Forthcoming: FISHERIES, Vol. 34 (4), 2009.

ABDICATING RESPONSIBILITY: THE DECEITS OF FISHERIES POLICY[1]

Daniel W. Bromley
Anderson-Bascom Professor of Applied Economics
University of Wisconsin-Madison
427 Lorch Street
Madison, WI 53706
www.aae.wisc.edu/dbromley

I. Introduction

The economic crisis now sweeping the world has been attributed to the abandonment of governments' necessary oversight responsibilities whose purpose is to reassure citizens that economic processes conduce to the enhancement of public well being. For several decades now the prevailing *zeitgeist* has celebrated the wisdom and prudence of the widest possible scope for individual autonomy in matters of creating income and accumulating wealth. These attitudes have flourished in an evolving culture that willingly accepted a falsely dichotomized polity—there is the "economy" and then there is "government." The resultant, encouraged by the profound ascendancy of globalization throughout the 1990s, was an imperative that government (the realm of collective action—"politics") must not be allowed to interfere with the economy (the realm of alleged individual "freedom"). The currency crisis to strike Southeast Asia in 1997 was an early warning of what happens when wealth creation is unhitched from what might be thought of as proper adult supervision.

National fisheries policy since the advent of the Exclusive Economic Zones seems small stuff indeed compared to the economic trauma that began in the summer of 2008. However, the central argument advanced here is that widespread abdication of due diligence on the part of national governments with respect to their fisheries resources arises from the same *zeitgeist* that has brought us the worst economic scenery since the world-wide depression of the 1930s.

In national financial affairs the debate is cast in terms of "free markets" versus government "interference" in the market. In fisheries policy the debate is cast in terms of the documented failure of national governments to manage—assure the sustainability of—fish stocks versus the utopian vision of so-called "privatization" and the implied abdication of management. The advocacy of individual fishing quotas—known as IFQs or ITQs—is the natural resource equivalent of economic deregulation dating back to the triumphalism of the

[1] An earlier version was submitted as written testimony to the Pacific Fisheries Management Council in conjunction with the planned introduction of an IFQs fishery for West Coast Groundfish. I am grateful for helpful comments by Seth Macinko and two anonymous reviewers.

1990s when the Soviet Union collapsed and it was happily announced that "markets had won." In contrast to the emerging understanding in world financial affairs that "the market" and its self-interested players cannot be trusted with the greater public good, quite the opposite ideology persists in fisheries policy—just leave it to the industry to bring about efficiency and rent maximization.

This faith in the universal beneficence of individual maximizing behavior underwrites the several deceits of contemporary fisheries policy and the bewitching allegories advanced on their behalf. I will discuss the five core deceits that authorize utopian claims about the beneficial outcomes to arise from an introduction of IFQs. These deceits are: (1) over-fishing can be blamed on missing property rights; (2) private ownership is necessary and sufficient for socially beneficial stewardship; (3) IFQs must be of infinite life and freely tradable in order to produce the desired efficiency and stewardship properties; (4) IFQs are private property; and (5) IFQs are necessary and sufficient to produce efficiency, and to maximize resource rent, in a fishery.

I will show each of these claims to be incoherent. I will then offer a brief outline of a national fisheries policy that acknowledges the clear need for allotted catch shares, but that rejects the common myth that an IFQ fishery is one that will not require careful and attentive management by governments. I will also explain the economic logic that underpins the imperative that fishing firms must pay a royalty share (resource rent) on the fish they catch and sell.

Before proceeding, the term "IFQ" is generally used to connote a particular set of attributes. In particular, an IFQ fishery has all of the following attributes:

1. Catch shares—portions of a fixed total allowable catch (TAC)—are given away free (gifted) to members of a specific fishery based on certified catch history over a politically determined time period;
2. This allotment is a gift in perpetuity and the gift may be leased or sold to others;
3. There is no attempt by governments to capture the resource rent in a fishery.

II. The Five Deceits

A. The Ownership Fetish

> *"From an economic theory point of view, the major source of the overfishing problem is the lack of property rights [Anderson and Holliday, 2007, p. 9]."*

To those not indoctrinated by the fisheries literature dating back to Scott Gordon's article in 1954, this assertion will be quite incomprehensible. To be as clear as possible, the unique "source" of over-fishing is that the annual rate of human-induced mortality on a renewable fish stock induces a decrease in future stocks and their productivity. Over-fishing,

like over-hunting, and over-grazing is straightforward biology, taught to countless undergraduate students exposed, for the first time, to the elegance of a Lotka or a Volterra.

Why do people fish? They fish to gain control of a future value—fish that can be eaten or sold. Fishing is explained by a quest for future value. Why do people over-fish? They over-fish because their desire for the control of future value exceeds the rate at which a renewable natural resource can produce future value. How does one prevent fishing? You do not allow fishing. How does one prevent over-fishing? You constrain the quest for control over future value to the rate at which nature can yield up future value today—and for evermore. If people are caught in the act of over-fishing penalties are imposed. Human societies, over a rather long history, have figured out how to prevent all manner of unwanted activities and outcomes—from child pornography to organized dog fighting. It is no great mystery, and ownership plays no part in the story. Only fisheries economists—and ideologues—believe that property rights (or the lack thereof) explain over-fishing.

Is it possible to stop over-fishing? Departments of natural resources in approximately 50 states seem to have figured this out. Over-fishing in federally managed fisheries occurs because the government agency charged with preventing over-fishing has failed to do so. Does it matter that the National Marine Fisheries Service is in the U.S. Department of Commerce rather than in a government department concerned with natural resource conservation? Does it matter that the regional fisheries management councils contain locally prominent representatives of the commercial fishing industry?[2] Does it matter that regional politicians interfere with the findings and recommendations of fisheries scientists?

If fisheries economists wish to offer up plausible hypotheses about over-fishing it will be necessary to develop comprehensive explanatory models as opposed to trivial ones. The act of over-fishing has become elaborately obfuscated by bogus claims about ownership. Those bogus claims are then magnified in fallacious ways.

B. Property Rights and Stewardship

> *"A key to creating incentives for more sustainable behavior is to provide fishers with more secure harvesting or territorial rights to fish. Such rights enable fishers to enjoy a sustainable flow of benefits from fishing with an enforceable right to exclude others from those benefits but generally do not give ownership over the resource stock [Grafton, et al. 2006. p. 701]."*

.

> *"…a key to generating appropriate incentives is for fishers to have the ability to exclude others from fishing, thereby reaping both the pain of overexploitation and the gains from conservation. Exclusive property rights, however, do not guarantee sustainability [Grafton, et al. 2006. p. 701]."*

[2] See Okey [2003].

> *"The key to IAFs [inventive-based approaches to sustainable fisheries] is to provide harvesters with long-term secure rights (Hannesson 2004) that are legally enforceable, along with corresponding duties by nonowners to not interfere with these rights (Cole and Grossman 2002). In practice, individual harvesting rights are often specified as a revocable privilege…However, these privileges are de facto economic property rights, provided that adequate monitoring and surveillance exists [Grafton, et al. 2006. p. 701]."*

These quotes are consistent with the tradition in fisheries economics. Sadly, they are consistent with the deep and chronic conceptual confusion in that literature.[3] We see here that revocable privileges are long-term secure rights, that such privileges are de facto economic property rights, and that these revocable privileges protect the holder from nonowners. Those who understand legal matters will tell us that it is quite impossible to believe that "revocable privileges" are "secure rights." They would also point out that it is impossible to believe that such "privileges" are "de facto economic property rights." These dual impossibilities spring from the legal reality that "privileges" cannot be "rights," that there is no such thing as "de facto rights," and that there is surely no such thing as "economic property rights." Finally, since those holding "revocable privileges" are not owners, it is logically impossible to claim that these revocable privileges protect the holder from "nonowners." Only owners can be protected from nonowners [Becker, 1966; Hohfeld, 1913].

Some fisheries economists have acquired the habit of using terms—concepts—to mean anything they want, and very often to mean nothing at all.[4] Fisheries biologists must come to a shared understanding about concepts such as recruitment and age class before they can write down models of population dynamics. Ecologists must do likewise with concepts such as succession and resilience. Physicists are not free to define entropy to mean whatever they wish—at the moment—for it to mean. In contrast, many fisheries economists seem under no obligation to adhere to the precise legal meaning of the legal concepts they invoke. Fisheries economists are not at liberty to deploy legal concepts as if seen through a "looking glass."

Ignoring the above legal mumbo-jumbo for the moment, notice that the authors regard "exclusive property rights" as necessary but not sufficient for stewardship. This hedge is problematic for the simple reason that the claim of necessity is itself bogus.

As above, a necessary condition for sustainability—the only condition—is that a renewable resource will be used ("drawn down") at a rate that does not diminish its capacity to reproduce itself in subsequent time periods. Those who claim that exclusive property rights are necessary (but not sufficient) for sustainability commit a logical fallacy that pervades public perceptions about private ownership and socially beneficent behavior. This fallacy draws on political ideology—and nothing more than such ideology—that sanctifies the individual as the sole decision maker who can produce "optimal" outcomes. But its core flaw is that it reflects the same incoherence exposed in the previous section—the desire to embed

[3] These concepts are discussed in great detail in Bromley [1989, 1991, 2006].
[4] Robert Brandom reminds us that "Grasping a concept is mastering the use of a word [Brandom, 2000, p. 6]."

over-fishing in the realm of property rights rather than in the realm of biology and how humans act with respect to nature.

Notice that if private ownership were necessary for stewardship, as the above quote implies, it would be impossible for there to be good stewardship in the absence of individual property rights. And of course this is nonsensical. The stewardship properties of Yosemite National Park, or the Grand Canyon, do not seem defective by the absence of exclusive private property rights therein. The timber resources on federal lands in the United States do not seem under threat by the absence of private property. Indeed there are plausible arguments that timber resources are bounteous precisely because they are protected by public ownership rather than by private ownership. And this brings us to the sufficiency argument.

The State of Washington, 1945, passed the Forest Practice Act to require that private landowners re-plant trees on land from which they had harvested trees, or leave a certain number of trees per acre to enhance regeneration of the stock. If private property were so salubrious for stewardship this law in the State of Washington would, quite obviously, be unnecessary. The Soil Conservation Service was created in the USDA following the Dust Bowl because farmers—obviously the owners of the land they farmed—were destroying their top soil by practices giving rise to soil loss in the neighborhood of 15 tons per acre per year. If private ownership of land were sufficient for stewardship, the Soil Conservation Service would be redundant. Virtually every city in America has local ordinances requiring that private dwellings (and surrounding landscaping) be kept in some plausible state of repair. Owners who ignore such ordinances are subject to fines. If owning private property were a sure guarantee that an asset—a house and a yard—would be kept neat and tidy then such laws would be redundant.

These examples remind us that private (individual, exclusive) ownership and control not only fails the sufficiency claim, it cannot even survive the necessity claim. While this fact is well known among economic theorists, it seems to have gone unnoticed by many who contribute to the fisheries literature. To be precise about the matter, if the "time preference" of a private owner is such that income now trumps income in the future then private owners will be quite intent on liquidating (destroying) a renewable natural resource in order to spend the proceeds—or invest them elsewhere [Clark 1973; Page 1977; Smith 1969]. It is surprising that so many fisheries economists remain innocent of this work. Perhaps they have been smitten by the utopian claims for IFQs.

C. On Perpetuity

> *" …ITQ fishers may often be expected to favor management actions that protect and enhance fish populations, because the value of a quota share increases as stocks become more abundant. Problems that may arise, such as misreporting or high-grading of catches, have been successfully countered by the use of observers, required by the management system but paid for by the industry; …Experience with ITQ systems shows that many fishers willingly support and adhere to conservative management strategies and may also avoid fishing practices that endanger habitat or*

> *threaten other species, so long as they are guaranteed long-term rights. But this does not mean that enforcement and scientific monitoring are unnecessary in ITQ systems; both are essential unless catch levels are set at precautionary low levels. It is thus unsurprising that the two countries with perhaps the most fully developed ITQ systems, New Zealand and Iceland, have some of the highest costs of management per fishing vessel [Beddington, et al. 2007, p. 1714]."*(emphasis added)

Here we see yet another rendering of the optimistic speculations concerning how IFQ (ITQ) programs are alleged to work—fishers "may often be expected," "problems that may arise …have been successfully countered," "may also avoid." Notice that all of these promising results are strictly conditional: "…so long as they are guaranteed long-term rights." It seems that fishing firms can be expected to act in socially optimal ways—except when they decide not to. And then we need government observers—and fishing firms need "guaranteed long-term rights." The cynic might speculate that this resembles a threat—give us long-term rights or we will not be good stewards. More curiously, the necessity of observer coverage, and high "management costs," suggest that even with the "most fully developed ITQ systems," fishing firms—like teenagers—cannot be trusted out alone. If IFQs are so salubrious for stewardship and enlightened management, why is there a need for on-board observers? Why can't these firms with IFQs be trusted?[5]

The common assertion (as above) is that IFQs must bestow "long-term rights" and that the IFQs must be fully transferable. It is claimed that only in this way can the holder of an IFQ (I refuse to call such a person an "owner") capture the future value of his/her beneficent stewardship over time. We see that an IFQ program is intended to allow the lucky recipients of these government handouts to make money two ways—either by fishing or by selling the gifted IFQs.

But of course reality undermines such optimistic speculation. Since an IFQ is for a share of an unknown future TAC, there is sweeping uncertainty concerning what, exactly, the empirical content will be of a share of an unknown TAC in 5 or 10 years. What exactly IS the value in 10 years of a share of an unknown TAC if the buyer has no idea whether or not the fish stock will crash because of increased ocean temperatures? It is not in doubt that a seller and a buyer of an IFQ could conjure some price that both would find compelling. But that is not the economically pertinent question. The only question that matters is whether or not that eventual and highly speculative market provides a sufficient incentive for current holders to practice good stewardship each and every season they fish—that is, until the current holder decides to cash out. The requisite incentive properties are vanishingly small.

It will be claimed (as above) that IFQs must be granted in perpetuity so that holders will have a long-run motivation for stewardship. Perpetuity induces stewardship, unless it fails to—see Clark [1973], Page [1977], and Smith [1969]. Apparently it is possible to believe most anything. The argument for perpetual IFQs fails. Does "tradability" matter for long-run

[5] See Branch and Hilborn [2008] for an account of the British Columbia groundfish trawl fishery where individual transferable quotas and "100% observer coverage" produced "optimal" results.

efficiency? It cannot matter for the reasons above. The only situation in which trades among holders of IFQs (catch shares) might conduce to efficiency is within a single fishing season. That is, if one holder ends up with excess landings no great harm is perpetrated by a consensual bargain that transfers all or a portion of that overage to others. No great harm would result, as well, from ex ante swaps of shares before a season starts. But these trades enhance efficiency within a single season only.

D. IFQs and Property Rights

> *"[I]ndividual permanent catch quotas of a regulator-determined TAC are only a stage in the development of management from licensing to private rights. This evolution can be expected to continue until the owner has a share in management decisions regarding the catch; and, further still, until he has an owner's share in management of the biomass and its environment... [Scott, 1989, p.33]."*
>
> *"[A]nother important issue is the quality of the property right in what really counts, i.e., the resource itself and its environment [Árnason, 2000, p. 23]."*
>
> *"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 turns out that there are ways to turn public goods into private goods [Árnason, 2000, p. 24]."*
>
> *"The solution to the current wasteful race to fish involves establishing property rights. Individual transferable quotas represent a positive step toward private property rights, and they have stopped excessive exploitation and improved fisher profitability. With the exception of New Zealand, however, current ITQs still rely heavily on political management of the resource. The ultimate solution is full- fledged property rights [Leal, 2000, p.27]."*

These quotes capture the standard deceit—that IFQs are private property rights. There are two genres of literature to which we might turn for an answer to this important legal matter. We could consult some fisheries economists whose grasp of the relevant legal literature—as above—is seriously defective.[6] Or, we could consult the U.S. Congress. The Magnuson-Stevens Fishery Conservation and Management Act states:

> "SEC. 303A. LIMITED ACCESS PRIVILEGE PROGRAMS.
>
> (a) In General.--After the date of enactment of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006, a Council may submit, and the Secretary may approve, for a fishery that is managed under a limited access

[6] See Cole and Grossman [2002] for an account of how economists are often confused about legal concepts such as property rights.

system, a limited access privilege program to harvest fish if the program meets the requirements of this section.

(b) No Creation of Right, Title, or Interest.--Limited access privilege, quota share, or other limited access system authorization established, implemented, or managed under this Act--

(1) shall be considered a permit for the purposes of sections 307, 308, and 309;
(2) may be revoked, limited, or modified at any time in accordance with this Act, including revocation if the system is found to have jeopardized the sustainability of the stock or the safety of fishermen;
(3) shall not confer any right of compensation to the holder of such limited access privilege, quota share, or other such limited access system authorization if it is revoked, limited, or modified;
(4) shall not create, or be construed to create, any right, title, or interest in or to any fish before the fish is harvested by the holder; and
(5) shall be considered a grant of permission to the holder of the limited access privilege or quota share to engage in activities permitted by such limited access privilege or quota share."

IFQs are permits and nothing more [Bromley, 2005; Macinko and Bromley, 2002, 2004]. But of course this legal clarity does not deter the issuance of contrary opinions among those who write about IFQs. Many authors claim that because IFQs can be transferred (leased or sold) they thereby become a property right. The fact that they can be (and have been) contested in divorce proceedings is also claimed to make them a property right. And then the fact that bankers will loan money to purchase IFQs seems adequate to these observers to render IFQs a property right. In this latter regard, recent financial difficulties remind us that American bankers have shown themselves quite eager to lend money on a wide variety of instruments of dubious credibility and provenance. Apparently one could obtain a mortgage without a credit history, without a down payment, and without an income to service the debt.

I now turn to a recent effort to document the alleged salubrious stewardship outcomes of IFQs [Costello, et al. 2008]. To set the stage, the authors wish to describe a fishery without IFQs: "Because individuals lack secure rights to part of the quota, they have a perverse motivation to 'race to fish' to outcompete others. This race can lead to poor stewardship and lobbying for ever-larger harvest quotas, creating a spiral of reduced stocks, excessive harvests and eventual collapse [Costello, et al. 2008, p. 1679]." Notice once again the conventional catechism that over-fishing is inevitable in the absence of "secure rights." And from this false encomium to something called "rights," the story glides immediately to IFQs—we are put on notice that in a fishery without IFQs there is a good chance of an "eventual collapse." From this inauspicious start the authors set about to test the following proposition: "Can catch shares prevent fisheries collapse? [p. 1679]."

But of course their findings are comprehensively spurious because they failed to make the essential distinction between the effects of a binding total allowable catch (TAC) as opposed to the effects of IFQs (catch shares). Notice that it is impossible to make this

distinction because an IFQ is simply a share of a TAC. So when they tell us that they found 121 fisheries using "catch shares" they should have told us that they found 121 fisheries in which TAC limits had been introduced. Notice that this correct specification of the research question undermines the celebration of IFQs (and catch shares) as solving the over-fishing problem. Since a "catch share" is a portion of an annual TAC this would seem to suggest that prior to the introduction of catch shares there were no limits on total catch in these 121 fisheries. Could it be that all of these fisheries were crashing not because of the absence of IFQs (catch shares) but because of the absence of binding TAC limits? Is it possible that the authors have captured the effects of the introduction of catch limits (TAC) but have chosen to attribute the reversal of "eventual collapse" to catch shares (IFQs)? It would seem that their IFQ cases are simply TAC cases. We have an attribution problem here.[7]

If one wished to test the stewardship properties of catch shares (IFQs), the careful researcher must analyze a large number of TAC-controlled fisheries and then find some that have introduced IFQs. The pertinent research question would then become—have catch shares enhanced the stewardship properties of a fishery already under coherent and binding TAC management? Only then could the researcher be sure whether the claim of stewardship is correctly attributed to catch shares and not to the existence of a firm TAC. After all, it is binding TACs that explain the absence of over-fishing. Catch-shares stifle racing, but their contribution to stewardship across seasons is nugatory.

Recall that the purpose of a TAC is to prevent over-fishing, while the purpose of allotted catch shares is to preclude racing for fish in a given season. And it is precisely here that we encounter the fount of so much conceptual and policy mischief. The advocates for IFQs have violated the first "law" of coherent economic policy—one policy instrument for one policy problem. If over-fishing is a problem then address that problem with a single coherent policy instrument. This is the purpose of a TAC, and the dreary record of fisheries management suggests that TACs are not taken seriously, nor rigorously enforced, in many fisheries. If racing is a problem then address that with a single coherent policy instrument. That is the purpose of allotted catch shares.

With over-fishing addressed by a meaningful and binding TAC, and with racing addressed by the allotment of catch shares, what possible reason can there be for the free gifting of allotted catch shares into perpetuity to the members of an industry—without any obligation to return resource rent to the nominal owner of the valuable fish in the EEZ? The only possible reason can be yet another deceit—that by handing over the public's wealth in the EEZ fisheries to the private sector, members of the industry will then buy and sell these gifted quota shares in an elaborate exercise of consolidation until decentralized

[7] Not only are catch shares and TAC limits locked together as "one thing" managerially, there is a good chance that they are linked in the mind of those who fish. The linguistic charade of "rights-based" fishing over the past decades has induced those who fish to believe that they are gaining "rights" (rather than a revocable permit under the control of fisheries managers) when they receive the marvelous free gifting of catch shares under IFQs. Having received this enormous free income stream, embodied in something they imagine to be a "right," renders them more willing to accept hard TACs. We might, to good effect, understand this to be a form of bribery: "We will give you, for free, all of that wealth and all we ask in return is that you now behave better than you have heretofore." But of course the large management costs in New Zealand and Iceland, and the need for elaborate observer coverage in many fisheries, suggests that many governments have been duped.

"rationalization" has created a closed class of vessels earning excess (extra-competitive) profits.

We now encounter the final conjuring—that the creation of this extra-competitive income constitutes the maximization of resource rent, thereby bringing about "efficiency" in the fishery which will "make society better off."

E. Resource Rent and Efficiency

> *"One can interpret the arguments over ITQ programs primarily as a debate over objectives: proponents of economic efficiency against those more concerned about jobs, social equity, and community impacts [Hilborn, 2007, p. 155]."*

This quote captures yet another conceptual confusion that has plagued fisheries policy for decades—achieving efficiency versus something else vaguely called "jobs, social equity, and community impacts." The problem here is the false choice on offer—you can have an "efficient" fishery, or you can have those others things. This framing puts managers and public officials on notice—if they decide in favor of jobs, social equity, and communities it signals that they do not care about "efficiency." And of course this then reinforces the worst (or the best, depending) anecdotes about managers and politicians—given a choice, they favor "inefficiency."

The incoherence of this approach does not preclude its wide acceptance—as revealed here in its repetition by an esteemed fisheries biologist. This particular incoherence has its origins in the failure of most fisheries economists to comprehend the concept of efficiency, and then to pass on that failure to non-economists where it can do mischief. Very soon it has been repeated often enough that it comes to be thought true. We can set the record straight with a few tight paragraphs.[8]

Efficiency is a property that concerns economic decisions at the margin. Technical efficiency is attained when all factors of production are allocated precisely in accord with their respective marginal contribution to the desired output. Price efficiency is attained when that allocation also brings the marginal value of the contribution of those factors to total output precisely in accord with their marginal cost. Top level efficiency means that both technical and price efficiency prevail, and that the final product is traded in a market where its price is perfectly in accord with the marginal valuation of the consumer of the product. In contrast to this quite elaborate theoretical idea, efficiency in the fisheries literature has become thoroughly mongrelized to mean that resource rent has been maximized. The deceit is then compounded by the fact that most authors are confused about the concept of rent.

The concept of efficiency has a profound bearing on public policy—what we call welfare economics. Every economist is presumed to understand the two fundamental theorems of welfare economics for the simple reason that these two theorems underwrite any

[8] See Bromley [1990] for an elaboration of this material.

possible prescriptive claim—policy recommendation. The indirect theorem tells us that for any possible set of initial conditions—factor endowments, income and wealth position, institutional arrangements (legal structure)—there is an allocation of resources that is Pareto optimal. This means that the particular allocation cannot be improved upon and it is, therefore, Nash efficient. The direct theorem tells us that this efficient allocation of resources can be sustained by competitive markets that assure equilibrium across all margins [Bromley, 1990]. Both confusions—efficiency and resource rent—can be exposed with reference to Figure 1.

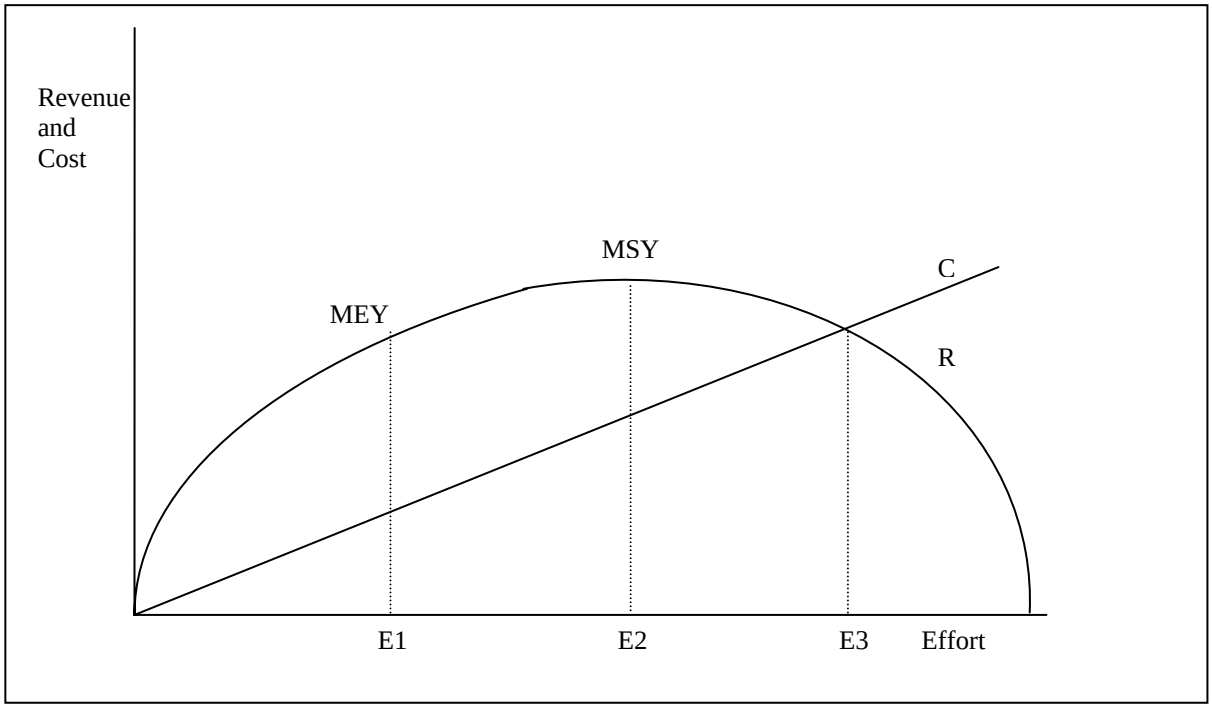

Figure 1.

Though we could draw on a large number of accounts of this iconic Figure, I will use the one that was presented to the Pacific Fishery Management Council in a report pertaining to the proposed introduction of an IFQ fishery. The authors wrote:

> *To explain how sustainable and economically desirable resource rents arise it is useful to look at a simple fishery model (Figure 1) that includes: fishing effort; revenue and costs; and a biological optimum called maximum sustainable yield (MSY). MSY is a standard reference point for the biologically optimum level of catch. In Figure 1 MSY is reached at point E2 -- beyond this point revenue begins to fall as catches fall and costs continue to rise due to the increased effort needed to catch fewer fish. Resource rent is the vertical difference between the revenue curve R and cost line, C. The difference is largest at point E1. This point is referred to as the Maximum Economic Yield (MEY). At MEY the resource rent is greatest, the fishing effort is at its*

lowest, and the total catch at E1 is equal to that at E3, the point at which revenue equals cost, only normal profits are earned, and a depletion of fish stocks results. MEY is therefore a desirable ecological and economic goal for the management of a sustainable fishery. The resource rent accrued at MEY would generate the highest net revenue and result in the largest return to society.

Most fisheries do not operate at E1 and fail to maximize rents. They operate at E3. This is because the cost line C includes an allowance for normal profits. New entrants will continue to enter an unrestricted fishery until E3 is reached and a profit can no longer be made. At E3 all rent has been dissipated and the stock is being over-fished by the difference between E3 and E2. Even if regulations restrict fishing to MSY and some rents are generated this is still economically inefficient compared to E1. Over time rents can be increased through incentives and entrepreneurial behavior by improving output markets (increasing the height of the revenue curve) or improving technologies (decreasing the angle of the cost line)." [Sylvia, et al. 2008, pp. 2-3].

Notice that the vertical distance in Figure 1 is referred to as resource rent and it is claimed that this magnitude must be maximized in order to produce the "largest return to society." The reader is then told that fishing effort must be restricted from E3 or E2 back to the "efficient" level of effort—E1. It is also claimed that all of us ("society") are suddenly made better off when effort is driven back to E1 because it is here that "resource rent is maximized." It is said that here the fishery will be efficient. If resource rent is maximized in an efficient fishery, and if society is alleged to be better off at E1 as opposed to E3, the question worth asking is what sort of magic has transpired to bring about this happy result? The magic is that firms are evicted or bought out—it is called "rationalization"—in order to generate extra-competitive profits in an exercise reminiscent of a quest for a "sole owner" [Scott, 1955]. A sole owner is a monopolist.[9]

I will return to this matter, but it is first necessary to focus attention on the common assertion that a fishery with effort level E3 is inefficient. The standard account refers to "rent dissipation" when aggregate effort is at E3 rather than at E1. The idea of rent dissipation seems wasteful—as if something important is disappearing or being squandered. The problem is that the term rent has a very distinct meaning in economics, and a different meaning in the fisheries literature. Rent (correctly speaking, "economic rent") *is the net revenue to a firm that is in **excess** of what would be necessary to keep the firm engaged in its current activity.* Economic rent is extra-competitive (excess) profit. Industries with blocked entry, or with some other means to prevent competitive pressure, earn economic rent. The point of a competitive market economy—see the above first and second theorems of welfare economics—is to provide opportunities for entry so that supply is increased and prices are thereby "pushed down" to their competitive (lowest-possible) level. Consumers gain from lower prices. That is the sole justification for a competitive market economy.

[9] Scott denies that a sole owner is a monopolist [Scott, 1955, p. 117]. However, for a single fishery—say the Alaskan halibut/sablefish fishery—it seems difficult to maintain that having that particular fishery exploited by a single owner is not a situation of a single (monopoly) supplier of halibut/sablefish into the market. The same reasoning applies to the Bering Sea/Aleutian Island crab fishery, or indeed the Bering Sea pollock fishery.

The standard account of Figure 1 invites the unsuspecting reader to believe that something horrible is happening when effort E3 is observed. It is said that "rent dissipation" has occurred and the fishery is "inefficient." But which rent do fisheries economists have in mind here—economic rent or resource rent? The common lament seems to be that resource rent is being dissipated as the fishery moves toward E3—but this is incorrect. As effort expands from E1 to E3 it is the economic rent that is being dissipated—and this is not to be lamented. In fact, the dissipation of this economic rent is precisely what happens in a competitive economy. And it **must happen** if the industry is to be competitive rather than monopolistic (or oligopolistic). At E3 all fishing firms are earning competitive profits—what all firms earn in a competitive market. If firms were not earning competitive profits they would exit the fishery to realize a greater return for their labor and management skill in other lines of work. Notice that when aggregate effort is less than E3 there are extra-competitive returns (excess profits) to be made in the fishery as evidenced by the vertical distance between R and C in Figure 1. We see that these excess profits serve as the attractant (the "economic pheromone") that draws entrants in pursuit of these artificially high returns. Firms will enter—capturing some of that excess profit—until all firms are earning no more than competitive returns (normal profit). We now see that this thing called "rent dissipation" is nothing but the elimination of excess profit that would otherwise accrue to firms when aggregate effort is less than E3.

Notice how the authors of the above quote describe this process—"New entrants will continue to enter an unrestricted fishery until E3 is reached and a profit can no longer be made [Sylvia, et al. 2008. pp. 2-3]." But these authors have already told us that "the cost line C includes an allowance for normal profits." The reader is therefore induced to believe that firms which are actually making normal (competitive) profits are unable to make any profits at all. And from this deceit emerges the standard prescription that these fishing firms, because they are "not making any profit" would actually be better off if they were evicted or bought out of the fishery so that they might escape the impoverished servitude of rent-dissipated fishing.[10] After all, wouldn't they be much happier as electricians, or school teachers [Bromley, 2008]? Apparently those who fish cannot be trusted with their own occupational choices.

It is now apparent that the "rent" fisheries economists wish to maximize is not resource rent at all but is, instead, economic rent—excess profits accruing to the lucky firms NOT excluded from the fishery. The pursuit here is simply to maximize the income that would accrue to the sole owner (a monopolist or a "near" monopolist).

The slippery nature of "profit" shows up in yet another curious claim: "Even when management sets harvest quotas that could maximize profits, the incentives of the individual harvester are typically inconsistent with profit maximization for the fleet [Costello, et al. 2008,

[10] In a serious theoretical *faux pas*, Gordon lamented this situation by saying: "This is why fishermen are not wealthy, despite the fact that the fishery resources of the sea are the richest and most indestructible available to man [Gordon, 1954, p. 132]." The flaw I have in mind is not his claim of fisheries as "indestructible" but rather the observation about poor fishermen. His assertion is akin to lamenting that an Iowa family farmer is not wealthy despite being settled in the middle of the most bounteous agricultural land in the world.

p. 1679]." The abiding problem here is that the job of fisheries managers is to protect fish stocks—not to try to maximize the profits of the fleet. Only a sole owner (of the entire fleet) in a particular fishery would be concerned with maximizing profits of the fleet. The above quote seems to suggest that individual fishing firms should be treated as mere pieces of capital (vessels) to be deployed or shunted aside so that aggregate fleet profit can be maximized. It is rather like General Motors or Ford closing assembly plants in order to increase corporate profits. Except here the "plants" to be closed (removed from the fishery) are individual firms. Are individual fishing firms—many of them family firms—nothing but pieces of capital to be used or banished as government fisheries managers seek to "maximize profit for the fleet"?

I am not aware of another setting in which economists would seriously claim that "maximizing industry profits" represents the pertinent objective function. Firms seek to maximize profits—industries do not and cannot because an "industry" is not a plausible decision-making entity (unless the "industry" is a monopolist). An industry is merely the sum of the firms in it, and economic theory regards a perfectly competitive industry as one in which each firm in that industry is making normal profits. Talk of "maximizing industry profits" is incoherent. No economist would talk of maximizing the profits of a group of farmers growing Granny Smith apples—increasing or decreasing the number of apple producers until aggregate industry profits were somehow maximized. The only thing that matters is whether or not each firm in an industry is earning a competitive return on its investment. The U.S. Forest Service, when it provides timber to the private sector, is certainly not motivated by the mandate to maximize the aggregate profits of those firms harvesting federal timber. The Minerals Management Service is certainly under no obligation to lease oil and gas resources in the Outer Continental Shelf in order to "maximize industry profits" for the oil sector.

And this brings us back to the persistent problem concerning resource rent. The confusion is about to get worse by the introduction of yet another rent—this one called Ricardian rent. Ricardian rent is the differential income earned by the most productive fixed asset (land) in comparison to all other parcels of lesser quality in the same "local market." He who owns superior land in a particular market earns Ricardian rent. In fact there is a continuum of Ricardian rents from the very best land ranging all the way down to a parcel that is just slightly better than the worst. The worst parcel earns zero Ricardian rent, but each of the other parcels earns "infra-marginal" (Ricardian) rent. Henry George suggested that all of this differential surplus (Ricardian rent) could be taxed away without altering the uses to which each parcel of land would be put. After all, Ricardian rent is a species of economic rent in that it is a surplus over and above what is required by way of income in order to keep that parcel of land in its current use. And since it is excess (infra-marginal) income why not tax it away? Why should an owner get to keep all of the surplus value created by the fortuitous gifts of nature (superior land), or the public's investment in roads, busy intersections, schools, and parks?

Scott Gordon [1954] got fisheries economics off to a rather bad start by speaking of two fishing "grounds" as if discussing two agricultural parcels. He insisted that fishing firms will over-fish the superior ground and under-fish the inferior ground—and Gordon called this the dissipation of "resource rent" (even though it is Ricardian rent). Gordon wanted an owner

of the fishing grounds so that effort would be optimally allocated across grounds of differential quality. All of Gordon's fish were seriously demersal and stayed close to home.[11] And so the underwater version of "Ricardian rent" soon lost its differential-quality component and became "resource rent" in any fishery of any size or species composition. Gordon wanted to maximize this "wet" Ricardian rent. Interestingly, if fisheries economists insist on maximizing this "resource rent" for an entire fishery then there is no good reason why the entirety of it should not be taxed away. If effort is restricted to E1 in the hope of maximizing "resource rent" then the government should tax away that excess profit and return it to the owner of the fish in the EEZ. Doing so would allow all fishing firms to capture their full competitive return, and it would have no effects upon fishing effort.

There are no coherent reasons to maximize economic rent in a fishery. The single policy innovation that will induce efficiency in the fishery is to require fishing firms to pay for the fish they catch. A market economy requires that all owners of factors of production—and fish in the EEZ are a factor of production to fishing firms—must receive a payment for their relative contribution to the value of the total product of the firm using those factors. In this case fish are the raw material (similar to gold, silver, timber, and oil) gathered up by the private sector and delivered to the market ready for further processing. Payment for this raw material is correctly understood to be resource rent.

Very few managed fisheries require firms to pay for the fish they extract from the ocean. Moreover, rationalization programs to reduce effort from E3 to E1 do not require the remaining firms to pay for what they catch and sell. They do not pay any resource rent. Starting again at effort E3, if firms were made to pay for the fish they catch then the cost ray C in Figure 1 would rotate in a counter-clockwise direction and would then intersect R to the left of its current point (E3). This payment of resource rent is necessary to establish both technical and price efficiency—and it would result in a reduced level of aggregate effort. Effort would be reduced because when firms must pay for the fish they catch their average and marginal costs rise somewhat, leading to profit maximization at a slightly reduced level of effort.

The standard fisheries story fails to grasp this point and insists that aggregate effort must be reduced in a bogus and chimerical quest to reach E1—at which point fishing firms who manage to remain in the fishery get to keep all of the resource rent, plus they reap excess profits made possible by the exclusion of most of their former competitors. We now see that avoiding "rent dissipation" is nothing but the creation of excess profits for the fortunate firms not evicted under rationalization schemes. And these extra-normal profits are then bolstered by using gifted IFQs as leverage to acquire additional quota shares, thereby augmenting these excess profits into perpetuity. This flawed model—and the conceptual and linguistic conjuring attendant to it—are then deployed to offer ersatz indictments concerning the lack of "efficiency" in the fishery. Effort at E3 is said to produce a situation in which: "…the so-

[11] Gordon recognized the limiting nature of his model but few fisheries economists seem to have noticed. He wrote: "Other species, such as herring, mackerel, and similar pelagic or surface dwellers migrate over very large distances, and it is necessary to treat the resource of an entire geographic region as one. The conclusions arrived at below are applicable to such fisheries, but the method of analysis employed is not formally applicable. The same is true of species that migrate to and from fresh water and the lake fishes proper [Gordon, 1954, p. 129]."

called economic rents (total revenue minus total costs) from the fishery will equilibrate at zero, resulting in minimal overall economic efficiency [Beddington, et al., 2007, p. 1713]." And, as we saw above: "New entrants will continue to enter an unrestricted fishery until E3 is reached and a profit can no longer be made [Sylvia, et al. 2007]."

These authors seem unaware that a competitive industry is precisely one in which the difference between average revenue and average cost, both at the individual level of the firm, and aggregating across all firms, must be zero. A competitive industry is one in which total industry revenue is precisely exhausted (used up) by total industry costs (when all factors of production—including the fish from the EEZ—have been paid their competitive return). There can be—must be—no economic rent (excess profit) in a competitive industry. That is precisely the point of a competitive market.

At effort level E3 each fishing firm is covering all necessary costs, and also realizing enough of a net return (profit) to make fishing the preferred occupational choice. And as long as landings are on the sustainable curve R it cannot be claimed that the fish stock is in danger of overexploitation. Sustainability is assured. The curious reader might therefore be justified in asking: "Please tell me again what is wrong with effort level E3?" The only honest answer to this pertinent question is that those firms comprising aggregate effort E3 are not required to pay anything for the fish—the owners of the fish are not receiving any resource rent.

We see that the advocacy for IFQs is based on this flawed understanding of efficiency and resource rent. When IFQs are gifted to those with a history in a particular fishery, there is an after-market for quota as consolidation occurs. This after-market fails to produce any resource rent (payments for fish landed) for the owners of the resource (the U.S. Treasury acting as the repository for the government's trust responsibility as manager of the fishery). Payments for additional quota shares by those who wish to expand are received by others who were similarly gifted, but who now wish to cash out and do something besides fish for a living. Commercial fishing firms stand to the fish they seek to catch in exactly the same relationship as those who seek to harvest timber from federal lands, or those who wish to extract oil and gas from federal lands (or from the outer continental shelf). In the absence of payments to the owners of the fishery resource we see that the "rent-maximizing" level of effort in Figure 1 (E1) represents nothing but the creation and maintenance of excess profits accruing to those fortunate enough to remain in the fishery after all others have been excluded through consolidation of the initial free gifting of IFQs. And, it means that the firms are not paying for the fish they catch. The free gift of IFQs has an added bonus—free fish. It is impossible to assert that efficiency has been achieved when a fishery is being exploited at effort E1.

III. Bringing Management Back In

The decades-long accretion of deceits, confusions, conjurings, and contrivances conspire to yield up a conceptually incoherent diagnosis of the "fisheries problem." This bogus diagnosis then underwrites a plethora of counterfeit justifications for the introduction of IFQs. Fisheries policy makers have been deceived to believe that IFQs are private property rights, that private property is a reliable engine of stewardship, that fishermen cannot make

money in the absence of IFQs, and that economic efficiency will be realized if some fishing capacity can be restricted in order to maximize the difference between total revenue and total cost in an industry. This is said to be consistent with "maximizing resource rent" in the fishery. It is fantasy—all the way down.[12]

Drawing on this ersatz picture, the inevitable impression to arise from the phony claims for IFQs is that management is no longer necessary—IFQs can be handed out as gifts to those firms with a history in a particular fishery, and then the after-market can be relied upon to bring about "efficiency" in terms of who will remain in the fishery. Fishing effort will automatically equilibrate at the efficient level, and resource rent will be maximized. It all sounds too good to be true—and of course it is. Indeed, as Beddington, et al. [2007] point out, the most thoroughly "privatized" fisheries—New Zealand and Iceland—have some of the highest management costs in the industry. If IFQs accomplish so many desired results—enlightened stewardship, economic efficiency, rent maximization—why are management costs so high?

If we can escape the extravagant claims for IFQs, is there a plausible path forward? Imagine fisheries policy motivated by the following objectives: (1) assure sustainable fish stocks; (2) produce resource rent for return to the owners of the stocks; (3) reduce racing (derbies); and (4) offer entry opportunities for aspiring firms. From these four central principles, other objectives—contribute to enhanced product quality, re-vitalize small fishing ports, offer tourist attractions to coastal communities—can be appended where appropriate.

The first objective is met by honest science-based limits on total annual catch. While the science is indeed difficult at times, the principle of listening to the scientists is quite unimpeachable. Science-based TACs—assiduously enforced—are the necessary and sufficient condition for sustainability in fisheries.

The second objective is met by requiring fishing firms to pay the owners of the fish they catch a royalty for the privilege of being able to make a living off of the public's endowment of fisheries wealth in the EEZ. The best way to accomplish this is to require those who seek to participate in a particular fishery to submit a royalty bid indicating what fraction (the royalty bid) of annual gross landings receipts they are willing to pay the government in order to gain income and wealth from catching our fish.[13]

The third objective is met by abandoning the practice of giving away catch shares (IFQs) into perpetuity—a practice that restricts all future management options to the blunt instrument of raising and lowering TACs. All permits must be for fixed time periods—say five years, or ten years—so that fisheries managers can also control the number of vessels participating in a particular fishery without having to devote the public's money to buyback

[12] I was reminded to re-visit my Ph.D. dissertation which was published by the U.S. Bureau of Commercial Fisheries over 40 years ago [Bromley, 1969]. While all dissertations, even when finished, are "rough drafts," my arguments then seem as pertinent today as they did back then.
[13] The royalty auction is explained in Bromley [2005, 2008] and in Bromley and Macinko [2007].

that which was recently given away to the industry for free.[14] This will solve the derby fishery, and it will enable accomplishment of the fourth objective.

The fourth objective is achieved by virtue of having accomplished the second and third objectives. That is, the existence of limited-term permits assures everyone that at frequent intervals (perhaps annually, perhaps every five years, depending on the design of the allotment-share program), some portion of the existing permits in a fishery will come open for acquisition by new entrants. Those firms holding permits could bid once again to retain them, but new entrants would also have an opportunity to enter the fishery through submitting a higher qualifying bid.

It is here that we find a profound difference between an allotment-share fishery (ASF) and the standard IFQ fishery. In an IFQ fishery, quota shares are controlled by a closed class of vessels who are able to block new entrants by trading shares among themselves, but not selling to new entrants. With the entire TAC obligated in perpetual gifts to the industry, the management agency loses the ability to offer fishing opportunities to new entrants. Moreover, in an IFQ fishery, entry requires the up-front purchase of quota from those who now hold it. Notice that this cost represents an entry barrier that can be overcome only through a contractual arrangement with the current holder of the IFQ (paying for the quota shares at the end of the season), or through entering the credit market in search of liquidity. Either route exposes the entrant to virtually all of the stochastic variation in next-year's TAC, as well as to the endemic risks in a highly variable economic activity.

The allotment-share fishery (ASF) requires no such ex ante financial maneuvers. If the aspiring fishing firm submits a winning royalty bid, there is no prior financial obligation required. The royalty is simply deducted from the proceeds due the fishing firm upon sale of the product at dockside. No fish, no fee.

Notice that I have left aside many of the possible refinements—two classes of permits (5-year, 10-year), staggered terms for permits so that a portion of them come up for renewal each year, size-class permits so that small vessels are not bidding against large vessels, concentration caps so that a few firms are not allowed to gain control of a fishery. I have elsewhere spelled out a number of refinements to this basic model [Bromley, 2005; 2008, Bromley and Macinko, 2007].

IV. Summary

The manifold contrivances under discussion here have given rise to a perception that management will be virtually unnecessary in an IFQ fishery. The magic of IFQs is alleged to produce a setting in which fishing firms will become exemplary stewards, they will become efficient, the fishery will become efficient, resource rent will be maximized, there will be no more racing for fish, and society will be better off.

[14] New Zealand seems to have learned this lesson the hard—and expensive—way [NRC, 1999].

The foregoing discussion reveals that those who offer this utopian vision are themselves confused about the necessary concepts they deploy to support their optimistic allegories. Among the key concepts they have wrong are: (1) efficiency; (2) economic rent; (3) resource rent; (4) Ricardian rent; (5) average costs and average revenue among firms and across an industry; (6) extra-normal profits; (7) stewardship; (8) property; (9) rights; (10) privileges; and (11) property rights. This is not auspicious ground on which to construct a coherent case for anything at all. In the wake of this dismal account, the only possible reaction to their over-confident policy offerings concerning IFQs is comprehensive incredulity. At a practical level, empirical evidence from New Zealand and Iceland reveals the deceit that IFQs will bring us a self-regulating fishery.

The world's fisheries are in desperate condition precisely because fisheries management over the past several decades has been one of rather complete malfeasance on the part of national governments and their fisheries management agencies. The advocates of IFQs have managed to exploit this tragedy by offering up the canard that if only their roseate policy instrument could be introduced there would be no need for management in the first place.

Adopting this spurious advice would compound the tragedies of past malfeasance by the foolish embrace of confusions, contrivances, and deceits.

References

Anderson, Lee G. and Mark C. Holliday (eds.) 2007. The Design and Use of Limited Access Privilege Programs, Washington, D.C.: NOAA/NMFS, May.

Arnason, R. 2000. "Property Rights as a Means of Economic Organization," in Use of Property Rights in Fisheries Management: Proceedings of the FishRights99 Conference, Shotton, Ross, (ed.). Freemantle: Western Australia, 11-19 November 1999. FAO Fisheries Technical Paper 404/1. Rome: FAO.

Becker, Lawrence C. 1977. Property Rights, London: Routledge and Kegan Paul.

Beddington, J.R., D.J. Agnew, and C.W. Clark. 2007. Current Problems in the Management of Marine Fisheries, Science, 316 (22 June):1713-16.

Branch, Trevor A. and Ray Hilborn. 2008. "Matching Catches to Quotas in a Multi-Species Trawl Fishery: Targeting and Avoidance Behavior Under Individual Transferable Quotas," Canadian Journal of Fisheries and Aquatic Sciences, 65:1435-46.

Brandom, Robert. 2000. Articulating Reasons, Cambridge, MA: Harvard University Press.

Bromley, Daniel W. 1969. Economic Efficiency in Common Property Natural Resource Use: A Case Study of the Ocean Fishery, U.S. Bureau of Commercial Fisheries, Washington, D.C. Working Paper No. 28, July.

Bromley, Daniel W. 1989. Economic Interests and Institutions: The Conceptual Foundations of Public Policy, Oxford: Blackwell.

Bromley, Daniel W. 1990. "The Ideology of Efficiency: Searching for a Theory of Policy Analysis," Journal of Environmental Economics and Management 19(1):86-107.

Bromley, Daniel W. 1991. Environment and Economy: Property Rights and Public Policy, Oxford: Blackwell.

Bromley, Daniel W. 2005. "Purging the Frontier From Our Mind: Crafting a New Fisheries Policy," Reviews in Fish Biology and Fisheries, 15:217-29.

Bromley, Daniel W. 2006. Sufficient Reason: Volitional Pragmatism and the Meaning of Economic Institutions, Princeton: Princeton University Press.

Bromley, Daniel W. 2008. "The Crisis in Ocean Governance: Conceptual Confusion, Spurious Economics, Political Indifference," MAST, 6(2):7-22.

Bromley, Daniel W. and Seth Macinko. 2007. Rethinking Fisheries Policy in Alaska: Options for the Future, Report prepared for the Alaska Department of Fish and Game, Juneau, October 31.

Clark, C. W. 1973. Profit maximization and the extinction of animal species, Journal of Political Economy 81:950-61.

Cole, Daniel and Peter Grossman. 2002. "The Meaning of Property Rights: Law vs. Economics," Land Economics, 78(3):317-30, August.

Costello, Christopher, Steven D. Gaines, and John Lynham. 2008. "Can Catch Shares Prevent Fisheries Collapse? Science, 321(19 September):1678-81.

Gordon, H. Scott. 1954. "The Economic Theory of a Common Property Resource: The Fishery," Journal of Political Economy, 62:124-42.

Grafton, R. Quentin, Ragnar Arnason, Trond Bjørndal, David Campbell, Harry F. Campbell, Colin W. Clark, Robin Connor, Diane P. Dupont, Rögnvaldur Hannesson, Ray Hilborn, James E. Kirkley, Tom Kompas, Daniel E. Lane, Gordon R. Munro, Sean Pascoe, Dale Squires, Stein Ivar Steinshamn, Bruce R. Turris, and Quinn Weninger. 2006. "Incentive-Based Approaches to Sustainable Fisheries," Canadian Journal of Fisheries and Aquatic Sciences, 63:699-710.

Hannesson, R. 2004. The Privatization of the Oceans, Cambridge, MA: MIT Press.

Hilborn, Ray. 2007. "Defining Success in Fisheries and Conflicts in Objectives," Marine Policy, 31:153-58.

Hohfeld, Wesley N. 1913. "Some Fundamental Legal Conceptions as Applied in Judicial Reasoning," Yale Law Journal 23:16-59.

Leal, Donald R. 2000. Homesteading the Oceans: The Case for Property Rights in U.S. Fisheries. PERC Policy Series, PS-19. Bozeman, MT: PERC.

Macinko, Seth and Daniel W. Bromley. 2002. Who Owns America's Fisheries? Washington, D.C.: Island Press.

Macinko, Seth and Daniel W. Bromley. 2004. "Property and Fisheries for the Twenty-First Century: Seeking Coherence from Legal and Economic Doctrine." Vermont Law Review, 28(3):623-61.

NRC (National Research Council). 1999. Sharing the Fish: Toward a National Policy on Individual Fishing Quotas, Committee to Review Individual Fishing Quotas, Ocean Studies Board, Washington, D.C.: National Academies Press.

Okey, Thomas A. 2003. "Membership of the Eight Regional Fishery Management Councils in

the United States: Are Special Interests Over-Represented?" Marine Policy, 27:193-206.

Page, T. 1977. Conservation and Economic Efficiency. Johns Hopkins University Press, Baltimore.

Scott, Anthony. 1955. "The Fishery: The Objectives of Sole Ownership," Journal of Political Economy, 63:116-24.

Scott, A. 1989. "Conceptual Origins of Rights Based Fishing," in: Rights Based Fishing, Neher, P. A., R. Árnason, and N. Mollett, (eds.). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Smith, V. L. 1969. On models of commercial fishing, The Journal of Political Economy 77(2):181-98.

Sylvia, G., M. Harte, and C. Cusack. 2008. Economic and Policy Analysis of a Fixed Term Auction-Based Individual Fishing Quotas Proposal for the West Coast Limited Entry Groundfish Trawl Fishery, Appendix F, Attachment B. Portland, OR: Pacific Fishery Management Council.