

Economic Aspects of Fisheries Utilization in the Law of the Sea Negotiations

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INTRODUCTION

The reason that fisheries economics has developed as a special area of concentration is that the poorly defined property rights to fish stocks that normally exist will cause the freely competitive market to utilize the fishery in a suboptimal manner. The economic problem is to find policies that can correct this. The policies that are successful are those that, in one way or another, assign property rights.¹ Proper operation of international fisheries requires the definition of property rights on two levels. First, the living resources of the ocean must be divided up among the various countries and second, each country must decide how to

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1. See F. CHRISTY & A. SCOTT, *THE COMMON WEALTH IN OCEAN FISHERIES* (1965). For those that dislike the term property rights "control over use of the resource" may be used instead.

divide the rights internally. In essence, those aspects of the law of the sea negotiations that deal with fisheries are concerned with the first stage of this property right distribution.

If conservation per se was the only problem, international fisheries management would be easy to achieve. The real problem is how the distribution of the wealth of the living resources will be affected by the exploitation program. The main portion of this paper will discuss several of the proposed solutions to this problem in light of their ability to bring about rational economic use of marine fisheries. The success in each case is directly related to preciseness of the definition of property rights.

The paper also contains three other short sections that deal with the economic aspects of other issues of international fisheries management. Section II discusses the problem of public goods. For instance, secure property rights notwithstanding, international cooperation in research, and in the provision of such things as weather and fish location information may be mutually beneficial to all countries concerned in terms of services provided and cost. Section III deals with the economics of international trade in fishing effort or in rights to fish once, or if, property rights are defined. Finally, section IV deals with the economics of the fisheries problem with regard to other aspects of the law of the sea.

I

The purpose of this section will be to compare selected proposed solutions to the fishery problem in the law of the sea negotiations according to their ability to obtain an economically rational and efficient method of harvesting the wealth from the ocean's living resources. There are other ways in which they could be compared (such as chances for international agreement, or equity of distribution) but these will not be directly considered here. The final product will prove useful in providing one other element for the contracting States to consider as they begin negotiations on fisheries in the Law of the Sea Conference.

Although there are almost as many proposed solutions as there are States at the negotiation table, they can be broken down for purposes of discussion into three main categories: the species approach, the distant waters approach, and the exclusive fisheries

zone. Concern over new entrants, developing, and land or shelf locked states could conceivably be considered a fourth category, but they can easily be discussed in the context of the above three.

It is obvious that the proponents of each of the above solutions are motivated by political and distributional goals. I am not a lawyer nor an expert on international political science, but I think that the United States favors the species approach to avoid recognizing any fishery zone outside territorial waters which by "creeping jurisdictionalism" may lead to coastal States' control over things such as the right of innocent passage. Likewise it appears reasonable to assume that those countries who favor some type of fishing zone do so because they feel an increased portion of the ocean's wealth will come under their control with such a plan. Also, Japan and other distant water fishing States are opposed to zones because they stand to lose the right of free access to some of their historical fishing grounds.

Since, in the last analysis, comparisons of these proposals on the basis of their distributions are value judgments, none will be attempted here. Rather, as previously mentioned, the purpose is to compare them purely on the economic rationale of their distributional characteristics, and where possible, to suggest changes such that the same distributional objectives can be obtained without a loss in economic efficiency.

Before any comparisons can be made, criteria for obtaining economic efficiency in harvesting the ocean's living resources must be enunciated. In a national fishery the criteria are that additional units of fishing effort should be applied to the fishery as long as the value of the fish caught is greater than or at least equal to the cost of producing the effort, and that the effort be produced as inexpensively as possible. This guarantees that fish will not be caught if their value is less than that of the other goods that could have been obtained had not the last unit of fishing effort been produced.

While an open access (*i.e.* unregulated) fishery will produce effort as cheaply as possible, individual boat owners will consider only their private costs and revenues in determining how much effort to use and so additional effort will be applied to the fishery as long as the value of average catch per unit of effort is greater than the average cost of effort. Therefore, with no control on entry, too much effort will be produced.²

Economic efficiency requires that effort be reduced until the cost

2. For greater detail see CHRISTY & SCOTT, note 1 *supra*.

of the last unit of fishing effort equals the value of its catch. This will lead to an increase in the value of total output. The value of fishery output will fall, but by a smaller amount than the value of other products will be increased. Attempts at reducing effort by artificially reducing the effectiveness of the fishermen will violate the second criterion for economic efficiency. In the economic literature the point at which these criteria hold is called maximum economic yield, which under most conceivable cases will involve a smaller amount of effort than will the open access yield or the maximum sustainable yield.³

Since the unregulated fishery will not be operated in an economically efficient manner, it is generally agreed that there must be some form of unified control to limit the amount of effort and to guarantee that it is produced as inexpensively as possible. This is not to say that all fisheries that are subject to a unified control system will meet the economic criteria. But such a control system is necessary if those criteria are to be met.

Given that there is a unified control system, one of its major problems is deciding who is going to cut back on effort. Unless there is some method by which those that remain in the fishery can be made to pay those who leave according to some agreed upon formula, the wealth inherent in the renewable characteristics of the fish stock is given to those who are able to continue fishing. This is the distributional problem of fisheries management.⁴

The same efficiency criteria hold for an internationally exploited fishery, but the problem of regulation is much more complex because the distribution of the fishery can be very important in determining the value of the fish. This is because the amount that a nation is willing to pay for marketable items is based upon their tastes and incomes. In those cases where income earned by the fishing industry is a significant portion of total income, the amount people in that State are willing to pay for fish depends, in part, upon how much fish they are able to harvest.

3. For the exception to the rule see Southey, *Policy Prescriptions in Bionomic Models: The Case of the Fishery*, 80 J. POL. ECON. 769, 769-75 (1972).

4. For a description of how Canada is trying to solve this problem see Pearse, *Rationalization of Canada's West Coast Salmon Fishery*, in *ECONOMIC ASPECTS OF FISH PRODUCTION* (OECD Paris, 1972).

This means that before a maximum economic yield of an international fishery can be defined, the distribution of the wealth of the fishery must be specified. But in order for a distribution to be chosen there must be a unified control system. Without an authority each State will try to get its "share" of the fishery by maintaining the ability to catch it. This will involve the same type of economic waste as was described above. The distributional problems of regulating an international fishery are more difficult to handle in that reductions in effort will result in shifting the wealth of the fishery among States rather than among individuals within a State. Because of the increased chances of different social, economic, and political factors involved in the international case, the problem of equity is much more difficult to solve. As was mentioned previously however, the proposed solutions to be discussed have, explicitly or implicitly, already specified a distributional scheme for much of the ocean's wealth.

From the above it can be concluded that a definite distribution of international fish stocks is important for two reasons. First, such distribution must be specified before maximum economic yields can be defined and second, without it the States will over capitalize their fishing fleet which will cause harvesting costs to be unnecessarily high.

The different proposals will be judged on their ability to obtain well defined rights to the fisheries such that the proper amount of effort can be applied in the most economical manner. (To be complete, the cost of day to day fishery negotiations among the States must be included in the definition of economic efficiency.) In order for economic efficiency to be obtained, the rights must be in terms of the wealth of the fisheries and not solely in terms of rights of access to them. This point will be discussed in more detail later.

There are four basic types of fish stocks that must be considered in the following analysis: 1) Those stocks that remain within an area under the control of one State; 2) Those stocks that move between areas under the control of two or more States; 3) Those stocks that spend a portion of their life in areas under the control of one or more States and the rest on the high seas (anadromous species are usually a special case of this type); 4) Those stocks that spend a major portion of their life on the high seas. Types 2 and 3 include special cases where the stock may be in the harvestable stage of its life in a subset of the jurisdictional areas in which it spends its life. Obviously the classification that a certain stock receives will depend upon the particular way in which the jurisdictional areas are determined.

The Species Approach

For purposes of economic analysis, the main points of the species approach as put forward by the United States⁵ are:

1) Coastal States are to have regulatory power over, and preferential rights to, all coastal species beyond the territorial seas off their coasts to the limits of their migratory limits. These preferential rights will be based on the harvesting capacity of the State, but there is no explicit mention of how they will be affected by the growth of such capacity. The same principle applies to anadromous species that breed in the estuarine or fresh waters of a coastal State. These States must provide access to resources not fully utilized to other States in the following order of priority: those that have traditionally fished the stock, other States in the region (particularly those that are landlocked or otherwise disadvantaged), and other States. The articles state that this access shall be "under reasonable conditions," but that the States "may be required, without discrimination, to pay reasonable fees to *defray their share of the cost of . . . regulations.*" Note that these fees are only to pay regulation costs and are not meant to be a source of wealth to the coastal State.

2) Stocks that are located in or migrate through the waters adjacent to more than one State shall be regulated by agreement among them.

3) Highly migratory species are to be regulated by international agencies consisting of States that are engaged in fishing for them.

4) The conservation standard is to be maximum sustainable yield subject to relevant economic and environmental factors, and no conservation standards can discriminate in form or in fact against any fisherman.

At the outset there are two points that can be dealt with in brief fashion. First, to the degree that maximum sustainable yield is held up as the goal for management, maximum economic yield will be prohibited. Second, the stocks that are located exclusively within the territorial waters of a coastal State have the potential of being rationally managed because that State has the sole right to

5. See *United States Revised Draft Fisheries Article*, U.N. Doc. A/AC.138/SC II (4 August 1972).

manage them. Whether in fact it exercises that right to ensure that the economic criteria are met is another matter. The problem, however, is not so easy for other stocks.

The basic idea behind the species approach, the regulation of resources on the basis of biological rather than political grounds, is sound, but this particular proposal leaves much to be desired from an economic point of view. Its main problem is that it does not specify the distribution of the stocks in sufficient detail, and this will more than likely cause economic inefficiency. Consider first the "coastal stocks." In brief, each coastal State will, under most circumstances, be motivated to increase its harvesting capacity at the expense of global efficiency, and if it does not do so, it is unlikely that the allocation of the "unutilized portion of the stock" will result in efficient production.

With regard to the first point, harvesting capacity is an elastic yardstick in two ways. First, it is hard to define precisely what a unit of capacity is. But more important, even in cases where a workable definition of capacity can be reached, unless the potential long run returns from land based investments are very high, the coastal State will be motivated to expand its capacity until it can harvest and thereby legally control 100% of the coastal species off its shores. While this will settle the distribution problem, in most cases it will mean that the fish will not be harvested at the lowest possible cost because the coastal State will not necessarily be the most efficient producer of effort. But from the individual State's point of view, if the only way to obtain property rights to the stocks is to establish harvesting capacity, it makes sense to do so.

However, if the coastal State may expand its capacity by entering into joint ventures with other States (or with their nationals), the outlook for economic efficiency is not so bleak. Since it can make the most net revenue from such arrangements by entering into agreements with States that can produce effort at the lowest cost, it is likely that it will do so. Given the possibility of expanding capacity in this manner, the coastal State will have fairly well-defined property rights to the coastal species. While it can not sell them, other countries must work through it to get a guaranteed portion of the yearly catch.

With regard to the second main problem with coastal species, in the event that the coastal State does not expand its harvesting capacity to the extent of the yearly possible catch, the problem of who gets the unexploited part of the resources arises. The proscribed priorities in distributing shares may be of little use if

the number of States in any one category desire more than the amount left to be distributed. Therefore, although the potential number of States involved may be smaller, there will still be an excess demand for the stocks. This means some form of negotiation, with its attendant costs, must take place in order to solve the problem. Admittedly, the negotiation costs may be lower than in the complete open access because of the reduced number of participants and the existence of a final authority in the person of the coastal State. However, even ignoring the negotiation costs, there is no guarantee that the resulting distribution will insure that effort will be produced at the lowest possible cost, except in the unlikely case that access to the stocks is allocated on the basis of ability to produce effort at a low cost, or unless the rights, once granted, are transferable. This last point will be discussed in greater detail below.

In addition, if the restraint on the discrimination of conservation methods is interpreted to mean that the State quotas and limitations on effort from a State are not permissible (on the grounds it is impossible for all eligible States to have a meaningful quota or a meaningful level of effort), then the unutilized portion must be harvested with modified open access. In that case the eligible States will be motivated to sustain a large and powerful harvesting capacity so that they stand a good chance in the race to harvest. This will keep harvesting costs higher than they need be. Therefore, whether the unutilized portion is allocated on a share or on modified open access basis, the chances of having the effort produced at the lowest cost are not good.

The discussion so far has concerned the problem of one coastal State's management of its "coastal species," and it should be obvious that these problems expand in cases where such species are located in or migrate through the waters off more than one State. Certainly the prospects for economic efficiency do not improve in those cases.

Turning to the highly migratory species, the proposal is essentially no proposal at all. Allowing such species to be regulated by the appropriate international fishery organizations, and further specifying that these organizations shall be open to all States that fish or even *intend* to fish a particular resource, is at best an extension of the status quo. The specific inclusion of those States that

intend to fish will probably make it even more difficult to reach an economically rational agreement than it is under the present arrangement.⁶

These comments should not be interpreted to mean that international fishery regulatory agencies serve no useful purpose. Such organizations are essential to proper management of international species and have had a moderate amount of success in doing so, especially from a conservation point of view. While they have been successful in preventing extinction (either from a biological or an economic point of view), this has come primarily at the expense of economic efficiency. This is a result of the very nature of the organizations. Individual countries within them are very jealous of their rights to use the stocks and so while they may agree to certain conservation policies (i.e. size limitations, yearly quotas, closed seasons) it is very difficult to get them to agree to individually reduce effort. This is especially true in those cases where there are no workable limitations on new entrants coming into the fishery after those already there have cut back. It essentially boils down to a problem of allocation of the stocks. No country will agree to any conservation technique that is perceived to affect its share. Those techniques agreed to, (see above) almost universally lead to a global over-capacity of fishing effort as the countries involved try to maintain "their share" of the catch.

The problem with this aspect of the U.S. interpretation of the species approach is that it in no way improves the possibility of the countries involved agreeing to any regulation method, much less one that grants definite rights to the stock, which would allow for an economically efficient use of it.

The main problem with this approach, at least regarding economic efficiency, is that there are no adequately defined ways of distributing strong property rights. This is true for everything from coastal to highly migratory species. The problem could be overcome by a program that would, in part, grant exclusive rights to the coastal stocks to the limits of their migration to the coastal State. Alternatively, the coastal State could be granted a specific portion of each such stock (perhaps based on its harvest capacity at a specified point in time or upon average catch over a period of time), granting the rest to other States. But even in the latter case the coastal State should be given full regulatory powers.

6. For a lucid discussion of the ability of existing arrangements to manage high seas stocks see Christy, *Northwest Atlantic Fisheries Arrangements: A Test of the Species Approach*, 1 OCEAN DEV. & INT'L L.J. 65 (1973).

These rights would have to be in terms of a given percentage of maximum economic yield, and for the program to be effective they must be transferable. That is, the State that holds these rights should have the alternative of catching the fish associated with them, hiring nationals from other States to catch the fish, or selling the rights.

Under this arrangement, the State with the regulatory powers would determine the optimal amount of effort to be applied for a given period (for practical purposes, a period would have to be at least two or three years) based on the expected price of fish, and the lowest cost of producing effort. Recall that the first criteria for efficiency is that extra fish should be harvested as long as the cost of doing so is less than the amount people are willing to pay for them. This would guarantee that the proper amount of effort would be used during each period. Each State would then have the right to produce effort in proportion to its ownership of fishing rights. Because of the transferability, there would be motivation to buy or sell the rights (more properly to lease them for a given period) until effort is produced at the lowest possible cost.

To see the logic behind this, consider a State with the right to apply a specified amount of effort to the fishery over a given period, but with an inefficient fishing industry. If the State valued the fish then it would be to its advantage to hire effort from another State that could produce it more cheaply. The State would gain from such a move because it would still have the fish, but the cost of obtaining them would be less. In technical terms, fewer resources would be needed to produce the goods to trade for the effort than would be needed to produce effort at home. The resources that are thus freed can be used to produce other needed goods. On the other hand, if the State values some other goods more than it does the fish, then it would make sense to lease its right to fish to another country and then use the proceeds to buy those goods. Since it can not produce effort at a low cost, it makes more sense to lease the rights than to produce the effort and then sell the fish. Of course the States that would be willing to buy the rights would be those that have the ability to produce effort at a low cost. The end result of these transactions would be to cause effort to be produced at the lowest possible cost. Although the States that hold the rights to the fishery will

not necessarily produce the fishing effort, they will receive the wealth that is inherent in their rights. The process of trade will be discussed in more detail in the sub-section on resource zones to follow. The problems of the application is the subject of Section III.

Granted, some countries may want to use their rights as a source of employment for certain hard to employ segments of their economy or there may be internal political restrictions on the above described trades. To the extent that this is true, the procedure will not result in effort being produced at a minimum cost. But at least the possibility of it happening exists, and given enough time to adjust to the system there is reason to believe that countries will realize the possible gains from seeing that it does.

Turning now to the case where coastal species are located in or migrate through the waters of more than one coastal State, the problem of how to divide the rights between them still exists. But once such rights are established, the problem of determining the proper amount of effort and then allowing free trade to guarantee that it will be produced at the lowest possible cost will not be substantially different than in the case of coastal species. The same type of argument applies to highly migratory species once some method of distributing the rights is found.

The Distant Water Fishing Approach

The relevant part of the distant waters approach as presented by Japan are as follows:⁷

1) Developing coastal States are entitled to reserve for their flag vessels (i.e., they have preferential rights to) that portion of the allowable catch (which is defined to be maximum sustainable yield) of the coastal fish stocks that they have the ability to harvest. The extent of these rights are to be determined by agreement of the States involved on the basis of proposals made by the coastal State. There are dispute provisions should the States fail to agree. In determining the part of the allowable catch to be reserved for the developing coastal State, due consideration is to be given to the growth of its fishing capacity until it has developed the ability to fish for a major portion (approximately 50%) of the allowable catch.

2) Developed States shall have the right to reserve to its flag ships that portion of maximum sustainable yield necessary to

⁷. See *Proposals for a Regime of Fisheries on the High Seas* (Submitted by Japan), U.N. Doc. A/AC. 138/SC II/L. 12 (14 August 1972).

maintain "locally" conducted small-scale fisheries. Again, the actual amount will be determined by the same type of negotiation process used in determining preferential rights for developing States.

3) When more than one coastal State is entitled to preferential rights, those of each country must be agreed to by all concerned. No limit as to their individual or combined rights is specified.

4) The coastal State shall have the right to regulate its coastal fisheries to insure its preferential rights. The conservation methods used may not discriminate in form or in fact between fishermen of one State and those of other States. The allocations of catch by national quota are permissible as are regulations as to seasons, areas, permissible gear, and total stock quotas. If the coastal State is the only one utilizing a particular fishery, it may set its conservation measures as it wishes. However when another State enters, or even desires to enter the fishery, new conservation and distribution rules must be determined by negotiations between the two States.

5) No such preferential rights exist for anadromous or highly migratory stocks. The conservation and regulation of these shall be controlled by international or regional consultations and agreements.

The distant water approach as proposed by the U.S.S.R. is different from the above in that there is no limit on the growth of the preferential rights of the developing coastal States, and anadromous fish are to be included in the preferential rights category.

Although the distributional aspects of these proposals are definitely more in favor of the distant water fishing nations than are those of the species approach, no definite distribution program is specified. Therefore, here again, it is doubtful that the proposal will result in an economically rational system of utilizing the marine fishery resources. Many of the specific criticisms of the species approach apply here also.

Both distant water proposals will encourage coastal States to increase their harvesting capacity (whether or not they have a comparative advantage in producing effort) in order to establish non-transferable fishing rights. The limitation of 50% of allowable catch, will, of course, reduce the extent of this inefficiency. More

can be said on this however. First, Japan set such a limitation in order to protect distant water fishing rights and not to reduce wasteful overcapitalization in the coastal State. Second, in the event that the coastal State is able to produce fishing effort at a very low cost, limiting it to 50% of the fishing may unnecessarily keep harvesting costs high.

With regard to that portion of the allowable catch that is not subject to preferential rights, neither proposal scores high on economic efficiency grounds since they are subject to the same weakness in this regard as in the U.S.'s species approach. Japan's proposal, by permitting national catch quotas, will however, enable each State the option of harvesting its quota as efficiently as possible. That is, since they have the right to catch a specified amount, they will not have to rush out to get their catch before others get it. Therefore, they can develop the optimal sized fishing fleet for their catch level, and use it in the most efficient manner. However, to the extent that timing of the catch can affect its ease of capture this is not the case.⁸ But unless the catch quotas are distributed on the basis of cost of producing effort, they will not allow for a global minimum cost of harvest.

In the event catch quotas are not used, but rather the coastal State uses such measures as closed seasons, total quotas, etc., then the non-preferential portion of the allowable catch will be available to all States on a first come first serve basis subject to the rules set down in the conservation measures. This will encourage those States to enlarge their fishing fleet so that they can remain competitive in the race for the fish. Because of this, it is very likely that total fishing capacity will be larger than is necessary to harvest the allowable catch on a seasonal basis. Therefore costs will be unnecessarily high.

With regard to highly migratory species, these proposals are again similar to the United States' species approach and are hence subject to the same criticisms. Japan, by removing anadromous fish from the admittedly weak jurisdiction of the coastal State and placing them under the control of international bodies, puts them in a category where their distribution is even less clearly spelled out. Therefore, the chances for proper economic utilization are reduced.

Economic Fisheries Zone

The main points of the economic fisheries zone approach (as

8. For a more detailed discussion of this point see Christy, *Northwest Atlantic Fisheries Arrangements*, note 6 *supra*.

jointly proposed by Canada, India, Kenya, and Sri Lanka) are:⁹

1) Each coastal State shall have the right to establish an exclusive resource zone beyond its territorial sea where it will have sovereign rights for the purposes of exploration, exploitation, conservation, and management. While the article on anadromous species was not completed in time for presentation to the Geneva Conference, it seems reasonable to assume that they will be considered property of the coastal State where they breed. This seems logical in view of Canada's earlier statements on the subject.¹⁰ No exact distance limitation is specified although 200 miles is the one most widely discussed at the international level.

2) The coastal State may allow nationals of other States to fish in its exclusive zone subject to conditions and regulations which can include payment of fees and other forms of remuneration. These are more than fees to cover regulation costs; they are for the right to fish.

3) The coastal State shall allow neighboring developing coastal and landlocked States access to this exclusive zone. The extent of this access will be a matter of negotiation between the States involved and will be based to some degree upon the historical catches of the neighboring States. These rights of access, once defined, are not transferable to third parties by lease or license, by establishing joint ventures, or by any other methods.

4) Coastal States shall have preferential rights to stocks beyond its exclusive fishing zone to the extent of their harvesting capacity.

5) Stocks of limited migratory range outside of exclusive fishing zones are subject to regulation by a regional agency consisting of representatives of nearby States. (No mention of neighboring developing and land locked States is made in this regard.)

6) Highly migratory species outside exclusive fishing zones shall be subject to the "authority designated for that purpose by the Conference on the Law of the Sea."

9. See *Draft Articles on Fisheries* (Submitted by Canada, India, Kenya, and Sri Lanka), U.N. Doc. A/AC. 138/SC. II/L.38 (10 July 1973).

10. See *Management of the Living Resources of the Sea, Working Paper Submitted by the Delegation of Canada*, U.N. Doc. A/AC. 138/SC II/L.8 (27 July 1972).

Extending the jurisdiction of the coastal State, as far as control over fishery resources are concerned, increases the number of stocks that are under the sole control of one authority. Therefore, the number of stocks having the potential to be rationally managed is increased. In essence, the coastal State now has the ownership rights to the wealth of the fish stocks in its exclusive economic zone. Assuming that the remuneration principle can be taken literally, the State can choose to take that wealth in whatever form it deems superior. If it has a strong desire for the fish, and it is relatively efficient in producing fishing effort, then the best form would be the actual fish caught by its own fleets. On the other hand, if its cost of producing effort was high, and was expected to remain so in the future, the best way to utilize the resource would be to hire boats from other states. In that way, it could still have the fish, but it could use its men and equipment to produce things in which it has a comparative advantage. Finally, if it does not desire the fish it can lease the rights to the annual allowable catch to other states, or it can harvest the allowable catch at home and then sell the fish depending upon its relative efficiency in producing effort. More realistically, some combination of the above will be the most advantageous. For example, it may be most efficient to harvest a portion of the allowable catch and then hire effort to obtain the rest.

The particular plan chosen will depend upon the States' relative desire for the fish, which can be measured by the relative price of fish internally as opposed to its international market price, and upon the relative cost of producing effort internally versus that of other States. Since the State has sole control over and receives all proceeds from the stocks in this zone, it will be motivated to regulate them such that no fish will be harvested that is not at least equal in value to the cost of obtaining it, and that effort is produced as inexpensively as possible. That is, it will be motivated by its own self interest to see that the fishery is operated according to the criteria for economic efficiency.¹¹

This is not to say that the States will actually regulate in this manner. In fact, evidence from other nationally controlled fisheries shows that they do not. But at least they will have the option of doing so. Under international open access or weak international regulation such an option does not exist.

Some have argued that the zonal approach will lead to under-util-

11. This is not to say that these States may not use their fisheries as a source of jobs to reduce structural unemployment, even if this may mean a higher cost of producing effort. Such a policy, however, implicitly states that the increase in the cost of producing effort is the least expensive way of removing such unemployment given institutional constraints.

ization of some stocks since the coastal States are under no compulsion to lease out rights to that part of the catch it can not harvest. Under normal peace time conditions this should not be much of a problem. Once a country has an internationally recognized right to the fish stocks in its zone, and it knows that it will not lose control of them in any way from leasing (including the ability to refuse to lease in the future), there will be no reason for a policy of under-utilization.

Therefore, as far as the zonal approach grants complete control over stocks to one State, and as long as these rights are transferable, the option of rational economic management is present. In this light the clause that the coastal State must provide access to neighboring landlocked and developing States, while it may have some desirable distributional effects, will partially eliminate this option. This is especially true in view of the fact that these rights are nontransferable. Once the actual degree of access to the fish stocks is determined, the only way these neighboring States may obtain the wealth associated with their rights is to harvest the fish. They do not have the opportunity to hire other boats to fish or to sell the rights to other States. This will be detrimental from both those States' points of view as well as from a global view. Since the States are limited in the way they may use the rights, they may not be able to use them to the maximum advantage. Also, the restriction may cause the fish to be harvested at a less than minimum cost.

These restrictions on transferability are particularly inappropriate in that they give no benefit to the host State. That is, once specific rights are granted to the neighboring States, it is of no concern to the coastal State who actually harvests the fish or where they will finally be consumed. Neither of these will affect the harvest or use of its portion of the allowable catch.¹²

With regard to the need of the landlocked or otherwise disadvantaged States, several aspects of a zonal approach as suggested by Afghanistan, Austria, Belgium, Bolivia, Nepal, and Singapore are quite interesting.¹³ Their approach is similar except that more

12. An exception to this would be if the timing of the catch is crucial in determining its ultimate size or ease of harvest. See note 8 *supra*.

13. See *Draft Articles on Resource Jurisdiction of Coastal States Beyond the Territorial Sea* (Proposed by Austria, Belgium, Bolivia, Nepal, and Singapore), U.N. A/AC. 138/SC II/L.39 (16 July 1973).

emphasis is placed on the rights of the neighboring landlocked or coastal States which can not or do not declare a zone. They are given the right to participate in the exploration and exploitation of the living resources of the zones of their neighbors in an equal and nondiscriminatory manner. It is also suggested that other States be allowed to fish the remaining allowable catch, after the coastal State and its disadvantaged neighbors have obtained their "share", subject to the payment of fees. The real difference is that the coastal State is required to contribute a certain percentage of the revenue derived from the exploitation of its zone to an international authority which will distribute it in an equitable manner. The exact definition of revenue is not given but it presumably includes fees from other States which use the zone, and perhaps some of the net revenue from its own use of it.

This particular aspect is useful because, like transferable rights to a fish stock, it allows for the separation of rights of access from rights to the wealth of the fishery. The problem of determining the proper distribution is, of course, still present.

In the context of this proposal, the wealth sharing aspect may not be completely effective because of the loosely defined rights of the coastal States in relation to the neighboring disadvantaged States. The concept is a good one however. If a State had sole authority over a fish stock that was subject to such a percentage fee, it would still be motivated to operate it as efficiently as possible. It will try to operate where its net revenues are a maximum. The fact that it will lose a certain percentage of them to the international authority will not affect its desire to keep them as high as possible.

Therefore, while there will be a sole authority who will be motivated to set up an economically efficient regulation program, the total wealth from the fishery will not all go to it. This method allows for a distribution system that takes into account many States, without setting up the economic problems that are inherent in systems which grant distributions on the basis of access.

To return to the main topic, there is a limit to the extent of the fishery zone, and to the degree that valuable fish stocks live beyond or migrate through those limits, the zonal approach is not completely satisfactory. In order for those stocks to be rationally exploited, some form of unitary control must be placed over them. Further, from earlier comments it is obvious that allowing the coastal State preferential rights to the limit of its harvesting capacity is not a proper way to designate such authority. And while the stipulation that only nearby States may belong to the body that regulates regionally migrating species will limit the number of

States involved, there is no guarantee that a proper program will be developed. Also, since there is no clue to the make-up of the "authority" to be designated for the purpose of regulating highly migratory species, it is impossible to discuss the chances of their being efficiently managed. However, to the degree that it has sole authority of such stocks, and is willing to make distributional decisions, proper economic exploitation may occur.

In summary, the main differences between the zonal approach and the species and distant water approaches are the number of stocks of fish that are under sole control of one State, and the optional efficient management they provide. One may disagree with the particular distribution entailed in such an approach, but it is superior on efficiency grounds.

II

There are some goods and services that once produced can be consumed by many parties simultaneously with no effect on quality. Put another way the marginal cost of allowing someone else to consume them is zero. Some examples are military and police protection, and the use of a road or bridge up to the point where congestion sets in. They are called public goods in the economics literature.

There are many public goods that are useful, and sometimes necessary, for the proper exploitation of marine fisheries. Examples are weather information, fish location information, and research on biological aspects of the population that are important for regulation and technological aspects of harvesting. Once information concerning the weather conditions on the fishing grounds is available it costs nothing (other than effort of communication) to share it with all who use the fishery. Likewise, once a new method of harvesting is developed, its existence can be made known to all concerned with no additional expenses.

Of course, if there are no property rights to the fishery then there can be indirect costs of sharing these public goods. A State with a well developed weather information system may have an advantage over another that does not in that it will be able to be more effective in its fishing. By sharing this information they will lose their advantage. Therefore, even if the costs of its weather system will not be affected by making its forecast available, its fishery output will. The same reasoning holds true for

the other public goods discussed above.

This, then, is another waste of open access fishing. Each State will find it to its advantage to keep the benefits of the public goods it produces for its own nationals. Therefore each State will be forced to produce them independently. This will result in a larger amount of resources being put into the production of these goods than is necessary. In an international fishery where well defined property rights exist, this will not be a problem. The States involved will be assured of a certain percentage of the wealth of the fishery. Therefore it will be to their advantage to share public goods. In fact they will be motivated to join together in their production so that the total cost will be kept to a minimum.

In light of this, two important conclusions can be set forth. First, to the degree that the law of the sea negotiations result in a program for the distribution of the marine fisheries involving only a right of access rather than a specific property right, there will be a tendency for noncooperation in the production of fishery related public goods. This type of allocation scheme has an inherent tendency to keep the global cost of providing these services high. This fact should be kept in mind by the parties involved.

Second, although granting of property rights in one form or another will tend to encourage cooperation in the production of these goods, programs for their production should be part and parcel of the distribution agreement. This will be one way of making sure that the problem will be handled in an adequate manner. Including this in the program also provides a method whereby the recognized difference between the developed and the developing States can be considered. For example, assume that a particular fish stock is given to two countries, one more developed than the other, on a sound property right basis. The exact share given to the less developed State may have been determined in some degree by its relative condition. But the provision may also hold that the more developed State should bear all or a large part of the costs of providing for specified fishery related public goods. This will benefit the other because of the increase in value of its property rights. This increase will be the same regardless of whether the State decides to use the rights or to lease them.

III

One of the conclusions of the first section of this paper was that as far as the fisheries zone concept granted transferable property rights to stocks of fish, it provided the option for rational fisheries management. However, there can be problems in the actual imple-

mentation of such a plan depending upon the exact characteristics of the particular fishery and countries involved. The purpose of this section will be to briefly discuss these potential problems.

One of the problems is that a property right does not really exist unless it is enforceable. That is, the right to control a certain stock of fish is meaningless unless there is some way to prevent others from using it without proper permission. A State can not rationally exploit a stock that is simultaneously being used by other States which are beyond its control nor can it hope to sell or lease rights when States can use the stock freely. Therefore, in granting property rights, it may be necessary at the same time, depending upon certain geographical and biological conditions, to set up an international agency with recognized authority to enforce them. The only alternative is for the individual State to police these rights by force. This may be less than optimal in two ways. First, it may be damaging to world peace, and second, if the cost of enforcement is high relative to the value of the fish stocks, the net value of the property rights are greatly reduced. Enforcement costs are an important aspect of any conservation or distributional fishery policy, but they are especially important in this case because of the need for proper transferability.

Another potential problem when property rights are used as the means of distribution is the possibility of monopoly power. If one State is given control of a large enough portion of a certain type of fish in any market area the monopoly power that results could result in improper management. Because the State would have control over such a large portion of the potential sales, it has control over the selling price of the fish and thereby the leasing price of the property right. This control is inherent in its ability to determine the actual amount of fish that are sold. The State will find it to its advantage to keep yield below maximum economic yield in order to maximize its profits.¹⁴

In actuality the probability of this occurring is quite small in view of the large number of types of fish located in geographically dispersed areas that are good substitutes for each other, and in view of the increasing size of the world market for most fish due to

14. For a discussion of this monopoly power see Anderson, *Optimum Economic Yield of a Fishery Given a Variable Price of Output*, 30 J. OF FISH. RESEARCH BD. OF CAN. 509 (1973).

improving transportation and distribution systems. Because of this, it would be very difficult for any one State to get significant monopoly power over a single type of fish. However, the possibility of it happening should be a factor to consider in choosing among distributional proposals.

Problems may also exist because of monopsony power. If there are only a small number of potential buyers of the annual rights to certain fisheries that are being sold by many States, it is possible for the buyers to combine to keep the price down or even to interfere with the regulation process. For example, assume that there are many coastal States, each with rights to stocks of similar fish within their fishery zones. Also assume that they are not able to harvest all of the allowable catch efficiently, and so each desires to sell some of the rights to fish. If there is only one potential buyer and the total amount it wants to buy is less than the total available for sale, it may pit the coastal States against each other to obtain a lower price or less stringent conservation measures. The possibility of this occurring is also small in view of the high demand that exists for protein. There may only be a small number of distant water fishing States, but the total amount of fish that they are willing to buy will more than likely be large enough in relation to the quantities available for sale that their monopsony power will be quite small, but still worthy of consideration.

IV

Although this paper has been exclusively concerned with fishery aspects of the Law of the Sea negotiations, these aspects actually form only one part of a complex set of issues open for debate. Other important issues involved are the width of the territorial sea, the width of the continental shelf, the distribution and use of non-living resources on and under the sea bed (both within and without the limits of the continental shelves), the right of free passage through international straits, protection of the marine environment, freedom of scientific research, and the rights of landlocked States. Viewed in this light, discussions of economic efficiency of fishery exploitation become more difficult. One reason is that in a multiple use approach, the most efficient way to manage a fishery may not be compatible with the most efficient way of using the marine environment as a whole. Second, because the different States have different feelings about the importance of the issues involved, some may view fisheries as an item to be traded off to obtain their point of view on other issues. Each of these problems will be briefly discussed.

The marine environment is capable of providing many types of services. For example, certain portions of it are suitable for fisheries exploitation, deep sea mining, and ocean transport. It is also possible that these uses may conflict with each other. Residuals from the mining process may be detrimental to the reproductive capacity of the fish stock, fixed mining platforms may block transport lanes or restrict access of fishing boats to the stock, and certain types of fishing gear may be incompatible with ocean transport. In these cases the programs that will maximize the net value of using the marine environment to provide any one of these services will, more than likely, not be part of a combined program that maximizes the sum of their net values. For example, prohibiting mining and using a specific amount of fishing effort with a certain type of gear may be the way to maximize the value of fishery output. However, by allowing mining to proceed with certain constraints, and then readjusting the amount of effort and the type of gear, it may be possible to increase the value of marine production such that there is a net gain. The value of fishery output may fall, but the value of the increased mineral output will more than make up for this decrease. These values will have to be properly discounted to take into account any long run effect on the fishery. Similarly, there may be a way of allowing ocean transport whereby the increase in the value of transport services more than makes up for any decrease in the value of mineral or fish output. Law of the Sea negotiations which do not take these interdependencies into account when the management programs and policies are developed will not allow for the optimal use of the marine environment.

Turning now to the possibility that fisheries issues will be considered trade-offs for other aspects of ocean use, each sovereign State can be assumed to operate at the international negotiation table such that it maximizes the well being (however defined) of its citizens. The State will strive for rational use of fisheries depending upon the relative importance given to fisheries in the definition of its well being. It goes without saying that they will only favor those rational programs that provide them with what they consider to be their fair share of the resource.

There are two ways that trade-offs can enter the picture. First, those States that have a relatively large interest in fisheries may be willing to accept, and in fact may even hold out for, an econom-

ically inefficient program in which they are major gainers from a distributional point of view. That is, they would be willing to sacrifice a certain part of potential global output through inefficiency if they are able to obtain a relatively larger amount of the wealth of the fisheries than they otherwise would.

Second, those States that place a higher relative importance on other items may be willing to agree to fisheries proposals that are really not in its best interest as far as fisheries alone are concerned (or in the best interest of global efficiency for that matter) in order to insure agreement on what it considers to be more important items.

These points are neither new nor need they be reason for great concern. Even in simple groups made up of relatively homogenous individuals, it is sometimes the case that second best alternatives must be used as the price of securing agreement. Surely then, there is a good case for such a procedure in a group so divergent in nature as the one developing the law of the sea. Hopefully the States involved will be fully aware of the implications of these trade-offs so that the correct decision can be made. This will necessitate a long and hard look at the actual losses they will be suffering as compared to the hoped for benefits of the trade-off. Careful measurement and assessment will be necessary to guarantee that what they are gaining is truly worth more than what they are losing.

To carry this one step further, even when a State is sure that its individual gains will be greater than its individual costs, it should look at the losses suffered by other States. These costs should bear some weight in the decision making process. Hopefully the international consensus on one issue, secured through trade-offs with other issues, will not be for a program where there is a lopsided distribution of the gains and losses.

SUMMARY

There are many complex issues involved in the Law of the Sea negotiations. The purpose of this paper has been to discuss the implications of various proposals with regard to the utilization of the living marine resource on economic efficiency. Although this should not be the overriding matter in either fishery negotiations per se, or in all of the negotiations combined, it is important enough that it should be directly taken into account.