Management Strategies for Multi-Species Complexes in Artisanal Fisheries[1]

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Artisanal fisheries are extremely diverse when considered on a worldwide basis, although less so within particular countries. As a general case, artisanal fisheries are those in which fishermen operate from vessels of relatively modest size, using relatively inexpensive fishing gear and personally sell their catches to purchasers who might be consumers or middlemen trading on the local market. Characteristically, the fishermen do not sell directly to a centralized fish marketing organization operating a distribution network. Trading and processing activities are often the responsibility of the womenfolk of the household.

In virtually all parts of the world where coastal fish populations have expanded to densities which are far above the carrying capacities of the adjacent lands, artisanal fisheries have witnessed steadily increasing fishing effort as individuals who are unable to secure land or paid employment turn to the common property resource of the sea for income and sustenance. The results in all areas where this has happened have been a declining catch per unit of effort and, in a great number of areas, a declining total catch.

The universal solution to this problem would be to reduce the rate of population growth to zero. However, most governments appear unwilling to face up to the fact that, irrespective of political or religious considerations, the principal cause of poverty is population growth rates that exceed economic growth rates. Population growth presents particular problems for fisheries where entry is rather easier than into agricultural pursuits.

The mythology of fisheries science holds that total catches from a single species stock will rise and fall in a parabolic fashion (Schaefer, 1954) or in multi-species stocks even rise and not fall at all (Marten and Polovina, 1982). The reality, which is difficult to document, but which now appears self-evident, is that catches will rise in response to increasing effort, although at steadily decreasing rates, but thereafter decline in a rather gradual fashion, as high-priced predators are replaced by lower-priced species located lower in the food chain (Fig. 1). Ultimately, the system will collapse. The decline in value of the catch is normally more marked than the decline in the total volume of the landings. The reason for this is relatively simple: the higher-priced predatory species are generally more vulnerable to a greater variety of fishing gears and often also more vulnerable to individual fishing gears

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than are herbivorous, omnivorous or planktivorous species.

An important feature of artisanal multi-species fisheries is that they are almost always also multi-gear fisheries, in which the individual fisherman changes his fishing gear in response to the weather, tides, moon phase and seasonal changes in the availability of different species of fishes. This flexibility is, of course, limited by the relative wealth of the individual. The poorest fishermen have the least flexibility in their fishing options and are usually limited to the least expensive gears. The need to maintain a degree of flexibility in the types of gear used must be borne in mind if a licensing system is instituted.

Additionally, in many artisanal fisheries, individual species are exploited at different stages of their life cycle by different groups of fishermen, and this can become a source of conflict in the community. Classic examples are of beach seine or push net fisheries which harvest juvenile reef fish or juvenile shrimp to the detriment of the fisheries for the adult stocks. The worst conflicts arise when fishermen use different gears to exploit the same fishing grounds, but in which some of the gears are markedly more efficient (and usually also more capital and energy-intensive), and thus take a disproportionately large share of the total catch.

The realities of economics dictate that the poverty of artisanal fishermen is generally neither greater nor less than their agricultural counterparts in the coastal zone. Additionally, the fisheries often absorb part-time labor out of the agricultural harvest seasons. Characteristically, the artisanal fishing groups are unorganized and wield little political power.

THE 'PROBLEM' OF ARTISANAL FISHERIES

At the outset we emphasize the point that artisanal fisheries, and the potential need for intervening in them to solve identified "problems," must be examined in the context of the economies (national and even international, but especially rural) of which these fisheries are a part. Three elements appear to be important: (1) the extent of overall economic development and availability of alternative job opportunities and non-fishery options for capital investment; (2) population growth relative to growth of employment opportunities, and (3) markets for the products traditionally caught by artisanal fishermen or for new products (e.g., shrimp) that occur in traditional fishing grounds.

The above factors are the primary determinants of change in the artisanal fisheries sector, change that all too often has been manifested by: breakdowns of traditional systems for controlling access; the presence of increasingly capital-intensive gear types fishing for higher valued species (e.g., shrimp) in response to attractive export markets which often place them in direct competition for other species in the by-catch traditionally caught by artisanal gear; increasingly inequitable distribution of incomes within the fisheries; and overfishing and thus considerable waste of productive resources

in the form of fuel, labor and capital that could be earning more for the economy if employed elsewhere.

To a certain extent, these outcomes are common to all open-access fishery resources, both temperate and tropical, and there is no need to elaborate on all the theoretical arguments regarding open-access resources that explain the reality that fisheries administrators deal with on a day-to-day basis (Christy and Scott, 1965; Anderson, 1977). The elements of competition among gear types and resulting income distribution outcomes, however, tend to be peculiar to tropical multi-species, multi-gear fisheries such as exist in many near-shore areas traditionally exploited by artisanal fishermen, and to developing economies in particular where most of the world's artisanal fishermen are located. Multi-species fisheries in the tropics are characterized by multi-gear competition.

It is, thus, the balance between the elements of overall economic development, employment creation, population and market orientation that is important in any given context. For example, the artisanal fisheries problem in any given country will depend not only upon the underlying biological resource available to fishing, but also upon whether economic development and job creation are resulting in incentives to reduce fishing pressure, sufficient to compensate for the added entry and fishing pressure that comes about due to population growth and increased market prices. In much of the tropics, unfortunately, the race is being won by those factors that encourage entry and consequently produce a deteriorating biological and socio-economic environment for artisanal fishermen.

There are some exceptions, of course. In Japan, the overall development of the economy has brought about a reduction in number of fishermen by two-thirds in the last 40 years, a factor that has certainly contributed to the relative success of that country's coastal fishing management program which is run through local cooperatives. One wonders if the system could have been so successful if numbers of fishermen had doubled instead during the same peiod, as they have in most other countries of Asia.

Certainly, too, there are artisanal fisheries that are isolated from markets, maintaining more of a subsistence than commercial orientation, and thus unlikely to be facing immediate needs for controls over fishing effort.

Large numbers of artisanal fishermen, perhaps the majority worldwide, are facing increasing competition within their own sector, particularly from coastal trawlers (Smith, 1979). It is not over-dramatizing the problem to say that artisanal fishermen are increasingly caught between few and even declining numbers of non-fishing opportunities on-shore and increasing competition, if not conflict, with other industrial gear types (off-shore), such as trawlers that are frequently owned by individuals or companies from outside the artisanal fishing communities themselves.

The resilience of the artisanal fisheries sector in absorbing labor is an important asset in economies where employment opportunities are limited (Garcia, 1983). Many economies exhibit increasing levels of labor mobility, much of it brought about

through necessity, as access to land has been denied increasing numbers of rural dwellers for a variety of reasons, including the widespread failure of land reform. Large segments of this displaced labor force have migrated to cities and thus no longer participate in rural economies; but there is also evidence in many parts of Asia, especially Indonesia, the Philippines and India, of a growing class of landless laborers who become part-time fishermen at various times of the year, especially at times of slack demand for casual labor in agriculture. To the extent that fisheries have been able to assist these individuals avert starvation, the sector should be seen as a crucially important part of the rural economy.

The artisanal fishery problem will thus depend upon area or economy-specific conditions. These conditions range from traditional systems that have maintained a balance between population size and resource carrying capacity and include regulatory mechanisms over access such as still exist in many Pacific island fisheries (Baines, 1982) and to the opposite extreme such as the Gulf of Thailand, the north coast of Java or Manila Bay in the Philippines where several decades of extreme competition (begun with the introduction of trawling) have led to the disappearance of certain species (e.g., members of the family Leiognathidae), declining total catches and increased physical conflict resulting in deaths among fishermen. Clearly, the management needs in these fisheries, and the whole range of those in between, will vary accordingly.

Not only is it necessary to access the current status of the artisanal fishery in question; a historical perspective is also useful. For example, a review of past national credit programs may help explain why certain gear types evolved. Capital-intensive gears that compete with artisanal gears may have expanded in number because owners had more ready access to low-cost credit than did the artisanal fishermen. Coastal trawlers or nearshore purse seiners most likely were financed through bank loans carrying interest rates far lower than those available to artisanal fishermen through the non-formal money-lending sector.

In the Philippines, a differential tax structure on fuels in which diesel fuel (used by trawlers) is taxed at one-fifth of the rate on regular gasoline (used by the small non-trawl vessels) has favored the development of small trawlers in the coastal zone where they now take a large proportion of the catch (Smith et al., in press). The situation in this particular example is compounded by a high degree of concentration of ownership (and hence incomes in the trawler fleet compared to much more dispersion of ownership in the non-trawl fleet.

In summary, the problem of the fishery in question needs to be defined in terms of the following parameters: (1) biological status of the resource (Is over-exploitation occurring and if so why?); (2) economic status of fishermen in relation to other rural groups (Are they better or worse off and why?); (3) population growth rates and rates of entry to the fishery; (4) extent of competition among gear types and the resulting distribution of catch, catch value and incomes; (5) extent of market orientation and degree to which market development has

resulted in increased entry to the fishery and technical advance (increased capital intensity).

More specifically, the key parameters in terms of potential management are: (1) the extent to which overfishing is producing a catch of lower total value than that which could be produced with reduced effort; (2) the degree of multi-gear competition; and (3) the extent to which fishing labor can be absorbed in alternative non-fishing activities.

MANAGEMENT OBJECTIVES AND STRATEGIES

If one thinks of a management strategy as including not only the process of choice of management goals, but also the means by which management goals can be achieved, it becomes necessary to begin by asking what is the purpose of managing the fisheries in question and for whom? Is the primary purpose to serve the consumer of fisheries products (domestic or foreign) or is it to serve the income needs of fishermen? These questions are critically important because as goals they are often mutually exclusive. Goals of economic efficiency that produce given volumes of product for the least cost are often achieved through use of large capital-intensive vessels that are labor displacing, a prospect not at all welcome in economies that already have much difficulty providing gainful employment for large numbers of rural residents. Consequently, in most artisanal fisheries, some balance between economic efficiency and socio-economic objectives must be sought.

Fisheries managers must also take both a short-term and a long-term view of the situation. Short-term views would imply looking within the fishery for possible means of reallocating use rights or excluding some users and thus redistributing benefits in accordance with the management goal selected. A longer-term view often dictates that it is necessary to search outside the fisheries sector entirely. This is because a major consideration is often overlooked; once a fishery is fully exploited, the only way to increase labor utilization within the fishery is to revert back to more labor-intensive gear and this may raise fishing costs; upgrading of vessels and gear will often displace labor.

Alternative income opportunities to which fishermen can be attracted, or for which they can be retrained, will, on the other hand, increase incomes for those who remain in the fishery.

An important objective in multi-gear fisheries is to achieve the desired mix of species. As shown in Figure 1, the fishery tends to become less diverse and also to become dominated by lower-valued species when effort increases over time. However, it is likely that the decline in value will be accompanied by an increase in total catch as predators (which compete with man) are eliminated from the system. Fish prices are determined by consumer preferences and the point at which the maximum value is reached will be determined by local factors. We are not yet able to predict how the species composition of the catch will change in response to increased effort, but it is clear that the fishery manager will have a range of options between maximizing

the net value of the catch and maximizing the tonnage of fish captured.

The appropriate management intervention will thus depend upon the management goal chosen. At the very least, intervention should not make the prevailing biological or socio-economic conditions any worse. Given that the historical experience with management interventions around the world - mostly in single species temperate fisheries (Crutchfield, 1979; Scott, 1979; Stokes, 1980) - has been far from successful, one could be satisfied if, after initial steps, further deterioration was at least halted. The ultimate goal for tropical multi-species fisheries should remain that of maintaining a diverse, stable and highly productive fish community, or in economic terms of reducing the levels (hence costs) of labor and capital applied so as to free these inputs for more productive use in other sectors of the economy.

Moving immediately from an open-access, unregulated (or unenforced) fishery to one of direct limits on effort is impractical in most artisanal fisheries where institutional frameworks for such change simply do not exist. Consequently, a management strategy that proceeds through a series of steps each with its own objective seems appropriate. In increasing order of complexity and difficulty, steps/goals worth considering, with indicative inteventions, are:

Step 1: GOAL - AVOID FURTHER ECOLOGICAL DAMAGE OR IRREVERSIBLE DAMAGE TO STOCKS:

1) Effectively enforce bans on use of poisons, dynamite, mining of coral reefs;
2) Ban use of fine mesh nets such as are often used by beach seines or in cod ends of small trawlers;
3) Protect nursery areas;
4) Control environmental degradation, e.g., siltation, pollution;
5) Promote habitat enhancement (e.g. artificial reefs).

Step 2: GOAL - RESOLVE CONFLICTS AMONG GEAR TYPES:

1) Defuse outright conflict among gear types (e.g., by introducing and enforcing area restrictions for trawlers);
2) Removal of existing subsidies, if any, that favor one gear over another (e.g., differential credit or tax structure).

Step 3: GOAL - OPTIMIZE YIELDS BY CONTROLLING EFFORT (FISHING MORTALITY):

1) Vessel or fishermen registration (licensing) possibly supplemented by taxes;
2) Establish territorial use rights.

The key to success at each of these steps is the degree of enforcement, which can be considerably enhanced by involving the fishermen in the planning and decision making regarding the need for management interventions. If Step 1 above cannot be achieved

(and this is currently true of many coastal fisheries in the tropics), it's highly unlikely that Steps 2 and 3 can be addressed at all. Where the fisheries manager enters this scheme depends upon whether or not the problems, as implied in the successive goals, exist for the fishery in question. It is never too early to begin the management process. Even fisheries that are presently under-developed need management if over-exploitation at a later date is to be circumvented. Opportunities to develop effective management strategies decline as development of a fishery progresses (Pearse, 1982). Certainly, retrieving a deteriorating habitat and fishery is considerably more complex than preventing it in the first place, no matter how difficult it may appear at the time to introduce measures of control over fishermen whose profits are still high.

In cases of no prior regulation, starting management with measures such as those shown above under Step 1 will be readily appreciated by fishermen and, if successful, lead to added sophistication in subsequent interventions.

Nor is it ever too early to include the creation of an information system (and means by which such information will be analyzed) into the management strategy. Suggestions ranging from the simple (Lampe, 1980) to the comprehensive (Stevenson et al., 1982) have been made, but a minimum data set that includes catch, effort, catch composition, prices, costs, incomes (fishing and non-fishing) and distribution of asset ownership would be a bare minimum for any fishery.

In summary, a management strategy should include the following major elements: (1) definition of the fishery or habitat to be managed; (2) identification of problems; (3) construction of an institutional framework; (4) establishment of short-term and long-term management strategies and objectives; (5) identification of information requirements; (6) selection of short-term and long-term intervention mechanisms and (7) monitoring of impact and change of interventions according to adjustment of objectives.

MANAGEMENT INSTITUTIONS AND INTERVENTIONS

This topic has been discussed in several recent meetings and reviews (FAO, 1983; Christy, 1982; Mercer, 1982; Anderson, 1977) and it is apparent that some concensus has emerged as far as possible options for the management of industrial fisheries are concerned. However, Pearse (1979) and Crutchfield (1982) have recently pointed out, despite several decades of theoretical research on alternative management interventions, application of these techniques has met with only limited success. Crutchfield even goes so far as to say, "... the results are remarkably disappointing. The number of programs that have actually succeeded in checking depletion of ocean fish stocks can be counted on the fingers of one hand. And those that have protected the stocks while providing some real improvement in earnings, stability of employment, and ability to withstand the usual economic jolts to which fisheries are subject can be counted by someone with no hands at all." (p. 9). He then

proceeds to make a most important point, "The real weakness lies in our institutional mechanisms for getting something done, and for making the regulated fishing industry itself a part of the analytical and decision making process." (p. 10). Crutchfield was referring to fisheries worldwide, but tropical artisanal fisheries even more so exemplify this fatal weakness.

For the most part (except in those cases of traditional fishing rights mentioned earlier), artisanal fisheries that have locale-specific management approaches administered through institutions appropriate for the fishery or ecological habitat in question are rare or non-existent.

A partial list of criteria that management interventions in artisanal fisheries should meet includes: enforceability (minimal avoidance/corruptibility), administrative simplicity, benefits to exceed administrative costs, equitability of distribution of benefits, flexibility/adaptability, participation (by fishermen), minimal dislocation (including provision for compensation), and (of course) ability to meet stated objectives. As stated by Crutchfield (1980), "At the least, one should expect that a fisheries management intervention will prevent things from getting worse."

Progress in institutional development and successively more complex interventions need to proceed hand-in-hand. There is emerging agreement among researchers and managers alike that some form of property rights systems is necessary (Christy, 1982; Panayotou, 1982), although there is sharp disagreement on this point from some quarters with a more socialist view. To some extent the latter opinions appear to represent a fear of monopolistic control. Additionally, most writers agree that some form of institutional framework for decision-making is necessary and the major question concerns the level within the nation. For most artisanal fisheries, the national level covers too many diverse habitats, and Keen's (1983) suggestion of management at the habitat level seems useful. For some coral reef habitats, this may mean management at the level of the individual fishing community; for estuaries and bays, it may mean a group of communities organized under a single management authority.

Regardless of the administrative levels at which management institutions are established, the question of appropriate management interventions still remains. As described earlier, the choice depends upon the problems of the particular fishery. It is not true, as is sometimes implied in the literature, that creation of property rights (e.g., the EEZ) will solve overfishing problems in national waters. Their solution depends upon the costs of intervention and enforcement. For most artisanal fisheries, an institutional structure that generates sufficient income for enforcement purposes will be necessary. Referring back to the three step strategy mentioned earlier, it is apparent that the first two steps do not generate income (resource rents) in any way. Therefore, costs of enforcement must be borne by the public treasury until such time as a local institution has evolved to the point of being able to initiate steps to limit fishing effort directly and to collect income from such intervention mechanisms with which to enforce them.

The theoretical literature abounds with arguments and

counter-arguments regarding direct and indirect means of limiting fishing effort and fishing mortality and the advantages and disadvantages of each. Figure 2 outlines the range of options. Several of those options listed in Figure 2 have generally been unsuccessful in reducing effort in temperate single-species single-gear fisheries. These include quotas, closed seasons and gear restrictions, because they have been unable to reduce the total costs of capital and labor applied in the fishery. It is, therefore, unrealistic to expect that such interventions would be any more effective in tropical multi-species artisanal fisheries. Taxes and control of prices also appear to be impractical in the context of widespread poverty and dispersed production/marketing of much of the artisanal catch. Primarily, this leaves the long-term incentives and limited entry options.

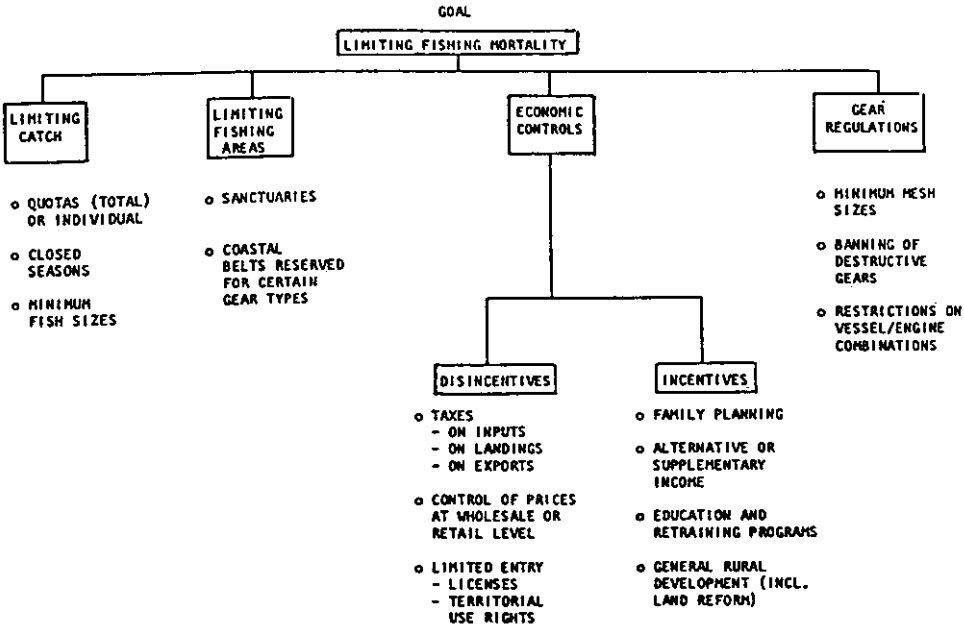
Panayotou (1982) has recently completed a useful examination of many of these options as they relate to artisanal fisheries. He favors systems of local fishing rights coupled with longer term efforts to develop alternative employment outside of fishing due to the impracticability of instituting controls over artisanal fishemen, who in may instances have few alternative employment options. A long-term perspective of the inexorable growth of populations and the problems associated with denying landless laborers access to a fishery means that the only long-term approach that will raise fishermen's income and reduce fishing mortality is one which raises the opportunity costs of inputs (alternative incomes of labor and alternative returns to investment of capital) and thus attracts fishermen and investment capital out of fishing.

Nevertheless, there are intermediate steps that can buy time against population growth and particularly which can deal with the growing problems of multi-gear competition in the traditional artisanal fishing grounds. We have already mentioned minimum mesh sizes and area restrictions as examples; Indonesia, for example, has banned all trawling in its waters since 1981 (Sardjono, 1980), with apparent plans to introduce selective licensing at a later date. The prohibition or severely restricted licensing of unselective, energy intensive, gears such as trawls should be accompanied by encouragement of the use of passive, preferably selective, gears such as traps and gill nets. The use of selective gears will, in principle, make management of multi-species fisheries easier.

LIMITED ENTRY SCHEMES

Licensing schemes to limit entry in conjunction with territorial use rights that define the institutional framework for management at a level where enforcement and fishing community participation in decision-making are made possible, appear the most promising of those options available. However, it must be borne in mind that both the labor and the capital inputs into a fishery must be controlled and that controlling only the labor input is insufficient (Willman, 1983). In multi-gear fisheries, the major question is who or which gears to license. Should all gear types be licensed at no more than

TABLE 1. OPTIONS FOR LIMITING FISHING MORTALITY



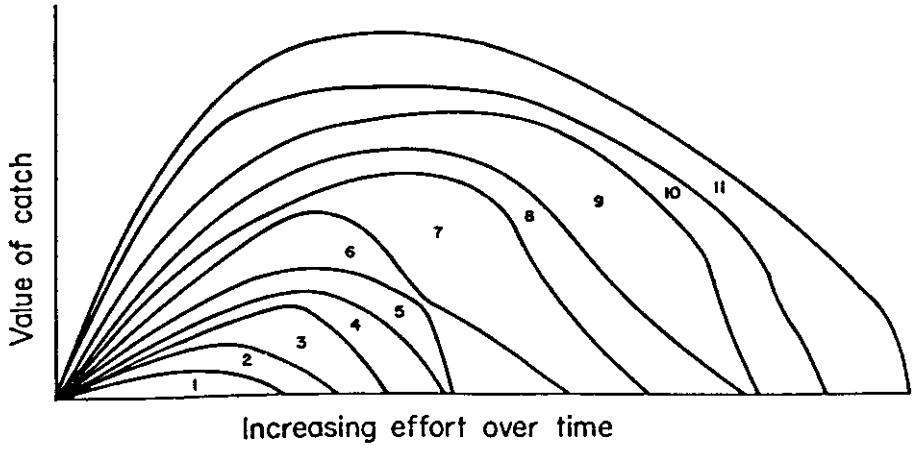


Figure 2. Options for limiting fishing mortality.

the usual nominal fees? Or should only the more capital-intensive gears (e.g., trawlers; perhaps in only limited numbers) be licensed and the income derived therefrom be used for investing in non-fishing income activities for the artisanal fishermen? The latter approach would deal both with the short-term problem of resolving conflict and competition among gear types and with the longer-term problem of providing incentives for rural residents to become employed outside of fishing.

The basic problem in most Asian economies, where the majority of the world's artisanal fishermen are located, is the extreme difficulty of limiting entry of artisanal fishermen because of the pressures of population growth and rural poverty. In contrast, in many other areas, the numbers of current and potential fishermen are smaller and in some places, traditional limited entry schemes still exist in one form or another. However, in all cases it is possible that many fishermen will have short-term survival objectives and be tempted to use such damaging techniques as dynamite. It is, therefore, vitally important from the point of view of potential habitat degradation that institutions be initiated that include an element of self-management by fishing communities.

Most limited entry schemes involve the allocation of licenses to boats, individuals, fishing gears or to collective groups. The licenses can be for relatively short time periods, longer periods or permanent and might be free and/or involve the payment of single or periodic fees. The fee(s) may be fixed by government or determined at an auction. The license might be for a single type of fishing gear or for several types and the license might be transferable to another individual or boat or only returnable to government if fishing ceases. Also, the license might be for a specific fishing ground, regional or national. Clearly, the options are extensive and decisions on which, if any, should be adopted are technical, economic and political.

The most important of all of the questions to be decided is whether or not the individual fisherman shall acquire a permanent property right or right of access to the resources in question or whether this right shall be transient. If the right is permanent, the implication is that the state is divesting itself of ownership of a part of its Exclusive Economic Zone or a part of the resources of that zone but without necessarily relinquishing its right to legislate and thus control activities within the zone. The principal effect of such divestiture is that fishermen will acquire an asset and an interest in maintaining the value of that asset.

A GENERALIZED MANAGEMENT SCHEME

Clearly, there are endless permutations which could be derived from the limited entry options presented above. However, the following scheme is suggested on the basis that it is one which most readily would fulfill the management objectives professed by governments of countries which have multi-species artisanal fisheries. The objective of the scheme would be to stabilize the

numbers of active fishermen in a community, induce them to take an active role in the management and control of the fishery by according them certain proprietary rights and provide means whereby governments can, to a large degree, control the relative incomes accruing to the fishermen and the profitability and degree of competition within the fishery by actively selling or repurchasing licenses as the situation warrants. An apt simile is the system whereby taxi-cab licenses are held and allocated in the City of New York. In essence what is suggested here is no different from established activities of government in numerous land-based activities where access to government lands is involved. Allocation of sea-bed exploration/exploitation rights involves a similar system.

The major features of the system we propose would be the allocation of permanent, but transferable, licenses to individual fishermen. Such fishermen would receive licenses on the basis of having established that they derived a substantial part of their income and sustenance from fishing within a particular coastal zone, i.e., a customary right. The licenses would be distributed with a degree of liberality, most claimants would receive a license and they would initially have little value. Having issued licenses, it would be important for the authorities to institute a buy-back scheme, held publicly and with some ceremony and that the identities of those that had opted out of the fishery be publicly known and the register of licensed fishermen be freely available. Individuals who wished to enter the fishery would have to buy out a licensed fisherman or participate in a public auction if the authorities decided that further licenses should be issued. No individual could hold more than one license. All private purchases would have to be registered by the state to be valid.

At an early stage, it would be most important to form the fishermen into local, regional and national federations, cooperatives or unions (whichever are politically acceptable terms). Such bodies would be the fora for discussion of management options and for negotiation with various governmental authorities.

It is suggested that the basic unit of effort in an artisanal fishery should be the fisherman and that all fishermen on a vessel be required by law to possess a valid license. This has a dual function of ensuring that the most cost-effective vessels find favor in the fishery by ensuring that a large vessel with, say, six crew would need to capture at least six times more fish per unit of time than a one-man operation before it is regarded favorably. At the same time, the system would ensure that by virtue of their licenses the fishermen had considerable bargaining power and in the event that larger vessels were introduced into the fishery, the resulting benefits would be more equitably distributed than is presently the norm. As the fishermen issued with licenses would normally be part of the rural communities, their possession of the majority of licenses would also ensure that many of the benefits of fishing accrued to those communities. Many coastal communities now see their customary resources being harvested by relatively large vessels based in the main cities and crewed by urban laborers. This adds

to the concentration of cash in the metropolitan centers and contributes to the increase in rural poverty. If the proposed system is established, then the proprietary rights of the licensed crew members can ensure an orderly, if conservative, development of the artisanal fishery into an industry. In this manner, expansion in effort within the fishery would be in terms agreed upon by the artisanal fishermen themselves.

There are practical questions to be addressed by the fisheries authorities. For example, should the licensed fisherman pay an annual rent on his "lease" of state property? The answer is probably affirmative, but in most rural communities, this would have to be set initially at a nominal fee to ensure that the entire affair was not viewed merely as a tax-gathering ruse played upon communities which traditionally are immune from the attention of such familiar urban specters as the tax collector.

It also seems desirable to issue licenses which impart fishing rights over fairly large areas, but what is covered by this term would need to be considered on an individual country basis. In most instances, fairly natural ecological boundaries would be the obvious choice and would also dictate the range of gear types which individual fishermen were entitled to use. Obviously, it is important to avoid bisecting relatively uniform areas, such that one is left with rival fishing groups on either side of the boundary, squabbling over access to shared stocks. It also seems fairly obvious that licenses should not be valid for the use of any fishing gears which are regarded as undesirable by either the fishing community or the state and that licenses should be forfeited for any gross violation of fishing laws such as fishing with explosives or poisons.

CONCLUSIONS

What has been presented here is presumptuous insofar as it suggests a specific course of action to national governments. This is predicated by the fact that in many countries, fish communities might be irreversibly altered if no action is taken to control the intensive exploitation of nearshore fish resources and the trend towards the exploitation of ever smaller sizes of recruits to the fisheries. If no action is taken to manage these fisheries, yields will undoubtedly fall, both in terms of value and tonnage, to the detriment of the nations concerned and of the artisanal fishing communities.

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