

Strategies and Constraints in Development of Insular Fishery Resources

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ABSTRACT

The strategies of development of island fisheries are affected by a variety of constraints including biological, technical and socioeconomic. Choosing a development strategy implies some consideration of the objectives of development and the limits of production imposed on the fishery and fish resources. Employment, export markets, tourism, transportation and processing are just a few of the factors which may have to be considered. For example, increasing commercial catch of the species for export, for domestic consumption or for tourist consumption are objectives which imply different management and development strategies. Similarly, development of recreational fisheries for seasonal pelagics, for party-charter operations or for consumptive or non-consumptive recreational uses have unique requirements. Small island shelf areas will limit production of some highly valued resources such as conch or spiny lobster. Conversely, the production of a migratory species such as dolphin or mackerel may not be significantly impacted by fisheries of an individual island state, so development and management policies must be structured accordingly. Examples are drawn from fishery resources of the Caribbean and Florida.

INTRODUCTION

Development programs for fisheries resources are faced with many biological, technological and socioeconomic constraints. The strategy of development will always be a choice of what is desired by development and what is possible to achieve. Hence, there will be a balance between objectives and constraints. Fisheries of island states are unique and have special limitations on their development. Biological characteristics of island fishery resources often dictate the range of effective strategies. This paper will examine several objectives and constraints that are common in fishery development programs and the types of fisheries strategies that are likely to develop under them.

Development Goals

Fisheries are just one segment of national and regional economies. The overall development goals of the island state will encompass the fisheries goals insofar as fisheries can make a significant contribution to those goals. Therefore, fisheries

development cannot be examined in isolation from other segments of national and regional economies. Fisheries should contribute to the national or regional development goals.

What are those goals? An appropriate set of goals is always the choice of the governing body of the state. However, I will discuss several general ones that have been suggested by other studies.

Typically, the developing island economy wishes to improve employment, their balance of trades and production of goods and services (see, e.g., Mitchell and Gold, 1982). I would add a more tactical goal, as well: a desire for flexibility, i.e., the ability to weather adverse events (for example, hurricanes, tourist reductions) and to capitalize on opportunities (opening of unanticipated markets).

Fisheries development can contribute to each of these objectives. But within the fisheries segment of the economy, the objectives may actually be conflicting. For example, for over-exploited resources, increased production may be achieved by reducing effort by fishermen. This may be translated into reduced employment of fishermen. Hence, increased production will only be achieved (in this example) by reduced employment - a conflict between objectives. However, increased production may increase employment in other sectors of the economy. Therefore, the view of fisheries development must be expanded beyond just fishermen and fish to other sectors of the economy.

FISHERIES SECTORS

The sectors of the fishery may be categorized as follows:

Biological Sector

This sector defines the type of fish and shellfish that are available. Typically, these will include: demersal shellfish such as lobster and conch; demersal finfish such as snappers, groupers and triggerfish; coastal pelagics such as mackerels, dolphin and flying fish; and oceanic pelagics such as billfishes and tuna. Each of these resources have unique limitations: limitations on when and where they are available, and on the reproductive potential (how much exploitation they can withstand).

Demand Sector

Who wants to use the fishery resources? In what form are they desired? Several markets exist for the fishery resources of island states: export markets (typically for conch and lobster); domestic consumption by local populations; domestic consumption by tourists (for example, snappers and dolphin in restaurants and hotels); and demand for recreational resources. This latter market implies non-consumptive uses of fish that are not simply measured by the weight of fish caught. Desires from recreational sectors may include aspects of the size and number of fish caught and the method of participation. It is expected that

recreational demand will be closely tied to tourism.

Harvest Sector

How is the harvesting achieved? What kind of vessels, gear and crewing arrangements are made? Often the vessel/gear is limited to beach seines on small boats, one day trips with limited gear technology (for example, hand lining for snappers or diving for lobster). In some areas this has been expanded to boats taking 3 to 7 day trips (for example, conch diving in Belize) which requires storage and ice capacity. Other harvest types include: mobile distant water vessels (for example, shrimp trawlers); charter vessels for tourist fishing or diving trips; and private recreational vessels.

Processing Sector

How are the fish prepared for their final market? Are they sold fresh? Are they gilled and gutted? Frozen? Salted or smoked? Are they put into cartons for shipping? What arrangements are made to facilitate the transfer from the harvester to processor (for example, cooperatives)? The processor's role will be defined by the demand for the product.

Distribution Sector

The fishery will require a system of distribution from the harvester/processor to the final market. Export to regional markets or markets outside the region will require shipping by sea or air. Distribution within an island will require trucking to the retail market. Development of these distribution systems should be facilitated by a fisheries development program.

Service Sector

This sector supplies the goods and services necessary for the fishery to operate: docking facilities, fishing gear and equipment suppliers, fuel, repair and boat building facilities, ice and refrigeration, insurance and financial assistance.

Development of fishery resources will require some attention to each of these sectors. A stable, productive fishery needs all sectors to function efficiently. However, there are two key points to be made in relation to those sectors. The first point is that there is nothing that can be done to increase the potential for production by the biological sector except through mariculture. The amount of potential production and the seasonal availability are governed by laws of nature. Management and regulatory methods should be used to assure that natural potential is achieved, but the only way to effectively change the potential is through some sort of mariculture. In most instances, the most effective way to achieve an increase in potential is to circumvent the natural biological sector entirely and make fish production an industrial

(harvesting/processing) function. Therefore, biological constraints often will dictate the kind of development that will occur.

The second point is that the service sector will often be the limiting factor in development. It is the underpinning of successful operation in a fishery. In many instances the tactics of fishery development, i.e., the methods by which development strategies are implemented are best achieved through assistance through the service sector.

Following is a presentation of several examples of fisheries development in the Gulf and Caribbean region in which the biological constraints, i.e., the biological sector, influence the strategies of development and the potential to achieve development goals.

FISHERY EXAMPLES

Conch and Lobster

Important demersal shellfish to Caribbean shelf areas are primarily conch and lobster. Both of these have high value to export markets. The high value received for exports will limit the amount of domestic consumption (better prices can be achieved abroad). At the same time, it is unlikely that an individual fishery or state will influence the export prices substantially, although collectively they might. Conch and lobster are easily locatable on the shelf and thus are vulnerable to exploitation. Also, lobster in particular have wide variations in annual production. It is likely that a percentage of recruitment of conch and lobster may come from elsewhere in the region. Therefore, regional management may be required to coordinate the regulation of effort for both biological and economic reasons.

The Belizean conch fishery showed a typical development phase, followed by a peak and decline in production (Fig. 1). At the same time, the economic production increased. This evidence would indicate that production would be increased further by reduced effort: biological production would increase while prices remain high. This would improve the production and balance of trade goals. However, it would reduce employment within the harvesting sector. Perhaps employment in other sectors (processing, distribution) could compensate. However, the choice to implement such an action would depend upon the relative costs and benefits between the goals.

The lobster fishery in the Florida Keys shows the full progression of development (Fig. 2). In the 1960's the fishery development improvements in the harvesting sector (improved vessels and traps) and in the processing and distribution sectors (Powers and Bannerot, 1984). This was reflected in increased production. In the 1970's the fishery became saturated. In essence production has been maintained, but production per operator or per trap has declined. Thus, the economic viability of an individual vessel operator may be threatened. At the same time, production has become unstable.

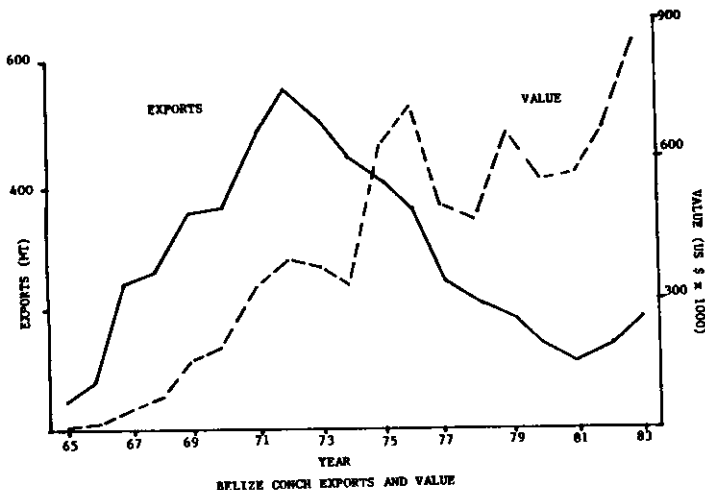


Figure 1. Annual exports (metric tons) and export values (United States dollars) of conch meat from the Belizean conch fishery (Source: Belize Ministry of Trade and Industry).

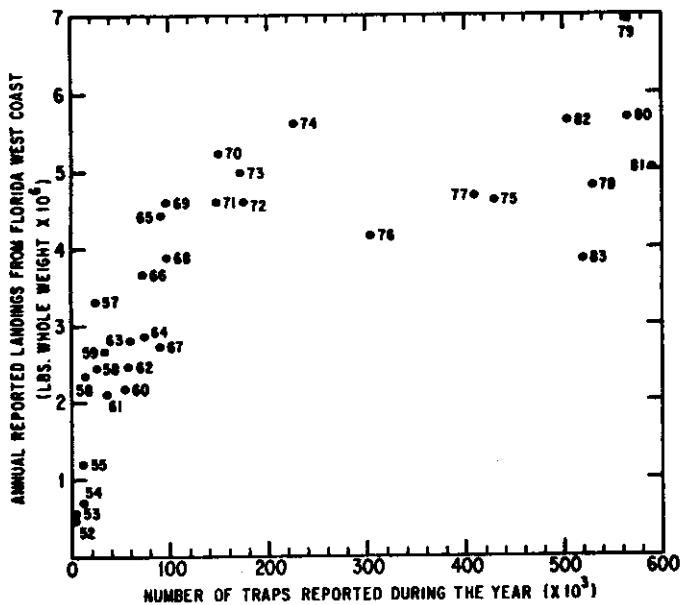


Figure 2. Annual reported landings of spiny lobster (in millions of lbs whole weight) versus the number of traps reported for the same year (thousands) in the west coast of Florida commercial spiny lobster fishery. Numbers on the graph indicate the year (Source: Powers and Bannerot, 1984).

The fishery appears to have achieved biological production and employment goals. However, economic efficiency may have been sacrificed, i.e., economic production may be limited due to excessive effort that is employed. The same production could be achieved with less effort resources.

Coastal Pelagics

Important coastal pelagics to the Caribbean and Gulf region include mackerels, dolphin and flying fish. These resources are characterized by migration across the boundaries of individual states. Their abundance and availability will be influenced by the harvest sector throughout the region. In addition, coastal pelagic fisheries are highly seasonal. Thus, the harvest, processing and distribution sectors have to be flexible to switch to other resources when the season is completed.

An example of coastal pelagic fisheries is given for the fishery for king mackerel in the Gulf of Mexico (Eldridge, 1985). Figure 3 shows the catches of king mackerel in a small area off southwest Florida. This fishery relied upon the smaller, young recruits of the fishery. In recent years, the availability of recruits has declined.

The progression of catches mimic the development of the harvest and processing sectors in that area. Obviously, the catches of this small area were not the sole cause for declines in recruitment. There were regional effects. However, the resulting impact on the local economy of this area was a decline in the harvest processing and distribution sectors for king mackerel. Production and fisheries related employment declined.

These events show the need for regional cooperation to develop and maintain fisheries resources, especially for those pelagic migratory fishes which cross jurisdictional boundaries. However, regulatory mechanisms to improve king mackerel production have only recently been implemented.

Oceanic Pelagics

Fisheries for billfish and tunas generally require a highly mobile and technologically advanced harvesting sector for commercial exploitation. In most cases, this is beyond the feasibility of island states. Instead, they have elected to allow access to foreign operators or joint ventures (with licenses). Such strategies would require improvements in the service sector.

Recreational fisheries for billfishes and tuna may be an important adjunct to an overall development strategy. Charterboat operations can be utilized commercially. Tournaments for billfishes such as those in Puerto Rico and the Bahamas have a significant positive impact on local economies.

However, the same transboundary and seasonality problems that exist with coastal pelagics also exist with oceanic pelagics. But the transboundary problems associated with billfish and tunas extend beyond the region. Ocean-wide cooperation would be required.

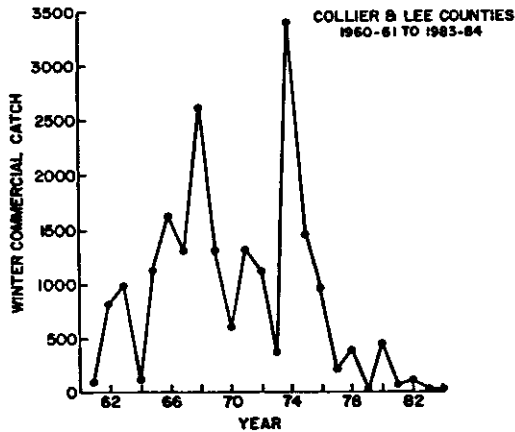


Figure 3. Annual commercial landings of king mackerel (in thousands of lbs) in Collier and Lee Counties (the area of southwest Florida). (Source: NMFS statistics summarized in Eldridge, 1985).

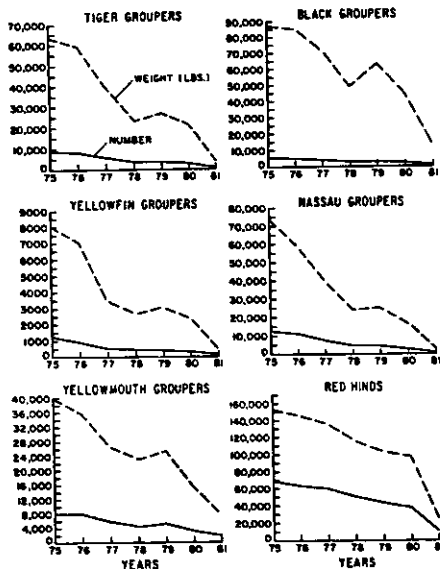


Figure 4. Annual commercial landings of various groupers in Bermuda. The dashed line is the landings in weight and the solid line is the landings in number (Source: Bermuda Department of Agriculture and Fisheries and Bannerot, 1984).

Demersal Finfish

Important demersal finfish in the region are often termed reef fish. These include snappers, groupers, triggerfish and many other species. Their production is often limited by the limited shelf area of many islands. Therefore, they are particularly susceptible to over-exploitation. Often the populations are reduced such that only small fish are available. This is shown in Figure 4, the grouper catches in Bermuda (Bannerot, 1984), where weight declined faster than number. Achieving potentials of production of these species often require mechanisms to limit exploitation of small sizes (minimum sizes, increased mesh sizes). Reef fish are also important recreationally in many areas (angling, spear fishing and non-consumptive uses such as diving in sanctuary areas).

Similar development of reef fish fisheries occurred in the trap-fisheries of Puerto Rico. Increased trap usage was associated with stable production and declines in catch of reef fish per trap (Bannerot, 1984). Management actions to improve these trends are warranted.

DISCUSSION

Fisheries development programs are like any other human venture: they are filled with choices, risks and uncertainties. A strategy for development will depend upon which objectives are being addressed and upon how the risks and uncertainties are perceived. The evidence must be weighed and choices made.

Perhaps the choice will be made to develop fisheries for domestic consumption, recognizing that most of the increased demand will be from tourist consumption. This would imply development of supplies of lobster, conch, dolphin and snappers and other fish for hotels and restaurants and processing and distribution systems to deliver to them. Production of most of these resources will be fairly limited and would often require regulation to maintain high production levels. Such a choice would impact the development goals by increasing production of goods and services, helping balance of trade through tourist expenditures, decreasing employment in the fisheries segment (if effort limitation is required) and increased employment in tourist related industries. At the same time, fisheries development would become vulnerable to changes in patterns of tourism. The choice is not clear and values have to be weighed. Similarly, choices and benefits must be evaluated when developing in other fishery areas such as export and recreational fisheries.

In conclusion there are no easy solutions. This fact stresses the importance of having management and information institutions available to react to changing conditions. Information is needed to improve decision-making capabilities and regional management is required to implement changes. These are a sector of the fishery development system unto themselves. Choices will be made with limited information, recognizing the risks involved and

some management will occur de facto. But increasing information and data collection capabilities on a regional basis will reduce the risks of adverse events from any choice of strategy and effective management institutions will increase the chances the strategies are successful.

ACKNOWLEDGMENTS

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