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Fisheries Management Regimes for the Future

by

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Introduction

I have been asked to discuss some of the new developments in the field of fisheries management. This is a timely subject because a number of countries have recently developed new approaches to managing fisheries, some of which are proving remarkably successful.

I will begin by showing how the organization of fishing has changed over time. My purpose is to illustrate the vital link between fisheries management, the rights to fish held by fishers, and the implications for policy making. I then discuss where some recent developments in this field are leading and some of the more significant changes we can expect to see in the coming years. I want to draw particular attention to the breakthrough in fisheries management resulting from individual quotas, how this innovation has affected the organization and governance of fisheries in some countries, and its potential for improving fisheries management.

Early Evolution of Fishing Rights

From ancient times and through the early Middle Ages, much of the marine fishing in Britain and Europe actually took place in rivers and estuaries, involving weirs, traps and other fixed gear attached to stream banks and beaches. Consistent with this link to the land, rights to fisheries were held by the owners of the bordering land.

A major turning point for countries that inherited British traditions of fishing and maritime law was the signing of the Magna Carta by King John of England in 1215. Landowners had become upset when the king ignored their right to the fisheries in certain

rivers and began granting fishing rights to outsiders. So the barons at Runnymede inserted a clause in the Magna Carta which effectively prevented the king from granting exclusive fishing rights in certain English tidal rivers (Scott, 2007).

Over the following couple of centuries, the courts gradually transformed the king's undertaking into a general law forbidding the king or anyone else from granting exclusive fishing rights to anyone in any tidal waters. Thereafter no one could hold exclusive rights to fish or exclude anyone else from fishing. This became known as the general 'public right of fishery' in tidal waters (Megarry and Wade, 1966).

This ban on private property in tidal fisheries was reinforced by the ancient "law of capture" which ruled that no one could claim ownership over wild animals or fish until they were caught. Four centuries after King John, further reinforcement came with the doctrine of the 'freedom of the seas' articulated by the Dutch jurist Hugo Grotius in 1609; this held that no one, and no nation, could own the high sea or restrict anyone from fishing on it (Scott, 1989).

These legal principles together left little scope for property rights in marine fisheries. Thus, over the following centuries, everyone within a nation had an equal right to fish, free from the encumbrances of property and regulation. In fact, unrestricted access to fisheries became a deeply entrenched principle among fishing nations, and remained the general rule until recently.

From an economic viewpoint, the open-access regime was natural and appropriate as long as the fish stocks could easily satisfy all the demands on them, as was usually the case historically. In these circumstances there was no need to ration access to the stocks, or to go

to the trouble and expense of organizing and allocating rights among fishermen. Nor was there much need to regulate fishing.

Controls on Catches

The open access policy was supported by the generally accepted view that ocean fisheries were inexhaustible. Even in the late nineteenth century leading biologists, including Thomas Huxley and economists such as Alfred Marshall were debating the subject. But by that time, as fishing fleets expanded, technology advanced, and catches grew, the impact of fishing on the most accessible, valuable and vulnerable stocks was becoming apparent. Some species of whales and other mammals, salmon and some shellfish – showed convincing evidence of overfishing. Scientists and governments were beginning to recognize that the capacity of fish stocks to yield sustainable harvests was limited, and that excessive fishing could deplete them.

Obviously, some control of fishing was needed to ensure sustainable catches. Governments, even those that had lost the power to grant fisheries as property, still had the power to regulate fishing. So, in the twentieth century, governments of fishing nations launched a massive regulatory effort to protect stocks from overfishing. These efforts did not change the fundamental rights of fishermen, but government regulators progressively introduced closed fishing seasons, closed areas, and myriad restrictions on boats and fishing gear in an attempt to constrain catches to the sustainable productive capacity of the stocks.

But given continued expansion of fishing fleets and advances in technology, these efforts had mixed success. After World War II it was clear that many of the world's most valuable stocks were fully exploited, and many were being depleted (Hilborn *et al.*, 2003).

The Common Property Problem

Whole industries had been built on cod, whales, anchoveta, tuna and other species, but historians were beginning to notice a consistent pattern in the development of fisheries: none of them remained prosperous for long. British research scientist Michael Graham, wrote a thoughtful little book entitled *The Fish Gate* in which he referred to this universal phenomenon as The Great Law of Fishing; “Fisheries that are unlimited become unprofitable” (Graham, 1949).

Economists took up the task of explaining this phenomenon, and identified a fundamental flaw in the way fisheries were organized. If a fishery is profitable, but is open to everyone, they said, it will attract more fishers and more vessels, and this will happen even if the additional capacity is not needed to take the available catch. They concluded that profitable fisheries were, therefore, unstable, and would expand, redundantly, raising costs until all profits were dissipated (Gordon, 1954; Scott, 1955). Fisheries were condemned to a kind of dismal Malthusian equilibrium, evidenced around the world in over-expanded fleets of over-equipped vessels, over-exploited stocks, and low incomes of vessel owners and fishers. Indeed, major fisheries around the world reflected this dire pattern, including those of Iceland and other countries around the North Atlantic.

In economists’ jargon, if fisheries are managed as common property, fishers impose externalities on each other: the catch of each reduces the catch of others. Furthermore, if participation is open to all, profitable fisheries will attract new entrants until profits are eliminated. In other industries, new producers acquire rights to the resources they need, then produce products and compete in markets with established producers. But they do not usually interfere with other producers’ production. In an open-access fishery, however, new

entrants lower the catch of other fishers, reducing their earnings until the fishery finds its equilibrium when profits are eliminated.

From the point of view of fisheries managers, this negative external effect gives rise to two general problems. One is the conservation problem. Open-access fisheries encourage fishers to catch as many fish as they can before others catch them, with little impetus to conserve the stocks because the benefit will accrue mostly to others. Biologists referred to the resulting depletion of open-access resources as the ‘tragedy of the commons’ (Hardin, 1962).

The second problem is economic: over-expansion of labour and capital in fishing dissipates potential profits (more correctly the ‘economic rent’ or surplus value the resource is capable of yielding net of production costs). This ensures that even the richest fisheries will, in the long run, yield meager returns, consistent with Michael Graham’s Great Law of Fishing.

These two tendencies – overfishing and dissipation of economic returns – became worldwide phenomena in the latter half of the twentieth century (Shotton, 2000).

In their effort to prevent overfishing, governments and fisheries managers struggled to constrain fishing pressure through restrictions on fishing time, fishing areas, fishing gear and vessel capacity. They found themselves in a race against vessel owners who were continuously adopting new shipbuilding technologies and equipment for finding and catching fish and for circumventing the restrictions (the more effective the restrictions, the more to be gained from circumventing them). All this resulted in enormous inefficiency and waste of resources – all because fishers had no way of obtaining exclusive rights to the fish on which they depended.

To alleviate the industry's poor economic performance and low incomes, governments often introduced subsidies and assistance programs for fishers, ranging from support for vessel construction to easier access to unemployment insurance. Whatever the desirable social effects of these measures, by buoying up the incomes of fishers they aggravated the problem of overcrowded fisheries.

Limitation of Access by Limiting Rights

The perverse process of profits attracting redundant fishing capacity until the profits are all dissipated means, ironically, that the greater a fishery's potential profitability the more redundant fishing capacity it will attract. Thus, on Canada's Pacific coast, by the 1960s, the potentially highly profitable salmon fishery had attracted a fishing fleet many times the size needed to harvest the available catch. In the face of this extreme overcapacity, and in an effort to halt further expansion, the government licensed the existing vessels and declared that no additional licenses would be issued.

This new practice of limited licensing spread remarkably quickly. Within a few years it applied to all the major fisheries in Canada and many in other western fishing nations.

Today, limiting the number of vessels in an overcrowded fishery seems only logical (like limiting the number of people on an elevator). But at the time it met with strong opposition. The tradition of open access was deeply entrenched in the fishing community.

License limitation was introduced as just one more measure to control expansion of fishing capacity, but it had much more profound implications because it fundamentally changed fishers' rights. Previously, everyone had an equal right to go fishing, and those who did had no right to exclude others. License limitation changed this. Fisheries remained

common property insofar as those with licenses shared access to them, but all others were now, for the first time in centuries, excluded.

Once they were limited, fishing rights gained some of the essential characteristics of property – exclusivity, duration, transferability and security. The licensees' rights were, collectively, exclusive. Licenses had defined terms, varying widely in duration from one season, to perpetuity. They were sometimes transferable. They offered a degree of security to the licensees, who could enjoy the economic benefit of exercising them (Scott, 1989). And because they were now limited, they were valuable.

By the same token, limited licenses gave holders only a right of access to the fishery, not the right to a catch or a stock of fish. Thus they were weak property rights, and weak policy instruments for realizing the economic potential of a fishery. Every fisher still had a strong incentive to increase his fishing power so as to strengthen his position in the competition for fish. Although the number of vessels could no longer be increased, vessel owners replaced their boats with bigger, more powerful vessels, invested in better equipment and added crew (Pearse and Wilen, 1979).

In an effort to forestall the continuing, wasteful expansion of fishing power, governments added more restrictions on vessel size and capacity and on fishing gear. Some governments purchased and retired vessels and licenses to reduce overexpanded fleets. Notwithstanding these efforts, investment and the cost of fishing kept rising while catches typically did not – and the treadmill of overexpansion, overexploitation, poor economic performance and regulatory intensification continued.

Individual Quotas

In the late 1970s, the notion of ‘stinting’ the fisheries was broached; that is, allotting each licensed fisher a specific share of the total allowable catch (Christy, 1973; Maloney and Pearse, 1979; Pearse, 1982). The idea was that if license holders had the right to a defined share of the total allowable catch, the main externality would be eliminated; they would no longer be driven by the wasteful competition for the catch, which was behind both the conservation problem and the economic problem.

As with limited licensing, the idea of individual quotas met with resistance. Although it meant simply defining more closely each fishers right to fish, it was regarded by some fishers as yet another attack on the traditional free competition for the catch. There were fears of “privatizing” the fisheries (although it implied no change in ownership of the resource). And the initial distribution of catch shares was particularly contentious.

By the early 1980s, several countries, notably Iceland, New Zealand, and the Netherlands, had adopted or were experimenting with individual quotas. The resulting improvements were impressive. With the security of defined shares of the catch, and the ability to adjust them through purchase and sale, fishers restructured their operations to achieve economies of scale and harvest their quotas as efficiently as possible, or alternatively sold them to others. The excess capacity of fleets was soon eliminated by the fishers themselves.

In addition, now freed from the hectic race for the fish in brief fishing seasons, fishers could fish for most of the year, when markets were most favorable, and take time to clean and prepare their fish for the best prices. With higher prices for their product and the lower

costs of rationalized fleets, fishers found themselves in much more profitable and stable fisheries.

Another important result of quotas was a new cooperation among fishers. Under traditional fishing regimes, fishers regarded each other as competitors, a clear barrier to cooperation and information sharing. But once their catch shares were defined, fishers found they had a common interest in cooperating to protect the stocks, sustain and increase the total catch, enforce the rules of fishing and generally to improve management – not just to protect their catch but also to increase the value of their assets in fishing rights (Scott, 1999; Pearse, 2002). Today, fishers operating under individual quotas often collectively take responsibility for (and paying for) detailed monitoring of catches, biological sampling, surveys, administration of quota transfers enhancement projects and other management functions.

Clearly, property rights in fisheries have gradually evolved and become more clearly defined. Back when anyone could fish, fishers held no property rights because their rights were no different from those of everyone else. When they were required to hold licenses, and licenses were restricted in availability, these fishing rights began to take on the characteristics of property. These property characteristics have been progressively strengthened, especially through the leap to ITQs, through clearer specification of a right to resources, longer duration, even perpetual terms, greater transferability and divisibility and increased security.

The Icelandic Experience

Iceland provides an excellent example of a fishing nation whose management system has evolved through the stages described above. It also demonstrates the improvement that can be achieved by developing the property rights of fishers (Arnason, 1995).

For centuries, the prolific stocks of fish off Iceland were exploited by British and European as well as Icelandic fleets, all operating in a regime of international common property with little management control. Development of the fishing industry followed the predictable path for common-property fisheries. Fishing and catches increased until the sustainable capacity of the stocks was exceeded. Over the four decades following World War II fishing expanded and catches tripled, but the capital employed in fishing increased 12-fold. The important demersal stocks were overfished and heavily depleted, and some herring stocks collapsed. The economic performance of the fisheries, as well as the resources on which it depended, was in long-term decline.

Attempts to negotiate conservation measures were frustrated by the international character of the fisheries, leading Iceland to engage in a lengthy campaign to assert jurisdiction over its coastal resources. Its claim to a 200-mile Exclusive Economic Zone was finally recognized in 1976 and confirmed by the 1982 Law of the Sea Convention.

The extended zone embraced the major Icelandic stocks and gave Iceland the opportunity to manage them effectively. Still, while it ended the international character of the common property problem, the fisheries remained common property for Icelandic fishers. To deal with this domestic dimension of common property, Iceland experimented with individual vessel quotas for herring and capelin in the late 1970s. The success of these projects led to adoption of vessel quotas for the all-important demersal fisheries in 1984 and, in 1990, to new legislation that provided for a uniform individual quota system for all Icelandic fisheries.

Iceland's individual quota regime was introduced by assigning to each vessel an initial percentage share of the allowable catch, usually based on its catch history. These

shares, or quotas, are permanent, perfectly divisible and freely transferable. Every year, each vessel is entitled to catch its quota, which varies from year to year with adjustments in the total allowable catch and any purchases or sales of its quota.

The improvement under the new regime has been impressive (Agnarsson and Arnason, 2007). In terms of resource management, the decline in fish stocks ceased and in important cases was reversed. The previously depressed herring stocks have recovered and are now at record levels. Haddock are back up to the levels of the 1950s.

In terms of economic performance, fishers, freed from the competitive race for the fish, and with their guaranteed share of the catch, have found it to their advantage to reduce excess capacity, cut costs in other ways, put more time and effort into improving the quality and value of their catches, and to fish when markets are most advantageous. The result is a substantial improvement in profitability (Arnason, 1999).

Excess fishing capacity, fishing effort and costs have been reduced significantly. For example, the purse seine fleet was reduced from 140 vessels when the quota system was introduced to 40 in 2005, and from nearly 50 thousand gross registered tonnes to 30 thousand. Over the same period, the catches of this fleet more than quadrupled. Economic studies indicate a huge increase in productivity in the fishing industry since the 1980s. The increase in (marginal, variable) profitability, as reflected in the prices paid for annual rentals of quota, increased 18-fold, from about \$25 million (U.S.) in 1984 to about \$450 million in 2005 (Arnason, 1995).

An important element in this success, especially in the rebuilding of the stocks, has been the willingness, indeed the eagerness, of vessel owners to cooperate with the authorities under the quota management regime.

In a wider context it worth noting that Iceland is rated one of the world's leading countries in terms of economic well-being (IMF, 2006). With few other natural resources or other economic advantages, Iceland's success depends heavily on its fisheries (Agnarsson and Arnason, 2007). In short, in contrast to the marginal or negative net contribution of fisheries in many countries, well-managed fishing has made Icelanders wealthy.

Accumulating Experience

New Zealand and the Netherlands are also among the early leaders in this kind of fisheries reform, having adopted individual quotas for most or all of their fisheries and experienced similar improvements (Arnason, 2002). Their successful experience encouraged others, so that today, at least 10 major fishing nations have adopted individual quota as their main, or at least a major instrument for organizing their fisheries, including Chile, South Africa, Russia, the Baltic countries, Namibia, Greenland, and the United States and Canada.

Hundreds of fisheries of all types, from shellfish to tuna, are now organized under individual quotas, and they account for nearly 15 percent of the global ocean catch (Arnason, 2002). The accumulating documentation of experience indicates that, notwithstanding a variety of difficulties in implementation, this method of organizing fisheries results, almost without exception, in substantial improvement in both the conservation of stocks and in the economic performance of fishing industries (Arnason, 1999, 2002; Kaufmann *et al.*, 2000; Shotton, 2001).

The key to these improvements lies in the new incentives that drive fishers' behavior when their rights to the catch are quantitatively defined. This seemingly simple change eliminates, for the first time, the perverse incentives behind wasteful competition, overexpansion, and lack of restraint which are at the root of both the depletion of stocks and

the fishing industry's traditionally poor economic performance of fishing industries. The main preoccupation of fishers shifts from maximizing their catch to utilizing their share most efficiently – reducing costs and increasing product values. Rather than focusing on immediate returns they pay attention to the sustainability of their actions and their impact on future earnings. And instead of competing, they find it advantageous to cooperate.

Two important conclusions for fisheries policy-making flow from this shift in incentives. One is that both theory and experience show that the stronger the rights of fishers, in terms of their clarity, security, transferability and other characteristics of property, the stronger their incentives to operate efficiently and sustainably. Significantly, the most successful regimes, such as those of Iceland, New Zealand, and Australia, provide for individual quota rights that are permanent, readily divisible and transferable, and secure against encroachment by third parties, including governments.

The second point is that the realignment of fishers' incentives to behave in a socially desirable fashion opens the door to a shift in fisheries management also, from a system that depends on regulatory controls to one that relies on markets and the fishers themselves to manage fishing operations, as in other resource industries.

These conclusions, and the favorable experience with individual quotas and markets as the allocation mechanism, have stimulated interest in the possibility of extending this system to deal with other fisheries management challenges, some of which I would like to draw attention to here.

Future Developments

So far, individual quotas, and market trading in them, have been used to allocate catches only among commercial fishers. Several countries are now showing interest in

extending this approach to resolve the problem of allocating catches among competing groups or sectors of fishers (Pearse, 2006).

Many fish stocks support two or more sectors of fishers, which are separately licensed, regulated and managed. These sectors may be different types of commercial fishers, or they might include recreational fishers or other non-commercial sectors. The allocation of the catch among them may or may not be formalized, but it is typically determined without reference to economic criteria and it is often a contentious issue.

The potential for improvement through market trading in shares of the catch among the different sectors parallels the benefits from trade in individual quotas within a sector. Theoretically, a single market for quota rights, accessible by the fishers in all sectors, would lead to the benefit-maximizing allocation among sectors as well as among individuals, providing the fishers in all sectors demand fish for extractive purposes, rights are freely divisible and transferable and transactions costs are low (Arnason, 2006a; Arnason and Pearse, 2006).

In the simplest case, commercial fishers using a particular stock are often categorized and licensed separately according to their region of operations, the gear they use, or other criteria. Even where an individual quota system applies to all of the sectors, transfers of quota between sub-sectors are usually prohibited, which is an obvious barrier to efficient production.

Once individual quotas are well established in a commercial fishery, and are transferable within each sector, it is not a big step to transferability among the sectors. In Iceland, for example, where fishing fleets are licensed separately by region, fishers can (under certain restrictions) transfer quota from one licensing region to another. In other

cases, where commercial sectors are distinguished only by the gear they use, individual quotas remove much of the rationale for non-transferability, and it is surely only a matter of time before we will see transfers among the various sectors.

A more interesting possibility is trade in rights to the catch between commercial and non-commercial sectors. Several countries using individual quotas are experiencing growing conflicts between commercial and recreational fishers – over their shares of snapper in New Zealand, lobster in Western Australia, and halibut, among other species, in Canada and the United States. In these same countries, the allocation of catches to aboriginal fishers is also a serious concern of fisheries managers.

The advent of individual quotas has sharpened these intersectoral conflicts by raising the value of commercial fishers' assets in the form of quota rights. These values are directly affected by the size of their quotas, which is constrained by the catches of other sectors and threatened by their expansion. At the same time, marketable rights to the catch afford a mechanism for resolving these conflicts. In Canada and New Zealand, individual transferable quotas in commercial fisheries have facilitated treaty settlements with aboriginal groups by allowing governments to purchase defined shares of the catch from commercial fishers for transfer to aboriginal organizations – a direct, compensated transfer of shares that was not possible before fishing rights were quantitatively defined (McRae and Pearse, 2004).

Typically, however, only commercial fishers use quotas, and their adoption in recreational and other sectors presents formidable administrative obstacles, so a simple quota system covering all sectors is not feasible. Nevertheless, a market mechanism for allocating catches can be developed and the same optimal result can be achieved if the fishers in non-quota sectors form a representative organization to hold their sector's allocation of the total

catch and to act for them in the market for fishing rights. This requires only a clear allocation of the catch among the sectors to begin with, and thereafter the opportunity for the sectors to trade with each other in rights to the catch.

These arrangements are not unrealistic. An interesting development in Canada's Pacific halibut fishery is a case in point. A couple of years ago, to resolve a conflict arising from an expanding recreational catch at the expense of commercial fishers' quotas, the Minister of Fisheries fixed the recreational sector's share of the catch at a percentage somewhat greater than its actual catch at that time, and declared that if recreational fishers ever want any more they will have to buy quota from the commercial sector. In the meantime, the recreational fishers have been leasing their surplus allocation to the commercial sector, accumulating a substantial financial endowment they can use to acquire a greater recreational share in the future if and when they need it.

It seems likely that we will see more of such arrangements where commercial fishers employ transferable quotas and share the catch with other sectors. Moreover, other sectors might include groups whose interest is not in catching fish but in conserving them. Theoretically, if such preservation demanders organize themselves effectively to participate in market for fishing rights, they can ensure the optimal division of the catch between protection and exploitation (Arnason, 2006b).

Another potential development is the tradability of rights to interdependent species of fish. Often, two or more fisheries are interdependent; the abundance of one species linked to another by a predator-prey relationship, competition for the same food or habitat or other effects. These cases present an opportunity to increase the aggregate value of production from the combined fisheries by increasing production of higher-valued species at the expense

of lower-valued species. Fishers could make such trade-offs to maximize the aggregate value of production if their rights were extended so as to allow them to negotiate the size and catch of their stock with the fishers in related fisheries.

Thus, in New Zealand, for example, the Challenger scallop and the Nelson dredge oyster fisheries occupy overlapping areas, and the harvesting and enhancement activities of each affects production in the other. Recently, the fishers holding the quota rights in these two fisheries have joined together in an effort to maximize the return on the two fisheries combined.

A logical extension of such arrangements could respond to the growing pressure in advanced fishing nations to shift the focus of management from individual fisheries to whole aquatic ecosystems. Many interdependent species and fisheries might be managed under a plan designed to maximize the economic return from the whole system (McClurg, 2002). This could involve a large number of trade-offs, costly biological and economic information, and complicated compensatory payments among quota holders, which might lead the quota holders to seek efficiency in a single enterprise or cooperative. This single enterprise could hold the fishing rights for all the interactive species and internalize the benefits and costs of all the adjustments needed to maximize aggregate returns (Arnason, 1999).

A step in this direction is being taken by fishers in a cluster of groundfish fisheries on the coast of British Columbia. To date, the fisheries have been separately organized and managed, most under individual quotas, but the fishers in each fishery incidentally take significant quantities of the other species which they have been obliged to discard. They have recently formed an umbrella organization and negotiated amendments to their fishing rights to allow them to trade quota among fisheries — one species for another — thus

improving the efficiency of operations and eliminating waste (Diamond Management Consulting Inc., 2005).

As individual quotas become institutionalized, opportunities exist in a variety of other directions as well. At the local level, they can allow communities to secure a defined share of nearby marine resources to support economic stability and development. At the international level quota trading could ease conflicts over allocations among nations and facilitate the specialization of fishing fleets.

In terms of the management of fisheries, the most auspicious effect of individual quotas, in my opinion, is the incentives they give fishers to cooperate and organize themselves to take over fisheries management responsibilities traditionally left to governments. The experience so far suggests that self management of fisheries can lead to significant improvements both in the management of fish resources and in the organization of fishing (Arnason, 2002; Kaufmann *et al.*, 1999).

Three general points can be drawn from this discussion. First, all these opportunities for improvement and development flow from aligning the incentives of fishers with the public interest in both sustainable resource management and maximum economic benefit. Second, they all invoke market mechanisms to replace traditional regulatory methods of pursuing these objectives. Third, they do this by broadening and strengthening the rights held by fishers, including, as the essential first step, creation of transferable rights to defined shares in the catch.

Slow Progress

These promising developments can be expected only in countries and fisheries that have adopted individual quotas or other forms of quantitatively defined, transferable rights.

Today, competitive, common property fishing is still the rule in most fishing nations, accounting for more than 85 percent of the world's catch. This includes most of the fisheries in developed as well as developing countries, and most of those of the European Union.

In view of the generally dismal condition of the world's fisheries, and the striking improvement in both resource management and economic performance where individual quotas have been introduced over the last two decades, the sluggish progress of fisheries management reform is disappointing. The opportunities foregone in terms of the potential benefits to be gained from giving fishers secure and well defined rights to resources, like producers have in other resource industries, is now well documented. Even environmental organizations, initially suspicious of strengthening commercial fishers' rights, have begun to advocate individual quotas to improve both environmental and economic performance (Environmental Defense *et al.*, 2007).

The obvious question is why, in the face of all this tangible evidence of opportunity for improvement, most fishing nations persist in such deficient management policies. The answer undoubtedly varies from country to country, but it is instructive to identify the factors that helped overcome resistance among fishers and inertia within governments in bringing about reform in countries where reform has taken place. For example, strong political leadership played a major role in New Zealand's reforms in the 1980s, well-organized and well-informed fishers helped in the case of Iceland, a crisis in the fishery facilitated policy change in Canada.

Not all of these influences are under the control of governments, but governments can, at least, play an important role in providing leadership in the form of initiative, information, support for the organization of stakeholders, consultation with them, and, at the

appropriate time, creation of an agenda and timetable for policy changes. To an outside observer, this kind of governmental interest in fisheries reform seems surprisingly weak in countries that not yet adopted reforms, even though many of them have much to gain from it.

Moreover, international organizations with interests in fisheries, such as FAO, OECD and EU, should also be playing a more active role in promoting fisheries reform by gathering and disseminating information on experience with alternative policies, helping to organize pilot projects and providing expertise.

Conclusion

To summarize briefly, after centuries of fishing industry development, it is now abundantly clear that traditional fisheries management regimes cannot be relied upon either to sustain fish resources or to realize their potential economic benefits. Better understanding of the economics of fisheries over the last half century has stimulated a search for more effective methods to overcome the distortions and inefficiencies of common property fishing (Wilen, 2000). There are ways of doing this other than individual quotas; one is to assign all the quota to a single enterprise, thereby eliminating common property altogether. For sessile or immobile species, the same effect can be obtained by assigning exclusive rights over defined geographical areas (TURFs). But the only practical method for most marine fisheries is to assign defined shares of the catch to individual fishers. This not only eliminates the externalities fishers impose on one another in common property fisheries, but also creates incentives for fishers to fish efficiently, reduce costs, increase the value of production, and provide for the future.

The successful experience with individual quotas is consistent with the theory that appropriately defined property rights can maximize the value of production (Demsetz, 1967).

It is consistent also with the way governments allocate rights to other natural resources, such as forests, water, rangeland and minerals, with generally satisfactory results.

In view of the gloomy outlook for fisheries managed under more traditional systems, and the accumulating evidence of potential improvement under individual quotas, I believe all fishing nations that have not already done so should carefully examine their opportunities through reform this new direction.

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