

## Example 7.1

# Avoiding the Tragedy of the Commons in Fishing with Individual Transferable Quotas

The tragedy of the commons is a dramatic example of the severe inefficiencies that can result from externalities. The phrase derives from 14<sup>th</sup> century England, when villages began setting aside a pasture called the common to which citizens who did not own land could bring horses, cattle, and sheep to graze. Since the common was freely available to all, unlanded citizens had an incentive to bring an animal to the common to graze so long as it was profitable to keep the animal. But this self-interested calculation ignores the externality involved in grazing on the common: grazing by any one person's animals reduces the amount of grass available for all animals, and the productivity of the common as a source of feed decreases. Because of the externality, people have to be willing to limit their use of the common in order to preserve it. But this does not happen if people place their narrow self-interest above the common good, as economists assume they will. Narrow self-interest propels everyone to bring their animals to the common while there is still grass to be eaten. As populations grew, the predictable result was that the village commons became overgrazed to the point that they would no longer support any animals at all. Hence, the tragedy of the commons.

Commercial fishing is the current leading example of the tragedy of the commons. Fishing grounds are common-use habitats for various species of fish. As the demand for fish grew in the last half of the 20<sup>th</sup> century, fishers rushed to the fishing grounds to meet the demand. More vessels entered the fishing grounds, and continued technical changes made them ever more productive at catching fish. The fishing vessels became larger and more powerful on average, and were equipped with ever more sophisticated gear, such as electronic fish-finding technology and better nets on trawlers that go after ground fish such as cod. With open access to the fishing grounds, the narrow self-interest of fishers gives them an incentive to over-fish the grounds to the point that the stock of fish falls below the commercially viable level. The Worldwatch Institute, an agency that monitors fish stocks, estimated that by the 1980s the number of fishing vessels worldwide was 30% greater than the number required to catch the maximum sustainable level of all the commercial species of fish. Some fishing grounds that had

once been highly productive collapsed. By 1990, the Atlantic coastal waters of the United States and Canada were so over-fished that six species of ground fish that had been mainstays of the commercial fishing industry there fell well below sustainable levels: cod, haddock, pollock, redfish, silver hake, and red hake.

By the 1970s, governments saw the pressures being placed on the fishing grounds and began to take steps to preserve them. One of their goals was to protect their own fishers from foreign competition, and for this they turned to the United Nations: the United Nations Convention on the Law of the Sea, passed in 1982, granted nations jurisdiction over the ocean within 200 nautical miles of their coastlines. Governments also established various councils to manage the fishing grounds within the 200-mile limit. The councils began with a command-and-control (CAC) approach, as so often occurs in the attempt to correct for externalities. They imposed direct regulations on inputs and outputs through such policies as: limitations on the number and size of vessels that could fish for a particular species; restrictions on the gear that the vessels could use; establishing a total allowable catch (TAC) from the fishing grounds each season so that the fish stocks remained above the sustainable level; and in some cases closing part or all of the fishing grounds until the fish stocks replenished themselves. For example, the New England Regional Council closed 17,000 km<sup>2</sup> of the Georges Bank fishing ground in 1993 in an effort to restore the ground fish stocks that had crashed.

In 1986, New Zealand decided to heed economists' advice on how to correct for externalities and adopt a pricing mechanism to manage its fishing grounds. It created Individual Transferable Quotas (ITQs), which give each fishing vessel a right to a portion of the TAC for a species of fish. ITQs have since been used in Australia, Canada, Iceland, Italy, the Netherlands, South Africa, and the United States.<sup>1</sup> Economists refer to ITQs as a Coasian solution to the tragedy of the commons in fishing, because ITQs give each fisher a private property right over his allocation of the fish. As noted in Chapter 7 of the textbook, Ronald Coase argued that establishing private property rights over external effects is all that is necessary to correct for the inefficiencies of externalities. ITQs are analogous to marketable permits for reducing pollution, which give firms a property right to emit given amounts of pollutants.

The experience with ITQs to date suggests that there is considerable merit to Coase's proposal. The ITQs have two huge advantages over the CAC approach in managing the fishing grounds: first, if designed properly, they can ensure that the fish taken each season are caught in an efficient manner, and second, they give fishers an incentive to preserve the fish stocks for the common good. The use of ITQs to regulate the catch of Pacific halibut offers a good illustration of these advantages.

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<sup>1</sup> The US established ITQs programs for three species: surf clams and ocean quahogs, developed by the Mid-Atlantic and New England Fishery Management Councils (1990); wreckfish, developed by the South Atlantic Fishery Management Council (1992); and halibut and sablefish off the coast of Alaska, developed by the North Pacific Fishery Management Council (1995)

The fishing ground of the Pacific halibut off the coast of British Columbia is managed by the International Pacific Halibut Commission (IPHC), a joint U.S.–Canadian body that has been in existence since 1923. The IPHC, concerned about the declining stock of halibut throughout the 1970s, issued a series of regulations to limit the amount of halibut taken. It decided first to limit the fishing ground to Canadian fishers. It also required each vessel to have a license to fish, with a maximum of 435 licenses to be issued. The licenses could be transferred to another vessel, provided the new vessel was no more than ten feet longer than the licensed vessel it was replacing. At the time there were 333 Canadian vessels fishing for halibut.

The regulations were not very successful. New vessels entered the grounds; the number of vessels quickly reached the maximum of 435 licensed vessels. Also, many of the vessels incorporated new and more productive long-line gear, which is the primary method used to catch halibut. The IPHC responded by setting a TAC, with the limit set so that 75%–80% of the estimated stock of halibut would be left after each season to replenish stock. The fishers were so much more productive, however, that the IPHC had to keep reducing the number of days in the season to maintain the TAC. The season fell steadily from 65 days in 1980 to just six days by 1990. With only six days to fish, fishing for the halibut had the mad-dash look of a fishing derby, with vessels scrambling to bring in fish before the TAC was reached. The fishing also became much more dangerous because, with only a six-day window, the fishers would go out no matter how bad the weather was. Fishing is already one of the more dangerous occupations.

The IPHC responded to these difficulties by introducing ITQs in 1991, with one ITQ to a vessel. The proportion of the TAC allocated to a vessel's ITQ was determined by formula – 30% based on the length of the vessel and 70% on the proportion of the TAC taken by the vessel over the past four years. At first a quota could be sold only to a vessel without a license, with the license transferred along with the quota. The 10-foot maximum-additional-boat-length restriction remained in place. Then, in 1993, the IPHC increased the transferability of the ITQs by allowing temporary seasonal sales from one licensed vessel to another. Each quota was divided into two shares, and a vessel could sell either one or both of its shares to other vessels. No vessel could own more than four quota shares, however, so that even if a vessel had the four largest quota shares it turned out that it would be allowed to take only 1.57% of the TAC. This restriction was put in place to respond to a common fear of ITQs among the fishing community, that all the quotas would be purchased by a few large corporations using huge vessels and the traditional local fishers would be driven out.

The ITQs were successful in a number of ways, and all because they created a set of transferable property rights to the TAC. There was no longer open access to the fishing grounds. The most important effect this had was to eliminate the fishing derbies, since a vessel with an ITQ now had a right to catch a certain amount of fish no matter when it fished. The season increased from 6 days in 1990 to 6 months in 1991, and then to 8 months in 1992 and beyond. As a result, the fishers could sell nearly all of their catch as fresh fish. Also, they were no longer forced to sell most of their catch all at once to the fish processors, which had given the processors market power over the fishers. The prices received for their catch increased on both accounts, and the revenues to the fleet rose by \$23 million from 1991 to 1994. Also, fishing for the halibut became much safer.

A second effect was the sale of over 200 quota shares to the more efficient vessels, with the least efficient vessels dropping out entirely. From 1991 to 1994, the number of vessels fishing for halibut decreased from the maximum of 435 to 313, and the total number of crew members fell by 20%.

By 1994, the average quota rent (profit) for the remaining 313 vessels was \$3.84 per pound of fish landed, versus a temporary quota license price of \$2.00 per pound. The restrictions on the number of shares that could be transferred prevented the quota rents and quota prices from equalizing. They also prevented the maximum efficiency cost savings from transferring licenses to the most efficient boats. One study estimated that the cost savings would have been five times greater had the quota shares been fully transferable. Consequently, most of the quota rents came from the increased revenues, and not from decreases in the costs of landing the TAC.

The transfer restrictions did prevent halibut fishing from becoming highly concentrated, as intended, but the supposed gains to the small-scale local fishers may not have been worth the efficiency losses. The sting to the small-scale fishers of losing out to the big corporations is greatly diminished when the quotas are distributed free of charge, as they were here. An ITQ represents an immediate source of wealth to the initial holders. The small-scale fishers can realize this wealth by selling their quotas to the more efficient larger vessels, which can afford to pay more for a quota than the small-scale fishers can earn by fishing. This is why more than 100 vessels stopped fishing from 1991 to 1994. Their owners knew they would be better off if they sold their quota shares to the more efficient vessels. The only gain to the small local fishers by restricting the quotas, then, was to preserve their way of life, and it is difficult to place a dollar value on that. One suspects that the local fishers would not have been worse off even if the ITQs were completely transferable and more of them stopped fishing.

Finally, one potential difficulty with ITQs is that some fishers will try to cheat and land more fish than their quota if they can get away with it. Or they may catch more than their quota but then discard the smaller fish at sea so that they land and sell only the more profitable larger fish. The halibut fishers who remained understood the profitability of the quota system, however. They voluntarily agreed to finance a monitoring system for

illegal and excess landings and they contributed for the first time to the IPHC's program to measure the halibut fishing stock.

The other ITQ programs that have been tried so far have generally enjoyed similar successes. They have demonstrated beyond doubt the wisdom of the Coasian prescription, that granting to fishers the property rights to the fish stock is an effective way to avoid the tragedy of the commons in fishing.

### Sources

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- R. Grafton, D. Squires, and K. Fox, "Private Property and Economic Efficiency: A Study of a Common-Pool Resource," *Journal of Law and Economics*, October 2000. (The description of and data on the Pacific halibut are from this study: the description of the fishing derbies and the ITQ program, pp. 683–690; the increase in fleet revenues, p. 689; the estimated quota rents and the quota prices, p. 703; and the estimated cost efficiency gains without the transfer restrictions on the ITQs, p. 709.)