPFMC.

Neher, P.A., Arnason, R., and Mollet, N., eds. 1989. *Rights Based Fishing*. Dordrecht: Kluwer Academic Publishers

Neilson, 1993. Reproductive Biology of Atlantic Halibut in Canadian Waters. *Canadian Journal of Fisheries and Aquatic Sciences* 50.

North Pacific Fishery Management Council (NPFMC). 1992. True North: IFQs Off the Port Bow. Anchorage: pp.1-23.

Northern Pacific Halibut Act. 1982. 16 USC 773. Public Law 97-176, May 17, 1982.

Norwegian Authorities. 1993. IQ Management Systems in Norway. *The Use of IQs in Fisheries Management*. Paris: Org. for Econ. Coop. and Dev. Document.

O'Boyle, R., Annand, C. and Brander, L. 1994. IQs in the Scotian Shelf Groundfishery. *Limited Access Management: Keeping the Focus on Conservation*. Washington DC: CMC and WWF.

Palmer, E.A. 1995. House Votes to Reauthorize Magnuson Act. *Congressional Quarterly*. 10/21/95: 3203.

Palsson, G. and Helgason, A. 1995. Figuring Fish and Measuring Men: The ITQ System in the Icelandic Cod Fishery. *Ocean and Coastal Management* 28: Nos.1-3: 117-146.

Parfit, M. 1995. Diminishing Returns. *National Geographic* November: 2-37.

Pearse, P.H. and Walters, C.J. 1992. Harvesting Regulation under Quota Management Systems for Ocean Fisheries. *Marine Policy* 5: 167-182.

Pearse. P.H. 1994. Fishing Rights and Fishing Policy: The Development of Property Rights as Instruments of Fisheries Management. *State of the World's Fisheries Resources: Proceedings of the World Fisheries Congress*. Lebanon, N.H.: International Science Publishers.

Petterson, J.S. 1992. Preliminary Socioeconomic Impact Review of the NPFMC Halibut IFQ System. La Jolla: Paper Prepared for the Deep Sea Fishermen's Union. Included in EIS. See NMFS 1992.

Pollack, S. 1995. Northeast Groundfishermen Rail Against Tough New Proposals. *National Fisherman* 76: No.8: 15-17.

Raizin,M. 1993. ITQs of the Surf Clam and Ocean Quahog Fishery of the Northwest Atlantic. *The Use of IQs in Fisheries Management*. Paris: Org. for Econ. Coop. and Dev. Document.

Rawls, J. 1971. *A Theory of Justice*. Cambridge: Harvard University Press.

Rettig, B. 1993. Potential Elements of IFQs or License Limitation Programs in North Pacific Groundfish and Crab Fisheries. Document prepared for the North Pacific Fishery Management Council.

Ricci, D. 1993. *The Transformation of American Politics*. Yale University Press.

Roberts, E. 1996. Personal Communiction with Roberts who is with Greenpeace in Washinton D.C..

Schmitt, C.C. and Skud, B.E. 1978. Relation of Fecundity to Long Term Changes in Growth, Abundance and Recruitment. Sci. Rep. 66. Seattle: IPHC.

Smith, H.N. 1950. *Virgin Land*. London: Oxford University Press.

Smullen, S. 1996. NOAA Report No. 164. 9/20/96. NOAA Web Site via Internet.

Stephan, J.R. 1992. Letter from United Fishermen's Marketing Association written to NMFS. Included in EIS. See NMFS 1992.

St.Pierre, G. 1984. Spawning Locations and Season for Pacific Halibut. Sci. Rep. 70. Seattle: IPHC.

--------1989. Recent Studies of Pacific Halibut Postlarvae in the Gulf of Alaska and Eastern Bering Sea. Sci. Rep. 73. Seattle: IPHC.

Swenson, E. 1995. Greeenpeace Protests IFQs in Waterfront Drama. *National Fisherman* 76: No.6: p.11.

Terry, J.M. 1993. ITQs for the Fixed Gear Sablefish and Halibut Fisheries of Alaska. *The Use of IQs in Fisheries Management.* Paris: Org. for Econ. Coop. and Dev. Document.

Thoreau, H. D. 1973. *The Illustrated Walden.* Princeton; Princeton University Press.

Tkacz, B. 1994. Proof, Allocation are Hurdles for Bycatch Innovators. *Win-Win Bycatch Solutions.* Seattle: National Fisheries Conservation Center.

Townsend, R.E. and Pooley, S.G. Corporate Management of the Northwestern Hawaiian Islands Lobster Fishery. *Ocean and Coastal Management* 28: Nos.1-3: 63-83.

Townsend, R.E. 1995. Transferable Dynamic Stock Rights. *Marine Policy* 19: No.2: 153-158.

Turris, B.R. 1994. Canada's Halibut Fishery: A Case Study of an IQ Fishery. *Limited Access management: Keeping the Focus on Conservation.* Washington D.C: CMC and WWF.

United States Coast Guard. 1996. Search and Rescue Statistics 1992-1995. Juneau.

Valencia, M.J. and VanderZwaag, D. 1989. Maritime Claims and Management of Indigenous Peoples: Rising Tides in the Pacific and Northern waters. *Ocean and Shoreline Management* 12: 125-167.

Warren, B. 1995. Greenpeace Steps Up Anti-ITQ Campaign. *National Fisherman* 76: No.3: p.64.

Waterman, M. 1996. Magnuson-Stevens Bill: Conservation Efforts are Applauded but Most Everything Else Still Draws Fire. *National Fisherman* 77: No.8: 14-15.

Wilkinson, C. 1992. *Crossing the Next Meridian.* Washington: Island Press.

Willard, G.W. 1992. Letter from City of Seldovia written to NMFS. Included in EIS.

Wilson, J.Q. 1995. *Political Organizations.* Princeton University Press.

World Almanac. 1996. Mahwah, N.J.: World Almanac Books. p.164.

Young, M.D. 1995. The Design of Fishing Right Systems-the New South Wales Experience. *Ocean and Coastal Management* 28: Nos.1-3: 45-61.