

The role and value of property rights in fisheries management

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1. Introduction

Background

Overexploitation of common property resources – fisheries, water basins, oil and gas reservoirs, pasture land, the air we breathe – arises largely because of poorly defined and enforced property rights in a context of scarcity. Individuals competing for these resources do not consider the implications of their extraction (use) on others, creating what economists refer to as external costs.¹ Examples of these external costs include overfishing, reduced production and excessive extraction costs of water and petroleum, overgrazing pastures and air pollution leading to poor air quality. In anticipation of these results, participants tend to rush to exploit the resource, leading to overcapitalization and extreme economic waste. These situations are examples of the ‘Tragedy of the Commons’. (Hardin, G. 1968)

Avoiding the economic waste should provide a strong incentive for collective action. The options for regulating behaviour fall into one of three broad categories: a) develop a group solution for exploiting the common property resource (Ostrom 1990); b) use government regulation through input/output controls; and c) assign formal property rights to resource users. All three options have been, or are being, employed in fisheries around the world, including in Canada, with varying degrees of success.

Purpose and objective

This paper is intended to give an overview of the use of property rights in fisheries management. Its purpose is to provide input into the on-going debate about the effectiveness of market-based approaches to fisheries management, and more specifically, to inform discussions at the senior management and ministerial level among the Canadian Council of Fisheries and Aquaculture Ministers. Other approaches to management – group solutions and regulatory control – are discussed briefly, but the scope of work precludes a close examination of alternative approaches.

The use of market-based approaches to fisheries management in Canada has expanded greatly since the first measures were introduced in the 1970s. By 2004, some 50 of Canada’s major fisheries (on the Pacific and Atlantic coasts) accounting for between 50-60% of total landed value, were managed with some form of rights-based approach. (OECD 2004)

This paper traces the evolution of market-based approaches internationally and in Canada, examining the characteristics of property rights and how these characteristics manifest themselves in specific fisheries. It reviews the rationale for implementing market-based approaches in each case, and provides an assessment of the results in relation to objectives. It also identifies barrier to implementation and the reasons for opposition to market-based approaches in the inshore fisheries in Canada.

¹ External cost or social cost is the term economists apply to situations where one person’s activity adversely affects others, but the person causing the harm does not bear its cost. The cost is “externalized” to others. The adverse impact could take the form of impaired health due to industrial waste. Or, it could take the form of increased costs of production arising from the other’s activity. It is this latter example that describes the externalities arising in an open access fishery, or even a competitive fishery with limited entry. Each harvester has an incentive to invest in greater catching capacity to maximize his/her share of the catch. This imposes a pecuniary cost on all others in the fishery by reducing their revenue potential. The rational response of all participants is to invest to increase capacity. Eventually, stocks are run down and all profits in the fishery are eliminated.

2. Evolution of fisheries management: 1950 to present

Fisheries management as a discipline emerged during the 1950s and 1960s in response to the growing need to reduce the risk of depleting fish stocks. National governments had jurisdiction over narrow territorial seas, and hence, limited reach to impose effective control, even if they had the right tools. It was not until the late 1970s that most nations extended jurisdiction over fisheries to 200 miles. This at least provided the authority to manage most major fish stocks.

How well that authority has been exercised is another question. If judged by the state of many of the world's fish stocks, the answer is not very well. This is partly because the biology of fish populations was not well understood, resulting in catches that exceeded sustainable levels. But mainly it is because fisheries managers in the early days exercised limited control or used ineffective tools, allowing users to exert excessive pressure on fish stocks.

Fisheries management in Canada may be characterized as an on-going balancing act involving biological, economic, social and cultural objectives. The management approaches and tools tend to reflect the priorities of the day. At the risk of oversimplification, three broad approaches may be distinguished: open access, input controls and rights-based. Though these approaches developed sequentially, there is considerable overlap in the use of input and output-based methods. (Gardner 1994; OECD 2005). Input and output controls are examined on page 7.

- ❑ **Open access:** the essence of open access fisheries is that there is no effective control on the number of vessels and how much fish they can catch. From the 1950s to the late 1970s, most fisheries in Canada were effectively open access. Licences were required, but were readily available. There were some vessel and gear restrictions (input controls), but no meaningful constraints on total catches. This was the era prior to extended jurisdiction, when Canada's domestic fishing industry was relatively small. The threat to the stocks off our coasts came from foreign fleets, where effective open access continued (despite quotas) until 1977.
- ❑ **Input controls:** the essence of management using input controls is that the quantity of fish taken is constrained through limits on fishing effort, i.e., limits on the number and size of vessels, gear restrictions, closed areas and times, trip limits, etc. Limited entry and vessel size restrictions were introduced in the lobster fishery in the 1960s (landings were a fraction of what they are today). Limited entry was introduced in the inshore groundfish and other fisheries in the late 1970s, and by 1982, all fisheries had become subject to limited entry licencing and other input controls. But even in fisheries where quotas (output controls) are imposed or where there are other limits on catches (e.g., minimum size restrictions such as for lobster and crab), as long as fishing is *competitive*, each vessel has a strong incentive to maximize its share of the catch. This incentive causes fishers to seek ways around the various input controls, including investing in larger and more powerful vessels and technology. Not only does this result in continued pressure on fish stocks, but it also causes fishing to become less and less profitable for all participants.
- ❑ **Market-based approaches:** the essence of a market-based approach to fisheries management is to change the fishers' incentive from share maximization to economic efficiency, i.e., to give each licence-holder a right to a share of the TAC (e.g., an individual quota) so that the objective becomes one of profit maximization – using the least cost combination of permissible fishing inputs to achieve the highest output value. How effectively participants in market-based fisheries are able to achieve this objective depends largely on the quality of the property right they hold; whether this is an individual transferable quota (ITQ) or some other device.

3. Rights-based fisheries management in theory

Why create property rights in fisheries

The limitations of input controls to manage fisheries had become evident in many major fishing nations by the late 1970s.² The experimentation with forms of property rights became widespread during the 1980s, with Canada, New Zealand, Iceland, Australia and the Netherlands implementing systems in various fisheries. The over-arching goal in each case (and in all subsequent cases) was to improve sustainability, addressing its environmental, economic, social and cultural dimensions.

Fisheries where licence-holders fish competitively subject to input controls tend to be characterized by self-reinforcing cycles involving:

- ❑ a race to catch the available quota
- ❑ wasteful investment in vessels and gear aimed at winning that race
- ❑ short seasons, gluts and landings of poor quality fish
- ❑ restrictive controls aimed at trying to extend seasons
- ❑ low vessel productivity and inefficiency
- ❑ low profitability and poor incomes
- ❑ excessive fishing pressure contributing to stock depletion
- ❑ lack of cooperation in implementing conservation measures
- ❑ high cost of fisheries management.

This set of results is not the product of irrational behaviour on the part of licence-holders. On the contrary, the behaviour leading to this result is the perfectly *rational* response to the incentives provided. Moreover, not only is the management regime composed of input controls powerless to produce a different outcome, it may actually contribute to the problem by mandating inefficient operations (e.g., trip limits).

Licence-holders are forced to short-run and long-run share-maximizing behaviour because they compete with every other licence-holder for a share of the allowable catch. As long as the resource retains its common property characteristics (it does not belong to anyone until the fish is caught), competitive behaviour amongst licence-holders generally produces the set of outcomes listed above.

The introduction of property rights holds the potential to produce a more positive outcome because it *changes the incentives* driving the investment and operating decisions facing harvesters. If the harvester knows that a specified share of the allowable catch “belongs” to him/her, then there is no need to race to catch it as soon as the season opens. If there is no need to race, then there is no need to invest in larger and more powerful vessels. Not only can the harvester then adjust fishing operations in response to market conditions (fish when prices are highest) in the short run, he/she can also adjust vessel characteristics in the long run to suit the amount of quota held (or buy more quota to optimize vessel efficiency).

² Canada was one of the earliest adopters of property rights, introducing individual quotas in the Lake Winnipeg fisheries in 1972 and in the Atlantic herring fishery in 1976. The Netherlands introduced individual quotas in its sole and plaice fisheries in 1976, allowing them to become transferable a decade later. Iceland introduced individual quotas in its herring fishery in 1979.

The introduction of property rights can also produce beneficial results for fisheries managers and the resource. The idea is that someone holding an ownership interest in a resource, with his/her income dependent on the continued health of that resource, has a vested interest in its sustainability. In theory at least, this should encourage resource stewardship: sustainable fishing practices and a willingness to contribute to the management of the fishery. It should also provide a willingness to contribute to the costs of scientific research (e.g., stock assessment) needed to support management.

Property rights – what’s in the bundle

How well rights-based fisheries achieve these efficiency and sustainability outcomes depends largely on the quality of the property rights that form the basis of access to the resource. By “quality” is meant the nature and scope of the entitlement – the bundle of rights that encourage and enable the holder of the right to make value-maximizing decisions (including ones affecting the health of the resource in the long run). It should be noted that a licence or a quota may provide some of the characteristics of property (a right to go fishing) but does not confer ownership of the fish. The fish remain a public resource until caught.

The quality of property rights may be defined in terms of six main characteristics. (Scott 1989) The extent to which these characteristics are combined in a fishing right will determine how rights holders are able to use the right, and in turn, how effectively the efficiency and sustainability objectives can be met.

- **Exclusivity:** this refers to the extent to which the right protects the interests of rights-holders and excludes non-rights holders from access to the resource. Exclusivity helps to reduce the incentive to race for fish. More specifically, it captures the extent to which the right protects: individual output from the fishery (i.e., the quantity of the catch in the case of quota-limited fisheries); changes in inputs to the fishery affecting fishing effort (e.g., vessel, trap or net in the case of effort-controlled fisheries); and/or, the timing and area covered by the fishery. The greater the exclusivity, the more valuable the right, since the resource and the individual shares of the resource are protected from capture by other users (and from over-fishing quotas by rights holders). The less exclusive, the more likely others would pose a competitive threat, thereby perpetuating the race for fish. In the hierarchy of exclusivity, then, an Individual Quota (whether transferable or not) would offer greater exclusivity than a limited entry licence. Both rights are strengthened if enforcement is effective, and weakened if it is ineffective.
- **Transferability:** this refers to the ability of the holder to sell, lease, trade or otherwise dispose of the right. It forms a key characteristic in rights-based fisheries where achieving efficiency is a primary objective (e.g., efficiency in the sense of fleet reducing the number of vessels in overcapitalized fleets, thereby improving productivity). Through transfer opportunities, the right gains value as an asset and will ultimately end up in the hands of those who are able to use it more productively. Although rights are freely transferable in many regimes worldwide, there may be restrictions on who may hold the right and in what proportions it may be held. For example, in most regimes only those who hold fishing licences may hold and trade quota. And in order to limit structural changes in the fishing industry (harvesting and processing) and to prevent anti-competitive (monopolistic) behaviour, restrictions are often placed on the percentage of quota any individual may hold. Restrictions on transferability tend to reduce the value of the right since they limit the extent of the market.

- **Durability:** this refers to how long the right exists. It may be unspecified, in perpetuity, a fixed period of years, or renewable annually (there are examples of each approach internationally). Duration is important because it directly affects the security offered to the right-holder. Rights with longer duration provide more security for investments, whether in vessels and gear or in support of actions to promote resource sustainability (e.g., accepting a lower TAC or higher minimum size in order to promote stock recovery). Rights with shorter duration provide less security and promote short-term decision making, with the potential that efficiency and sustainability objectives may not be met.
- **Divisibility:** this refers to the ability to divide the right into smaller parts than it is ordinarily quantified. For example, a right may be allocated as a percentage share of a TAC, say 5%. Divisibility means that the right holder may sell or lease any part of the right (the quota or input control unit, e.g. a trap). For example, leasing fractions of an individual quota is common in multi-species fisheries (e.g. IVQ in BC groundfish trawl) in order to avoid overruns or to operate within by-catch limits. Of course, the nature of the right may limit or preclude its divisibility. In fisheries where an IQ is tied to the licence (e.g. Newfoundland crab fishery), the licence-holder may be permitted to divide the quota for in-season leasing, but a permanent sale of quota could only be accomplished with the sale of the licence because the licence and quota are not separable. The greater the scope for divisibility of the right, the more flexible its use and the greater the adaptability to changing circumstances in the fishery.
- **Security:** this refers to quality of title, or how well protected the right is from a legal perspective (it implies nothing about protection from natural variation). The more secure the title, the more valuable the right. This is because security affords protection and reduces risk, facilitating access to capital to support investment in productive assets.³ A right protected explicitly by law offers strong security. The ITQs held in the New Zealand fisheries are protected by law and provide this high level of security. No such statutory protection is offered in Canada. Under the *Fisheries Act*, licences are a privilege granted at the Minister's discretion and offer limited security. And further, Section 16 of the *Fishery (General) Regulations* (SOR/53-93) states that a licence is the property of the Crown and is not transferable. In practice, the Department re-issues licences as a matter of course and allows transfers to eligible parties, thereby providing some security and a basis for asset value.⁴ IQs/ITQs in Canada occupy a weak position in terms of security. Their status is a matter of policy and practice, not law. Moreover, their value can be (and has been in some cases) diluted by Ministerial discretion simply by expanding the number of licence-holders in a fishery and reducing the effective share of the TAC that the ITQ had represented.

³ Despite their doubtful legal status as property, some banks accept that licences have value as assets and rely on this to support loans to harvesters (though when they lend, they require general security agreements attaching homes and other property). But the demand for bank financing has been limited (at least in Atlantic Canada) because the banks have had a difficult time competing with lenders within the fishing industry who have been prepared to lend more and on more favourable terms because they have more to gain. To make lending more attractive to banks (and to reduce the incentive to seek loans from processing companies), DFO is amending licencing policy in the Atlantic fisheries to allow banks (and other recognized financial institutions) to take licences as security, effectively allowing them to control the disposition of the licence.

⁴ The status of the licence as an asset was strengthened in the 2008 Supreme Court decision in *Saulnier v. Royal Bank of Canada, 2008, SCC 58* where the Court held that a commercial fishing licence is property that can be sold to settle debts in bankruptcy proceedings. The ruling is confined to the definition of property in specific statutes (including the federal *Bankruptcy and Insolvency Act*). The Court found that the "...subject matter of the licence (i.e. the right to participate in a fishery that is exclusive to licence holders) coupled with the proprietary interest in the fish caught...bears a reasonable analogy to rights traditionally considered at common law to be proprietary in nature..."

- **Flexibility:** this refers to how effectively the right allows holders to freely structure their operations to achieve their goals. This includes the ability to adjust to changing circumstances, whether in the fishery, in markets or in personal matters. The greater the flexibility (largely a function of the combined effect of the other characteristics and any residual effects of input controls), the more valuable the right and the more likely it will contribute to efficiency and sustainability objectives.

Understanding the relative strength of these characteristics and quality of the resulting rights may be helped with the aid of a schematic representation. (OECD 2006) The six characteristics are arrayed at the points of a hexagon, with their relative strength given a numerical value from 0 to 5. The strength of the characteristics is continuous over the range, with a value of 5 indicating a high level of the characteristic and a 0 a low level. This approach allows the characteristics to be mapped and different instruments (i.e. limited entry licence, IQ, ITQ) to be compared in relation to different sets of objectives. A summary of various instruments and the factors determining the relative strength of property characteristics is set out in Annex 1.

This approach is illustrated in Figures 1 and 2, representing a comparison of Limited Entry (LE) and ITQ fisheries in Canada. The bundle of rights is stronger in the case of the ITQ fishery.

- The LE fishery (e.g. inshore lobster) provides harvesters with a limited right of access, but no specified share of the TAC (low exclusivity: 3); the licence is transferable, but only to eligible harvesters (moderate/high: 4), licence is not divisible (low: 1); annual renewal of licence (in practice, indeterminate duration: 4); no legal protection (in practice, security is high, though subject to Ministerial discretion: 4); flexibility limited by constraints on divisibility and various input controls (moderate flexibility: 3).
- The ITQ fishery (e.g. BC halibut) provides harvesters with an exclusive right of access and specified share of the TAC (high exclusivity: 5); the quota is fully and permanently transferable (high: 5), quota is fully divisible (high: 5); annual renewal of licence/quota (in practice, indeterminate duration: 4); no legal protection (in practice, security is high, though subject to Ministerial discretion: 4); high flexibility subject to some input controls (high: 4).

Fig. 1: Limited entry fishery

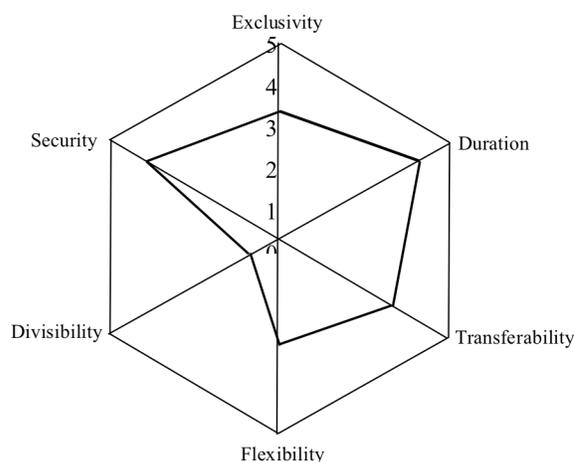
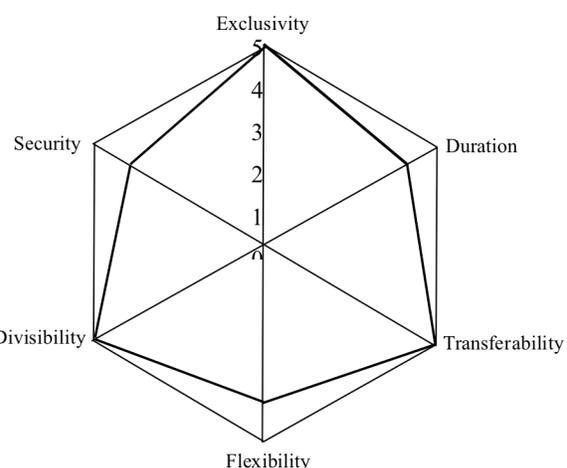


Fig. 2: ITQ fishery



Kinds of rights and who can hold them

The rights in rights-based fisheries take many forms, falling generally into one of three categories:

- **Input controls:** in this category, rights operate through units of fishing effort – the inputs to the fishery that determine the quantity of fish caught. Though not generally thought of as rights, input controls come within the scope to the extent that they embody one or more of the characteristics of “property”. The limited entry licence is the most common form of control, conferring on the holder a right of access to the fishery that is denied those not holding the appropriate licence. In this sense, the limited entry licence creates a degree of *exclusivity*, one of the more important characteristics of property. Other rights could extend to controls on vessel size and capacity, units of fishing gear including net size, pot or trap limits, number and size of hooks and allowable fishing days or days at sea, all of which could be transferable. The value of the right in each case – specifically, its capacity to further economic and sustainability objectives – would be strengthened to the extent that it exhibits the bundle of property characteristics outlined above.⁵
- **Output controls:** this category of rights operates through the division of the total allowable catch into individual or community quotas. These quotas (IQ or CQ) may take the form of boat or vessel quotas of fixed shares of the TAC (and often equal within vessel classes), and would be non-transferable if the objective were to minimize the rate of structural change. Key fisheries in Norway and Newfoundland and Labrador operate with IQs. Some fisheries in Canada operate with CQs, allowing the community to determine the allocation rules. Alternatively, the individual quotas may be transferable (ITQ), if the objective were to promote efficiency. Several nations have adopted ITQs with the express purpose of promoting efficiency and sustainability objectives. These include New Zealand, Australia, Iceland, Canada, the Netherlands and the United States. To a greater or lesser degree, the rights created in these ITQ regimes embody all the property characteristics outlined above.
- **Territorial use rights fisheries:** also known as TURFs, the rights are defined not in quantifiable shares, but in spatial units. These regimes are common in countries with strong community-based traditional fisheries (e.g, Japan, Philippines and some South Pacific Islands), and have been introduced more recently into the Chilean fisheries. (Cancino, J. et al. 2007) They work best in fisheries targeting sedentary species or relatively small and well-defined areas. The best examples of TURFs in Canada would be the sea urchin fisheries on the Atlantic Coast, where access is through an exclusive licence to a defined area. Through tradition, lobster fisheries in some areas approximate TURFs because specific licences tend to be fished in the same location year after year, even after they change hands.

⁵ It is not enough that rights nominally embody the characteristics; they must demonstrably show the effectiveness of the characteristics. The main reasons that input controls typically fail to meet economic and sustainability objectives is because: a) they do nothing to address the incentive for share maximization with all its negative consequences; and b) they are difficult to enforce. At best, limited entry creates asset value (if exclusive *and* transferable), but only if other controls are effective in limiting wasteful investment and conserving the resource. The lobster fisheries in Atlantic Canada offer one example of effective limited entry/input controls, but one that is conspicuous by the absence of others.

Rights may be held by individuals, associations or communities:

- ❑ **Individual** (whether a person or corporation) ownership of rights tends to be the more common form because most fisheries evolved through participation by individuals or corporate entities, and also because this approach is consistent with well established legal principles. In Canada, different rules apply in the Atlantic and Pacific fisheries. In the Atlantic inshore fisheries, only individuals and not companies may hold licences (and associated quotas); companies may hold licences and quotas in the offshore fisheries; in the Pacific fisheries rights may be held by both.
- ❑ **Associations** include Producer Organizations (POs) in the U.K. and other EU members (quota shares are given to fishermen-run groups to manage allocations among members, generally using ITQs); vessel-owner cooperatives in the U.S. are allocated pollock and hake quotas to manage internally among members (these allocations are made under Limited Access Privilege Programs, or LAPPs); (Environmental Defense Fund 2008) and, Community Management Boards in Shelburne County, Nova Scotia, internally manage groundfish allocations using member-determined methods (mostly IQs).
- ❑ **Community** allocations are less common because towns and villages are generally not set up to fish or manage an allocation. Where such allocations have been made, they tend to be framed as economic development initiatives. Examples include: Community Development Quotas in Alaska (more on this in Section 4); Northern Shrimp licences held by Innu and Inuit organizations in northern Québec and Labrador are fished by southern operating companies in return for royalty payments and employment opportunities on vessels; and, community-based licences held in various inshore fisheries by First Nations in Atlantic Canada.

What is clear from the foregoing is that there are many types of property rights held in various ways. Annex 2 provides a summary with international examples.

4. Rights-based fisheries management in practice

General observations

Evidence is mounting that fisheries managed using property rights are contributing to a reversal of decades of negative ecological and economic impacts associated with traditional input control management measures. (Arnason 2002; Libecap 2009; Redstone 2007; Yandle 2008) These reports indicate that well-designed and carefully implemented rights-based systems are playing a role in the quest for sustainability and economic efficiency. Among some of the general observations about the shift from input control to rights-based systems:

- ❑ **Economic:** major gains in vessel productivity and economic efficiency result as the number vessels and the costs of fishing decline, fishing seasons are longer and crew incomes increase.
- ❑ **Resource:** compliance with TACs increases, discards decrease (some variability in this result), and fishing practices improve resulting in more effective fisheries management.
- ❑ **Social:** greater safety as the race for fish and its attendant risks diminished, and a higher percentage of crews are employed full time.

Not all the results are unambiguously positive. Depending on the perspective taken, some outcomes would be considered clearly negative: (Ecotrust 2009)

- **Economic:** on the one hand, a rise in quota and licence values would be expected to develop as private rights lead to a more productive and efficient fishery. This is evidence of a well-managed fishery. This is good for holders of those rights and corresponds to what occurs in other markets based on high quality rights. The corollary, though, is that those wishing to enter the fishery face higher costs than those exiting because their costs now include the cost of quota or licences that those exiting (at least those first generation rights-holders) obtained for free. These costs drive up the overall cost of fishing and can result in increased pressure on the resource (see below).

The gain in quota and licence value represents a windfall for the holders of those rights in the first instance because in most cases they would have obtained them at no cost simply based on their history in the fishery. How harvesters gain access to rights in the first instance represents a thorny policy issue; in most cases, in order to gain support for a rights-based approach, rights are allocated based on catch history. Other mechanisms could be used to assign rights including auctions or lotteries. Also, if windfalls are problematic politically, they can be overcome through the use of taxes, or even by placing a term limit on the right in the first instance so that it has no residual value (when the term is up the quota reverts to the Crown and is reassigned).

- **Resource:** providing harvesters with property rights would give them an ownership interest in the fishery and, in principle, make them better stewards of the resource since they would invest in its sustainability (e.g., through co-management, responsible fishing). Few empirical studies have tested this hypothesis, though a recent one based on IQ/ITQ regimes in Canada and the U.S. points to encouraging results including lower incidence of discarding and reduced interannual variability in exploitation rate, landings, and ratio of catch to catch quotas. (Essington 2010) While these results are encouraging, there is also evidence that the introduction of ITQs has caused high-grading, or increased the incidence of high-grading (where this may already have been a problem). (Arnason 2002; OECD 2002) The incentive to high-grade arises from the natural desire of the ITQ holder to maximize the value of his/her right by taking only the largest and highest valued fish, while discarding the others. Policing an ITQ fishery can result in increased costs for observer coverage, dockside monitoring and quota reporting systems.

If the property right allows unrestricted transferability, then the right effectively is separated from the licence. This means an investor outside the fishery could (and in some cases in Canada, does) end up holding the right. Whatever other issues this creates for some observers, it would serve to blunt the stewardship argument sometimes used to justify the introduction of property rights because the right holder is no longer the person in the boat making the operational decisions affecting the resource. These decisions are more likely to be based on what's needed to maximize revenues, particularly since the vessel operator now needs to cover the cost of leasing quota in addition to other operating costs. The implications carry beyond the resource, since quota leasing also means less revenue for skipper and crew, thereby undermining the income argument raised as one of the positive impacts of property rights.⁶

⁶ Quota leasing arises even if rights have to be held by a licence-holder. Essentially, the lease value (if competitively determined) approximates the economic rent generated by the fishery. One of the arguments leveled against property rights that allow stay at home leasing arrangements to emerge is that it gives rise to the development of a rentier class of quota holders. In Newfoundland and Labrador, these quota holders are known as "slipper skippers".

- ▣ **Social:** the introduction of property rights (e.g., ITQs) ordinarily is intended to lead to fleet rationalization, and inevitably results in a decrease in crew positions (reduced employment) where fisheries are oversubscribed. This affects community stability. Communities may also be affected by a redistribution of landings away from some ports, with a concentration in others. This would lead to a further decline in employment and income associated with processing plant jobs. In many cases, some of these distributive effects are likely to have occurred eventually, since the fishery could not sustain at acceptable income levels all those seeking to make a living from it. The transferable right accelerates the adjustment process.

Viewed from a social perspective, full transferability of the right also carries potential implications for the status and earnings of vessel crews. The right may be held by a licence-holder who decides to retire, or, an investor may hold the right in cases where eligibility to own quota is not restricted to licence-holders. In either case, the quota is leased to an active licence-holder, effectively creating a class of “sharecroppers” who must pay for the right to fish. To be clear, leasing does serve a useful function in facilitating fishing operations in by-catch fisheries, or to avoid quota overruns. But holding quota simply to lease it may to some seem at odds with current Atlantic inshore fisheries policy and its emphasis on the owner-operator.⁷

Case studies of rights-based fisheries

The bundle of characteristics shaping the quality of the right plays a key role in determining the outcome and impact of using property rights as access and allocation tools in managing competitive fisheries. In theory, the higher the quality of the right – i.e., the more exclusive, permanent, transferable, divisible and secure the right – the more likely that economic efficiency and sustainability objectives would be achieved. But economic efficiency may not be the only or even the most important objective. Socio-cultural objectives may be paramount, suggesting that a community-based approach may be required. This being said, there has to be a reconciliation of the objectives. If the policy is to pursue socio-cultural objectives, the trade-off on the economic efficiency must be acknowledged and accepted, including the possible continuity of support mechanisms.

So, design matters. A crucial first step is to specify the objectives; to state what economic, socio-cultural and sustainability outcomes are intended. Then it is a matter of going to the toolbox and selecting from a range of measures – not just property rights but input controls as well – the mix that is most likely to move the fishery toward those objectives. (EDF 2009)

It should be clear that in designing the rights, fishery managers and licence-holders have great latitude in shaping the structure and operations of fishery. (PEW 2009) This is because each of the property characteristics is susceptible to considerable variation. The right may be issued to communities, rather than individuals, in the first instance. The right may be permanent, unspecified or of a defined duration (say, 15 years, after which it is returned to the Crown). Transferability may be unrestricted (available to anyone, inside or outside the fishery) or restricted to licence-holders. Divisibility may be complete (allowing fractional quota holdings in by-catch fisheries) or constrained (quota is tied to the licence and may be transferred only in whole with the licence).

⁷ While some may argue that the situation is no different from a retired farmer who leases his land for others to farm. The difference, of course, is that the retired farmer owns the resource itself – the land – and may do with it as he pleases (including letting it go to waste). The property right in the fishery does not confer ownership of the resource – the fish – but merely a right to harvest a specific quantity. The fish continues as a common property or public resource to which access is limited. To some observers, allowing the quota-holder to lease the quota and live off the proceeds seems to invest the quota with a right *to* the fish, rather than simply a right to fish (a specified quantity).

Design also matters because each fishery is different. A rights-based approach may work well in some fisheries and not so well in others. They are generally appropriate for fisheries with TACs that can be divided into individual quotas. This includes most fisheries in Canada, but so far leaves out important ones such as lobster on the Atlantic coast⁸ (FRCC 2007) and salmon in British Columbia for which TACs have not been established. A rights-based approach may also have limited value in extending seasons in fisheries where biological or climate factors are constraints. Also, because rights-based approaches require a higher standard of monitoring and reporting, the introduction of property rights makes sense only in those fisheries where such standards are or can be met.

The question of design is examined in this section by summarizing the experience of 12 international and Canadian fisheries where property rights of some form have been implemented. The rationale for introducing property rights (issues and objectives) and the specific approach used in each case are summarized in Tables 1 and 2. The discussion below explores the characteristics of the rights and how they were designed to achieve the objectives, with commentary on results and impacts (intended and unintended).

International fisheries

The common themes amongst the international fisheries during the 1970s and 1980s were competitive fishing, featuring unworkable input controls that failed to prevent over-capitalization, a race for fish, short seasons, low incomes and over-exploitation of resources. Similarly, each nation sought to reverse these characteristics by using rights-based approaches, and more specifically, through the use of individual quotas whose quantum (percentage share) was generally based on catch history over some specified period. The exception among the cases reviewed is the Community Development Quota (CDQ) program implemented among coastal communities in Western Alaska.

- **Iceland** implemented non-tradable individual quotas (IQ) in its herring fisheries in 1975, moving gradually to introduce transferability (ITQ) and then extending ITQs to all its fisheries by 1986. The system is established in the *Fisheries Management Act* of 1990, though the Act also states that ITQs are not irrevocable property rights. ITQs confer a harvest right, *not* a property right in the quota held by the vessel owner. This was made explicit in amendment to the legislation in 1997, making it clear that the ITQ could not serve as collateral for loans (though the banks circumvent this by making a loan conditional on approving any ITQ transfer). The rights are exclusive, permanent, divisible and freely transferable (sold and leased), with the important restriction that only vessel owners (those with fishing licences) may hold them. ITQs are less than fully secure, given the provision in the *Act* that they are not irrevocable.

⁸ Satisfactory methods of estimating biomass have so far prevented setting TACs in the inshore lobster fisheries, though conservative TACs could be set based on exploitation and expected changes in stock size. A second potential constraint concerns the level of fleet rationalization that could be achieved given the current vessels and technology in use. In most areas, the lobster fishery is conducted from small boats (30-45') using a simple stern-mounted winch to haul the traps. Trap limits range from 250 to 375 and all are hauled each day. Efficiencies are gained by attaching multiple traps to a string (say 5-7) to limit the number of hauls and vessel movements. Even at that, it ordinarily takes 6-7 hours at a minimum to complete the day's work in good weather. Property rights could facilitate the process of fleet rationalization, but the constraints imposed by current harvesting technology (coupled with the seasonal limits imposed by weather, biology and markets) could put a ceiling on the potential gains.

Notwithstanding some qualifications in the strength of the property right, ITQs in Iceland appear to have achieved their objectives. (Runolfsson 2001) Fleet rationalization has occurred, incomes have improved and fishing seasons have been extended (loss of jobs has been offset by longer work periods for those remaining). The initial quota holders made windfall gains, though in an effort to limit the gains, Iceland introduced a special tax on quotas to extract some of the rents. Limiting access to ITQs to vessel owners has limited speculative investment outside the industry, and limited the size of the windfall gains. With respect to resource stewardship, there are concerns about discarding, which some believe has increased with the introduction of ITQs. On the other hand, TACs are adhered to with greater acceptance of management decisions because the industry is more financially resilient.

- **Norway** introduced individual vessel quotas (IVQ) in the 1970s based on the capacity of vessels (not catch history). The country did not embrace ITQs because economic efficiency has not been high on the list of social objectives. Instead, the objectives through the 1970s and 1980s had been community stability by maintaining employment in the fishing industry, and ensuring that fishing industry workers received incomes on a par with the average industrial wage. These objectives were met though massive price subsidies (70% of value added in the industry at peak). Subsidies began to be phased out in the mid-1980s, exposing the economic weakness of the industry that had been characterized by overcapacity, low profitability (before subsidies) and overexploitation.

A measure of transferability was introduced in the 1980s, as overall quotas began to decline and fleet capacity had to be reduced. Vessel quota could be bought (with the vessel to which it was tied) and assigned to the buyer's vessel thereby improving efficiency somewhat. This trade was further liberalized, though limits were imposed on the duration of the right, its divisibility (the whole IVQ and vessel to which it was attached had to be bought), and the vessel class within which trades could take place. Notwithstanding the limitations, rights were sufficiently well defined to cause longer fishing seasons and improvements in fleet efficiency due to reductions in fleet size. (Hannesson 2007)

- **Australia** introduced ITQs into the southern bluefin tuna fishery in 1984 in response to declining stocks and overcapacity and worsening economic performance of the purse seine fleet. ITQs were denominated as percentage shares of the TAC and based on the catch history of each vessel meeting specified criteria. ITQs are exclusive, permanent, fully transferable (permanent sale or lease with approval of the management authority), divisible and relatively secure. They are generally regarded as property by the Australian courts. (McIlgorm 2000) Nonetheless, though the ITQ embodies several of the characteristics of property and is of fairly high quality, the strength of the right is weakened by provisions of the *Fisheries Act* giving managers certain discretionary powers over fisheries and by the absence of provisions for the payment of compensation for the loss of the entitlement embedded in the ITQ.

The objectives of reducing vessel numbers and promoting stock recovery followed the introduction of ITQs, though it is unclear whether these results can be attributed to the introduction of property rights or the sharp cut in TACs that accompanied it. Nonetheless, the economic performance of the fleet did improve and the fleet was able to adjust more readily to further TAC cuts in subsequent years through the transferability mechanism. A key factor in the improved economic performance was the ability of vessels to target larger and more valuable fish, presumably attributable to the absence of any race to catch the TAC. (Meany 2001) Other impacts include consolidation of ITQ holdings, reduced employment (though offset by longer seasons), and the windfall gains by initial quota holders.

- **New Zealand** introduced ITQs into its fisheries in 1986 to combat the classic problems of excessive effort, overcapitalization, poor profitability and over-exploitation. As a matter of policy, the objectives of the Quota Management System (QMS) are not only conservation, but also maximum economic return from the fishery. The mechanics of QMS are set out in the *Fisheries Act 1996*. Under QMS, the ITQ is a percentage share of the Total Allowable Commercial Catch (TACC), with initial entitlements based on individual catch history over a specified period. The quality of the right is relatively high because the ITQs are completely exclusive, permanent, fully transferable (any New Zealand national may hold them), fully divisible (sale and lease) and secure (protected by law). There is a limit on quota ownership that varies from fishery to fishery (from a low of 10% to a high of 45%, with a standard limit of 35%). (Lock and Leslie 2007)

The Government of New Zealand regards the QMS as successful, contributing to a range of positive outcomes including greatly improved economic efficiency (as reflected in fleet rationalization – 40% fewer vessels – and high quota values), profitable fisheries, effective co-management of fisheries including cost-sharing by the fishing industry (science and quota management), and sustainable fish stocks. (Crothers 2009) One implication of the high quality of the rights has been a rapid consolidation of ownership, including quota holdings outside the fishing industry (these results are seen as positive outcomes). Government sees the system evolving to the point where industry manages the fisheries (so far, it is managing the catch documentation system) and is accountable for sustainability results (though what accountable means has not yet been defined). Government has also moved away from simply giving rights to prospective users to a system of auctions or competitive tenders for the initial allocations.

- **United Kingdom** is member of the European Union (EU) and operates within the Common Fisheries Policy (CFP) that encourages its members to improve economic circumstances for fishermen through Producer Organizations (PO) aimed at promoting rational fishing and sound market conditions. Under the CFP, each of 19 regionally based POs in the UK receives part of the national quota, with each PO's total determined by the vessel-specific Fixed Quota Allocations (FQAs) held by its members (the FQA is based on catch history). Though initially there was resistance amongst fishermen to the idea of buying and selling FQAs, trading is now widely practiced (both permanent selling and short-term leasing). POs have played an important role in industry-funded fleet rationalization by buying up quota. One of these, the Shetland Fish Producers Organization (SFPO), has bought aggressively and holds 35% of its total PO quota on a communal basis (i.e. owned by the SFPO on behalf of its members, rather than by members individually). Part of the quota is allocated to help new entrants get a start in the fishery (the high cost of quota represents a barrier to access) and part leased to existing members of the SFPO. All pay a lease or rental fee to the PO for the quota. (Goodlad 2001)

The market for FQA has emerged in the absence of legal title (or even policy sanction) in the “rights”. In other words, even though the bundle of property characteristics is very weak, there is enough confidence in the management system to provide a basis for the development of trade. The key seems to be the belief that government would not abandon individual vessel quotas as the method of managing fisheries. While this represents a slim basis for security, a market has evolved, resulting in positive outcomes in terms of fleet rationalization and improved profitability. Quota values have increased sharply making it difficult for new entrants, but at least one PO is using the system to address this and contributing to the stability of its fishing communities.

- **United States** has made limited use of rights-based management. This is changing with a re-direction of policy towards the wide spread implementation of “catch shares” in its commercial fisheries.⁹ Despite the reluctance to adopt rights-based approaches using individual quotas, the U.S. implemented a Community Development Quota (CDQ) scheme in Alaska in 1992. The aim here was to alleviate poverty by giving native communities fixed percentage shares of quotas in various fisheries in the Bering Sea and Aleutian Islands (BSAI). The quotas are managed by six corporations, each comprised of several of the 65 communities to which the quotas are allocated. The CDQs are not actually fished by the communities (capital and other constraints limit fishing to subsistence level in coastal waters), but leased to commercial fishing companies on a royalty basis or in exchange for equity interest in the companies. The income earned through these arrangements is invested in local development initiatives, many of which are focused on the fishing industry.

The rights are exclusive, permanent and protected by law, but with tight restrictions on transferability. They may be leased but not sold. The benefits derived from direct and indirect participation in the fishing industry have been substantial. (Northern Economics 2002; WACDA 2008) Aggregate annual revenues have grown steadily, rising from about \$20 million in 1992 to \$190 million in 2008. These revenues are generated from investments (65%) and royalties (35%). In 2008, the CDQ groups held assets with a net value over \$425 million. Through direct investments and through partnerships with fishing companies, some 2,000 jobs have been created for community members. The investments have been mainly in the fishing industry including fish processing plants, fishing vessels and fishing-related infrastructure.

Canadian fisheries

Similar to the international experience, the common characteristics of Canadian fisheries during the 1970s and 1980s were competitive fishing, featuring ineffective input controls that failed to prevent over-capitalization, a race for fish, short seasons, poor quality landings, low incomes and over-exploitation of resources. The initial attempts to address these issues in the 1980s met with some success in the offshore fisheries (groundfish and scallop) through the use of Enterprise Allocations (essentially, company ITQs). Relatively few participants and low transactions costs helped in system design and acceptance. (Gardner 1988)

Designing and implementing property rights in the so-called inshore fisheries proved more of a challenge since ITQs departed from the traditional competitive approach to fishing and were viewed with considerable suspicion. Nonetheless, licence-holders recognized something had to be done to improve economic conditions in the fisheries. Generally, fishery managers worked with stakeholders to accept individual vessel quotas, and once the merits of this mechanism had become evident, the shift to transferability followed in most cases.

⁹ The United States, through the National Oceanic and Atmospheric Administration, introduced a draft policy in 2009 aimed at encouraging the use of “catch shares” as a mechanism for rebuilding fisheries and communities. The Policy is available at http://www.nmfs.noaa.gov/sfa/domes_fish/catchshare/index.htm

- **British Columbia sablefish/halibut IVQ:** licence-holders in both fisheries approached DFO in 1989 for assistance to develop IVQ programs to combat the classic problems of excessive effort, overcapitalization, poor profitability, short seasons, poor safety record and over-exploitation. Initial IVQs were based on catch history and vessel capacity. Following a trial period and a review of the programs, the IVQs were made transferable in 1993/94, with upper and lower holding limits. The quality of the right is fairly high because the IVQs are exclusive, permanent (in reality, unspecified duration), fully transferable, and fully divisible (sale and lease).

Strengthening the rights by making them transferable and divisible produced the results expected: fleet rationalization, improved economics, and a longer season resulting in higher prices as the industry is able to provide year-round supply. Quota values have increased to levels making access difficult for new entrants. Contributing to the higher quota values is the fact that quota is fully transferable, making access available to interests outside the fishing industry. But this also means that quota leasing becomes more prevalent, rewarding investors, but adding to fishing costs. Rationalization has resulted in an estimated 50% reduction in numbers employed on vessels, though with longer seasons, the overall level of employment (person-years) has remained roughly constant. (Turriss 2009; Turriss 2010)

- **British Columbia groundfish trawl IVQ:** mixed species fisheries present challenging conditions for trawl vessels because it is difficult if not impossible to target specific species, which is often required because of differing quota limits. Failure to do so can lead to dumping of fish that exceeds trip limits or is not permitted in the catch. Under the best of circumstances, vessels find it difficult to operate efficiently. The BC groundfish trawl fishery ranks as particularly complex because it involves some 50 species, with as many as 15 caught in a single tow.

The introduction of fully transferable IVQs in 1997 contributed to a solution to the challenges. IVQs were set according to catch history and vessel capacity, with limits on holdings at the species level and on total holdings by a licensee in order to control consolidation. Transferability not only addressed the general problem of overcapacity by providing a buy-out mechanism resulting in fewer vessels, but it also addressed the in-season constraints imposed by area- and species-specific quota limits by allowing acquisition of additional quota to cover overages. Permanent and in-season transfers are permitted among trawl licence-holders, and between the trawl and sablefish longline sectors. Though the IVQ regime continues to evolve, observers report success on several fronts: reduction in discards, improved vessel economics, and longer season with positive effects on fish quality and on the processing sector. (OECD 2002; Turriss 2009; Turriss 2010) A reduced employment level (about 50%) is offset by greater job stability over the year and higher average incomes. Concerns have been expressed about the extent of IVQ ownership outside the fishing industry and quota leasing to vessel operators (Ecotrust 2004), though the extent and implications of leasing are disputed. (Turriss 2010) Leasing has the potential to put distance between the interest holder and the resource, weakening the argument that property rights contribute to improved stewardship.

- **Lake Winnipeg ITQ management:** non-transferable IQs were introduced in 1972 to address overcapacity and low profitability. This helped quotas holders plan their seasons, but did not result in fleet rationalization. And with other restrictions on licence transfers, it was difficult for young people to enter the fishery. Transferability was introduced in 1986, creating what were known as quota entitlements (based on equal shares of the TAC). These separated quota from the licence, allowing licences and quotas to be bought and sold (with a limit on the number of quota shares that may be held). Communities as well as individuals may hold the ITQ.

Transferability not only created a mechanism for fleet rationalization and entry to the fishery, it also provided licence-holders with an asset that generated retirement income. In 1993 the ITQ was entrenched in provincial legislation, creating an exclusive and secure right. That the quality of the right is not as high as it could be is a matter of policy. The lack of divisibility is a minor issue. Of greater significance is the upper limit on quota holding (a policy introduced at the request of licence holders). This limits fleet rationalization and prevents economic performance from reaching high levels. Participants circumvented the policy by buying licences and placing them in the names of family members and then fishing the quota from a single vessel to reduce costs and improve performance. (Gislason 2002) There is nothing illegal about this, but it serves to underscore how markets work to achieve efficiency gains when the bundle of rights is of sufficiently high quality.

- **Maritimes – Area 19 snow crab ITQ:** the fleet adopted IQ in 1979, making them one of the first in Canada to embrace property rights in the fisheries. IQs were based on equal shares of the area TAC. The fishery expanded during the 1990s, resulting in increases in the number of licences. Also, as prices and incomes increased, temporary entrants were permitted on the basis of a sharing formula. The new entrants eventually became permanent. The process tended to be ad hoc, resulting in unstable access and allocation. This undermined the exclusivity and security characteristics of the harvesting rights, and with restrictions on divisibility, limited the flexibility to adjust to changing conditions.

With a view to allowing greater certainty and flexibility in the fishery, the fleet adopted a system of transferable trap limits, implemented in the 2005 management plan. (DFO 2005) Each trap entitles the holder to an equal share in the TAC. The traps are transferable with a lower limit of three and a maximum of 26. This quality of the property right seems adequate given the fleet objectives (there is limited experience on which to base firm conclusions). Regulation limits quota-holding to eligible licence-holders, the low trap threshold provides affordable access for entrants, and the upper limit on trap holding avoids concentration.

As with other property rights regimes in the Atlantic fisheries, there is limited security given Ministerial discretion to modify allocations and the terms of access. With the increase in crab biomass throughout eastern Canada in the 1990s and the collapse of groundfish stocks (perhaps linked), landings and values greatly increased, prompting DFO to respond to demands to increase the number of licences. TACs and landings increased five-fold, rising from 20,000 t in 1990 to just over 100,000 t in 2002 (with some fluctuations, landed value increased from about \$50 to \$600 million over this period). The total number of licence-holders (all areas) increased from 1,300 to just over 4,000 between 1995 and 2000, with most of the increase occurring in Newfoundland and Labrador. (Gardner Pinfold 2006)

- **Maritimes – groundfish <65’ mobile ITQ:** with extension of jurisdiction in 1977, increased access to the resource and ineffective input controls, the mobile gear fleet expanded its capacity greatly during the 1980s. By 1986, the fleet was estimated to have had four times the capacity needed to harvest the available quota. Seasons were short and quality of fish poor due to competitive conditions. Measures to control the fishery (trip limits, seasonal limits) served to drive up costs. Individual quotas (based on catch history) were introduced in 1989 in an effort to address the race for fish. This produced positive results, but could not address the overcapacity problem. The fleet agreed to introduce transferability in the 1991 season. Initially, only in-season transfers were permitted. In 1993, permanent transfers were allowed. (Liew 2002)

Considerable fleet rationalization followed full transferability in 1993, but little, if any, of this could be attributed exclusively to ITQs (though transferability greatly facilitated the process). The factors driving change included the collapse of most groundfish stocks, a licence buy-back program in the mid-1990s, and the introduction of ITQs in the inshore scallop fishery (in which many mobile gear licence-holders also participated) that induced many groundfish ITQ holders to sell and specialize in scallops. Though there were limits on the share of the quota any licence-holder could hold (2% of the overall quota, but no limit on individual stocks), licence-holders circumvented this limitation by selling (transferring) their licences with the quota attached (often to processing companies).¹⁰ The buyer would idle the vessel and fish quota accumulated in this manner from a single vessel. Thus, though the path to rationalization and improved operating conditions may not have been what was anticipated, this sector is in much better shape to respond to stock recovery (with considerable control over quota and vessels, the sector can increase or withdraw capacity as required in response to resource and market conditions). The high concentration of quota holding has occurred despite the lack of formal security of the rights.

- **Maritimes – sea urchin TURF:** a dive fishery developed along the Nova Scotia coast during the early 1990s as a competitive fishery. It was effectively open access until 1999, when limited entry was introduced. Each licence was limited to using one boat, with a maximum of four divers. To limit concentration of effort, licence holders could fish one of three, and then one of ten, specific areas. In 1995, after considerable industry consultation, a new management plan was approved creating restricted zones (even as this process unfolded, it was possible to gain entry to the fishery; so it was a matter of creating enough zones for the then current licence-holders, as well as continuing the process as participation increased until entry was closed in 1999). The conditions of licence for each zone created exclusive access for each licence holder and required that licence-holder to take steps to enhance resource productivity. Though there was considerable opposition to the zone concept, by 1997, 26 zones had been negotiated with harvesters. With exclusive access, these zones conformed to what are commonly referred to in the literature as Territorial Use Right Fisheries (TURFs).

¹⁰ Vertical integration is prohibited under the Atlantic Fisheries Commercial Licencing Policy (licences may not be issued to processing companies). The industry circumvented this (and other limitations) through the use of trust agreements, whereby the licence was held in the name of an eligible licence-holder, while the beneficial interest (the use of it) was transferred to the buyer of the licence. ITQ could be accumulated because DFO would only see the name on the licence, but would not know in whose hands the beneficial interest rested. DFO took steps to eliminate the use of trust agreements in 2007 with changes to the Licencing Policy. The <65’ mobile gear fleet (and some other fleets) was exempted from the new licencing provisions because it had used the trust agreement as a mechanism for substantial fleet rationalization and had become “effectively vertically integrated”. Undoing the structure would have imposed considerable hardship on the companies involved and also would have been seen as a retrograde step from the perspective of sound fisheries management, given the fleet rationalization that had occurred. (Gardner Pinfold 2007)

An assessment of results a decade after the introduction of TURFs indicated mixed results. Zone-holders were for the most part pleased to eliminate wasteful competition. But few engaged in stock enhancement activities in their zones as required by licence. This may have been due to costs and market conditions. The agreed sanction (stipulated as a licence condition) for failing to enhance and failing to meet minimum harvest requirements was not imposed, thereby limiting the turnover of licences. Resource managers believe that with time and effective management the TURF approach should provide a strong incentive to harvest sustainably and conduct stock enhancement (in much the same way that oyster growers tend their “crop”). But disease wiped out urchin stocks in 1999-2001, limiting the effectiveness of the experiment. (Miller 2008)

5. Concluding observations

Property rights are economic instruments, introduced into fisheries primarily to achieve economic efficiency objectives. If well designed, they can achieve these objectives, but not without strong support from science in establishing TACs and complementary constraints (gear selectivity, area closures, minimum landing sizes); and not without observer coverage to monitor fishing practices (to address discarding) and enforcement of quota limits. Though in principle strong property rights regimes would be expected to enhance sustainability because rights-holders would have an incentive to invest in the resource, the emergence of sustainable fishing practices cannot simply be assumed. Effective co-management, stability in the management regime and increased partnership are also required. Stewardship improvements require improvements in the trust between industry and regulators and measures that effectively reward conservation.

In reviewing the various fisheries, the question arises about how high the quality of the right has to be in order to achieve key objectives. Among the fisheries reviewed, these objectives tend to be framed in relative rather than absolute terms. In most cases, the general objectives were to shift from hopeless economic inefficiency to one of profitability, and to help move the fisheries from a position of biological unsustainability to one that is sustainable.

The introduction of some form and some degree of property rights is shown to accomplish general economic objectives. Fisheries managed with high quality market-based mechanisms achieve efficiency gains through fleet rationalization, and also exhibit greater operating flexibility through transferability and divisibility of individual quotas. The mechanism is self-interest, but with the incentive directed towards economic efficiency rather than share maximization. This is a crucial difference because it changes the kinds of decisions participants make, eliminating the destructive competition and replacing it with a focus on maximizing net income derived from the individual rights.

In designing a rights-based system, careful consideration must be given to which characteristics go into the bundle and how they are defined. Economic efficiency may be an objective, but achieving it carries implications for other values including employment, community stability and socio-cultural traditions. Because these and other values are important, consideration must be given to such things as the nature of the right (catch-based, effort-based or area-specific); and if catch-based through individual quotas, the nature and scope of transferability and divisibility to determine who may hold the right and the extent of fleet adjustment. If fleet rationalization is an objective, then it follows that structural adjustment will result in some adjustment of employment – fewer enterprises, but longer duration and higher incomes. In assessing the possible socio-economic impacts, comparisons should be between the expected results of the regimes, versus the expected results of maintaining the status quo.

Though most rights-based regimes operate through the allocation of rights to individuals, it does not follow that this is the only or the most effective option. There are many examples of community management (whether communities of interest or place), where government leaves it up to the members of the community to determine the rules governing access and allocation to their share of the “commons”. In her seminal work, Ostrom (1990) rejects the notion that common property governance necessarily implies a “tragedy”, and provides evidence of common pool management where users develop rules and enforcement mechanisms enabling them to sustain tolerable outcomes. Concrete examples of community-based approaches in Canada include fisheries in Nunavut (where a communal approach is the cultural norm and forms a requirement under the Nunavut Land Claims Agreement); the Community Management Boards in Shelburne County, Nova Scotia (who internally manage groundfish allocations using member-determined methods, mostly IQs); and, First Nations in Atlantic Canada who hold community-based licences in various inshore fisheries.

The surprising thing is that in achieving the efficiency objectives, the market in rights seems to tolerate an incomplete or imperfect set of property characteristics. All the fisheries reviewed have achieved some measure of fleet rationalization, improved operating conditions and greater profitability as long as three characteristics are present: exclusivity, transferability and divisibility. The specific areas where the quality of the rights tends to be weak are duration (they are not permanent and may be unspecified) and security (in some international cases, they are not protected by law; but no such protections exist in Canada’s marine fisheries).

The question of security is of particular interest in Canada, where fishing “rights” are created through policy and practice, as current statute precludes a legal right, and regulation limits the permission to a term of one year. The licence conveys nothing more than a permission to fish according to its terms and conditions, without a legal expectation of renewal or transfer. The approach to fisheries management (terms of access and allocation mechanisms) is ordinarily spelled out in fisheries management plans, with relevant provisions (including individual quota shares) specified in licence conditions. It is the “social contract” between harvesters and DFO – the investment in the management process and the weight of expectation – that lend security to the result. But notwithstanding this, the Minister retains the discretion to change the arrangements.

Lack of security and unspecified duration of the right are areas of weakness that may mean that the rights do not attain their highest value. In other words, it may mean that the market value may not be as high as it might have been had the risks associated with lack of permanence and insecurity not been as high. From an economic perspective this means there may be prospective holders of the right who might have been able to put it to a more productive use had the right enjoyed a long or even indefinite duration and offered greater security. The lack of security also may have an impact on the levels of investment available to the sector, as potential investors have little incentive to invest in the resource and the down-stream infrastructure to increase the value of the product, as access to the resource is variable.

But this begs the question whether it is quota value in its own right that is the most important objective, or even an objective at all. Ideally, rights would have permanence and enjoy greater security than they do in many fisheries (internationally and in Canada). New Zealand may be held up as the standard in this respect. There, maximizing economic returns from the fishery is an explicit policy objective. This has attracted investment from outside the industry, high concentration of ownership and extensive quota leasing. The New Zealand regime is all about economic efficiency and does not concern itself with distributional issues (economic returns for whom). Distributional issues (who benefits) are important in Iceland and Norway, and accordingly, restrictions are imposed on who may hold quota and how it may be traded.

Harvesters and representatives of fishing communities in Canada often cite concentration of quota ownership as one of the undesirable consequences of market-based management systems. Most regimes impose explicit limits on quota ownership to address these concerns, but also to impose a limit on fleet rationalization and the extent of potential efficiency gains (or conversely, on the extent of employment losses and adverse community impacts). In some of the fisheries, the limit is set at 1-2% of total quota. How well the regimes have adhered to these limits is difficult to say. In part this is due to the opacity of quota holding and the ways in which ownership can be obscured. In part it is also due to the lack of published data on the subject. And in part it is due to the limited number of studies examining how well rights-based fisheries meet their objectives, and more generally what positive and negative impacts (economic, social) they generate.

Table 1: Overview of selected rights-based international fisheries						
	Iceland	Norway	Australia	New Zealand	United States	United Kingdom
	ITQ – All fisheries	IVQ - Groundfish	ITQ – S. bluefin tuna	ITQ – All fisheries	Alaska CDQ	Producer Org.
Issues	<ul style="list-style-type: none"> ▪ Race for fish ▪ Overcapitalization ▪ Low profitability ▪ Over-exploitation 	<ul style="list-style-type: none"> ▪ Overcapitalization ▪ Low profitability ▪ Over-exploitation ▪ High subsidies 	<ul style="list-style-type: none"> ▪ Overcapitalization ▪ Low profitability ▪ Over-exploitation ▪ Depleted stocks 	<ul style="list-style-type: none"> ▪ Excessive effort ▪ Overcapitalization ▪ Low profitability ▪ Over-exploitation 	<ul style="list-style-type: none"> ▪ Native poverty ▪ Limited economic opportunity 	<ul style="list-style-type: none"> ▪ Race for fish ▪ Early closures ▪ Overcapitalization ▪ Low profitability
Rights introduced	1975-1986	Early 1970s	1984	1991	1992	1984
Objectives	<ul style="list-style-type: none"> ▪ Stock stability ▪ Reduce discarding ▪ Economic returns ▪ Co-management 	<ul style="list-style-type: none"> ▪ Reduce capacity ▪ Economic returns ▪ Community stability 	<ul style="list-style-type: none"> ▪ Stock recovery ▪ Reduce capacity ▪ Improve returns 	<ul style="list-style-type: none"> ▪ Stock stability ▪ Economic returns ▪ Co-management ▪ Cost recovery 	<ul style="list-style-type: none"> ▪ Alleviate poverty ▪ Extend opportunity ▪ Develop through access to resource 	<ul style="list-style-type: none"> ▪ Reduce capacity ▪ Economic returns ▪ Improve planning ▪ Co-management
Approach	<ul style="list-style-type: none"> ▪ % share of TAC ▪ % based on history ▪ Limit on % held ▪ Vessels only hold 	<ul style="list-style-type: none"> ▪ Boat quotas (IVQ) ▪ Capacity based ▪ IVQ transfers with boat only ▪ Limit on IVQ held 	<ul style="list-style-type: none"> ▪ % share of TAC ▪ % based on history 	<ul style="list-style-type: none"> ▪ % share of TAC ▪ % based on history ▪ Limit on % held ▪ Catch entitlements ▪ Input controls 	<ul style="list-style-type: none"> ▪ Allocate to eligible communities (65) fixed % shares in BSAI TACs ▪ Acquire equity in fishing companies 	<ul style="list-style-type: none"> ▪ Devolve quota mgt to fisher groups ▪ ITQs used by some POs ▪ ITQ based on vessel history
Characteristics*						
Exclusivity	5	5	5	5	5	5
Duration	5	4	5	5	5	4
Transferability	5	3	4	5	1	4
Divisibility	4	3	4	5	4	4
Security	4	5	5	5	5	3
Flexibility	5	4	4	4	4	4
Results	<ul style="list-style-type: none"> ▪ Reduced capacity ▪ Greater efficiency ▪ Higher quota value ▪ Stewardship 	<ul style="list-style-type: none"> ▪ Reduced capacity ▪ Higher productivity ▪ Improved incomes 	<ul style="list-style-type: none"> ▪ Fewer vessels ▪ Greater efficiency ▪ Higher quota value ▪ Stewardship 	<ul style="list-style-type: none"> ▪ Resource recovery ▪ Greater efficiency ▪ Better management ▪ Gov't revenues 	<ul style="list-style-type: none"> ▪ Community institutions built ▪ Investment in fishing industry 	<ul style="list-style-type: none"> ▪ Fewer vessels ▪ Improved incomes ▪ Higher quota value
Impacts	<ul style="list-style-type: none"> ▪ Improved management ▪ Windfalls to first ITQ holders ▪ Some discarding 	<ul style="list-style-type: none"> ▪ Major reduction in fleets/employment ▪ Sharp drop in fishery subsidies ▪ More resilient fishing industry 	<ul style="list-style-type: none"> ▪ Windfall to first ITQ holders ▪ Consolidation ▪ Target larger more valuable fish 	<ul style="list-style-type: none"> ▪ Windfall to first ITQ holders ▪ Consolidation ▪ ITQ ownership outside fishery 	<ul style="list-style-type: none"> ▪ >\$190 million revenues (35% from royalties) ▪ >2,000 employed ▪ >\$450 million net assets 	<ul style="list-style-type: none"> ▪ Windfalls to first ITQ holders ▪ More resilient fishing industry ▪ Potential for communal rights

*Scale of 1 to 5, where 1=low strength of characteristic and 5=high strength of characteristic

	British Columbia	British Columbia	Lake Winnipeg	Maritimes	Maritimes	Maritimes
	ITQ Sablefish/Halibut	ITQ - Groundfish	IQ/ITQ – Whitefish	ITQ – 19 Snow Crab	ITQ - <65' mobile	TURF - Sea urchin
Issues	<ul style="list-style-type: none"> ▪ Race for fish/safety ▪ Overcapacity ▪ Low profitability ▪ Gluts/poor quality ▪ By-catch discards ▪ Exceed TACs 	<ul style="list-style-type: none"> ▪ Race for fish/safety ▪ Overcapacity ▪ Low profitability ▪ By-catch discards ▪ Exceed TACs ▪ Poor catch data 	<ul style="list-style-type: none"> ▪ Overcapacity ▪ Low profitability 	<ul style="list-style-type: none"> ▪ Unstable access and allocation ▪ No basis for long-term planning 	<ul style="list-style-type: none"> ▪ Race for fish ▪ Overcapacity ▪ Low profitability ▪ Gluts/poor quality ▪ By-catch discards ▪ Exceed TACs 	<ul style="list-style-type: none"> ▪ Limited mgt due to high cost ▪ Costly & wasteful due to competition ▪ Poor reporting
Rights introduced	▪ 1990-1994	▪ 1997	▪ IQ:1972/ITQ:1986	▪ 1979/2005	▪ 1991	▪ 1995
Objectives	<ul style="list-style-type: none"> ▪ Stock stability ▪ Reduce discarding ▪ Improve returns ▪ Co-management 	<ul style="list-style-type: none"> ▪ Integrate manage't ▪ Reduce discarding ▪ Improve returns ▪ Improve data 	<ul style="list-style-type: none"> ▪ Reduce capacity ▪ Improve returns ▪ Improve access 	<ul style="list-style-type: none"> ▪ Stock stability ▪ Stable access ▪ Economic returns ▪ Co-management 	<ul style="list-style-type: none"> ▪ Stock stability ▪ Improve returns ▪ Reduce discarding ▪ Co-management 	<ul style="list-style-type: none"> ▪ Enhance resource ▪ Improve returns ▪ Better management
Approach	<ul style="list-style-type: none"> ▪ % share of TAC ▪ % based on vessel capacity & history ▪ Full transferability ▪ Observer/monitor 	<ul style="list-style-type: none"> ▪ % share of TAC ▪ % based on vessel capacity & history ▪ Inter-fleet trading ▪ Observer/monitor 	<ul style="list-style-type: none"> ▪ IQ based on equal % share of TAC ▪ IQ owner-operator ▪ ITQ in 1986 to facilitate entry 	<ul style="list-style-type: none"> ▪ IVQ then ITQ ▪ ITQs as trap shares ▪ # of traps held determines % share of TAC 	<ul style="list-style-type: none"> ▪ IQ converted to ITQ ▪ Based on catch history 	<ul style="list-style-type: none"> ▪ Create area licence ▪ Promote enhancement ▪ Devolve mgt to licencees
Characteristics*						
Exclusivity	▪ 5	▪ 5	▪ 5	▪ 5	▪ 5	▪ 5
Duration	▪ 4	▪ 4	▪ 4	▪ 4	▪ 4	▪ 4
Transferability	▪ 5	▪ 5	▪ 4	▪ 3	▪ 5	▪ 5
Divisibility	▪ 5	▪ 5	▪ 3	▪ 2	▪ 5	▪ 1
Security	▪ 4	▪ 4	▪ 4	▪ 4	▪ 4	▪ 4
Flexibility	▪ 5	▪ 5	▪ 4	▪ 4	▪ 4	▪ 4
Results	<ul style="list-style-type: none"> ▪ Reduced fleet ▪ Greater efficiency ▪ Co-management ▪ Reduced discards 	<ul style="list-style-type: none"> ▪ Reduced discard ▪ Greater efficiency ▪ Longer seasons ▪ Better data 	<ul style="list-style-type: none"> ▪ Improved access for new entrants ▪ Greater seasonality 	<ul style="list-style-type: none"> ▪ Resource stable ▪ Improved access ▪ Better management 	<ul style="list-style-type: none"> ▪ Reduced fleet ▪ Greater efficiency ▪ Discarding ▪ Co-management 	<ul style="list-style-type: none"> ▪ Fishing to market ▪ Some enhancement ▪ Improved data ▪ Under exploitation
Impacts	<ul style="list-style-type: none"> ▪ High quota value ▪ Improved returns ▪ Windfall gains ▪ High lease income ▪ Stable employment ▪ Higher quality fish ▪ High concentration 	<ul style="list-style-type: none"> ▪ High quota value ▪ Improved returns ▪ Windfall gains ▪ High lease income ▪ Stable employment ▪ Higher quality fish ▪ High concentration 	<ul style="list-style-type: none"> ▪ Increased flexibility ▪ Improved returns 	<ul style="list-style-type: none"> ▪ Windfall gains to first ITQ holders ▪ Basis for inclusive participation 	<ul style="list-style-type: none"> ▪ High quota value ▪ Higher quality fish ▪ High concentration among processors ▪ Full impacts unclear due to moratorium 	<ul style="list-style-type: none"> ▪ Reduced management costs ▪ Improved safety ▪ Disease reduced stock in '99-'01 so long-term benefits not realized

*Scale of 1 to 5, where 1=low strength of characteristic and 5=high strength of characteristic

Annex 1						
Summary of the Characteristics of Market-like Instruments						
	Exclusivity	Duration	Quality of the Title	Transferability	Divisibility	Flexibility
Transferable limited licence (LTL)	LTLs provide an indirect access right to the resource. Situation depends on the structure and size of the fishery – Score: 3.5	LTLs are often attributed on a medium/long term basis or in perpetuity – Score: 5	In practice, the characteristics may be attenuated by non-compliance and sovereign risk and depends on incentives to compete – Score: 5	Transferability is high, but always limited – Score: 4	Licences are in general difficult to divide – Score: 0-1	Holder can choose the best way to use its right to fish, subject to technical restrictions – Score: 3
Territorial Use Right Fisheries (TURFs)	TURFs provide a single holder with a direct access right to the resource. Situation depends on TURF size and species exploited. When sedentary species – Score: 5	TURFs are attributed on a permanent or long term basis – Score: 4-5	As the right is attached to the exclusive access to a sea territory, quality is in general high. Situation depends on size of the TURF – Score: 4	Examples suggest that transferability is often high – Score: 3-5	Depending on licence terms, TURF may or may not be sub-divided – Score: 4-5	The single user can choose the best way to manage the TURF – Score: 4-5
Community Quota (CQ)	CQs provide a community with a direct access right to the resource. Situation depends on the size and cohesion of the community. Exclusivity often limited by “outsiders” – Score: 5	CQs can be attributed on a long-term permanent basis – Score: 4-5	CQs are managed by and in the interest of the community. Situation depends on the nature of the allocation – Score: 4-5	Transfers may take place within and among communities – Score: 3	As CQs are based on catches, they can be divided – Score: 4	Community can choose the best way to harvest its quota, with respect to social constraints – Score: 4
Individual Quota (IQ)	IQs provide a direct access right to the resource. Situation depends on compliance – Score: 5	IQs are often attributed annually and renewed – Score: 3	In practice, the characteristic may be attenuated by sovereign risk and non-compliance – Score: 3	IQs are not transferable unless in whole with the licence – Score: 2-3	Notwithstanding the transferability issue, IQ can be divided in season – Score: 4	Holder can choose the best way to harvest its quota, subject to trade restrictions – Score: 4
Individual Transferable Quota (ITQ)	ITQs provide a direct access right to the resource – Score: 5	ITQs are attributed on a permanent or renewable basis – Score: 4	In practice, the characteristic may be attenuated by sovereign risk and non-compliance – Score: 4	Transferability of ITQs is high, but always limited – Score: 4	Any fraction of ITQs can be divided or aggregated – Score: 5	Holder can choose the best way to harvest its quota under general constraints – Score: 4

Source: OECD (2006) Using Market Mechanisms to Manage Fisheries: Smoothing the Path

Annex 2		
Summary of Market-like Instruments in OECD Fisheries		
Instrument	Examples in OECD Countries	Key Features
Territorial Use Rights (<i>TURFs</i>)	Ocean quahog (Iceland) Sea urchin (eastern Canada) Oyster (US) Mussels, scallops (NZ) Abalone (Japan) Lakes and some coastal areas (Sweden) Aquaculture (Mexico)	Allocation of a certain area of the ocean to a single user, usually a group, who then undertakes fishing by allocating rights to users within the group. Usually of long duration and with high degree of formal and informal transferability within the group.
Community-based catch quotas (<i>CQ</i>)	Japan, Korea, US (Community Development Quotas for Eskimo and Aleut Native Alaskans), New Zealand (allocation of a permanent share of the TAC to Maori), Canada, Europe (collective quotas allocated to Producer Organizations)	Catch quotas are attributed to a “fishing community” with decisions on allocation of rights within the community taken on a cooperative basis. They are often used in formalizing traditional access rights in small-scale fisheries. They provide a high degree of exclusivity, divisibility and flexibility.
Vessel Catch Limited (<i>VC</i>)	Australia, Canada, Denmark, France, Germany, Italy, Ireland, the Netherlands, New Zealand, Norway, UK, US	Restrict the amount of catch that each vessel can land for a given period of time (week, month, year) or per trip. These instruments are characterized by relatively low or moderate levels for most rights characteristics. They provide limited exclusivity and may not reduce the race to fish, while providing some degree of flexibility and quality of title.
Limited Non-Transferable Licences (<i>LL</i>)	Australia, Belgium, Canada, Greece, Iceland, Italy, Japan, the Netherlands, UK, US, France, Spain	These licences can be attached to a vessel, to the owner, or to both and have to be limited in number and applied to a specific stock or fishery to be considered as market-like. By restricting access to a stock, this instrument helps to reduce the race to fish and prevent rent dissipation. However, the lack of transferability and divisibility limits the optimal use of fishing capacity.

Annex 2 (continued) Summary of Market-like Instruments in OECD Fisheries		
Instrument	Examples in OECD Countries	Key Features
Limited Transferable Licences (<i>LTL</i>)	Mexico, UK, Norway and France (to a limited extent)	By making limited licences transferable, fishers are provided with an increased incentive to adjust capacity and effort over the short to long term in response to natural and economic conditions. They are generally given for a very long duration, but are not divisible.
Individual Non-Transferable Quotas (<i>IQ</i>)	Germany, UK, Italy, Spain, Denmark, Norway, Canada, Portugal, US, France, Belgium	Provide a right to catch a given quantity of fish from a particular stock, or, more usually, a percentage of a total allowable catch (TAC). Relatively high characteristics of exclusivity and flexibility allow rights holders to use their rights in a least-cost way to secure a given quantity of fish. The race for fish that exists under a competitive TAC is largely eliminated, but the lack of transferability restricts the efficiency of harvesting.
Individual Transferable Quotas (<i>ITQ</i>)	Australia, Canada, Iceland, New Zealand, Norway, Poland, US	Provide a right to catch a given percentage of a TAC which is then transferable. This instrument rates highly on all criteria. The features of the system allows for appropriate long-term incentives for investment decisions as well as optimizing short-term use of fishing capacities.
Individual Non-Transferable Effort Quotas (<i>IE</i>)	Allowable fishing days (Iceland, Belgium) Limited number of pots in crab and lobster fisheries (Australia, Canada, France, UK, US) Limited number of fishing hours per day in scallop fishery (France)	Rights are attached to the quantity of effort unit that a fisher can employ for a given period of time. They tend to be used in fisheries for sedentary species and are characterized by moderate or relatively high levels of exclusivity, duration and quality of title.
Individual Transferable Effort Quotas (<i>ITE</i>)	Tradable fishing days (Spain's 300s fleet) Fishing Capacity (Sweden)	Transferability makes short and long term adjustment easier and allows for a better use of fishing capacities.

Source: OECD (2006) *Using Market Mechanisms to Manage Fisheries: Smoothing the Path*

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