Economic Exploitation in the Philippine Small Pelagic Fishery and Implications for Management

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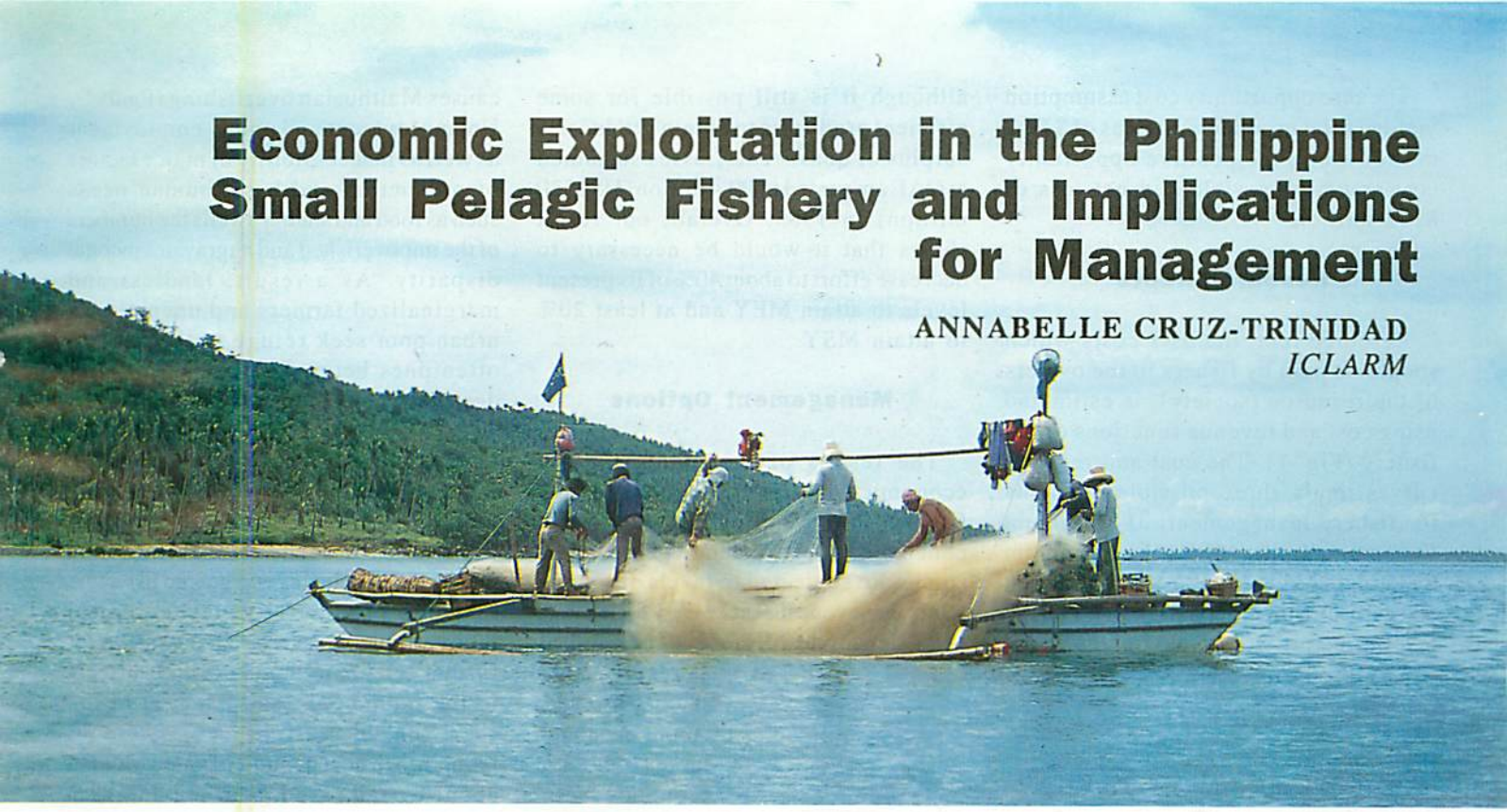

Introduction

The Philippine small pelagic fishery is both biologically and economically overfished. In 1988, the Bureau of Fisheries and Aquatic Resources (BFAR) and ICLARM team led by Paul Dalzell concluded that *equilibrium* (total costs = total revenue) was reached in 1981 and that the fishery was running at an annual loss of US$250 million.

Small pelagic fish, like roundscads (*galunggong*), anchovies (*dilis*), sardines (*tunsoy*) and mackerels (*alumahan*), are traditionally a cheap source of protein for low-income groups in the Philippines. A decline in supply translates into increased prices for consumers but depressed incomes for subsistence fishers and a shift to more destructive fishing techniques.

Recently, a more comprehensive analysis of the fishery's bioeconomics was made.[1] The verdict was the same, but the economic losses appear to be higher - $330 million annually - than previously estimated. Here, some findings from the new analysis are presented.

Producers' Surplus

Producers' surplus is estimated as returns above opportunity costs of vessel owners and crew members. Opportunity cost of capital was based on the prevailing savings rate whereas two assumptions were made regarding opportunity cost of labor: the first is based on the estimates of shadow wage rates (SWR) while the second is based on zero opportunity costs.

Owner's pure profit is negative for the municipal and commercial sectors due to high operating costs. Trawlers, purse seines and bagnets maintained high operating costs and resulted in pure losses to owners as opposed to ringnets, beach seines, surface gill nets and fish corrals (Table 1). Pure losses sustained by vessel owners indicates a misallocation of capital in the fishery and possible exit barriers.

Pure profits to labor resulting from positive opportunity costs yielded positive values for the commercial sector but negative values for the municipal sector. The latter is a reflection of the relatively low level of earnings in the municipal sector and the compensation structure that distributes the risk between owner and crews. This is opposed to the commercial sector, especially in trawlers and purse seines, where a fixed wage system (plus fringe benefits), passes the risk factor to the owner. Pure profits to labor resulting from zero opportunity cost yielded positive values for both sectors. This, however, represents an unstable situation, because the large number of unemployed may exert a downward pressure on wages such that rents accruing to labor are totally dissipated. Furthermore, owners of the fishing unit capture some of labor's pure profits either by wage bargaining, as in the commercial sector, or by functioning as owner-operator or by hiring family members as crew as in the municipal sector.

Table 1. Pure profit to owner, labor and fishing unit of small pelagic gears (in pesos), March-April 1988 (US$1 = ₱20).

Gear	Owner	Labor[a]	Labor[b]	Fishing unit[a]	Fishing unit[b]
Municipal	**-1,738**	**-10,852**	**2,886**	**-12,590**	**786**
Surface gillnet	118	-1,798	1,522	-1,680	1,640
Round haul seine	-10,256	-40,321	2,751	-50,577	-7,505
Fish corral	1,679	2,062	2,795	3,741	3,751
Drive-in net	1,509	-3,351	4,475	-1,842	5,258
Commercial	**-85,669**	**44,208**	**86,307**	**-41,461**	**638**
Trawler	-71,219	-28,657	19,361	-99,876	-518,58
Purse seine	-578,787	183,398	312,815	-395,389	-265,971
Bagnet	-4,298	-35,918	12,578	-40,216	82,80
Ringnet	125,960	121,771	131,491	247,731	257,450
Beach Seine	4,052	20,586	28,392	24,638	324,44
Encircling gillnet	10,279	4,067	13,203	14,346	23,481

[a]Opportunity cost of labor is equal to shadow wage rate.
[b]Opportunity cost of labor is zero.

The zero opportunity cost assumption yielded total producers surplus of $10.2 million while the positive opportunity cost assumption yielded a net loss of $242 million.

Resource Rents

Resource rent, the user costs which should be paid by fishers to the owners of the resource (society), is estimated using cost and revenue functions of the fishery (Fig. 1). The cost and revenue curves imply three possible elements for fishery management: a) Maximum Economic Yield (MEY); b) Maximum Sustainable Yield (MSY); and c) Open Access Equilibrium (OAE). MEY is the level of effort which maximizes profit

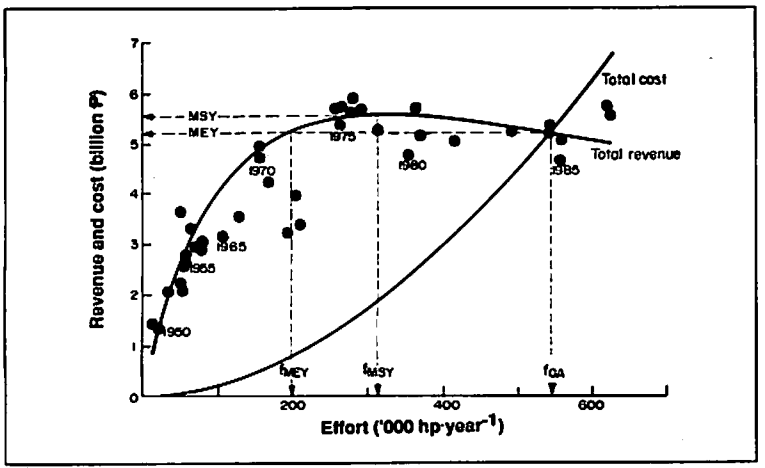

Fig. 1. *Revenue and cost functions of the Philippine small pelagics fishery, 1949-1988.*

and in this case corresponds to a catch level of 465,000 tonnes or ₱5.2 billion/year (exchange rate at US$1:₱28, July 1993) and an effort level of 170,000 hp. Since the resources are best used at this level, MEY is favored as a management objective from the economic point of view. However, the maximum yield of the resource is not attained at this level, which, in poor economies, can be translated to wastage of a protein source. The MSY responds to this limitation. It is attained at a higher level of effort, 320,000 hp and corresponds to a catch of 515,000 tonnes or ₱5.6 billion/year.

The last point considered is the OAE, the effort level in which cost and revenue are equal. This is attained at 410,000 hp, which, according to the data used, must have occurred in the early 1980s (confirming the scenario assumed by Dalzell et al.[2]) The graph shows that at OAE, rents to society are dissipated although it is still possible for some efficient producers to obtain producer's surplus or quasi-rent. Losses sustained at OAE amounted to ₱9.4 billion (US$330 million) in 1985. Overall, our result shows that it would be necessary to decrease effort to about 40% of its present levels to attain MEY and at least 20% to attain MSY.

Management Options

The results of the biological and economic analysis of the small pelagic fishery in the Philippines lead to two conclusions. First, small pelagic fish stocks are subjected to levels of fishing effort far beyond that necessary to generate MSY let alone MEY. Second, and as a result, both sectors are sustaining economic losses (negative economic rents) implying inefficiencies in the use of labor and capital in the small pelagics fishery.

Solutions to the problems of overexploitation will rest not only within the fishery sector, but, more importantly, in sectors outside its traditional realm. We illustrate this using the transect approach developed by Daniel Pauly and Clive Lightfoot (*Naga*, April 1992, p. 7-10) and subsequently by Jose Padilla and M.S. de los Angeles (*Naga*, July 1992, p. 36-38) (Fig. 2). This broader policy context for management is justified by the interlinkages among fisheries resource issues, on one hand, and issues of economic development, on the other. The underlying causes of fisheries resource overexploitation and degradation are often of socioeconomic, institutional, political and/or cultural origins. Some issues we have identified include:

Population growth and poverty

Population growth exerts a two-pronged pressure on the resource: first is the increasing demand for food and second is the increasing number of fishers and resource-dependent population which causes Malthusian overfishing (Pauly[3]). Unemployment and under-employment as well as inaccessibility of major factors of production and basic human needs such as food and shelter swells the numbers of the impoverished and aggravates income disparity. As a result, landless and marginalized farmers and unemployed urban poor seek refuge in the fishery, oftentimes being the first ones to use destructive techniques.

Is technological improvement an option?

In an overfished resource, granting that no policies have been geared to restore resource productivity, technological innovation will serve as an incentive for further entry (Smith[4]). The likely effects in the municipal fishery are: i) in the short run, increase in incomes due to reduction in cost per unit of catch brought about by improved gear/engine; ii) in the long run, increase in the number of fishers due to improved profitability; iii) in the long run, further deterioration of inshore fishery and declining incomes. Technological innovation in the commercial sector would cause unemployment due to capital-labor substitution, resource degradation, and declining incomes for both commercial operators and municipal crew.

Structural adjustment policies

The roots of poverty, unemployment and underemployment in this country runs deep into the heart of our industrialization policies. The adverse effects of these policies are manifested in the fishery in the form of:

i) overcapitalization due to tax exemption on imported capital equipment, i.e., most commercial vessels were imported from Japan because it was cheaper than having them built in Philippine shipyards.
ii) protectionist regimes such as the ban on fish imports and the institution of tariffs that led to production inefficiencies, i.e., effective protection rates of fresh/frozen fish ranged from 108% in 1974 to 99% in 1979 implying that domestic cost of production is, on the average, 100% higher than world prices.
iii) low repayment rates of credit programs

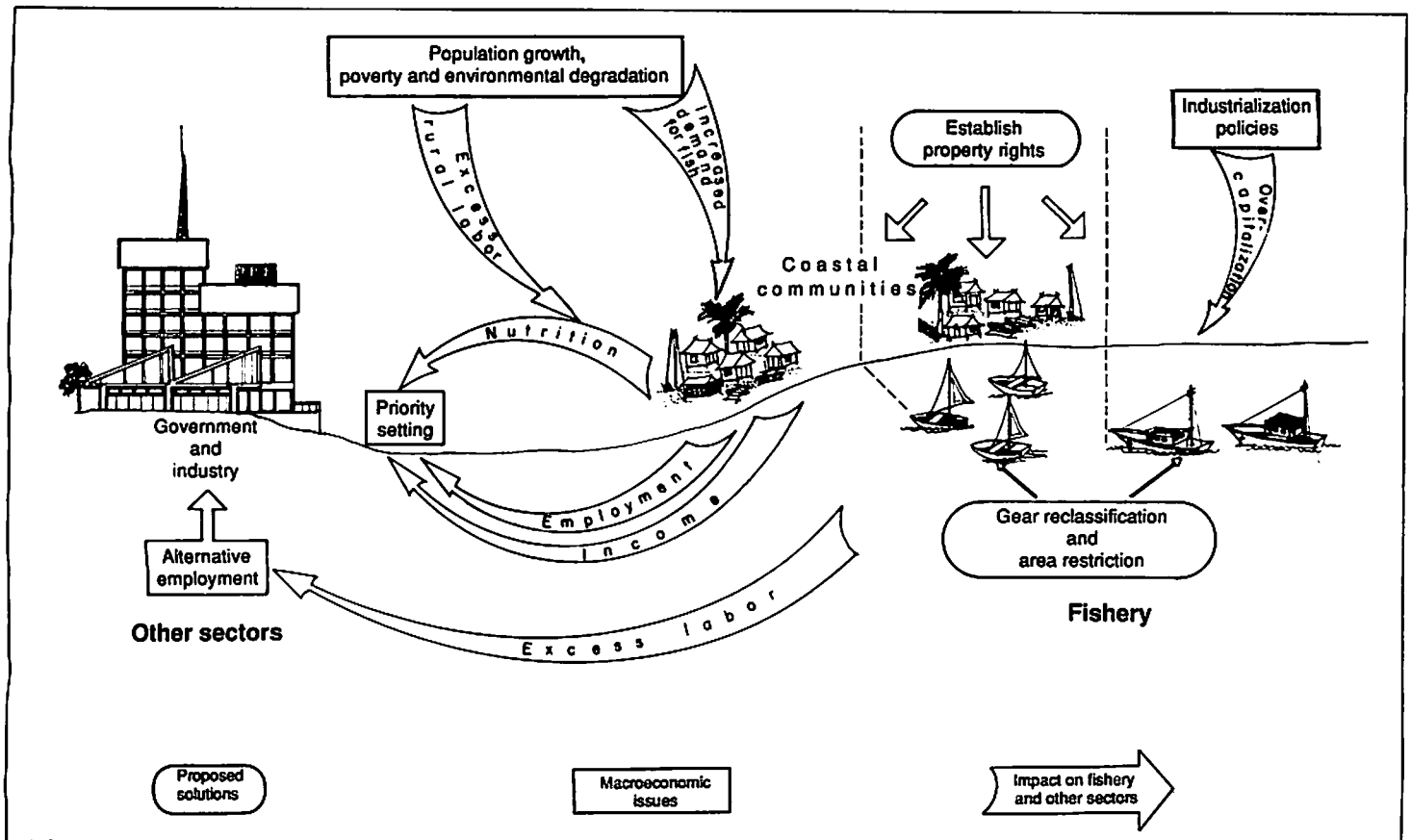

Fig. 2. ***Causes and impact of the Philippine small pelagic fishery sector problems and proposed solutions from fisheries and external sectors.***

which enabled fishers to acquire vessels and equipment but did not effect an increase in income nor production.

Alternative Sources of Income

The holistic approach to fisheries management is based on the premise that solutions to low incomes must be dealt with outside the fishery, i.e., increasing opportunity costs. Our study showed that employment alternatives do exist but it was not possible to determine whether these were available on a permanent basis. More than 52% of the respondents desire to engage in business, 32% would rather seek employment in the service sector and the remaining in farming and aquaculture. Of the total, 30% estimate they will earn more in alternative employment while the remaining percentage is divided equally among those who will definitely earn less and those who are not sure.

The greatest drawback for fishers to engage in nonfisheries activities is the access to cheap capital, a factor which the government and private sector should consider, possibly through the involvement of NGOs. Meanwhile, the employment of excess labor is dependent on land ownership and tenurial arrangements and the economic activities in the area which should be the concern of government in regional planning. A parallel move would be training programs and educational support to enhance skills of displaced fishers.

Creation of property rights

The creation of property rights in natural resources has been identified by the World Bank as an important measure for its sustainable use. The positive impacts of creating property rights include: i) the empowerment of "owners" to enforce measures that would result in optimum benefits; and ii) the creation of a market such that appropriate user costs and taxes (on externalities) can be charged.

Conclusions

We have consciously veered away from traditional solutions to fisheries management problems and opted to recommend measures that attack fishery-related problems as emanating not from the fishery itself but from sectoral interlinkages. While the issues we have raised may seem too broad-based, we realize that recommending traditional resource-based measures alone are mere stop-gap remedies. Thus, it does seem logical to believe that while searching for solutions to manage the small pelagics fishery, we stumble on solutions to effectively manage our economy as well.

Further Reading

[1]Trinidad, A.C., R.S. Pomeroy, P. Corpuz and M. Agüero. 1993. Bioeconomics of the Philippine small pelagics fishery. ICLARM Tech. Rep. 38, 74 p.

[2]Dalzell, P., P. Corpuz, R. Ganaden and D. Pauly. 1987. Estimation of maximum sustainable yield and maximum economic rent from the Philippine small pelagic fisheries. BFAR Tech. Pap. Ser. 10(3), 23 p.

[3]Pauly, D. 1990. On Malthusian overfishing. Naga, ICLARM Q. 13(1):3-4.

[4]Smith, I.R. 1981. Improving fishing incomes when resources are overfished. Mar. Policy 5:17-22.

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