COMMENTARY

Implementation issues: the political economy of efficient fishing

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Abstract

Responses to over-fishing are very similar. Efforts begin with gear restrictions, area closures and seasonal closures. Entry restrictions, including a license moratorium and a license buyback program, often follow. The results are similar too. Over-fishing and effort increases continue. Common property (not open access) regimes (community development quotas—CDQs), private property regimes (individual transferable quotas—ITQs) and Pigouvian taxes can produce the optimal amount at the minimum cost. Of course, the details of each are critical. Political feasibility issues and local conditions are factored into the CDQ-ITQ-tax decision and the resolution of the key details of each. Fisher heterogeneity and possible ways to reduce it are especially important issues. Since over-fishing problems, initial government responses and results are so common, the policy formulation process and recommended outcome have potential global relevance. © 1999 Elsevier Science B.V. All rights reserved.

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1. Introduction

Attempts to reduce harvest pressure are quite similar throughout the world. Reduction efforts start with targeted gear restrictions, expanded area closures and shorter fishing seasons. Those measures are often supplemented later on with entry barriers, commercial fishing license limits, including caps on the total number of licenses and vessel or license buyback programs. Fishers still do not own the fish until they capture them, so entry barriers don’t change their incentive to pursue fish without regard to crowding and stock depletion costs. Harvest pressures continue to grow and some fishery stocks fall to levels that...
greatly increase harvest costs and that preclude rapid biologic recovery. Sometimes increased harvest pressures spread to other fisheries. The failure to reverse, or even arrest, unacceptable trends sometimes leads to new measures such as fishing moratoria and/or quantification and assignment of limited fishing rights. When those rights are assigned to fisher associations, they are often called community development quotas, or CDQs. When those rights are assigned to individual fishers, they are typically called individual transferable fishing quotas, or ITQs. Fishing moratoria are far too frequent. Fisheries with a CDQ or ITQ regime, or an efficient Pigouvian Tax, are far too rare.

The objective here is to examine the impediments to policies that would produce efficient fishing practices, including CDQs, ITQs and Pigouvian taxes, and the key details of each. The next section describes where we are and major remaining challenges. Section 3 is a quasi-theoretical discussion of the issues. Section 4 offers recommendations for action and additional research. Section 5 contains a summary and concluding remarks.

2. Literature review and discussion

Economists (Gordon, 1954; Anderson, 1977; Scott, 1979; Wilen, 1979; Clark, 1980) have devised models that describe the root causes of over-fishing in excruciating detail. Policy-makers continue to widely, but not completely, ignore the implied solutions, even though the few trials of economists’ preferred strategies, especially ITQs, have shown their effectiveness and identified ways to further improve performance.1 Fisheries crises exist all over the world and many are quite severe, so why are ITQs still quite rare (Gates et al., 1996)? CDQs, a more fragile, but more producer-friendly method, are also rare, especially in modern times, but there are effective CDQs (Ostrom, 1990; Blomquist, 1992; Bromley, 1992; Taylor, 1992). Pigouvian taxes can produce efficiency, but an efficient tax/fee regime does not exist.

In some industries, producers risk severe legal sanctions to establish and hold together informal, incomplete collusive agreements, but the government-enforced fisheries equivalent in the form of a CDQ or ITQ isn’t even seriously considered most of the time. Only about 25% of OECD countries (OECD, 1993) employ ITQs in any fishery. It is surprisingly difficult to identify a fisher cartel that fishers will accept, or else to get the political process to produce the acceptable terms. A statement in a recent Pacific Coast Federation of Fishermen’s Association (PCFFA) memorandum (Bingham et al., 1997) against the use of ITQs in any US fishery points to the latter. PCFFA described an ITQ2 system that would get widespread support, but said: “PCFFA remains skeptical that any government agency will support, much less implement, such principles and remains, therefore opposed to the enactment of any IFQ system”.

Johnson and Libecap (1982) identified a key stumbling block; the heterogeneity of the producers. Feeny et al. (1997) also discuss the heterogeneity issue in some detail. Fisher heterogeneity hinders agreement on the key specific provisions of harvest rules and incentives. The Texas Bay Shrimp Fishery that Johnson and Libecap (1982) used for examples will serve that purpose again here. Texas has had typical gear, season and area restrictions since 1959. Those types of restrictions were progressively tightened to pursue a variety of management objectives, including reduced harvest pressure. In 1989, the legislature delegated control to the Texas Parks and Wildlife Department (TPWD). TPWD implemented an entry moratorium and license buyback program in 1995 (Texas Parks and Wildlife Department, 1995). TPWD funds buybacks from donations and part of the annual bay shrimp license fee. Key areas of diversity in the Texas Bay Shrimp Fishery and many other fisheries include past history (a typical basis for quota allocations), dedication to the fishery, full- or part-time status and gear type. Economists have given little explicit attention to means of reducing heterogeneity and thereby increasing the probability of consensus on an acceptable ITQ, CDQ, or Pigouvian tax format.

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1 See OECD (1993) for numerous examples.

2 PCFFA calls them individual fishing quotas [IFQ].
Key non-producer interests can also hinder agreement on an efficient management plan. They include fisher suppliers, fish processors, boat builders and banks that lend to fishers. In some small coastal regions, they and their dependents are a large segment of the community. Again, little attention has been given to how an ITQ, CDQ, or Pigouvian tax might be crafted to diminish that source of opposition. Merrifield and Firoozi (1995) looked at how adjustment assistance might reduce the pecuniary externalities that underlie resistance to such change.

Since ITQs, CDQs and fishing taxes are seen as drastic measures, they are usually not discussed until other policy options, typically gear restrictions, area closures and shorter seasons, are tried first. Those initial restrictions make the socio-economic and political environment more hostile to reform proposals, especially ITQs and CDQs. The New Zealand experience is a good example. According to an OECD (1993) study, ITQs were implemented with relative ease in new, largely unexploited fisheries like Orange Roughy, but with much greater difficulty, or not at all in other fisheries.

The key environmental conditions that deteriorate include the producer heterogeneity and the nature of non-producer interests discussed above. For example, fishers' propensity to exploit more than one fishery rises each time a fishing season shrinks. Fishers directly affected by the shortened season have more time to devote to other fisheries and the opportunity cost of entering another fishery is reduced to the extent that the idle equipment they already have is usable in other fisheries. The capital stuffing caused by shortened seasons means that low opportunity cost equipment may be abundant and extremely efficient. Gear restrictions promote substitutions, so the under-employed capital is often well suited—perhaps better suited—to other fisheries.

The development and adoption of expensive, new technologies means that some fishers have adapted favorably to the short seasons and the derby-like races to catch fish that result. Races favor large, highly capitalized firms who may believe they can capture more fish (all fisheries combined) during several races. Such large firms also have more political influence and they are more likely to use it. Likewise, for large, established fish processors. Such races directly depress the ex-vessel fish prices that processors pay by landing large amounts of fish in a short amount of time. In addition, races increase the market power of the largest processors. A fully developed red snapper ITQ with broad support was put on hold at the last minute, apparently as a result of a relatively few large fishers and processors with disproportionate political clout. PCFFA (Bingham et al., 1997) says that a major reason for their opposition to ITQs is their belief that government fishery agencies tend to favor large producers.

Fishing restrictions have made the ability to move among fisheries more important and increased the diversity of fishers in each fishery. That raises resistance to CDQs and ITQs even among fishers not directly involved. The latter may oppose ITQs and CDQs to retain an option to enter new fisheries. The trend towards greater multiple fishery participation also raises ITQ/CDQ enforcement and implementation costs. Each vessel must be monitored for more things and more fishers can legitimize claims to participation licenses and to a quota share. That increases the cost of license and quota buybacks and reduces ITQ/CDQ political feasibility.

3. Facilitating efficiency

What can be done to make politicians, especially the representatives from the districts where fishing occurs, more receptive to an efficient property rights regime; probably some form of ITQ, CDQ, or a Pigouvian tax? The issues described in Section 2 must be addressed.

Since fisher heterogeneity appears to be the primary barrier to agreement on an efficient regime, that issue is a good place to start. What is the most useful definition? What is the most efficient means of reducing it? Those issues remain

3According to an OECD (1993) study, “support of the fishermen (p. 11)” is the key to successful implementation of ITQs.
unresolved, so the objective function represented by expression (1) is offered only as a starting point for additional research.

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\text{Min } V = V(\sigma H, \sigma G, \sigma PP) \tag{1}
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s.t. Cost and Time Constraints

where: \( V \), variability among the fishers of the target fishery; \( \sigma \), standard deviation; \( H \), annual harvest, itself a function of skill, capital and degree of dedication to the target fishery; \( G \), fishing gear; and \( PP \), past participation in the fishery, a frequent criterion for ITQ share allocation. The political climate and the biological condition of the fishery affect the urgency of reductions in \( V \).

Entry moratoria with license/vessel buyback are means to reduce heterogeneity. Such programs, typically called limited entry programs, already exist in many states, but they were adopted in failed direct attempts to stop the growth of harvest pressure. Before returning to the issue of heterogeneity reduction, it is worth noting specifically why they failed. Even as complements to area closures, seasonal restrictions and gear restrictions, including limits on vessel upgrades, limited entry programs only achieved temporary harvest reductions. Even without changes in equipment, fishers improve their skills. A 1.5% per year improvement in catch efficiency without vessel modification was reported for a New England fishery (Gates et al., 1996). In any event, once the buybacks end, any reductions in harvest pressure are quickly offset by increased pressure from the remaining fishers. For example, in a New England fishery a 14% effort reduction that cost $25 million was expected to gradually evaporate in less than 9 years. For the same reason, the authorities should definitely not buy the expensive licenses of the most active, efficient fishers until less active licenses are retired first. The remaining, smaller fishers could end up even more heterogeneous. In addition, the active, efficient fishers often quickly re-enter the fishery by buying another fisher’s license with enough money left over to upgrade their equipment (Gates et al., 1996). Low buyback rates like the TPWD’s 2–3% per year rate for bay shrimp licenses may not even temporarily stop the harvest pressure growth.

Heterogeneity reduction may already be an unnoticed outcome of current buyback programs; an unintended, solitary long-term benefit. Timing and focus adjustments can improve the effect on heterogeneity. Additional research is certainly needed to better understand which remaining licenses (or vessels) contribute most to heterogeneity and are therefore the highest priority buybacks. However, the licenses of the fishers least committed to the target fishery, whether by virtue of the small scale of their operation or their greater commitment to another fishery, is one promising starting point. If a majority employ a certain narrowly defined type of gear, the remaining minority is another promising target.

If a slow pace is acceptable, or inevitable because of funding or political constraints, the authorities can solicit license offers and purchase the cheapest ones, perhaps by gear type. The cheapest licenses are almost certain to be the least used. Because of meager funding, that is the early TPWD strategy. Such a strategy benefits from restrictions on the transferability of the licenses, such as the TPWD rule that prohibits non-shrimp fishers from purchasing licenses until September 1, 1999. Not surprisingly, as buyback episodes reveal the TPWD’s demand function, bids increasingly cluster near the previously accepted high bids. Once bids begin to cluster tightly, but before full transferability, bid solicitation should perhaps yield to a uniform offer policy, wherein the TPWD posts a single low price that it will pay any license seller. The TPWD is considering such a policy change. If adopted, that strategy can co-exist with full-transferability provided the TPWD purchases comprise a large share of the license market.

If a slow pace is unacceptable, price is a much less useful way to discriminate between small-time fishers and more dedicated fishers. Bid solicitation may not yield enough serious offers to pick from. The fishers not eager to quit the target fishery may submit offers way above what they would actually accept. They will fish for information about the authorities’ willingness to pay and take a shot at getting real lucky. The authorities could post an offer for licenses, but the large price it would take to buy and retire many licenses
quickly will attract a diverse array of license sellers, which would defeat the aim of reducing heterogeneity. If the authorities have detailed information about each license-holder, they can perhaps identify the least typical fishers and then offer them an estimated minimum willingness to accept.

The other part of improving the probability of consensus are the details of a CDQ, ITQ, or Pigouvian tax regime. Anything but a carefully crafted scheme is dead on arrival, even for a relatively homogenous group of fishers. Pigouvian taxes and ITQs need no introduction, but CDQs are ‘radical’ enough that a general description precedes the discussion of critical details.

Community development quotas (CDQs) are organized, official common property regimes. They are not equivalent to the open access situations that always cause scarce resources to succumb to ‘the tragedy of the commons’ made famous by Garrett Hardin’s 1968 Science article.4 Common property regimes limit access to the fishery to members of a finite group. Texas’ moratorium on the issue of new licenses has converted the Texas Bay Shrimp Fishery from open access, to a common property regime. Economists and other social scientists, have documented efficient common property regimes. They claim that CDQs will often perform better than private property regimes (ITQs), the long-time favorite of economists.

A common property regime becomes a CDQ when the authorities delegate management authority to a local government body or a fisher association. The authorities specify the total allowable catch, or let the fisher association make that decision if other specific goals are met, such as stock level and bycatch reduction. According to the literature, efficient CDQ regimes include most or all of the following conditions: (1) The user group and the resource both have well-defined boundaries; (2) The use rules fit local conditions; (3) Users can participate in rule modification; (4) The users monitor compliance and implement graduated sanctions for violators, or delegate those functions to agents accountable to them; (5) The users have access to low cost conflict resolution mechanisms; and (6) The users can organize their own regimes independently of external governments. A license buyback program aimed at increasing homogeneity can help significantly with many of the above conditions, especially #1 and #4.

The regional fishery management councils created by the Federal Fishery Conservation and Management Act of 1976 do not satisfy those conditions, but more homogenous groups of fishers might. That is the key issue. For the target fishery, is a sufficient level of homogeneity a realistic outcome of homogeneity enhancement measures like license buybacks? If so, the advantage of the CDQ approach is that fishers settle the remaining issues themselves. For example, the co-operative nature of a CDQ regime may allow it to do a better job of curtailing poaching and dealing with detail-intensive management objectives. Problems like high-grading (or discarding) and objectives like bycatch reduction require highly customized approaches. For example, several articles (see Turner, 1996) make the case that fishers can greatly influence the composition of their harvest by their selection of time, place and fishing method; a combination not easily dictated by the authorities.

ITQs don’t demand as much homogeneity to work, but may require as much to be adopted. If that political threshold is reached, the authorities specify a total allowable catch (TAC) and then allocate it to individual fishers. The share owned by each fisher (the quota) is defined as a percentage of a TAC that varies from year to year, or each fisher’s quota is defined as a particular amount, measured in tons or dollars. Fishers can buy or sell shares of the TAC. Rights to fish are worth the most to the most efficient fishers. They will purchase the quotas of the least efficient fishers, thereby minimizing harvest costs.

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4 See Feeny et al. (1997) for a detailed discussion.
5 See (Ostrom, 1990; Blomquist, 1992; Bromley, 1992; Taylor, 1992).
6 See footnote 5.
7 Page 6 of Turner (1996) contains several additional references on the subject of bycatch reduction.
An OECD (1993) study and the PCFFA memo confirms what economists have long suspected. The allocation issue is the main source of opposition to ITQs. However, the apparently elusive, key issues identified by the PCFFA memo are not widely known. It is not just a matter of reducing heterogeneity enough so that the remaining fishers can agree on an allocation criterion. So that fishers don’t end up ‘sharecroppers’ for absentee quota share owners, fishers want to limit ownership of quota shares to individuals actually engaged in harvesting the fish resource. The PCFFA memo says that fishers are especially concerned that fish processors will buy quota shares to acquire market power. Limiting ownership of quota shares to fishers aims to enhance stewardship of the resource and increase safety by giving fishers more control of when they fish. There is concern that fishers may acquire market power, so PCFFA says that no fisher can have more than 0.5% share of the TAC. So that market forces, not politics and bureaucrats, decide long-term participation in the fishery, PCFFA wants individuals with any recent history of landings, ‘however insignificant’, to receive some quota shares. If that initial allocation doesn’t exhaust the TAC, catch history over a broad time window of at least 10 years is the appropriate basis from which to allocate the remaining quota shares. Then the fishers who exit receive some compensation. So that the fishers who want to stay can expand their quota share holdings to an economically viable amount without having to bid against newcomers, the PCFFA wants to limit, for 5–10 years, the market for quota shares to fishers who received an initial allocation. Politicians will have to recognize differences in catch history, so an initial allocation that includes individuals with a history of landings, however insignificant, will probably allocate more than the TAC. Gradual proportional quota share shrinkage over time, or when transferred, or a quota share buyback must follow. The latter, and compensation for pecuniary externalities (if any), requires funding. Beneficiaries are the logical source. In the case of the Texas Bay Shrimp Fishery, the direct beneficiaries are the remaining Bay Shrimpers and Gulf Shrimp Fishers. The license fee component now used to fund license buybacks is one readily apparent source of funds for a quota share buyback. Efforts to tap gulf shrimpers will have to recognize that they are based in several states. Ways to tap indirect beneficiaries, such as the commercial fishers and recreational interests that benefit from reduced ecological damage (less bycatch and reduced bottom disruption with less trawling), merit thorough investigation.

Beyond the issue of sufficient homogeneity to achieve agreement on major issues, the key to what little political feasibility a Pigouvian tax has is the disposition of the tax revenue in a way that benefits the fishers. Otherwise, fishers will strongly object to what amounts to a taking from their perspective. Though the fish resource is officially owned by all the people, fishers are not used to paying for the right to capture fish. If fishers are already subject to other assessments, such association expenses or license fees, use of tax revenues to eliminate those levies and to biologically enhance the fishery might make a Pigouvian tax acceptable to fishers. The other difficult issue is the periodic re-computation and re-implementation of an efficient tax rate. Even a one-time, politics-free computation of a tax rate that will internalize stock depletion and crowding costs is a difficult exercise.

4. Recommendations

A greater degree of fisher homogeneity is usually a prerequisite to political consensus on means to achieve optimal harvests with cost minimization. Common early responses to open access problems like shorter seasons, additional area closures and gear restrictions not only fail to address the root of the open access problem, they exacerbate fisher heterogeneity. Pressure to adapt apparently creates fishers and processors with political clout and market power that believe they are better off exploiting multiple fisheries during several derby-like races to catch fish. Whenever possible, the essential entry moratorium and license/vessel buyback program should pre-empt gear restrictions and progressively shorter sea-
sons. Buyback programs already exist in many coastal areas, but they are mistaken efforts to reduce harvest pressure directly. Heterogeneity reduction must be the primary target. The sooner the process is set in motion, the more likely that biological conditions will permit the kind of relatively slow buyback rate that makes price a more effective homogeneity-increasing tool. Further research is needed to identify means of rapidly increasing homogeneity.

Since cartel-like ITQ and CDQ arrangements may appear to unfairly guarantee bay shrimp fishers an income that other regional fishers will envy, it is especially important that the fishers pay all of their management costs, including vessel/license and quota share buybacks. In some coastal regions, a seemingly protected income differential was a fairness issue with significant political weight.

Meet the PCFFA’s ITQ demands. The minor inefficiencies that will result from limiting ownership of quota shares to fishers and the cost of buying back over-allocated quota shares, beats the alternatives; open access or derby-like races to catch fish with inefficient gear, possibly during adverse weather conditions.

5. Summary and concluding remarks

Lack of interest in the Pigouvian tax solution is not surprising, but getting fishers to accept a producer cartel in the form of a CDQ or ITQ program is surprisingly difficult. However, such a ‘cartel’ is the only efficient way to end the race to catch more fish that has produced world-wide economic and biologic overfishing. Fisher heterogeneity is the key impediment to consensus on an efficient CDQ or ITQ. Failure to recognize the key details identified by the PCFFA memo is another serious barrier.

Anti-trust statutes are another potential hurdle not noted so far. Bay shrimp ITQs or CDQs will not diminish competition much, but they could reduce competition significantly in other fisheries. Shrimp farms, imported shrimp and Gulf shrimp are close substitutes for Bay shrimp, and with multiple local (one bay, or a few adjacent bays) ITQ or CDQ programs, the individual cartels will compete with each other to sell their individual TAC.

An entry moratorium, combined with properly targeted vessel/license buyback, is a way to reduce fisher heterogeneity. The key details that arise for buybacks targeted at reducing heterogeneity and other means of cutting heterogeneity, demand much more study. The effect of pre-existing fishing restrictions on heterogeneity, consensus-enhancing efforts and necessary ITQ details also demands much more attention. Do some fishers and processors adapt to the restrictions to an extent that they will be worse off under any ITQ or CDQ configuration? If so, consensus may not be possible without compensation for them.

Progress on many fronts, including explicit modeling, is stalled by the elusiveness of a definition of heterogeneity that would suggest an appropriate function for expression (1).

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