Implications for Equity and Management

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Abstract

The economic efficiency and distribution of benefits from the fisheries of San Miguel Bay, Philippines are examined in this paper. The total annual value of catch from the Bay in 1980-1981 was estimated to be ₱53.5 million (US$6 million). Small trawlers, which represented only 3% of the fishing units and employed 7% of the labor force were found to earn the largest shares of total catch value and 50% of the ₱3 million pure profits, or resource rents. The open-access equilibrium of this fishery has not been reached but further increases in fishing effort would reduce economic efficiency and resource rents.

Attention is drawn to the divergence between goals of economic efficiency and equity and it is concluded that serious consideration should be given to limiting effective fishing effort in this fishery so as to maintain positive resource rents and to deal with the presently highly skewed distribution of benefits that favors trawlers at the expense of non-trawl gears.

Introduction

This paper has two objectives. The first is to summarize the costs and earnings data presented in the other papers in this report so that comparisons between gear types can be highlighted. The second is to discuss the implications of these findings for issues of economic efficiency, equity and management of the San Miguel Bay fisheries. A full discussion of management options can be found in the concluding volume of this series on the San Miguel Bay fisheries.

Before presenting the summary findings it is necessary to discuss some of the concepts and terms that have been used in this study, in particular the concept of opportunity cost (see also

Smith et al., this report) because its determination is critical to the evaluation of the economic health of the fisheries. Opportunity costs of the factors of production (labor and capital) are the returns that could be earned by using these respective factors in the next best activity. Most costs and earnings studies omit this cost item (e.g., Ovenden 1961; Kurien and Willmann 1982) because they focus on financial analyses and residual returns to capital and labor. These residuals were certainly of interest in San Miguel Bay fisheries because they represent the cash income of owners and crewmen. For owners and crewmen, incomes earned are the prime factors in determining whether they continue to engage in fishing. But to weigh the option of fishing against other occupations or sources of income, owners and crewmen must compare their earnings with those that could be earned in alternative activities; in other words they must compare their returns to capital and/or labor with potential returns in the next best use.

However, Panayotou (1981) has pointed out the dichotomy that exists between conditions of entry to and exit from a fishery. The potential entrant to a fishery may be guided in part by the opportunity cost concept but the individual already engaged in fishing may find it difficult to shift his assets (i.e., vessel and gear) out of the fishery and into some alternative use, although he could consider selling out. Capital is likely to be more immobile than labor under such circumstances. The non-owner, for example, has somewhat more flexibility (assuming options for labor exist) than owners whose vessels and gear represent sunk costs. On the one hand, owners will continue to employ their vessels and gear as long as their variable costs are met. A potential entrant to the fishery, on the other hand, will want to be able to cover both variable and fixed costs. This dichotomy explains why existing vessels will continue to fish even when the profits earned are insufficient to attract additional entrants.

The presence of pure profit is an indication that open-access equilibrium of an open-access fishery has not yet been reached. To determine whether any pure profit (rent) exists in the fishery, it is necessary to conduct more than a financial analysis. Opportunity costs of capital and labor must be included as costs also and deducted along with other variable and fixed costs from total revenues to determine the pure profit or loss in the fishery. These opportunity costs are sometimes treated as variable costs (for labor) or fixed costs (for capital) (e.g., Panayotou et al. 1982). In the papers of this report, the three costs (fixed, variable, opportunity) are treated separately, so that readers will recognize the traditional expression of costs and earnings as 'return on investment' before opportunity costs of capital are deducted. A fishery would be fully exploited if, after deducting fixed, variable and opportunity costs from total revenues, no pure profit (or rent) remains (Fig. 1).

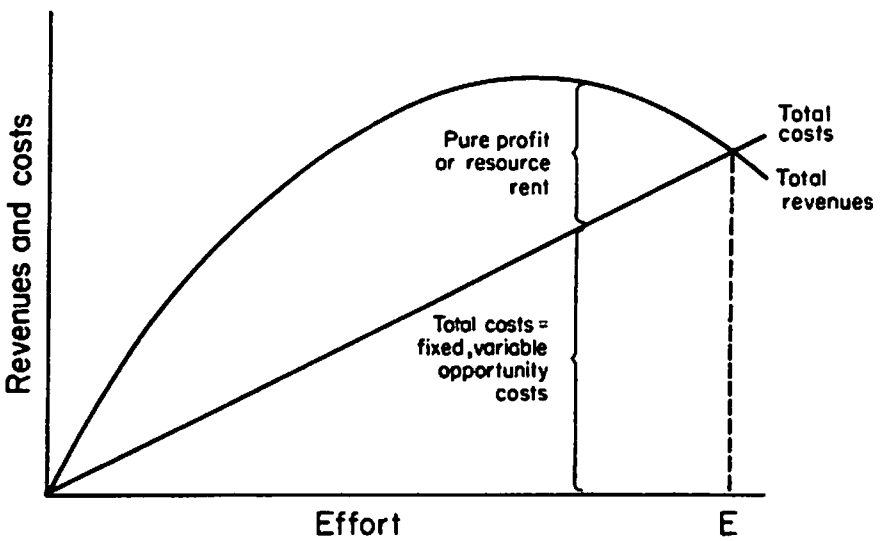

Fig. 1. An open-access fishery will tend to equilibrium (E) where total revenues just cover fixed, variable and opportunity costs and no pure profit (or rent) is earned.

The determination of the appropriate opportunity costs for capital and labor is not an easy task. Over- or underestimating either will result in a misrepresentation of the pure profits or loss in the fishery. There are those who argue that the true social opportunity cost of labor in small-scale fisheries is zero. However, this is not the case for San Miguel Bay fisheries because opportunities as laborers on rice fields and copra plantations or as piece-workers in processing establishments do exist in most communities, albeit at low wages. Also, migration of labor out of Bicol to better opportunities elsewhere is also possible and indeed is occurring (Bailey 1982). Under such circumstances, one would be hasty to conclude that the opportunity cost of labor is zero (Squire and van der Tak 1975). Consequently, for this study, a positive opportunity cost for labor was determined.

A careful assessment of the risks in these alternative occupations compared to the risks inherent in fishing has not been made. Therefore, any income earned by fishing labor above its opportunity cost includes a potential premium for risk. For most alternative activities, the opportunity wage was ₱10/day. Only in Sabang, Calabanga was there a higher daily opportunity wage of ₱15. This was offset by lower wages in communities such as Siruma, and the ₱10 daily opportunity cost of labor was used throughout this study as a reasonable average.

Depending upon location and the level of their capital assets, owners of fishing units have varying options for alternative investment. One option is to deposit their capital in the local rural bank and earn interest on their savings. This may be the only alternative for those with limited capital while those with more could consider a wide range of productive investments, such as fish processing, pig farming or public transportation. Opportunities for alternative investment are greater in those communities such as Sabang, Calabanga which have more varied economic sectors and are close to markets. Because opportunity costs of capital are a function of the level of capital available, ideally a different opportunity cost should be used for all gear types. In the absence of sufficient data to allow this more refined estimation, the 9% rural bank savings rate was used for analysis of all gear types. It should be kept in mind that to the extent that this rate understates the return that could be earned outside fishing (e.g., trawler operators with their high capital assets may be able to earn more than 9% elsewhere), it results in an overestimate of the pure profits of that gear type.

For discussion of economic efficiency and equity issues in San Miguel Bay, it will thus be necessary to look at both pure profits (or loss) and actual incomes derived by owners and crewmen of each gear type.

A second major point concerns the extrapolation of costs and earnings from the survey sample to the fishery as a whole. For cost reasons, the sample was drawn entirely from the two communities of Castillo, Cabusao and Sabang, Calabanga. The earnings of fixed gears are certainly location specific and this sample of them may not have been representative. For example, it is believed that the earnings of stationary liftnets were underestimated (see Supanga and Smith, this report). The mobile gears based in these communities, such as small and medium trawlers, mini trawlers and gill-netters all range throughout the Bay and thus are believed to be representative of the fishery as a whole. The majority of trawlers are, in fact, based in these two communities. Gill-netters in other communities which do not land their catch in Sabang and Castillo may have lower operating costs but it was assumed that these are offset by the lower prices that prevail in those more isolated communities and that their net revenues before sharing approximate those of the sample. These mobile gears caught 75.4% of the total catch of the Bay in 1980-1981. The survey data covered approximately 11,250 fishing trips. Consequently, it is concluded that extrapolation from the sample is reasonable as long as the reader recognizes the possible sources of bias.

Summary of Costs and Earnings by Gear Type

INVESTMENT COSTS

Eight gear types representing 1,587 (or 67%) of the 2,382 fishing units in San Miguel Bay were monitored on a daily basis for 12 months (June 1980-May 1981). These eight gears represent the

extreme range of investment levels and degrees of capital intensity that prevail in the small-scale or municipal fisheries of San Miguel Bay (Table 1), and thus indicate the inappropriateness of placing all these gear types under the "municipal fisheries" label. This argument is set out in Smith et al. (this report) and Pauly and Mines (1982).

CAPITAL:LABOR RATIOS

As can be seen from Table 1, there are really three distinct categories of gear used in the Bay. At the lowest extreme are gears such as scissor nets, cast nets, fish pots and hook and line that have investment costs of less than ₱1,000 and low capital:labor ratios. Next is a mid-range group that includes the most important of the small-scale gears, with investment costs of ₱3,500-13,000 and capital:labor ratios of 2,300-4,600:1. At the highest extreme are small trawlers (classified in the Philippines as "municipal" trawlers because they are less than 3 GT) and medium trawlers (classified as "commercial" trawlers) which require investments of more than ₱50,000 and have capital:labor ratios of 11,000-12,000:1. Capital intensity increases with the level of investment required per fishing unit. Trawlers are thus labor saving when compared to other small-scale municipal gears.

Table 1. Investment costs, labor requirements and capital/labor ratios of major gear types in San Miguel Bay.

	1981/82 investment costs (₱)	Average labor requirements	Capital intensity[1]
Scissor net	250	1	250 : 1
Gill-net (motorized)	13,000	3	4,333 : 1
Mini trawler	9,200	2	4,600 : 1
Stationary liftnet	12,200	4	3,050 : 1
Fish corral	9,100	2	4,550 : 1
Filter net	3,500	1-2	2,333 : 1
Small trawler	55,000	5	11,000 : 1
Medium trawler	70,000	6	11,667 : 1

[1] Capital/labor ratio which shows investment cost per unit of labor.

DISTRIBUTION OF CATCH

The catching power of these diverse gears follows the same pattern (Table 2), and it is interesting to note how the total annual catch of San Miguel Bay is distributed among the major gear types. All catch (including *balao*) is included in these computations. Trawlers of all three types harvest almost 56% of the total catch; only gill-netters, among the non-trawl gears, have a significant share (19%) of total catch. Biologists argue for the exclusion of the *balao* catch from total catch when discussing distribution among gear types because it is a very distinct fishery and is not characterized by a high degree of competition among various gear types as are the other fisheries in the Bay (Pauly and Mines 1982). Gill-netters and small trawlers, for example, compete for many of the same species. If *balao* (and hence mini trawlers) are excluded from the total, trawlers catch 41% of the Bay's catch with non-trawl gears catching the remainder. Stationary gears catch less than 10% of the total. For purposes of comparing the value of catch and pure profits by gear types, *balao* (and mini trawlers) will be included in the subsequent calculations.

DISTRIBUTION OF THE VALUE OF CATCH

The total annual value of the San Miguel Bay fishery during the 1980-1981 period was over ₱53 million (Table 3). Fifty five percent of this total value was earned by the three categories of trawlers. Small trawlers, which represent only 3% of all fishing units, alone earned almost one-third of total catch value, an increase over their one-quarter share of total catch by volume because of

Table 2. Catch per trip, average effort and total catch of major gear types in San Miguel Bay, June 1980-May 1981.

Gear type	Av. catch/trip (kg)	Av. no. of trips/year	Total no. of fishing units	Total catch[3] Tonnes	% of total		
Scissor net	6.0	44	634	167	0.9		
Gill-net (motorized)	45.3	234	350	3,710	19.6		
Stationary liftnet	69.0	55	171	649	3.4		
Fish corral	32.0	209	89	595	3.1		
Filter net	22.8	225	60	308	1.6		
Mini trawler	136.0	187	188	4,781	25.2		
Small trawler	470.0[1]	127	75	4,477	23.6	55.8	30.6
Medium trawler	520.0[1]	128	20	1,331	7.0		
Other gears[2]			795	2,949	15.5		
			2,382	18,967[2]	100		

[1]Vakily (1982) estimated medium trawler catch based upon a power factor of 1:1.5 over small trawler catch for the period 1979-1980. During the record keeping study, June 1980 to May 1981, the value of the catch/trip of medium trawlers was 11% higher than the value of the catch/trip of small trawlers. Since they caught the same species in the same proportion and sold in the same market, it was assumed in the above table a power factor of only 1:1.11. The figures differ from those in Pauly and Mines (1982) because the catch/trip for trawlers was based on a different time period.

[2]Based on Pauly and Mines (1982) but adjusting for our lower catch of medium trawlers.

[3]Includes *balao* catch of mini trawlers.

Table 3. Annual value of catch in pesos by gear type, San Miguel Bay, 1980-1981.

Gear type	Annual value of catch per fishing unit	Total number of fishing units	Total value of catch (all units) ('000 ₱)	Value per gear type as % of total value		
Scissor net	607	634	385	0.7		
Gill-net (motorized)	32,900	350	11,515	21.6		
Stationary liftnet	10,000	171	1,710	3.2		
Fish corral	16,200	89	1,442	2.7		
Filter net	7,700	60	462	0.9		
Mini trawler	38,500	188	7,238	13.5		
Small trawler	228,700	75	17,153	32.1	55.1	41.6
Medium trawler	254,400	20	5,088	9.5		
Other gears[1]		795	8,464	15.8		
		2,382	53,457	100		

[1]Based on average annual catch from Pauly and Mines (1982) and an assumed average price of ₱2.87/kg (from Table 4).

the more highly priced shrimps that they caught. In value terms, the share of mini trawlers was lower than their volume share because of the low price of *balao* at the landings (Table 4).

The level of investment cost per fishing unit is a significant determinant of that unit's annual value of catch (Fig. 2). Due to variation in operating costs (especially for medium trawlers) this same relationship does not hold for pure profits (Table 5) nor for cash incomes of owners and crew.

FACTOR PRODUCTIVITIES

Two commonly used measures of factor productivity are the volume or value of catch per unit of capital or labor input (Kurien and Willmann 1982). Since prices vary depending upon the species caught, measuring capital and labor productivities in value terms is preferable to measuring them

Table 4. Average price of catch received at landings in San Miguel Bay by gear type, 1980-1981.

Gear type	Average price (₱/kg)
Scissor net	2.30
Gill-net (motorized)	3.15
Stationary liftnet	2.53
Fish corral	2.47
Filter net	1.47
Mini trawler	1.53
Small and medium trawlers	3.83
Weighted average prices	
all gears	2.32
all gears except mini trawlers	3.37
all gears except trawlers	2.87

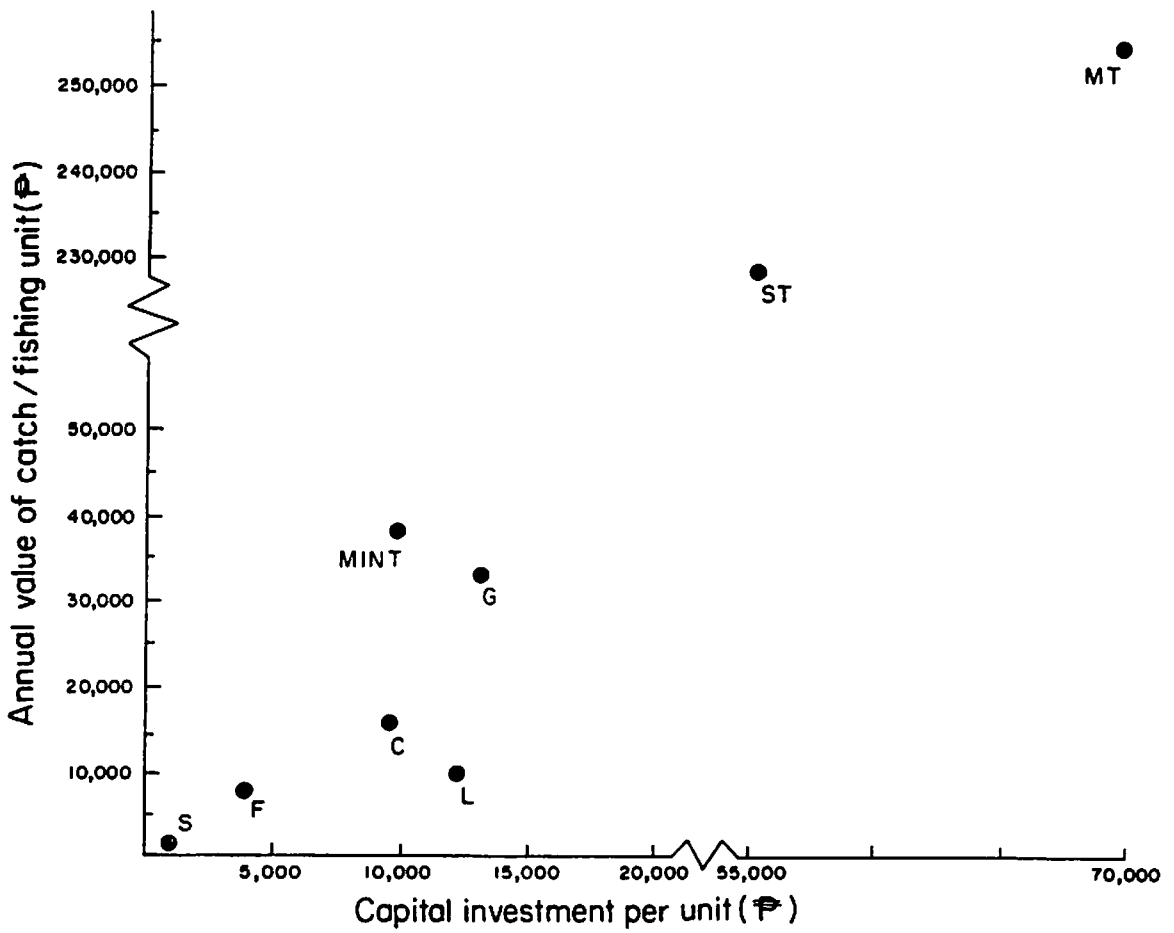

Fig. 2. Relationship between capital investment and annual value of catch for various gear types operating in San Miguel Bay. Note: S – scissor net; F – filter net; C – corral; L – liftnet; G – gill-netter; MINT – mini trawler; ST – small trawler; MT – medium trawler. The relationship between annual value of catch per fishing unit (V) and capital investment (I) can be expressed as $V = -11{,}497 + 3.95\ I$ with $R^2 = 0.96$.

solely in volume terms, because the former indicate the "value added" by capital and labor inputs. The differences between volume and value measurement of factor productivities can be seen in Table 5.

Of all the gears studied, the mini trawlers exhibited the highest capital and labor productivities in volume terms. Of the medium investment gears, the liftnets had the lowest capital and labor productivity. In value terms, small and medium trawler labor contributed the greatest "value added" in the fishery. Along with mini trawlers, they also showed the highest catch value per peso invested. Although it was not a strong degree of correlation ($r = 0.45$), there was a positive relationship between capital intensity (from Table 1) and capital productivity in value terms. A positive relationship was also found between capital intensity and labor productivity in value terms ($r = 0.89$). Finally in value terms, there was a positive relationship between the capital and labor productivities ($r = 0.78$).

Table 5. Capital and labor productivities of major gear types, San Miguel Bay, 1980-1981.

Gear type	Annual value of catch per fishing unit (₱)	Annual volume of catch per fishing unit (kg)	Volume of catch per ₱ operating cost (kg)	Capital productivity		Labor productivity	
				Value per ₱ invested (₱)	Volume per ₱ invested (kg)	Value per labor unit (₱/man-yr)	Volume per labor unit (kg/man-yr)
Scissor net	607	264	1.8	2.43	1.1	607	264
Gill-net (motorized)	32,900	10,600	0.6	2.53	0.8	10,972	3,533
Stationary liftnet	10,000	3,795	0.8	0.82	0.3	2,494	949
Fish corral	16,200	6,688	1.2	1.78	0.7	8,087	3,344
Filter net	7,700	5,130	4.7	2.17	1.5	5,121	3,420
Mini trawler	38,500	25,432	1.2	4.19	2.8	19,252	12,716
Small trawler	228,700	59,690	0.5	4.16	1.1	45,741	11,938
Medium trawler	254,400	66,560	0.4	3.63	1.0	42,393	11,093

Although these factor productivities are important measures of cost effectiveness, they do not account for differences in operating costs. In particular, in the motorized fisheries of San Miguel Bay, it is important to examine energy efficiency. Energy costs include gasoline, diesel, kerosene, LPG (for lights) and oil. The advantages of stationary gears, especially fish corrals and filter nets, are immediately apparent (Table 6). Even with their higher priced catch, the small and medium trawlers ranked among the lowest in terms of energy efficiency. With further increases in fuel prices inevitable and fuel comprising a major operating cost, the advantage should shift further in favor of stationary gears, excluding liftnetters which have high LPG expenses.

Table 6. Energy efficiency of major gear types, San Miguel Bay, 1980-1981.

Gear type	Fuel expenses per trip[1] (₱)	Value of catch per ₱ fuel expenditure (₱)	Volume of catch per ₱ fuel expenditure (kg)
Scissor net	–	–	–
Gill-net (motorized)	52	2.71	0.9
Stationary liftnet	7	2.41	0.9
Fish corral	8	9.67	4.0
Filter net	0.5	83.00	51.3
Mini trawler	94	2.19	1.4
Small trawler	707	2.55	0.7
Medium trawler	1,019	1.95	0.5

[1] Includes expenses for gasoline, diesel, kerosene, LPG and oil.

The ultimate measure of the economic health of the fisheries, however, is the presence of profits. Here, mini and small trawlers substantially outperformed all other gear types (Table 7).

Table 7. Average annual value of catch, net revenue before sharing and pure profit (loss) in pesos per fishing unit, San Miguel Bay, 1980-1981.

Gear type	Value of catch	Operating costs	Net revenue before sharing	All "other" costs[1]	Pure profit (or loss)[2]
Scissor net	607	150	457	497	(40)
Gill-net (motorized)	32,900	16,900	16,000	15,400	600
Stationary liftnet	10,000	4,750	5,250	9,450	(4,200)
Fish corral	16,200	5,350	10,850	7,450	3,400
Filter net	7,700	1,100	6,600	5,400	1,200
Mini trawler	38,500	21,800	16,700	9,100	7,600
Small trawler	228,700	123,200	105,500	78,600	26,900
Medium trawler	254,400	167,800	86,600	97,900	(11,300)

[1] Includes fixed and variable costs borne by owners after sharing, opportunity costs of owners' investment capital and labor and opportunity costs of all crewmen (including pilot and machinist on trawlers). For further details, see preceding papers in this report.
[2] Net revenue before sharing less "all other costs".

DISTRIBUTION OF PURE PROFITS (LOSSES)

Not all gear types earned pure profits during the 1980-1981 period, although there was ₱3 million overall in pure profits shared among five gear types. All other gears incurred losses or broke even, though as noted earlier this does not mean they earned no incomes for their owners and crewmen. It simply means that the sum of all costs, including opportunity costs, was higher than the value of their catch. There was a very skewed distribution of these pure profits (Table 8) even more so than the distribution of catch by volume and value. Over 85% of the pure profits of the San Miguel Bay fisheries are earned by the mini and small trawlers. If mini trawlers are excluded, small trawlers earned 77% of the pure profits, with gill-netters, fish corrals and filter nets sharing the balance.

As discussed in detail in Villafuerte and Bailey (1982), there is a higher degree of concentration of ownership in the trawler fleet than among other gear types of lower investment cost. This concen-

Table 8. Pure profit (loss) by gear type in pesos in the San Miguel Bay fisheries, 1980-1981.

Gear type	Pure profit (loss) per fishing unit[1]	Total number of fishing units	Pure profit (loss) for all units	Pure profit (loss) per gear type as % of total	Pure profit per gear type as % of pure profits only (₱4,030,900) (excluding losses)
Scissor net	(40)	634	(25,360)	(0.8)	–
Gill-net (motorized)	600	350	210,000	6.9	5.2
Stationary liftnet	(4,200)	171	(718,200)	(23.5)	–
Fish corral	3,400	89	302,600	9.9	7.5
Filter net	1,200	60	72,000	2.4	1.8
Mini trawler	7,600	188	1,428,800	46.7	35.4
Small trawler	26,900	75	2,017,500	65.9	50.1
Medium trawler	(11,300)	20	(226,000)	(7.4)	–
Other gears[2]	0	795	0	0	–
Totals		2,382	3,061,340	100	100

[1] From Table 7.
[2] Pure profit of other gears assumed to be zero on average.

tration of asset ownership results in significant concentration of the benefits of the fishery in the hands of a few. The ₱1.8 million pure profits earned by the 75 small and 20 medium trawlers was earned by approximately 35 families. Almost one-half of these pure profits were earned by five families. In contrast, the ₱0.25 million pure profits earned by the gill-netters were shared among 350 fishing units owned by several hundred families.

In contrast to the mini and small trawlers, medium trawlers were unable to cover all of their costs. This was primarily due to their larger engines and higher operating costs (see Navaluna and Tulay, this report). Because of these losses by medium trawlers, there was no correlation between investment costs (or capital intensity) and pure profits (Fig. 3).

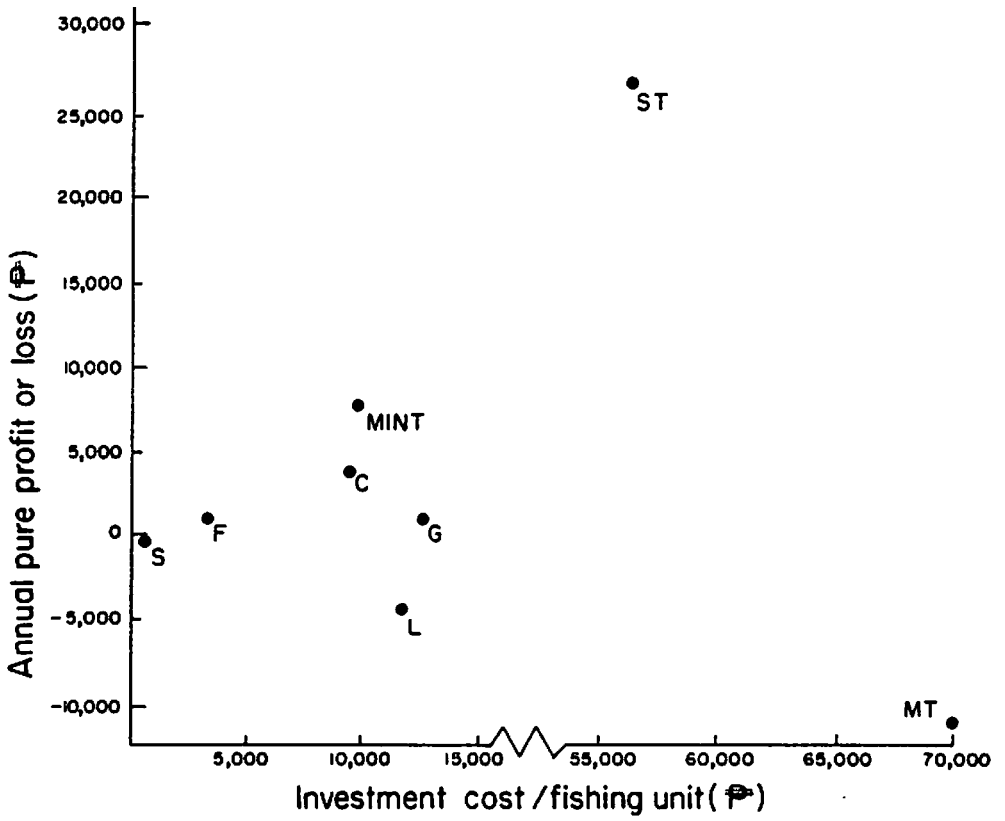

Fig. 3. Relationship between investment costs and pure profits (or losses).
Note: S – scissor net; F – filter net; C – corral; L – liftnet; G – gill-netter; MINT – mini trawler; ST – small trawler; MT – medium trawler.

Fuel Expenditures, Government Taxes and Resource Rents

Annual fuel and oil expenditures by the various fishing units of San Miguel Bay were approximately ₱18.5 million in 1980-1981. These expenditures were split almost evenly between diesel fuel for the small and medium trawler fleets on the one hand, and gasoline for non-trawl fishing units on the other. These expenditures represented 62% of the operating costs of all fishing units (68% for gill-netters and 61% for small trawlers) and 37% of the entire costs of the fishery during the period under study.

These costs are based upon actual fuel expenditures by fishermen. However, a significant part of the price of regular gasoline and diesel fuel to a lesser extent represents government taxes (Table 9). Consequently, to call the full fuel expenditures of fishermen a "cost" is not strictly correct; rather the tax represents a share of the resource rent (or pure profit) that accrues to the Philippine government. This tax is used by the government in part for road construction, energy exploration and special projects; part is also rebated to the oil refineries to cover currency devaluations and increased crude oil costs (the wholesale prices of all fuels are controlled by the government).

Not only is the government's share of the resource rent quite high (approximately ₱5.5 million) and more than the pure profits earned by the San Miguel Bay fishermen, it is derived primarily from sales to non-trawl and mini-trawl fishing units, because the tax is higher on the regular gasoline that they use than on diesel fuel. The non-trawl fishermen are paying a disproportionate share of the fuel taxes, a fact that further skews the distribution of benefits from the fishery in favor of the small and medium trawlers.

Moreover, the price that the gill-netters and the mini trawlers pay for gasoline (₱5.55/l) does not reflect its true cost to most of these fishermen. As pointed out in Yater (this report) and Tulay and Smith (this report), fishermen who obtain fuel on credit often receive lower prices for their catch when selling to the middleman who provided the credit. The data tend to illustrate excessive oligopoly/oligopsony profits in the provision of fuel. Therefore, fuel dealers are also earning part of the resource rents over and above the ₱53.5 million value of the fisheries, which reflects prices actually received by fishermen. The exact amount of these oligopoly/oligopsony rents cannot be determined. However, if the gill-netters and mini trawlers received on average 10% less for their catch than they would have done under a more competitive environment, these profits could be as high as ₱1.9 million, less the cost of the credit provided by the gasoline dealers.

Incomes

Cash incomes of owners and crewmen are determined by the sharing system in use for the gear in question, and are a function of the catch value and costs. During the period observed, monthly cash incomes of non-fishing owners ranged from ₱146 to ₱1,693 and those of ordinary crewmen ranged from ₱164 to ₱599 depending upon the gear type used (Table 10). These cash incomes are the net revenues to owners and crew after sharing, less the fixed and variable costs (including opportunity cost of capital) borne by owners out of their share. These incomes can be compared with labor opportunity costs to determine if labor is making a greater contribution to the national economy by

Table 9. Gasoline and diesel expenditures and taxes for all fishing units, San Miguel Bay, 1980-1981.

	Approximate fuel price per liter San Miguel Bay (1981)	Total tax per liter[1] (₱)	Tax as % of fuel price (%)	San Miguel Bay fishery fuel expenditures (1980-81)[2] (₱)	Total tax revenues (₱)
Regular gasoline	5.55	2.52	45	9.2 million	4.18 million
Diesel	3.20	0.46	14	9.4 million	1.35 million
Total					5.53 million

[1]Source: Caltex Head Office, Manila. Fuel tax is imposed at the wholesale level.

[2]Extrapolated from operating expense data monitored by the project's economics module. Please refer to the preceding papers in this report for additional details on fuel expenditure as percent of operating expenses for each of the major fishing gear types.

Table 10. Average *monthly* cash incomes in pesos of owners and crewmen by gear type after sharing and payment of all fixed and variable costs[1], San Miguel Bay, 1980-1981.

Gear type	No. of months operated	Income of owners[2] Non-fishing	Owner-operator[3]	Income of pilot *(maestro)*	Income of machinist	Income of ordinary crewman[4]
Scissor net	3	n/a	133	n/a	n/a	n/a
Gill-net (motorized)	12	271	516	245	n/a	218
Stationary liftnet	4	(773)[5]	(543)[5]	230	n/a	164
Fish corral	7	740	947	n/a	n/a	207
Filter net	12	175	348	n/a	n/a	173[6]
Mini trawler	12	432	877	445	n/a	342
Small trawler[7]	12	1,693	n/a	810	698	599
Medium trawler	12	146	n/a	482	400	339

[1]Opportunity costs of owner's labor and capital and opportunity costs of crewmen (labor) not yet deducted. Based on average number of months of operation.
[2]After deducting fixed and variable costs that must be borne by owner. This is owner income per fishing unit.
[3]Owner-operator receives owner's share plus one crew share (pilot's share if applicable).
[4]Ordinary crewmen who own no fishing assets, except in the case of gill-netters, where ordinary crewmen may contribute nets.
[5]Loss.
[6]Part-time only.
[7]Weighted average of Sabang- and Castillo-based trawlers.

being used in fishing rather than in some alternative activity. With the exception of liftnets, ordinary crewmen on all other gear types earned at least their opportunity costs. Because the absolute incomes earned are low (with the possible exception of small trawler crew), this is a reflection of the fact that low opportunity wages prevails in the area (Bailey 1982).

It is worth noting that the incomes reported here are not household incomes, which may be higher depending upon the number of fishing units owned or used and the number of working members in the household. These monthly cash incomes do, however, provide an indication of the extent of low incomes in the capture fishery sector, and are most certainly below the poverty threshold established by the Development Academy of the Philippines.[1]

Discussion of Implications

The key points in the preceding sections of this paper can be summarized in three figures that depict the distribution of total annual catch (Fig. 4), total annual value of catch (Fig. 5), and pure profits (Fig. 6) among the various gear types used in San Miguel Bay. The shares of resource rents accruing to the government and gasoline dealers are not shown. The dominance of the trawlers in all three distributions is readily apparent. Small trawlers in particular earn large shares of total catch, value and pure profits, and since they catch many of the same species as other small-scale non-trawl gear, these shares are earned at the apparent expense of the other gears.

The trawlers are also the most efficient of all gears used in San Miguel Bay, their capital and labor productivities are the highest of all gears. If the management goal of the San Miguel Bay is to maximize economic efficiency, every effort should be made to encourage the continued operation of trawlers, although a limit on their numbers would probably have to be considered so that the rent (pure profits) they presently earn would not be dissipated with the entry of excessive trawlers.

However, it is clearly not equitable that 75 small trawlers owned by approximately 35 families and employing 375 crewmen earn more pure profits than the remaining 2,300 fishing units used by

[1]The DAP poverty threshold for a family of 6 in 1971 was ₱5,000 (Abrera 1976). In current terms, adjusting for inflation, the 1980 threshold would be just over ₱15,000.

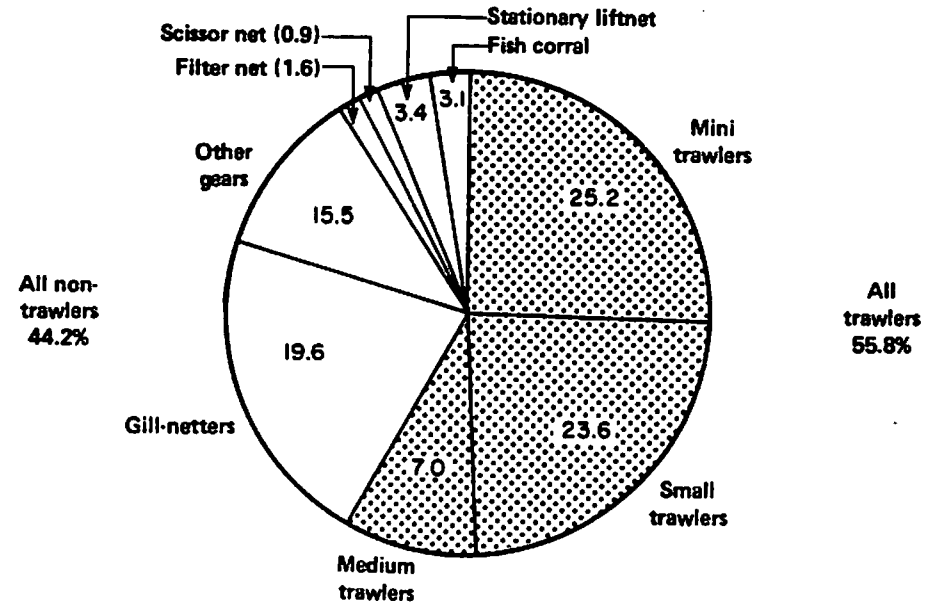

Fig. 4. Distribution of total annual catch (19,000 tonnes) by major gear types (including *balao*), San Miguel Bay, 1980-1981.

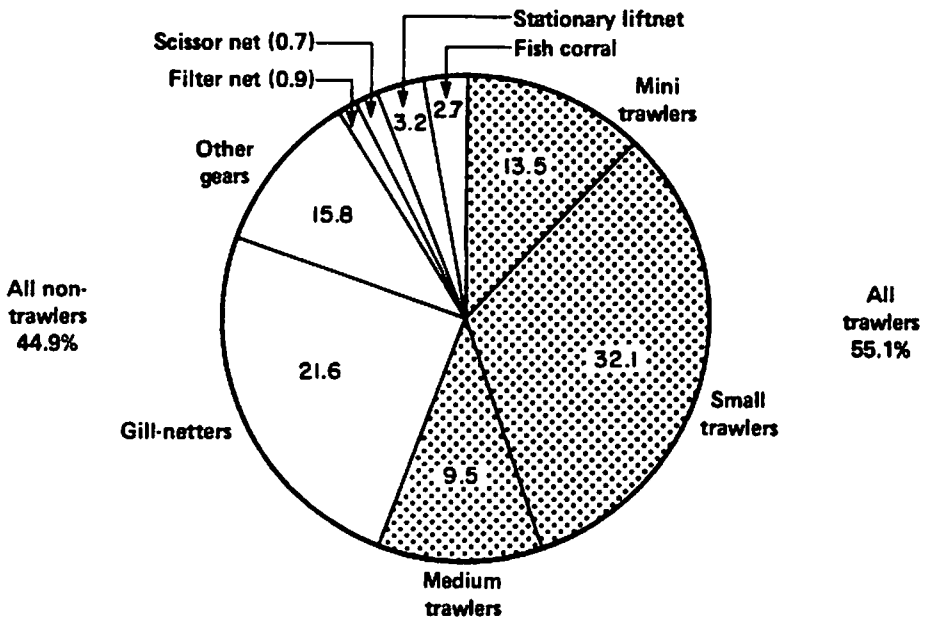

Fig. 5. Distribution of total annual value of catch (₱53.5 million) by major gear types (including *balao*), San Miguel Bay, 1980-1981.

5,100 fishermen. Whether or not this highly skewed distribution of benefits should continue is clearly a political decision. The final project report of San Miguel Bay fisheries (Smith et al., in press) explores management options in considerable detail; it fully integrates the biological, economic and sociological aspects in discussion of the management alternatives that might be considered by policymakers. The only point needing emphasis here is that there is a marked divergence between goals of economic efficiency and equity in multigear fisheries such as San Miguel Bay.

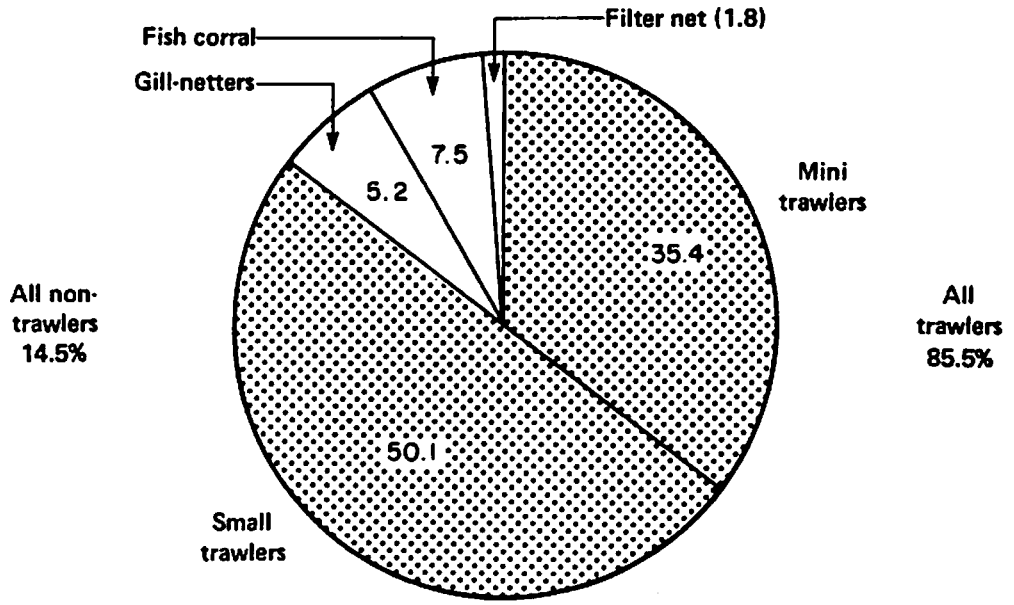

Fig. 6. Distribution of pure profits (₱3 million) among competing gear types, excluding those that incurred losses (i.e., medium trawlers, scissor nets and stationary liftnets), San Miguel Bay, 1980-1981. Also excluded is the ₱5 million share of the resource rents earned by the government through taxes on regular gasoline and diesel fuel.

The distinction being drawn here is somewhat of an oversimplification because although these pure profits are retained by a small group of trawler owners, much may in fact be reinvested in the local economy, generating additional employment for the community as a whole. However, shifting the distribution of benefits in favor of the majority may not have a significant negative impact on this multiplier effect. A definitive answer to this question requires an examination of capital flows, investments and savings patterns among the Bay's fishermen, a study which has not yet been conducted. Nevertheless, as pointed out by Pearce (1978), "employment in secondary and tertiary occupations is generally related to the level of the catch, and is not necessarily affected by the organization of the fishery itself".

What are the implications of the preceding economic analysis for management of San Miguel Bay fisheries? Based on 1980-1981 conditions, the results show that open-access equilibrium has not been reached because pure profits are being earned on average by gears that exploit the Bay. However, in absolute terms, the value of pure profits (₱3 million) is small relative to the total value of the fisheries (₱53 million). There has also been a considerable increase in effective fishing effort in the Bay over the past decade in the rapidly expanding trawler fleet, motorization of gill-netters and the introduction of mini trawlers. Despite this increase in effective effort, some pure profits are still being earned, but there is little room for further expansion.

Because there are no historical data on costs and earnings in San Miguel Bay fisheries, it cannot be determined definitively if the Bay is economically overfished. However, it is believed that further increases in effective fishing effort will certainly reduce economic efficiency and resource rents by raising costs and will ignore the equity issues raised here. Consequently, the major decision that must be faced by those responsible for managing the Bay is how to allocate the benefits from this fishery among the competing users. A positive step in this direction should include the recognition that the present "municipal fisheries" label is inadequate to reflect the diversity of economic conditions found among the various diverse gear types lumped in this single category. Increasing loans to small-scale non-trawl fishermen without simultaneously reducing effort among other gears will have only a negative effect. What is needed is an approach that limits the effective fishing effort in the Bay, and which addresses questions of overfishing and equity simultaneously.

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