Fundamental Changes to Fishery Management Regimes

The individual transferable quota (ITQ) program is a new approach to fisheries management which the North Pacific Fishery Management Council (NPFMC) recommended and the Secretary of Commerce approved for the fixed-gear halibut and sablefish fisheries off Alaska. The NPFMC also is considering an ITQ program for the other groundfish and crab fisheries off Alaska, and the Pacific Fishery Management Council (PFMC) is considering an ITQ program for the fixed-gear halibut and sablefish fisheries off California, Oregon, and Washington.

The two principal features of an ITQ program are suggested by its name. First, there are individual quotas; that is, instead of having a quota for a fishery as a whole for each species or species group, each fishing operation has its own individual quota for each species or species group. Second, the individual quotas, or parts thereof, are transferable among fishing operations. For example, a fishing vessel owner who shortly before the beginning of the fishing year is issued ITQs of 10,000 lb for halibut and 15,000 lb for sablefish may decide later in the year, that given the prices of ITQs and his own circumstances, he would rather catch 12,000 lb of halibut and 12,000 lb of sablefish. To do so he would have to acquire an additional 2,000 lb of halibut ITQs and could sell up to 3,000 lb of his sablefish ITQs. The amount of ITQs issued to each person prior to the start of each fishing year is based on the amount of ongoing rights to annual ITQs that person owns as of a specific date prior to the start of a fishing year. The ongoing rights to annual ITQs are also transferable.

The adoption of ITQ programs represents dramatic and fundamental changes in fisheries management. This article identifies the absence of an efficient mechanism for allocating fish under open access management as the source of many fishery management problems and the impetus for considering ITQ programs. The article also discusses the potential advantages of utilizing the market mechanism to allocate fish, and it reviews the potential benefits and costs of ITQ programs, as well as the obstacles to successfully implementing them.

The Impetus for Considering ITQ Programs

Historically, the crab and groundfish fisheries mentioned above have been managed as open access fisheries with relatively few restrictions on either the number of participants or the catch of individual participants. There have been three results. First, harvesting capacity increased well beyond the level required to harvest the quotas. Second, fishery management actions were taken to prevent catch from exceeding the allowable harvest and to allocate the allowable harvest among competing user groups. Third, the excess harvesting capacity and many subsequent management responses reduced the net benefits derived from the fisheries by increasing industry and management costs and decreasing the quantity, quality, and value of fishery products. Increased costs include 1) increased general operating costs for fishermen and processors; 2) increased fishing mortality not associated with actual landings (i.e., by-catch, high-grading, and ghost fishing); 3) decreased safety; 4) decreased stability for the industry and dependent communities; 5) increased costs to develop and implement management actions to prevent overfishing and to address allocation conflicts; and 6) increased enforcement and inseason management costs.

Reliance upon an inefficient allocation mechanism – the race for fish – is the source of many of these fishery management problems. The race for fish is inefficient for two reasons. First, it provides each individual fishing operation with an incentive to fish faster, even when this leads to a reduction in net benefits from the fishery. The response of individual fishermen to this incentive is to use more resources including labor, fish, fuel, and capital equipment (e.g., vessels, gear, and electronics). However, since total catch in most fisheries is constrained by quotas, this response increases fishing costs without increasing catch. In addition, the response often decreases the quantity and quality of the fishery products extracted from the available resource and increases processing costs. Thus, over time, the race for fish tends to reduce the difference between the total value of fishery products and the cost of all the inputs to the production process. The difference between the total cost of inputs and total value of outputs is a commonly used measure of the net benefits derived from a fishery. Net benefits include external benefits and costs, such as those associated with changes to the environment or public health and safety.

The second reason the race for fish is an inefficient allocation mechanism is that it allocates more fish to faster fishing operations even if slower operations would generate greater net benefits from the use of the fish. That is, the available catch is not distributed among fishing operations on the basis of who is capable of generating the highest net benefit.

Often management's responses to the symptoms of an inefficient allocation mechanism have aggravated the problem. There are several reasons for this. First, the information required to select the appropriate management measure and to implement it effectively is seldom available. Second, even with adequate information, many management measures that are politically acceptable are not effective in treating either the symptoms or their cause. Third, the use of a specific management measure may be motivated by an interest in the distribution of net benefits among user groups with inadequate concern for the total net benefits generated by the fishery. Finally, the cycle of continually selecting, implementing, evaluating, and revising new management measures which address only the symptoms of the problem results in ever-increasing management costs which do not yield long-term solutions.

An Alternative Mechanism for Allocating Fish

The market mechanism is used to allocate numerous resources in the United States and in many foreign countries. The extensive use of the market mechanism is principally because it allocates resources more efficiently than other allocation mechanisms do (particularly if potential sources of market failure are recognized and corrected with appropriate policy intervention). With an open access fishery, individual fishing operations do not pay for the fish they use. Because this valuable input to the production process does not have a direct cost, operations spend more on other inputs, resulting in an inefficient use of several resources. An ITQ program establishes rights to use fixed amounts of fish, thereby imposing a cost on each fishing operation for the fish it uses.

With an ITQ program, allotments of weight are issued at the beginning of each fishing year to those who have obtained the harvest rights for each fishery. As fishing operations proceed with harvesting, they must possess and surrender to the government an amount of ITQ equivalent to the amount of each species caught. For example, if 1 metric ton (t) of walleye pollock is caught, 1 t of ITQ for pollock must be debited from the pollock ITQ held by the operation. In this situation, the fishing operation incurs a cost for the pollock it uses, regardless of whether the operation actually has to buy pollock ITQ in the market or whether the operation is initially given ITQ. In the latter case, the allotment carries an implicit cost equal to what the operation could have sold the ITQ for in the market.

Accordingly, the incentive for each fishing operation to use too many resources to fish ever faster under open access is replaced by the incentive to fish in a manner that will simultaneously maximize the benefits each fishing operation and society receive from the fish used. Having each fishing operation pay for the fish it uses also results in an efficient allocation of fish among fishing operations because fishing operations that generate a larger net-return-per-pound of fish caught will be willing to pay more for the ITQs than those who are less efficient.

The Potential Benefits and Costs of an ITQ Program

The halibut fishery off Alaska provides an extreme example of the results of an open access fishery with respect to the shortened fishing season, the increased intensity of the fishery, and the associated decrease in net benefits. In 1981 the fleet fishing for halibut off Alaska included fewer than 2,900 vessels; by 1991 the fleet had grown to 4,400 vessels. In the most productive halibut management area, the fishing season decreased from more than 120 days with no trip limits in 1975, to one 24-hour opening without trip limits, one 24-hour opening with trip limits, and one 48-hour opening with trip limits in 1992. This dramatic decline in season length occurred despite a substantial increase in the quota between 1975 and 1992.

The ITQ program for the halibut fishery is expected to provide substantial benefits by eliminating the race for fish and thereby allowing fishermen to use the halibut quota more productively. By substantially reducing the premium on time and allowing each fisherman to decide when to fish for halibut, the ITQ program will reduce fishing costs and increase the quantity and quality of landings. Specific examples are discussed below.

Gear losses will be reduced for several reasons. Because fishermen will be able to choose when to fish, the fishing grounds will be much less congested. Fishermen will take more time to avoid each other's gear and to retrieve gear when it becomes tangled. Fishermen will not have an incentive to deploy more gear than they probably can retrieve during a brief opening in order to either preempt desirable fishing grounds or allow for the off chance that they can retrieve more gear than expected. Fishermen will be able to avoid fishing when the weather or tides are expected to increase gear or vessel losses.

Fishing safety will increase for the following reasons: The incentive to fish despite poor weather conditions and to fish to or beyond the point of exhaustion is reduced substantially. Accidents will be fewer with a slower-paced operation. The fishing grounds will be

less congested. Also, fuel and bait costs will be reduced because each fishing operation will be free to choose its optimal fishing periods, trip lengths, and fishing rates. Similarly, processing and inventory costs can be reduced by having the seasonality of harvests match more closely those of halibut consumption.

Fishing mortality due to ghost fishing by lost gear will be reduced by the reduction in lost gear. Discard mortality for halibut and other species will be reduced for the following reasons: Halibut fishermen will take more time to avoid areas and times with higher bycatch rates for sublegal-size halibut. The incentive for halibut fishermen to discard groundfish taken as bycatch will decrease. The discard mortality rates for sublegal halibut and some groundfish species will be reduced because more time will be available for careful release. Legal-size halibut that are taken as bycatch in other fixed-gear fisheries can be retained.

By decreasing these sources of fishing mortality, the halibut ITQ program can increase the percent of total allowable fishing mortality that is landed and used to produce seafood. With ITQs, fishermen have an increased incentive to high grade, that is to discard fish that are expected to have a lower price per pound if these discards are not counted against their ITQs. With ITQs, these discards are a problem if they are not accounted for. The net effect of the halibut or any ITQ program on unreported discards will depend on a variety of factors including price differentials, the cost of replacing lower-priced fish with higher-priced fish, and the effectiveness of the ITQ monitoring and enforcement programs.

Perhaps most importantly for the halibut fishery, the harvest of fish can be scheduled to provide better and therefore higher-valued products. The short, intense fishing periods for halibut have reduced product quality by producing gluts of fish, only a fraction of which can be consumed as the higher-valued fresh product. By providing individual fishermen and processors with the option of determining when and how halibut is harvested, the ITQ program is expected to increase product quality and value in several ways. Fishermen will take steps to reduce handling-related quality deterioration of halibut onboard vessels. Deliveries will be coordinated with processing capacity so that delays are reduced between the time of landing and processing. Catch will be scheduled in order to provide consumers with more highly-valued halibut throughout the year. Although an increase in the value of halibut would reflect an increase in benefits to consumers as a whole, there will be both winners and losers among individual consumers. Consumers who prefer fresh halibut throughout the year will benefit at the expense of those who prefer to have either low-priced frozen halibut or fresh halibut shortly after the short fishing periods, when the markets are glutted and prices are reduced.

Like the halibut fleet, the fleet fishing the remainder of the North Pacific groundfish fishery has also grown dramatically – from fewer than 900 vessels in 1981 to more than 2,200 ten years later. This growth has been accompanied by reductions in season lengths and numerous allocation disputes between user groups. Most groundfish species are taken as target catch in some fisheries and as bycatch in others. The quotas and bycatch rates in the groundfish fisheries are seldom such that the quota for each species can be used fully without exceeding the quotas for one or more other species. An ITQ program, if it applies to all species, can reduce this problem by providing the flexibility and incentives for individual fishing operations to modify their bycatch rates so that more of each quota can be used. In addition, the price of ITQs for a species provides an estimate of the benefit of changing the quota for that species. For example, if the price of ITQ for 1 t of walleye pollock is $100, then the value to fishermen of increasing the pollock quota by 1 t is $100. Such estimates are among the critical inputs in determining the appropriate quotas.

If a bycatch species in an ITQ fishery is managed under open access, and if the quota for that bycatch species is expected to be taken before the ITQs in the fishery are all used, the ITQ program will not eliminate the race for fish as the allocation mechanism. Fishermen will race to harvest the target species before the fishery is closed by the bycatch quota. Therefore, the potential gains from the ITQ program for a fishery are substantially reduced, if not eliminated completely, when one or more species that are taken in that fishery and that are fully utilized are not included in the ITQ program.

As with any major change to the management regime, the imposition of ITQs will result in changes or instability. Eventually, however, the economic stability of fishermen, the industry, and dependent coastal communities can increase. The chance of missing an entire season due to bad weather, an illness, a mechanical failure, or other vessel problems is eliminated. The ability of local fishermen and processors to have longer seasons is increased. The ability of fishermen to avoid seasonal market gluts and the associated lower prices is increased. And the regulatory environment will be

more stable because fewer regulatory changes will be needed to address allocation problems. Once a comprehensive ITQ program is in place, the market mechanism, instead of the regulatory process, can be used to address many of the allocation issues that currently consume large amounts of Council, industry, and staff time. This will allow management resources to be directed towards management issues other than those of allocation.

In the race for fish, as excess harvesting capacity has increased, enforcement and in-season management tasks have increased. With ITQs, in-season management activities will shift away from micromanaging quotas to overseeing the accounting system for monitoring ITQ holdings. This shift may or may not lead to a cost savings. However, ITQ programs increase the cost of enforcement. The effectiveness of the market mechanism to allocate a quota among competing uses is dependent upon the enforcement of the use rights established by the ITQ program. Additionally, an ITQ program provides increased incentives for each fishing operation to underreport the amount of fish it uses. The result is that additional resources will be required to monitor catch and deter unreported use of ITQ species. The monitoring and enforcement programs combined with the fishermen's and processors' level of acceptance of the ITQ program will determine the extent to which catch is underreported. If monitoring and enforcement programs are grossly inadequate or the industry fails to support these programs, underreporting would be expected to escalate and eventually result in the failure of ITQ programs.

Obstacles to Implementing an ITQ Program

The specifics of an ITQ program determine the magnitude of the net benefits of the program. They also determine the distribution of the net benefits among those who harvest, process, market, and consume fish. The magnitude and distribution of the net benefits jointly determine the merits of a specific ITQ program. The specifics of an ITQ program address 1) the initial allocation of harvesting rights, 2) the transferability of ITQs, and 3) monitoring and enforcing ITQs. Each of these topics includes obstacles to developing and implementing an ITQ program.

The initial allocation of ongoing rights to ITQs is a contentious issue because it is a principal determinant of the distribution of the net benefits of an ITQ program. The ongoing rights to ITQs could be either sold by the government or given away. There are several advantages to having the government sell the rights to ITQs: It may be difficult to justify giving away the right to use a resource owned by the public, particularly when the value of that right may exceed $1 billion. Selling ITQs is a simpler process which does not require the complex rules, data sets, and applications and appeals processes associated with giving away ITQs. Compared to a set of allocation rules, the market mechanism may result in a more rapid transition to the optimal fleet configuration. And current participants are not left with drastically different out-of-pocket costs as a result of having been issued different amounts of ITQs.

Despite the potential advantages of selling ITQ rights, the rights probably will be given away. An ITQ program will tend to be less disruptive initially if the rights are given to current participants in the fisheries. Furthermore, current participants who decide to decrease their participation, relative to their level of initial allocation, will be compensated, to some degree, by being able to sell all or part of the rights they were given. Also the Federal Government apparently does not have the authority to sell the rights without changing the Magnuson Fishery Conservation and Management Act, which is the basis for Federal management of these fisheries. Perhaps the most decisive reason why fishing rights are likely to be given away is that the Councils are responsible for recommending ITQ policy to the National Marine Fisheries Service (NMFS), and industry members who would be given the rights, and the wealth associated with them, are well represented on the Councils.

Whether the government initially sells rights to ITQs or gives them away, the rights could be either ongoing or temporary rights to be reclaimed by the government for resale according to a specific schedule. For example, the rights could be for 10 years, or one-tenth of the rights could be reclaimed each year. The temporary assignment of rights would make an ITQ program more acceptable to those who oppose the idea of much more permanent assignments of rights to public resources. Reclaiming a fixed percent of the temporary rights each year also would assure that at least that percent of ITQ rights would be available for sale each year, thereby providing an ongoing source of funds to support fishery management programs.

If ITQ rights are to be given to current participants in the fisheries, *participants* and *current* must be defined, as well as how the rights will be distributed initially among them. For the Alaska halibut and sablefish ITQ program, *participants* are defined as the owners or lease holders of a vessel at the time landings were made, and *current* is defined as participation in the fishery

between 1988 and 1990. Several alternative definitions are being considered for the ITQ program for the groundfish fisheries off Alaska, including vessel owners at the time of approval of the ITQ program, skippers and crew, and the owners of processing plants. The distribution of the ongoing rights to receive ITQs is based on each current participant's catch history. *Catch history* for halibut and sablefish, respectively, is defined as the participant's best 5 years of halibut catch between 1984 and 1990 and the participant's best 5 years of sablefish catch between 1985 and 1990. The range of definitions of *current participants* and the rules for distributing ongoing rights among them have not been identified for the other groundfish and crab fishery ITQ programs.

Regardless of what is decided concerning catch and processing histories, the decisions will be difficult to implement because the data required to do so efficiently and effectively are not available. The first problem is that the data collection programs for catch data by vessel and for vessel ownership were designed for purposes other than implementing an ITQ program. Therefore, these data were collected and edited less accurately and less completely than if they were intended to be used for an ITQ program. The second problem is one of confidentiality. The attorney general of Alaska has ruled that catch data can be released only to the individual who recorded the landing. That means that neither the state nor NMFS can provide a vessel owner or lease holder with the official catch history of his vessel(s) unless either he made all the landings, or all of those who made the landings for him sign confidentiality waivers. These two problems will increase the difficulty, time, and cost of the application and appeals processes.

The next obstacle to developing an ITQ program is determining what restrictions to place on the transferability, ownership, and use of the ongoing rights to ITQs and of the ITQs themselves. These restrictions affect the magnitude and distribution of the net benefits of an ITQ program. For the Alaska halibut and sablefish ITQ program, restrictions have been placed on: 1) who can acquire and use the rights, 2) how much ITQ a person can use, 3) the type of gear that can be used, 4) the amount of ITQ that can be used by each of several categories of vessels, and 5) when the ITQ for a fishing trip must be acquired. One objective of such restrictions is to offset possible sources of market failure such as external benefits or costs, the ability of one participant to affect the price of input or outputs, lack of information on the availability of ITQs, and the inability of potentially efficient users of ITQs to acquire the funds necessary to buy ITQs.

The final obstacle to implementing an ITQ program is developing acceptable systems to administer, monitor, and enforce the program. The principal criteria for defining *acceptable* include the costs of the systems, the ability of the system to provide good estimates of the fishing mortality for each species (for the entire fleet and for individual operations), and the ability to ensure that quotas are not exceeded significantly. The accuracy of fleetwide fishing mortality estimates obviously is important for enforcing overall quotas and protecting the long-term productivity of the stocks, while the accurate assessment of removals by individual operations is important for ensuring equity among fleet participants. Typically, the accuracy of estimates cannot be improved without increasing their cost. In general, the estimates should be improved to the point at which the benefit and cost of an incremental improvement are equal. The cost of better estimates of fishing mortality would include the cost of increased observer coverage, improved measurement equipment, and operational changes that would improve the effectiveness of the observers and the measurement equipment.

With respect to acceptable estimates of aggregate fishing mortality by species, there are several similarities between the current fishery management regimes and one that includes an ITQ program. Basically, the cost and benefit of improving an estimate are expected to be equal well before all methods for improving an estimate are exhausted. It is not possible to generalize whether the cost of providing estimates of aggregate fishing mortality that are as good as those currently used would increase or decrease with an ITQ program. With an ITQ program, the cost will tend to increase due to increased high-grading and increased underreporting of landings, but will tend to decrease due to decreases in other types of bycatch discard mortality and fishing mortality caused by lost and abandoned gear. Ultimately, the cost of providing estimates of aggregate mortality will depend on the specifics of the ITQ program, the monitoring and enforcement systems, and also on the acceptance of the program and systems by the fishing industry.

There is no reason to expect the estimates of aggregate fishing mortality and of fishing mortality by fishing operations should be improved to the same level. For example, estimates of the former and latter within 10% and 30%, respectively, of the actual values could be

acceptable. Acceptable estimates of fishing mortality by fishing operation must meet several criteria. They must be good enough that they are seldom challenged in court and good enough so that fishermen do not question the fairness of the program. Finally, the cost of generating the estimates must not be prohibitive. Substantial legal and statistical work may be necessary to design an ITQ program with estimates that meet these criteria, particularly for species that are not retained.

The performance of an ITQ program in achieving the quota for a fishery is an important consideration to the program's success. With ITQs, the ability of managers to enforce quotas will be tied to the effectiveness of enforcement activities in preventing fish from being landed outside of the program and also by the accuracy of estimates that are made of discarded fish. Theoretically, if all fish caught could be credited to someone's ITQ account, keeping fishing mortality within the desired bounds would be straightforward. However, enforcement will not be entirely effective, nor will observations of discard be completely accurate. It should be noted though, that the current race for fish presents managers with considerable difficulties in shutting down fishing in time to keep total mortality under quota levels, without leaving large quantities of fish unharvested. This has been a problem in the intensive halibut fishery and in the multispecies groundfish fisheries off Alaska. Under such conditions, the ability to correctly estimate fishing mortality is, to a degree, a hollow accomplishment, if the available management tools do not allow for effective use of that knowledge.

Summary

The decisions by the NPFMC and PFMC to consider ITQ programs are the result of the serious fishery management problems that exist and the potential for an ITQ program to address effectively many of these problems. The information discussed in this article indicates that an effectively designed and implemented ITQ program can increase substantially the net benefits generated by a fishery. This is accomplished by replacing the race for fish with the market mechanism, which is used to allocate most resources. There are technical and political obstacles to developing and implementing a ITQ program that will fulfill this potential. The technical obstacles include developing adequate estimates of the effects of alternative ITQ programs and of fishing mortality by fishing operation. The political obstacles are due to different opinions concerning the appropriate distribution of net benefits, and misunderstandings and uncertainty concerning an ITQ program's effects. Even if an ITQ program is expected to provide greater net benefits for the Nation as a whole, there will be both winners and losers.

The ultimate success of an ITQ program will depend upon continued monitoring and evaluation of the program's performance. Numerous fisheries around the world have made reasonably successful transitions to ITQs, but most of those ITQ programs have been modified, to some degree, since their inception. As a management tool, ITQs are still very much in their formative stages, and part of the learning is in the doing. The success of an ITQ program depends on how well its provisions accommodate the social, cultural, legal, economic, and fishery conditions under which it is implemented. For example, a set of provisions that works well for a large-boat, offshore fishery in New Zealand may contain components that are ill-suited for a small-boat, inshore fishery off Alaska. Finally, nowhere in the world is there an ITQ program that encompasses a volume of harvest or diversity of operations equal to the groundfish and crab fisheries off Alaska. If approved and implemented, the ITQ program for those fisheries will, by necessity, blaze new trails in fisheries management.

This article was written by DRS. JOSEPH TERRY and JAMES HASTIE of the Resource Ecology and Fisheries Management (REFM) Division.