

# A Cooperative Management Solution to a Fishery Commons

JEFFREY POMPE and CHARLES E. ROCKWOOD

## Introduction

It is an economic truism that a scarcity of resources necessitates choice. A successful market system allocates resources in an impartial manner, auctioning them off to their highest valued uses. However, market failures do occur and common property resources, such as fisheries, are well-known examples. Unlimited access to a common property fishery negates any incentive to conserve the resource, and a classic case of overfishing is the usual result. This pa-

Jeffrey Pompe is with the School of Business, Francis Marion University, Florence, SC 29501, and Charles E. Rockwood is with the Economics Department, Florida State University, Tallahassee, FL 32306. Views or opinions expressed or implied are those of the authors and do not necessarily reflect the position of the National Marine Fisheries Service, NOAA.

**ABSTRACT**—A common property resource with open access, such as a fishery, will be used to excess when faced with sufficient demand. This will lead to an excessive amount of effort on the part of the fishery, resulting in a depletion of the stock. This paper discusses the development of a property rights regime for the Atlantic calico scallop, *Argopecten gibbus*, fishery of Florida. The management solution of the Calico Scallop Conservation Association (CSCA) provides an example of the assignment of property rights to a common property resource without resorting to governmental intervention. In this particular fishery, self-regulation limited early harvesting which would be uneconomic; there may be other fisheries in which self-regulation could be economically efficient and biologically appropriate. While this solution may not be applicable to all common property resources, for those cases which may be similar, the example of the CSCA provides valuable information that may be helpful in establishing a more efficient use of the resource. Some types of government facilitation may also be useful.

per examines a shared resource, Florida's Atlantic calico scallop, *Argopecten gibbus*, which appears to have been exempt from this overexploitation and inefficiency due to a cooperative management solution.

## Background

The Brevard County calico scallop fishery, along the eastern coast of Florida, was once among the largest scallop fisheries in the world. Recorded landings exceeded 40 million pounds of scallop meat in 1984. At present, the fishery is mostly inactive as a result of a biological kill caused by the protozoan parasite *Marteilia* previously unknown in this part of the Atlantic, and the appearance of which is not believed to have been associated with harvesting levels or techniques (Moyer et al<sup>1</sup>).

The Brevard County calico scallop fishery was developed in the early 1980's, although some commercial fishing began as early as 1967. The development was triggered by an increase in stocks and the refinement of automated steam processing equipment (Blake and Moyer, 1991). Calico scallops are fairly small, generally reaching 40–60 mm (1.6–2.4 inches) in shell height (SAFMC and GFMC, 1982). Depending on the time of year, harvesting intensity, and other factors, it requires an average of 100–350 calico scallops to yield a single pound of scallop meats and 8.75 pounds to equal 1 gallon. Not surprisingly, therefore, a viable commercial fishery had to await the devel-

<sup>1</sup>Moyer, M. A., N. J. Blake, and W. S. Arnold. 1992. An ascetosporan disease causing mass mortality in the Atlantic calico scallop, *Argopecten gibbus* (Linnaeus, 1758). Univ. S. Fla., Dep. Mar. Sci., St. Petersburg. Unpubl. Final Rep. under grant NA90AAHSK119, April 1992, 18 p.

opment of a highly mechanized method of harvesting and processing. Not surprisingly, also, the highly mechanized methods developed have produced an economic environment in which the efficient processor is relatively large. As a result, the processing of the scallop is oligopsonistic in nature, with the 5 firms owning and operating some vessels but also sometimes contracting with private vessels. In 1988, 5 firms were active in the Brevard County calico scallop fishery, with 4 firms processing the scallops in Cape Canaveral (Rockwood and Pompe<sup>2</sup>).

The Brevard County calico scallop fishery was unique in the way the product was handled. Boats were normally only out about 12 hours, including runtime from the dock. (Shrimp boats, for example, may be out 3 weeks or more and may or may not freeze their product while at sea.) Calico scallops were processed mechanically as soon as they arrived in port by one of the four large processing plants located in Port Canaveral. Indeed, vessels typically were given appointment times at the plant to ensure that their product would be expeditiously handled when it arrived (Rockwood and Pompe<sup>2</sup>).

Although calico scallops are found in places other than the eastern United States, and even there extend as far north as North Carolina, the heaviest concentrations have been found in offshore beds, of up to 20 miles wide, from St. Augustine nearly to Fort Pierce.

Location of the processing plants in Port Canaveral was due to geography rather than mere happenstance. Calico

<sup>2</sup>Rockwood, C. E., and J. Pompe. 1988. Economic impact of the Brevard County calico scallop fishery. Econ. Consultants, Inc., 2423 Winthrop Rd., Tallahassee, FL 32312. Unpubl. rep., 31 p.

scallops cannot be landed just anywhere; vessel run-time to and from the scallop beds is critical to the economic viability of the fishery and to the freshness of the landed product.

The oligopsonistic nature of this fishery provided the opportunity for cooperative behavior, which was effected through formation of a Calico Scallop Conservation Association (CSCA)<sup>3</sup> in 1986 (Rockwood and Pompe<sup>2</sup>). Florida's calico scallop industry may not fit the classic model of a commons fishery, since some biologists do not consider overfishing to be a problem during most years since stocks are annual (Blake and Moyer, 1991). However, early harvesting of scallops before maturation, which could stress the fishery and prove uneconomic, was regulated by the association. Indeed, the stated purpose of the association was to hire a biologist to determine harvesting guidelines. Members agreed to limit fishing until at least 75% of the stock at a particular location reached a shell height of at least 38 mm (Blake and Moyer, 1991). Therefore, although this fishery may not fit the classic overfishing model it is still relevant to policy. The enforcement of the self-regulation will be discussed below.

Also important, the calico scallop fishery is for all intents and purposes entirely a commercial fishery. Thus, unlike so many fisheries, recreational fishermen do not compete in any serious way either for the calico scallop resource directly, or for resources which are in any meaningful sense in the same food chain. This characteristic, combined with reasonable costs of contracting, facilitated the cooperative solution.

### **The Commons Tragedy and Alternative Solutions**

The lack of property rights to a commons area leads to social welfare losses resulting in what Hardin (1968) described as the "tragedy of the commons." This classic article explains how a herdsman is compelled to increase his herd without limit until the village commons is overgrazed. This action is "ra-

tional" for the individual, since the additional benefits for the individual herdsman exceed the additional private costs. However, the additional cost to society is greater than the additional benefit, for the eventual result is destruction of the commons. Similarly, an individual would have no incentive to protect scallop resources unilaterally if any benefits from conservation were to be shared by all members of the "commons," while the lost revenues were suffered only by those who conserve.

As Ciriacy-Wantrup and Bishop (1965) have noted, this is more accurately the case where there is open access to a natural resource. The fact that the resource is common property does not dictate a "tragedy." Therefore, it is important to differentiate between open access (*res nullius*), where resources can be exploited without restrictions, and common property (*res communes*) which can have restrictions on use.

Hanna (1990) discusses the positive attributes of community control, contending that overuse of resources is possible under private ownership as well. With open access to a resource, if sufficient demand exists, the resource tends to be overused. With a lack of enforceable property rights, scarcity rents will be dissipated, and firms will tend to overuse the resource. The current generation suffers a loss of welfare as high capital costs and inefficiency, in the form of an excess amount of boats, fishermen, and effort, results. In addition, as fish populations decline from overfishing, benefits to future fishermen and consumers may be lost or reduced.

However, if these rents can be captured by firms sharing the commons, the members have an incentive to come to a voluntary agreement that prevents overuse. Resource owners recognize that the resource has an asset value as well as a use value. By conserving the resource for future users, owners can expect a return on their investment in the form of economic profits. To maintain a commons without ruination, users must be able to exclude interlopers and regulate member-use of the resource at reasonable cost. As discussed further in the next section, the CSCA has been able to meet both conditions.

Arguments have been made that the solution to the problem of open access must be either privatization or government intervention (Hardin and Baden, 1977). However, Berkes et al. (1989) offer several examples of controlled use of a commons without resorting to one of these two possible solutions. Maine lobsters, for example, have been maintained by traditional fishing rights, enforced by the community, using violence if necessary (Acheson, 1988). The Nijukiine Forest on the lower slopes of Mount Kenya was successfully operated as a communal forest by kinship and neighborhood groups until colonial rule broke down traditional rules (Castro, 1991). Aquaculture, which provides property rights, has also mitigated the commons tragedy in some species such as crawfish, mussels, and oysters.

Privatization, the process of defining and enforcing ownership rights for individual or corporate control, may be a possible alternative to help manage some resources better. Property rights to fishing sites on rivers and streams in Scotland and England have been in operation since the 1960's (Anderson, 1983). Landowners maintain desirable fishing spots to rent to sporting groups.

Although different laws do not usually allow the same procedure in the United States, there are some similar developments. In Montana's Yellowstone River Valley, for example, some spring creeks, flowing entirely on private property, are maintained and rented by landowners (Anderson, 1983). In these cases, where rights can be established and enforced, efficient use of the streams is encouraged.

Among the various policies attempted by the government to prevent fishery overuse are regulated inefficiency, tax systems, and quotas. Unfortunately, the fisheries literature is replete with the failures of such regulation with few encouraging results. As is illustrated by the regulatory attempts of the Pacific salmon fishery, government intervention is often ineffectual and costly. Crutchfield and Pontecorvo (1969) estimated that the excessive amount of capital and labor used as a result of regulated inefficiency led to a waste of \$50 million each year. In ex-

<sup>3</sup>Mention of trade names or commercial firms or organizations does not imply endorsement by the National Marine Fisheries Service, NOAA.

aming the regulated Pacific halibut industry, Crutchfield (1969) estimated that two-thirds of the fishing effort was unnecessary.

In addition, well meant government intentions are often negated by special-interest and rent-seeking behaviors. For example, the 1976 Magnuson Fishery Conservation and Management Act, extended the nation's oceans jurisdiction of from 3 to 200 miles, with the goal of controlling overfishing by foreign fleets. However, as foreign fishing declined, the regional regulatory body was pressed to allow increased domestic harvests. As a result, catch quotas and trip limits, meant to prevent overfishing, were lifted in 1982. With improved technology, such as fish finders, and increased demand for fish pushing up prices, certain New England fisheries, for a short time, saw an increase in catch levels. Since 1983, however, there has been a sharp drop in fish caught, due to severe overfishing (Ingrassia, 1991). Estimates quoted in Tregarthen (1992) have placed the lost value to society of the overfishing of New England waters at about \$150 million per year.

### **The CSCA Solution**

Coase (1960) indicates that agreements are not instituted in many common-property situations because costs would be too high. Fields (1989) separates costs into two categories—transactions costs among commons users and exclusion costs against outsiders. Transactions costs would result from efforts by the members to police free-riders within the cooperative who may shirk responsibilities. Costs of exclusion would be those incurred to maintain the commons boundaries from outsiders. Unless some occurrence would lead to increased demand for the product or to decreased costs of operation, a solution to the inefficiency in the fishery would not be expected without government intervention.

The impetus behind the movement toward the scallop cooperative was the increase in stocks and technological changes discussed earlier, especially those that led to an oligopsonistic structure in scallop processing, and hence to

relatively much lower costs of enforcing cooperative behavior. In this environment, successful formation of the CSCA was possible.

Economies of scale limited new processor entrants to the fishery, thus holding down exclusion costs. Since there is no competition from recreational fishermen for the scallop, this exclusion cost is further reduced. Additionally, the nonmigratory nature of scallops makes property rights still more attainable for the cooperative. With the concentration of the scallops within a relatively small area, cooperation by a small number of members is further enhanced. Since all scallops caught were delivered to the CSCA processors, desired rules on harvesting could be maintained by the CSCA.

The specific mechanism was that any firm in the fishery had the right to inspect the catch of any vessel, whether being landed at its processing plant or the plant of a rival firm. It was agreed that if a random sample of 6 gallons of shucked scallop meats averaged less than 38 mm in shell size, the product, by common agreement, was to be discarded—thrown overboard. Thus, although the scallop industry was not overfished in the classic sense, this joint conservation and economic measure represents the cooperative solution.

In the first couple of weeks of the cooperative agreement, rumors of the landing of undersized product were frequent. But, the checking mechanism ended the rumors quickly. In the end, one boat captain turned himself in, and one processor turned in one of his boat captains. In each case the product was discarded. After those instances, the agreement seemed to work well, and the natural conflict among boat captains and between boat captains and processors was reduced at least to a tolerable level.

A part of the reason why the agreement worked so well is no doubt due to the fact that the CSCA did not establish the 38 mm shell size constraint. That was developed independently by a university biologist whose research was underwritten largely by the industry, but who was able to be persuasive about the rationale for the size restriction. Thus, the agreements of the CSCA

were limited to these harvesting guidelines and not to other economic decisions such as a division of market share.

With the small number of CSCA members (5), costs of policing were kept low. More members in the agreement would increase the policing costs, so transactions costs would be expected to be directly related to the number of firms. Liebcap and Wiggins (1984) found that if the number of firms was less than five, private agreements could be completed successfully between firms sharing a common pool of oil. State enforcement was necessary when the number of firms rose to about 10-12.

Johnson and Libecap (1982) show that the greater the heterogeneity among firms, the higher the contracting and transaction costs will be. Although levels of operation and output vary among the CSCA members, managerial skills and processing equipment are similar for each member, and can be transferred to new members, along with quota rights. Johnson and Libecap (1982) also argue that taxes or quotas set by the government are inefficient solutions, as better fishermen will lose economic rents that they could garner through greater fishing skills.

Environmental uncertainties such as disease and migration of scallops challenge management of the fishery. This complicates determination of harvesting guidelines. Although this uncertainty will increase the costs of control to the cooperative, it can still be argued that the CSCA solution was a more desirable result than could be expected from open access and was as good as or better than could be expected from governmental regulation.

### **Enabling Legislation**

Although the conditions under which a cooperative solution can arise are very restrictive, the conditions could be enhanced greatly by enabling legislation. The enabling legislation would allow the formation of cooperatives and provide that decisions of the duly elected cooperative member firms would be binding on all. This would allow for a cooperative solution without the need for the very unusual circumstances which fostered the CSCA.

Historically, it has been difficult to limit access to ocean fisheries, as some voluntary agreements have been seen to be violations of antitrust policy. Agreements by U.S. fishermen unions from the 1930's to the 1950's were dismantled by the Federal government as violations of the Sherman Act. Numerous legal cases brought by the canneries and excluded fishermen challenged the legality of these arrangements (Libecap, 1989).

Vertical integration, when a company operates in more than one stage of the production process, could be subject to antitrust legislation. Cooperatives have been given some exemptions in this area. Section 6 of the Clayton Act (1914) and the Capper-Volstead Act (1922) partially exempted agricultural cooperatives from antitrust restrictions. The Fisheries Cooperative Marketing Act (1934) gave a similar exemption to fishermen's organizations (Benson and Greenhut, 1986).

What would be the logical decisions that might be legislatively mandated as enforceable? Government guidelines most readily acceptable to affected parties would be ones that increase the value of the catch. Limits to the number of members, cooperative membership fees, resource opening and closing dates, gear restrictions, and harvest limits (quantity and/or size) seem the most obvious choices. Gear restrictions that allow small scallops to escape would be efficient, although if restrictions simply limit competition, this may reduce technical efficiency and thus be undesirable. If a fishery is already established, greater consideration may have to be given to guidelines, since established fishermen would prefer the status quo to permitting additional competition.

Certain attributes of the calico scallop fishery help to identify fisheries or other industries with similar management problems that would be suitable for such a cooperative approach. As mentioned, the small number of participating firms, the fact that they were in close proximity to each other, and the fact that there were no recreational fishermen all seem important. The fact that the life cycle of calico scallops is very short is also significant. One can hardly

imagine prudent management of whaling by the member firms. As whales live for decades, the time horizon would be too long. No doubt other critical attributes of a successful candidate for such a management regime will occur to others.

### Conclusion

A common property resource with open access, such as a fishery, will be used to excess when faced with sufficient demand. This will lead to an excessive amount of effort on the part of the fishery, dissipating scarcity rents, and resulting in depletion of the stock. The possibility of capturing these lost rents creates an incentive for fishermen to contract among themselves. Since establishing property rights is costly, the rewards for the contractors must outweigh costs.

This paper has considered the formation and enforcement of property rights which led to a gain in efficiency. The CSCA provides an example of how property rights can be assigned to a common property resource without resorting to governmental intervention. Although the scallop industry was not overfished in the classic sense, cooperative self-regulation of scallop harvesting represented an improvement over the common pool losses that would exist without controls.

The impetus behind the transformation was technological change. By internalizing the cost of regulation, resources could be allocated more efficiently, with increased productivity of the grounds and lowered costs due to economies of scale. Distribution of the gains may be controversial, requiring compensation to parties negatively affected. If the fishery had been well established before the CSCA, it would have been more difficult to achieve cooperation, as established fishermen would have preferred the status quo.

The inflexibility and ineffectiveness of much government policy makes the cooperative solution a desirable alternative. Earlier, a few examples of the failure of government regulation of fisheries were considered. Given the current deregulatory mood among policy makers (i.e., banking, airlines, trucking,

etc.), which has recognized the benefits of the market incentive approach, it would be practical to consider the applicability of the cooperative as an alternative approach to regulation. By allowing groups to be self-regulating, in effect Adam Smith's self-interested individual principle can lead to gains for society.

The calico scallop fishery is a common property that lent itself to a cooperative solution, as discussed above. If costs of policing members and excluding nonmembers can be kept low, the motivation to act in a productive and collective manner can exist for similar fisheries. The government may play a role in reducing the costs of establishing rights in those fisheries that exhibit elements similar to the CSCA. For example, government officials may set the maximum sustainable yield allowed or perhaps limit the number of members. The rights to the fishery could be auctioned off to the highest bidders, whether they may be the local community or other interested parties, creating revenues that could be utilized for improvement of the resource. The government could be used in a limited manner, with the sole purpose of internalizing the costs of regulation. Clearly, it may not be feasible to provide ownership rights for all fisheries, especially those involving migratory patterns over large areas.

The economic benefits from an efficiently run operation can be considerable. With the prospect of growing resource scarcity in fisheries and substantial social welfare gains to be realized from proper management, the viability of efficient cooperatives should be further explored.

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