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Costs and Earnings of Mini Trawlers

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Abstract

Mini trawlers are the smallest trawlers operating in San Miguel Bay, Philippines. This paper examines the costs and earnings of this type of gear and offers explanations for the high pure profits earned. Variations in catch and incomes are related to differences in the various sharing systems and to variations in fishing effort.

Introduction

The mini trawler, or *mangquerna*, was introduced to Castillo, Cabusao in the early 1950s by fishermen from the community of Vinzons in the neighboring province of Camarines Norte. Vinzons fishermen still migrate annually to San Miguel Bay during the sergestid shrimp *(balao)* season (November to March) when mini trawler catch is at its peak.

Mangquerna is the most widely used local term for this type of gear, though there are more localized terms, such as *bancuerna* (Barcelonita, Cabusao), *itik-itik* (Castillo, Cabusao) and *kuto-kuto* (Tinambac). According to older fishermen in Castillo, its local name *(itik-itik)* was derived from *itik* (duck) due to the tendency of mini trawl operators to congregate during a good catch, just as ducks do when a feed source is located.

This paper reports on the costs and earnings of mini trawlers in San Miguel Bay.

Methodology

As of 1980, there were 188 mini trawlers located in the Bay, not counting those from Vinzons which fish within the Bay at certain times of the year (Esporlas 1982). Fully 51 or 27% of those located within the Bay in 1980 could be found in Barrio Castillo. Castillo and other communities at the southern base of the Bay are the centers for the processing into shrimp paste or *bagoong* of that portion of the mini trawl catch that consists of *balao*.

In 1979, however, the records of the municipal treasurer in Cabusao showed only 36 registered mini trawlers in all barrios of the community, so apparently many mini trawlers failed to register

with the municipality and to pay the necessary license fee. Since the 1980 registry was not available, our 1979 inventory of fishing units in Castillo became the basis for estimating the number of mini trawlers in the community. Because so many of the mini trawlers had failed to register with the municipality, we had difficulty in persuading mini-trawler owners to participate in the study. Many were afraid that the data collected would be turned over to the Bureau of Internal Revenue (BIR). Consequently, we were unable to use random sampling techniques, but instead identified a 30% sample (n = 16) of these Castillo mini-trawler owners who were willing to participate in the costs and earnings study.

Data were collected from these owners through a 12-month record-keeping exercise from June 1980 to May 1981. Prior to the monitoring of their daily costs and returns, interviews were conducted with each owner to determine their investment costs. Notebooks were provided to each respondent and data were collected and recorded either on a daily or a weekly basis depending upon the cooperation of each respondent.

At the start, 16 fishing units were monitored. Within a few months, units had to be dropped from the sample. Three units were sold to new owners who declined to participate in the record-keeping survey; the fourth suffered a major engine breakdown and because the owner was sick and could not afford to repair the engine, the vessel no longer went out fishing. These four units were replaced by four other units which had records of their costs and returns dating back to June 1980 when the study started. There were no subsequent dropouts and the sample size was maintained at 16 throughout the study. Data were collected from a total of 2,992 fishing trips.

Operation of the Gear

Mini trawlers are the smallest of the various trawlers operating in San Miguel Bay. Although smaller than the small and medium trawlers (see Navaluna and Tulay, this report), the net shape, material used and mode of operation is similar. Mini trawlers on the average are 10.5 m long, 0.9 m wide and are generally powered by 16-hp Briggs and Stratton gasoline engines (Fig. 1). Unlike the *banca* used by gill-netters, the mini trawler has no outriggers. Trawling speed is very slow, estimated to be 1 knot (1.85 km/hr) (Vakily 1982); therefore, very few fish are caught along with the shrimp. Mini trawlers are manned by a crew of two. Of our sample, only two were owner-operated while 14 (88%) were each operated by a pilot and a crewman retained by the owner. The limited number of owner-operators can probably be explained by the fact that operating a mini trawler is extremely hard work, undertaken by younger fishermen (or family members) who may not yet have the capital to purchase their own fishing unit.

Mini trawlers use two types of nets, the *pamalao* and *pamasayan* which have the same body but differ in the mesh size and material used at the cod end. The cod end of the *pamalao* consists of a fine-meshed screen like that used for mosquito nets. The *pamasayan* is made of nylon with a cod end mesh size of 17 knots. On the average these nets have a headline length of 4-5.5 m for the upper rope and 5-6 m for the lower rope (Fig. 2).

The *pamalao* is used from September to June, the southwest monsoon period, when the tiny sergestid shrimps *(balao)* are abundant (Fig. 3). The *pamasayan* is used to catch larger shrimps primarily during July and August, when *balao* are not as prevalent. Mini trawlers choose between the two nets depending upon their predicted catch. Switching by mini-trawl operators from one net to the other occurs during the months of May to June and September to October because the onset and decline of the *balao* is never exact. In this manner, the mini trawlers are able to operate throughout the year.

The Castillo mini trawlers operate throughout the shallower areas of the Bay. Though they are legally required as trawlers to fish beyond the 4-fathom (7.3 m) mark, since their main objective is to catch shrimp, mini trawlers fish very close to shore wherever shrimp are to be found. They fish with-

Fig. 1. A mini trawl hull under construction. Mini trawlers are dugout logs without outriggers.

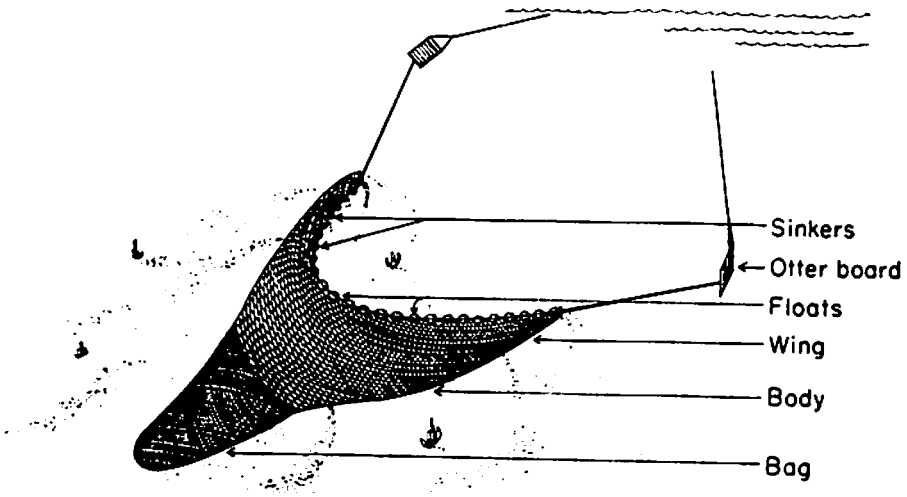

Fig. 2. Mini trawl gear is similar to that of larger otter trawlers but with smaller mesh.

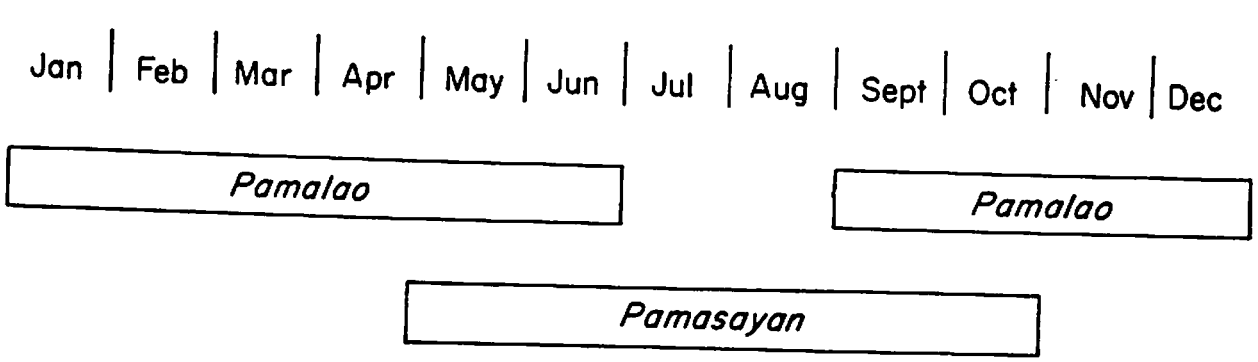

Fig. 3. Seasonality of gear use by mini trawlers.

in 500 m of the shoreline in Barcelonita, Cabusao. The mini trawlers generally do not fish beyond the 7-fm (12.8 m) mark because of their short towing rope and small net.

Other methods are also used to catch *balao*. The most common is a small scissor net *(hudhud)* pushed by one man at wading depths. This gear is similar to the scissor or push net known as *sakag* used to catch *balao* and other species of shrimp that are cooked, dyed red, sun-dried and then shipped to Manila. Push nets operate for only a few months each year, however (see Supanga, this report). Motorized push nets are used in other shrimp fisheries in the Philippines (e.g., Laguna de Bay) but are not used in San Miguel Bay in large numbers or with any regularity.

Catch and Effort

A typical fishing trip for a mini trawler lasts only one day. Fishing for the *balao* using the *pamalao* net is primarily a daytime fishery, with the mini trawlers leaving the shore at 5 a.m. and returning between 3 and 4 p.m. Fishing using the *pamasayan* net is at night often until 3 to 5 a.m. the following morning. Only during one month (June 1980) did mini trawlers on average make more than one fishing trip per day (Table 1).

The average number of trips per year was 187 with little variation from month to month. After adjusting for Sundays which are rest days in Catholic communities like Castillo, the average mini trawler fished on 60% of the 313 potential fishing days during the 12-month period, June 1980-May 1981. If a mini trawler fished on a Sunday, Monday was a rest day because most fishermen believe that when Sunday fishing is good, Monday catch will be poor.

Although average fishing effort (as measured by number of trips) showed only a small variation throughout the year, average monthly catch per fishing unit ranged from a low of 480 kg in August 1980 to a high of 4,365 kg in January 1981 (Table 1). As will be discussed in the next sections, however, average gross incomes per fishing unit did not vary as much as average catch because when catch was low prices per kg were higher. This was due to the presence of larger shrimps in the catch during the months of July-September. Average catch per mini trawler was slightly over 25 t for the 12-month period, or 2.1 t/month.

There was considerable variation in effort (no. of trips) and in catch between fishing units, however (Table 2). For the 12 months the number of trips per fishing unit ranged from 119 to 224. Average catch per trip ranged from 86 to 200 kg, and annual catch ranged from 14.4 t (fishing unit no. 11) to 35.7 t (fishing unit no. 2).

Variation in number of trips (and monthly catch) can be explained by a number of factors, including engine breakdowns (1 major case) and vessel damage during typhoons (3 cases) involving fishing units 8, 11 and 12. The variation in catch per trip can be explained by the following factors: age of the owner-operator[1] (or the boat pilot if the owner did not fish himself), years of fishing experience, education level of the owner-operator or boat pilot, and the gasoline expenditure per trip. Mathematically, this relationship can be expressed as:

$$Y = \alpha A^{\beta_1} E^{\beta_2} S^{\beta_3} G^{\beta_4} e$$

or in log-log form[2]:

$$\text{Log } Y = \text{Log}\alpha + \beta_1 \text{ Log } A + \beta_2 \text{ Log } E + \beta_3 \text{ Log } S + \beta_4 \text{ Log } G + e$$

[1] Due to the arduous work on a mini trawler, age was hypothesized to have a negative impact on catch.
[2] Log-log specification resulted in a higher R^2 than the linear specification.

where

Y = average catch per trip
A = age of the fisherman (owner-operator or boat pilot)
E = years of fishing experience of the fisherman (owner-operator or boat pilot)
S = years of formal education of the fisherman (owner-operator or boat pilot)
G = average gas expenditure per trip
e = error term

Average catch per trip (Y) and average gas expenditure per trip (G) are monthly averages. A dummy variable to cover seasonality effects was not included. Total number of observations for this estimation was therefore 192 for the 16 fishing units in the sample.

The estimated equation using ordinary least squares multiple regression techniques was:

Log Y	= Log	.348	− .334 LogA +	.080 Log E +	.063 Log S +	1.041	Log G
s.e.	=		(.189)	(.084)	(.238)	(.064)	
t	=		1.76	0.95	0.26	16.33	
F	=	70.37					
R^2	=	.60 (Adjusted R^2 = .59)					

Sixty percent of catch variation per trip can thus be explained by the four explanatory variables included in the specified equation. The overall fit of the equation is good. All the coefficients have the expected signs, including age which was hypothesized to have a negative impact on mini-trawler catch. Gasoline expenditure per trip is highly significant ($p > .01$). The coefficient for age is significant at the 10% level, and since older fishermen are less likely to be mini-trawler operators in the first place, the results support the contention that younger fishermen, all other factors being equal, are likely to be more successful than older mini-trawl operators. Fishing experience and formal education of operators have no apparent impact on catch levels. If mini trawlers do in fact group together when shrimp are located, then it is not surprising that experience and education have no effect on catch per trip, since all nearby fishing units will benefit from the success of the more experienced fishermen in identifying good fishing locations.

Gasoline expenditures per trip are a measure of fishing effort since all mini trawlers in the sample are approximately the same size and use identical engines. Increases in gasoline expenditures could be due to either longer search time, or longer trawling time or both. According to the estimated equation, a 10% increase in gasoline expenditure will result in a 10.41% increase in catch, all other factors (age, education and experience) being equal. Average gasoline expenditure per trip during 1980-1981 was ₱91.27; average catch per trip was 136 kg. Therefore, the added cost of a 10% increase in gasoline expenditure would be ₱9.13; the added return expected would be 136 kg x 10.41% = 14.16 kg, valued at ₱21.66 (average price per kg of mini trawler catch was ₱1.53/kg during the study period). The added expenditure would produce an added net revenue of ₱12.53. In the following sections dealing with costs and returns, a particular group of mini trawlers that took advantage of this added net revenue by fishing longer will be identified and some explanations for this different behavior will be put forward. However, it is necessary to first discuss the costs of owning and operating a mini trawler.

Investment Costs

The major items that are required for a mini-trawl fishing unit are the boat, engine and *pamalao* and *pamasayan* nets, including otterboards (Table 3). Together, these items comprise 93% of the current replacement cost (₱9,187) of a mini-trawl unit. Other items include various containers, store-

Table 1. Catch and effort of mini trawlers, Castillo, San Miguel Bay, 1980-1981.

	1980							1981						
	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Annual total	Monthly av.
Effort														
No. of days in month	30	31	31	30	31	30	31	31	28	31	30	31	365	30.4
No. of Sundays	4	4	5	4	4	5	4	4	4	5	4	5	52	4.3
No. of potential fishing days	26	27	26	26	27	25	27	27	24	26	26	26	313	26.1
No. of actual fishing days	16.7	15.4	15.4	13.6	18	14.4	14.7	15.3	16.0	17.8	13.7	15.9	187	15.6
No. of non-fishing days	9.3	11.6	10.6	12.4	9	10.6	12.3	11.7	8.0	8.2	12.3	10.1	121	10.5
No. of fishing trips	16.8	15.4	15.4	13.6	18	14.4	14.7	15.3	16.0	17.8	13.7	15.9	187	15.6
Av. catch/fishing unit (kg)	1,344	748	480	588	2,014	3,240	2,970	4,365	3,136	3,168	1,554	1,456	25,063	2,089
Catch per trip	81	49	31	43	112	225	202	285	196	178	113	92	–	136
Catch per fishing day	80	49	31	43	112	225	202	285	196	178	113	92	–	135

Table 2. Annual catch and effort of mini trawlers by fishing unit, Castillo, San Miguel Bay, 1980-1981.

	Fishing units															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Effort																
No. of days in a year	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365
No. of Sundays	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
No. of potential fishing days	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313	313
No. of actual fishing days	184	211	206	191	176	175	169	180	276	199	150	119	210	212	195	172
No. of non-fishing days	129	102	107	122	137	138	144	133	87	114	163	194	103	101	118	141
No. of fishing trips	179	209	204	188	174	175	171	179	224	199	150	119	210	212	195	172
Catch/fishing unit (kg)	25,187	35,703	33,969	32,080	34,750	30,393	15,481	24,800	23,069	17,067	14,384	21,707	21,278	18,309	22,483	20,663
Catch per fishing day	137	169	165	170	197	174	91	138	102	86	96	182	101	86	115	120
Catch per trip	142	171	167	171	200	174	92	139	103	86	96	182	101	86	115	120

Table 3. Average investment costs of mini trawlers, Castillo, San Miguel Bay, 1981.

Item	Av. no. owned	Av. acquisition cost/item (₱)	Replacement cost (1981) per item (₱)	Av. expected life (yr)	Annual depreciation per item[1] (₱)
Banca	1	1,562	4,500	9.2	489
Engine	.81	2,888	3,700	10.3	359
Nets:					
Pamalao	1	444	600	2.1	286
Pamasayan	1	361	500	2.8	179
Rattan basket	7.2	14.77	15	1.2	12.50
Tub	1	50	74	1.0	74
Storehouse	.31	1,090	900	8.6	105
Otterboards[2]	.25	167	180	3.8	47
Flashlights	.75	29	54	1.5	36
Gasoline container	.75	36	40	2.2	18
Anchor	.13	50	100	5	20
Average acquisition cost per mini-trawl unit[3] = ₱5,298			Average replacement cost per mini-trawl unit[4] = ₱9,186		Average annual depreciation per mini-trawl unit[5] = ₱1,496

[1] Based upon 1981 replacement cost.
[2] For most respondents, the cost of the otterboards was included in the cost of nets.
[3] Equals Σ (av. no. owned x av. acquisition cost per item).
[4] Equals Σ (av. no. owned x av. replacement cost per item).
[5] Equals Σ (av. no. owned x annual depreciation per item).

house (five of 16 respondents used a storehouse separate from their own house), flashlights and anchors (14 brave souls of 16 respondents used no anchor).

As shown in Table 3, there is a significant difference between the acquisition cost of the average fishing unit of our 16 respondents and the current replacement cost of the same set of items. The average length of current ownership of boats and engines in the sample units was 3.3 and 3.9 years, respectively. The oldest boat was purchased in 1972 and the oldest engine in 1973, indicating that these items can have a long life if well cared for. Respondents believed boats could, on average, last nine years and engines, 10 years. In fact several of the boats and engines used by respondents were acquired second-hand; all boats were purchased through own finances. Thirty eight percent of the engines were financed through the Development Bank of the Philippines.

All respondents used 16-hp Briggs and Stratton gasoline engines, 13 respondents own engines, one rents his engine and the other two use mortgaged engines. These mortgaged engines are owned by others who, in return for a cash payment of approximately ₱500, lend their engines to operators of mini trawls. Their engines can be redeemed upon repayment of the amount borrowed without interest. The engine lender thus receives a cash loan for no interest (except wear and tear on his engine), and the engine borrower uses an engine for only the cost of interest foregone on his ₱500 cash payment.

A mini-trawler unit can thus be acquired for less than a gill-net unit (see Yater, this report). Based on current replacement costs, annual depreciation costs for the average mini trawler is ₱1,496, assuming a straight-line basis and zero-salvage value.

Value of Catch

As mentioned earlier, the monthly catch value for the average mini trawler varies less than the monthly catch itself due to the presence of larger shrimps with high prices from June to September.

However, at its peak in January, monthly value of catch is still more than double the lower values obtained from June to September (Fig. 4). Although such variation is typical of each season, the peak apparently does not always occur during the same month each year. One determining factor is the weather. The average monthly value of catch per mini trawler during the period of study was ₱3,209.

Operating Costs

Operating expenses are deducted from the gross value of the catch, yielding the net revenue which is divided between the owner and crew depending upon the sharing system that is used. Not surprisingly, the major operating expense for mini trawlers is gasoline, which is 78.6% of the total (Table 4). An average of 16 liters is consumed per trip. Food is the second major operating expense. Because only the larger shrimps are iced, expenses for ice are very low. Some units in the sample used no ice at all during the whole period of study. However, it is a common practice for middlemen to provide ice free to mini trawlers as part of an agreement to assure supply of shrimps so absence of an expense for ice in our respondent's records does not necessarily mean no ice was used.

The production system for mini trawlers can only be understood if its links to suppliers and middlemen are explained. In addition to ice, shrimp middlemen and *balao* processors also provide gasoline in advance to mini trawlers (and to other motorized vessels) based in Castillo in return for the right to buy the catch. There are at least five regular gasoline suppliers for the mini trawlers in Castillo and several others who also sell gasoline during the peak months of the *pamasayan* season. In some cases, the whole operation of input supply, production and processing is vertically integrated. To cite an example, an individual may own a small fleet of mini trawlers of five to six vessels, engage in buying and selling of shrimps and crabs and sell gasoline and other fishing accessories.

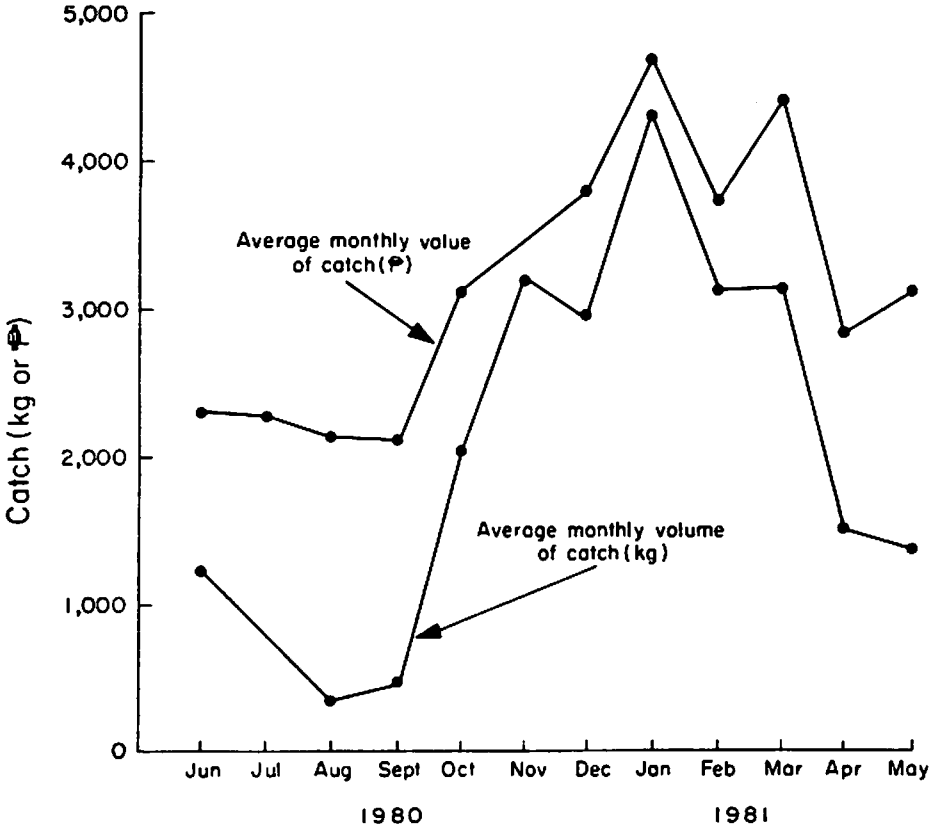

Fig. 4. Average monthly volume and value of catch of mini trawlers, Castillo, San Miguel Bay, June 1980-May 1981.

Table 4. Average monthly operating expenses and net revenue in pesos (before sharing) of mini trawlers, Castillo, San Miguel Bay, 1980-1981.

	1980							1981						
	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Annual total	Monthly average
Total value of catch per fishing unit	2,377	2,347	2,168	2,077	3,105	3,601	3,867	4,715	3,788	4,428	2,876	3,155	38,504	3,209
Total operating expenses per fishing unit	1,554	1,645	1,735	1,576	2,069	1,874	1,897	1,963	1,993	2,064	1,505	1,832	21,707	1,809
gasoline	1,291	1,359	1,432	1,316	1,640	1,390	1,405	1,503	1,537	1,603	1,180	1,410	17,068	1,422
oil	37	40	38	39	44	48	48	49	53	44	37	37	514	43
repair/parts[1]	24	13	44	18	94	84	104	54	62	51	16	44	609	51
food	159	163	176	151	218	195	184	192	219	226	194	259	2,336	195
miscellaneous (cigarettes, ice)[2]	43	70	45	52	73	151	156	165	121	141	78	82	1,183	99
Monthly net revenue per fishing unit before sharing (P)	823	702	433	501	1,036	1,727	1,970	2,752	1,795	2,364	1,371	1,323	16,797	1,400
Average price/kg received[3]	1.76	3.14	4.52	3.53	1.54	1.11	1.30	1.08	1.21	1.40	1.85	2.16		1.53[4]

[1] Some owners but not all include minor repair and maintenance costs as part of the operating costs rather than pay for them out of the owner's share.
[2] Also includes payment for occasional labor to assist with net or boat repair or to dive to recover nets entangled on underwater objects.
[3] Average price received is not the average price of *balao*, but the average per kg of the whole catch which also includes some larger shrimps.
[4] Weighted average by volume caught per month.

The capital requirement and risks for a middleman with these various activities is quite substantial which explains the small number of individuals in Castillo who can function in this manner. Gasoline is purchased in 55-gallon drums from Libmanan at ₱5.05/l (1981 price) and transported by private jeepney to Castillo where it is resold at ₱21.00/gallon (equivalent to ₱5.55/l). If the middleman is engaged in buying and selling shrimps, gasoline would be advanced to the operators of mini trawlers to assure a steady supply of shrimp. Agents may also be retained and paid a 10% commission to purchase shrimps. Iced shrimps and blue crabs are shipped to Manila 400 km away in styrofoam boxes via the bus or privately-owned jeepneys. A jeepney is used for shipments of four or more styrofoam boxes. The bus from Naga City is used for small shipments. In either case, a regular buyer in Manila receives the shipment and is responsible for selling the shrimp. Payment is made to the Castillo businessman after the sale of the shrimp. The actual transfer of funds is made when the jeepney makes the next trip or by bank transfer between Manila and Naga. Other fishing equipment, engine parts and nets to supply the businessman's own boats are purchased during trips to Manila where prices are lower.

The Castillo businessman purchases ice to preserve the shrimp he sends to Manila from the Naga City ice plant (which is the closest to Castillo) at ₱20.00 per block which is transported to Castillo in the back of a jeepney. Rice husks and sacks are used to minimize melting. What is not needed for the Manila shrimp shipments is resold to other middlemen at ₱36.00 per block (1981 price). The jeepney takes shrimp to Naga for shipment on the bus and brings ice to Castillo on the return trip thus optimizing the use of the jeepney.

The few Castillo businessmen who engage in these multifarious activities require significant amounts of capital to keep their businesses operating smoothly. Advances to mini-trawler operators is one method by which regular supply is assured. Although *balao* processors do not need the Manila outlet for their product and timeliness of shipments is less of a problem, they too assure supply by providing advances, both cash and in kind, to mini-trawler operators.

Because the per trip operating costs of mini trawlers (Table 5) are higher than those for any other gear in the community, mini-trawler operators in many cases believe they have little choice but to tie themselves to particular businessmen. For most mini-trawl operators their entire production unit, their inputs and their market outlets are all controlled by local businessmen. Whether this arrangement is exploitative or not is debatable; at least a regular, though fluctuating income for the crew of mini trawlers is assured.

Sharing Systems

The income of owners and crew of mini trawlers depends upon the sharing system used. The basic system of sharing divides the net revenue (gross income minus operating expenses) equally between the owner and the crew. In Castillo, however, there are three variations of this basic system that indicate ways by which owners successfully provide incentive to their crew. For example, owners can offer to (1) increase the share of the pilot and/or (2) shoulder more of the routine repair and maintenance costs themselves.

The first of the three variations (variation A) is that in which the pilot receives 10% of the owner's share, or 5% of net revenue in addition to his share as a member of the crew (Fig. 5). The daily incomes of the partner (ordinary crew) and the pilot under this system are ₱19.46 and ₱23.35, respectively. The owner must still pay for fixed costs (depreciation, licenses, etc.) and certain variable costs (major repair and maintenance) out of his daily income of ₱35.03. Five (31%) of the 16 mini trawlers in our sample used this sharing system.

Another five (31%) mini trawlers used a sharing system (variation B) whereby repair and maintenance expenses are paid by the owner out of his share rather than as an operating expense (Fig. 6). This system, however, did not apparently have the desired effect of increasing incomes of either crew or the owner. In fact, daily incomes were lower (but not statistically lower) than daily incomes that crew and owners received under the first sharing arrangement. Because the former group fished more often on average (16.6 vs. 13.9 days/month), monthly incomes for the two groups were the same (Table 5). We examined the average volume of catch, value of catch and price received of the 10 mini trawlers in these two sharing system groups and found no significant difference between the two. We therefore concluded that this particular method of incentives to crew is ineffectual.

The remaining six mini trawlers in our sample practiced a sharing system (variation C) whereby 20% of the owner's share (equivalent to 10% of the net revenue) is given to the pilot (Fig. 7). This incentive from the owner is thus twice as large (in percentage terms) as the incentive payment made under variations A and B. Minor repair and maintenance expenses are treated as operating expenses, as they were in variation A. This group of mini trawlers has significantly higher gross income and owner and crew income than the other two sharing system groups. The daily incomes of the partner and pilot are ₱29.22 and ₱40.90, respectively; owner's income is ₱46.76. Despite the fact that average prices received were slightly lower than for the other two groups, this added incentive to the pilot appears to have the desired effect of increasing incomes of both owner and crew.

This third group of mini trawlers tended to fish longer than the other two groups; their fuel expenses were on average ₱7.50 higher per trip, implying they either searched or fished for about one hour longer than the other two groups. This third group of mini trawlers are all owned by a single owner who is also a businessman of the type described under the previous section on operating costs. He has very little pilot turnover and claims to have been able to attract the best pilots in Castillo. His pilots, who average 25 years of age, are approximately 10 years younger on average than those of the other two groups, implying that older age is not an advantage for the strenuous work required of pilot and crew of a mini trawler. He also pays occasional bonuses to his crew. Finally, his boats are better maintained than those in the other groups. Three of the boats in the other groups were damaged or had engine trouble and unfortunately for two of them, these problems occurred during

the peak of the *balao* season. A combination of factors, including the added incentive provided by this sharing system, therefore produces added benefits to owner and crew alike.

Average monthly incomes received by owners and crew under these three sharing systems are shown in Table 6. The usual sharing day for mini trawlers is Sunday since this is a rest day, but there are occasional variations depending upon the crew's need for cash and the owner's cash position. If the owner has not yet been paid by his shrimp buyers, the sharing is postponed but with the owner providing for the daily maintenance of the crew's families.

Table 5. Average operating expenses per trip for mini trawlers, Castillo, San Miguel Bay, 1980-1981 (187 trips per year).

Item	Cost (P)	Percent of total operating cost
Gasoline	91.27	78.6
Food	12.52	10.8
Cigarettes, ice and other miscellaneous expenses	6.35	5.5
Repair/parts	3.27	2.8
Oil	2.76	2.4
	116.11	100.0

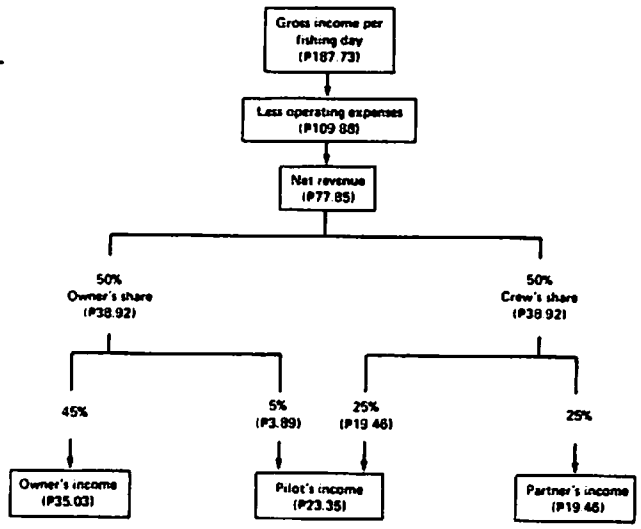

Fig. 5. Revenue sharing systems of mini trawlers, Castillo, San Miguel Bay, 1980-1981. Variation A: daily sharing system, with minor repair and maintenance costs treated as operating expense (n = 5).

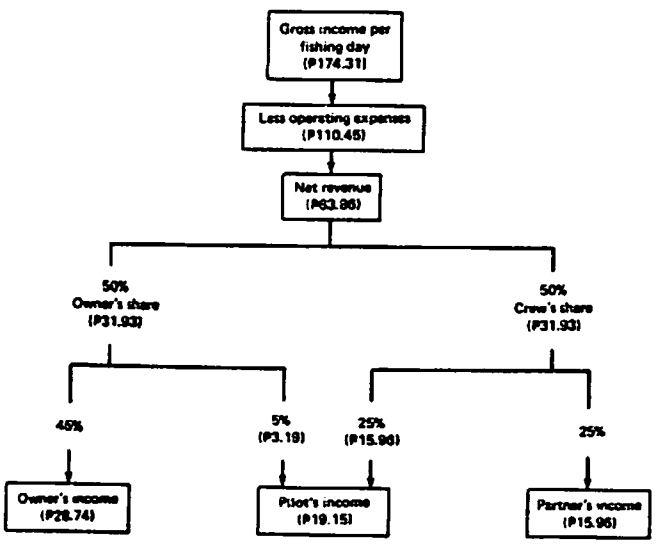

Fig. 6. Revenue sharing systems of mini trawlers, Castillo, San Miguel Bay, 1980-1981. Variation B: daily sharing system, with all repair and maintenance expenses paid by owner out of owner's share (n = 5).

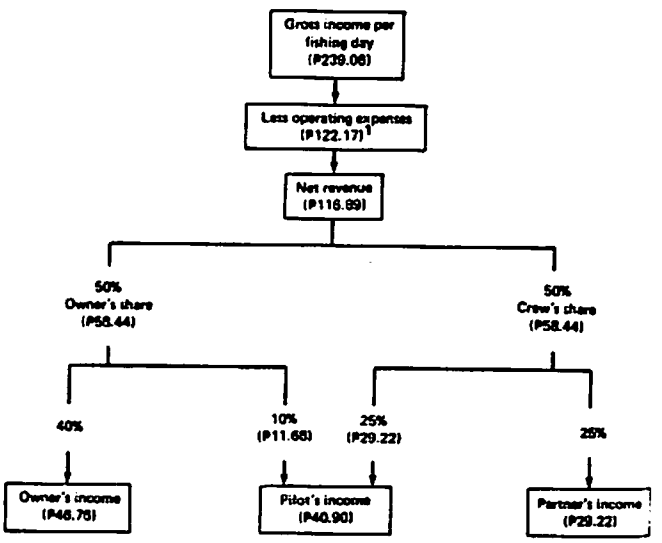

Fig. 7. Revenue sharing systems of mini trawlers, Castillo, San Miguel Bay, 1980-1981. Variation C: daily sharing system with additional incentive share to pilot (n = 6).

[1] Includes minor repair and maintenance.

Table 6. Monthly average incomes of owners, pilots and partners (ordinary crewmen) of mini trawlers, Castillo, San Miguel Bay, 1980-1981, under various sharing systems.

	Sharing systems[1]			
	Variation A (n = 5)	Variation B (n = 5)	Variation C (n = 6)	All mini trawlers (n = 16)
Average no. fishing days/month	13.9	16.6	15.9	15.6
Monthly income (₱)				
non-fishing owners[2]	487	477	743	580
pilots	325	318	650	445
partners	270	265	465	342

[1]See Figs. 5-7 for details.
[2]Before deduction of fixed and variable costs borne by owner.

Returns to Capital and Labor

To determine whether any excess profits (pure profits or rent) exist in the mini-trawler fishery, all remaining fixed, variable and opportunity costs must be subtracted from the incomes that are earned by owners and crew after sharing. Owners incur all three of these costs and crew incur opportunity costs. For this study, we have chosen to represent any pure profits remaining to owners as a return to capital and any pure profits remaining to crew as a return to labor. Together, these returns represent pure profits or returns to the fishing unit.

RETURNS TO CAPITAL

After deducting all remaining fixed and variable costs from the ₱6,960 annual income of owners, a residual of ₱5,184 remains (Table 7). This residual represents the return to the owner's capital, labor, management and risk. Further accounting for the opportunity costs of the owner's capital and own labor results in a pure profit to owners of ₱2,821 annually per fishing unit. The opportunity cost of capital is the interest foregone (9%) on the capital invested when the mini-trawler unit was acquired. The opportunity cost of the owner's labor is the income foregone (estimated at ₱38.50/man-day) during those 4 days/month when he must engage in work to support his fishing unit.

RETURNS TO LABOR

In addition to actual fishing days, boat pilots and partners spend an average of 4 days/month working without remuneration on repair and maintenance of their fishing units. Adding these days to actual fishing days results in crew working a total of 235.2 days/year on average (Table 8). We used a daily wage of ₱10 to estimate the opportunity cost of labor for pilots and partners of ₱2,352 annually. Deducting these amounts leaves a pure profit for labor of ₱4,740 for the average mini-trawl unit.

RETURNS TO THE AVERAGE FISHING UNIT

Summing up the pure profits of owners and crew results in a pure profit for the average mini trawler of ₱7,561 annually (Table 9).

Excess profits of this amount should be sufficient to attract new entrants into the fishery. Although the mini-trawler fleet in San Miguel Bay has indeed expanded rapidly during the 1970s due in part to the availability of subsidized credit, there is no evidence of a rush to this gear by

Table 7. Annual returns to capital of mini trawlers (in pesos), Castillo, San Miguel Bay, 1980-1981.

	All mini trawlers		All mini trawlers
No. of fishing days/year	187.2	Variable costs	
Daily income of owner	37.18	maintenance and repair	127
		rental fees[2]	83
Annual income of owner	6,960		
		Subtotal	210
Annual costs of owner			
		Total fixed and variable costs	1,776
Fixed costs			
		Residual return to owner's capital,	
mayor's fee	20	labor and management	5,184
license fee[1]	50		
depreciation	1,496	Less opportunity costs	
Subtotal	1,566	investment capital[3]	515
		own labor[4]	1,848
		Total opportunity costs	2,363
		Owner's pure profit	2,821

[1]Based on current replacement costs (Table 3).
[2]Two owners rented a boat and engine, respectively, for a short period while their own equipment was being repaired.
[3]Based on 9% of acquisition costs.
[4]Represents work performed by owners in support of their mini trawler. Estimated at 4 days/month and ₱38.50/day, based on daily earnings from processing, the activity foregone.

Table 8. Annual returns to labor of mini trawlers (in pesos), Castillo, San Miguel Bay, 1980-1981.

	Boat pilot	Partner	Per fishing unit
No. of fishing man-days/year	187.2	187.2	374.4
No. of gear repair man-days/year	48.0	48.0	96.0
Total man-days/year	235.2	235.2	470.4
Daily income	28.53	21.92	50.45
Annual income	5,340	4,104	9,444
Less opportunity cost[1]	2,352	2,353	4,704
Pure profit	2,988	1,752	4,740

[1]Estimated at ₱10 per day.

Table 9. Annual pure profit for mini trawlers (in pesos), Castillo, San Miguel Bay, 1980-1981.

Pure profit of owners (capital)	2,821
Pure profit of labor	4,740
Pure profit per fishing unit	7,561

fishermen presently operating less profitable types. The possible reasons relate primarily to the fact that work on a mini trawler is much more arduous than on other gear types. The average fishing trip lasts longer than that of a gill-netter for example. Also, the daily operating capital requirements of mini trawlers are the highest among the municipal fishing gears, with the exception of the small trawlers which really belong in a different category (see Navaluna and Tulay, this report). Finally,

the monthly income of owners and crew is highly variable from month to month unlike those of gill-netters which tend to be more stable. These factors produce a premium to those involved in owning and operating mini trawlers. In conclusion, it is recommended that these aspects of barriers to entry and pure profits in the mini-trawl fishery be examined in more detail to determine whether this fishery offers potential for absorbing capital and labor from those other fisheries in San Miguel Bay which are far less profitable.

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