PROPERTY RIGHTS AS A MEANS OF ECONOMIC ORGANIZATION

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1. INTRODUCTION

This paper is concerned with the role of property rights in economic activity. In particular, the paper focuses on the relationship between property rights and the level of production, productivity and production growth in economies. The basic thesis of the paper is that property rights are absolutely fundamental in this respect and, more generally, to almost everything that people usually regard as economic progress.

A cursory glance at economies around the world suggests that a high level of production and productivity usually go hand-in-hand with extensive, well defined and well enforced property rights. Alternatively, where property rights are poor or missing, the corresponding economic activity is generally severely depressed. Moreover, it is often seen that extensions of the system of property rights is followed by a spurt of economic growth. It follows that a major component of economic policy should be to improve and expand the system of property rights. This, however, often runs into problems of a technical nature; adequate property rights simply cannot be defined and enforced. Or, there may be problems of social nature; people may not be willing to accept an extension of property rights.

Fisheries, as so many other natural resource extraction activities, are among the economic activities where property rights are poorly defined or even nonexistent. This generally results in huge inefficiencies, frequently referred to as the fisheries problem. Since the fisheries problem fundamentally stems from lack of property rights, the obvious solution is to introduce these rights. There are, however, substantial technical as well as social problems with defining and enforcing sufficiently good property rights to solve the fisheries problem.

The paper discusses some of the property rights that have been proposed in fisheries and their relative quality: In Section 2, the appropriate objectives of the economic activity are discussed. The crucial conclusion of that discussion is that the purpose of the production sector is to maximize the net production of goods. Section 3 deals with technical ways to maximize the availability of goods. Two major ways are identified: (a) specialization and (b) accumulation. In Section 4 I argue that property rights are both necessary and sufficient to achieve the objective of maximizing the net availability of goods and are consequently fundamental to economic progress and wellbeing. The relationship between property rights, the market system and externalities is examined in Section 5 and I argue that the fisheries problem is fundamentally caused by the lack of property rights. In Section 6 the constituent parts, or characteristics of property rights, are considered and represented as dimensions along which the quality of given property rights can be measured. A particular measure of the quality of property rights, the \( Q \)-measure, is developed. In Section 7, the \( Q \)-measure is applied to the property rights based fisheries management systems of Iceland and New Zealand. Finally, in Section 8, the limitations of property rights are discussed.

2. THE ECONOMIC OBJECTIVE

It is as axiomatic that the social objective is to maximize the common good or, in more modern parlance, overall social welfare. This fundamental axiom is not arbitrary. It has deep roots in social philosophy and ethics. It can for instance be justified on the basis of social contract theories in the tradition of Locke, Rousseau, Kant and, more recently, Rawls (see Gough 1957 and Rawls 1971). According to these theories the proper social structure is what free and rational people ignorant of their prospective position in society, but knowing everything else, would agree on. From behind this "veil of ignorance" these people, form a contract - a social contract - specifying the organization of the society in which they and their descendants will live. In a deep sense this social organization is fair and just because this is what a free and rational individual with no particular special interests ("the veil of ignorance" serves to eliminate special interests) would agree on.

What would be the content of this social contract? Obviously two things:

i. Society should be organized in such a way that the supply of desirables should be as high as possible and

ii. The distribution of these desirables to individuals should be reasonably equitable.

The first stipulation is almost self-evident. Clearly, it does not make sense to reduce the net availability of desirables. The second stipulation warrants some discussion. Consider first risk. Obviously every individual would like to have as much for himself as possible. However, when forming the "social contract" from behind the "veil of ignorance" he does not know his future place in society. Therefore, depending on the individual’s risk attitudes, he may have preferences over the distribution of desirables. Thus, perfect risk aversion would call for perfectly equal distribution and vice versa. With risk neutrality, on the other hand, any distribution is as good as the other. Therefore, assuming some risk
aversion by individuals, the "social contract" would certainly put a limit on the inequality of distribution.

The second consideration concerning the distribution of desirables has to do with their availability. From behind the "veil of ignorance" the individuals forming the "social contract" realize of course that the availability of desirables at each point of time may depend on the distribution of these desirables. Thus, with perennial equal sharing, people's willingness to produce might perhaps be undermined. Hence, it might be a good idea to maintain a system of rewards to induce people to exert themselves for the common good. This, of course, calls for a degree of inequality - an unequal distribution of desirables. It is important to realize, however, that this inequality is 'earned'. It is actually a reward for a larger contribution to the common good, just like the payment for labour. Therefore, any requirement regarding the distribution of desirables would first and foremost apply to the initial allocation, which people cannot really control, and not the subsequent accumulation of wealth, which depends largely on individual industry and enterprise.

Modern welfare theory, although built on a different foundation namely utility theory, produces the same result. According to standard results of this theory, more precisely the Pareto criterion (Ng 1980), a necessary condition for welfare maximization is that the net production of desirable things be maximized. It is important to realize that it is net production that counts here, i.e. production where the use of all inputs including labour and natural resources has been subtracted. The other necessary condition for welfare maximization is that this production be shared or distributed appropriately among the population.

So, in accordance with both social contract theory and utility theory a natural social objective is to:

i. maximize the availability of desirables and
ii. effect a fair distribution of these desirables.

To make this objective operational one must specify what is meant by 'desirables'. Basically, desirables are what people regard as valuable, i.e. desirables are anything that people are willing to put a price on or, equivalently, require a compensation to part with. Thus, in a perfect market system, where everything is traded, desirables are the same as goods or commodities. So, in this system the social objective of maximizing the availability of desirables is equivalent to maximizing the gross domestic product (GDP).

The real world, of course, does not contain perfect market systems and all actual market systems are imperfect to a greater or lesser degree. Therefore, in these economies, the GDP can not be regarded as equivalent to the aggregate availability of desirables. Faced with this practically difficulty, it may be reasonable to regard GDP as a first approximation to the availability of desirables, at least in reasonably well functioning market economies. Similarly, the contribution of production sectors to the common good may be measured by the net production of goods in these sectors.

It is sometimes asserted that there is a conflict between the most desirable distribution of goods and their maximum production. Therefore, the argument typically goes, the requirement of maximum net production must be relaxed in the interest of equity or fairness. This argument, while certainly not vacuous, is often given too much weight. One of the most important results in economic welfare theory, the second welfare theorem (Debreau 1959), is that any distribution of benefits that is desired is compatible with maximum production and, indeed, the market system. So, there is no fundamental conflict between the two objectives. Consequently, even in particular cases, there can be little reason to sacrifice economic efficiency for more equitable distribution of the net production. The reason is not that distribution does not matter, rather distributional considerations can, at least in principle, be taken care of by the appropriate initial allocation of endowments.

Thus, the assumption that the social purpose of the production sector is to maximize the net production of goods rests on fairly solid ground. It follows that the production activity and the surrounding social institutions should be organized to facilitate this. For this purpose one invents, modifies, develops and scrap social institutions in the search for those most effective, given the current technological knowledge.

The same conclusions apply to every individual production activity making up the production sector as a whole and therefore also to the fisheries sector. This should be organized and operated so as to maximize the net-production of goods. Anything else will reduce the overall availability of goods and therefore economic opportunities to society as a whole. This raises the question of the appropriate organizational framework for the fisheries activity. To this I now turn.

3. HOW TO ACHIEVE THE ECONOMIC OBJECTIVE

Over the past two and a half centuries, economic theory has accumulated a great deal of knowledge about how to increase net production of goods and services. It is now generally acknowledged (Barro and Sala-i-Martin 1995) that the quantity of output from a given quantity of scarce inputs, labour and natural resources is primarily determined by two factors:

i. accumulation of capital (physical, biological, human) and
ii. the degree of specialization.

Accumulation of capital has long been recognized as a key factor in the ability to expand production. For a given level of variable inputs, e.g. labour, increased level of capital basically shifts the production possibility frontier (the production function) upward. As a result more output is obtained from the same level of labour (Figure 1).

Capital in this context not only includes physical capital, it also includes natural capital, *i.e.* the natural resources of all types that serve as inputs into the production process, and human capital, *i.e.* the quality and ability of the human labour used in the production process. The accumulation of physical capital occurs through investment in physical capital units. Human capital is accumulated by education, training and by the accumulation of knowledge. Natural resources by their nature cannot be produced. Therefore to increase their contribution to net production it is first important to increase the access to these resources and, consequently, their flow into the production process. Second, for long term economic growth it is important to extract natural resources wisely and, if possible, on a sustainable basis.

Specialization enables producers to (a) focus on what they do best and (b) get better at what they do. Both (a) and (b) increase productivity and hence production growth in the world (Barro and Sala-i-Martin 1995).

4. HOW PROPERTY RIGHTS ACHIEVE THE ECONOMIC OBJECTIVE

The preceding sections have shown that the keys to production and economic growth are:

i. accumulation of capital and

ii. specialization.

Now I will show that property rights, especially private property rights, are a fundamental prerequisite for this to occur.

Accumulation of capital obviously requires property rights. No one is going to save valuables in the form of physical capital, natural resources or even human capital unless he enjoys adequate property rights over his accumulation. There are two reasons for this. First, accumulation of capital necessarily means sacrifice of current consumption. Hence, to do so one must be reasonably sure of not only retaining possession of the accumulated assets but also gaining from their existence. Without property rights, this is not possible. Second, even if some people decided to accumulate nevertheless, this accumulation would be seized by others and, in order to avoid a similar fate, quickly consumed. So without property rights there will be (a) no accumulation and (b) what capital there might exist will be quickly seized and squandered.

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3 This assumes something less than perfect altruistic individuals.
Specialization requires trade. If there is no trade, people, if they specialize in a single production process, will not be able to obtain the various goods they desire. Hence, in a situation of no trade, people will be forced to be self-sufficient, i.e. to produce all their needs themselves. This is the typical situation in primitive societies. Under these circumstances, firms, which are based on the idea of selling specialized products, could not exist. So, the modern day economic structure of specialized production and production units, i.e. firms, with the accompanying economic benefits is fundamentally based on the possibility to trade.

Trade, in turn, requires property rights, which is obvious. After all, trade is nothing but a transfer of property rights and without property rights there can be no trade. Hence, without property rights, there can be little economic specialization.

It may be illuminating to wonder about the possible extent of specialization without property rights? I have already established that without property rights there can be no trade. Therefore without property rights the only way to benefit from specialization is by the division of labour by command or custom within a larger economic unit. This economic unit which has some parallels with the modern firm, would be some sort of a community. It could e.g. be a village, tribe or even a kingdom.

Alternatively, it could be a command economy for instance along the lines of 20th century socialist economies (although, it may be recalled, these were typically to a considerable extent based on private property rights). However, for this type of organization to work, the community as a whole must be able to uphold its property rights against outsiders. So, in fact, this solution depends on some property rights. To sustain this system, almost inevitably some coercion is required. This certainly implies certain rights by the enforcer which are close to property rights. Finally, this arrangement is probably not economically very efficient if only for the reason that it tends to stifle private initiative and invention.

So, the fundamental conclusion that property rights are necessary for a high supply of goods is established and, indeed, what is generally regarded as economic progress in general.

The importance of this conclusion can hardly be overemphasized. Without property rights, there can be neither trade nor accumulation of capital. Without trade there can be little specialization. Without specialization and accumulation of capital, there can be little production. So, without property rights, human society seems doomed to abject poverty. In fact, with little or no property rights, human society would be primitive indeed, not much different from the more advanced versions of animal societies.

Given that property rights are necessary for economic progress, an interesting question is whether they are also sufficient. More to the point, does the existence of well defined and enforced private property rights inevitably lead to economic progress, i.e. increased supply of desirable goods? The answer to this question appears to be a qualified "yes". The qualification is for

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4 It may be illuminating in this context to wonder about the most likely organization of society where trade is not possible. Under these circumstances, it seems that it might be advantageous to organize society in closely knit communities where some specialization can occur on the basis of traditional sharing of the community's production with people attending to their pre-assigned duties according to tradition and social pressure. The family, of course, is an example of this kind of organization.
practical reasons. The actual outcome of any property rights system depends not only on the structure and extent of the property rights themselves but also on the operation of certain other social institutions most notably the market system and the property rights enforcement system, i.e. policing and the judicial system. For instance, conceivably, the market system might be dominated by monopolies and the property rights enforcement system riddled with corruption, in which case production would suffer. What seems to be true, however, is that if the system of property rights is complete, i.e. every valuable is subject to private property rights, and if the system is perfectly enforced, then expansion of output to the limit of the technically feasible is a highly probable outcome.

5. PROPERTY RIGHTS AND THE MARKET SYSTEM

5.1 The market system

The market system is known to have certain attractive economic properties (Debreau 1959, Varian 1992). Among other things, if the system is perfect, it will generate full economic efficiency and optimal economic growth. The interesting thing is that this happens without any centralized direction. As Adam Smith (1776) said, it is as if an invisible hand guided every action (privately motivated by self interest) toward the common good.

The market system also exhibits certain fundamental ethical properties, at least as specified by social contract theories and utilitarianism. First, it maximizes the availability of desirables at every point of time. Second, as discussed in Section 2, the market system can sustain any socio-politically preferred distribution of desirables by the judicious initial allocation of resources. I now argue that the existence of property rights is fundamental to the operation of the market system. More precisely, it is both necessary and sufficient for the operation of the market system.

The heart of the market system are trades in the market place. Such trades presuppose property rights over the commodities that are traded. Hence, property rights are necessary for the operation of the market system. If a system of property rights is put in place, the opportunity for individuals to benefit from production specialization and trading will arise. Therefore, assuming only a small degree of individual enterprise, trading will commence and the market system is on its way. The reverse, however, is not true. The existence of markets does not lead to the creation of property rights. The causal relationship is from property rights to markets and trades not vice versa.

So, the property rights system is really more fundamental than markets. Assuming only that people look after their interests, markets will automatically arise if there are property rights. Moreover, the market cannot exist without property rights but the existence of property rights does not depend on the market. In this sense, property rights are more fundamental than the market.

In his path-breaking treatise on the wealth of nations, Adam Smith extolled the ability of the market system to coordinate the immense complexity of individual economic decisions and activities without causing huge problems of shortages and oversupply and to direct all these diverse actions and desires toward the common good. Since the market system owes its existence of private property rights, this praise is appropriately assigned to the system of property rights. The great social coordinator is really the institution of property rights, not the market or market forces! Consequently, our current economic system is perhaps more appropriately referred to as the property rights system or the private property rights system rather than the market system.

5.2 Externalities and property rights

A well known problem of the market system are externalities. The market system is only efficient if there are no externalities (Debreau 1959). What is less well known is the close causal relationship between externalities and property rights. Basically, we may assert that lack of property rights causes externalities. How does this work?

If property rights are missing, people may simply take what they want, at least to the extent this is allowed by social custom. If the resource is scarce, this causes an external effect. The act of "taking" simply leaves less of the resource to others. They are in other words adversely affect by the "taking". A negative externality is created. With property rights in place "taking" is not permissible. Consequently, with property rights, there can be no externalities. With property rights in place the method of obtaining is buying. If the resource is scarce the purchase price will be positive. This means that the previous owner will be compensated for handing the property right over.

The externality created by "taking" (as opposed to buying) is in economics generally referred to as a technical externality (Bator 1958). This is the type that causes economic inefficiencies. Property rights do not actually remove external effects. The resource is still scarce and someone’s use of it will reduce the quantity available to all others. What property rights do is to turn a technical externality into a pecuniary externality which is economically harmless. A pecuniary externality is harmless because through the act of trading, the interests of both parties, the buyer and the seller, are considered in the appropriate way. Only if the buyer values the resource more highly than the seller will the trade take place, which is in accordance with the common good.

All economies are infested with technical externalities. The only difference is the pervasiveness of the externality problem. Generally speaking natural resource based economies are more affected than others. The traditional way to correct for externalities is to impose prices, so called Pigouvian corrective prices (Pigou 1912) on the externality-causing activity. An

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3 Actually, if "taking" is not allowed then property rights exist.
property rights is high. However, according to Scott (1988, 1996) the most crucial property rights characteristics are:

1. security or quality of title
2. exclusivity
3. permanence and
4. transferability

6. PROPERTY RIGHTS: CONTENT, DIMENSIONS AND QUALITY

6.1 Characteristics of property rights

A property right is not a single variable. As Professor Scott (1988, 1996) has informed us, it really consists of a collection of different characteristics. The number of distinguishable characteristics that make up a property rights is high. However, according to Scott (1996, 1999) the most crucial property rights characteristics are:

i. security, or quality of title
ii. exclusivity
iii. permanence and
iv. transferability

5.3 The fisheries problem, externalities and property rights

The fisheries problem manifests itself as excessive fishing capital and fishing effort, reduced fish stocks and dissipation of economic rents to the point where the fishery is economically hardly worth pursuing. Given the intrinsic productivity and richness of many ocean fisheries, this outcome constitutes a serious economic failure.

The fisheries problem is caused by externalities. Fish stocks are limited. Consequently one fisherman's catch reduces the harvesting opportunities of all other fishermen. This is a typical technical externality. As all other externalities, it arises because of a lack of the appropriate property rights. In this case there are inadequate property rights in the fish stocks from which the harvest is taken.

It follows immediately that the fisheries problem would disappear if only the appropriate property rights could be defined, imposed and enforced. This is the problem. But, it turns out that there are substantial technical and social problems to defining, imposing and enforcing sufficiently good property rights in many fisheries, especially off-shore ocean fisheries. For this reason, fisheries managers have often been forced to resort to rather weak and indirect property rights such as access licences and harvesting quotas. In some cases, however, these indirect (or pseudo) property rights can solve a good part of the scarce resources in modern day market economies. For the others technical externalities still remain.

6. PROPERTY RIGHTS: CONTENT, DIMENSIONS AND QUALITY

6.1 Characteristics of property rights

A property right may be challenged by other individuals, institutes or the government. Security, here refers to the ability of the owner to withstand these challenges and maintain his property right. It is perhaps best thought of as the probability that the owner will be able to hold on to his property right. Probabilities range from zero to one. A security measure of one means that the owner will hold his property with complete certainty. A security measure of zero means that the owner will certainly lose his property.

Exclusivity

This characteristic refers to the ability of the property rights holder to use and manage the resource (his property) in question without outside interference. An individual's personal things such as his clothes, generally have a high degree of exclusivity. A right to the enjoyment of a public park has almost zero exclusivity. An ITQ holder has a right to a specified volume of harvest from a given stock of fish over a certain time period. Given the conventional legal protection, this right as such is virtually 100% exclusive. However, when it comes to the actual harvesting, the question of exclusivity refers to his ability take this harvest in the way he prefers and to prevent others from interfering with this ability. Any government fishing regulations clearly subtract from this ability. The same applies to the actions of other fishermen that may interfere with his ability to harvest his quota in various ways. Thus, an ITQ right generally provides substantially less than complete exclusivity to the relevant asset, i.e. the fish stock and its marine environment.

Permanence

Permanence refers to the time span of the property right. This can range from zero, in which case the property right is worth nothing, to infinite duration. Leases are examples of property rights of a finite duration. By convention, the label "ownership" usually represents a property right in perpetuity or for as long as the owner wants. There is an important difference between an indefinite duration, in which the duration of the property right is not stipulated, and a property right in perpetuity which explicitly stipulates that the property right lasts forever. The duration of a property right may seem related to security; if a property right is lost then, in a sense, it has been terminated. Conceptually, however, the two characteristics are quite distinct. Thus, for instance, a rental agreement may provide a perfectly secure property right for a limited duration.

Transferability

This refers to the ability to transfer the property right to someone else. For any scarce (valuable) resource, this characteristic is economically important because it facilitates the optimal allocation of the resource to competing users as well as uses. An important feature of transferability is divisibility, the ability to subdivide the
property right into smaller parts for the purpose of transfer.

Following Scott (1988), it is helpful to visualize these characteristics of property rights as measured along the axes in four-dimensional space (Figure 3). A given property right may exhibit all four characteristics and others to a greater or lesser extent. It is convenient to measure this on a scale from 0 to 1. A measure of zero means that the property right has none of the characteristic. A measure of 1 means that the property right holds the characteristic completely. Given this a picture of perfect property rights would be a rectangle in the space of the four property rights characteristics illustrated in Figure 3. The outcome is illustrated in Figure 4.

The map of the property rights characteristics shown in Figure 4 can be referred to as the characteristic footprint of a property right, the characteristic footprint of a perfect property right represents the outer limit for the quality of all property rights. It follows that the corresponding characteristic footprint of any actual property right in the same space of characteristics must be completely contained within this rectangle.

Figure 5 illustrates the characteristic footprint of some actual property right within the characteristic footprint of a perfect property right. The difference between the two areas enclosed by the two maps indicates the relative quality of the actual property right.

**Figure 3**
Characteristics of property rights

**Figure 4**
A perfect property right
6.2 A measure of the quality of property rights: The $Q$-measure

Given the multi-dimensional nature of property rights, it is useful to construct an aggregate numerical measure of the quality of a property right. Such a measure can serve in at least two ways. First, it can be used to compare the quality of a given property right with some other property rights of interest. Thus, for instance, it may facilitate the comparison of the property rights content of individual quotas across fisheries and nations. Second, an aggregate measure of the quality of property rights may help social managers to judge the economic efficiency of the institutional framework of the activity in question.

For convenience I refer to the measure of the quality of property rights as the $Q$-measure. What properties should the $Q$-measure satisfy? First, it should increase with all property rights characteristics. The higher their numerical value (on a scale from 0 to 1) the stronger the property right. Second, it is convenient to restrict its value to the same numerical range as the characteristics, namely the closed interval $[0,1]$, with "0" indicating zero quality property rights and "1" complete property rights. Third, since it appears that a positive level of some property rights characteristics, e.g. security and permanence, is necessary for the property right as a whole to be worth anything, a zero value of any of these characteristics should imply a $Q$-measure of zero as well. These particular property rights characteristics are essential. Fourth, the $Q$-measure should be flexible with respect to the individual weights of the various property rights characteristics.

The $Q$-measure satisfies these requirements:

$$Q = \left( \prod_{i=1}^{N} x_i^{a_i} \right) \cdot \left( w_1 + \sum_{j=N+1}^{M} w_{2,j} \cdot x_j^{a_j} \right)$$

(1)

This $Q$-measure comprises $M$ characteristics. The first $N$, $(x_i, \ i = 1,2,\ldots, N)$ are essential property rights characteristics, i.e. those that render the property right worthless if they are zero. The remaining $M-N$ property rights characteristics, i.e. $(x_j, \ j = N+1, N+2,\ldots, M)$, are non-essential. The exponents, $a_i, \ i = 1,2,\ldots,M$ are all positive. So are the weights, $w_1$ and $w_{2,j}$, which moreover sum to unity.

It is easy to check that this $Q$-measure satisfies all four of the requirements stated above. It is, moreover, flexible in the sense that it can account for any number of essential and nonessential characteristics.

In our special case of four property rights characteristics, the $Q$-measure corresponding to (1) is:

$$Q = S^\alpha E^\beta P^\gamma T^\delta (w_1 + w_2),$$

(2)

where $S$ denotes security, $E$ exclusivity, $P$ permanence and $T$ transferability.

\[\alpha, \beta, \gamma, \delta, w_1, w_2 \geq 0 \text{ and } w_1 + w_2 = 1\]

Figure 5
The quality map of a property right
and $T$ transferability. The first three characteristics are considered essential. Note that the $Q$-measure is homogenous with respect to these characteristics. $\alpha$, $\beta$ and $\gamma$ represent the elasticity of the $Q$-measure with respect to these characteristics, respectively. A fairly natural assumption is that of unitary homogeneity, i.e. “constant returns to scale” where the sum, $\alpha + \beta + \gamma = 1$. $w_1$ and $w_2$ are weights. $w_1$ is actually the maximum value of $Q$ given that there is no transferability. Due to the non-homogeneous entry of transferability, $T$, in the $Q$-measure, the elasticity of $Q$ with respect to transferability is somewhat complicated. More precisely, this is given by the expression $E(Q,T) = \delta \cdot T^3/(w_1 + w_2 \cdot T^3)$.

An example

The $Q$-measure, even for our simple case of four property rights characteristics, is far too complicated to be illustrated graphically in a useful manner. However a couple of numerical examples may throw some light on how it works. First, assume that the exponents $\alpha$, $\beta$ and $\gamma$ are all equal and exhibit constant returns to scale, i.e. $\alpha + \beta + \gamma = 1$. Second let $\delta$ equal unity. Finally, let $w_1 = 0.6$ and $w_2 = 0.4$. Table 1 provides an example of the value of the four property rights characteristics for two imaginary property rights. The first is strong in all four characteristics. The other is also strong in security and exclusivity but weak in duration and transferability. For concreteness, we may think of the former as ownership of an apartment and the latter as a rental contract for the same apartment. The numerical details and the corresponding $Q$-values are given in Table 1.

A diagram illustrating the characteristic footprint of the two property rights is provided in Figure 6.

The first property right is pretty close to a perfect property right and scores well on the $Q$-measure as shown in Table 1. The lack of transferability (e.g. due to limited divisibility) is the main subtraction from a perfect score. The other property right is obviously fairly poor, primarily because of the lack of duration and transferability. This is reflected in its $Q$ value which according to Table 1 is only 0.43.

Table 1

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Property right 1</th>
<th>Property right 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Exclusivity</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Permanence</td>
<td>0.95</td>
<td>0.30</td>
</tr>
<tr>
<td>Transferability</td>
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<td>0.20</td>
</tr>
<tr>
<td>$Q$</td>
<td>0.90</td>
<td>0.43</td>
</tr>
</tbody>
</table>

7. ESTIMATED $Q$-VALUES FOR THREE QUOTA SYSTEMS

In this section, the $Q$-measure developed in Section 5 is used to assess the quality of the fisheries property rights in the quota systems of Iceland (Arnason 1996a, Runolfsson 1999), New-Zealand (Sharp 1996, Major 1999) and Norway (Hannesson 1994, Arnason 1996b).
individual quota (IQ) system with limited transferability of the quotas. In all three countries, the security of the property right is fairly high. However, in Norway, in certain fisheries, new vessels may be allocated quotas thus subtracting from the quota shares of the existing vessels, which reduces the security of the Norwegian property right. In all three countries the exclusivity of the harvesting right is high, limited only by government fisheries regulations which in the case of Iceland and in particular Norway are more extensive than those in New-Zealand. Permanence of the property right differs greatly between the countries. In New Zealand the quota rights are explicitly in perpetuity. In Iceland they are of indefinite duration but there are non-trivial socio-political threats to the continuation of the system. In Norway individual quota rights are explicitly non-permanent, allocated only annually. However, since quotas are customarily allocated to the previous recipients in more or less the same proportions it may be claimed that the associated property right has gained a degree of permanence. Finally, transferability in New-Zealand is close to perfect (only foreigners are excluded). In Iceland, transferability is only slightly more restricted. In Norway, as noted, there is virtually no transferability of the quotas.

A rough numerical estimate of the values of the property rights characteristics for these three countries is provided in Table 2. The corresponding characteristic footprint are illustrated in Figure 7.

According to the $Q$ values shown in Table 2, the quality of the New Zealand quota property right, $Q=0.96$, is near perfect. The property rights quality of Iceland’s quota rights, $Q=0.86$, is considerably lower but still quite high. The property rights quality of Norway’s fishing rights, $Q=0.44$, is much lower than that of both New Zealand and Iceland. Thus, although by no means negligible, Norway’s IQs must be regarded as possessing comparatively weak property rights.

It is helpful to compare these results with a corresponding assessment of the property rights quality of a typical closed access, common property fishery employing the same methodology. In these, $Q$ would typically be in the range of 0.5 - 0.2 depending on the number of participants. Hence, compared to this, the Norwegian IQ system represents a substantial improvement.

While the above assesses the property rights quality of the harvesting rights embodied in the quotas another important issue is the quality of the property right in what really counts, i.e. the resource itself and its environment. IQs and ITQs, being extraction rights, form only an indirect property right in these underlying resources. Consequently, they provide the individual quota-holders with little control over the fish stocks and the marine environment and equally small protection from the interference of others (quota holders, marine predators

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7 The $Q$-values are calculated on the basis of the same parameter specifications as in the example in Table 1 above. In particular, $\alpha=\beta=\gamma=1/3$, $\delta=1$, $w_1=0.6$ and $w_2=0.4$.

8 Thus, for instance, security=0.95, permanence=0.9, transferability=0.0 and exclusivity=0.005 yields $Q=0.1$. 

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Figure 7
Iceland, New Zealand and Norway
The quality of quota property rights
and other users of the marine environment such as mining companies, polluters etc.) in these resources. In terms of the analytical framework, this means that the exclusivity, as far as these basic resources are concerned, is much reduced. Thus, it appears that the above assessment of the property rights quality of the quota rights may be unduly high. In this light Table 2 may be reworked as follows:

**Table 2**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Iceland</th>
<th>New Zealand</th>
<th>Norway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>1.00</td>
<td>1.00</td>
<td>0.90</td>
</tr>
<tr>
<td>Exclusivity</td>
<td>0.90</td>
<td>0.95</td>
<td>0.70</td>
</tr>
<tr>
<td>Permanence</td>
<td>0.80</td>
<td>1.00</td>
<td>0.50</td>
</tr>
<tr>
<td>Transferability</td>
<td>0.90</td>
<td>0.95</td>
<td>0.10</td>
</tr>
<tr>
<td>Q</td>
<td>0.86</td>
<td>0.96</td>
<td>0.44</td>
</tr>
</tbody>
</table>

As shown in Table 3, the Q-values are now much reduced. From the perspective of the underlying natural resources, i.e. the fish stocks and their marine habitat, the Icelandic and New-Zealand property rights values are now barely respectable. Indeed, these values might be compared to a typical farming property right on land which (depending on outside pollution and the regulatory framework) would typically have a Q-value in excess of 0.9. Clearly, the quality of the Icelandic and New Zealand ITQ property right is substantially inferior to this. The Norwegian IQ property right also appears quite weak.

**Table 3**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Iceland</th>
<th>New Zealand</th>
<th>Norway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>1.00</td>
<td>1.00</td>
<td>0.90</td>
</tr>
<tr>
<td>Exclusivity</td>
<td>0.50</td>
<td>0.55</td>
<td>0.30</td>
</tr>
<tr>
<td>Permanence</td>
<td>0.80</td>
<td>1.00</td>
<td>0.50</td>
</tr>
<tr>
<td>Transferability</td>
<td>0.90</td>
<td>0.95</td>
<td>0.10</td>
</tr>
<tr>
<td>Q</td>
<td>0.71</td>
<td>0.80</td>
<td>0.33</td>
</tr>
</tbody>
</table>

8. **LIMITATIONS ON PROPERTY RIGHTS**

8.1 Imperfection of property rights

In reality, property rights are quite imperfect. This applies not the least in fisheries, as is shown. Given the close relationship between economic efficiency and property rights it may be assumed that any deviation from a perfect property right results in a corresponding economic loss. Property rights are limited for two basic reasons, technical reasons and social reasons.

8.2 Technical limitations

In many cases, the available technology does not allow a definition and enforcement of the appropriate property rights, at least not at a sufficiently low cost. This applied even more so in earlier times. Technical problems of defining property rights in land, held back advances in agricultural and farming production for a long time (Demsetz 1967). In most areas of the world, progress in enclosure and enforcement technology eventually changed this (De Alessi 1999), making possible huge advances in land productivity. In modern times, valuable resources such as air and atmosphere quality (apparently excessively used for airborne emissions of various types), the ozone layer and, of course, ocean fish stocks are still devoid of adequate property rights largely for reasons inadequate technology.

As a result, indirect and imperfect property rights mechanisms must be used, such as harvesting rights in fisheries and emission rights to polluters. Since these property rights are imperfect, they will not lead to the optimal use of the corresponding natural resources.

However, just as technological progress made successive extensions of the private property rights system possible in the past, similar progress will help extend and improve private property rights the future. This applies not the least to the oceans (De Alessi 1999) where the private property rights frontier is now expanding just as in agriculture centuries ago. Of course, improvements in property rights technology would be encouraged if the potential beneficiaries of this technology were known. In an environment of no property rights, or only weak ones, it is often unclear who will receive the new and improved property rights. As a result the incentive to develop the necessary technology is correspondingly reduced. This is another example of weak property rights, but in this case, it is weak property rights within the possible new property rights.

The so-called public goods, of which roads, public parks and national defense are often-quoted examples, are by definition non-amenable to private property rights. But, on closer inspection it often turns out that there are ways to turn public goods into private goods. Road tariffs can be charged to users; admission can be charged to the users of parks and policing and even military defense (which is actually policing too) withheld from those that do not want to pay for the service.

8.3 Social limitations

There is often significant social opposition to the extension of the property rights system. Although, as argued in previous sections, improved property rights generally increase the availability of goods to society thus offering the opportunity to make everyone better off, this is not really surprising.

First, the institution or improvement of property rights almost by definition dispossesses someone. Private property rights means the exclusion of a subset of the population. Hence, an immediate impact of expanded property rights is the expropriation of prior rights, even if unused. This may be more or less dramatic depending on the details of the situation.

Second, although the opportunity exists, there is no guarantee that there will be full compensation to those dispossessed and that everyone will be better off. This depends to a large extent on who has the political and economic power in society.
Third, the establishment of new or substantially improved property rights requires an overhaul of, and even a radical shift in, the social institutions associated with the activity in question. This, inevitably disturbs the social equilibrium, reallocates social prestige, power and respect. As a result there may be opposition to the change even if everyone gains in a more narrow economic sense.

The fourth factor is general uncertainty. A substantial change in property rights structures obviously has many implications. The ultimate outcome for given individuals is clearly uncertain. Hence, if these individuals are strongly risk averse, they may be justified in opposing the change, even when the expected value is positive.

For these reasons and others, there is likely to be social opposition to extension of the system of private property rights. In many cases this kind of social opposition is actually the limiting factor in the expansion and improvement of the property rights system. In fisheries, one of the most crucial reasons for the relatively slow adoption of ITQ fisheries management system around the world is precisely this social opposition.

9. LITERATURE CITED


Scott, A.D. 2000. Moving through the narrower: from open access to ITQs and self-government.


1. INTRODUCTION

This presentation provides a bridge between the two previous more theoretical discussions of rights-based management programmes and the actual design, implementation and operation of such programmes. Although the fundamentals of rights-based programmes are quite simple their real world application can be difficult because of the peculiarities of specific fisheries and the many different objectives of management. The basic theme is that there are many ways to design a rights-based programme and none of them are inherently right or wrong in the broader context of fisheries management. However, to the extent that certain elements that are related to the nature of the rights are modified (usually to achieve other objectives of management or to correct for perceived weaknesses of the rights) it is important to consider exactly what is being forgone and what is being gained. The bottom line is that if the benefits of rights-based management are to be achieved it is critical not to remove or nullify those rights by the way the programme is implemented.

The discussion will focus on the important issues which must be addressed when designing a rights-based management programme. Some sections will focus on rights-based management in general, in others, the discussion will centre on individual transferable quota systems (ITQs). The issues under consideration are:

i. The nature of the property right
ii. Management units
iii. Determination of total allowable catch
iv. Monitoring and enforcement
v. Need for other regulations
vi. Rent extraction and cost recovery and
vii. Initial allocation

There are many options for addressing each of these issues and there is no one option that always works best for all fisheries. Which option is superior will depend upon the biological, economic and cultural aspects of the fishery for which the rights-based programme is being developed as well as on the overall management objectives.

Restrictions on ownership and transferability in rights-based management especially ITQs normally increase programme complexity and reduce the individual participant's flexibility. If such restrictions are to be considered, it is important to insure that the trade-off in terms of the achievement of other fisheries management objectives is worth the costs of the increased complexity and the reduced gains from the restricted flexibility.

Rights-based management programmes may not be appropriate for all fisheries. Like all fisheries management regimes they have their shortcomings. The fundamental question is whether or not a rights-based programme that specifically designed for a particular fishery can achieve the management objectives of that fishery better than any other type of management. For more background on rights-based management the reader is referred to Grafton (1996) Squires et al. (1995) Squires et al. (1998) all of which contain an extensive set of references.

2. THE NATURE OF THE PROPERTY RIGHT

The most basic attribute of a rights-based management programme is how the property right is denominated. What exactly does the possessor "own" and what rights does that ownership bestow. This is critical to the success of the programme in terms of biological effectiveness economic efficiency achieving distributional goals and ease of implementation and operation. There are three basic types of denominations: area, inputs and outputs.

Firstly rights can be granted to utilize a designated geographical area. Francis Christy has provided considerable discussion on this form of property right which he calls TURFs (territorial use rights in fisheries). (See Christy 1982, 1993a and 1993b). While it does not have to be the case this right normally includes control of the basic decision of how much to harvest and how the harvesting should be accomplished. This type of right may be appropriate for certain sessile species such as molluscs where relatively small areas can be harvested independently. Ideally the owner would receive all the benefits from seeding, bottom preparation, postponing harvests, etc. and would bear all the costs of improper use. Even in this special case, there will be important issues with respect to other uses of the water column such as harvest of mobile species and transportation. Area rights may also work with free swimming species in special cases such as small bays. It is important that the area be large enough to provide some control over the stocks and this could cause potential distribution issues.

Rights can also be denominated terms of inputs. Here, the owner is granted the right to use certain inputs in designated areas at specified times. The most general form would be a licence programme where the number of participants is limited. More frequently, however, the right is based on physical harvesting capacity and is measured in terms of number of boats, attributes of boats such as units of displacement or horsepower, traps, or days at sea, etc. Sometimes the notion is to limit the in-
puts such that the resultant harvest will achieve the biological objectives of management, but sometimes there are other general measures imposed on the right-holders such as closed seasons or total allowable catch limits.

Finally rights can be denominated in terms of outputs whose owners are granted the right to harvest a specific amount of fish each year. These programmes are called individual transferable quotas or sometimes, individual fishing quotas. Basically the total allowable catch is divided into small parts and allocated to individual participants. These shares can be bought sold and leased so that the individual owners have flexibility in planning their fishing activities.

While the actual construction and implementation of an ITQ programme can be a complex process the basic idea is quite simple. The three words - individual transferable and quota - which comprise the term ITQ tell the whole story although it is most useful to describe them in a different order.

**Quota:** An ITQ programme is based on an annual Total Allowable Catch (TAC). Biological concerns for the current size of the fishstock and for how it will change over time are addressed by limiting the total amount of annual fishing mortality. The procedure for setting the annual TAC in an ITQ programme is fundamentally the same as for any other TAC based management regime.

**Individual:** Instead of an open race for the TAC however an ITQ programme allocates shares to individual participants. Each participant is given the right to harvest a certain amount of fish each year, usually as a percentage of the TAC. It is useful to distinguish between the share right itself which is permanent and the Annual Harvesting Rights (AHRs) which allow for a specific amount of harvest each year. The basic rationale for individualized quotas is to insure that the TAC is maintained and at the same time to maximize the flexibility and individual control of the participants. Most traditional management programmes allow all interested parties to participate but to control total harvest by restricting where when and how they operate or by shutting down the fishery when a TAC is reached. The basic premise of ITQs is to regulate the amount each participant can take but to allow them to catch where, when and how they want. This avoids the race for fish which exists in fisheries regulated only by total allowable catch limits. They also avoid the complex rules used in fisheries regulated using gear restrictions or area and seasonal closures. Both the race for fish and the complex rules can have deleterious effects on profit product quality and biological effectiveness.

**Transferable:** To increase flexibility for the participants the individual quota shares are transferable. Individuals can buy, sell or lease the right to catch the fish. This allows participants the freedom to operate at the scale they think is most advantageous. For example, people can buy more rights if they think they can operate more efficiently on a bigger boat or if they can obtain a better price by being able to meet purchase orders throughout the year. Alternatively people can sell if they choose to run a smaller operation or they may sell out completely if they choose to retire or go into another business. At the same time new participants can enter the fishery by buying fishing rights.

In summary, ITQs are a regulation tool that can simultaneously address the biological aspects of management and avoid some of the problems of traditional management techniques. ITQs provide operators with the flexibility to increase their profits by lowering their costs (by finding the most efficient way to harvest fish) and by increasing their revenues (by selling their products at those times and in those markets where prices are higher). This flexibility arises because fishery managers do not have to tell the harvester how to operate. The manager's job can also be easier because he does not have to worry about Derby openings or about trying to figure out ways of keeping the catching power of a fishing fleet to a level that does not overfish the stock. By facing the allocation decision at the outset the dual questions of how much to catch and who can catch it are separated. This separation leads to a system which can provide incentives for matching the fishing power of the fleet to the productivity of the fishstocks.

This is not to say that ITQs do not have their problems. There are drawbacks especially in certain types of fisheries. One special issue is that ITQs are a relatively new and fundamentally different way to manage fisheries even though similar concepts are used in other types of resource management.

Depending on the exact nature of the input denomination a system that is analogous to ITQs is possible. For example, if traps or days at sea are the unit of measure it is possible to have an individual transferable trap programme or an individual days at sea programme. Individuals can increase or decrease their holdings of the rights to match the capability of their vessel or their desired level of activity. Denomination in terms of vessels or other "macro" elements does not have this potential.

There is no ironclad rule that a rights-based management system will achieve the management objectives of a particular fishery better than one of the traditional types of management. However, as made clear in the first two lectures there are good reasons to believe that a rights-based system will provide significant potential benefits and should be considered. Similarly there are no ironclad rules about which type of denomination - area, input or output - will work best when designing a rights-based system. Area rights may work very well in certain types of fisheries but will have many drawbacks in other types. In choosing between input and output based ITQs, an output based system has some important advantages. For one thing ITQs are based on a traditional form of management - total allowable catch limits which, to the extent they can be enforced, have the potential to achieve biological objectives. There is a more tenuous relationship between other regulations (such as gear restrictions, closed areas and closed seasons) and the actual total harvest, especially as participants have the time to change.
their boats, gear and activities in response to the regulations. In addition, ITQs provide incentives to choose the most efficient combination of inputs to obtain the harvest and to plan the harvest activity such that the fish can go to its highest valued use. Input controls by their nature restrict input choices and thus provide incentives to use non-restricted inputs if these will increase harvest. This will result in higher costs and will sometimes affect product quality.

These conceptual advantages will however not always be obtained, especially if it is difficult to set total allowable harvests, or if it is difficult to monitor the individual harvest of many participants landing fish over widely dispersed areas. The type of denomination that will work best depends upon the nature of the fishery and the objectives of management.

There are other dimensions of the rights which can have an effect on the success of the programme in addition to the denomination of the rights. The exact nature of the ownership right can have many facets some subtle and others overt. The nature of the right can be changed or limited to accomplish biological managerial or cultural objectives - any of which may be fully within the purview of overall fisheries management. However, it is important to compare what is being gained by meeting these other objectives to what is being lost by the diminished flexibility which often results from limiting the right.

3. ISSUES RELATING TO THE NATURE OF THE PROPERTY RIGHT

3.1 Eligibility to own

Should any legal entity be allowed to own the right or should ownership be limited to natural persons or to specific types or groups of persons? On the one hand preventing corporations or the general public from participating may help maintain industry and community structure and may prevent the possibility of absentee “sea lords”. At the same time the limited flexibility may prohibit rights-owners from having the opportunity to organize their activities to their best advantage and this may adversely affect the efficient use of fishstocks or the accomplishments of other fisheries management objectives.

Options

i. allow any legal entity the right to own rights
ii. allow only persons the right to own ITQ shares and
iii. establish other restrictions on eligibility, such as banning foreign ownership or requiring that only bona fide fishermen or individuals from certain areas or who use certain types of gear can own rights.

3.2 Duration of ownership right

Should the ownership right be permanent or should it be for some limited period? In some programmes, such as ITQs in the USA the ownership right can be guaranteed at most only as long as the management plan which implemented the programme is in effect. An ITQ programme can be eliminated if the fishery management council develops a new plan that meets all the standards in the law, including that the change will be an improvement over the status quo. In other countries, ITQ programmes are part of the fisheries law itself. By allowing the ownership right to be as permanent as current policy allows the right-owner will have the secures possible planning horizon and will have better incentives to make efficient investments in harvesting and processing equipment and to develop market channels. On the other hand, there may be hesitation to make long term plans if rights may be given to someone else at a later date.

However, managers may wish to set limits on ownership rights to maintain some long term control over the fishery. By setting a term of 3 years, managers will have the opportunity to reassign rights if it feels current owners are not using them properly. However, doing so would require that they face the difficult distributional task of reallocating the rights at regular intervals.

Options

i. ownership rights can be assigned permanently
ii. ownership rights can be assigned for the duration of the existing management plan
iii. ownership rights can be assigned for fixed periods subject to renewal if specified criteria are met and
iv. ownership rights can be temporary initially but after a trial period made permanent.

3.3 Transferability I

A fundamental issue is whether rights should be transferable at all. Some argue that making the rights transferable is not appropriate because it is a permanent and (oftentimes) free consignment of a public resource to a private individual. In this view, transferability just offers the possibility of certain individuals obtaining wealth from a “public resource”. However, restrictions on transferability would constrain the flexibility of owners which is one of the potential advantages of rights especially ITQs. Additionally, with no transferability, the agency must devise ways to reallocate the right once an owner has died or retired from fishing. Without transferability, the allocation question must be faced over and over again.

Options

i. Rights can be fully transferable by sale, lease, gift, inheritance. In the case of ITQs both the share-right itself and the AHR can be fully transferable by sale, lease, gift, inheritance, or through joint-harvesting arrangements.
ii. Rights can be sold but not leased. In the case of ITQs the share-right may be transferable but the AHR may not be sold. This will prevent the emergence of absentee “sea lords”.
iii. Rights can be leased but not sold. In the case of ITQs the share-right may not be sold but the AHR annual harvest right is transferrable perhaps with some restrictions. This will allow flexibility for emergencies such as illness or vessel breakdowns.
iv. Rights can be made non-transferable. The individual who receives the right is the only one that may harvest the fish.
3.4 Transferability II

Even if rights are to be transferable some would argue that limitations on the types of trades that are permitted may be justified in certain circumstances. The initial allocation will likely include individuals who differ by gear type, boat size, firm size, type of final product, home port, etc. Free transferability among all such individuals may result in changes in the industrial or cultural aspects of the fishery which managers may wish to prevent. Restrictions on transfers between specified groups may help prevent such changes. However, they will also limit the flexibility of ITQ owners and in the long-term could become a stifling influence on the development and utilization of the fishery as a whole.

Options
i. Place no restrictions on the transferability of rights among different groups of owners and
ii. Determine critical groupings of participants and prohibit or restrict purchases leases etc. between members of these groups.

3.5 Ownership caps and restrictions

There is some concern over the potential of certain entities obtaining “excessive shares” of the rights when implementing ITQ programmes and the problem may be relevant for other types of rights as well. Although there is no clear definition of what an excessive share is, it normally refers to market power for ex-vessel fish, final product, or even ITQ shares. It could also refer to the general historical industrial and cultural make up of the fishery. Managers can take specific actions to address these issues or they may determine that other applicable laws are sufficient for doing so. For example in many countries existing antitrust law addresses problems of excess market power in industry including fisheries and managers may conclude that this is adequate. On the other hand, managers may have an interest in directly addressing such issues in the construction of a rights-based programme because of the fear that antitrust law may not be applied to the fishery in a routine manner or that the appropriate criteria for excessive shares may differ from that in the antitrust law. If this is done, however, the difficulties of defining market power and of measuring the gains and losses of various actions, such that they can be approved as part of a management plan should not be underestimated.

Options
i. Leave excessive share problems to antitrust law.
ii. Place caps on the percentage of ITQs for a particular management plan or for a particular stock within a management plan that any one entity can own.
iii. Place other restrictions on how firms or individuals can combine to harvest the ITQ. For example, limit the percentage of total catch that can be landed by one boat or landed in one port.

4. MANAGEMENT UNITS

4.1 How many species in the quota system

Defining the management unit or units is an important part of any fisheries regulation programme. This is no less true with a rights-based programme. A management unit in an ITQ programme is the species, stock or aggregation for which a TAC is specified and for which harvesting rights are distributed. In the Surf Clam and Ocean Quahog ITQ programme there are only two units: Surf Clams throughout their range and Quahogs throughout their range. At the other extreme, the proposed ITQ programme for Alaskan Sablefish and Halibut has many management units. Each stock consists of several geographic areas. Selecting and defining the management units for an ITQ programme is an important step. The success of the programme can depend critically on how well it is done. There are two types of questions pertaining to the selection and definition of the management units that must be answered.

The first question is: How many species should be included in the programme? If different species are biologically or commercially related there may be grounds for managing them jointly under the ITQ programme. Some of the considerations that need to be addressed are: (a) Are the species caught as a bycatch or as a directed catch with the same gear or by the same fleet? (b) Are there ecological or spawning relationships between the species? Care must be taken when selecting the stocks as there are two types of errors that can be made. An error of exclusion occurs when a species that is closely related to those in the ITQ programme is left out. This makes it difficult to appropriately manage the species that are in the programme and/or the one that is left out. For example if the catch of a species which is not covered in an ITQ programme has a significant bycatch of a species which is included it may be quite difficult to account for bycatch mortality. On the other hand, an error of inclusion occurs when a minor or unrelated species is included in the programme. Determining and enforcing the TAC for such a species can involve more work and managerial repercussions on the major species than the gains from managing the minor stock are worth.

The second question is: How should each of the included species be classified? There may be several stocks or geographically distinct units of the same species. If so it may be appropriate to have a separate TAC for each. At the other extreme, there may be certain groups which may be treated as aggregations for management purposes even though they consist of separate species. Rockfishes in Alaska are a good example. These aggregations can have a joint TAC.

Here again the decisions are critical. An error of conglomeration can occur if biologically distinct stocks are not separated. A single overall TAC on two separate stocks may put too much pressure on one stock if it is closer to port or has a higher catch-per-unit of effort. On the other hand, the error of excessive specificity may occur if the different species are divided into too many stocks because the programme can become unwieldy and difficult to manage.

There is definitely a trade-off in answering these two questions. The larger the number of stocks that are included, the more detailed the management becomes, but the more complex it becomes.
cluded in the programme the more inclusive the system will be and the lower will be the need for a separate management programme to handle species and stocks that are not included. And, the more finely the quota share stocks are geographically defined the easier it will be to focus management on narrowly defined species or species groups if there are biological technological or distributional reasons for doing so. However, the larger the number of area divisions, the more complex and difficult it will be to manage the ITQ programme. There will be more TACs to set, and the monitoring programme will have to distinguish landings according to the stock from which they were harvested.

If there is only one directed fishery or if there are many truly independent directed fisheries the actual operation of an ITQ system is fairly straightforward. For the most part, the core of the problem is the selection of which species to include and how to enforce the independent TACs once that decision is made. There are special implementation and operational problems when using ITQs with interrelated species, however.

4.2 Handling bycatch

A bycatch fishery is where the harvest of one species results in the catch of another. The actual percentage composition of catch may vary depending upon type and disposition of gear, area, depth and time of fishing. But, harvest of only the directed species will be a rare occasion. Interdependent directed fisheries are where certain species can be targeted relatively cleanly, but which result in occasional harvests of other species. Because of the vagrancies of Mother Nature and of the men and equipment used to catch fish, this occasional non-target harvest is almost ubiquitous in marine fisheries.

For the most part, marine fisheries can be classified into these two groups. Bycatch fisheries result in the harvest of more than one species, and interdependent directed fisheries will occasionally result in the harvest of other than the target species. The problems of ITQ management in bycatch fisheries are present, though to a limited degree in interdependent directed fisheries. The following discussion will be primarily in terms of bycatch fisheries but the applications to interdependent bycatch fisheries are obvious.

The fundamental issue in an ITQ system in a bycatch fishery is the selection of which species to include. ITQ systems are driven by biologically determined TACs. And since the ratio of TACs will only balance with the average bycatch ratios by chance, one inherent problem is that it will not be possible to simultaneously and exactly meet the TACs for all species.

It has been argued that a major advantage of ITQ programmes is that they are output based. Outputs are normally easier to measure than inputs and so enforcement is easier. Just as important the system provides incentives to use the minimum cost combination of inputs. However, with bycatch fisheries the optimal operation may be in terms of multiple activities (i.e. so much effort directed at species 1, so much at species 2 and so much general effort, etc.). Therefore managing a bycatch fishery in terms of output is not as straightforward as it is with independent species.

The purpose of this discussion is to describe the problem of species selection and the complications which can result when rules are instituted to mitigate some of the enforcement difficulties which result from that selection. It will prove useful to use a simple two species example. Assume that the desired mortality for two interrelated species 1 and 2, are 1000t and 100t respectively but the bycatch ratio between them is 5 units of species 1 for every unit of species 2.

While this example masks some of the complexities, it allows some important but often-ignored points to be made quite clearly. One option is to only include species 1 in the ITQ programme and put no constraints on the harvest of species 2. This implicitly says that species 2 is not worth “saving” or rather that the full potential harvest of species 1 is more important than maintaining a high stock level for species 2. Setting the TAC of species 1 to 1000t the mortality and landings of the two species for at least the first year will be as indicated by Result 1 in Table 1. If the “safe” catch of species 2 is really 100t then ultimately its stock will be reduced and its safe catch level will fall accordingly.

If for biological or economic reasons it is determined that the stock of species 2 should not be allowed to fall then it should be included in the ITQ programme. However, inclusion of a species in the programme by itself is not enough. If both species are included and the TACs are set to the desired mortality and the programme is perfectly enforced the mortality and landings will be as indicated in Result 2: Species 2 will be maintained but at the expense of 500t of annual harvest of species 1.

Perfect enforcement in this instance would include dockside monitoring to insure that individual, and hence total quotas, are not surpassed. But in addition it would be necessary to have a no-discard policy and onboard observers or other mechanisms to insure that all fishing mortality is counted.

For example, without an enforced discard policy, mortality and landings would be as indicated in Result 3 in Table 1. Participants would take the TAC of species 1 which would result in the harvest of 200t of species 2. Since that harvest would be above the permitted landings the rest would be discarded. As far as the health of species 2 is concerned, there is no difference between an imperfect enforcement policy and not including species 2 in the ITQ programme. The only difference would be economic in that while the mortality would be 200t a year only half would be landed. The rest would be wasted as discards.
An exception would occur when the catches of both species are needed to cover the variable costs of a fishing trip. In that case, perfect enforcement of landings is enough. After the quota of species 2 is taken, fishermen would not continue to operate because it would not be economical to fish only for species 1.

In instances where the set of TACs in a multi-species fishery is not compatible with bycatch ratios there will be considerable pressure from rights-owners to make some changes. An often-heard plea is to increase the binding TAC which in this case would mean an increase in the TAC for species 2 up to 200t. Such a move will produce Result 1, the same thing that would have happened if species 2 were left out of the programme. Obviously the only change in TAC that would be consistent with preserving species 2 and which would allow TACs to equal actual landings would be to reduce the TAC of species 1 to 500t. It is not surprising that this is not advocated by industry.

Another suggested method to mitigate the restrictions on industry is a bycatch trade-off programme where AHR for one species can be traded for AHR of another at a specified trading ratio. In the context of the current example when individuals run out of AHR for species 2 which would occur when harvest equals 500t of species 1 and 100t of species 2 they would be able to trade some of the remaining 500 AHRs for species 1 for AHRs for species 2. The amount of species 1 AHR that would be traded and the harvests it would allow will depend upon the bycatch ratio and the trade-off ratio. This can be demonstrated as follows:

Let $\alpha_c$ be the bycatch ratio as defined as the amount of species 1 caught with every one unit of species 2. Let $\alpha_t$ be the trade-off ratio as defined as the amount of species 1 AHR that must be traded to obtain 1 unit of AHR for species 2. Let $H_2$ be the amount of species 2 AHR that are obtained in the trade-off and let $H_1$ be the amount of species 1 AHR that are maintained and used for harvest after the trade. Since there will be 500 units of species 1 AHR available for trade the following relationship must hold.

$$H_1 = 500 - \alpha_t H_2$$ (1)

In order to abide by the constraints of the system the relationship between $H_1$ and $H_2$ must correspond to the bycatch ratio.

$$H_1 = \alpha_c H_2$$ (2)

Substituting (2) into (1) and solving for $H_2$ gives

$$H_2 = \left[ 1/(\alpha_c + \alpha_t) \right] \times 500$$

Using (2) it follows that

$$H_1 = \left[ \alpha_t/(\alpha_c + \alpha_t) \right] \times 500$$

The amount of species 1 annual harvest rights (AHR) traded is 500- $H_1$ or

$$\text{Amount traded} = \left[ \alpha_t/(\alpha_c + \alpha_t) \right] \times 500$$

<table>
<thead>
<tr>
<th>Result</th>
<th>Landings</th>
<th>Actual mortality</th>
<th>Desired mortality</th>
<th>Mortality over/under</th>
<th>Discard waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species 1</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Species 2</td>
<td>200</td>
<td>200</td>
<td>100</td>
<td>+100</td>
<td>0</td>
</tr>
<tr>
<td><strong>Result 2 - Legal fishing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species 1</td>
<td>500</td>
<td>500</td>
<td>1000</td>
<td>-500</td>
<td>0</td>
</tr>
<tr>
<td>Species 2</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Result 3 - Illegal fishing</strong></td>
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<td></td>
</tr>
<tr>
<td>Species 1</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Species 2</td>
<td>100</td>
<td>200</td>
<td>100</td>
<td>+100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Result 4 - Trade ratio 1/1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species 1</td>
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<td>917</td>
<td>1000</td>
<td>-83</td>
<td>0</td>
</tr>
<tr>
<td>Species 2</td>
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<td>183</td>
<td>100</td>
<td>+83</td>
<td>0</td>
</tr>
<tr>
<td><strong>Result 5 - Trade ratio 5/1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species 1</td>
<td>750</td>
<td>750</td>
<td>1000</td>
<td>-250</td>
<td>0</td>
</tr>
<tr>
<td>Species 2</td>
<td>150</td>
<td>150</td>
<td>100</td>
<td>+50</td>
<td>0</td>
</tr>
<tr>
<td><strong>Result 6 - Trade ratio 10/1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Species 1</td>
<td>667</td>
<td>567</td>
<td>1000</td>
<td>-333</td>
<td>0</td>
</tr>
<tr>
<td>Species 2</td>
<td>133</td>
<td>567</td>
<td>100</td>
<td>+33</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 2 displays the results of these trades for various trade-off ratios in this case. The number traded and \( H_1 \) always sum to 500 and except for rounding errors the ratio of \( H_1 \) to \( H_2 \) always equals the bycatch ratio. The higher the trade-off ratio, the more units of species 1 AHR will have to be “traded” to keep fishing legally and the lower will be the amount by which the actual catch of species 2 exceeds the TAC.

This can be seen more clearly by comparing results 4, 5 and 6 in Table 1. The basic notion of bycatch trade-off programmes is to discourage individuals from fishing illegally by discarding species 2 after the AHRs have been used up, see result 3. By comparing results 3 and 4 it can be seen that bycatch trade-off programmes do have some potential advantages. First the over-run of the TAC for species 2 is reduced and discarding is eliminated however, this comes at the expense of giving up some of the safe harvest of species 1. By comparing what happens with higher trade-off ratios in results 5 and 6, it can be seen that as the trade-off ratio is increased the fishery is pushed from result 3 to result 2. There is no doubt however that trade-off programmes do produce the same kind of result, although at different levels than leaving species 2 out of the programme all together.

However, the results are more complicated than this because it is necessary to take into account the economic incentives involved. Whether rights holders will participate in a trade-off programme will depend, at least in part, upon the effect it will have on net earnings. Consider the four cases presented in Table 3. Given a trade-off programme, technically participants have four options. They

### Table 2

<table>
<thead>
<tr>
<th>Trade ratio</th>
<th>1/1</th>
<th>2/1</th>
<th>3/1</th>
<th>4/1</th>
<th>5/1</th>
<th>6/1</th>
<th>7/1</th>
<th>8/1</th>
<th>9/1</th>
<th>10/1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number traded</td>
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<td>143</td>
<td>188</td>
<td>222</td>
<td>250</td>
<td>273</td>
<td>292</td>
<td>308</td>
<td>321</td>
<td>333</td>
</tr>
<tr>
<td>( H_1 )</td>
<td>417</td>
<td>357</td>
<td>312</td>
<td>278</td>
<td>250</td>
<td>227</td>
<td>208</td>
<td>192</td>
<td>179</td>
<td>167</td>
</tr>
<tr>
<td>( H_2 )</td>
<td>83</td>
<td>71</td>
<td>63</td>
<td>56</td>
<td>50</td>
<td>45</td>
<td>42</td>
<td>38</td>
<td>36</td>
<td>33</td>
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</tbody>
</table>

### Table 3

<table>
<thead>
<tr>
<th></th>
<th>Species 1 (t)</th>
<th>Species 2 (t)</th>
<th>Revenue ($)</th>
<th>Effort</th>
<th>Cost ($)</th>
<th>Net revenue ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal</td>
<td>500</td>
<td>100</td>
<td>6200</td>
<td>1</td>
<td>4250</td>
<td>1950</td>
</tr>
<tr>
<td>Discard</td>
<td>1000</td>
<td>100</td>
<td>11200</td>
<td>2</td>
<td>8500</td>
<td>2700</td>
</tr>
<tr>
<td>Trade-off</td>
<td>750</td>
<td>150</td>
<td>9300</td>
<td>1.5</td>
<td>6375</td>
<td>2925</td>
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<tr>
<td>Trade all</td>
<td>0</td>
<td>300</td>
<td>3600</td>
<td>3</td>
<td>12750</td>
<td>-9150</td>
</tr>
</tbody>
</table>

b) Bycatch ratio: 10/1 Trade-off ratio: 5/1 Price species 1: $10.00 Price species 2: $12.00

<table>
<thead>
<tr>
<th></th>
<th>Species 1 (t)</th>
<th>Species 2 (t)</th>
<th>Revenue ($)</th>
<th>Effort</th>
<th>Cost ($)</th>
<th>Net revenue ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal</td>
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<td>100</td>
<td>6200</td>
<td>1</td>
<td>4250</td>
<td>1950</td>
</tr>
<tr>
<td>Discard</td>
<td>1000</td>
<td>100</td>
<td>11200</td>
<td>2</td>
<td>8500</td>
<td>2700</td>
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<tr>
<td>Trade-off</td>
<td>667</td>
<td>133</td>
<td>8267</td>
<td>1.33</td>
<td>5667</td>
<td>2600</td>
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<tr>
<td>Trade all</td>
<td>0</td>
<td>200</td>
<td>2400</td>
<td>2</td>
<td>8500</td>
<td>-6100</td>
</tr>
</tbody>
</table>

c) Bycatch ratio: 10/1 Trade-off ratio: 5/1 Price species 1: $10.00 Price species 2: $18.00

<table>
<thead>
<tr>
<th></th>
<th>Species 1 (t)</th>
<th>Species 2 (t)</th>
<th>Revenue ($)</th>
<th>Effort</th>
<th>Cost ($)</th>
<th>Net revenue ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal</td>
<td>500</td>
<td>100</td>
<td>6800</td>
<td>1</td>
<td>4250</td>
<td>2550</td>
</tr>
<tr>
<td>Discard</td>
<td>1000</td>
<td>100</td>
<td>11800</td>
<td>2</td>
<td>8500</td>
<td>3300</td>
</tr>
<tr>
<td>Trade-off</td>
<td>667</td>
<td>133</td>
<td>9067</td>
<td>1.33</td>
<td>5667</td>
<td>3400</td>
</tr>
<tr>
<td>Trade all</td>
<td>0</td>
<td>200</td>
<td>3600</td>
<td>2</td>
<td>8500</td>
<td>-4900</td>
</tr>
</tbody>
</table>

d) Bycatch ratio: 10/1 Trade-off ratio: 5/1 Price species 1: $10.00 Price species 2: $150.00

<table>
<thead>
<tr>
<th></th>
<th>Species 1 (t)</th>
<th>Species 2 (t)</th>
<th>Revenue ($)</th>
<th>Effort</th>
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<td>100</td>
<td>20000</td>
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<td>4250</td>
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<tr>
<td>Discard</td>
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<td>100</td>
<td>25000</td>
<td>2</td>
<td>8500</td>
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</tr>
<tr>
<td>Trade-off</td>
<td>667</td>
<td>133</td>
<td>26667</td>
<td>1.33</td>
<td>5667</td>
<td>21000</td>
</tr>
<tr>
<td>Trade all</td>
<td>0</td>
<td>200</td>
<td>30000</td>
<td>2</td>
<td>8500</td>
<td>21500</td>
</tr>
</tbody>
</table>

Illegal by discarding species 2 after the AHRs have been used up, see result 3. By comparing results 3 and 4 it can be seen that bycatch trade-off programmes do have some potential advantages. First the over-run of the TAC for species 2 is reduced and discarding is eliminated however, this comes at the expense of giving up some of the safe harvest of species 1. By comparing what happens with higher trade-off ratios in results 5 and 6, it can be seen that as the trade-off ratio is increased the fishery is pushed can fish legally which means they will stop fishing when the TAC for species 2 is taken. They can fish illegally, which means they will continue to fish after the TAC for species 2 is taken and land only species 1. Third, they can participate in the trade-off programme and trade away some of the “extra” AHRs for species 1. Finally, they can trade away all of their AHRs for species 1. The cases show the net returns for each of this options for different trade-off ratios or prices for the two species. To keep
things simple the amount of effort used to harvest legally is defined to be 1 and it has an assumed cost of $4250.

In the first case in Table 3a, the trade-off ratio is 5/1 and the prices for species 1 and 2 are $10 and $12 respectively. Without enforcement at sea, there will be incentives to fish illegally and discard the catch of species 2 above the TAC. This will take twice as much effort as fishing legally, but the returns for landing the extra 500t of species 1 are more than the extra cost. Note that this would not be the case if the cost for effort were above $5000, the marginal return for continuing to fish after the TAC for species 2 is achieved.

In this case participating in the trade-off programme will increase net returns. Trading away some of the AHR for species 1 will reduce the amount of effort that will be needed and this, plus the difference in revenue from the loss of some species 1 but the gain of some species 2, combine to produce higher net returns. If the trade-off ratio were increased to 10/1, perhaps on the notion that more protection for species 2 is needed. (Table 3b), the change may not have the desired results because given the changes in the allowable harvest levels and the required amount of effort the returns from participating the programme are less than fishing illegally.

Tables 3c and 3d are the same as Table 3b except that the price of species 2 is increased. The results can be generalized as follows. For a given trade-off ratio and cost of effort the incentives offered by trade-off programmes will depend upon the relative value of the bycatch species. If it has a relatively low value there will be no incentive to participate because there will a loss of revenue from trading species 1 for species 2. For intermediate relative values, there can be gains from trading species 1 AHRs to make the landing of species 2 legal. In the extreme case of very high relative values, there will be incentives to trade all of the annual harvest rights for species 1 and only land species 2. This will produce exactly the opposite of the desired result of lowering mortality on species 2.

4.3 Catch surrender programmes

Another option to address this problem is a surrender programme where inadvertent catches of a species for which no quota is held may be surrendered to the government with no penalty. The purpose is to discourage discards without encouraging further catches. With a surrender programme the mortality and landings will be as in Result 1. It is better than the no observer option which produced Result 3, because all fish that are killed are landed. However, it is no different biologically than leaving species 2 out of the system altogether.

To summarize: once the species to include in the system have been selected the basic problem is to avoid over catching any of the quotas while at the same time providing the opportunity to harvest as much of the main species as any restrictive bycatch quotas will allow. However, once a decision has been made to include a species any concession to mitigate the under harvest of some TACs will in effect reverse the decision to include the species in the first place. One could argue that if a species is going to be left out of the programme it should be an explicit decision. This will allow for a more objective basis for judging the programme on its real objectives and it will also avoid the use of the unnecessary and potentially costly mitigating rules.

While the above discussion in terms of fixed bycatch ratios allows for the strongest possible statement of the problems, the conclusions must be moderated for real world policy application. For example, with a bycatch ratio ranging from 10/1 to 3/1 depending upon the gear, location, or time fished, a perfectly enforced no discard policy would provide incentives to fish such that the amount of directed catch per unit of bycatch is maximized. Therefore over time, through the transfer of ITQs to those with higher ratios or through research into methods to increase bycatch ratios, the bycatch constraints on directed catch will become less binding. Those fishermen with higher ratios or those who are able to develop them can take more directed catch with each unit of bycatch and hence will be able to pay more for each unit of AHR for the bycatch species.

In addition there are some very strong advantages to surrender programmes. With interdependent species it is possible to harvest significant amounts of species that are not being directly sought. If people will be penalized for landing fish for which they have no quota then these catches will be discarded. Allowing industry to land them and perhaps paying them a small "handling fee" to cover any out of pocket costs of getting the fish to shore may prevent significant waste. On the other hand a surrender policy in a bycatch fishery where there is a regular, but not constant, amount of a secondary species caught with a directed species will essentially allow unlimited catch of the secondary species. This is especially true if the directed species has a high price relative to the variable costs of fishing. It comes down to a question of which is worse: potentially allowing a stock to be damaged by un-enforceable no discard rules, or absolutely letting it be damaged by allowing open fishing on the stock with a surrender policy.

Whether surrender programmes are appropriate or not will likely depend on the exact nature of the fisheries involved. All else equal, they are more likely to be advantageous in interdependent fisheries than in bycatch fisheries. However, they still may work with bycatch fisheries to the extent that intent to over-catch the secondary species can be determined such that penalties can be validly applied.

Another related issue is the need for retroactive trading. In its most simple terms retroactive trading occurs when fishermen are allowed to purchase or rent AHR after they have already landed the catch. It can easily be seen that this could be an alternative or a supplement to a surrender programme. If firms land extra bycatch, they then have the option of trying to purchase sufficient AHR after the fact: if they cannot they are forced to surrender it.
The case for retroactive trading is normally based on two related arguments. Since accidental catches do occur, fishermen should have the opportunity to keep rather than surrender them if AHR is available. This is especially true in that if they do obtain AHR, then the catch will be part of the legal total allowable catch. If they just surrender it, the fish are dead but others still have the right to go out and catch more even if the current sum of legal catch and surrender catch is greater than the total allowable catch. Basically the argument is that every opportunity should be given to make the catch count as part of the TAC. However, there are some drawbacks to retroactive trading.

In extreme, retroactive trading means that fishing can be done "on speculation". Vessels cruise with or without AHR of their own and when they come upon stocks they begin to harvest hoping that they will be able to buy AHR for their catch when they return to shore. If enough people do this, it is possible that total landings can be more than the TAC and it will be impossible for all to obtain AHR. Those that do not will surrender the catch. Although all fishing activity is legal, the catch is higher than the safe TAC. The possibility of this occurring should be grave news to a fisheries manager.

When building contractors build homes "on speculation" it is possible that some may not be sold and the firm may go bankrupt. However, fishing firms' over-optimism under a retroactive trading programme will have social as well as private consequences. The overall effect could be the depletion of the fishstock. None of the participants own the stock and hence do not take its value into account when making the financial decision to speculate by harvesting without AHR. Granted they are limited by the expected returns relative to the variable costs of fishing but they will not consider the total social costs of their actions.

Therefore it appears that retroactive trading should be allowed only in restricted circumstances. It should only be allowed for those species where surrender programmes are used; otherwise it loses its main justification. Further it may be wise to disallow it for interdependent species just to prevent people from taking too many "accidental" catches of directed species for which they have no AHR. Finally it may be wise to assess non-trivial fines for that catch for which no AHR can be obtained by the end of the trading year. This would lessen the incentives to fish on speculation.

5. THE DETERMINATION OF THE TOTAL ALLOWABLE CATCH

Because the TAC is the main biological component of an ITQ programme, it is essential that it is set with care. TACs are used in many other types of fisheries management programmes, whether as actual binding limits or as implicit or explicit targets to be achieved using gear restrictions, season closures, etc. For the most part, the rules and procedures for developing TACs under other programmes can apply under ITQ programmes as well. The basic idea is to set a total fishing mortality level that is a balance between what can be taken this year and what should remain to grow and reproduce for future years. Application of this principle will vary according to the population dynamics and the current status of the stocks under consideration. This may involve a stock rebuilding plan if an ITQ programme is instituted in an over-fished stock, where the TAC is kept low until the stock rebuilds. In such cases the policy relationship between stock size and the TAC should be set out in advance.

There are some facets of TAC determination under an ITQ programme that merit special consideration. One important issue is the definition of the harvest-right especially when TACs will likely vary from year to year. The right to harvest cannot be defined in terms of a constant amount of fish each year. In the extreme case this would mean that the TAC which by definition is the sum of the individual quotas of all participants could never change. The right to harvest a particular stock must depend upon the current productivity of the stock. Therefore ITQ programmes work better if the individual rights are defined in terms of a percentage of the TAC. As the TAC goes up or down according to biological conditions, the individual right to harvest in terms of actual catch will vary accordingly.

Another issue is how to set TACs in those fisheries which have not previously used them. In newly developing fisheries, the accumulated biological data may be insufficient. In other fisheries, current management may be based on the notion that biological issues can be addressed without using TACs. For example, they have not been used with shrimp which are essentially an annual crop the size of which depends upon factors other than the number of spawners, and so recruitment overfishing is unlikely.

If ITQs are to be used in these situations, the relevant question is: Are the gains from a reduced race for fish and increased flexibility of participants worth the effort and possible drawbacks of instituting TACS? In developing fisheries is the information available sufficient to balance between setting the TACs too high and adversely affecting future catches and setting them too low so that current harvests are unduly restricted?

Another consideration pertaining to TAC-setting is the relationship between TAC determination and the other components of the ITQ programme. As noted, there is a wide range of issues to be considered in selecting the number and make up of the management units, and one that deserves special mention is the basis for determining a TAC. There needs to be sufficient theory and data to set a credible TAC for a certain species in a specified geographical area. If the problem is a lack of data, it can potentially be overcome. However, if the management unit is defined purely on political grounds the problem of a credible TAC will remain. In summary another drawback to expanding the number of management units is the in-
increased data needs and work load of setting one more TAC.

The setting of TACs can also be related to certain enforcement problems. If it is likely that highgrading and bycatch discards will result in a fishing mortality that is significantly different from landings, and if there are no other satisfactory ways of correcting for this, adjustments in TACs may be appropriate. For example, if participants can be expected to discard smaller less valuable fish of a particular species and if the smaller fish normally represent 10% of the catch, the TAC can be reduced by 10% of what it otherwise would have been.

While the basics of TAC-setting in ITQ fisheries should be the same as in non-ITQ fisheries, there are some exceptions. For example, if non-owners participate in the TAC-setting process they may argue for higher TACs than are justified in order to lower the price of acquiring share rights or AHR. On the positive side, it may be possible to allow rights-owners more power to set TACs so that the net present value of harvest over time can be considered, rather than just focusing on biologically safe TACs.

6. MONITORING AND ENFORCEMENT

Fisheries management systems are only as good as their monitoring and enforcement systems. This is as true of ITQ systems as of other types of management. However, there are some fundamental differences in the formulation and operation of a suitable monitoring and enforcement system for an ITQ programme. ITQ systems, as for other TAC-based programmes, must have a way to monitor the total harvest and ensure that it does not surpass the TAC. In addition, it is necessary to monitor the harvest of each participant and to ensure that it does not surpass their annual harvest rights. With transferability, it is also necessary to keep track of the current amount of share rights and AHR owned by each participant. While these extra burdens may seem formidable, it is necessary to evaluate an ITQ management and enforcement system relative to the other options for management and relative to the potential management benefits of an ITQ programme. Will overall monitoring and enforcement costs be higher or lower? Even if the costs are higher are the accomplishments of ITQ management worth it?

The successful operation of an ITQ programme requires that the monitoring system be seen as capable of detecting abuse. Participants must be confident that others cannot beat the system and thus diminish the value of their rights. In addition the participants must know that the system will detect any misconduct on their own part so incentives to cheat are small. This does not necessarily mean that every fish brought to the dock and every landings report filed must be personally inspected by an enforcement officer.

In-person inspections will still be important aspects of an ITQ monitoring system, but their ultimate success will require computerized systems of electronic reporting and data management. In addition there must be at least two sources of information for any transaction. For example both the harvester and the first fish receiver must fill out independent landing forms that can subsequently be checked against each other. Similarly a transfer of share right or AHR from one person to another must be verified in writing by both parties. The computer system should have a series of tests that can verify the accuracy and consistency of reported landings and trades.

The work of monitoring agents will change under an ITQ programme. The emphasis will shift from checking the daily operations of the fleet to monitoring catch levels. It is unclear how the actual amount of monitoring activity or its cost will change with an ITQ programme. Depending upon the circumstances, it is likely that at-sea monitoring which can be expensive, can be significantly reduced. On the other hand, the amount of bookkeeping type activities will likely increase. Concurrently, because participants have a long term interest in protecting their harvest rights they will be more inclined to adhere to the rules and to assist agents in detecting abuse by others.

Permits for both harvesters and processors will likely be a crucial part of an ITQ monitoring system. These permits should be available to any interested party at a nominal fee. A fisherman would be required to obtain a harvester’s permit to own or lease ITQs. Any harvesting activity would be recorded against the harvesting permit number. Processors would be required to obtain a fish-receivers permit to buy fish landed under the ITQ programme. All purchasing and processing activity would be recorded against the fish-receivers’ permit number. The idea behind a permit programme for processors is twofold. First, it provides for the double entry system that is necessary to establish proper supervision. Second, it provides for a broader-based enforcement programme. If processors have to show that fish in their possession were legally harvested, they will be careful from whom they buy. If they will not buy illegal fish, there will be less incentive for ITQ owners and non-owner alike to land non-quota fish.

Penalties for non-compliance should be firmly established, rigorously enforced and severe enough to encourage compliance. There should be provision to revoke harvesting or fish-receiving permits and even to confiscate the basic ITQ harvesting right for intentional cheating.

7. RENT EXTRACTION AND COST RECOVERY

One of the advantages of rights-based fishing, especially ITQs, is the incentive generated to produce efficiently so that the rents from the fishstock are not dissipated, but rather accumulated by the rights-owners as a result of their search for efficient harvesting processing and marketing. This raises the question whether some (or all) of the rents should be extracted for the public coffers either to pay for the costs of managing the system or to insure that the gains from a resource that belongs to the entire nation are shared by all citizens. This is strictly a matter of public policy. There are some economic consid-
Rent extraction and cost recovery are separate issues and one could argue that cost recovery should be included in all management programmes whether they are rights-based or not. If fisheries management is a necessary part of bringing food to the table, then it makes sense that the industry, and ultimately the consumers of fish products, cover these costs. This insures that the nation truly makes net gains from fishing and it will also create incentives to keep management costs as low as possible. In addition, if cost recovery is only considered to be a part of rights-based management, then there will not be a level playing field if a choice between rights-based and other types of management is to be considered.

One serious problem with cost recovery programmes is the difficulty of estimating what part that the government spends on fisheries is attributable to management and how it can be allocated to the different species under management. If this cannot be done in a routine, transparent, and non-accrimonious manner, it may be wise to impose a landing tax as a percentage of the ex-vessel price.

There are two important facts to consider when considering rent extraction policies. First, one of the basic premises of permitting fishing rights is that they provide socially beneficial incentives to rights-owners because they have claims to the profits of production. If they retain these gains they have incentives to seek efficiencies in their operations. In the transition from a traditionally managed fishery to a rights-based fishery, this may involve considerable research and development costs to design and build better vessels and/or processing plants and to develop new markets. This is because traditional management often provides incentives to produce in a way that provides the most gains given the particular management plan which will not be the most efficient. Also, in the long run there will be technological advances or changes in tastes for fish products that allow for increased returns from modifying harvesting, processing, and marketing equipment and procedures. It is important that the rights-based management system provides incentives to undertake these changes and not be undone by over zealous rent collection policies.

A second and related issue is that it is difficult to identify the rent that is due to the ownership of the fish stock. Technically rents are the residual that remain after subtracting costs of production from gross revenue. And these must include all rents to intra-marginal factors of production (Copes 1970, 1972). This includes the so-called “highliner rents” earned by participants who have unique skills or knowledge which enables them to produce at lower costs that other participants operating under the same conditions. It would be a mistake if rent extraction programmes sought these rents.

Basically the rent from a fishery is determined by the size and reproductive capacity of the fish stock and the types and amounts of fixed and variable inputs which are used to harvest, process and market the fish. It is difficult, if not impossible, to state how much is due to the fish stock and how much is due to the choice of inputs. The creation of rights-based fishing if done correctly provides the incentives for owners to select the appropriate inputs. Care must be taken to insure that incentives to seek out and implement new ways of production are not unduly weakened.

This does not mean that rent extraction policies should never be implemented, but that the policies should be designed for the particular fishery under consideration. In well established fisheries where there is little potential for technology improvements and the minimum average cost of the marginal producer is known, or can easily be determined, a significant portion of the difference between price and that minimum average cost can likely be extracted with little effect on short term viability or long term efficiency. In other cases there is a potential to adversely affect short term operations and the possibility of future operations. Johnson (1995) provides an interesting discussion of rent collection in ITQ fisheries.

Options for collecting rents include:

i. auctions
ii. resource rental as a percentage of estimated annual rent due to the resource
iii. resource rental as a percentage of AHR price
iv. resource rental as a percentage of rights share price
v. resource rental as a percentage of ex-vessel price and reclaim a percentage of total rights shares annually and auction them off (perhaps with original owner having the right to match the highest bid).

All of these options have their strengths and weaknesses, but one may be best for a particular fishery. Auctions have the advantages that they do not require research effort by the government. Perspective bidders make their bids based on their estimated gains after taking into account any changes they will have to make in harvesting, processing and marketing. As a result there should be little negative effect on long term efficiency. It will likely cause resentment amount current participants who feel that the initial rights should be granted for free. A resource rental as a percentage of estimated annual rent due to the resource will require extensive research and will likely cause much acrimonious debate between industry and government.

Resource rentals based on AHR or quota share prices, which should provide some measure of the value of rents being earned, will eliminate the need for extensive research but they may not provide an accurate picture of current rents, e.g. individuals will have incentives to report lower transfer prices. In addition AHR prices may overestimate current rents because they may include “highliner rent”, or be based on variable rather than total costs, as participants bid for AHR to complete their season. A resource rental as a percentage of ex-vessel price will be easy to calculate but it may not be based on true rents if costs are not the same percentage of ex-vessel price for all species. Reclaiming a percentage of total rights shares annually and auctioning them off eliminates
the need for research and depending on the depth of the market, allows the government to obtain a return equal to the residual of revenue over all costs. It also provides opportunities for new entrants by guaranteeing that some rights shares will come on the market each year. At the same time it would weaken the property right because an owner cannot insure that he will maintain control of the right into the indefinite future.

8. THE NEED FOR OTHER REGULATIONS

The heart of an ITQ programme is the TAC. If properly enforced it will address all conservation issues. However, there are conservation issues that are not satisfactorily addressed in a basic ITQ programme. For example:

i. If the TAC for one species is taken in a particular area during a particular season, or with a certain type of gear or fishing method, the bycatch or discard mortality of other TAC species may higher than would otherwise be the case.

ii. Individuals in a particular stock may exhibit high growth rates over a season such that the biomass and value increases if a fish is taken later in the season.

iii. Fishing in nursery grounds or during spawning periods may have larger effects on future stock sizes than taking equivalent catches at other times or places.

If these or other situations occur, the actions of individuals trying to maximize their profits from their rights may result in harvesting patterns which do not optimally utilize the long term productive capacity of the stocks. In short, the TACs and the incentives offered by share rights will not always address all of the biological concerns, and in such instances, it may be worthwhile to consider supplemental regulations.

Any additional measures that will be worthwhile will depend upon the particular fishery. A suggested approach for addressing these problems is:

i. Describe exactly the conservation problem that will not be addressed by a basic ITQ programme

ii. List possible ways in which the ITQ programme can be modified so as to solve the problem

iii. List possible supplemental regulations that will address the problems

iv. Determine which of the potential solutions derived in items ii) and iii) best address the problem and specify a modified ITQ programme which incorporates these additional rules or procedures and

v. Compare the basic ITQ programme with the modified ITQ programme to determine which one most adequately addresses the management objectives. If the modified one is judged superior, it should be adopted; if not, the basic programme should be used (assuming that an ITQ programme is to be used). The basic issue is to make sure that the modifications do not introduce problems worse than those they solve.

Consider the case where there are nursery grounds or spawning periods where harvests can have significant long term effects. If the quality of the flesh or the product recovery rate falls during spawning, this may not be a problem because ITQ owners may not want to use their ITQs on lower-valued fish. However, if costs are reduced by fishing spawning aggregations or if the roe is commercially valuable, there may be incentives to harvest spawning fish rather than at other times of the year which may create a problem for optimal utilization of the long term productivity of the stock.

The problem could be addressed within an ITQ programme by adjusting the TAC level. Or it may be possible to assign coefficients that would transfer catches at different times of the year into equivalent terms with respect to future stock sizes. For example each ton of fish harvested during the spawning period could count as 1.5t of fish harvested during other periods of the year. This would allow individuals the flexibility to operate when they wanted but it would force them to consider the long range effect of their decisions. This adjustment would increase management costs. Research would be necessary to calculate the appropriate coefficients and enforcement would become more complex and perhaps more expensive.

The problem could also be addressed by adding a supplementary regulation that fishing not be allowed in spawning areas or during spawning periods. This would likely be easier to enforce but its inherent lack of flexibility may reduce the potential gains to individual operators that ITQs can provide. It is important to ensure that the gains that are provided in an ITQ programme are not annulled by supplemental restrictions unless it can be shown that the overall gains are greater than the costs.

The ultimate questions are: which of the two modifications best addresses the problem and if adopted, will it provide an overall improvement in the system as a whole? The answer will depend upon the exact biological economic and institutional characteristics of the fishery involved.

9. INITIAL ALLOCATION

The initial allocation of quota shares to individuals is obviously important. It will determine who will initially participate in the fishery and so will have substantial distributional implications. How future participants are determined depends upon the rules for transferability and the duration of the ownership rights. This will also affect who gets the gains from the fishery in the long run. For the most part the initial allocation issue is independent of other components of an ITQ programme. It is a once-and-for-all-step. Given flexible transferability rules and non-expiring ownership rights allocation decisions only have to be made once. To maintain a balanced focus when considering ITQs, the independence of the initial allocation question from other fundamental issues should be highlighted. Otherwise, the distributional issues may unnecessarily cloud or overshadow the discussions of other important, but independent issues.

There are many initial allocation options, too many to list and discuss all here. However, to develop one for a
particular fishery the following questions must be answered:

i. Will the rights be sold or given away? If the rights are to be sold, will it be by an auction, by tender, or by some other means, and will existing participants be given a preference?

ii. If the rights are to be given away how will the recipients be selected?

iii. Once the recipients have been selected, on what basis will the quota shares be distributed among them?

iv. Will the quota shares be based solely on the definition of quota share stocks, or will they be further subdivided by vessel category, gear type, or some other classification?

In the past the recipients have typically been chosen on the basis of past participation in the fishery. Historical catch and vessel size or other indicators of investment are the most common basis of distributing quota shares among this pool. For the Pacific halibut and sablefish ITQ programme the North Pacific Council divided the individual quotas into vessel share classifications but this has not normally been the case in other ITQ programmes. In recent discussions of allocations there has been an emphasis on developing allocation systems where crew members and hired captains can be eligible and not just vessel owners.

10. LITERATURE CITED


RESISTANCE TO CHANGES IN PROPERTY RIGHTS
OR, WHY NOT ITQs?

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1. INTRODUCTION
1.1 The Commons and ITQs
One of the strongest arguments for using individual transferable quotas (ITQs) is that they represent a particularly efficient way to avoid so-called “tragedies of the commons.” Government intervention, or command-and-control regulation is one way to reduce or prevent the overfishing that tends to occur in fisheries; another is to change the prevalent condition of open-access – which is said to lay behind the tendencies for overexploitation in fisheries – by limiting access. ITQs are close to private property in the extent to which they limit access by assigning exclusive, and marketable, access rights to individuals.

This presentation explores the reasons for resistance to ITQs in the fisheries of the world. To do this, I must sketch the background to the approach I am taking, which is based upon a critique of the conventional notion of the tragedy of the commons (see McCay and Acheson 1987, Berkes 1989, Bromley 1992, Ostrom 1990).

1.2 The Commons: open access
A common error is to confuse or misuse the terms “commons” and “open access”. When Garrett Hardin wrote about “the tragedy of the commons” (1968) he referred to the old village “commons” as a metaphor for any situation of un-regulated open access. Consequently, people have come to understand the commons as an un-regulated situation where “freedom” causes overexploitation. They forget the lessons of history that “the commons” – or equivalent terms in other languages – actually refers to certain places and resources marked not only by common use but also by restrictions and regulations. The English agrarian commons is, and was, a diverse and changing institution, but an institution it certainly is (Cox and Buck 1985, Hanna 1990).

1.3 Property: exclusive, individualized and tradeable property
A similar error is found in the works of economists who created much of the arguments for the use of ITQs and similar market-based tools to manage common pool resources. Often, they use the term “property” to mean the Western notion of private property, that is, exclusive, individualized, and tradeable property rights (Gordon 1954, Demsetz 1967). Anything else is not property. What this does is define out of existence the possibility of institutions such as common property, or exclusive property rights assigned to members of a group, who hold common use-rights to it.

Once we recognize that “commons” institutions exist – including common property – and that they may have restrictions on access and use of common resources, the argument for privatization is weakened. There are clearly more alternatives.

2. ACCESS
2.1 Open access: not necessarily a sufficient cause of tragedies of the commons
Open access is an important cause of the social dilemma we call the tragedy of the commons: if there is no way to keep others from enjoying the fruits of one’s work, or of one’s self-restraint, why should one bother? (This is also known as a public-goods problem.) However, decline of fish stocks and other common pool resources can come about for other reasons. For example, even though access is closed, assuring to current resource users the right to future benefits, the resource users may decide to exploit it beyond the point of sustainable use. One reason for doing so may be uncertainty about the future; another can be the opportunity to invest the proceeds in another activity promising greater returns. Yet another may be unusual market opportunities or unexpected personal crises. Risk, uncertainty and rates of discounting the future all contribute to decision-making behavior irrespective of access questions (see Clark 1973). So do personal and cultural

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1 Common Pool Resources are resources with features that make them difficult to divide or fence them off, like so-called ‘public goods’, but also are such that one person’s use can diminish another’s. Some call them Common Property Resources but that practice confuses the physical features of the resource with one of several social institutions (common property) that may be used to allocate and manage them.
preferences (see C. Smith 1981; Gatewood and McCay 1990 on worker satisfaction in fisheries). Accordingly, the difference made by the fact that a resource is managed with open access conditions, limited access, or even exclusive, tradeable rights as with ITQs may be small relative to other factors. Open access is neither necessary nor sufficient to cause tragedies of the commons.

2.2 Private property: not necessary a sufficient tool for comedies of the commons

The converse is that private property—including the quasi-private property represented by ITQs—is neither necessary nor sufficient, to cause “comedies of the commons,” or the ability to develop sustainable use patterns for a common pool resource.

One argument for this proposition is that the particular property right system in question is not “private” enough. Scott (2000) has outlined the dimensions of “property” and discussed ITQs as a more “perfect” kind of property, depending on provisions concerning their duration, exclusivity, transferability and divisibility, and security and quality of title. The ITQ holder (typically a vessel owner) has “the exclusivity and security” that an owner needs to economize his operations. Nonetheless, the asset itself remains “essentially collective – exclusive property rights in a fishstock that cannot be divided into individual parts. The right-holder cannot protect and improve ‘his’ property, and, because of public-good features, he has only a limited desire to try to do so” (Scott 1994). Public goods have benefits that are not divisible and exclusive; consequently, the individual’s rational strategy is to let others do the work, because s/he can “free-ride” on the fruits of their efforts (Olson 1965).

While this is true enough, Scott, like many other economists, assumes that whatever is in “collective” ownership is not therefore within the domain of rational management. If we expand his argument to include the assumption that ITQ holders and others have some kind of interest in managing the collective, despite their “free-rider” incentives, then we can see the potential for commons management with, or without, ITQs. What is interesting in this light is Scott’s earlier argument (1993) that ITQs can create the structure and incentives for resource user self-management. But my general point is that the exclusive property rights created do not necessarily, nor sufficiently, lead to the incentives for appropriate sustainable use. Some kind of collective system of monitoring, deliberation, and rule-making appears to be necessary.

3. WHY NOT ITQs?

3.1 Background

I turn now to the question of why people resist ITQs when the idea is proposed. Four general reasons for resistance to ITQs are: (a) cultural preference for competitive and non-marketable fishing rights; (b) the transaction costs of changing to ITQs in relation to perceived benefits; (c) concerns about the intended results of ITQs, particularly the downsizing, efficiency goals; and (d) concerns about the intended and unintended consequences of such systems, particularly the displacement of people, the “tragedy of the commoners”.

The discussion that follows is based on my own research and involvement with policy committees as well as knowledge gained from the research and reporting of others. I have watched the development and results of the ITQ system of the US Surf Clam and Ocean Quahog fishery since 1979; the ITQ system itself began in 1990 (McCay et al. 1990, McCay and Creed 1990, 1994; McCay 1994, McCay 1995a, 1995b, McCay et al. 1995). I have also collaborated on research with that of others on Atlantic Canada’s groundfish and crab fisheries (McCay et al. 1998, Apostle et al. 1998, McCay 1999). The discussion is also informed by my work editing a special issue of a journal that focused on ITQs (McCay 1995) and my participation on a US National Research Council committee asked by the US Congress to review ITQs and alternative management measures in order to recommend whether it should lift a moratorium it imposed on ITQs in 1996 (NRC 1999).

3.2 ITQs and changes in the fishery

3.2.1 Property rights and social changes in the fishery

ITQs and other changes in property rights can affect the social structure and relations of a fishery in a variety of ways that concern people and provoke resistance. These include: working relationships on a boat; the structure of the fleet and larger industry; power relations between harvesters and buyers; changes in fishing-dependent communities; in the structure and function of the management system; and even in science and policy.

3.2.2 Changes in the structure of the fleet and industry

The effects of ITQs on the structure of a fishing fleet and industry are widely known and discussed, particularly the consolidation of ownership and control that may attend downsizing, as ITQ-holders economize on their assets. The actual paths and patterns of structural change vary greatly, but the fact and fear of it are virtually universal. Economists refer to this and other issues as “transition costs,” but designers of fishery management regimes and their constituents are increasingly mindful of the need to take these changes into account and find ways to moderate them according to local standards.

3.2.3 Changes in working relationships on the boat

Less well appreciated is that working relationships on a boat can be affected by ITQs. For example, when the vessel owner also becomes the owner of the right to fish, as has been typical in ITQ systems to date, the traditional co-venturer and semi-egalitarian nature of relationships between owner, captain, and crew often changes, with a further distancing of the owner from the others. If, as has also been typical, the granting of ITQs creates windfalls for present vessel owners and high entry costs for others, crew and non-owner captains may find themselves in dead-end jobs. They have little opportunity to work their way up. This issue has been addressed in Alaska’s halibut and sablefish IFQ system, where a portion of the proceeds goes into a loan fund for crew-members to purchase IFQ, and units are small enough to make this possible. Even more likely, more and more crew find their jobs in jeopardy where ITQs are a tool for downsizing a fishery. The power structure on the boat is thus structured in favor of the owners and owner-captains; incentives for skilled
crew to stay on may be reduced, and paradoxically, although jobs may be fewer as owners economize, the quality of crew willing to work may be reduced. A related phenomenon is the possible shift away from the widespread system of payment (part of the co-venturer social structure), whereby owners, captains, mates, and crew share the proceeds of a fishing voyage according to some locally recognized system. An ITQ-based fishery may become more like a wage labor or piece work system, with concomitant changes in how people evaluate and value their work.

3.2.4 Change in power relations between harvesters and buyers

An important effect of ITQ regimes where the initial allocation of the ITQ goes to vessel owners is to change, or threaten to change, the distribution of bargaining power between buyers and sellers of marine products. In some ITQ schemes, traditional buyers are excluded from that allocation because of attempts to reserve ITQs for active harvesters, in order to maintain the structure of a fleet. Where this happens, buyers may argue that they are unfairly disadvantaged, given their roles in developing a fishery industry. A recent example is in the Alaska halibut and sablefish fishery where processing companies continue to argue for some kind of “processor ITQ.” However, buyers have other ways to redress the imbalance, including financing the acquisition of ITQ on the part of harvesters, who become beholden to them or, in some cases, “fronts” for ownership by the buyers. In other schemes, buyers too may participate in ownership of ITQ and may be able to shift the power in their direction not only by using their access to capital to finance harvesters, but also by becoming ITQ owners themselves and providing ITQ to harvesters on a share or other basis. It is this behavior that leads to the frequently heard complaint or fear that with ITQs fishermen become “sharecroppers,” with the implication of poverty-inducing dependency.

3.2.5 Changes in fishing-dependent communities

Resistance to ITQs is fierce in many coastal communities that are heavily dependent on owner-operator fishing and the effects described in Section 3.2.4 are of major concern. In some communities the advent of ITQs has created schisms between families that participated in, and benefited from, the initial allocation and subsequent trade, and other families. Because a veneer of egalitarianism is often important in small coastal communities, these schisms can be harmful in many ways, affecting the local politics of school boards, town councils and churches. Moreover, communities in which most fishers are small-scale are concerned about losing rights of access to the fishery altogether. These and other concerns lie behind a social movement in the Canadian province of Nova Scotia to develop “community-based management” as an alternative to ITQs (Kearney et al. 1998). Another community concern is the transmission of knowledge and culture of fishing, where access is restricted to relatively few.

Fishery-dependent communities are also affected by geographic shifts in fish landings, the location of processing firms, and changes in ancillary industries like welding and ice-making that can be triggered by ITQs. Interestingly, some communities have obtained (e.g. Chatham Islands, New Zealand) or are trying to obtain (Gulf of Alaska) ITQs in the name of the community rather than individuals, in order to gain more control over the transfer and distribution of quota and hence opportunities for jobs and income.

Two more “community” issues should be mentioned, each of which deserves much fuller treatment than I can give here. The first, recognizing that one important community is “the public,” is the issue of how the initial allocation and subsequent transactions appear to equal a “giveaway of public resources.” Management bodies have been forced to find ways to get the fishing industry members to “buy in” to the shift to ITQs, and thus search for ways to preserve something like the status quo in devising the criteria for initial allocation (i.e. using historical participation as the major criterion). In the process, finding methods of allocation such as auctions get short shrift because there is usually little public information about or interest in this process. A second and related issue concerns the claims of other groups, particularly indigenous populations, recreationists, and conservationists. Their interests and claims also seem to have been given short shrift in the initial negotiations and design of ITQ systems, and their responses have sometimes been costly to resolve, as in the case of the Maori of New Zealand.

3.2.6 Changes in the structure and workings of the management system and in science and policy

One hoped-for effect of ITQs is to get government agencies out of the business of dealing with the sticky issues of allocating rights to a common resource; that role is relegated to markets. It can be difficult to get there—determining the initial allocation and rules of subsequent transfer can nearly overwhelm managing bodies because so much is at stake. However, once the system is developed, the management system should have reduced responsibility, more being taken over by the ITQ holders themselves. Government will, or should, retain some control over important biological conservation parameters because the resource itself is usually construed as a public one because of the bycatch, fish habitat and other side-effects of any fishery.

Yet there will be pressures for greater involvement of ITQ holders in the scientific domain as well, because of the now direct and measurable way that changes in total allowable catches and other measures affect the value of their assets (Scott 1993). Thus, somewhat paradoxically, ITQs may lead to an increase in co-management and in their participation in science (McCay et al. 1998). This is evident in New Zealand, as attested by many presentations at the Fremantle 99 Conference concerning the organizations created by ITQ-holders to engage in fisheries research. It is also evident in the United States, where ITQ-holders in the surf clam and ocean quahog fisheries have created a direct role for themselves, with the government, in scientific research.

Another effect of ITQs on the management process is the sharp narrowing of the “community” involved by the definition of ITQ-holders. In the extant systems, the initial ITQ holders were vessel owners. Although this can...
change in some systems after the initial allocation, the
general effect is to truncate the participation of the people
who have an interest in the process and who therefore are
asked and choose to participate. The downsizing and con-
solidation that often accompanies ITQs further affects the
management process: with smaller groups and more nar-
rowly defined interests, developing consensus positions
and hence strength in bargaining vis-à-vis government
agencies and their decision-making bodies becomes
easier.

4. LESONS LEARNED
4.1 “No free lunches, mates”: tradeoffs cannot be
avoided
One thing that is clear from reviewing ITQ systems is
the importance of looking at the tradeoffs and the dis-
tribution effects. Yes, ITQs do result in increased effi-
ciencies, lowering costs of the “race for the fish.”
Investors can better match capital and labor to the re-
source itself. On the other hand, the social structure gains
new fracture points, co-venturers become owners or la-
bourers, people who thought of themselves as independ-
ent fishers begin to use terms like “sharecroppers” and
“tenant farmers,” or “businessmen” and “fish lords.”
Clearly there will be new equilibria. But is this what peo-
ple wanted? The message is that the tradeoffs should be
identified as much as possible prior to decision making,
and their outcomes should be monitored to provide infor-
ments for adjustments in the future (NRC 1999).

4.2 “Them that has gits...”: Reproducing the
structure of the past in the initial allocation
and transfer rules
Another issue that arises from comparative research
on ITQ systems is that the structure of the industry prior
to ITQs and the initial allocation and transferability rules
make a big difference to the outcomes, at least in the short
term (3 - 10 years). The windfall benefit of the initial al-
location reverberates throughout the system for a long
while. Consequently, the initial allocation and transfer-
ability rules are indeed important, and it is therefore no
wonder that people who do agree to consider ITQs put so
much time and effort into this phase of the process. In the
US surf clam and ocean quahog system, for example, the
process lasted for 11 years. Consequentially, as expected,
small-scale fishers became concerned about the fates of
themselves, their families, and communities resist ITQs or
become involved in efforts to design them in ways that
protect those interests.

4.3 “You can’t go home again”: irreversibility of the
process
There is a processual quality to the creation of lim-
ited access management measures, from trip limits or boat
quotas to ITQs. And the record suggests that the process
is difficult to reverse. For example, a decision to impose
boat quotas will often, especially in the context of declin-
ning resources, create pressures to allow “stacking” or con-
solidation of quotas from several boats onto one. It is but
a short step to ITQs. Once something like an ITQ system
is created, it is difficult to end it. Although governments
often insist that only “revocable privileges,” not “property
rights,” are created with ITQs, the social fact quickly de-
velops that ITQs are thought of, and treated as, property,
creating demands for greater security if not compensation
when they are threatened. As Scott (2000) argued in his
presentation at the Fremantle 99 Conference, the “better”
the property right in relation to economic goals, the more
“durable” and “secure” it is.

Once again, the message is the importance of exam-
ining trade-offs and possible consequences with great care
before agreeing upon ITQs. Not only can the conse-
quences be unexpected and undesirable but it also may be
difficult to make changes, once the process is well ad-
vanced.

4.4 “You can’t do it alone”: stakeholder participa-
tion
ITQs, IQs, and other more restrictive access rules
require full and effective participation of all interested
parties. There is no question that such a process is messy,
difficult, and unreliable, but it is also necessary to meet
objectives such as fairness and equity not to mention the
legitimacy of the process and its results. Arguably, more
legitimate processes have higher rates of compliance. In
addition, fuller participation brings the knowledge and
experience of practitioners, which should result in more
effective and enforceable design of the system.

A persistent argument for ITQs is that “ownership”
will increase the incentives for stewardship over the re-
sources. I have also noted one limitation to this conclu-
sion, which is that ITQ holders do not really own the
resource, just access rights to it; ownership remains in the
larger collective. However, it does seem that ITQs bring
stronger incentives for participation in management, for
some measures of “self-regulation”, and for industry
sponsorship of, and collaboration in, biological research.
ITQ holders, some of whom have invested heavily (others
of whom are working with their initial allocations), have a
particular interest in what they will be allowed to catch
and when, since their individual catches no longer depend
on how well they compete with others but rather on what
their portion of the TAC amounts to (disregarding any
cheating that might occur). In addition, in situations in-
creasingly marked by “precautionary” approaches to fish-
eries management (that is, erring on the conservative side
when there is uncertainty), they, like other fishers, have
strong interests in more accurate fisheries data. Conse-
quently, some ITQ-holding groups have organized to im-
prove the accuracy of fisheries data.

It is indeed possible, as Scott (1993) argues, that
ITQs will foster viable systems of self-regulation for sus-
tainable use. Not only are there incentives for more accu-
rate information but there is also the opportunity to
measure each individual’s stake, and hence, responsibil-
ity. Assuming a public accounting of ITQ ownership, it is
possible to assess ITQ owners some fraction of their as-
sets to cover the costs of research and other collective
activities. This appears to be happening in some New
Zealand fisheries, according to reports at the Fremantle 99
conference. In the US surf clam and ocean quahog fish-
ery, it has not yet happened: some ITQ holders remain
“free riders” on the actions of others more willing to con-
tribute funds to research initiatives. More than property
rights are required to get collective action (as any home-owner trying to organize a neighbourhood-level action knows).

4.5 “Foxes and others in the henhouse”: is the public good served when there is close collaboration?

Another tradeoff is between a narrower “community” for more efficiency. The actors in management arenas become the ITQ holders. Non-holding fishers and members of the larger communities affected by the fishery are marginalized and for the most part excluded. A related question is the tradeoff between the well-organized management participation of ITQ holders and the interests of the larger community. “Agency capture” is a well-known social fact. Government agencies mandated to serve public goals serve the interests of smaller, better-organized interest groups instead.

4.6 “What you wants is results; what you gits is consequences”: unexpected consequences and social learning

The creation of ITQs in fisheries since the late 1970s has resulted in many unexpected consequences. Creating commodities out of the right to fish might be expected to provoke claims of right where none had existed before, and such has been and will be the case. The most famous example to date is that of the Maori of New Zealand, who invoked a treaty to challenge the New Zealand ITQ system and eventually gained control of a majority of that country’s ITQ. A more recent instance is that of the Miq’maq of Atlantic Canada, who have court backing for their claims of rights to engage in commercial as well as subsistence fisheries, and who may (but have not yet) extend their claims to ITQ fisheries in the region. Another case is that of the mostly native coastal communities of the Bering Sea of Alaska, who initially claimed rights to quotas for deep-sea pollock, but have more recently also obtained preferential rights to shares of ITQ fisheries for halibut and sablefish as well; these are in the form of “community development quotas” which can be used by the communities or their lessees, profits to go to community needs such as education.

ITQs also have provoked counter-forces, especially the “community-based management” movement, through which fishery-dependent coastal communities are claiming the right to shares of either an overall quota or ITQ, to be managed on behalf of the community rather than individuals per se. Consequently, the very notion of ITQ has been greatly expanded. Related management systems include not only ITQs, but, more simply, IQ (without transferability), BQ (boat quota), CQ (community quota). In addition, CQ2, or cooperative quotas: especially in the United States with its Congressional moratorium on ITQs, have stimulated a new emphasis on cooperative quotas which have many of the attributes of ITQs is found in heavily-capitalized offshore fisheries in the North Pacific and are being considered for other fisheries.

In addition, the question of transferability continues to receive close scrutiny. Although the economic benefits of full transferability are evident, the social benefits of partial, or/no, transferability are reflected in the design of some systems, such that ITQs are really IQs.

5. SOCIAL LEARNING

The history of ITQs is still young, the first such management systems having begun only in the late 1970s. It is possible to trace an historical trajectory that suggests that social learning is taking place. New Zealand’s experience in the mid-1980s with orange roughy showed the folly of using absolute shares, or poundage of fish, as the currency of ITQs. Since then, ITQ systems have been devised as proportionate to some annual figure such as total allowable catch. Canada’s early experience with ITQs in its Atlantic herring fishery showed the folly of poor monitoring and enforcement, which made the ITQs themselves worthless because who really needed them? Subsequent systems in Canada and elsewhere have given great attention to monitoring and enforcement, including, in Canada, the development of industry-sponsored dock monitoring. The US surf clam and ocean quahog fishery ITQ regime had no explicit limits on accumulation and concentration, and although its industry already had high levels of concentration, the consequence after ITQs became a regional if not international lesson in the dangers of unfettered market activity for people who prized independence and small-scale fishing. In the meantime, in Iceland, where ITQs began in the early 1980s, fishermen went on strike against the absentee ownership and other changes that were occurring in the fishery industry. Consequently, the US halibut and sablefish ITQ system in the North Pacific (known as IFQs, or Individual Fishery Quotas), off the State of Alaska, was developed with explicit attention to the challenge of protecting the existing, predominately owner-operator, structure in the fisheries while achieving some of the economic and safety benefits of ITQs. Also in the United States, in the Gulf of Mexico, attempts were made to develop ITQs for the red snapper fishery. But this was aborted by Congress moratorium in 1996 on the further introduction of ITQ systems. But, one of the lessons that arose in the course of that effort was the importance and difficulty of dealing with the position of recreational fishing when designing ITQs.

6. CONCLUSION: IN OR OUT OF STEP?

The last issue I wish to address is whether ITQs are “in, or out of, step” given changes in how we think about and address natural resource management. The “traditional” system of management, ensconced in our schools and government agencies and hearkening back to the 19th and early 20th centuries, emphasizes utilitarian values (“greatest good for the greatest number”), commodity production (including “maximum sustainable yield”), single species models and management plans, deterministic scientific models, reliance on scientific expertise and a top-down system of governance. The “social” or “human dimension” is relegated to little more than being a source of fishing mortality or “political” obstruction.

The change, found in forestry, water, and fisheries areas, may be labelled “ecosystem ‘management’” (“management” is put in scare quotes to indicate the possible hubris in suggesting that humans can actually manage ecosystems; we certainly do affect them, though). It includes the incorporation of more bio-centric values into
our predominantly utilitarian ones; appreciation of the importance of multiple-species interactions and habitat considerations; a humbler science, which accepts uncertainty and recognizes discontinuities and surprises in nature; calls for bio-regional and adaptive management; and a more bottom-up and collaborative way of making plans. The “social” is far more central to this paradigm. User groups and members of their communities and the general public are active and engaged participants in ecosystem management.

The question is, then, what is the place of a regime based on privatized rights in relation to the goals of ecosystem management? ITQs are commodity-oriented. They usually are designed around single-species. They have the short-term horizons of systems dependent on market signals. In those ways they are closer to “traditional” management and arguably antithetic to goals of socially and ecologically responsible fisheries management. On the other hand, ITQ regimes have seen bottom up, collaborative initiatives and partnerships in science and research. They have potential for increased stewardship, linked causally with increased ownership. The answer is, at this point, open.

7. LITERATURE CITED


1. INTRODUCTION

1.1 Conceptual attributes

Property Rights in fisheries, and elsewhere, are often defined as a ‘bundle of attributes’ and exist as a continuum in terms of their characteristics. Scott (1996) refers to the most important of these as: a) transferability, b) exclusivity, c) security and d) durability.

These four conceptual elements provide a basis for looking at the characteristics of existing fisheries property rights systems. These attributes are mediated, or conditioned, by the need to manage the fishery. Transferability requires ownership registries plus the rules and means to make them function; exclusivity requires monitoring and enforcement systems; and security of title requires an effective and honest legal system; durable rights are those that the possessor holds for a long time, perhaps in perpetuity. Many of these management needs may exist, irrespective of whether the fishery is considered to have weak or strong property rights.

The strongest fisheries property rights systems will be those in which Scott’s characteristics are the least constrained, and by looking at how different national and regional management regimes have developed and, or, constrained these attributes, an understanding of the development of ‘strong’ property-rights fisheries systems can be gained.

In many areas of the world, there exist property rights systems in fisheries that depend on unwritten, traditional, or customary agreements about who may fish in a particular location, and sometimes, what type of gear they are allowed to use (e.g. Foale 1996). While unwritten, these rights may be well accepted and fiercely enforced and be just as effective in achieving their objectives as those that have been legislated into existence. Scott (1996) refers to the most important of these as: a) transferability, b) exclusivity, c) security and d) durability.

Depending on which criterion is to be given greatest weight, property rights systems in fisheries may be structured as follows:

1. "Individual" transferable harvest quotas

These are commonly called ITQs - the famous, or perhaps infamous term, which is now well known if not so commonly understood. Various terms have been used to describe these depending on the circumstances of their application and some writers use the term ITQ in a general sense. For example, ICES 1997 in their characterization of ITQs uses the term ‘Individual’ to include when rights are held by a person, a vessel, a community, an enterprise, or some other form of collective. They assume that the ‘quota’ can be either an output unit - tonnes caught - or an input unit - the amount of fishing gear that can be used. Non-transferable quota management systems are commonly termed (Individual Quota) IQ systems.

ITQs may be stinted in various ways and to various degrees. If the harvest right is attached to a fishing boat, they may be referred to as IFQs - Individual Fishing Quotas, but in other ways they may have no operational differences to an ITQ (See e.g. Grafton 1996, for a detailed review on their conceptual characteristics).

ii. Community quota

Community quotas may share most of the characteristics of ITQs except that there are additional constraints on who may own them - this may be perceived as a constraint on their transferability - they cannot be sold (or even leased) to someone who is not a member of the community. The existence of a community quota may have a legal basis: in this case a condition attached to the quota may be that it legally must remain ‘in’ the community. However, municipalities, for example, may buy quota in the market as other quota holders do and then lease them to fishermen they deem to be part of their community, as is the case in the Shetland Islands. Another issue relates to how the community is defined. Conventionally, communities have a geographical context, but in some management regions, a different approach has been adopted. In these, a community has been taken to mean a collection of people with similar interests, now often referred to in a fisheries management context as a virtual community. In the Maritime Region of Canada for example, two of nine communities that

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1 This document contains an excellent bibliography broken down by national case studies (USA, Canada, Iceland, U.K., Australia, New Zealand and Norway) and formal analyses.

2 This word has the sense of "Limitation, restriction, especially in respect in the supply of the necessities or comforts of life" (OED). In has a specific Property Rights connotation, now little used I am sure, of “A limited number of cattle, according to kind, allotted to each definite portion into which pasture or common land is divided, or to each person entitled to the right of common pasturage”.

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have been awarded quota to manage themselves are defined in terms of the type of fishing gear they use.

iii. Territorial user fisheries rights
Conventionally called TURFs\(^3\), these convey to the 'owners' some fishing rights to a specific area. There is no reason why they need not have all the attributes of for example an ITQ system, except the right is to undertake fishing in a defined area, rather than remove an amount of fish. The rights may be transferable and of variable durability, exclusivity, etc. Christy (1982) and Panayotou (1984) provide further details.

iv. Fishing input rights
These may be exactly analogous in the sense of their property-rights attributes to ITQs, except that the right relates to the amount of fishing gear that can be used. A particularly well known example is the Western Australia lobster fishery where the unit of ownership is a individual lobster trap. Another Australian example is found in the Northern Prawn Fishery. Originally, when input control was introduced into this fishery, the measure of vessel capacity used was based on vessel gross registered tonnage and engine power. This input unit subsequently changed to a unit length (one foot - 12 inches) of the shrimp trawl ground rope because the vessels started towing four trawls rather than just two.

1.2 Administrative attributes
Systems are also defined by how they function. In the context of this paper, the following functional attributes are relevant:

i. Starting, or transforming, the management of a fishery into a rights-based system
The key here is obtaining agreement, or deciding, on how many 'rights' will be assigned to the participants. This includes avoiding undue 'gaming'\(^4\) by fishermen to influence any future fishing-rights allotment.

ii. Funding of register and other management costs
When formal rights-based fisheries systems are introduced they make clear the benefits that accrue to those who obtain the access rights, and thus at the same time highlight their associated responsibilities. These management responsibilities must be funded and usually this is done through a form of levy on the catch.

iii. Extending the attributes of the rights
One of the important aspects of strengthened fisheries property rights is that they become an asset, which can be used in a manner similar to other property or capital assets. For example, depending on their legal definition, they can be seized and divided among spouses in divorce disputes, used as collateral in obtaining finance and be attached with liens by disgruntled creditors in relevant circumstances.

iv. Resource management
This is, in my view, the most important functional attribute relating to fisheries property rights systems. With few exceptions, the total desirable catch in terms of obtaining the maximum benefits from the fishery will change from year to year, either to avoid growth overfishing\(^5\) or because of an expectation of excessive declines in recruitment. In this case the stock may fall below some minimum biological acceptable level unless fishing mortality is reduced. In out-put, i.e. quota controlled fisheries, the amount of fish a rights holder is entitled to remove is usually defined as a percentage of the total allowable catch. Thus the rights holder's absolute catch each year will vary as does the total allowable catch (TAC). How the TAC is determined is usually independent of the type of rights system used in the fishery (though in rights-based fisheries management systems the quota holders are often formally involved in the TAC-setting process). Thus, monitoring and enforcement is necessary to ensure quotas are not exceeded, as in any fishery where catch in limited.

In input-controlled fisheries, adjustments are required to the amount of effort that is exerted to control fishing mortality. In the case of trap fisheries this may mean adjusting the number of traps by removal of a percentage of the traps that are fished (though varying the length of fishing seasons remains an option). In the case of a ground-rope rights-based fishery, e.g. the Australian Northern Prawn Fishery, fishermen may be required to forfeit a percentage of their foot-rope length entitlements if the TAC is to be reduced. This in turn requires that they either purchase the difference from other rights holders to maintain their level of effort in the fishery, or they become unable to participate.

5 The biomass of the fishstock will depend on its growth rate - a function of the ages and numbers of fish, and mortality, either from fishing or natural causes. If mortality is excessive, the fish will be caught when they are too small and potential fish yields will be forgone.

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\(^3\) For those for whom English is not their mother tongue, turf is the noun describing the covering of grass and other herbage on the surface of the ground. It also has developed a possessive sense, e.g. this is my 'turf', or his 'turf', implies a proprietary right.

\(^4\) Gaming arises when people alter their behaviour to influence the outcome of a future decision. An example is asking for a salary raise of 20%, when wanting 10% and expecting to get half of what is requested. A fisheries example could be targeting species not usually fished to qualify in a future allocation of ITQs, or even more directly, (mis)reporting catches that are not actually taken to increase one's historical catch record, again to increase any future ITQ allocation when the allocation will be based on past catch levels.

\(^5\) Another functional, perhaps more accurately termed policy, issue relates to whether some form of resource rent will be charged and if so how the amount should be determined.
2. CURRENT NATIONAL PRACTICES

2.1 Introduction

An exhaustive account of this topic should include all countries with fisheries, but this would not be helpful and this account concentrates on those that have introduced transferable fishery property rights in the last few decades. A functional approach has been taken based on literature that is available.

2.2 General applications

The following table gives an indication of the start of some important 'strong' rights-type fisheries. It is not exclusive, but provides and indication of general developments around the world.

<table>
<thead>
<tr>
<th>Country</th>
<th>Start</th>
<th>Nature of owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern Blue Fin Tuna</td>
<td>1984</td>
<td>TQs</td>
</tr>
<tr>
<td>South East Trawl Fishery</td>
<td>1992</td>
<td>ITQs</td>
</tr>
<tr>
<td>Australia Lobster fishery</td>
<td>1964</td>
<td>Tradeability in licences soon after limited entry introduced; pot licence tradeability from early 1970s.</td>
</tr>
<tr>
<td>Prawn Northern Fishery</td>
<td>1969</td>
<td>Tradeability in vessel licence to which catch rights were assigned (fixed vessel and headline length)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tradeability extended to 35 fisheries (depending on fishery: either gear units, quota or time &amp; gear limits)</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Winnipeg</td>
<td>1972</td>
<td>IQ; became transferable in 1986 (Crowley and Palsson 1992)</td>
</tr>
<tr>
<td>East Coast Enterprise Allocation System</td>
<td>1982</td>
<td>Allocations to companies in the programme as Transferable Property Rights</td>
</tr>
<tr>
<td>Atlantic Herring Lake Erie</td>
<td>1983</td>
<td>ITQ to the vessel</td>
</tr>
<tr>
<td>Maritime off-shore scallops Northern Shrimp (Nfld. – Labrador Pacific Geoduck</td>
<td>1986</td>
<td>ITQs</td>
</tr>
<tr>
<td>East Coast (Scotia- Fundy) – groundfish</td>
<td>1987</td>
<td>Enterprise allocations (IQs) but no limit on number of vessels that may be used.</td>
</tr>
<tr>
<td>B.C. 6 Pacific Halibut</td>
<td>1991</td>
<td>IQ</td>
</tr>
<tr>
<td>Chile</td>
<td>1992</td>
<td>ITQs were permitted for industrial fishing after stock depletion and recovery management programme and for new previously unexploited fisheries</td>
</tr>
<tr>
<td>Iceland</td>
<td>1976</td>
<td>Individual vessel quotas introduced into the herring fishery</td>
</tr>
<tr>
<td></td>
<td>1979</td>
<td>Quotas made transferable</td>
</tr>
<tr>
<td></td>
<td>1981</td>
<td>ITQs introduced into the capelin fishery</td>
</tr>
<tr>
<td></td>
<td>1984</td>
<td>ITQs introduced into the demersal fishery</td>
</tr>
<tr>
<td></td>
<td>1985</td>
<td>Effort quotas introduced</td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>Vessel quotas made transferable in the capelin fishery</td>
</tr>
<tr>
<td></td>
<td>1988</td>
<td>IVQs in all fisheries</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>System made uniform in all fisheries</td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plaice and sole</td>
<td>1976</td>
<td>IQs within the EU national quota allocated to the Netherlands; full transferability introduced in 1985</td>
</tr>
<tr>
<td>Cod and whiting</td>
<td>1981</td>
<td>Full transferability introduced in 1994</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>System made uniform in all fisheries</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1983</td>
<td>ITQs started with previously unexploited orange roughy, a deepwater resource; the major period of introductions started in 1986. New species are still being added to the QMS.</td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surf Clam/Ocean Quahog Wreckfish Alaska Sablefish and Pacific Halibut</td>
<td>1990</td>
<td>ITQ system</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An interesting development has been the trend to transfer management of quota to the industry itself. This process started in the Netherlands as early as 1993 at the same time leasing began to be permitted. This solved the government’s problem of needing to monitor all the trading taking place but it led to a ban on leasing after September in the annual fishing year so that accounts could be balanced. This process is being privatized at the present time. In New Zealand, industry-specific management companies now exist for orange roughy, scallops and rock lobsters.

2.3 Nature of owners

A variety of practices exist in relation to who may own quotas, whether they be nationals, enterprises, or enterprises through ownership in the vessels to which the quota has been assigned.

6 (Herring) Spawn-on-kelp, Groundfish trawl, Red sea urchins, abalone, Green sea urchins, Roe herring and sea cucumbers are also managed under IQ.
<table>
<thead>
<tr>
<th>Country</th>
<th>Owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Vessel owners, Trawler operators</td>
</tr>
<tr>
<td>Australia</td>
<td>Catch &gt; 5t; then 75% based on catch history in one of two years at choice of fishermen; 25% based on investment in vessel as determined by independent assessor.</td>
</tr>
<tr>
<td>Canada</td>
<td>Varies depending on fishery; may be the 'vessel' (B.C. halibut); on the east coast ITQ holder in the demersal fishery must be a registered fisherman; in the Enterprise Allocation System it is the company.</td>
</tr>
<tr>
<td>Chile</td>
<td>Individuals/companies who were successful bidders</td>
</tr>
<tr>
<td>Iceland</td>
<td>Quota is assigned to vessels, which must also have fishing licences. These are not automatically transferable and approval is only given if the exchanged vessel is comparable in fishing power.</td>
</tr>
<tr>
<td>New Zealand</td>
<td>New Zealand citizens, residents and companies qualifying as New Zealand companies (≥75% N.Z. ownership).</td>
</tr>
<tr>
<td>United States</td>
<td>Any U.S. citizen or commercial entity that qualifies to own a fishing vessel may purchase or lease an allocation. Rights entitlements exist in form of tags - vessels must have these if they participate in this fishery. Ownership of a vessel is not a prerequisite.</td>
</tr>
<tr>
<td>Alaska</td>
<td>Vessel owners who are US citizens or companies satisfying a particular legal requirement. In subsequent transfers, new owners must demonstrate that they have worked as a crew member on a US fishing boat for at least 150 days.</td>
</tr>
</tbody>
</table>

### 2.4 Initial allocations

Invariably, the first question from those who may have to operate under this form of management is "how will my share be determined?" Two methods have commonly been used (a) the catch history based on a receding period of the fishing and (b) some function of the dimensions of the vessel.

<table>
<thead>
<tr>
<th>Country</th>
<th>Method</th>
<th>Owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>Based in part on the average performance of the permit holders during the period 1989-1996.</td>
<td>Fishing permit holders</td>
</tr>
<tr>
<td>Chile</td>
<td>Open bidding in public auction</td>
<td>Successful bidders</td>
</tr>
<tr>
<td>Iceland</td>
<td>Method varied with fishery. For the demersal species, lobster and deep-sea shrimp allocation, was based on historical catch during the base years - usually a three year period qualified by exemption if the vessel was not operating. For herring and inshore shrimp, the initial allocations were equal. For capelin, 2/3 of the catch was allocated equally; the rest was in proportion to vessel hold capacity.</td>
<td>Licence holder</td>
</tr>
</tbody>
</table>

* Note - this form of management in Argentina is still in the process of implementation.
2.5 Durability

Strong property rights imply they are durable, i.e. ownership conferred for a long period. A variety of approaches to this aspect of property are found in rights-based fisheries management systems.

<table>
<thead>
<tr>
<th>Country</th>
<th>Durability</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States, Alaska</td>
<td>U.S. State unable to revoke rights to recover quota subject to certain conditions and with out legal liability for legal compensation. QS is a harvest privilege and good indefinately. However, they constitute a use privilege, which may be modified or revoked by the Council and the Secretary at any time without compensation.</td>
</tr>
<tr>
<td>Iceland</td>
<td>Are permanent quota or TAC shares</td>
</tr>
<tr>
<td>Chile</td>
<td>Initially 10 years</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Short term right assured - long term right not assured. Rights to transfer quota exist only for owners of vessels listed on the central register. Fishermen may not sell the rights in parts (i.e. nor divisible) though purchasers can buy portions. Transfer must be approved and registered by the minister.</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Rights are held in perpetuity - though significant redistribution of rights occurred to satisfy aboriginal (Maori treaty) settlements</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Long term nature of right NOT guaranteed by government</td>
</tr>
</tbody>
</table>

2.6 Controls on concentration of ownership/transferability

Once participants have determined what their share in a new rights-based fishery may be, the next question raised is "will the new system end up as a monopoly?" A variety of approaches have been undertaken to avoid this situation.

<table>
<thead>
<tr>
<th>Country</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Traps licenced to vessels, minimum of 63, maximum of 150. Fisherman may own more than one vessel. Owner must remain “fit and proper to be a fisherman”.</td>
</tr>
<tr>
<td>Argentina</td>
<td>Quota allocated to the ice fleet cannot be transferred to the factory trawler fleet.</td>
</tr>
<tr>
<td>Canada</td>
<td>No aggregation of quota for the first two years (to allow participants to adjust to the system)</td>
</tr>
<tr>
<td></td>
<td>Maximum holding limited to 2% of any species in any management area (McCay et al. 1996).</td>
</tr>
<tr>
<td></td>
<td>Maximum quota accumulation 50% of TAC</td>
</tr>
<tr>
<td>Chile</td>
<td>10% of quota sold through zero revenue auction; owner limited to buying no more than 50% of quota on sale.</td>
</tr>
<tr>
<td>Iceland</td>
<td>TAC-shares and vessel annual quota are transferable, the former without any restriction, however, vessel quotas can only be freely transferred between vessels in the same geographical region. Transfers outside of the region are subject to approval – which is normally given.</td>
</tr>
<tr>
<td>New Zealand</td>
<td>In principle, no single owner can hold and/or lease &gt;35% of quota for all areas (there are 10 management areas, though many are combined for different species). Minimum holding of 5t for finfish and 1t for invertebrates exists.</td>
</tr>
<tr>
<td>United States, Alaska</td>
<td>A variety of vessel types and fishing areas are defined that determine how the catch of sablefish and halibut may be taken. No more than 0.5% of the combined International Pacific Halibut Commission area quota may be caught by a single vessel (with a grandfather provision for initial allocations above this limit). No more than 1% of sablefish may be taken by any one vessel with the same grandfather provision. Depending on the management area similar restrictions exist.</td>
</tr>
<tr>
<td></td>
<td>A minimum holding of 160 bushels is required. There is no maximum holding or limit to accumulation subject to U.S. anti-trust laws (NRC 1999).</td>
</tr>
</tbody>
</table>

7 Usually meaning that the person does not undertake activities harmful to the fisheries.
8 In zero revenue auctions, the proceeds are returned to the seller. One function of such auctions is that they establish what the market value is for the quota, at least in theory.
2.7 Enforcement

Property rights imply rights can be asserted or enforced. The following table lists some national approaches.

<table>
<thead>
<tr>
<th>Country</th>
<th>General methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Option for dockside weighing of catch supplemented by monitoring of fish sales records. Catch records must be provided within 24 hours of landings. VMS system in operation for several fisheries.</td>
</tr>
<tr>
<td>South East Trawl Fishery</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>Vessel must 'hail' when landings will be done so that they can be monitored; 24 hour update of information. Fishing privileges can be suspended. Dockside monitoring of landings, port sampling and &quot;black box&quot; vessel tracking system.</td>
</tr>
<tr>
<td>B.C. Halibut</td>
<td></td>
</tr>
<tr>
<td>Maritime Offshore scallops</td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>Primary emphasis on auditing of landings, sales and shipping records which must be completed at all points of sale or transfer of ownership of fish. All those dealing in fish must be licensed. Strict requirements for operation of VMS to enable tracking of vessels within and between quota zones</td>
</tr>
<tr>
<td>United States, Alaska</td>
<td></td>
</tr>
<tr>
<td>Surf clam and Ocean quahog</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>The Secretary will promulgate regulations to establish a monitoring and enforcement regime. Penalties include forfeiture of QS. Fish sales must be to registered fish buyers. Emphasis on shore-side monitoring through checking of logbook data. Records of vessels and processors are monitored. Offences are treated as commercial fraud. Penalties include fines and forfeiture of fish, vessels and quota holdings.</td>
</tr>
<tr>
<td>Alaska</td>
<td></td>
</tr>
</tbody>
</table>

2.8 Cost recovery

With rights come responsibilities, notably invitations, one cannot refuse, to pay for management. A variety of approaches exist as tabulated below.

<table>
<thead>
<tr>
<th>Country</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>National policy requires 90% recovery of management costs attributable to managing the fisheries. Applies to all fisheries irrespective of whether they are managed by ITQs.</td>
</tr>
<tr>
<td>Canada</td>
<td>All costs for management, monitoring and enforcement are recovered from licence holders (e.g. port validation of landings, salaries, travel, overtime, etc. Two thirds are collected in advance through a licence fee, the rest through a fee of $Can250/vessel plus $Can0.09/lb levy. Pay DFO $Can 2.9 million in fees.</td>
</tr>
<tr>
<td>B.C. Halibut</td>
<td></td>
</tr>
<tr>
<td>Maritime Offshore scallops</td>
<td></td>
</tr>
<tr>
<td>Iceland</td>
<td>Upper bound of 0.2% of estimated catch value to cover the cost of monitoring and enforcing the ITQ regulations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>Full management cost recovery from industry</td>
</tr>
<tr>
<td>United States</td>
<td>Allocation permit fees are collected to help cover administrative costs including the production and distribution of cage tags. 3% of ex-vessel value of IFQ harvests collected by NMFS to cover management and enforcement costs and fund a loan programme (NMFS 1999)</td>
</tr>
<tr>
<td>Alaska</td>
<td></td>
</tr>
</tbody>
</table>

3. LITERATURE CITED


1. INTRODUCTION

This paper briefly overviews some important characteristics and features of group and, or, community-based rights in the use of fisheries resources (abbreviated as Group Rights in Fisheries – GRF). In the case of GRFs, important co-ordinating functions required for the management of fisheries are performed by groups or communities of people who have been jointly vested with, or who have jointly acquired, rights to fishing grounds or to fish-stocks. Fishing rights held by individual fishermen or sub-groups of fishermen may be nested within GRFs, but these are attenuated to a varying extent by group or community rules. GRFs are not always characterized by the same extent of exclusivity as is the case with individual transferable quotas (ITQs) either because of the group’s inability to ensure and protect such exclusivity (the cost might be prohibitive to do so) or because the group willingly allows others to share in the benefits conferred by the GRFs.

While GRFs of traditional and modern designs are found throughout the world, their current global importance in the management of capture fisheries is limited, though important exceptions exist, in particular in Japan (Yamamoto and Short 1992, FAO 1993) and in several Pacific islands (see Ruddle 1994 and references therein). GRFs are more prominent in the management of inland fisheries including lakes, reservoirs and rivers (e.g. Scudder and Conelly 1985).

With the exception of some recently-established management systems where groups or organizations of fishermen hold catch-quotas, GRFs are primarily based on territorial rights to fishing grounds, fish aggregating devices, natural and artificial reefs, stretches of rivers or sections of bays and lakes. Within such exclusive territories, use rights and/or utilization rules (e.g. type of gear; time of fishing; etc.) may be further defined for specific fisheries and individual fishermen or groups of fishermen. Utilization rules may change in accordance with variability in resource availability and abundance.

The prevalence of territorial rights is likely to be due to the often extra-ordinary difficulty of defining, assigning, monitoring and enforcing rights based on catches. The costs associated with these tasks, commonly referred to as transaction costs, may often outweigh their benefits from greater productivity of resource exploitation, capture of resource-rent and conflict avoidance. In the words of Demsetz (1967), the gains of internalization of externalities may not be large enough to surmount the costs of internalization. In fact, as long as the exploitation rate of a stock is not high, the major externality arises with crowding and excess pressure on the best fishing locations (Scott 1993). Schlager (in Scott 1993) has shown that several of the self-management groups she studied were able to prevent congestion and arrange for the rotational use of the best fishing spots (see also Berkes [1989], and Plateau and Seki [in press]). The ease and lower costs of defining fishing rights based on territoriality is one of the important arguments in favour of stationary fishing methods (another is energy savings) (Christy 2000b).

Territorial rights have obvious limitations in the management of migratory fish stocks. Where the migratory route is extensive, a GRF encompassing the full range of a stock would likely have many participants and incur high transaction costs in agreeing on management objectives, information collection, implementation and enforcement of management measures.

Scott (1993) argues that another important reason why self-management by fishermen groups is relatively rare is the difficulty of deciding (or the high cost of bargaining) on the distribution of costs and benefits. He notes that contrary to the case in fisheries, in many land-based resources, historically, the distribution of rights often happened quasi-automatically through rules like ‘finders keepers’ (or ‘first-come, first-served’). Consequently, by resolving this major impediment the assignment of catch quotas can be a powerful incentive for self-management by fishermen groups and for accepting increasing responsibility (and cost coverage) for all or most management tasks. There is evidence that the allocation of quotas to individual fishermen or to fishermen groups have indeed encouraged self-management (e.g. Māori fisheries in New Zealand, Scottish producer organizations).

Where an ITQ-regime is imposed in a non-participatory manner on a fishery, it may however, undermine the social fabric on which the success of collective action in natural resources management largely hinges. All traditional GRFs rely significantly on so-called social capital, which comprises, inter alia, group or community values, behavioural norms and social networks. Norms of trust and reciprocity lower the costs of bargaining, contracting, monitoring and enforcement (Baland and Plateau 1996, Ostrom 1990). Social networks can reduce the cost of information collection

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1 The views expressed in this paper are those of the author and do not necessarily represent the views of the Food and Agriculture Organization of the United Nations (FAO).
and sharing and provide insurance mechanisms against the adverse effects of economic shocks (accidents, natural disasters, etc.). The role of local-level social capital is even more important under conditions where general trust in a society is low (Platteau 1994, Putnam 1993).3

There are several issues related to the introduction of ITQs that can potentially erode the social fabric of fishing communities. Arguably, a fully participatory and transparent process of introducing ITQs, and qualifications and/or temporary restrictions on transferability, might often avoid social disruptions. A first concern is the method and criteria for the initial allocation of quotas. Historical catches and the current level of investment in the fisheries often form the basis for quota allocations. In some instances, quotas are allocated to the highest bidder. Where data on past catch performance are poor, or may be subject to manipulation, the allocation process may not only result in much litigation in the courts but also spread mistrust, envy and conflict among fishermen, fishing communities and industry. Moreover, these two criteria ignore other factors such as family size, dependency on fishing for livelihood, the requirement to care for disabled and old people, etc., that might be considered were allocation is done at the community level.

While public auctioning of quotas might guarantee a high degree of transparency in the allocation process, it could exclude many current operators from acquiring quotas because of lack of access to capital. Inadequate access to capital is especially pervasive in developing countries as the fishermen usually lack collateral assets. In fact, some people may have privileged access to capital because of extraneous reasons that could cause strong misgivings among those unable to obtain capital and successfully bid. If that were to occur, the propensity could be large among the latter to disrespect the ITQ regime. As a consequence, enforcement could become prohibitively expensive or even impossible.

A further concern is the transferability of quotas. While transferability ensures that the price-mechanism comes to bear in the management of the fishery, unconstrained quota transfers could cause profound and rapid structural changes in a fishery that could greatly disrupt the existing social and economic fabric in fishing communities and the fishing industry.

Last, at the psychological level, the individualization of fishing rights may weaken other ‘regarding behaviour’ such as income and knowledge sharing, and assistance to the less able and weak members of the community. The latter often perform indispensable insurance functions in poor communities of developing countries.

2. CHARACTERISTICS AND EXAMPLES OF GRFs

Excellent analyses and case studies of the role of communities in natural resource management are provided by Baland and Platteau (1996), Proceedings of the Conference on Common Property Resource Management (1986), Ostrom (1990), Berkes (1989) and Pickerton (1989). More detailed treatments of many of the issues can be found in papers presented in these proceedings, (e.g. Christy 2000a,b, Kurien 2000, McCay 2000 and Campbell 2000).

For examples of GRFs in the countries of Asia and the Pacific, I refer the reader to the guide on traditional community-based fishery management by Ruddle (1994) and to the papers presented at the FAO/Japan Expert Consultation on the Development of Community-based Coastal Fishery Management Systems for Asia and the Pacific. Kobe, Japan, 8-12 June (FAO 1993). For examples in Africa, I refer the reader to papers listed in the annotated bibliography on community-based and traditional fisheries management in Africa by Brainerd (1991), to Weigel (1985) and to Horemans and Jallow (1997) for West Africa. For the Caribbean region, the reader is referred to the work and papers by the Caribbean Natural Resources Institute (CANARI and Panos Institute 1994) and its director, Yves Renard (e.g. 1991). As the literature is vast and growing rapidly, these references are only some of many in this field.

In recent years the International Centre for Living Aquatic Resources Management (ICLARM), the Institute for Fisheries Management (IFM) at the North Sea Centre in Hirtshals, Denmark, and local research partners have investigated the performance and outcomes of fisheries co-management arrangements in a series of Asian and African countries. A summary has been provided by Kuperan (2000) for the Fishrights99 Conference that also contains a list of references.

2.1 Types of GRFs

Territorial rights are at the core of most traditional fisheries management regimes. They are the principal characteristics of the Japanese fisheries management regime and are increasingly claimed by small-scale fishermen’s unions and organizations in many countries around the world. In India and Sri Lanka customary rights continue to exist in some lagoon fisheries. In the Philippines, the recently promulgated local government code has assigned exclusive fishing rights up to 15km from the shore to municipalities. Territorial fishing concessions, however, have already a longer history in Philippine municipal fisheries (Smith and Panayotou 1997). The International Collective in Support of Fishworkers (ICSF), Chennai, India, is a strong advocate of assigning exclusive inshore fishing rights to coastal fishing communities, and campaigns for the better monitoring and enforcement of existing reserved inshore zones. More details on the ICSF can be obtained from its web site: http://www.icsf.net

3 Note however, that traditional norms and social ties may not be unequivocally positive for local-level management and development. Customary rules and behaviour may discriminate against certain groups in the community and the traditional power structure may prevent fair and equitable treatment of participants in the fisheries.

4 An excellent source for the latest research findings and for information exchange is the International Association for the Study of Common Property: http://www.indiana.edu/~iascp/index.html

5 The International Collective in Support of Fishworkers (ICSF), Chennai, India, is a strong advocate of assigning exclusive inshore fishing rights to coastal fishing communities, and campaigns for the better monitoring and enforcement of existing reserved inshore zones. More details on the ICSF can be obtained from its web site: http://www.icsf.net
1984). Recently, with the introduction of artificial reefs in some areas in Kerala, India., exclusive fishing rights around these structures are claimed by the communities or groups of fishermen who erected them (Kurien 2000). In the Philippines and Indonesia territorial rights are claimed around fish aggregating devices in tuna fisheries (FAO 1991).

In a few localities of Indonesia, traditional territorial fishing rights continue to exist and there is evidence that many more existed in the past. Here, as well as in many Pacific island fisheries, territorial rights are often derived from an extension of land rights into nearshore waters. They are more likely to occur where valuable sedentary resources in confined areas such as bays, lagoons, reefs, etc. exist and which can be easily demarcated and, or, observed.

Examples of output-based GRFs are found in the Netherlands, New Zealand, Philippines, Senegal, UK and USA. In the case of Netherlands and UK, producer organizations have been given the right to distribute quotas among their members. In New Zealand, Māori have been assigned both territorial and quota-based fishing rights. In the USA, community development quotas have been allocated as part of ITQ regimes. Recently in Senegal, local fishermen’s organizations have introduced catch-quotas per vessel and fishing trip for high value demersal resources (Gaspart and Platteau) in some areas. An objective of similar schemes in Argentinean and US fisheries is to influence the market price.

Examples of input-rights or controls are found in The Gambia, India, Japan, Norway, Senegal and Sri Lanka. Rights to place anchors or to fix tidal stake-nets for the capture of shrimp in the Gambia River are assigned and regulated by local communities (Leendertse 1995). Japanese fishing cooperatives hold rights to assign fishing licences for the capture of non-sedentary coastal resources. Moreover, limits on the number of vessels and of fishing-trips and hours-fished are common management measures within the exclusive fishing territories of Japanese cooperatives. Recently trip-limits were introduced in some villages in Senegal for the canoe purse-seine fishery for small pelagic fishes (Gaspart and Platteau, in press). In the Norwegian Lofoten fishery, fisheries cooperatives undertake various regulatory functions, primarily based on input-limitations as well as technical management measures such as closed seasons and areas (Jentoft and Kristoffersen 1989). In India and Sri Lanka territorial rights in lagoons are usually complemented by input regulations concerning the type and size of the fishing gear and the time of fishing.

Mixed nested rights systems that prevail in Japanese inshore fisheries have been typical for most traditional and informal fisheries management systems. They may also comprise individual harvesting quotas which may only be transferable with the consent of the group or cooperative.

2.2 Objectives of GRFs

GRFs usually attempt to achieve a number of objectives whose relative importance depends on the particular management situation. These include:

i. conflict avoidance and resolution: an important reason for sometimes violent conflicts between large-scale and small-scale fisheries is that no exclusive zones have been created, or when they are defined by the law, they are not enforced

ii. fairness in access to resources and net benefits: the group or community is often better able to take into account the specific situations of individuals and families when sub-dividing rights

iii. protection of return on investment, e.g. in the case of FADs and artificial reefs

iv. resource conservation: this objective is not always met, partly because the knowledge about resource abundance is insufficient and partly because people cannot afford to ‘save for the future’

v. exertion of market power among more recently created GRFs, e.g. in Senegal and Argentina (This is often the primary motivation for fishermen to claim rights and introduce self-regulations.) and

vi. capture of resource-rent: this is rarely a priority and is usually only partially achieved.

2.3 Legal status of GRFs

GRFs may exist in a number of legal forms depending on the management regime. These forms include:

i. codification in formal law, e.g. as in Japan, Norway and elsewhere where countries have assigned exclusive inshore zones for small-scale fisheries

ii. informal and of recent origin, e.g. in Senegal and for artificial reefs in Kerala

iii. customary and protected under formal law, e.g. in Sri Lanka, Vanuatu, Micronesia, Kiribati and other Pacific Islands and

iv. customary, but not codified in formal law, as is the case for most traditional GRFs.

2.4 Rights holder or authority of GRFs

As with the objectives and legal status, the identity of the stakeholder who is assigned the rights or authority to impose the rights varies depending on the particular management regime. Among the possible forms are:

i. multi-functional fisheries cooperatives, e.g. Japan, Canada, Turkey, Senegal and USA

ii. producer organizations (UK and Netherlands)

iii. fishermen’s organizations and guilds, e.g. Gambia, Sri Lanka (Negombo lagoon), India (Pulicat lake), Indonesia and Spain (When a resource is exploited by fishermen from several fishing communities, an organization is needed that can represent fishermen from different communities.)

iv. local administrative units, e.g. municipalities in the Philippines – which had exclusive rights to the collection of milk-fish fry which they usually auctioned, and now have additional rights (see Section 3 above)
v. villages, communities, e.g. Senegal, India and Sri Lanka (These apply primarily to local sedentary resources
vi. village headmen, chiefs of tribes and clans etc., e.g. in some South Pacific islands.) and
vii. NGOs, e.g. Bangladesh – in the case of some floodplain and reservoir inland fisheries. Earlier
government policy had been to auction rights which then were acquired by rich people who employed
labourers or sub-leased their rights to local fishermen.

2.5 Rights defining or accompanying rules
Rights in fisheries are subject to a variety of rules. These rules determine how a rights-based management
regime will function and they reflect the political, legal and social circumstances in which the rights-based regime
has developed. There are many characteristics of rights regimes that affect the nature of operational rules. These
include (see also Ruddle 1994):

i. eligibility criteria for group membership, e.g. residence, birth, clan, tribe, caste, gender and marital status (a detailed study is that on the Pulicat Lake fisheries by Mathew 1991)

ii. rules on transferability - rights are often not transferable or are restricted to intra-group transfer through bequest, sale, lease or marriage dowry.

iii. secondary or temporary rights for non-group members, usually in exchange for a fee or gift, etc.

iv. gear rules, e.g. for non-permitted types or relating to their technical specifications

v. species rules, e.g. reserved or taboo species

vi. conservation rules, e.g. for closed seasons, buffer zones or non-fishing zones

vii. sharing rules, e.g. for fishing rotation; lotteries for participation, income/cost-sharing rules as in the Japanese pooling systems.

2.6 Means of monitoring and enforcement of rights
For a right to have meaning in a fisheries system, it must be enforceable. Enforcement is usually achieved through a system of monitoring and the prosecution and punishment of trespasses. Monitoring may be done by rights holders themselves (e.g. many traditional systems), specially assigned staff employed by the group or community of rights holders, or in cooperation with a government enforcement agencies (e.g. Japan). In traditional GRFs, little enforcement may be needed because of voluntary compliance based on mutual trust of rules. More commonly, however, rule-compliance is based on the threat of social, economic, physical and supernatural sanctions, e.g. shaming, ostracism, banishment, corporal and supernatural punishment, and monetary and in-kind fines (Ruddle 1994).

3. ADVANTAGES OF GROUP AND COMMUNITY-BASED RIGHTS
The advantages of GRFs derive principally from the fact that essential management functions are performed by the rights holders themselves and not by a central management authority. These functions may encompass all or several of the following:

i. decision-making on management objectives
ii. conflict avoidance and resolution
iii. decisions on distribution of net benefits
iv. monitoring of abdiance with management rules and v. sanctioning of trespasses against management rules.

Easier and more complete access to critical information and the use of embedded social capital are the primary advantages rights holders have over a centralized management authority in performing these functions. Through their multifarious interactions and social relations, rights holders usually know much better about their individual and collective needs and preferences. For management decision-making rights holders can, through their direct participation in the fishery, draw upon their individual and collective knowledge on the location and abundance of fishery resources, observations of catches and catch rates and seasonal and annual changes, technological changes, economic returns and other information. This facilitates achieving mutually satisfactory management objectives. Better and more up to date information and less 'red tape' also engender greater flexibility and adaptability in fisheries management. Moreover, there is greater likelihood that rights holders respect and comply with management rules that were designed and agreed upon by them. The rights holders are also able to monitor each other's behaviour and detect trespasses against management rules.

It is obvious that the size of the community, or group of rights holders, has a strong bearing on the ease, or difficulty, of information sharing, collective decision-making and mutual monitoring. Where the number of rights holders is large spread out over a wide geographical area, direct information-sharing, decision-making and monitoring by group members may become impossible. Moreover, large groups tend to undermine the incentive for each member to act in the collective interest because (a) the internalization of externalities diminishes with increasing group size, and (b), the threat of loosing one's reputation - high in regular and repeated close interpersonal relationships - is less among large groups (Baland and Plateau 1995).

Where group size is large, rights holders would have to elect individuals who represent their interests in management decision-making bodies and confer information acquisition and monitoring functions to specially employed agents or rotate such functions among group members. Both types of solutions can be found in some traditional management systems (e.g. McKean [1986] on the management of common land in medieval Japan).

While there is wide agreement among social science researchers that successful collective action is more likely to occur in small groups (e.g. Olson 1965, Baland and Plateau 1996; Orstrom 1990) the influence of group heterogeneity on the outcome of collective action is less clear. By distinguishing different sources of heterogeneity (i.e. heterogeneity in endowments, socio-cultural characteristics or objectives) Baland and Plateau (1995) have shown that under certain conditions heterogeneity in endowments may be conducive rather than an obstacle to
successful collective action. Failures in collective action, therefore, should not be unquestionably attributed to inequalities in wealth as heterogeneity in objectives may be the real culprit.

In summary, in economic terms, the advantages of GRFs lie in the potential of lower transaction costs in the management of a fishery compared to centralized management or individual property rights (i.e., savings in information, monitoring and enforcement costs through the use of information held privately by fishermen and the use of social-capital embedded in local and professional organizations and institutions). Abdullah, Kuperan and Pomeroy (1998) demonstrate some evidence for lower transaction costs in fisheries co-management regimes compared to centralized management.

4. FREQUENT SHORTCOMINGS OF GROUP AND COMMUNITY-BASED RIGHTS

All or most of the shortcomings of GRFs, as evidenced from the study of traditional fisheries management regimes, derive from the fact that group rights as well as individual rights embedded in GRFs are insufficiently specified, exclusive and protected. The consequence of insufficiently specified rights (e.g. the GRFs do not encompass the full range of the fish stocks) is the existence of significant externalities that undermine the incentive of rights holders to seek long-term resource conservation. Similarly, GRFs not recognized in formal law and, or, inadequately protected from encroachment are under the continuous threat of new claimants that erode long-term stewardship and legitimacy.

Even where GRFs are recognized in formal law and well protected from external threats, they may fail to achieve effective fisheries management because of weak internal governance. A frequent weakness is that management rules are not able to accommodate technological progress and, or, natural population growth. This is often a direct consequence of the manner in which the entitlement to participate in the fishery is specified. Where the entitlement is based purely on membership in a household of the community (or group of rights holders), fishing power and effort may grow beyond sustainable levels with technological progress and increase in the number of households and their members. The pressure for accommodating excess fishing capacity and effort is often especially high where there is a dearth of alternative livelihoods in other sectors of the local economy. As a consequence, stocks may become over-exploited and the community (or group) is unable to capture resource rents. There are examples of traditional GRFs that have been able to devise rules to overcome these problems but they are rare in fisheries. McKean (1986), for example, reports that each household was allowed to send only one member to harvest common forestry resources in Japan (and only as much as she/he could carry) and that there were impediments to the establishment of new households in the communities. In fisheries, a common response has been to halt, or retard, technological progress but this comes at the cost of loss in efficiency. This cost may not be very high where labour costs are low and capital is dear as is the case in many small-scale fisheries of developing countries. The loss in potential efficiency would also need to be weighed against the difficulties and costs of defining, allocating and monitoring compliance with more specific entitlements such as catch quotas. These difficulties are likely among the reasons why entitlements in terms of catch quotas have rarely been observed in traditional GRF regimes but they are of growing importance in modern rights-based management regimes.

5. DIFFICULTIES IN ESTABLISHING GROUP AND COMMUNITY-BASED RIGHTS

There are formidable difficulties to overcome in establishing group and community-based fishing rights that would usually require long and consistent efforts on the part of national and local governmental and non-governmental organizations and on the part of the communities themselves. A prerequisite is the political will to decentralize decision-making power and fisheries management functions to the local level. In recent years, there is evidence in many countries (e.g. Philippines, Thailand and Malaysia) that such political will is indeed forthcoming but current fisheries law may not yet allow in all instances conferring exclusive fishing rights to communities, groups or individuals.

Efforts for the introduction of GRFs would generally benefit from the existence of prior traditional community organizations and management arrangements. Indeed, one of the first steps in any such effort would usually be to enquire and appraise in a participatory manner past and existing structures and arrangements for collective action by the community in the provision of various kinds of collective goods. Such an appraisal would indicate current strengths and weaknesses of the community in performing collective tasks and provide guidance on the kind of external support that might be required to foster successful collective action. Current weaknesses at the community level may include the absence of a viable organization or authority to hold and administer fishing rights, insufficient awareness on the need and potential benefits of improved fisheries management and large membership that necessitates the build-up of complex collective decision-making structures.

The fact that many fisheries are already heavily over-exploited and over-capitalized is a great impediment to the introduction of GRFs. Currently, while many countries have in place provisions that assign exclusive fishing rights to small-scale fisheries in inshore zones, these are hard to enforce as long as industrial fishing fleets are excessively large and dependent for economic survival on infringements of inshore waters. Thus, in many instances, the process of specifying and conferring exclusive fishing rights would likely have to go hand in hand with measures that are geared towards reducing fleet sizes and the number of participants in the fisheries. Such measures may include the cessation of economic incentives (e.g. subsidies, tax rebates) that enhance fishing capacity and fishing effort, the provision if incentives and direct investments to create alternative
employment opportunities for displaced fishermen, and possibly too, the provision of economic compensation for the owners of decommissioned fishing vessels.

Christy (2000a) provides a more extended discussion of the critical issues that need to be considered when endeavouring to establish a GRF (or to rejuvenate a traditional system).

6. LITERATURE CITED


