An introduction to fishery rights-based management

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Introduction

Aristotle, writing in the Fourth Century BCE, remarked that goods held most in common receive the least care. Barnes[2] interpreted Aristotle's statement to mean that open-access resources tend to be over-exploited, degraded, and sometimes destroyed. During the course of the twentieth century, Aristotle's observation became known as the "tragedy of the commons" after the well known article by Garret Hardin.[3] However, more than a decade before Hardin's publication, two seminal articles were published recommending property rights to fix the problems inherent in open access and common pool management of marine fisheries. Gordon (1954)[4] explained why an open-access fishery resulted in little or no profit because of the unlimited entry of vessels and unlimited use of fishery inputs. The analysis by Scott (1955)[5] took the same concept a step further and concluded that when conditions induce a sole owner to be concerned about the impact of the current season's harvests upon future harvests, the sole owner and common pool outcomes will be very different. The sole owner would manage the fish stock as a capital asset that results in benefits for this, and of future generations, whereas vessels under common pool management will continually "race for fish" and there will be overinvestment in vessels and gear leading to resource depletion.

Scott's view of sole ownership was the assignment of exclusive private property rights to use and manage a discrete fish resource to public or private entities that could include a cooperative, government board, private corporation, or international authority. However, as will be discussed in this paper, a diverse array of partial property rights regimes, referred to as fishery rights-based management (RBM) have been used to the manage marine capture fisheries to improve economic efficiency, reduce discards of fish and allow managers to more precisely control catches. There are examples of RBM fisheries where management costs have been recovered from rights-holders and examples where stewardship of the fishery is one of the top goals for industry holding rights to the resource.

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[2] Barnes, R. 2009. Property Rights and Natural Resources. Oxford University Press. Oxford: Hart Publishing, 2009. 472pp.

[3] Hardin, G. 1968. "The Tragedy of the Commons," Science, 162(1968):1243-1248.

[4] Gordon, H.S. 1954. The Economic Theory of a Common Property Resource: The Fishery. *Journal of Political Economy* 80:1031–38.

[5] Scott, A. 1955. The Fishery: the Objective of Sole Ownership. Journal of Political Economy 63:116–24.

Common pool and open access management

> *Wealth that is free for all is valued by none because he who is foolhardy enough to wait for its proper time of use will only find that it has been taken by another, the fish in the sea are valueless to the fisherman, because there is no assurance that they will be there for him tomorrow if they are left behind today.(Gordon 1954, p. 135)*

Under open access or common pool regimes, fishermen typically increase the capability of their fishing vessels in order to "outcompete" each other, ultimately leading to overcapacity, a state where the fishing fleet is capable of harvesting greater quantities of fish than is sustainable. The existence of overcapacity undermines efforts to maintain healthy fish populations, undercuts the economic performance of fishing fleets, creates social problems (e.g. unsustainable employment, low wages) and can compromise fishermen's safety at sea. Despite regulations on fishing inputs (e.g. fishing gear), limits on the total number of vessels and a host of other regulations,[6] overcapacity is a serious global problem that is also prevalent in many tuna fisheries. The World Bank recently reported that overcapacity of the global fishing fleet results in the loss of $50 billion annually, and that if fish stocks were rebuilt, half the present global fleet would be required to efficiently harvest the present marine catch. The 2009 FAO Review on the progress of the implementation of the Code of Conduct for Responsible Fisheries concluded that fishing overcapacity is likely to be the single most important factor affecting the sustainability of global fisheries, hindering efforts to achieve sustainable exploitation regimes.[7]

Failure to effectively address overcapacity creates a vicious cycle, where fishermen are forced to fish harder and longer, and invest more money in a race to catch diminishing stocks. As fish stocks decline, the outlook for fishermen's livelihoods becomes bleaker, resulting in political pressure on governments and international development organizations to provide financial assistance to ailing industries, often only resulting in short-term economic "fixes." Such short-term measures habitually include the expansion of harmful subsidy programs, over-investment in on-shore fisheries infrastructure and the adoption of programs that shift participation to other fisheries that are in moderately better condition.

Characteristics and categories of RBM

RBM refers to a diversity of programs where certain entitlements that bear property rights type characteristics are exclusively allocated to entities in a fishery. Entities can include individuals, groups, communities and nations. Characteristics of RBM programs and how they are combined will influence how people use the rights or privileges, the outcomes and benefits that can be expected and how much the rights could be valued or cost.

Important characteristics of RBM programs

A well defined RBM program is one where rights are unambiguous as to who can enjoy certain benefit streams arising from the fishery resource. Scott[8] highlighted four other important

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[6] These types of regulations can distort technological change in ways that "get around" the rules rather than reduce costs, resulting in dynamic inefficiencies. Dynamic inefficiencies may also arise due to disincentives to invest in the fish resource.

[7] FAO, 2009. Analysis of the Implementation and Impact of the FAO Code of Conduct for Responsible Fisheries since 1995. FAO Fisheries and Aquaculture Circular No. 103, FIEL/C1038 (En).

[8] Scott A. 2000. Introducing property in fisheries management. FAO Fisheries Technical Paper, 404/1: 1-13.

characteristics of property rights that determine the strength of the rights and influence their value and benefits: exclusivity, duration, transferability and security. Use restrictions in space and time are necessary to address open access problems. The longer a right exists, the more security it offers to offset investments and sacrifices made by industry. Transferability without restriction on duration facilitates ownership moving into the hands that values the resource most, and, ensures that the future value of the resource will be accounted for in current harvest decisions. Transferability is critically important in addressing overcapacity. Finally, without backing by the state, others could not be easily excluded and rights would become tenuous. National legal mandates that govern RBM systems determine the security of the right and whether compensation is legally required if the right is diminished.

Characteristics of the fishery and the human dimension will determine whether the RBM program is more conducive to the use of communal proprietorship or to individual ownership and the type of right. Rights can take many forms described below:

Access rights

Typically access rights refer to restrictions on the number of licensed fishers in an entire fishery or to a specific area within the range of a fishery (license limitation). While a license represents an exclusive right, by itself access rights programs are not well defined RBM programs and not able to adequately address the problems of overcapacity and overfishing. In some cases license limitation programs were the first step taken before the transition to better defined RBM programs described in the subsequent sections.

Catch-based rights

The most common RBM programs are catch-based, where the total safe catch level (TAC) for a fishery is divided and assigned to entities in that fishery. Usually, each right holder is entitled to catch a percentage of the total allowable catch that is set by the fishery management authority. As the fish population increases, managers increase the TACs and that translates into higher catches for rights holders. If transferability is allowed, rights can be traded among those in the fishery, sold to new entrants or temporarily leased for one or more fishing seasons.

There are many examples of systems where catch rights have been assigned to individual fishing businesses, referred to as individual fishing quotas (IFQs) or individual transferable quotas (ITQs). New Zealand and Iceland manage most of their fisheries under IFQ programs. There are many IFQ programs in Australia, Canada and the United States. Another common practice is the assignment of catch-based rights to groups of fishing businesses typically referred to as cooperatives e.g. cooperatives in the Alaskan pollock fishery prosecuted by industrial-scale fishing vessels, the system of lobster cooperatives in Baja Mexico where the fishery is comprised of small vessels. Management boards of these cooperatives establish rules for members that include how rights are fished, profit sharing arrangements among members of the group, how and when rights are traded or leased to other entities, setting employee wages and benefits and how management responsibilities associated with the use right are collectively met.

Apart from businesses engaged in the fishery, catch rights have also been assigned to community boards or private organizations, where a clearly defined group is granted ownership

of the rights. Typically these rights are leased to fishers and the organization oversees the dispositions of the revenues collected. The community development quota program in Alaska was implemented to ensure that benefits from the halibut fishery would accrue to coastal communities in Alaska.

One can also view the organization of rights holders as a continuum from individuals acting independently to groups that take collective action and hybrids in between the two extremes. There are a number of IFQ fisheries where individual quota holders formed organizations that jointly carry out science and management functions, better market their products and improve the cost efficiency of their operation. The Dutch flatfish IFQ system is a good example of such a hybrid, where individuals are allocated IFQs, but management groups facilitate the leasing and trading of individual quota shares, and have co-management responsibilities including enforcement of quota regulations.[9]

There are also examples of transboundary and highly migratory fisheries where catch-based rights have been assigned to member nations of a regional fishery management organization (RFMO).[10] The International Pacific Halibut Commission (IPHC) manages the joint stock of Pacific halibut shared by the USA and Canada and assigns a portion of the Pacific halibut TAC to each nation. In the early 1990s both the USA and Canada developed IFQ programs for their domestic fleets. Like the IPHC there are examples of tuna RFMOs that assign quotas to member nations and a few cases where the member nations developed RBM programs for their tuna fleets e.g. the Australian IFQ program for southern bluefin tuna. Although it is unusual for RFMOs to allocate rights either directly or indirectly to individuals, there is an interesting example in the eastern Pacific Ocean (EPO) developed to control the incidental catches of dolphins caught by vessels targeting yellowfin tuna. Since 1992 dolphin mortality limits (DMLs) were allocated to individual vessels under an international agreement. DMLs in the EPO are relatively weak rights because their duration is for only one year (or a shorter period), there are restrictions on transferability and security is subject to the ability of the various governments to renounce their DMLs or to reallocate them among vessels of their fleets.

Effort based and input-based rights

RBM programs based on allocations of total allowable effort are indirect means of controlling fishing mortality, where it is assumed that the number of days fished bears a constant relationship to the amount of fish a vessel of a given size and horse power can harvest. Such programs have been adopted by parts of the tuna fleet in the western central Pacific. Programs based on rights to utilize varying quantities of inputs to the fish harvesting process, such as capacity units and gear units, are less common. One successful example is the northern Australian prawn fishery, where a combination of vessel catching capacity units and gear restrictions were used to reduce the fishery's environmental footprint. Effort based and input based rights could be allocated to different entities and may or may not be transferable.

[9] Arnason, R. (2002) A review of international experiences with ITQs. Annex to: Future options for UK fish quota management. CEMARE Report 58. University of Portsmouth, UK. 71pp

[10] RFMOs are the primary international bodies for the management of highly migratory, straddling and high seas fish stocks.

Area-based rights

Rights for fishing activities can also be assigned by well defined spatial units and there is a diversity of programs that fall under this category. The most frequently cited are territorial use rights fisheries (TURFs) that are based on rights to intertidal or submerged land and typically established for bottom dwelling sedentary resources such as clams and mussels. When growth of the resource is not significantly affected by activities outside the TURF, the situation is almost identical to private ownership. For centuries, coastal communities and groups of fishermen throughout the world established TURFs for nearshore fish resources and the most extensive system of TURFs in existence today are in Japan and Chile.

Area based RBM programs are sometimes combined with other rights such as catch based or effort based rights and these rights bundles can be assigned to individuals, groups or organizations. Specific design features that are important for successful spatial management are the spatial scale of the TURF, the number of participants per spatial unit and the capability to monitor and enforce activities by defined areas. Area based rights can also be established for open water above areas where fish aggregate and one innovative idea put forward by UCSB researchers is the assignment of rights to "spillover areas" surrounding a marine protected area. Typically, nearby open fishing areas surrounding marine reserves are characterized by higher densities of the fish species that are resident in the marine reserve compared to areas further away from the marine reserve.

Fishery managers have combined various elements of RBM programs to address complexities inherent in heterogeneous fisheries and to meet multiple goals within a given fishery. In the Alaskan halibut RBM program catch rights were assigned to different entities comprised of individual fishers in the IFQ program and community boards under the community development quota (CDQ) program. The Alaskan CDQ program was established to benefit residents of rural coastal communities not directly engaged in the halibut fishery. Also, the United States and Canada are exploring RBM ideas to address excess demand for recreational opportunities in the halibut fishery.

Performance of RBM programs

Economic effects

After adoption of RBM economic performance improves through reduction of fleet capacity, improved cost efficiencies and increased profitability. After the implementation of both the Canadian and Alaskan halibut IFQ programs industry profitability increased dramatically, mainly because of increased prices for a fresh product that could be provided throughout a 245 day season compared to the situation prior to the RBM program where the entire catch was landed during a 2-5 day season. The number of vessels in each fishery also declined as less efficient vessels sold their shares to more economically efficient operations. In the case of the Australian southern bluefin IFQ program after the exit of the less profitable operators, the variable costs of fishing were reduced by 23-28%.

The most difficult stages of developing the RBM program is the contentious initial allocation of rights and adaptation to a new system by participants in a fishery. Transitional issues such as the development of new markets for trading quota rights should be facilitated if capacity

reduction is an overarching goal of the program. The introduction of IFQs by the Australian government for 16 species failed to bring about the hoped for reduction in the number of vessels operating in the fishery due to the very low levels of quota traded in the first 5 years of the program. To address these concerns, an industry-assisted quota brokerage service was established in 1997 that greatly increased capacity reduction as average yearly lease quota trades increased by more than 50 per cent.

Conservation effects

Researchers have concluded that RBM programs can provide enabling conditions that significantly contribute to the health of fish populations. These conditions include the elimination of common pool regulations that unintentionally promote discards of fish, the ability of managers to have more precise control of harvests so that catch limits are not exceeded and reduction of effort so that there is less impact on bottom habitat and reduced discards of fish. Researchers determined that the Australia bluefin tuna IFQ program resulted in a 20% reduction in fishing effort compared to the effort that would have been employed under common pool management to catch the same tonnage of fish.

The development of incentives for fishers to more efficiently exploit and conserve fisheries depends on the properties of entitlements and is highly correlated to the strength of the right. For example, New Zealand's Chatham Island fishermen did not organize to fund research on growth and recruitment of abalone until they owned IFQs.

There are many examples where industry and communities participating in RBM programs contribute to funding fishery improvements, usually through a cost recovery component that defrays some or all of the government’s cost for management. Furthermore, a number of mature RBM programs are characterized by advanced co-management, where under government oversight there is substantial devolution of management responsibilities to industry or communities.

For certain fisheries managers are concerned that RBM programs can actually increase discards of lower priced fish. There are many design features to deter such practices but their adoption may reduce economic efficiency.

Equity and socio-cultural effects

The evidence on employment effects indicates that changes in the structure of the workforce in the harvesting and processing sectors ensue after adoption of RBM. These changes can include: stability, where sustainable levels of employment become aligned with appropriate limits for the fishery and increased industry profitability; the replacement of part-time jobs by fewer year round jobs; increased average wages; redistribution of employment from one geographic location to another.

The goals of equity and maintaining the socio-cultural characteristics of a fishery are commonly considered to be inconsistent with economic efficiency. Nonetheless, design features of RBM programs have been adopted to meet these non-economic social goals e.g. measures to retain the participation of small vessel fleets or to avoid the concentration of wealth in the hands of a few. In the Alaskan halibut IFQ program upper limits on individual shares were imposed such

that no quota holder could own more than 0.5% of the total tonnage available in combination with other limits on the leasing and sale of quotas.[11] Researchers found that these restrictions on the Alaskan quota trading placed a bound on the number of active vessels in the halibut fishery. Without these restrictions, the fleet would have been smaller and more efficient, and the Alaskan fishery's value could have been 13-19% higher.

Conclusion

As one would expect the performance of RBM programs will depend on the characteristics of the right and other design features. For example, the maximum economic value of the fishery requires unattenuated property rights……rights that are well defined, divisible, transferable, exclusive, and enforceable.[12] However, tradeoffs between economic efficiency and other goals are usually made to optimize the multi-objective fishery management process, which will vary depending on the context of the fishery. Given the diversity of design features that have been developed and adopted over the past three decades, there can be many possible permutations of RBM that address a variety of fishery management objectives including many socio-cultural and equity considerations. Adding to the versatility of this tool is the idea that RBM can form the core of a solution that works in synergy with other economic incentive based tools such as ecolabeling, payment for ecosystem services and conservation credit schemes.

Suitably formulated RBM programs can be applied to the resolution of many of our existing global tuna problems. Tuna stocks encompass more than one zone of national jurisdiction, and also the high seas, and are exploited by fishing fleets from many nations. As a result, RBM programs for these types of fisheries may require unique program design features. Special considerations that arise when contemplating RBM for tuna fisheries are highlighted in Appendix 1.

[11] In 1996, this cap was increased to 1.5%.

[12] Anderson, T.L; Leal, D.R. 1991. Free market environmentalism. Boulder, CO.: Westview Press.

Appendix 1. Special considerations to be addressed for international fisheries

One of the most contentious issues at the onset of an RBM program is the initial assignment of rights. There is no "correct" method to initially allocate fishing rights and in many cases recent and historical harvests and participation typically influence the allocation outcome. Rights-based management programs can proceed via different mechanisms for RFMO-managed species. One option is for RFMOs to allocate rights to a proportion of a science-based TAC to member countries, and member countries can subsequently develop RBM programs for their domestic fleets engaged in the respective tuna fisheries (as does Australia and the US, for instance). Member countries could also individually or collectively lease all or part of their allocated rights to foreign fleets with accountability procedures incorporated into bilateral fisheries agreements. Alternatively, RFMOs can lease or allocate rights to individually licensed vessels in an appropriate registry, and even collect part of the royalties sufficient to monitor and manage the fishery. In the latter case, proceeds could even be divided among the various member states or be utilized to compensate non-participating nations with high seas fishing rights.

Transferability of rights within an industry and across nations are other sensitive issues that arise in the design of RBM programs. The ability to transfer rights is desirable in an RBM program to allow new entrants into the fishery and thus an important feature for the future participation of developing states.
Transferability is usually necessary to reduce overcapacity and reduce discards. While fishery participants are sometimes concerned that transfer of rights may lead to excessive consolidation or significant changes in the makeup of the fishery, such issues have been addressed in many RBM applications through the adoption of features such as ownership caps and modified trading rules that ensure the participation of specific groups or sectors of the fishery. These are just examples as there are numerous RBM arrangements that can be developed to deal with these complex issues, including those associated with social equity.

Rudimentary systems for quota trading among states are allowed in some RFMOs and an analysis of the legal issues surrounding transferability of quotas among members of RFMOs found that any such systems depend on decisions of the RFMO concerned, rather than on the development of new international law. [13] Furthermore, there is no legal impediment to states facilitating quota trading between their nationals under whatever conditions they agree.

The common pool problem in restricting access to high seas resources

The conditional 'freedom to fish' established by relevant provisions of UNCLOS and the ancillary Fish Stocks Agreement (UNFSA) gives all states the right to fish the high seas subject

[13] Serdy A. 2007. Trading of Fishery Commission quota under international law. Ocean Yearbook, 21: 265-288.

to the conditions established by the provisions of these and other agreements to which those states are party. In essence, the UNCLOS obligation to cooperate is manifest in UNFSA as an expectation that states wishing to undertake or allow high seas fishing will do so through membership of the relevant RFMO. Any catch or effort limiting or allocation arrangements adopted by states party to any such RFMO thus not only have to be negotiated to the satisfaction of the member states but may also have to provide for the potential future participation of states not yet party to that RFMO. If this latter consideration is not honored, non-party states are likely to resort to unregulated fishing in defiance of RFMO arrangements. Furthermore, if the former consideration is not honored, legitimate overfishing will eventually lead to stock collapse. Notwithstanding these common pool considerations, ecologically sustainable fishing cannot be guaranteed unless an arrangement can be developed that: a) closes the fishery to unlicensed operators (eliminates IUU-unregulated fishing); and b) ensures compliance with measures by licensed operators (eliminates IUU-illegal and unreported fishing).

Developing nations with aspirations to participate in tuna fisheries

Developing nations with aspirations to exercise rights to engage in tuna fisheries can do so in a wide variety of ways. For instance, they could negotiate arrangements to share in the economic benefits of healthy, efficiently operating tuna fisheries without developing their own fleets. Investing in further fleet capacity is not likely to be a good medium or long-term business model and would add to the present overcapacity problem of the global tuna fleet. Quota set asides can be leased to existing fleets and provide a stream of revenue to developing nations who could in turn utilize such revenue streams to benefit local communities and create environmentally sustainable employment opportunities.

Artisanal and coastal fleets that depend on tuna

Securing the future participation of existing coastal or small vessel tuna fleets can be included in appropriately adapted RBM programs. Member nations can assign a specific portion of their allocation to the coastal or artisanal fishing sector or to specific communities and establish separate trading and management programs to meet the objectives for the respective group while complying with RFMO rules.