

How to Measure the Potential Advantages of Limited Entry

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ABSTRACT

"Limited entry" is a term that categorizes a variety of fishery management strategies that attempt to control the amount of fishing effort by regulating the number of boats allowed to fish. This paper describes the basic arguments that are used to justify limited entry and case studies of practical problems that have been encountered in limited entry programs around the world.

The first conclusion of this paper is that the relative success of limited entry programs has been partly determined by when the programs have been implemented with regards to the biological status of the stocks. Timing is important. Unfortunately, limited entry has often been viewed as a last resort. Limited entry programs have been more successful maintaining and improving conditions before overfishing occurs than reversing adverse conditions resulting from overfishing after it has occurred.

The second conclusion of this paper is that the political requirements necessary to implement a limited entry program and the ultimate popular acceptance of the program depend on correctly defining and monitoring the objective that is to be achieved. The most successful limited entry programs have not promised more than they could deliver. Furthermore, what these programs have realistically delivered is more in terms of improved economic conditions for fishermen than the protection of fish stock that still requires conventional management tools used in conjunction with limited entry programs.

The conclusions in this paper emphasize why the improved economic conditions that result from limited entry may or may not achieve the goals of a limited entry program. This perspective is designed to be a guide to evaluate the likely success of limited entry programs in smaller or developing countries.

INTRODUCTION

There is a considerable body of theoretical literature and case studies on limited entry (Mundt, 1974; Rettig and Grimes, 1978; Kirby, 1982; Rettig, 1984). The bibliography at the end of this paper includes the most widely cited references including unpublished papers from a 1986 international limited entry workshop.

However, there is very little literature that offers much guidance on how to rationally present and discuss limited entry in a public or parliamentary setting. This is important because most limited entry programs are complicated by the fact that there are a number of diverse and inseparable results. Some of these are intended, others unintended (by products). Some results are desirable, others undesirable in the context of management objectives. It is important to accurately categorize and predict these results. Most limited entry programs have had difficulties during debate, implementation, and monitoring because of confusion over types of objectives (biological, social/economic) and the direct

and indirect pathways by which these objectives are achieved. The best published overview paper is Rettig (1984).

TYPES OF LIMITED ENTRY

Limited entry can occur by three different methods. "License limitation" restricts the number of operating units by restricting the number of licenses for boats or fishermen. "Stock certificates" divide the total allowable catch (fishery quota) into individual fishermen or boat quotas. "Entry barriers" indirectly restrict the number of boats or fishermen by license fees and license application requirements, tax on the catch, professional requirements (education, experience) or working standards (vessel requirements, hours of operations). Such entry barriers exist in many other industries that require a business license, education, experience, or start-up investment costs. Since entry barriers are indirect controls, they may not meet a strict definition of limited entry or they are often used in conjunction with license limitation of stock certificate programs.

There has now been enough world wide experience with limited entry to produce somewhat of a consensus on the following general points about limited entry (Rettig, 1984). See titles of limited entry references for experiences in different locations (Maine, Alaska, Japan, Australia, Canada, Great Lakes, Bermuda, South Africa).

OBJECTIVES OF LIMITED ENTRY

Resource (biological) objectives

Limited entry by itself may not prevent biological overfishing. Conventional management measures (minimum size, mesh size, closed season, bag limits) may still be necessary and often capable of handling biological resource requirements without limited entry. At the same time, limited entry can significantly improve the effectiveness and enforceability of conventional management tools to achieve biological objectives (Rettig and Ginter, 1978; Rettig, 1984; Bain 1985).

Documented examples are improved real-time reporting such that catch quotas are not exceeded for North Pacific halibut and salmon (Miller, 1984). A reduction in the number of traps could reduce juvenile mortality and ghost fishing mortality for lobster and finfish. Fewer trawling vessels might reduce the discarded finfish bycatch in shrimp fisheries.

Social/economic objectives

A long standing theoretical argument by economists for limited entry is national economic efficiency (Gordon, 1954; Scott 1955, Southey 1972; Pearse, 1979). If less human resources (capital equipment and labor) can be used to harvest a given catch, then this excess investment (overcapitalization) could be put to a better use doing other productive economic activities. It has always been recognized by economists that this is a long run argument and that in the short run there may be substantial economic and social "relocation costs" in terms of idle equipment, unemployment, or spill-over effects into other fisheries. Neither fishermen nor vessels can miraculously transform themselves into new forms of labor and capital that can instantaneously be productive elsewhere in the economy. The basic question is whether or not the long term economic efficiency gains to the whole economy are worth the short term cost to the

fishery and how to mediate these costs. These same considerations apply to economic changes in all sectors of the economy.

The measure of economic efficiency is simply the relative dollar cost (capital and labor) of harvesting the catch. It is most accurately measured at the margin. The incremental increase in catch associated with an incremental increase in the cost of fishing. It can be more easily measured (but less theoretically accurate) as the average cost of harvesting a catch. That is, simply dividing the total dollar cost of harvesting the catch by the total catch. This yields the per-pound cost of catching fish.

Increased economic efficiency (lower per-pound fishing costs) does not usually reduce retail fish prices, but it can halt cost-push inflation that switches consumers to imported fish or substitute products. This may be very important if seafood imports are causing a balance of payments deficit. This is common among smaller nations that are tourist oriented.

A widely documented phenomenon in most license limitation programs is that the costs of harvesting a given catch continues to rise (Morehouse and Rogers, 1980; Pearse, 1982; Copes, 1982; Wesley *et al.*, 1984; Bain, 1985). One interpretation is that even with a fixed number of boat (or individual) licenses, fishermen continue to invest in capital and labor in a competitive struggle to retain or increase their share of the catch. The conclusion has been that "capital stuffing" or upward "effort drift" reduces and may ultimately even eliminate the economic efficiency advantages of limited entry. In such cases, limited entry may simply delay but still ultimately produce the same level of overcapitalization that would occur without limited entry. This perspective obviously begs the question of why go to all the trouble of limited entry.

The theoretical argument that has evolved from this perspective is that the only way to produce economic efficiency is to issue a limited number of individual quotas ("stock certificates", "individual transferable quotas", "enterprise allocations") that allow each fisherman to harvest a given quantity of fish. Once fishermen know that a specific quantity is "reserved" for them then it is presumed they will choose the most efficient (least cost) method to harvest that quantity. Fishermen can buy or sell stock certificates or "property rights" to harvest more or less fish.

Such "certificates" or "individual transferable quotas" (ITQ's) have operated in the large vessel, offshore groundfish fleet in Atlantic Canada since 1982 (Frazer, 1978) and in the Australian southern bluefin tuna fishery since 1985 (Robinson, unpubl. ms.). The former is a somewhat unique situation and the latter is too new to evaluate.

The recognized administrative shortcoming of a stock certificate limited entry program is enforcement. There must be accurate and enforceable real-time vessel reporting and quotas. This works best where most of the catch is processed through a small number of fish houses for export with no local black market for over-quotas catch. Canadian offshore groundfish, Australian southern bluefin tuna and some of the Alaska and other "out post" fisheries meet these conditions. A stock certificate limited entry program would be difficult if not impossible to enforce in most community or artisanal fisheries.

A second problem with a stock certificate program is that for short lived species (shrimp) or closed season grow out species (spiny lobster) or migratory stocks (mackerel, swordfish) a stock certificate will not actually "reserve" a portion of the catch over the fishing season. Fishing at times during the season

when harvestable abundance is largest will be preferred. In this case the stock certificates must be for an amount of fish at a particular time (like time-sharing condos). This may further complicate enforcement and produce inefficiency. Another problem inherent with short lived species is that the total annual catch must be predicted to distribute the individual quotas. If the available annual crop is not harvested (low prediction of annual catch) it may never be caught (natural mortality, out migration). This is no problem for longer lived Canadian offshore groundfish and Australian southern bluefin tuna because these fisheries are managed by annual quotas (international agreements for SBT). In fact, quota management was the primary reason for choosing this form of limited entry (not efficiency).

CAPITAL METAMORPHOSIS

It has turned out that the conventional measure of economic efficiency has raised another very important issue with respect to monitoring the performance of limited entry programs. This issue is undoubtedly of more practical importance for management than the theoretical arguments for economic efficiency. The phenomenon of increasing costs under license limitation has another interpretation that does not necessarily lead to arguments for a stock certificate program. Increasing costs that occur with increased profits under license limitation may not be necessarily directed at increasing the catch. They may be expenses to improve working conditions (vessel safety, accommodations, communications), product quality (fish handling and storage), and diversification into other fisheries (Morehouse and Rogers, 1980; Anon, 1982; Pearse, 1982; Rettig, 1984). These costs would presumably also occur under a stock certificate program. Most important, these costs should not be interpreted as decreasing economic efficiency when either working conditions, product quality or mobility in the fishery are below comparable conditions elsewhere in the economy. These costs are actually investments that surely improve national economic welfare as much as if economic conditions remained marginal in the fishery and the profits were invested in other activities.

In most fisheries where limited entry has been considered, working conditions are arduous and even hazardous, product quality control is minimal and alternatives are bleak. These are common signs in any depressed industry. Under these conditions, it should not be surprising that when profits accrue under limited entry, these profits (new discretionary income to fishermen) will be spent in ways that will ultimately be measured as fishing costs. However, these costs will be embodied in a different form than fishing costs without limited entry. A larger proportion of costs are likely to be investments to improve working conditions, product quality, and diversification.

MEASURES OF LIMITED ENTRY SUCCESS AROUND THE WORLD

A review of limited entry programs around the world suggests that improved working conditions, product quality, or diversification have resulted from limited entry. Economic efficiency (reduced fishing costs) has not occurred. To further complicate matters, there are inseparable connections between improved working conditions, product quality and diversification (accommodations, navigation, communications, refrigeration, exploratory fishing, experimental gear) and increased productivity. If it is assumed that increasing costs for these things under limited entry is undesirable,

overcapitalization resulting from fishermen competing to harvest a larger proportion of the catch, then limited entry is unsuccessful. If these things are interpreted as desirable, improvements in working conditions, product quality and diversification that have the inextricable by-product of increasing productivity, then the conclusion is different.

This paper recommends the following guide posts for limited entry:

1. Limited entry should be justified (if justified) by specific accomplishments that relate to improving the effectiveness and enforceability of conventional management measures to achieve resource (biological) objectives and/or the social/economic objectives of improved working conditions, product quality, and diversification. Economic efficiency arguments do not receive much attention and gains are seldom measurable if they ever exist. Balance of payments considerations may be an exception.

2. Once these objectives are identified, there are two pathways through which they can be achieved (Figure 1). The first is the "compliance pathway." The argument is that the increased profitability resulting from limited entry can be used by fishermen to comply with new regulations that enhance conventional resource management or to achieve specific social/economic objectives. The second route is the "incentive pathway." The argument is that fishermen will use their new discretionary income to voluntarily invest in ways that enhance conventional resource management measures or produce desired social/economic results (improve working conditions, product quality and diversification).

The incentive pathway is always preferable to the compliance pathway when they both produce similar results. In most cases the desired results are achieved by a combination of the two pathways. It all boils down to what fishermen would do with increased profits (discretionary income). Limited entry is a success only when fishermen spend their new discretionary income in ways that achieve the social/economic objective of limited entry.

LIMITED ENTRY STRATEGY

Once the resource and social/economic objectives are defined and the pathways to achieving the objectives are identified, there are some specific strategy lessons that can be learned from other programs.

Macro vs. Micro Management

Limited entry may improve the effectiveness and enforceability of fishery management, but fishery management tools still remain relatively blunt instruments. Fishery management operates in a probabilistic rather than a deterministic resource and human environment. Limited entry should be viewed as indirect environmental manipulation rather than direct regulatory control or as an instrument to fine-tune fishery management. The main reason is that incentive pathways work better than compliance pathways. For example, tax and finance policies can be as indirectly important as closed season or catch quotas in determining the number of boats in a fleet. Profits through limited entry may be more effective than government regulations in changing working conditions, product quality, or diversification.

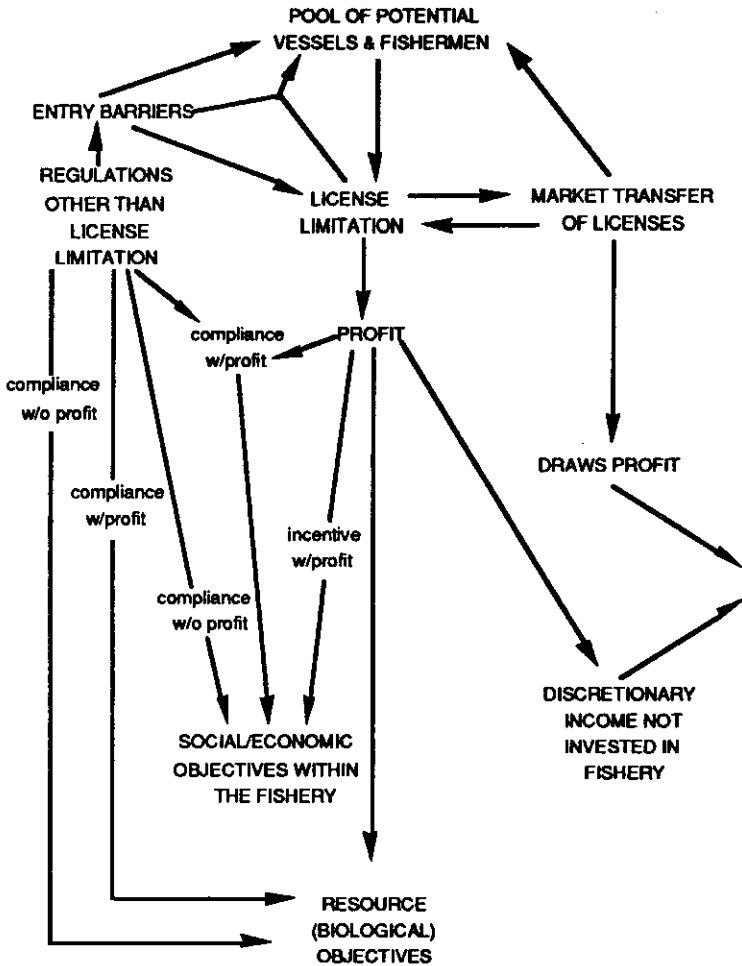


Figure 1. Pathways through which biologic and socioeconomic objectives can be achieved.

Moratorium on entry

Initial discussions of limited entry often concentrate on a moratorium on entry as at least the first step in a limited entry program. In virtually every case where a moratorium has been implemented without the necessary limited entry components of license participation and license transfer rules, the result has been to increase not cap or decrease fishing effort (Rettig, 1984). The reason is that

fishermen want to hedge against future unknown restrictions that they assume at least include admittance before the moratorium.

Exclusionary rules

In most instances limited entry is not considered until there is severe overcapitalization. At that point the potential benefits of limited entry can only be achieved in the foreseeable future by a substantial "forced" reduction in fishing effort as compared to capping expanding effort or a moratorium on entry with the expectation of natural attrition. Forcing active fishermen out of a fishery is much more difficult than controlling new participants.

Two major problems have occurred with exclusionary rules (Austin, 1981). First, whatever historical performance criteria were chosen (years fishing, annual catch, percent income from fishing) these criteria tend to correlate with identifiable social/economic/ethnic classifications of people. It is not surprising that fishermen who have been fishing the longest catch the most fish and are the most dependent on that catch for their income. The net result is that these criteria can be frequently interpreted as discriminatory.

Second, any attempt to exclude fishermen based on historical performance has produced enumerable administrative and legal problems because of the difficulties of documenting past performance. This can be some what mediated by how licenses are transferred (acquired in the future).

The lesson from these experiences is that the exclusionary rule should apply to the future, not the past. Then they are no longer exclusionary rules but professional standards. Such standards might include education, experience, full time commitment, working conditions, product quality, and diversification which are common standards in advanced ("professionalized") industries. The candidate population of fishermen may or may not be limited to past participants. However, any attempt to reduce the expected population should be done by establishing performance criteria (professional standards) that must be met in the future. This eliminates most of the problems of discrimination and can establish performance documentation records that will avoid administrative and legal battles over future conformance to the performance criteria.

Buy backs

One form of effort reduction to avoid politically contentious exclusionary rules has been to buy participants out of the fishery. This has not been successful because there has never been enough money available to buy out a significant number of fishermen (Bell, 1978).

The argument has been that at least some of the profits accruing because of limited entry could be taxed from fishermen (economic rent) and used to finance buy-back programs. The experience in Canada has been that fishermen can be bought out only with very large payoffs. When buy-backs were originally proposed, economists calculated expected buy-out values on the basis of the capitalized value of future profits. Profits were projected to be low under limited entry (zero under open access). The situation is that in most cases fishermen have very low capital and labor mobility and considerable debt service. It was long ago pointed out (Scott, 1955) that the profitability of fishing has little to do with why fishermen may be relatively poor. When they are poor it is because, like in other low income occupations, there are no economic alternatives (low opportunity cost). Fishermen view the present value of their opportunity to fish

in the future as the capitalized value of their potential work life revenue. Therefore fishermen capitalize revenue not profits which made buy-outs prohibitively expensive.

It is interesting to note that if fishermen capitalized profits rather than revenue it would be possible to buy fishermen out of an open access (zero profit) fishery at virtually no cost. The response of any fishermen as to how much he would have to receive to "sell" his privilege to fish demonstrates that this is not true.

License transfers

There must be an orderly method for new vessels and fishermen to enter a limited entry fishery. One alternative is that licenses or stock certificates can be transferred by fishermen returning them to a regulatory authority that either reissues or retires them. The primary motives for transferring licenses through a regulatory agency is that it offers the mechanism to retire licenses to reduce fishing by natural attrition or to directly control the qualifications of fishermen (experience, prevent dominance by outside investors). Fishermen strongly oppose license retirement because it breaks family lineage participation.

The most common alternative for transferring licenses is to allow them to be bought and sold in an open market. The advantage is that no regulatory agency has to reallocate licenses after the initial distribution. One concern is that market transfer values will be high and may appear to have no connection to earning potential. Another concern is that licenses will be bought up by outside investors. Most market transferable license programs address these concerns by not allowing licenses to be financed (not used as loan collateral) and only held by individuals not corporations. The ultimate market value of licenses is determined by whether expected future profits or revenues are being capitalized. The equity of these values is determined by whether the values are viewed as windfall profits or earned retirement. This occurs with other limited occupational licenses (taxi, liquor, tobacco).

The potentially biggest disadvantage with marketable licenses is that overcapitalization will continue and could be greater than under open access in the form of license investments. The purchase value of a license is a debt against future earning. From an economic efficiency perspective this debt is not a fishing cost because the amount the buyer pays the seller, the seller presumably invests in something that will increase productivity elsewhere in the economy. However, from the perspective of achieving specific resource or social/economic objectives that only come through increased profitability (compliance or incentive pathways), license investments prevent achieving these objectives.

Barriers to entry

Barriers such as license fees and application procedures, taxes, professional requirements (education, experience, full time commitment) or working standards (vessel requirements, safety conditions, operating hours) can indirectly restrict the number of participants. If the purpose of a limited entry program is to achieve any of these conditions then it may be possible to simply set these conditions as requirements for entry to directly achieve the objectives without license limitations.

The disadvantage of using entry barriers to try to achieve biological or social/economic objectives is that they only work through the compliance (no incentive) pathway. More important, there is no increased vessel revenue (profit) to finance compliance. Barriers to entry work best in combination with license limitation or stock certificate limited entry programs.

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