

Socioeconomics of Individual Transferable Quotas and Community-Based Fishery Management

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In many fisheries around the world, the failures of centralized, top-down management have produced a shift toward co-management-collaboration and sharing of decision making between government and stakeholders. This trend has led to a major debate between two very different co-management approaches-community-based fishery management and market-based individual transferable quota management. This paper examines the debate over the relative merits of these models and undertakes a socioeconomic analysis of the two approaches. The paper includes (1) an analysis of differences in the structure, philosophical nature, and underlying value systems of each, including a discussion of their treatment of property rights; (2) a socioeconomic evaluation of the impacts of each system on boat owners, fishers, crew members, other fishery participants, and coastal communities, as well as the distribution of benefits and costs among fishery participants; and (3) examination of indirect economic effects that can occur through impacts on conservation and fishery sustainability. The latter relate to (a) the conservation ethic, (b) the flexibility of management, (c) the avoidance of waste, and (d) the efficiency of enforcement. The paper emphasizes the need for a broader approach to analyzing fishery management options, one that recognizes and properly assesses the diversity of choices, and that takes into account the interaction of the fishery with broader community and regional realities.

Key Words: co-management, community-based management (CBM), community economics, distributional impacts, fishery policy, individual transferable quotas (ITQs), property rights, sustainable fishing

Centralized, top-down approaches to fishery management-the sort found in many management agencies within developed countries-have

been discredited in the wake of harvest declines and fishery collapses around the world, notably that of the Atlantic Canadian groundfishery (Charles, 1997). It has become clear that, while the government must maintain its overall role in guiding the fishery to best meet the needs of fishers, coastal communities, and citizens as a whole, fishery management must evolve toward co-management-closer collaboration and a greater sharing of responsibilities and decision making between government and stakeholders.

While the above reality seems generally accepted, this is where the agreement ends. There are two main contrasting visions of co-management. On the one hand, there are those who view the fishery as a cornerstone of the coastal economy, and of coastal life in general, and see co-management as a tool for careful planning to meet the current and future needs of both fishers and the communities in which they live. These people will tend to opt for a planned approach to co-management, likely through what is called community-based management. Others, who seek market-based approaches to management, tend to consider persons who currently hold marketable individual quotas as the legitimate stakeholders in the fishery, in whose interest the fishery should be managed. While the variety and complexity of fishery conditions leaves room for many different options in structuring fishery management, the most important debate regarding the choice of management system seems to be associated with the approaches identified above: community-based management and market-based individual transferable quota (ITQ) management. The literature contains a variety of work relating to this debate, for example, Charles (2001, 2002); Copes (1986, 1995, 1997, 1998, 2000); Neher, Arnason, and Mollert (1989); Organization for Economic Cooperation and Development (1993); Pinkerton (1989); Pinkerton and Weinstein (1995); Pomeroy (1995); Shotton (2000); Townsend and Charles (1997).

This paper examines the debate and undertakes an analysis of the two management models. We begin by briefly describing what is meant by each of the management approaches. This is followed by an examination of the structure, philosophical nature, and underlying value systems of each, including an overview of their treatment of property rights. A socioeconomic evaluation follows, with discussion of the distribution of benefits and costs among fishery participants, community economic impacts, and finally indirect economic effects that can occur through impacts on conservation and fishery sustainability.

Community-Based Fishery Management

Nova Scotia's Coastal Communities Network (CCN) defines community-based fishery co-management as "a method or system of management in which harvester and community interests have a significant role in the management of fishery resources," and where "local organizations clearly define and share specific management responsibilities and authority" with governments. The CCN notes that "in all community based co-management activities, fishers are recognized as the primary participants" but at the same time, "the involvement and support of the broader community is essential" (CCN, 1997, online report).

How does such a system operate in practice? First, the CCN highlights the key point that "local community representatives will share in management responsibilities through a community board representing stakeholders in the local fishery and in the coastal community at large." second, "the various roles will be defined by each local community through consultation among the representatives." Third, "the government will introduce the legislation necessary to delegate the requisite authority to the community boards so that they may implement the policies decided by them." Within this framework, community-based management would follow a broad set of

management objectives whereby "board decisions will take into consideration the sustainability of the industry and the community, and will also address social, economic, and ecological factors" (CNN, 1997, online report).

Individual Quota Management

Individual quotas represent fractions of a Total Allowable Catch (TAC), the total weight of fish of a defined stock (usually of a single species) that may be caught in any given year. Typically, a TAC is split up into various pieces, perhaps by fleet sector, by gear type, by size of vessel, or by community (where community quotas are in place). Individual quotas extend this sub-division down to the individual fisher level, giving each quota holder the right to catch a certain percentage of the TAC each year, typically based initially on how much fish each caught in the past (the so-called catch history, specifically the average catch attributed to the boat owner over a specified period of time).

The most publicized form of such quotas are individual transferable quotas (ITQs). If a fisher holds an ITQ equal to, say, 0.1% of the TAC for haddock in a given area, then the fisher would have the right to catch whatever quantity of haddock this value amounts to, over the course of the year. For example, if the total TAC in the area was 10,000 tons, the right would be to catch 10 tons. Not only is the fisher allowed to transfer quota to someone else within a given year (if, for example, the fisher is unable to go fishing in that year, or has more quota than is needed), permanent transfers of quotas can occur, whereby fishers and corporations can buy and sell quota at will, with few restrictions.

It is also possible for individual quotas to be nontransferable, with the difference from ITQs lying in what happens to the individual quotas between years. Permanent sales or transfers of quota are not allowed, so at the start of a new year, whatever temporary arrangements may have been made, the percentage of the TAC held by each fisher

reverts back to what it was previously. Thus each fisher's share remains the same from year to year. This system is in use in various jurisdictions (e.g., some parts of the Nova Scotian fishery), and is similar to the Enterprise Allocations which have been used in the offshore fishery of Atlantic Canada since the early 1980s. Some discussion of these nontransferable quotas is included here, but the primary focus of this paper is on ITQs. Because ITQs are more heavily promoted at present, they need to be examined with particular care.

CBM versus ITQs: A Contrast in Value Systems

With community-based management (CBM) and individual transferable quotas (ITQs) attracting so much attention, it is important to understand the key differences between them. These management approaches reflect very different views of what fisheries are all about. We must consider how they compare in meeting the current as well as the future needs of vessel owners, crew members, processing plant workers, and their communities. What is good and what is not, must be viewed from many angles: conservation of the resource base, sustainability of communities, economic viability of fishing enterprises, employment and income levels in the fishery, the distribution of income, and so on. Such diversity of considerations is needed in order to address important issues under the three major aspects of fisheries policy: biological, social, and economic.

First, in exploring the nature of CBM and ITQs, it is of interest to note that in theory, both could be used in the same fishery. This is because CBM is more of a framework for organizing fishery management at the local level, while ITQs represent a very specific way of dividing up a Total Allowable Catch (TAC). Thus, there is nothing to prevent a community from choosing ITQs as a part of its community-based management. The community might manage its fishery through a TAC and other conservation and harvesting regulations, and then allocate ITQs to its fishers, leaving the fishers to buy and sell quota. In

practice, however, this would be a dubious combination. Community-based management typically places a high value on community sustainability and well-being, which requires a planned approach to the fishery. An ITQ fishery relies on the market to make decisions, so there is really no place for community interests or community planning.

Thus, it comes down to a matter of philosophy: whether there is to be a role for the community or whether all decisions are to be made at the individual level, through the marketplace. In this regard, CBM and ITQs are based on different value systems, or ideologies. This is particularly noticeable with respect to socioeconomic aspects, the focus of this article, where community-based and market-based approaches to fisheries management diverge widely.

On the one hand, a system of ITQ management is driven directly by market forces with a goal of maximizing the profits going to those corporations or individuals who own the access rights to the fishery in the form of quotas. Essentially, an ITQ system's operational objectives are confined to narrow economic considerations of the market. ITQ systems in their basic logic and design are structured to ignore or override any considerations of equity, resource conservation, or community welfare and sustainability, that conflict with profit maximization by quota owners.

A community-based co-management system contrasts with the "pure economics" in the interest of quota owners which is characteristic of market-based ITQ management. Instead, it is open to consideration of a wide range of human needs in the community. It therefore lends itself to implementation of a balanced mix of biological, social, and economic objectives. Economic considerations certainly do play an important role in community-based management, but that role is subordinate to the chosen overall objectives of the community. In other words, in community-based management, markets are made to

serve human needs, which contrasts with the ITQ scheme in which fate and fortune of humans are ruled by market forces.

Property Rights Issues

The contrast between the two systems is evident from the decidedly different approaches they take to property rights. Community-based management is compatible with the innate common-property nature of the fish stocks and the ecology that produces and nurtures them. The need to recognize ecosystems as indivisible units, held as collective property, is well understood. The principles compatible with community-based management include equitably distributed access rights for local fishers to their common-property resources. Providing fishery-dependent local populations with priority access rights to adjacent resources, based on historical use, is an essential underpinning of communitybased management. Such local "territorial use rights in fisheries" have been recognized for centuries, implicitly or explicitly, by maritime cultures in many settings throughout the world.

Property rights in ITQ fisheries are sharply different. Proponents of ITQs claim they provide a way to privatize the fisheries, thereby bringing superior efficiency advantages of individual ownership. In actuality, such a claim is invalid, because it is based on the false notion that fishers' property rights through quotas are equivalent to the property rights of, for instance, a farmer, who owns and controls specific animals, as well as the farm's facilities and resources needed to raise those animals. Equivalence would require giving every fisher exclusive rights to, and control over, a specific identified set of fish, along with the ecosystem that produces those fish. This might be imagined in a few cases such as sedentary shellfish fisheries, in which private rights might be assigned to certain shellfish beds on a lease or ownership basis-but it is clearly not the way most fisheries operate. While ITQs do privatize fisheries in the sense of turning fishery access rights into privately owned marketable assets, the fish itself remains a

public resource, and generally ITQs give no individual property rights at all to any specified fish or specified part of the ecosystem that produces fish. Participants in an ITQ fishery continue to compete for catches from a common pool of fish, with the incentive to get the most valuable fish before a competitor does. In the process, ITQ fishers, pursuing their individual interests, are often induced to adopt practices which can inflict great damage on stocks and/or the supporting ecosystem (described below). Therefore, any claim that ITQs are equivalent to the individual ownership arrangements characteristic of other industries, and thus offer the superior performance possible in those arrangements, is not supported by an examination of the evidence.

Socioeconomic Comparisons

We turn now to the key question: What are the socioeconomic implications of CBM and ITQs? Unfortunately, the reality is that this question has received little attention by researchers. While many economists have been eager to examine individual transferable quotas, most economic studies of ITQs have focused narrowly on the harvesting process and impacts on boat owners. This has ignored the broader and more important issues of regional and community impacts. For example, while studies typically show that profits accruing to quota holders are maximized with the buying and selling of ITQs, little attention is paid to indirect impacts of ITQs on profits and losses throughout the economy, and to the distribution of benefits and losses in society. Meanwhile, community-based fishery management has received little attention in the economics literature, so there are few studies available on the alternatives to ITQ systems that such management could offer.

This paper represents one small attempt to rectify this imbalance, offering a broad perspective on the socioeconomic impacts of ITQs and CBM. In the discussion below, we first look at impacts on boat owners

and fishers, then at impacts on the communities and regional economy, and finally at the long-term economic effects of conservation impacts.

Impacts on Boat Owners and Fishers

Typically, ITQ systems have been put in place through a process in which quotas initially are given out free of charge to individuals who happen to be vessel license owners at the time ITQ management is introduced. This is a tangible and immediate benefit to that group of license owners, who thereby acquire quotas as assets which can be kept indefinitely, or sold off for a windfall cash profit, or even used as collateral for a loan. The value of such assets is often touted as an attractive benefit to fishers. However, if we compare this with the same fishery managed through a non-ITQ community-based system, with limited entry and tradable fishing licenses, it may well be that the total value of a fisher's license plus quota in the ITQ system is no greater than (and may be less than) the license value alone in the alternative system. This is because the total value of fishing rights, whether in licenses and/or individual quotas, reflects a share of the net value generated by the fishery. How large this value is depends on the financial success of the fishery under either system, which will vary according to circumstances.

There are some good reasons to believe well-designed CBM systems can offer a generally better performance than ITQ systems in terms of lower management costs, particularly as they may avoid the costly and often ineffective efforts to police the separate individual quota catches of all boats. CBM systems may also offer superior TACs by avoiding or minimizing stock losses caused by quota busting, high grading, data fouling, and other adverse practices induced by ITQ management. Consequently, community-based management may provide at least as great a set of economic assets, through fishing rights, as can an ITQ system. It will depend on how well each system

performs and on the financial arrangements made in either case by the government acting on behalf of citizens, who ultimately are the owners of the resource. However, there will be differences in how those assets are distributed, as will be discussed below.

Given that ITQs are promoted as economically efficient market mechanisms, it is interesting to speculate why they have not been introduced using the ultimate market tool: an auction of quotas. After all, rather than simply giving away access rights, the government could use the proceeds of an auction to pay for fisheries management, or add it to government general revenue as a return to the people of the relevant jurisdiction. On closer inspection, the reason this was not done becomes clear. While "market-efficient," an auction would mean that many established fishers would immediately lose access to the fishery for want of finances to compete in the auction, and this would be justifiably unacceptable to the fishing industry. So those promoting ITQ systems sacrificed the market efficiency they claimed to seek, and recommended simply giving away quota rights worth many millions of dollars, in order to gain approval from currently licensed vessel owners to accept an ITQ system. Once ITQs were installed and trades in quota had taken place, committed promoters were confident an ITQ system would be almost impossible to reverse. In particular, new owners of quota, who had paid the full market price for it, would have to be paid compensation to undo the quota rights, and the expense of this would likely prove to be prohibitive.

Capacity Reduction and Concentration

Now let us turn to a major implication of ITQ systems, namely that they lead naturally to concentration of quota among fewer boat owners, as some (perhaps the more technically efficient, or perhaps those with larger financial resources) buy quota from others. This has two major effects, one in terms of employment and community impacts (discussed below) and the other in terms of reductions in

fishing capacity (catching power). The latter has the desirable effect of increasing the total economic benefits from harvesting-at least in the short term-as it allows the TAC to be caught with fewer boats, with lower fishing costs per unit of catch. However, in an ITQ system, capacity reduction occurs in an unplanned manner with respect to socioeconomic impacts. The market decides who buys out whom in the fishery. In the extreme, without limits on such buying and selling of ITQs, there would be nothing to prevent the fishery from becoming permanently controlled by a few large companies or even a single corporation. This approach to fishery management has sometimes been advocated, despite evidence suggesting such monopolization in the fishery would imply an undesirable concentration of economic power that could easily be abused and that is intrinsically inefficient. On the other hand, if capacity reductions need to be made in a community-based management system, this can be done in a deliberate way, to achieve specified public objectives. For example, if the goal is to reduce catching power while harming employment as little as possible, capacity reduction might be accomplished through buy-back of the more capital-intensive vessels.

The capacity reduction that may be facilitated by an ITQ system is likely to generate financial benefits, but distribution of those benefits is widely considered to be inequitable. The first generation of quota-holders receives a windfall in the form of "free" ITQ from the government-a mechanism which, as noted above, seems to have been adopted to convince current vessel owners to accept ITQ schemes. Later generations must buy or lease quota at high prices from the original holders, and indeed may be unable to afford to get into the fishery at all. Certainly, servicing the loans needed to buy quota is likely to leave subsequent generations of fishers (unless they are lucky enough to inherit their fishing rights) with incomes no greater, and often lower, than those existing before an ITQ regime was established. Particularly when interest rates rise, quite a few may face bankruptcy.

Crew Members and Other Fishery Participants

Since ITQs are typically initiated by giving out quota to vessel owners, this has meant that crew members, and indeed all participants in the fishery other than vessel owners, receive no benefits from the ITQ system. Thus, if a vessel owner decides to sell off an ITQ, the crew members of the vessel receive none of the proceeds of that sale, despite having been closely involved in creating the catch history which generated the ITQ in the first place. This situation indicates crew members are especially likely to lose out when ITQs are implemented. Upon implementation of an ITQ system, they may well find themselves unable to go fishing, with no compensation. In the longer term, if and when they aspire to become licensed operators in their own right, they often find the cost of buying quotas prohibitive. The option left to them is to lease quota from corporations, or private investors, often at very high lease rates. In Iceland, where much of such leasing has taken place, lease rates as high as 80% of the value of the catch are reported. Clearly, there is a notable inter-generational inequity involved in having initial recipients receive a free gift of quotas from a public resource, while subsequent generations have to pay exorbitant purchase or lease rates.

These evident inequities, common to most ITQ systems, mean such a market-based arrangement is unlikely to be chosen under a community-based management system (except perhaps if, as is sometimes attempted, the "community" is defined narrowly as merely those selected by government to own ITQs!). A more carefully planned communitybased system is likely to operate so as to allow "new blood" to enter the fishery over time, from within the community. It is likely that well-qualified and ambitious crew members would be prime candidates for community-brokered entry to replace retiring fishers. A likely device-one being actively developed in a number of communities-would be the use of license and/or quota banks, depending on management arrangements used. The licenses and/ or

quotas would be leased under reasonable conditions and at reasonable rates to qualified fishers within the community.

Flexibility in Fishing

An oft-noted benefit of an annual individual quota is that it can be caught whenever the fisher desires, allowing for flexibility in fishing activity (e.g., by avoiding fishing in bad weather or by harvesting when prices are high), so that fishing is more productive (greater profits per day fishing), compared to a free-for-all system. However, with communitybased management, the same benefits can be obtained, either through annual quota allowances made to participating fishers, or with appropriate openings and closings made by the community management board, based on monitoring of weather and market conditions.

Impacts on Communities

As noted above, experience has shown that whenever ITQs are implemented, capacity rationalization takes place in the fishery, with concentration of quota in fewer hands leading to higher profits for initial recipients, but reduced employment in the fishery. Fishing capacity rationalization itself is neither inherently positive nor negative. It may well be necessary at times to maintain economic viability and allow fishing communities to share in the benefits of higher productivity in an advancing economy. Thus, the socioeconomic concerns relating to ITQs and capacity rationalization lie not in the rationalization phenomenon itself, but rather in the tendency to produce an excessive concentration of fishery access rights-both financially and geographically, as described below. This concentration is liable to inflict damage on smaller fishing communities, and the welfare of their people, by alienating their resources, reducing their incomes, and diminishing their viability.

First, when ITQs are freely tradable, corporations and large investors in the fisheries sector may use their financial power to buy up large aggregations of quota, thereby concentrating a substantial share of fishery access rights in their hands. They may assign their quota holdings to larger vessels which they operate directly, or lease out quota (with or without boats) to independent fishers, or provide loans to fishers to buy boats and quota-in all cases usually on condition that the fish caught be delivered to their plants.

Second, in terms of geography, the high level of capitalization in fishery access rights resulting from the ITQ system, and the corresponding financial concentration of ownership or control by corporations and investors, is likely to produce a geographical concentration toward the larger ports where the quota owners have their main facilities. This will occur for reasons of operational efficiency and control, with quota owners tending to concentrate the fleets they own, or support, close to their processing and holding facilities. Diversion of quotas to larger centers has a cumulative economic effect in the smaller communities. Since they have fewer active boats left, boat repair, baiting, and other related activities are reduced, whereby total fisheryrelated employment is diminished to an even greater extent. Furthermore, a reduction in the economic multiplier effect from shrinking fishing income in the local economy means that in addition to fisheryrelated job losses, there may be considerable job losses elsewhere in affected communities. Thus, despite higher profits for the original group of vessel owners, the extent of job losses may swiftly produce an overall negative impact on smaller communities. Many of those communities, which otherwise would have remained economically and socially viable, may eventually lose so much of their critical economic mass as to face serious decline or abandonment. This would imply losses in social infrastructure and in individual wealth of the inhabitants, as well as increased public and private outlays associated with unemployment payments and re-employment costs.

There may also be serious non-economic losses for those who would rather have stayed in the familiar surroundings of their community if it had remained economically viable. Many of them would grieve the loss of accustomed social relations and a familiar and attractive physical environment. Finally, it should be noted that the reduction in the number of inhabited places along the coast would have adverse consequences for the country at large, for instance, in terms of tourism, by reducing serviced access to parts of the country that would be attractive to visit. The fundamental point here is that the economic costs to society of the concentration of fishing operations through ITQs are likely to be quite significant, and may be substantially larger than the gains enjoyed by the benefitting companies and vessel operators. But typically these costs are not accounted for in decisions to move toward an ITQ system.

With community-based management, a measure of capacity rationalization may also be called for, but this may be done in a planned way to minimize adverse impacts. It seems unlikely that the concentration of fishery access rights and resulting fishery benefits-common in ITQ systems-would be considered acceptable. On the other hand, a community might focus more on small-boat operations through a more labor-intensive fishery, one that will retain a larger share of fishing income for the local work force, with a lower reliance on imported capital equipment.

The implications for fishing communities are that, first, fully-tradable fishing rights are unlikely to be desirable in a community-based management system. Second, there is a need for secure and privileged access for small fishing communities, or clusters of such communities, to local stocks. Commonly this would involve stocks on which the local fleet had long relied and to which they might claim a customary right of access. Such access rights may be formally recognized as TURFs (territorial use rights in fisheries), assigning to the community priority rights to harvest in a geographically defined

area. Where widely dispersed stocks were involved, they might be shared with other communities fishing the same stocks through the assignment of community quotas, mediated by higher authority. To meet the intended purpose, the community quota normally would be available only to fishing units based in the community. This recognition of rights to adjacent resources on which communities have been historically dependent can be justified on the grounds of both community economics and conservation. Where economically justified, community fish plants would have priority access to the locally based catch.

Indirect Economic Impacts: Conservation and Fishery Sustainability

ITQ systems and community-based management differ in their impact on conservation, which in turn differentially affects the long-term economic benefits these systems can provide. Four key considerations are discussed below: the compatibility of management with a conservation ethic, the flexibility of fishery management, the tendency to waste resources, and the efficiency of fishery enforcement.

(1) Conservation Ethic. An often ignored disadvantage of ITQs is that the original hand-out of quotas, on the basis of "catch history," rewards boat owners not for conservationist behavior, but for aggressive fishing, regardless of stock impacts and other ecological damage. The larger the catch history, the larger the quota, which is received free of charge. This creates an incentive to maximize one's catches in any fishery not currently using individual quotas, so as to create the greatest catch history, thus threatening conservation. It also sends a message to fishers that the government places a higher priority on promoting ITQ systems than it does on conservation.

It is often claimed by promoters that ITQ holders are highly motivated to fish sustainably, because they will want to keep up the value of the ITQs they own. The claim fails the test of logic for two reasons. First, it confuses the collective interest of ITQ holders with their individual

interests. Each individual ITQ holder can benefit from wasting fish through "high-grading" and other harmful practices (discussed below), because he/she gets the full financial benefit from doing so, while suffering only a small portion of the resulting loss to the fishery as a whole, which is spread over all ITQ holders. The individual profit incentive, which is the driving force for an ITQ fishery, thus motivates individual fishing practices contrary to conservation. There is a second type of anti-conservation incentive that motivates ITQ holders in certain fisheries, particularly of long-lived species. This concerns cases where ITQ holders collectively can make exceptionally high short-term profits by rapidly fishing down large stocks to unsustainably low levels, or maybe to extinction. In the process, these holders may be able to write off their investment in quotas and equipment and still retain handsome net returns. Some of the exceptionally long-lived orange roughy stocks of New Zealand appear to have provided an example for this scenario.

Likewise, under community-based management, there will also be some incentive for fishing practices that are contrary to conservation. However, this will be countered by a more favorable perspective on sustainability, and thus a sounder base for a conservation ethic, derived from two important circumstances. First, since community-based management typically occurs in the context of smallboat fisheries, the fishers are relatively more dependent on long-term investment in non-transferable fishing skills than on large financial investments in rapidly depreciating equipment which can be liquidated over a relatively short period. This should encourage a more long-term view among fishers. second, management in such cases is based on, and guided by, the collective interest of the community, expressed in the decisions of a collective authority. Inter-generational equity and continuing prosperity for the community as a whole are major features which drive a need for long-term sustainable use and equitable sharing of the community's fishery resources-obj ectives less likely to be advocated by an ITQ fishery that may well be largely in the hands of

corporations or a small number of privileged quota holders. Indeed, in smaller communities with a strong fishery base, it is common to find a collective interest in the health of the community's resource assets, which is strengthened by a collective interest in community-based harvest rights. This may extend to support for and/or participation in local fishery resource stewardship undertakings.

(2) Flexible Management. Flexibility, or adaptability, is important both within the fishing season and over longer periods of time. Unfortunately, the proper functioning of ITQ systems requires that quotas be fixed at the beginning of a season and be guaranteed for the duration of the season. This produces an inherent lack of flexibility; it limits the ability of managers to make in-season adjustments, lowering the TAC or imposing closures if stock monitoring indicates catches must be reduced to avoid damage to the stocks. This proved to be a significant problem in responding rapidly when cod stock collapses became apparent in Atlantic Canada in the early 1990s. With community-based management, however, flexibility can be built into the system, for example through a careful form of limited-entry licensing to regulate the number, size, and gear of fishing units allowed to operate. Consequently, even though in-season cuts will never be popular, they can at least be conducted fairly when needed. This better accounts for high levels of uncertainty in fish stocks, since stocks can be monitored throughout the season, allowing finetuning of permitted fishing time in mid-season if changing stock conditions so demand.

Over longer time periods, ITQ systems are inflexible in another way because, once in place, they can be expected to be difficult to dismantle. While governments typically give out quota shares free to initial quota holders, once the quotas enter into trade they often assume high values. If, at some point an ITQ system no longer appears desirable, due to actual or prospective biological, economic, or social problems, the government may find it difficult to move to

another management system. The government may be dissuaded because of the excessive expense involved in buying out quota holders, who have been made to feel they "own" the fish stock, particularly if they have bought quotas at high prices. Thus, unsatisfactory ITQ systems may linger on, perhaps leading to stock collapse. This is important to keep in mind given that the massive collapse of groundfish stocks in Atlantic Canada occurred after some 10 years of experience with the government's individual quota management for a large part of the fishery. Both the near-irreversibility of ITQ systems and their inflexibility in annual quota setting are clearly at odds with the requirements of the FAO-mandated and internationally accepted precautionary approach in fisheries management.

International and national fishery concerns have recently turned to the need to pursue ecosystem-based management, considering all of the interactions among stocks of different species and their competing uses of the marine food web. Ecosystem-based management is not well served by the single-species management practice which lies at the foundation of ITQ systems. On the other hand, community-based management has the potential to better take into account ecosystem realities-and indeed it can be argued that community-based management and ecosystem-based management are closely connected through their emphasis on a "place-based" approach.

(3) Avoiding Waste. A key objective of community-based fishery management is to get the greatest possible benefits for fishers and communities from the available harvest. Clearly, waste through discarding of marketable fish is not compatible with this objective, so the specific management measures adopted will aim to minimize such waste. In contrast, ITQ fisheries are notorious for their inherent incentives and/or management requirements that lead to the discarding of marketable fish. One illustration of this is high-grading, in which a quota holder maximizes revenue by keeping only fish of the

highest value per pound ("keep the \$3/kg fish and dump the \$ 1 /kg fish"). This may result (and by experience has already resulted) in large quantities of discarded fish, and thus a drain on the stock, leading to lower TACs in future years.

A second problem arises when ITQ fishers encounter in their catch non-target fish of a species for which they do not have the requisite quota. While in theory, fishers might sometimes be able to deal with this by buying enough quota of that species, there is a strong incentive for dumping the fish at sea, rather than paying a high quota price for what may be, for example, low-valued juvenile fish. In any case, ITQ systems experience great difficulty in administering mixed-stock fisheries, because the pre-season amounts of quota distributed for different species rarely match the proportions in which various species happen to be caught during the forthcoming year. This may result in discards of species caught in excess of quota, or closing of a mixed-stock fishery to protect stocks for which the full quota has been taken, even though it means foregoing uncaught amounts of other species in the mix for which quotas have not yet been filled.

(4) Efficient Enforcement. To the extent that ITQ schemes lead to a fewer number of fishers, in fewer communities, this may seem to make the traditional top-down enforcement easier-after all, fewer fishers should be easier to monitor. Yet, in real-world settings, enforcement of individual quotas can be a severe problem, particularly in small-boat fisheries with large numbers of vessels and plenty of opportunities to sell fish unobserved over the side or through colluding fish companies. The illegal catch over and above the TAC ("quota busting") means overfishing and a threat to sustainability of the fishery. This is a recognized problem with ITQs, and often the proposed solution is to restrict fishers to just a few larger landing sites, and/or to have observers on board. Such requirements may be very expensive to implement, even to the point of being financially prohibitive, while their effectiveness is much in question. Compulsory

landing sites do not prevent the transfer of illegal catches or the discarding of cheaper fish ("highgrading") at sea, while observer programs are typically unable to ensure the monitoring of all landings- for example, a single observer on a vessel clearly cannot remain on duty 24 hours a day.

Community-based management is likely to make less use of individual quota systems, if using them at all, so the wasteful discarding practices of ITQ systems may not be an issue. Even if individual quotas were to be used in community management, the potential problems that could arise may be avoided thanks to a community-wide attitude of resource stewardship. A sense of collective solidarity in managing a local resource for local advantage may help greatly in securing compliance with regulations, through peer pressure among fishers and the willingness to report and discipline offenders who violate the rules of common interest. Thus community quotas in conjunction with co-management and local stewardship may help to avoid or lessen anti-conservationist behavior such as quota busting and high-grading.

In such a situation, it may even be possible for a community to work with a locally administered system of individual non-transferable quotas, if there is a sensitive allocation of these to current and succeeding generations. From an enforcement perspective, even an ITQ system-if confined to a small, tightly knit group of fishers-may be able, through peer observation and peer pressure, to produce reasonable compliance with regulations. However, the inequities commonly attached to ITQ systems are less likely to mesh with community solidarity and stewardship. In any case, since community-based management allows for a wider variety of management tools than just individual quotas, a suitable "package" can be chosen to minimize economic incentives for illegal behavior.

Concluding Comments

In the concluding comments below, we highlight several key points to keep in mind with respect to the debate between community-based management (CBM) and individual transferable quotas (ITQs):

* Obviously, fisheries are not all the same. In some fisheries, perhaps those of a more corporate nature, fishing stable stocks with a small fleet and little connection to particular coastal communities, ITQs may give reasonable economic benefits while posing relatively few problems to conservation and to society. Indeed, such fisheries may not be at all suited to community-based approaches. On the other hand, in cases like coastal small-boat fisheries, ITQs likely have the greatest costs and the fewest benefits, while community-based management may well be a much more suitable choice. The important point is to reject the idea that "one size fits all." This point is all the more important to keep in mind given that one option-ITQs-has received high levels of study and promotion, while other options, notably community-based management, have received far too little attention.

* If participants in a small-boat fishery were pushing for individual quota management, the option of individual non-transferable quotas should be considered. As with ITQs, such systems are often prone to conservation problems, like high-grading and dumping, but the problems of such practices might be manageable in some fisheries because of their particular circumstances. There still would be questions of social equity to consider, but these could be reduced with non-transferability. Reductions in fleet capacity, where required, would take place not through arbitrary buying and selling of quota, and concentration of ownership, but rather through voluntary buy-back programs. With a fleet reduced to the appropriate size, retiring fishers would be replaced by qualified and experienced crew members, willing and able to buy a boat. Some concessions to facilitate family successions might be considered. The tricky part may be in maintaining non-transferability. Since this approach removes the large

windfall gains to initial holders that ITQs give, pressure may develop among windfall-seeking fishers to convert non-transferable quotas into ITQs. If this is allowed to happen, which has occurred already in many fisheries that started with non-transferable quotas, the negative social impacts of ITQs end up appearing after all, and principles of inter-generational equity would be violated. The best safeguards against such socially adverse developments would lie in a new, more sensitive government policy disallowing such developments, or at least requiring community approval of ITQs, whereby the decision would not be left to a small group of self-interested windfall seekers who happened to be the current license holders.

* To make proper choices among management approaches, it is crucial to take a broad view of the impacts of fishery management systems. It is important to look not only at how management choices affect boat owners, but also to examine economic impacts on crew members, on related industries such as baiting and boat repair, on communities, on the coastal economy as a whole, and of course on the success of conservation measures, which in turn affect the long-term economics of the fishery. This suggests the need for research that integrates fishery economics with regional economics, to deal better with the "big picture" of how activity in one sector, like the fishery, affects other economic sectors, and indeed an entire region, such as a stretch of the coastline.

* Taking into account the "big picture" economically implies a change in how fishery policy is developed. Up to now, it was usually developed and implemented without an understanding of the connections between the fishery and other economic activity along the coastline-in isolation from coastal communities, the coastal economy, and indeed the rest of the world. In the future, fishery policy and management must take into account a full range of socioeconomic considerations, including not only income and profits, but also aspects of intra- and inter-generational equity and quality of life. There must also be a

coordination with coastal zone management and community-based economic diversification to create appropriate employment alternatives. With this broader perspective, all the objectives of society should be taken into account in fishery decision making.

* In the course of historical development, some measure of population migration inevitably becomes necessary in response to major changes (e.g., in resource availability, productivity, trade relations, and demographics). Yet this is no excuse for forcing an unnecessary degree of financial and geographical concentration of fishing activities through the imposition of ITQ management systems that are demonstrably insensitive to social needs, highly inequitable in their distributional consequences, and in many ways harmful to conservation. Community-based fishery management provides an alternative with the potential to avoid these negatives. It deserves greater attention as an option in fishery management and a vehicle to support fishing people and coastal communities.

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