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Community-Run Fisheries:

Avoiding the 'Tragedy of the Commons' (full)

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"The fact that such [self-]regulatory systems exist
goes against the basic assumption . . . that fishermen are
fiercely competitive and unable to work together
for their mutual benefit. . . . It also weakens
the assumption that a fishery which is not regulated
by central authorities is not regulated at all."

--Svein Jentoft
and
Trond Kristoffersen

Introduction

Along the coastal waters of eastern Canada and the United States--in the Grand Banks off Newfoundland, for example, and in Georges Bank off New England--severe overfishing is leading to economic ruin. In spite of years of governmental restrictions on gear, catch, and seasons, fishers are overexploiting the once-productive resource their livelihoods depend on.

Is there a way to avoid this outcome? The answer is yes. Although their stories are largely unpublicized, a number of fishing communities have avoided self-destructive overexploitation for decades. And they do it with minimal, if any, governmental regulation.

This paper will explore these examples to see what lessons they hold for protecting and restoring fish stocks around the world. To understand why these lessons are so important, however, we must begin with the "tragedy of the commons."

The Tragedy of the Commons

In an influential 1968 article, "The Tragedy of the Commons," biologist Garrett Hardin (1968) explained why a scarce resource "open to all" is subject to overexploitation. He used as an example a pasture open to all herdsmen for cattle grazing (a "commons"). Hardin pointed out that eventually the pasture will become overgrazed. The reason? Each herdsman can capture all the benefits of adding more cows, while facing only a fraction of the costs--the harm caused by excessive grazing--since all users share the costs. The tragedy, notes Hardin, is that each individual is "locked into a system" of competition for grass that leads to ruin.

A similar tragedy occurs when a fishing territory is open to all fishers. Each fisher captures all the benefits of harvesting more fish, while facing only a small part of the costs--the reduction of the fish population for future harvest. Similar logic can explain the deterioration of other resources, such as parks, that are jointly used.

But evidence from the real world suggests that the tragedy of the commons is not universal. In many places, local fishers manage fishing grounds, usually without much governmental interference, and they prevent overfishing. For the most part, these arrangements are "community-based, spontaneously developed and informally organized" (Jentoft and Kristoffersen 1989, 355).

The very existence of these fisheries challenges the assumption that fishers are locked into a destructive pattern of competition that invariably leads to severe depletion. Their existence illustrates the fact that a fishery (the term for a specific fishing industry) can be self-regulated.

Scholarly attention to such self-regulated "commons" has grown in recent years, providing us with valuable information on why such management can occur. Elinor Ostrom (1990, 90-101) has identified characteristics that have enabled groups to manage commons over long periods without bringing about a tragedy of overexploitation. She found, for example, that boundaries must be well defined, rules must be linked to local conditions, and sanctions must be imposed when rules are violated. Usually, a strong community tradition is essential for such management, as well as absence of interference by governments.

Presented below are real-life examples, both past and present, of community-run fisheries. We will see what lessons they offer for future regulation of nearshore--and perhaps even offshore--fisheries.

Lessons from the Past

A number of Native American communities were successful in preventing overfishing. They succeeded because of their closely knit communities and strict rules about access to fisheries.(1)

Tlingit and Haida Indians of Alaska

Sockeye salmon, with their high nutritional value, were an important food source for the coastal Tlingit and Haida Indians of Alaska. However, sockeyes migrate only in stream systems that include a freshwater lake. Their relative scarcity encouraged Indians to establish clear rules specifying who had access to the stream systems where sockeyes congregate during spawning runs.(2)

House or family groups controlled access to locations where the sockeye could be caught, while the clan determined the fishing locations.(3) Each group had exclusive rights to its fishing locations. When an outsider infringed on a location, the trespasser was required to compensate the owners or potentially face violent consequences (Oberg 1973; De Laguna 1972).

The eldest clan male, the yitsati, generally possessed superior knowledge about salmon runs, escapement, and fishing technology and became the "custodian or trustee of the hunting and fishing territories" (De Laguna 1972, 464). He also assisted in parceling out goods that had been produced collectively to members of the clan (Oberg 1973, 92-3). Rights initially could not be transferred to those outside the group (Oberg 1973, 63) This allowed the exclusion of those who might not abide by customary norms.

Unfortunately, interaction with the Russians, the first Europeans to confront Tlingit fishing rights, led to a breakdown of these traditions. The Russian American Company recognized native ownership, but violated the custom of preventing transfer of rights to outsiders by introducing the practice of leasing fishing rights (Langdon 1989, 314). When the United States purchased Alaska from the Russians in 1867, leasing gave way to military conquest (Langdon 1989, 314). By neglecting the authority of Tlingit to establish fishing rights, the U.S. government allowed the tragedy of the commons to occur. Today, the state of Alaska is forced to implement extensive regulations to prevent the tragedy of the commons from occurring with native salmon.

Indians of Washington State

Before white settlement, small tribes of Indians in Washington state had salmon fishing rights similar to those of the Tlingit. In some cases, the tribe owned the rights; in others, families or individuals or a combination owned the rights, explains Robert Higgs (1982, 59). Intertribal agreements allowed enough salmon to escape upstream to ensure sustainable populations. Unfortunately, as with Tlingit and Haida, state and federal governments allowed newcomers to circumvent these rights.

Instead of recognizing the well-defined and enforced fishing rights, the U.S. government allowed newcomers to place nets across the mouth of the Columbia. This quickly depleted salmon runs, so traps and weirs were banned--only to be replaced by purse seine boats powered by internal combustion engines. The race to catch salmon moved to open waters. Ironically, from the country where private property is considered sacrosanct came a socialistic legal system driven by politics and military power.

Contemporary Community-Run Fisheries

There are many contemporary examples of community-run fisheries. A number of them exist without government approval.

Maine's Matinicus Island

Anthropologists Francis P. and Margaret C. Bowles have studied the lobster and herring fisheries off Matinicus Island, Maine. Fishers claim a well-defined area of approximately 77 square miles around the island.

The island's lobster fishery has operated successfully for over a century without official state recognition, despite many changes--including expansion into regional markets and dramatic improvements in boat style, fishing technology, and navigational equipment. And while the number of fishers has deviated little from the original number of thirty-six, fishers move in and out of the fishery. Over the 1970-1982 period, Bowles and Bowles (1989, 239) observed that twenty-one men entered or left the fishery.

Island fishers strictly control who will be accepted into their fishery. One must either live on the island and have island kinship ties or purchase property from a local fisher, who then becomes an informal sponsor. The latter approach is akin to an apprenticeship program. In addition, one must demonstrate a willingness to cooperate with other fishermen and respect their fishing rights and equipment. An individual must also make the necessary investment of wharf access, boat, and traps, an investment that totaled roughly $125,000 in the 1980s (Bowles and Bowles 1989, 236).

Local fishers actively defend the territory from outsiders through extralegal means. The Bowles write:

> Â **T**hey customarily signal a territory violation by opening the door and tying a half-hitch around the buoy of an outsider's trap. If this signal is ignored, an island lobsterman may haul up the outsider's traps and dump them together so that the buoys and warps become tangled. Actual trap cutting ensues only if these measures fail to convey the wisdom of removing the offending gear from the disputed area." Â
> **(Bowles and Bowles 1989, 243)**

On well-defended waters like those off Matinicus Island, lobster fishers have instituted conservation efforts, including limiting the number of traps used. Anthropologist James Acheson found that local incomes are almost 40 percent higher than incomes of lobster fishers in the more open areas off Maine's coast. And fishing is twice as productive as in more open areas (Acheson 1993, 74).Since the early 1900s, herring have provided an important supplement to lobstering for the area. One fishing technique now used, called "stop seining," involves blocking coves with nets after herring have entered the coves. The fixed nature of stop seining has spurred the development of "purchasable and transferable" rights to net herring in specific island coves (Bowles and Bowles 1989, 233). These rights are recognized and respected by local fishers. Sanctions for violating these rights are similar to those in the lobster fishery, and include property destruction.

"Purse seining," which involves netting herring in open water, does not operate with well-defined rights, say Bowles and Bowles (1989, 255). Because the location of the fish varies so much, it is not worth the effort to defend any one particular area. As a result, purse seining often leads to a race to catch fish before others do.

Self-imposed restrictions in lobstering and stop seining have existed for over a century. Still, Acheson (1993, 80) states that the state government of Maine could "annihilate the entire territorial system if it so chose by vigorously enforcing laws concerning trap cutting." Communal management exists, says Acheson, "only because of the benign neglect of the state."

Valensa, Brazil

The estuary fishery near Valensa, Brazil, illustrates how fishing communities can solve problems, yet the solution can break down when governments ignore the forces that led to success.

The mixed-species fishery began nearly a century ago. At first, notes John Cordell (1972), Valensa fishers fought over access to prime fishing spots. In addition, violence would often erupt when one type of gear became entangled with another, as when mobile nets run into stationary nets.

Over time, local fishers came up with two harvesting arrangements to resolve these problems. To prevent one gear type from hampering another, they divided the estuary into different fishing zones, with only one gear allowed in each zone. They assigned fishing spots by drawing lots to determine the order in which each fisher could use a particular spot.

After decades during which this arrangement operated successfully, the Brazilian government decided to "modernize" the Valensa fishery. The government made new nylon nets available to anyone who qualified for a bank loan arranged by the government. But local fishers did not qualify for the loan and did not have enough capital to purchase the nets on their own.

A few wealthy individuals around Valensa did qualify for the loans, and purchased the nylon nets. They hired men who had never fished the estuary before to fish using the nylon nets. The local fishers' management system crumbled as old and new fishers fought over fishing spots.

Eventually the fishery was overharvested and, ultimately, abandoned.

Nova Scotia's Port Lameron Harbor

In numerous villages along Canada's east coast, fishing has been the main source of income for generations, and fishers share strong traditional ties. Port Lameron Harbor in Nova Scotia has ninety-nine fishers who catch cod, halibut, herring, mackerel, and lobster in nearby coastal waters (Davis, 1984). Says one:

Â "**I**'ve fished here all my life. So did my father and his father. Men in my family have been fish'n here for a long time. If anyone's got a right to fish here it's me and I'm no different than most of the fellas fish'n here." **(Davis 1984, 145)** Â

Local fishers see themselves as having exclusive rights to their territory, which extends eleven miles along the coast and more than thirteen miles seaward. They actively defend it against outsiders.

Â "**F**or example, a Port Lameron Harbor fisherman, after setting his longline gear, watched a fisherman from a neighboring harbor set his gear close to and, on occasion, across his line. Subse quently, the Port Lameron Harbor fisherman contacted the transgressor' on the citizen band radio to complain about this behavour. Other Port Lameron Harbor fishermen who were listenin'in' on the exchange demonstrated support for their compatriot by adding approving remarks once the original conversation had ended. The weight of this support, coupled with the implied threat of action, i.e., cutten' off' the offenders gear, compelled the erring fisherman to offer his apologies." **(Davis 1984, 147)** Â

To avoid conflicts between local fishers using different gear, fishers divide their territory into different sectors, each allowing a specific kind of fishing gear.

However, federal fishery authorities have failed to recognize the territorial boundaries and local management strategies. In the late 1970s, the authorities began to require licenses for all fishing vessels and gear along the east coast of Canada. Port Lameron fishers failed to get gill net licenses for herring when they were first issued and were later denied access to these licenses when the government decided to freeze the total number available. Local fishers vehemently protested and the government eventually allowed them to obtain the licenses. But the experience left Port Lameron fishers doubting whether the government would take their local strategies into account in future policy actions.

Alanya, Turkey

In the coastal waters off Alanya, Turkey, unconstrained competition for the best fishing spots led to conflict and, at times, violence during the early 1970s (Berkes, 1986). After several years of trial-and-error arrangements to mitigate the conflict, a local fishing cooperative came up with a highly effective system that minimizes the incentive to compete for the choicest spots.

Before each season, a list of eligible Alanya fishers is prepared, along with a list of fishing locations based on the most recent information from fishers. Care is taken to space the fishing sites so that a fisher in one site cannot block the passage of fish to another's site. Fishers then draw lots for their initial assignment on opening day of the season. Every day thereafter, each fisher moves east to the next site until the end of January. After January, each fisher reverses course and moves west to the next site. This gives everyone about the same opportunity to reach the stocks of fish, which migrate from east to west between September and January and from west to east from January to May.

This arrangement has apparently eliminated the need to fight over prime fishing sites. There are now no signs of overcapitalization (Berkes 1986, 73-74)--that is, excessive investment in fishing gear to capture the fish before anyone else does. One problem remains, however. There is no procedure for limiting the number of fishers. If outsiders should decide to enter the fishery, the problem of competition could reappear.

Gulf Coast Shrimpers

For the most part, community management involves limiting entry and setting fishing rules. However, in addition to limiting entry, Gulf Coast shrimpers from the 1930s through the 1950s negotiated price agreements with shrimp purchasers.(4) Economists Ronald Johnson and Gary Libecap (1982, 1007-08) observed that shrimp fishermen unions and trade associations negotiated with local wholesalers to set minimum price floors for small shrimp taken from Mississippi waters higher than the prices for similar-size shrimp in distant waters. These higher prices reduced the quantity of small shrimp taken from Mississippi waters, since wholesalers would only pay if the shrimp were big enough to justify the higher prices.

Unfortunately, the effort was subsequently dismantled by the federal government as a violation of the Sherman Act. This decision was based on a previous case, Manaka vs. Monterey Sardine Industries,(5) which held that:

"A cooperative association of boat owners is not freed from the restrictive provisions of the Sherman Antitrust Act . . . because it professes, in the interest of the conservation of important food fish, to regulate the price and the manner of taking fish unauthorized by legislation and uncontrolled by proper authority."(6)

Ironically, the pricing strategy to conserve the fishery and raise incomes is now being carried out by every Gulf Coast state in the form of state-instituted, minimum-size rules for harvesting shrimp.(7)

Informal arrangements that local fishers carry out to sustain their fisheries usually came about because government officials left local people free to design their own arrangements. Unfortunately, because these approaches have not been recognized by government, and may in fact be illegal, they are always at risk of being dismantled.

When Government Works With Local Communities

In some instances, the government has supported community-based management. This support has been beneficial, since government recognition gives stability.

Scotland's Private Salmon Fisheries

In Scotland, privately held and transferable salmon fishing rights have existed for centuries. These rights exist for both territorial waters at sea (as far as twelve miles out) and inland waters, and apply to both commercial and recreational fishing. They were originally vested with the Crown, but over the centuries many were given away (Williamson 1993, 2). Today, individuals, companies, associations, conservation trusts, and fishing clubs own salmon fishing rights in Scotland.(8)

The right to fish for salmon carries with it the right to exclude other fishers from a well-defined area of water. Parliament has strengthened this right by making it a criminal offense to fish for salmon without written permission from the owner of the fishing right. Along with other members of the European Community, Scotland prohibits fishing for salmon in waters beyond the territorial limit.

The "community" aspect of Scottish salmon management is found in the 101 salmon fishery districts created by an act of Parliament. Each district consists of the catchment area of a river or group of rivers and the adjacent sea. Owners in each district form a District Salmon Fishery Board whose purpose is to protect and develop the fishery. Boards appoint "water bailiffs" with powers to police the fisheries for poaching activities. They also invest in and operate hatcheries for restocking rivers. Each board is self-financed by levies on owners in the district. These boards exemplify how owners can implement internal rules, restrict entry into their territories, and coordinate funding for otherwise "public" goods.

The government sets fishing dates and prevents the use of certain gear and the taking of immature salmon. But within these bounds, each owner is free to determine the level of fishing effort. For example, there is no licensing of fishers or fishing gear, and there is no restriction on the amount of fishing gear or on the amount of fish that can be taken. In essence, there is far less government regulation than is typical of other salmon fisheries.

Despite the absence of extensive government controls, Scottish salmon stocks have not been overfished by commercial fishermen. Indeed, the fisheries support a lucrative inland salmon sport fishery on famous salmon rivers such as the lower Tay, Tweed, and the Spey. These rivers are managed for profit by those who own salmon fishing rights.

Scotland was the first major salmon fishing country to prohibit the use of drift nets, which have led to overexploitation elsewhere. In other words, the open ocean commons has been closed. Scottish fishers supported the ban, which was instituted in 1962. They could see that indiscriminate netting at sea would harm their long-term interest. In contrast, in England where the right to fish for salmon is a public right on the open sea, drift netting has continued until very recently, when the government began a slow phaseout.

Because salmon fisheries can be bought and sold in Scotland, salmon fishers are able to acquire fishing rights to an area large enough for efficient operation. For example, near the turn of the century, a single company purchased the fishing rights in the estuary of the River Tay. The company reduced its catch, causing an increase in the annual returns from net fisheries in the estuary and from the sport fishery upstream.

The Scottish system seems to respond well to changing market conditions. It is now accommodating the growing demand for Atlantic salmon angling. The Atlantic Salmon Conservation Trust (Scotland) Ltd. recently purchased coastal salmon netting rights from commercial netters for the purpose of not operating them in order to increase salmon returns for the upstream sport fishery (Williamson 1993, 6).

Norway's Lofoten Fishery

Norway's Lofoten fishery has been described as the largest commercial cod fishery in the world, in terms of number of participants and size of harvests (Jentoft and Kristoffersen 1989, 355). There have never been quota regulations within the Lofoten fishery. Nor has there ever been a special licensing system. For nearly a century, fishers have successfully implemented their own fishing regulations, a responsibility delegated to them by the Norwegian government.

During the 1980s, the number of fishers varied from 4,000 to 5,000, and the annual catch averaged approximately 110 million pounds. In 1983, the export value of cod taken from the Lofoten fishery amounted to $140 million. About one-fifth of all Norwegian fishers get a substantial part of their income from the Lofoten fishery. Boats vary from 20 to 100 feet in length, with the largest made of steel and the smallest made of wood. Allowable gear includes hand line, long line, gill net, and Danish seine.

The impetus for self-regulation came from crowding problems and gear conflicts experienced in the fishery during the latter half of the nineteenth century. Near the end of the century, Lofoten fishers decided they needed regulation to overcome crowding and gear problems, but they wanted to carry it out themselves (Jentoft and Kristoffersen 1989). In 1897, the Norwegian government enacted the "Lofoten Law," which gave them responsibility for regulating the fishery.

The present system consists of fifteen control districts, each with separate, well-defined territories. Each district is responsible for developing and implementing regulations, enforcing these regulations, and resolving disputes among fishers. Inspectors are elected from each gear group, and a public control force includes control officers and inspection vessels. Judgments for regulation violations are carried out by the local magistrate. Both regulation and dispute resolution are carried out by each district's regulatory committee, made up of representatives from each gear group.

The regulatory duties of the committee include dividing the district's territory into separate fishing grounds and reserving each for a particular gear type. The size of each ground is determined by the committee. To participate in the fishery, every fisher must register with one of the districts and follow the rules of the district waters fished for that season.

The committee decides how big each space for a given gear type will be. For example, Danish seining, which represents the upper scale of harvesting power, has the least space available in the fishery. As a consequence, only about 15 percent of the total participants in the Lofoten fishery use Danish seines.

Japan's Fishing Cooperatives

The large network of Fishing Cooperative Associations (FCAs) governing much of Japan's nearshore fisheries offers another look at a government-sanctioned system. By law, FCAs own the fishing rights to specific territories extending as much as five-and-a-half miles seaward (Jentoft 1989, 142). These associations manage the fishery resources subject to guidelines and conditions set down by national and regional governments. "They started as organizations to administer regulations, but gradually expanded into other areas, such as marketing, processing, leasing out fishing equipment, purchasing supplies, education and the like," explains one observer (Jentoft 1989, 142).

To fish a specific area under the jurisdiction of a cooperative, a fisher must be a member and must comply with its rules, or risk being expelled from the organization and its fishing area. About 5,000 associations are scattered around Japan's coast.

Historically, these cooperatives have their roots in community customary law and formal laws of the feudal era. To help resolve disputes by coastal fishers, the feudal lords granted territorial fishery rights to village guilds and encouraged the guilds to work out solutions among themselves.

In 1884, the government enacted "Working Rules for Fishermen's Associations," which transferred fishery management from the village guild to a "fishery association" made up of local heads of fishing families (Herrington 1972, 421). In 1941, the fishery association became known as the fishing cooperative. Sweeping reforms shortly after World War II enabled all fishers from a local community to be eligible for membership, not just heads of families.

How well do the cooperatives work? John Cordell (1989, 334) observes that the overall benefits of these organizations can be seen in "the stability of coastal catches" and fisher incomes that are "equal to or above the national average" for all workers.

Adherence to the rules of a Japanese cooperative still depends very much on the cohesiveness of the local community linked to tradition. Ruddle and Akimichi (1989, 365) conclude that "[c]ommunity norms are flouted at one's peril and threat of social banishment (murachibu) is real and horrifying." Kevin Short reinforces the importance of community cohesiveness.

Â "**B**efu (1980) has documented examples of cutthroat competition and frequent conflict among fishermen of the Inland Sea region. What, then, prevents similar conditions from occurring in Shukutsu? The answer, I believe, lies in the social and cultural forces that bind the Â

fishermen into a relatively tight-knit, cohesive group in which individuals are willing to compromise their interests for the sake of their group." **(Short 1989, 380)**

Two Modern Experiments: Management Based on Quota

Are highly mobile fisheries amenable to community management? Because they are mobile, territorial segregation is not feasible. Self-managed quotas may be feasible, however. Two governments have recently experimented with devolving fishery management to fisher organizations by allocating them "quota"--the overall amount of fish that the organization is allowed to catch--and letting them manage it. The results have been mixed so far.

The Atlantic Herring Fishermen's Marketing Cooperative

In Canada in the mid-1970s, the Atlantic Herring Fishermen's Marketing Cooperative was given authority for the Bay of Fundy herring fishery (Peacock and MacFarlane 1986, 215-30). The Department of Fisheries and Oceans allocated exclusive quota to the cooperative. The cooperative, in turn, assigned individual quotas among its members. The cooperative was also responsible for policing vessel quotas, distributing surplus quota among the fleet, and collecting statistical information for the government. The government allowed cooperative members to make "over the side" sales to foreign vessels. This extra opportunity for sales helped boost prices, providing an additional incentive for fishers to join the cooperative.

In its first three years, the cooperative "so enhanced the earnings of fishermen, the quality of fish caught, and the ability to manage the fishery that many people began to see the Bay of Fundy herring fishery as a panacea and as a model for other fisheries," writes Rettig (1986, 18).

Unfortunately, cooperation among the members soon disappeared because of disputes between small and large-scale fishers. A group of fourteen fishers split away from the cooperative. The final blow came when the government withdrew the authority of its members to make over-the-side sales to foreign vessels. Members were left with little incentive to stay in the cooperative, and the cooperative unraveled.

Excess fishing capacity from the start (Peacock and MacFarlane 1986) and problems with the make-up of the cooperative itself combined to doom the system. Unlike Norway's Lofoten fishery, the cooperative had no mechanism in place to resolve disputes among different gear users. And while the cooperative supposedly had a self-policing function to make sure that individuals did not exceed their allotted quota, there were no real sanctions. In fact, the cooperative did not have the power to exclude from the fishery those fishers who decided to leave the cooperative.

United Kingdom Cooperatives

In the United Kingdom, the government has tried a similar experiment, so far with better results. The experiment is unusual in that it applies to offshore, rather than nearshore, fisheries.

In the early 1970s, when the United Kingdom joined the EEC, organizations of fish producers were set up all around the country. Their function was to conduct sales of the offshore fisheries' catch and administer the EEC price supports. Initially, fisheries regulations were carried out by the government and quota was allocated to individual fishers.

In 1984, the British government decided to allocate a quota to each producer organization and allow it to distribute the quota among its members. Each organization also became responsible for regulating fisheries in its sector and enforcing the quota allocations among its members (Jentoft 1989, 142-43).

John Goodlad (1986), chief executive of the Shetland Fish Producers' Organization Limited, thinks it has been successful, as do the chief executives of the Scottish fish producers' organizations. Producer executives also believe that the system has kept fish prices stable by not disrupting the supply of fish. The new system is flexible, too. If during the course of the year it becomes clear that a producer organization will fall under its quota, the difference is added to the next year's allocation. If a producer organization overshoots its quota, the difference is subtracted from the next year's total.

One problem voiced by many producers is that they do not control the total quota. The government can still allocate quota to nonmembers, which reduces an organization's ability to maintain cohesiveness among members and weakens its power to regulate. Nevertheless, this experiment illustrates a role for local organizations in mobile fisheries that might serve as a model in the future.

Recreational Fisheries

Communities can protect recreational fisheries as well as commercial ones. Several examples can be found in Newfoundland and Quebec.

The Exploits River, Newfoundland

The Exploits River near Grand Falls, Newfoundland, illustrates community management of an Atlantic salmon sport fishery. Initially using public funding, the community constructed a fish elevator that allows salmon to climb past the 150-foot waterfall on the river. The waterfall historically prevented fish from migrating any farther than nine miles upstream for spawning, but construction of the fishway opened two hundred additional miles of river for salmon spawning.

The increase in salmon production has been astounding. Prior to the opening of the fish elevator in 1989, the Exploits River had a maximum of only 2,000 salmon migrating upriver to spawn--and that was under ideal conditions. But four years after the elevator became fully operational, returning spawning salmon numbered 20,000 to 22,000 fish per year. Local managers anticipate the return of 100,000 fish per year in the next six years (Robinson 1994, 24).

The fish elevator project was spearheaded by Environment Resources Management Association (ERMA), a nonprofit private organization in Grand Falls. Conceived in 1983 and operational in 1985, the organization is an offshoot of early efforts by the Grand Falls Chamber of Commerce to enhance salmon fishing prospects on the Exploits River to bring in more sportsmen's dollars. Funded with federal dollars, ERMA employs fifty people to operate the elevator project as well as an ultra-modern hatchery and interpretation center.

More salmon have attracted more fishers to the community. ERMA manager Fred Parsons says he remembers when the number of fishers on the Exploits numbered only 1,500 per season. Now ten times that number of fishers flock to the river. According to Parsons, the Exploits River even competes effectively with salmon fishing on the Gander River, a world-famous Newfoundland salmon fishery. Parsons and fellow ERMA workers are working to establish a fee fishing system to fund ERMA's operating costs for the fishway, the hatchery, the interpretation center, and future projects.

Quebec: Cascapedia's Community-Run System

For years, the provincial government of Quebec tried to limit salmon gill netting by the Micmac Indians at the mouth of the Cascapedia River, to no avail. Then, in 1992, it took a different tack. The government allowed a local board to take over management of the salmon fishery, with financing from Cascapedia user fees. Half the board members were Micmacs, and half were local sportsmen and other community members.

Over the next two years, a new spirit of cooperation took hold. The Micmacs greatly reduced gill netting and, in return, Micmacs were trained as river guides and river guardians. Today more than one hundred Micmacs are employed as guides, private wardens, and in other positions that support the salmon sportfishery on the Cascapedia River. The income from these services has more than compensated for the reduced gill netting. Salmon caught commercially are worth about $30, but $400 when caught by a sport- fisher (Robinson 1994, 25). Harmony, conservation, and a lucrative sport fishery are the byproducts of this locally managed fishery.

Quebec: The ZEC Story

Quebec also has ZECs (Zones of Controlled Exploitation) for hunting and fishing. In a ZEC, a local community, in the form of a nonprofit corporation, assumes management responsibility. The corporation contracts with the government to develop recreation through user fees, to assist in monitoring fish and wildlife populations, and to set and enforce seasonal harvest regulations in conjunction with government guidelines. The government provided subsidies for ZEC start-up costs and, until 1995, for operating costs where user fees were insufficient.

According to Yannick Routhier of Quebec's Ministry of the Environment and Wildlife, the ZEC is a kind of "co-op." Users, through elected representatives who serve on the managing board of directors, have a voice in managing recreational use and controlling wildlife resources.(9) Many ZEC boards have broadened their composition to include local business interests and tribal interests. For example, the corporation that manages the Riviere-Jacques-Cartier, an Atlantic salmon sportfishery located about a hundred miles northeast of Quebec City, has a board that is equally divided among representatives of recreational users and representatives of municipalities within the river basin (Ministre de l'Environnement et de la Faune 1994, 7).

To appreciate the impact of ZECs, it helps to know their history. Beginning in the 1880s, the provincial government of Quebec began leasing huge areas of Crown land to private hunting and fishing clubs--in the early 1960s, they were leasing 60,000 square miles. These leases generated revenue for the government, provided jobs for people living in small remote communities, and provided the government with private guardians of game in remote regions where policing costs would otherwise be high.(10)

During the mid-1960s, however, people living in Montreal, Quebec City, and other cities along the St. Lawrence River began to demand more recreation. At the same time, new road construction had made remote areas more accessible, and the areas under lease to private hunting and fishing clubs were especially attractive because years of private protection had kept fish and wildlife abundant.

Responding to public demand, the government canceled about half of the leases between the 1965-1978 period, a loss to clubs of some 30,000 square miles of Crown land. The government began to turn some of these areas into government-run wildlife reserves for public use.

As more reserves were established, the costs of managing them rose, and government management could not keep pace. In 1978 the government began establishing hunting and fishing ZECs. Two years later, the government established salmon river ZECs, which managed recreational fishing for Atlantic salmon, anadromous brook char, and landlocked brook char. In 1987, the government expanded the use of ZEC to include waterfowl management. By October 1994, eighty-two ZECs had been established throughout Quebec. Sixty-three are general fish-and-game ZECs, eighteen are salmon fishing ZECs, and one is a waterfowl ZEC.

Fees are charged for ZEC membership (Canadian $20 per year) and road use (C $5.50 per day or C $40 per year). Daily fishing fees are also charged, ranging from as low as C $12 to C $75.

Fees also vary with exclusivity of use. On the Ste-Marguerite salmon ZEC, for example, a ZEC member pays a daily salmon fishing fee of C $32 on sections where rods are unlimited, but C $59 where the number of rods is limited.(11) Nonmembers enjoy the same access privileges but at slightly higher user fees.

ZECs are reducing poaching and improving conservation. Jean-Francois Davignon of the Atlantic Salmon Federation (Davignon n.d.) points out that ZEC managing corporations hire 116 wardens from local communities to assist the government in protecting wildlife and fisheries. Under local management, salmon spawning runs on the salmon rivers on the Gaspâ€š peninsula are much improved. "In 1984," says Davignon, "Gaspâ€š peninsula rivers were only at 30 percent of required salmon spawners. Today, they are averaging between 80 percent and 100 percent" (Davignon n.d., 2).

The chief criticism of ZECs is that they often underprice recreational activities, encouraging overuse of resources and budget shortfalls. Also, some ZECs seem to lack important functional support, such as policing. In 1995, however, all ZECs were required to rely on their own income for support. This requirement to be self- supporting should provide an incentive for ZECs to price their recreational goods more realistically.

Future Fisheries Management

Informally organized fisheries are playing a valuable role in fisheries management today. At the very least, governments should legalize them. Fishing communities with a history of fishing in nearby waters should be allowed to establish property rights to those waters. The communities should have sole authority to either prevent or restrict entry. Where boundaries are clear and where communities are allowed to keep out outsiders, the potential for controlling fishing is a good one.

Overfishing of offshore areas is a more difficult problem. In these areas, fishers are highly mobile. Typically, participants originate from different areas and do not share the strong group bonding that leads to cooperation in the nearshore fisheries. However, other organizing tools may prove useful in promoting cooperation. In the United Kingdom, we have seen a community-management approach being tried, as quotas are allocated to marketing organizations, which then manage the quotas themselves.

A Limited Partnership Fishery is another possible way to organize offshore fisheries. I will outline a possible design for it here.

Through the issuance of shares, comparable to shares in a publicly traded company, the partnership would establish perpetual rights to present and future income streams from a fishery.(12) Fishers of record would be given shares or would be able to purchase them at a reduced price (half its market value, perhaps). The fishery would be defined by region and by gear types allowed.

Next, a Permanent Trust Fund would be established for the fishery, financed out of a designated percentage of each fisher's earnings from the fishery, perhaps 10 percent. The amount a fisher pays into the fund would reduce the taxable income a fisher reports for that year--pretty much the way a government-sponsored retirement account does today. The fund would be used as a source of annual dividend payouts to all shareholders and as a revenue source for funding the internal management, regulatory enforcement, and investment expenses in the fishery.

Once issued, shares would be freely tradable among fishers in the fishery and would entitle the holder to certain harvest rights (that is, fish quota) or technology rights (the right to use certain gear, for example). Management conditions would be attached to the shares. For example, a person using a 10-meter boat would have to hold, say, 4,000 shares. If the owner wanted to move up in boat class, he or she would be required to buy enough additional shares from another fisher willing to sell.

A management board consisting of fishers elected by fellow fishers in the fishery would be established. The board would set regulations, such as the stipulations for new entrants, the maximum number of shares allowed per fisher, the gear allowed, and their spatial separation on the fishing grounds. Board members would have a fiduciary duty to ensure that the income-producing potential of the fishery is sustained over the long term. In support of the management board, a control arm consisting of fishing inspectors, citation officers, and a magistrate for levying fines

on violators, would also enforce regulations.

As an option, a second class of shares could be issued to fishers in adjacent areas who share fish stocks with the target fishery, a so-called nonvoting class B share. The purpose here is to encourage different fisheries to conserve shared fish stocks. For example, suppose fishers in a nearshore cod fishery share the cod stock with a winter offshore trawler fishery. Offshore fishers would own a limited portion of nearshore fishery shares, and fishers in the nearshore fishery would own a limited portion of the offshore fishery's shares.

With the Limited Partnership Fishery, shareholders hold perpetual rights to a fishery's income opportunities and thus have a personal stake in maintaining the future value of the fishery through conservation. As with any company, share value will rise or fall depending on the earning potential of the fishery, which is directly related to the biological condition of the fish stocks and the efficiencies of the fishery. If the value of the fishery declines, so will share value. On the other hand, if effort is reduced to rebuild future stocks, share values will rise.

Conclusion

Community-run fisheries challenge the notion that fishers will always be locked into the tragedy of the commons unless there is state control. The examples sketched on these pages illustrate that communities can avoid the tragedy of the commons. They offer hope for many coastal fishing areas around the world. They offer some lessons that can be applied to the more complicated question of curtailing overexploitation of offshore fisheries. Given the failure of government to regulate fishing successfully, a self-regulated fishery is an idea whose time has come.

Author

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Notes

(1) For other examples, see Conservation--Native American Style (Anderson 1996), a paper in this PERC Policy Series, and also Anderson (1995).
(2) By the way, the coastal Indians did not establish property rights for fish that were not scarce, such as the pink or dog salmon (Olson 1967, 12). Also, since their technology did not allow overexploitation of the open ocean, they generally treated it as a commons. However, some bands claimed ownership of bottom fishing grounds for two important food sources, halibut and cod.
(3) The optimal size of organization was determined mainly by the scale economies associated with fishing. In one case where a particularly large trap could be used, the village was the unit of ownership (De Laguna 1972, 387). Very small creeks could be "the special preserves of individuals" (Olson 1967, 12).
(4) Private efforts to set quotas for the catch also have been reported. During the 1950s, a fishing cooperative in Raritan Bay, New Jersey, set individual quotas on porgy and menhaden fish. However, because these fish became scarce in the early 1960s, for reasons not fully understood, these fisheries ended (McCay 1989, 203-27). In the 1970s, a similar quota system was developed by local fishers in the region's whiting fishery. See McCay (1980, 29-38).
(5) Manaka vs. Monterey Sardine Industries 41 F Supp 531 (D.C. Cal. 1941).
(6) Annotations to 15 U.S. C. A. Section 521.
(7) In general, the possibility of a local fisher group monopolizing fish prices is even more remote today because better transportation and storage systems for fresh fish ensure an even greater number of potential suppliers.
(8) The Crown still holds the rights to some of the salmon fisheries, which may be leased to private parties (Williamson 1993, 2).
(9) Information provided in a phone interview with Yannick Routhier of the Ministry of the Environment and Wildlife, September 14, 1995.
(10) Information provided in a phone interview with Yannick Routhier, September 14, 1995.
(11) Information by fax from Yannick Routhier, dated November 22, 1995.
(12) Townsend (1995) appears to provide the first direct analysis of corporate management as a collective governance alternative in fisheries.

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