MANAGEMENT OF THE SMALL PELAGIC FISHERIES OF THE JAVA SEA, INDONESIA

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Abstract

Inside the Java Sea pelagic fisheries are caught through a broad variety of fishing gears, both in coastal as well as in open waters. Nevertheless the bulk of the catch comes from seiners fleets. A brief review is presented of some of the measures taken to manage the small pelagic fishery. Modifications might be carried out in the process of taking management decisions in advanced countries to take into account the various constraints to management in Indonesia, *inter alia* : limited scientific research, lack of effective control, poor implementation and enforcement. Should these constraints and requirements be overcame then there would be optimistic prospects for successful fishery management.

Introduction

The hydrographic pattern of the Java Sea is predominantly influenced by the prevailing monsoon winds which create substantial seasonal changes in direction and strength of the currents, water salinity, and primary productivity of the waters in question (Wyrtki, 1961 ; Weber, 1976 ; Durand and Petit, 1995).

The principal groups of small pelagic fish of the Java sea are those of carangids (scads, *Decapterus russelli, D. macrosoma* ; trevallies, *Selar crumenophthalmus, Selaroides leptolepis*), clupeids (Sardinella, *Sardinella brachysoma, S. fimbriata, S. gibbosa, Amblygaster sirm* ; anchovies, *Stolephorus spp.)* and scombrids *(*mackerels, *Rastrelliger brachysoma, R. kanagurta*). Scattered shoaling stocks of these species are found along the entire of north Java coast and offshore as well, i.e., from the middle part of the Java Sea through eastern part of the waters to Makassar Strait.

The small pelagic fisheries in the Java Sea could schematically be divided into two main categories, first, the inshore "mini" purse seiners using outboard engine wooden vessels between 10 to 18 m length, and other minor fishing gears such as ***lampara***, ***payang*** (Danish seine), gill net and liftnet; secondly, offshore small/medium and big purse seiners employing wooden vessel of 15 to 20 m and 18 to 30 m in length, respectively. A number of seine nets (e.g., ***lampara***) for anchovies fishery have been intensively used especially in the inshore waters of east Java north coast since recently.

The small pelagic species is of particular importance to food security in Java since these species, which constitute a vital source of animal protein, are the type of fish commonly consumed by principally those of the lower income strata. Generally, the small pelagic fisheries supply the local market with fresh or traditional processed fish (i.e., dried salted, boiled salted and smoked).

Economically the pelagic fisheries of the Java Sea play a significant roie as source of income of the fishers and revenues of local government as well. Additionally they also provide foreign exchange earnings mainly in the sense that they may reduce the import of fishery products, besides from the export of salted fish. While from social viewpoint the fisheries are vital to employment and job opportunities that provided by fishing, processing, marketing, and distribution activities.

In fact, the small pelagic fish resources of the Java Sea have been harvested intensively (Widodo, 1988 ; McElroy, 1991 ; Nurhakim, 1995 ; Durand and Widodo, 1995). In 1992 about 500 000 ton with ex-vessel value of over $ 275 million was yielded. Taking into account the importance in biological, social, and economic roles, it will be of great interest to see what effective management regimes are recommended to ensure their long-term sustainable development.

Materials and Method

Materials

The on-going collection on the data of biology, exploitation (catch and effort data), economic and social aspects of fishing communities and fishing fleets have been conducted by PELFISH Project of the Research Institute for Marine Fisheries (RIMF), Jakarta, Indonesia since 1991 and afterward.

Those data will then comprehensively analyzed and reviewed in order to design a sound management strategies for the resources concerned. More comprehensive results will be presented in the PELFISH Project's seminar on socio-economic, innovation and management that will be conducted in Semarang, Indonesia in December 1995.

Method

In managing fisheries, the managers along with those of fishermen and biologists, should set up harvest strategies use for the fisheries. The strategies should takes into account the biological conditions of the stock, and the economic, social and political conditions of the fisheries as well.

There are several harvest strategies in fisheries management that are currently used in many fisheries, namely those of stock-size dependent strategies, periodic harvest strategies, sex-specific strategies, size-limit strategies, economics and harvest strategies, and strategies that include uncertainty (Hilborn and Walters, 1992).

To implement the strategies in the field a set of tactical tools generally used in various fisheries can be listed as gear restrictions, season lengths, gear limitations. effort limitations. annual catch quotas and size limitations.

A fishery may employ more than one of the above alternative tactics. The choice of tools for implementing a certain harvest strategy is very dependent upon the nature of the fishery which requires specific local knowledge.

Results

Fundamentally, the purpose of the fisheries management is to ensure sustainable production over time from the fish populations, through regulatory and enhancement actions which promote economic and social welfare of the fishers communities and industries that use the production.

In general the objectives of the fisheries management can be classified into three groups : (i) maintenance or restoration of the resource, (ii)elimination and reduction of conflicts and (iii)improvement of the economic performance of the fishery (Gulland, 1988).

For the time being, promotion of the fishermen welfare and revenues, support to production growth, increase the foreign exchange earnings and government revenues, and resource conservation rank high in the agendas of the fisheries administrators of the Government of Indonesia.

Among the harvest strategies commonly used in various fisheries stated by Hilborn and Walters (1992), it is very likely that the stock-size-dependent strategy is the one seems potentially effective to achieve the management objectives of the small pelagic fishery in the Java Sea. Harvest strategies which depend on stock size may take the forms of constant-stock-size strategy, constant-exploitation strategy or constatnt-catch strategy. It seems that the constant-exploitation strategy is the most applicable one.

To implement this strategy, a set of tactics can be devised. First, gear restrictions (in terms of net length, vessel size or vessel capacity, engine power, and light power used as FAD) and gear limitations (in terms of number of vessels). Secondly, an annual catch quota especially for the entire small/medium and big purse seiner fleet.

It is possible that such the two tactics can be made to work, particularly for the small/medium and big purse seiners, given the limited number of ports involved, namely Pekalongan and Juwana, where a number of 70% of the vessels are based and 90% of the catch are landed (Potier and Sadhotomo 1995). On the other hand the application of these tactics on inshore small scale fisheries will face operational difficulties that associated with the diversities of fishing operations, dispersion of landings sites and distribution channels.

Eventhough the history to date of enforcement of fishery regulations, including vessel limitation, in the Java Sea is not encouraging, however, that is no justification for not trying again to introduce a limited entry scheme, after trawl banning, this time for purse seiners limitation. The large socio-economic benefits to the wider economy of substantially reducing the risk of stock collapse must surely outweigh the relatively low enforcement costs involved.

Discussion

In the small pelagic fisheries of the Java Sea, quantitative controls may be exerted either on outputs (e.g., catch quotas), on inputs (e.g. catching capacities, number of vessels, number of fishermen) or on stock or biomass. One critical shortcoming of catch quotas is that, for maximizing their values, fishermen have advantage in discarding lower-value species and sizes. This "high-sortin" behavior tend to be particularly marked in the multispecies fisheries. Catches can be considerably more difficult to control that boats or fishers. Those will be particularly severe in pelagic fisheries such as of the Java Sea which presenting the following features : (i) multispecies, multigear, and small scale fisheries with many landing sites and concealed marketing circuit, significant of autoconsumption, etc., and (ii) limited enforcement and surveillance capacities.

Under such circumstances, control on inputs can be the best option. Most suitable input controls are those which apply to variables that contribute most significantly to the fishing power of boats, i.e., (i) the engine power, (ii) the size of net and the power of light as FADs, though the control of gear actually in operation may rise particular difficulties, (iii) the number of fishermen onboard since the purse seiners have been manually operated.

Control on the number of vessels may be accomplished by taxes or license fees, while control on size and capacity of vessels would naturally performed, since the major fish harbors (namely Pekalongan and Juwana) are so shallow that no vessels beyond a certain size able to enter.

Since there are lack of alternative employment opportunities outside the fishery, for whatever reasons,

management involving the retirement of participants in the current fishery is unjustified and probably non-enforceable.

Controls on fishing time (days at sea), on the distribution of fishing operations (closed areas or seasons), on the elimination of destructive types of technology (e.g., used of superlight), and so forth, can be useful as complementary measures (to improve working conditions, or for protecting particular vulnerable portions of the stock). The measures have the major advantages that they are relatively easy to be enforced, however, they have only a partial and, therefore time-limited effect on the control of fishing capacities and fishing rate.

So far the Government of Indonesia has set up a mesh size regulation but it is difficult to enforce since the ***nakhoda*** (seiner skipper) wants to avoid gilling fish by using bigger mesh size. Besides, as far as the fishermen dealing with light fishing which harvest a mixed catch, a smaller mesh size will present only minor problems.

In general, the advantages and drawbacks of input controls are as the mirror image of output controls. On the other hand, major limitation of stock or biomass controls rests in the applicability.

Management system are made up of different rules, mechanisms, and structures assembled in a coherent fashion. The number of effective management systems - i.e., of combinations of basic institutions that work - is limited : e.g., open access, TURF (territorial use right in fisheries), limited entry, co-management, tax or fixed price system, individual transferable quotas (ITQs), etc. ITQs, for example, imply that on adequate resource property regime has been adopted and consist of individual quantitative fishing rights expressed on inputs that are usually allocated through a market mechanism.

One of the essential aspects of fisheries management is control over access to the resources. This requires some form of rights to exclude potential fishermen from entering the fishery. Christy (1987) points out that the rights of exclusion can be related to the number of vessels (a license limit scheme); to share of the yields (a fisherman quota scheme); or to areas of the sea (TURF). Or it can be a right to extract revenues from the fishery which serves to control access indirectly by excluding those who are unwilling to pay the tax or fee. Exclusively rights can be exercised by national, regional, or local governments, by a community or by a group of fishermen. Clearly fisheries could be managed if our knowledge of fish population dynamics was improved.

In countries of fisheries where management has been directed explicitly to the regulation on access, overcapacities have been reduced, economic performances and, in several instances, fish stocks have improved.

Control by catch quota is only useful if the quota needed to achieve a given objective can be accurately determined.

Within most fisheries policies, social objectives have hitherto been unstated, non-specific or unprioritised. The policies have, in effect, been driven by conservation and economically oriented goals. In fact there are a number of socio-economic problems related to the potential development of the Java Sea pelagic fisheries. Methods of maximizing social benefits and methods for preventing over capitalization are important subjects for future study.

In the most fisheries the greatest potential economic benefits in the long term come from reducing the total costs of fishing; this commonly be done by restricting access in some way or other (common property and open access). A modified design of the traditional net has been introduces by Dremiere and George (1991) which able to reduce up to 25 to 35% of the cost. In general one forth of the total investment for a set of purse seine is spent for the net. The costs of enforcement should be taken into account.

Most of the coastal countries have revised their legislation to control the activity of foreign fleets operating in their EEZs in order to provide rooms for their domestic fishing fleets to exploit the resources. In Indonesia this also should be taken into account in anticipating the development of purse seiner fleet in the Java Sea which always increasing both qualitatively as well as quantitatively. In addition, there is an increasing tendency for the purse seiner owners in Pekalongan to expand their business into tuna fishing in high seas.

As far as the tendency of increasing number of new vessels stili takes place, an overall approach to pelagic fisheries of the Java Sea should be oriented toward adaptive management with suggestions for any moderate increase in fishing effort which should be carefully monitored and evaluated prior to attempting another increment. That is, if, after reassessment of the results of the recommended increase in fishing effort, there is still scope for further development, only then should this be implemented. To incorporate social, economic and resource oriented goals into management procedure, this increment should be based on a risk averse decision. It is preferable to err on the conservative side given the potentially negative social and economic impacts of over capitalization.

Although some form of fish surveillance and enforcement is clearly required, successful fisheries management will not occur if the participants do not generally agree to follow the rules and regulations (e.g., licensing and quota systems) with attention to problem of compliance, their impacts on the group structure of

organization of industry, and their wider social impacts on the areas that depend on the fishery.

Conclusion

Interdisciplinary approach to fisheries management and fish science in addition to fish biology and fish population dynamics is needed, for example sociology, anthropology and economics.

Those data will then be analyzed and reviewed in order to design a sound management strategies for the resources concerned. A more comprehensive results will be presented in the PELFISH Project's seminar on socio-economic, innovation and management that will be conducted in Semarang, Indonesia in December 1995.

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