Marine Fishery Regulation in the U.S. and the Role of Economic Analysis

Daniel D. Huppert

National Marine Fisheries Services
Southwest Fisheries Center
La Jolla, CA

INTRODUCTION

This paper is intended to provide a broad overview of economics applied to fisheries management. It begins with one of the fundamental issues: "Why regulate fisheries?" The first section summarizes the standard rationale for regulating fisheries and describes a lingering controversy over private ownership versus public regulation. Section 2 reviews the standard critiques of conventional regulations and recommendations for efficient fishery management. Section 3 is devoted to economic aspects of allocating fish and fishing rights. In the final section, I offer some observations on the role of economics and economists in fishery management.

My perspective is derived from involvement in marine fisheries management on the Pacific coast. That includes experience in developing management plans for coastal pelagic species (anchovy, mackerel, and squid), reviewing plans and periodic regulatory proposals for groundfish and salmon fisheries, research and consultations on limited access systems, and a recent study of the developing U.S. groundfish fishery off Alaska. The appropriate content and role of analysis depends upon specific issues, contexts, and policy objectives. These clearly differ among regions and fisheries. I will be interested to learn during this workshop whether the Pacific coast experience is relevant to fishery management in the Gulf and southeast regions.

WHY REGULATE OCEAN FISHERIES?

The earliest and perhaps most important contribution of economics to fisheries regulation was the development of a coherent rationale for government intervention in the fisheries. That rationale rests on a theory of optimum harvest combined with the dynamics of open access competition. The economically efficient fishery would expand until the marginal cost of additional fishing effort equals the marginal revenue from additional catch. Achieving this would generate a maximum rental income to a manager or owner of the fish stock. The early papers of H. Scott Gordon (1954), Anthony Scott (1955) and James Crutchfield (1956), established that the unregulated fishery will apply more fishing effort than needed to achieve the economic optimum, and that over-investment will occur in fishing capacity, and often in fish processing capacity as well. Without a fishstock manager (private owner or public authority), fishermen compete for fish by expanding capacity until marginal cost of fishing equals average revenue. If costs of fishing effort and the price of fish are constant, this competitive equilibrium yields no resource rents.[1]

Moreover, there is ample experience and documentation showing that commercial fishing fleets in practice do tend to deplete fish stocks and to overcapitalize. The more valuable fish, such as Pacific halibut, salmon, roe-bearing herring, attract the most fishing activity, are potentially the most endangered by unregulated fishing, and have the most highly overcapitalized fisheries.

Overfishing of common property fish stocks is not due to the perfidy and greed of fishermen. Also, it is not lack of foresight (or a high time rate of discount) that accounts for the lack of husbandry among fishermen. It is the absence of private or group ownership, and the concomitant lack of individual opportunity to reap financial gain from stock conservation and enhancement. It is a consequence of vigorous competition in an industry dependent upon an un-owned, depletable resource. Some economists blame overfishing on the absence of exclusive property rights in fishstocks. Lacking private rights to the fish stock, courts of law do not defend individual claims to the economic returns from investments in marine fish, and individuals cannot expect to reap future gains from individual conservation actions. Without price rationing of fish *in situ* through private property rights, markets fail to achieve economic efficiency, and the problem with fisheries is diagnosed as a "market failure."

The theoretical expectations of poor conservation and inefficient production under open access are supported by empirical evidence. A variety of research papers have shown that restricted access to marine fish resources leads to better conservation and greater eco-

nomic returns. Acheson's (1975) work on Maine lobster fisheries shows the average size of lobsters tend to be larger where "harbor gangs" effectively excluded outsiders. This suggests that yield-per-recruit is increased through lowered fishing mortality in sections of the fishery with a sort of illicit limited entry. Agnello and Donnelley (1975) find statistical evidence that labor productivity in the oyster industry is higher in states with private leasing than in states with open access to oyster beds. Townsend (1985) reaches similar conclusions regarding Maine's soft-shell clam fishery. Coastal towns with restrictive local ordinances enjoyed both higher yield-per-recruit and higher yield per unit effort. These studies depend upon the co-existence of restrictive and nonrestrictive regulatory regimes, which exist chiefly in coastal and inland waters of north America. Since they occur mainly outside of the narrow coastal zone, marine fisheries generate little comparative data of this sort to show that limiting harvest rights yields more efficient harvests.

The case for government regulation of recreational fishing follows a logic similar to that for commercial fishing (McConnell and Sutinen, 1979). Recreational harvests in the marine environment tend to be smaller than commercial counterparts in most circumstances. But the common property problem is essentially identical, and the consequences for fish stock depletion and loss of economic value can be severe when sport fishing takes a substantial fraction of the stock annually.

One solution to the common property problem is, of course, to establish exclusive and enforceable private property rights to the fish stock. Anthony Scott's (1955) "sole owner" would, like the owner of private livestock, have incentives to achieve economically efficient production. The private owner would have a secure right to receive the full benefits of conservation and enhancement efforts, to exclude others from taking those benefits, and to sell or lease his or her rights for a price or rent agreed to in voluntary transactions. Investment in fishstocks by private owners would expand until marginal rates of return equal the relevant interest rates. In theory everyone, producer and consumer alike, would be better off if private property rights were assigned to fish stock owners who then conduct efficient harvest programs.

While private ownership is practical for some marine organisms, the legal basis for exclusive, private holdings outside of tidal waters is absent, and the division of the marine ecosystem into private holdings might be impractical or unenforceable. James Crutchfield (1956), for example, claimed that fish stocks are incapable of ownership. This highlights two related issues that are still being debated: (1) whether it is feasible to divide up fish stocks into private property shares, and (2) whether it is useful to replace government regulation with private property and markets. Most fishery management personnel do not seriously consider establishment of exclusive private property as an alternative to government regulation. This presumption for regulation is fostered by legislation like the Magnuson Fisheries Conservation and Management Act, and by the obvious problems associated with open access fishing.

Private property rights have never been given a fair trial in marine fisheries. The development of property rights in fishstocks, according to A. Scott (1988), was severely retarded in English law by the Magna Carta. Canadian and U.S. law followed the English tradition. Where exclusive harvest rights are exercised in fisheries (primarily in freshwater ponds, streams, and tidal shellfish beds), they are apparently a useful mechanism for achieving conservation and economic efficiency. But private leaseholds for sedentary, intertidal resources, and ownership of fish stocks appurtenant to riparian property do not provide realistic examples for marine fisheries. In the ocean, harvest of one species at a given time and place frequently affects other species, harvested by other fisheries or by the same fishermen at different times and places. Also, fish harvests affect populations of protected marine mammals and some endangered species. To the extent the public is entitled to protection from these spillover effects, private ownership in marine fish stocks would not obviate the demand for regulating fishing activity.[2]

Nevertheless, some analysts of natural resource regulation reject the presumption that government regulation is an improvement on private ownership (e.g. T. Anderson, Libecap, and Stroup and Baden). The arguments hinge on two salient points. First, although private markets in resources are imperfect, due to mobility and complexity of the biological stocks and externalities, government regulation is not necessarily superior. Self-interests and political influences in agency decision making can cause significant divergences from economically efficient resource use. It is unrealistic to assume that regulators are powerful, effective, and beneficent decision makers, whose actions in the collective interest are accepted and heeded by the regulated.

Management agencies are sometimes "captured" by the industries being regulated, resulting in management for the benefit of those special interests. Also, because personnel in regulatory agencies are not financially rewarded for economic performance of the resource industries, their incentives to devise efficient harvest plans are weak, and they are prone to respond less to economic signals than to politics. This does not impugn the character of agency personnel; it simply extends to the individuals in government service the logic of rational, self-interested behavior. In sum, this view

of resource economics quite properly concludes "that the absence of property rights can generate market failure but that incentive structures within government can generate government failure" (T. Anderson, p. 5).

A second concern about government regulation is that it fosters counter-productive "rent-seeking" behavior. Competition for rents available from government regulated fisheries is somewhat like open access competition for fish. Those affected by regulations will expend money and time to sway decisions in their favor and to avoid the consequences of regulations once promulgated. If a shift in quota or area or season timing can increase the competitive edge of one person over another, he or she can be expected to spend time and money to influence the decisions. A self-interested, rational individual would spend on political influence so long as the expected effect on future earnings exceeds the cost of seeking rents through such influence. Fishermen groups may feel a need to hire spokesmen, to retain lawyers, and to set up "research foundations" in an effort to shift potential fishing opportunities and profits to their members. The resources expended in this manner are lost in a zero-sum game among the competing groups.[3]

It is unclear to me whether we should be troubled by the potential for rent-seeking behavior. We do not know whether this source of inefficiency in the fisheries will seriously diminish the value of newly emerging management techniques like individual quota shares. Also, it is unclear to this author that rent-seeking surpasses ideological demagoguery as a motivating force in fishery politics. I will proceed on the assumption that it is feasible to improve government management of fisheries without establishing exclusive private property rights to marine fish stocks.

REGULATION FOR GREATER EFFICIENCY

Besides providing a coherent explanation for the overfishing problem, economics supports an extensive critique of various regulatory approaches. All economic assessments of fishery regulation (beginning with J. Crutchfield (1961) and continuing through the textbooks of Anderson (1986), and Cunningham, Dunn and Whitmarsh (1985)) conclude that conventional, direct regulation of fishing activity cannot successfully solve the open access problem. Annual quotas, season closures, gear restrictions, fish size limits, and so forth deal simply with symptoms, not the disease. Conventional regulations do not create conditions under which exercise of normal business incentives will lead to optimal fishing capacity.

Conventional fishery regulations, in the face of open access competition, *can* reduce effective fishing effort to achieve target harvests (equal to maximum sustainable yield, or maximum economic yield, or any other criteria). It can be shown that limiting fishing effort through season closures or gear restrictions will attain a target quota by causing an increase in the cost of harvesting. Whether or not it is regulated via quota, the competitive fishery will be in economic equlibrium when average cost per unit harvest equals average revenue—that is, when no prospective profit induces entry of new fishermen or expansion by existing fishermen. With annual quotas, fishing effort cannot expand beyond that necessary to take the quota, but the costs of applying that level of effort is unregulated. Fishing costs will increase as overcapitalized fleets compete for the quota during short fishing seasons.[4] By allowing average cost to equal the price, conventional regulations assure the dissipation of any potential net value.

I hesitate to conclude that conventional regulations are unconditionally worthless, especially when they increase the size of fish stocks, improve the average size of the fish, protect endangered species, and reduce the chances of recruitment failure. While conventional regulations seldom produce any worthwhile efficiencies in fish harvesting, processing and distribution, they may improve overall product value by maintaining a desireable mix of fish size and species and they may raise consumer surplus in final product markets by maintaining large total annual harvests. In the absence of more effective regulations, it seems prudent to continue adjusting conventional regulations to increase the value of a given quantity of harvest.

As a guide to the importance of seeking efficiency in harvesting, economists can estimate the size of the potential economic rents that are up for grabs. For example, I recently estimated the potential rents for two multispecies groundfish fisheries (Huppert and Squires, and Huppert, 1988). Both assessments were based upon assumed biological catch limits, and upon average fishing costs and fish prices. Computations used standard linear programming methods. On the Pacific coast, the groundfish trawl fishery could yield about $12 million in net revenue. Similarly, in the Bering Sea and Aleutians Islands area an optimal fleet of factory trawlers and motherships would generate around $124 million annually. In both cases the profit is around 15% of the gross revenue. Both represent gains from efficiently harvesting an arbitrary quantity rather than the maximum net value associated with optimizing both harvest efficiency and total yield.

The principal types of economic regulation that could generate these rents are (1) taxes and fees, and (2) the various forms of limited access. Using these regulatory approaches, one can seek an economic optimum yield by simultaneously adjusting both harvest quantities and harvesting costs. Or, taking biological yield

guidelines as target catch levels, one could seek only to minimize fishing costs. Generally, the theory of taxes and fees for optimum fishing deals with optimum yield. Facing fish landings taxes (or royalties) equal to the true social net value of fish *in situ*, the competitive fishing fleet would adjust to the appropriate overall yield. Limited access, on the other hand, is concerned primarily with controlling excess fishing capacity and costs.

Taxes and fees have long been a favorite topic for economic theorists of environmental regulation. It can be shown with mathematical rigor that the proper taxes and fees applied to the inputs and outputs of harvesting firms can mimic the costs that would be imposed through ideal markets in fish resources. These fees bring private costs of profit-seeking harvesters into line with true social costs of fishing, and no further direct regulation is needed (Clark). Several practical and legal concerns militate against the use of taxes and fees. An economic argument against taxes is that fees will impoverish fishermen in the short run, because any increase in operating costs would cause average returns to drop below average costs (e.g. Cunningham, et al., p.163). Following the argument of M. Weitzman (1974), fisherman would receive lower incomes even in the long run, under any form of centralized management that transfers rental value of the resource out of the fishery. Thus management via taxes would generally be unattractive to the most influential groups in the fishery. Given the forces marshalled against taxes, I will go on to other options.

Limited access is basically of two types: license limitation and individual quota shares. These measures constructively address the open access problem, but they do not fully remove the problems associated with lack of property rights in fish. Myriad license limitation programs in North American, Australia, and New Zealand are well documented in the literature. (See Rettig and Ginter, 1981; Sturgess and Meany, 1982; Fraser, 1979; Rettig, 1984; and Mollett, 1986.) Most economics treatises on license limitation programs now list a series of shortcomings. A license to fish, without quantitative limits on harvests, does not alter the basic competition for fish among fishermen. Hence, minimization of fishing costs will not happen under license limitation. This shortcoming is especially pronounced in fisheries that have excessive numbers of fishing vessels at the outset of the limitation program.

Individual fishermen quotas are widely recognized as perhaps the most promising regulatory method for improved economic efficiency. They have been implemented recently in New Zealand's groundfish fishery (named individual tradeable quotas, ITQs) and in Australia's southern bluefin tuna fishery, and a similar system (enterprise quotas) is operating in Canada's north Atlantic offshore groundfish fishery. The key to this method is that it comes close to reproducing the conditions of a property right. When quota shares trade in open markets, the share prices approximate the scarcity value of fish, even though the share does not convert the fish stock into property.

Proponents of the technique (New Zealand Ministry of Fisheries personnel being among the most zealous spokesmen) point out the myriad dimensions in which fishermen can optimize harvest operations under ITQ's. Fishermen will be able to change fisheries through buying and selling rights to alternative species; they will be able to use the proceeds from selling their ITQ's to finance retirement; and the government will alter the annual level of harvests through buying and selling quotas. Economic efficiency of harvesting will be substantially improved as the quotas migrate to the most efficient fishermen and fishing firms accumulate shares to achieve optimum size operations.

Possible drawbacks to ITQ's include the difficulty that government enforcement officers may have in monitoring harvests and in detecting infractions. Without a credible enforcement effort, the similarity to private property status for share quotas will evaporate. (See F.G.Peacock and D.A. MacFarlane, 1986). Where fishing is multispecies, the ITQ may exacerbate the incentives for discarding by-catch of species for which shares are not immediately available. The New Zealand system has attempted to deal with this aspect, but some observers (e.g. Copes) are not convinced that the problem is solved.

In the United States, regulations to improve efficiency in fish harvesting are not widely adopted. Where adopted, their effectiveness is not demonstrably great. The most prevalent "economic" regulation is license limitation, which has been implemented in a myriad Pacific coast fisheries. British Columbia's salmon license program, initiated in 1969, is the oldest and most closely analyzed system. On the U.S. Pacific coast, all the non-Indian, commercial ocean salmon fisheries have been under license limitation since 1979. California has imposed license limitations on the roe-herring fishery, the abalone fishery, and the gill net fisheries (Huppert, 1986). Alaska has a most extensive system of license limitation for salmon fisheries (Schelle and Muse).

The available retrospective economic assessments of these license limitation systems (Fraser, 1979; Pearse and Wilen, 1979; Huppert, 1982; and Schelle and Muse, 1986) have found conflicting evidence of increased economic efficiency. Fraser (p.760) and Pearse and Wilen (p.768) reported that continued investment in the fishing fleet under the licensing program threatens the emergence of any economic rent. Huppert found some evidence of economic profits under California's nontransferable license system for roe-herring. But that evi-

dence was a short-run event, as roe prices subsequently declined and the state expanded the number of permits. Schelle and Muse interpret the sustained, high prices for salmon fishing permits in Alaska to be indicators of scarcity value. This value would not exist unless expected discounted future profits in the fishery were positive (see Karpoff, 1984). Overall, the economic assessments of license limitation in the Pacific fisheries tend to be lukewarm regarding the potential for efficiency and rent creation.

ALLOCATION OF FISHERY RESOURCES

Because allocation of fishery resources is an increasingly contentious topic, it is important to use the term "allocation" carefully. Economists are accustomed to "resource allocation" as a topic dealing with the allocation of various inputs (labor, capital, land, intermediate goods) among industries or among firms. In this sense, to optimize a fishing fleet or the amount of fishing applied to a given stock is an exercise in resource allocation. The economics of resource allocation deals mainly with efficiency. On the other hand, the discussion of allocation in fishery management circles concerns the distribution of fishing rights or fish among individuals or groups of individuals by a public authority. This version of "allocation" deals more with assignments of property and resource ownership, and concerns shifts in assets or opportunities among distinct groups of people, not among industries. Choice of allocations can be based on either efficiency or equity. Through the remainder of this section, I will use the term in this latter meaning.

Most conventional fishery regulations under open access involve no explicit allocations, as each fisherman has a co-equal right to fish. Conventional regulations do *cause* allocations, however, especially when a particular geographic area of the fishery is closed, or a particular gear type is prohibited. In California, for example, bottom trawl nets are prohibited within three miles of shore, purse seine nets may not operate in Santa Monica Bay, and commercial abalone divers may not fish in waters north of Monterey. In the anchovy fishery management plan, specific seasons were closed to the commercial purse seine fishery in order to reduce "conflicts" with recreational fishermen. In each case, the area or fish or season prohibited to one group of fishermen is implicitly allocated to another group.

Explicit allocations of fishing rights among fishermen associated with various gear groups, or between recreational and commercial fishermen are also commonly adopted along with conventional regulations. The Pacific Fishery Management Council (PFMC) allocates the annual harvest guideline for sablefish between otter trawl vessels and fixed gear (longline and pots). In California, marlin, kelp bass, and striped bass have been declared unconditionally for recreational use only. PFMC's salmon management plan allocates the coho and chinook harvests between recreational and commercial fisheries on the basis of a sliding scale. North of Cape Falcon, for example, as the coho salmon quota increases from zero, the recreational fishery allocation starts at 70 percent but falls at a rate of 10 percent for each increase of 300 thousand coho salmon quota.

Initial allocations of fishing rights or licenses in a limited entry system raise many difficult issues. The Alaska salmon license limitation law, for example, required a reduction in number of permits below the total number of fishermen with past experience in the fishery (Schelle and Muse, 1986). Eligibility for the limited number of permits was to be based upon past participation and economic dependency. The complicated points system developed to implement the legislative intent fostered many lawsuits which have continued to trouble the Commercial Fisheries Entry Commission for two decades. Most license limitation systems have avoided much travail by issuing permits to every fishermen with a shred of claim upon the fishery. Doing this to avoid tough allocation issues, however, removes any possibility that license limitation can yield any quick returns through reduced capacity and fishing costs.

Economic efficiency criteria can be applied to allocations via the *compensation principle*. The compensation principle states that a change is beneficial overall if the winners can compensate the losers. This is, of course, the principle which stands behind standard benefit-cost analyses. Applied to allocations of fish, the crucial question would be whether the fish (or fishing right) is allocated to the group which values it most, or to the group that produces fish most efficiently.

In evaluating a proposed change in the recreational-commercial salmon allocation, PFMC economists displayed the estimated net economic value changes associated with alternative allocation formulas (PFMC, 1988). Except when salmon quotas are exceptionally low, the new proposed formula would cause a positive net change in value. The salmon allocation analysis also estimated personal income impacts based upon county input-output models. Personal income generated in coastal counties was reckoned to be larger under the new allocation formula as well, except at very low quota levels. Unfortunately for proponents of the revised allocation, the projected harvest quotas for 1988 fell into the low end of the range, leading to expected reductions in both net economic value and community personal income. The Secretary of Commerce's failure to approve the new allocation formula was based in part on the demonstration of its negative economic effects.

A variety of empirical models can be used to quantify the extent of economic value or income redistributions caused by implicit or explicit allocations. In his analysis of the Atlantic coast menhaden fishery regulation, for example, V. Blomo (1987) used a bioeconomic model to show that a geographical redistribution of income may accompany conservation measures designed to increase yield-per-recruit. Reduced harvest of recruits can yield an overall increase in catch and value of catch, while shifting the menhaden fishery from autumn to summer and from south to north. The South Carolina fishery would lose an estimated $4.9 million in profits over a five year period, while the Atlantic fishery as a whole would enjoy an increase in profits of $10 million.

Decisions regarding allocations are frequently not concerned with efficiency of the resulting distribution of rights or fish, but with the equity or fairness in the distribution of economic opportunities. Thus, while allocations do have efficiency effects, these are generally of secondary interest. For economic analysis to be helpful, we need a concept of economic equity that can be applied as coherently and reliably as the efficiency criteria. In the absence of a standard for equitable allocation (or, in the menhaden case, of income redistribution), economic information on regulatory impacts will highlight the degree of economic conflict between the groups without endorsing, or even outlining, a course of action.

ROLE OF ECONOMICS IN U.S. FISHERY REGULATIONS

Fishery regulations under the Magnuson Fisheries Management and Conservation Act (MFCMA) are deimplementation by the U.S. Secretary of Commerce. The route from initial planning to publication of regulations varies from case to case, but it includes at least a formal Council "scoping session," review by scientific committees and industry advisors, formal public hearings and review of draft documents, preparation of Environmental Impact Assessments, economic impact reviews, and Secretarial review. As is typical of U.S. regulatory processes, the federal management system affords many opportunities for interested parties to enunciate specific objectives, to make suggestions and criticisms, and to influence the outcomes.

Economics is a useful tool in developing fishery regulations, because it deals coherently with efficiency in harvests and predicts shifts in distribution of income. Besides being useful, economic analysis has a formal place in the process. Economic factors are part of the "optimum yield" objective (MFCMA, Sec 303(b)6). The National Standards (MFCMA, Sec 301(a)) include "efficiency in utilization of fishery resources" as one criterion for management plans, and Executive Order 12291 requires evaluation of economic impacts of regulations. These provisions of the law and administrative procedure place a responsibility upon the Regional Fishery Management Councils to consider and document economic consequences of their proposed regulations. The Secretary of Commerce may approve or disapprove regulations based on the prospective economic effects.

In complex, participatory decision making, however, it is typical that objectives are diverse and frequently ambiguous. Policy analysts, such as Charles Lindblom (1959), note that economics is but one approach to problem solving and that non-economic considerations prevail. Economic theories lean heavily on optimizing calculations that require well specified objectives and constraints. Thus, policy analysts view economics as ill designed to handle issues in democratic decision making where the dividing line between ends and means is often hazy. From this viewpoint, the use of economic benefit-cost analysis to solve public resource management problems may not result in good decisions, because it substitutes narrow efficiency criteria for the more practical goal of finding effective consensus through adjustments among competing objectives and values.

Many of us have experienced a sort of professional disorientation when confronted with the disparity between decision making and professional advisory roles. When the PFMC voted to approve a specific anchovy quota formula, for example, it chose from a set of options that we on the plan development team had devised and reviewed. The harvest quota options differed qualitatively, but not grossly, from a formula that I had calculated as an optimum stochastic feedback control strategy (see Huppert, 1981). I did not quibble with the Council's choice, because I knew that several other considerations (e.g. the need for forage fish, conflicts between commercial purse seine fleet and live-bait fleet, etc.) had to be accommodated. Once the decision was reached, however, we were required as a matter of bureaucratic process to document why the Council's decision was the optimal one. It was not clear what objectives were sought via what management actions; but it was clear that different council members voted for different reasons. Thus an ambiguous intellectual exercise was created by imposing an economic-bureaucratic criterion upon an essentially political process.

Thus, the actual, as opposed to formal, role of economic analysis is often unclear. Because decisions are essentially political, not strictly economic or technocratic, it is rarely obvious when specific features of a regulatory package stem from economic considerations. Economists have frequently wrestled with the conflict-

ing roles they play as technical analysts/advisors and as decision makers or seekers of consensus. Several recent papers reflect economists' self-evaluation of their roles (Schultze (1982), Leman and Nelson (1981), Brandl (1985), and Nelson (1987)). These writers emphasize the need for economists to avoid becoming political hacks and to avoid using their economics training simply to rationalize political decisions. To be successful policy advisors, economists must learn to recognize political costs as well as opportunity costs in devising management advice; they must be as conscious of distributional effects as of efficiency effects; and they must "pay their dues" in resource agencies before achieving the level of cooperation and respect of which we are all clearly deserving.

The redistribution of income that Blomo projected for the menhaden fishery regulation is just the sort of trade-off that politically astute decision makers dislike. While the benefit/cost ratio is positive (i.e. the compensation principle is satisfied), actual compensation of losers is unlikely to occur. If both the potential losers and winners are represented in decision making, approval of the conservation plan may require compensating measures of some sort. A more difficult, but politically more acceptable, principle is that of "no losers." A tremendous amount of effort may be required to assure that a given regulation creates no significant uncompensated losers. I suspect that many otherwise inexplicably complex management measures adopted in fisheries represent practical efforts to avoid creating losers. Associated inefficiencies may represent a "political cost" of public decisions.

Recent experience does not provide copious evidence that economists can effectively influence fishery management decisions. Economics is frequently dismissed as superfluous, or too narrow, or not pertinent to practical decision making requirements. I believe this is incorrect, of course, but I also acknowledge the difficulty of incorporating economic information in management decisions. The vigorous politics of competition for allocations can make efficiency and equity seem unnecessary distractions.

Despite the political character of public decisions, however, economics can play an essential role in the development and evaluation of fishery regulations. Decision makers cannot evaluate alternatives without analysis of consequences; and economic consequences are clearly important. The existence of non-economic objectives and values makes it doubly important that government regulations receive thorough economic review. Non-specialists too frequently exhibit unwarranted confidence in their understanding of economics. How many times have I heard that we need not worry about the economics of fishing because "the market will take care of it?" Special interest groups are quick to portray their narrow economic interests as equivalent to the public interest. A thorough training in economics prepares one to view resource allocation and income distribution in the broad perspective that is pertinent to public resource management.

Charles Schultze (p.66) admonishes the economic advisor not to respond to the politics of policy decisions by watering down economics advice with political judgments. This is certainly good advice to fishery economists. Even though the fishery councils are political, and biological considerations crowd the technical agenda, economists have a professional duty to develop and state conclusions regarding the efficiency and income distributional consequences of decisions. The economics research agenda for fishery regulations has been thoroughly prospected by the theorists of yesterday, but the field is still wide open for the dedicated practitioner.

NOTES

[1]The complete exhaustion of all rent occurs if (1) costs of fishing are proportional to fishing effort (an aggregate input) and (2) competition leads the fleet to a zero-profit equilibrium. The mere statement of these conditions suggest two good reasons for rents not to be exhausted even under open access. First, there frequently appears to be an upward-sloping supply curve of labor in fishing (or an uneven distribution of talent and skill), so that fishing effort is supplied at increasing marginal cost. The industry equilibrium will occur where marginal cost equals price, leaving potentially hefty intra-marginal rents to better fishermen. Further, M. Weitzman (1974) showed that, with a rising supply of inputs, the variable factors will receive greater average incomes with free access than under a private property equilibrium in which rentiers own the fish stock and hire variable inputs. Johnson and Libecap (1982) note that heterogeneity among Texas shrimping firms leads to rising marginal costs.

A second reason, noted by Crutchfield (1956), is that with monopsonistic waterfront fish markets, the tendency to overfish might be substantially attenuated, as the dominant buyers force prices down to the minimum average production cost. This argument suggests that actions by firms with broader interests than individual fishermen could "manage" the fish stocks. There are many ways to organize for increased net economic returns from fishing. Fisherman cooperatives, labor unions, and marketing organizations are some alternatives to monopsonistic buyers and sole owners.

[2]V.K. Smith comments that creation of exclusive rights would involve destruction of pre-existing entitlements to harvest fish. Thus, rights facilitating private market transactions cannot be created in a vacuum.

[3]I speculate that many resource managers wishing to deflect pressures by user groups do so by making the users feel that they cannot gain by influencing the decisions. One useful tactic might be for the manager to disavow any interest in the economic outcomes of resource decisions, thus creating the impression that no user groups will have decisions influenced to their advantage by lobbying activity. If they believe this, interest groups would stick

to "racing for fish" and not devote significant effort to influencing decisions. One form of this tactic would involve the creation of a non-economic resource ethic. Managers could, cynically or fervently, make repeated and consistent public declarations that only biological conservation and the "health of the resource" matter in making decisions. In this ideological milieu, interest groups could attempt to influence decisions by providing alternative interpretations of the biological basis for quotas and allocations.

[4]The Pacific halibut longline fishery continues to be the classic example of this phenomenon. Between 1980 and 1986, the amount of fishing effort increased by 183 percent in response to price increases and productivity-increasing technical innovations (D. McCaughran, 1987). To maintain annual quotas, fishing seasons have been reduced from 20 days to two and one-half days in important regions. The concentration of fish catch in shortperiods prevents fish from entering the fresh market where prices would be higher than in the frozen fish market. Having more freetime and experiencing strong demand from the Japanese market, the halibut longline vessels have increasingly switched to sablefish fishing. So, during 1975 to 1986 the number of sablefish longliners increased by a more than seven-fold. Even though sablefish annual quotas have been increased in recent years, the open season in East Yakutat, for example, has dwindled from 180 days in 1984 to 9 days in 1987 (NPFMC, 1987).

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