Costs and Returns of Cabusao Stationary Gears

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Abstract

Costs and returns of three major stationary gears of Cabusao, San Miguel Bay, Philippines, are analyzed. The gears discussed include fish corrals, liftnets and filter nets. Systems for allocation of fishing rights are presented and the returns of capital and labor determined based on the sharing system practiced for each gear.

During the observation period, the fish corrals and filter nets earned pure profits in excess of their opportunity costs and the liftnets incurred pure losses.

Introduction

Stationary gears form an important part of the municipal fisheries of San Miguel Bay, Philippines. As of 1981 there was a total of 320 stationary gears in the Bay consisting of 89 fish corrals, 171 liftnets and 60 filter nets. In addition to these major types, there were also smaller numbers of tidal weirs and semi-permanent barricades which because of their lesser importance were not included in this study.

These stationary gears remain much the same as when they were first introduced into the Bay many years ago. Energy saving as they are, they represent a 'traditional' form of technology that has been very popular over the years and which, due to the recent increases in fuel prices, will undoubtedly remain popular for years to come.

As pointed out by Spoehr (1980), the fish corral (*sagkad* in Tagalog and Bicol languages) is an ancient invention and many were already in use in the Philippines when the Spaniards arrived in the 1500s. Until the 1930s it was the most important commercial fishing gear in the country, including San Miguel Bay (Herre 1927; Umali 1937). Numerous types of fish corrals exhibiting various designs are used from shallow to deep waters (Spoehr 1980). They all use a barricade to guide the fish into the inner chambers where they are trapped (Fig. 1). In San Miguel Bay, shallow water types predominate. Their contribution to the total catch of the Bay has declined considerably since World

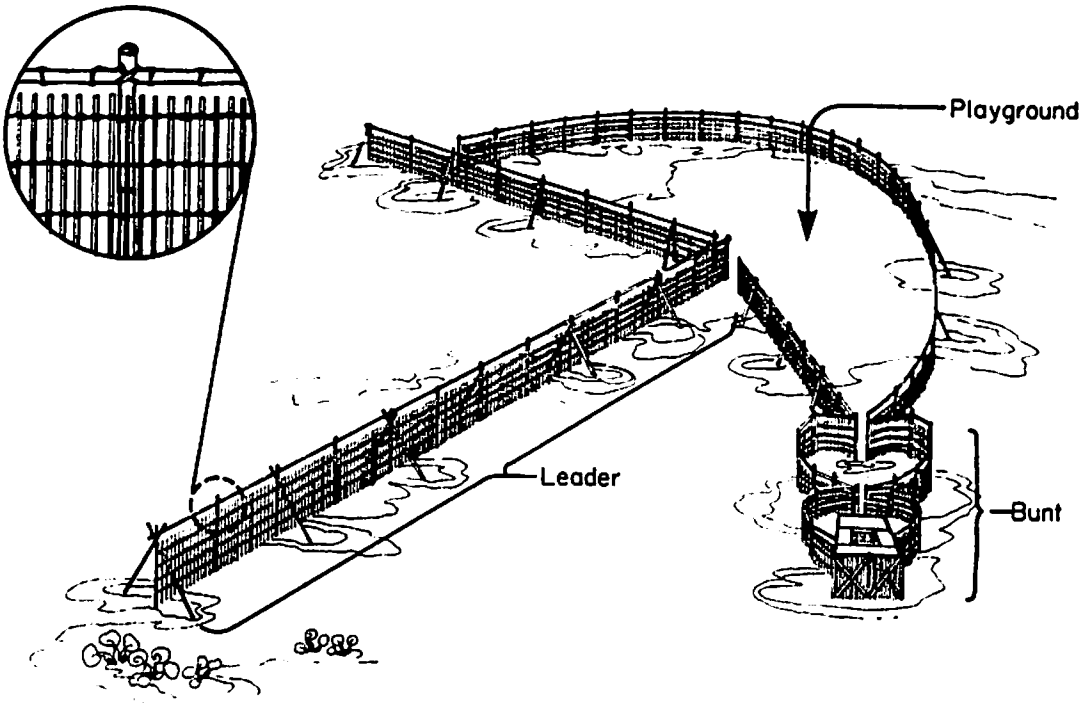

Fig. 1. Fish corral (*baklad*, also known as *sagkad*). Source: Umali (1950).

War II with the motorization of the municipal fishing fleet and particularly with the introduction of trawling. In the 1930s, Cabusao fishermen claimed that ₱500 was sufficient to erect a fish corral. Prior to 1970, the netting material used for the corral was an improvised bamboo screen (locally known as *banata*), but during the 1970s polarex material (plastic screen) was introduced. Current investment cost (approximately ₱10,000) is comparable to that required for other municipal gear such as a motorized gill-net unit.

Set liftnets (*bukatot* in Bicol) that currently operate in San Miguel Bay are also ancient fishing devices, though their reintroduction to San Miguel Bay in their present form is apparently quite recent (Fig. 2). Liftnets take many forms (Umali 1950; Spoehr 1980) and the Philippine *basnig* [a mobile liftnet usually operated from a vessel exceeding 3 gross tons (GT)] is thought to have evolved from earlier stationary liftnet types. Every year during the southwest monsoon a large *basnig* fleet is based at Mercedes at the mouth of San Miguel Bay but these vessels operate mainly outside the Bay. In the past, they used to operate within the Bay but it has now become too shallow for their nets which extend below the vessel during fishing. Although no historical data are available, respondents say that the stationary liftnet made its appearance in San Miguel Bay in the early 1960s, with Cabusao fishermen adopting it in 1967. Due to its small size, it is able to operate in the shallower depths where *basnig* do not operate. Currently, the stationary liftnets concentrate in the 4-7 fm (7.3-12.8 m) area in the center of the Bay.

Like the fish corrals, filter nets *(biyakus)* have also been prevalent in the Bay for many years. Filter nets are relatively simple gears used in shallow waters against the tide. In the 1930s, the gear was essentially mobile and could be removed from the water at the end of the day's operation. At that time the gear consisted simply of two poles with the net tied between them. By the 1940s, in Cabusao the gear evolved into a more substantial structure with up to 25 supporting poles and became a stationary gear (Fig. 3). It remains a much cheaper gear than the fish corrals and stationary liftnets.

The purpose of this paper is to examine the economics of these three stationary gears. The focus is on costs and earnings to determine the returns to capital and labor for each of the three gears.

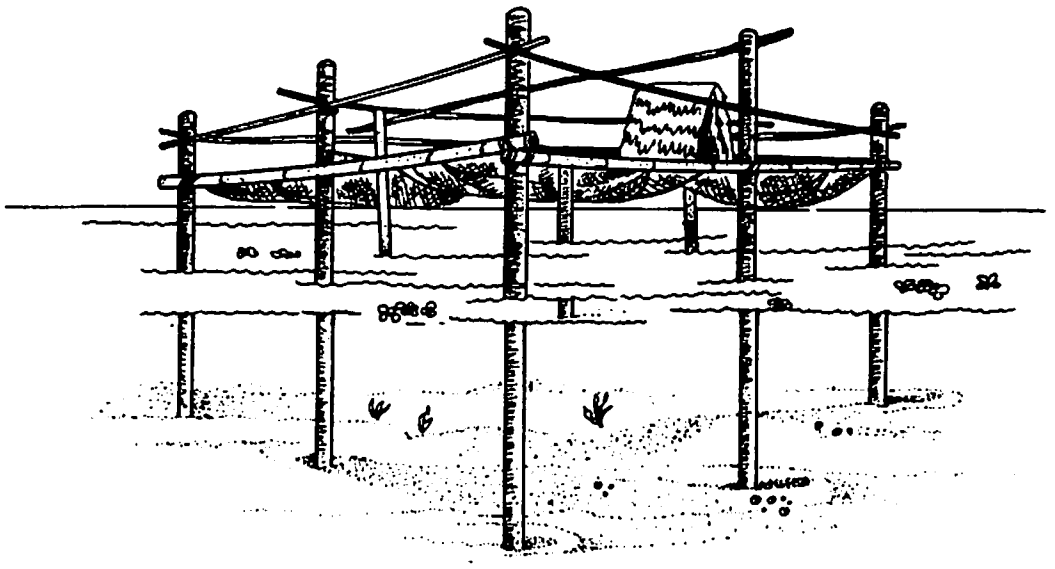

Fig. 2. Stationary liftnet *(bukatot)*.

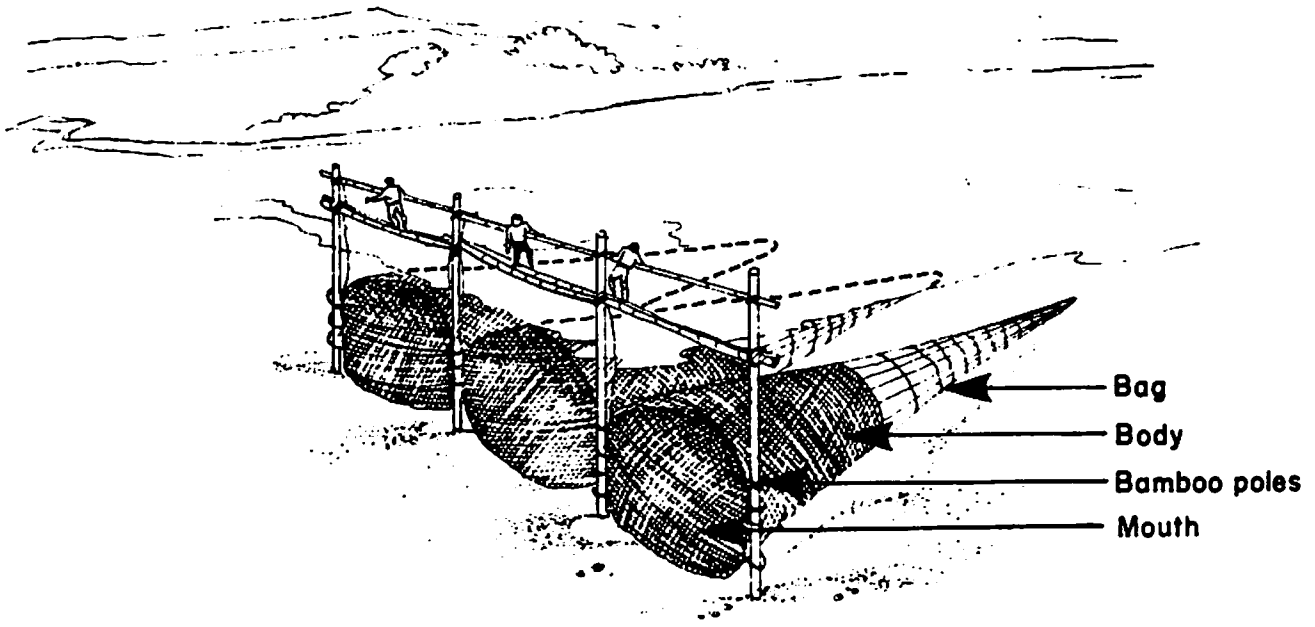

Fig. 3. Filter net *(biyakus)*. Source: Umali (1950).

Operation of Stationary Gears

FISH CORRALS

Fish corrals in San Miguel Bay are constructed in well sheltered waters along the shore and rivers. A major concentration of fish corrals is in the Looc River (actually an estuary) between Tinambac and Siruma. A second concentration is near the mouth of the Bicol River. This gear is most productive during full moon *(bulanon)* or when it is waxing. Fish corrals also operate during new moon *(dulum)* or when it is waning, but the bunt is hauled only once instead of the usual twice daily. Fish corrals operate seven months per year during the southwest monsoon, usually

starting in March and ending in September. Those gears operating near Tinambac have a somewhat longer season because they are located in more sheltered areas. The most common species caught are: anchovies *(dilis)*, small herring *(bulinao)*, deep-bodied crevalle *(salay-salay)*, deep-bodied anchovies *(tigi)*, shrimps *(bilugon)* and blue crabs *(kasag)*.

LIFTNETS

The stationary liftnet *(bukatot)* consists of a platform set on posts in waters between 4 and 7 fm. The structure is made of the trunks of anahaw palms and bamboos. Liftnets are operated during the dark phases of the moon with the aid of lights to attract schools of fish. Fish attraction usually takes 2-3 hours. The light's intensity is reduced when enough fish have been detected to encourage the fish to move nearer the surface of the water towards the light. Hauling is simply done by lifting the net, and the catch is then transferred to a boat where the species are sorted. An average of three hauls are made each night. Like the fish corral, this is a seasonal type of gear operating from 4-7 months per year depending on the weather. The usual species caught are similar to those caught by the fish corral: anchovies, small deep-bodied herring *(tamban)*, small herring, deep-bodied crevalle, and squid *(pusit)*.

FILTER NETS

Filter nets *(biyakus)* are usually located at the mouths of rivers with the mouth of the net facing the current. The gear has no non-return valve but relies on the strength of the current to make escape of the catch difficult. Unlike the fish corrals and liftnets, the filter nets are used year-round, although the peak season is the same as that of the other stationary gears (March-September). Like the fish corral, the filter net is most productive during the full moon, at which time fishermen will make two trips to the gear during the night to haul the net and harvest the catch. Single trips are made at other times. The proximity of the gear to shore also allows fishermen to use this gear even during times when the catch is very low, unlike the fish corrals and liftnets for which the purchase of gasoline is required to operate the *bancas* to reach the gear. The catch of the filter nets is known as *halo*, or 'mixed' species such as small anchovies, croakers, shrimps, occasional blue crabs, tiny shrimps *(balao)* and trash fish *(diaco)*.

Methodology

Data on fishing gear economics were collected through a record-keeping activity involving a small sample of gear owners and operators who were accessible from the site of our research station in Castillo, Cabusao. The Looc River was unfortunately too far away to include in the sample.

The period during which data were collected was June 1980 to May 1981. Based on our household survey conducted in Castillo during the late 1979, all owners and operators of these stationary gears were identified. We identified three fish corrals, three liftnets (the owners actually lived outside the barrio) and 23 filter nets. All three fish corrals, three liftnets and four of the filter nets were included in the sample, and their owners were asked to keep daily records of their fishing activities. When two of the three fish corrals stopped their operation in October 1980, two others from a nearby barrio were substituted so that the full 12-month fishing cycle could be monitored. Both owners and operators of these gears were interviewed to assure completeness of data.

To avoid repetition and aid comparison the following sections discuss important aspects of the analysis for all three gears together.

Catch and Effort

Fish corrals and liftnets are seasonal gears while the filter net is operated year-round (Table 1). The catch from the filter net is collected on the average every two days. The gear is used on about 190 days per year. More than one trip is made to the gear on several of these days, however. Decem-

Table 1. Catch and effort of stationary gears sampled in the Cabusao area, 1980-1981.

	1980							1981					Annual totals	Monthly average[1]
	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May		
Fish corral														
No. fishing days	24	23	20	16						13	25	24	145	20.7
No. non-fishing days	6	8	11	15			Not operating			18	6	6	70	10.0
No. fishing trips	30	30	30	21						17	37	44	209	29.9
Total catch (kg)	1,038	1,185	916	928						398	684	1,410	6,559	937.0
Catch per fishing day (kg)	43	52	46	58						31	27	59		45.0
Catch per trip (kg)	35	40	31	44						23	18	32		32.0
Liftnet														
No. fishing days	10	14	24	7									55	13.8
No. non-fishing days	20	17	6	23				Not operating					66	16.5
No. fishing trips	10	11	24	7									55	13.8
Total catch (kg)	541	1,233	1,727	433									3,934	983.5
Catch per fishing day (kg)	54	88	72	62										69.0
Catch per trip (kg)	54	88	72	62										69.0
Filter net														
No. fishing days	15	18	15	21	14	15	18	18	10	15	16	15	190	15.8
No. non-fishing days	15	12	15	9	17	15	13	13	20	16	14	15	174	14.5
No. fishing trips	17	22	16	23	15	17	18	20	10	21	23	23	225	18.8
Total catch (kg)	472	616	356	514	509	387	306	307	105	434	541	688	5,235	436.2
Catch per fishing day (kg)	32	34	24	25	36	26	17	17	11	29	34	46		27.4
Catch per trip (kg)	28	28	22	21	34	23	17	15	11	21	24	30		22.8

[1] Average for months of operation only.

ber to February are particularly lean months when the catch is well below the average. Monthly catch averaged 436 kg during the 1980-1981 period, equivalent to almost 28 kg per fishing day and 23 kg per trip from the shore.

Both the fish corral and the liftnet were more productive on a daily basis (when they operated) than the filter net, but both are operated only part of the year. Fish corrals were operated only for seven months during the observation period, and liftnets for only four months. Rough weather in April and May 1981 was the reason that the liftnet operators did not resume fishing. The normal liftnet fishing season runs from late March to October, or approximately seven months, and thus normally coincides with the season of the fish corrals which catch essentially the same species. Being further offshore, however, the liftnet is more susceptible to damage and is more difficult to reach during rough weather and in 1981, the fishermen decided not to construct their gear until after May (the end of our record-keeping project). The volume of catch per month for the two gears was approximately the same (937 and 983 kg, respectively), but the catch per fishing day and per trip of the liftnet was considerably higher.

As is the case with other fishermen, those who use stationary gears usually do not fish on Sundays. The number of active fishing days is also regulated by the phases of the moon as explained earlier.

Costs and Returns

INVESTMENT COSTS

Stationary gears require levels of investment that are somewhat less than the investment requirements for the major mobile gears, such as gill-netters and mini trawlers. By this criteria,

therefore, they can be considered very much within the municipal fisheries sector in that the amount required to set up one of these gears falls within the lending limits (₱15,000) of most credit programs for municipal fishermen.

Of the three gears discussed, the filter net has the lowest investment cost (Table 2). Almost half of the cost of the gear is the bamboo structure itself and recent increases in the price of bamboo (50% in two years) have had a significant impact on investment costs which in total have increased approximately 40% since 1980. Current replacement cost of the entire unit, including a non-motorized banca is ₱3,535. Because expected life span of the gear structure is short, annual depreciation costs represent over 40% of current replacement costs.

The fish corrals included in our sample are typical of those used in San Miguel Bay but, by nationwide standards, are small. They have no impoundment area but rather a leader that leads directly into the bunt. Their average investment cost is approximately 2.5 times that of the filter net. The current replacement cost of the average assets of the owner of a fish corral (not all owners have a complete set of all items) is approximately ₱9,000 (Table 3). Again, due to rapid depreciation of the gear structure and the net, annual depreciation per respondent is quite high (₱5,539).

Table 2. Average acquisition cost, replacement cost and annual depreciation for Cabusao filter net *(biyakus)*.

Item	Average no. owned per respondent	Per unit cost (₱)	Average acquisition cost (₱)	1982 replacement cost (₱)	Expected life span (years)	Annual depreciation (₱)[1]
Gear structure	1	1,085	1,085	1,630	2	815
Net	1	888	888	1,000	5	200
Boat (non-motorized)	1	460	460	750	5	150
Containers						
baskets	6	8	48	60	0.25	240
tubs	1	50	50	60	2	30
Paddles	2	7	14	20	1	20
Anchors	1	13	13	15	7	2
Totals			2,558	3,535		1,457

[1]Annual depreciation is based on 1982 replacement cost, using straight-line method with zero-salvage cost. US$1.00 = ₱8.00 (in 1982)

Table 3. Average acquisition cost, replacement cost and annual depreciation for fish corral *(baklad* or *sagkad)*.

Item	Average no. owned per respondent	Average acquisition cost per item (₱)	1982 Replacement cost per item (₱)	Expected life span (years)	Annual depreciation (₱)[1]
Gear structure	1	2,940	4,410	1	4,410
Boat[2]	1	1,050	1,335	5	267
Engine	0.4	2,850	3,700	9	
Net	1	1,350	1,512	3	504
Containers					
small baskets	6	9	10	0.5	20
large baskets	1	15	15	0.5	8
Paddles	1.6	9	15	1	15
Lamp	0.2	200	338	7	48
Anchor	0.4	120	135	20	7
Scoop	0.2	20	25	1	25
Storage shed	0.2	500	600	5	120

Average total acquisition cost per respondent[3] : 6,755

Average total replacement cost per respondent[4] : 9,083

Average total annual depreciation per respondent[5] : 5,539

[1]Annual depreciation is based on 1982 replacement cost using straight-line method with zero salvage cost.
[2]Forty percent of the respondents owned a motorized banca; 60% owned a non-motorized banca. The costs shown for this item are for the 'average' bancas.
[3]Average total acquisition cost per respondent = Σ (average acquisition cost per item x average number owned per respondent).
[4]Average total replacement cost per respondent = Σ (1982 replacement cost per item x average number owned per respondent).
[5]Average total annual depreciation per respondent = Σ (annual depreciation per item x average number owned per respondent).

The liftnet is the most expensive of the stationary gears used by Cabusao fishermen (Table 4). As with the other two gears, the increase in price of bamboo has resulted in a higher total replacement cost (₱12,190). In the case of the liftnet, increased engine prices have also had an effect, more so than for the filter net and fish corral both of which are close enough to the shore to be reached by non-motorized bancas.

Table 4. Average acquisition cost, replacement cost and annual depreciation for liftnet *(bukatot)*.

Item	Average no. owned per respondent	Per unit cost (₱)	1980 Average acquisition cost (₱)	1982 Replacement cost (₱)	Expected life span (years)	Annual depreciation (₱)[1]
Gear structure	1	1,900	1,900	2,750	1	2,750
Motorized banca	1	4,750	4,750	5,950	5	1,190
Net	1	1,900	1,900	2,090	2	1,045
LPG lamps	4	307	1,228	1,350	4	338
Baskets	5	9	45	50	1	50
Totals			9,823	12,190		5,373

[1]Annual depreciation is based on 1982 replacement cost, using straight-line method with zero-salvage cost.

FIXED COSTS

Under fixed costs, it is necessary to include all those expenses which are incurred independently of the daily operation of the gear. In the case of stationary gears, these costs include depreciation of fishing assets, any interest payments for borrowed capital used to purchase the assets, and any license fees or permits required to operate the gear. Some argue in favor of including the opportunity cost of capital (the interest foregone) as a fixed cost (Panayotou 1981) but we have chosen instead to deduct it from the residual return to owners after sharing because it demonstrates more clearly the opportunity cost concept. However, it is important to bear in mind that it is the sum of both capital investment costs and fixed costs (less depreciation, but including the opportunity cost of capital) that represents the cost of investing in a fishery, and that both fixed costs (including depreciation) and operating costs must be covered if the fishing unit is to make a profit.

There is one category of fixed cost that deserves special emphasis because it is peculiar to these stationary gear types. In each fishing community around San Miguel Bay, there is a senior fisherman known as the *amonojador*, whose function is to advise on and give permission for the erection of any stationary gear within municipal waters (see Cruz, this report). In addition to identifying potential locations for new gear, he is also responsible for resolving disputes that may arise between owners from time to time. The *amonojador* thus has an important function as allocator of fishing rights in the municipal fisheries, at least as far as stationary gears are concerned. For this service in Castillo, he is paid ₱10 annually by gear owners, although we have heard of payments as high as ₱100 in other locations.

The role of the *amonojador* has undoubtedly declined in importance since the introduction of more mobile gear types such as gill-netters and trawlers, but the fact that such a system still exists implies that at least in some communities a traditional system for allocation of fishing rights exists. There is another reason this system is breaking down, however, and this relates to population growth. Asked whether the *amonojador* system limits fishing effort in any way by denying permission to erect stationary gears, the ex-mayor of Calabanga replied, "No, because everyone in our community has the right to fish (and eat) no matter how poor we all are."

Fishing rights are apparently acquired through a tradition of use, and highly productive sites for stationary gears rarely change hands. Although in some communities in the Philippines, fish corral sites are subject to bidding by prospective operators, such is not the case in Castillo, nor in other communities of San Miguel Bay. Municipalities thus fail to take advantage of a bidding mechanism that they are legally empowered to establish under Presidential Decree 704 and which would provide them with a share of the rent from the resource.

OPERATING COSTS

Major operating costs for the fish corral and the liftnet include the costs of gasoline for the bancas to reach the gear and of kerosene (or LPG) to operate the lights (Table 5). However, only the liftnet has significant operating costs (₱120 daily); the operating costs of the fish corral and the filter net are only ₱38 and ₱5.60 daily, respectively. Unlike most other gears in the municipal fisheries sector, owners of fish corrals do not now use a sharing system to divide the catch value with their partners as they did in the past. Rather, the owner pays a fixed daily wage rate of ₱10 to each of two laborers. Hence, a daily labor expense of ₱20 is shown under operating costs. Because these operating costs depend on the operation of the gear, they are often referred to as variable costs in contrast to the fixed costs discussed earlier.

These operating costs are subtracted from the daily value of the catch and the resulting net revenue (Tables 6-8) is divided among owners and crewmen according to the sharing system being practiced.

Table 5. Average operating costs per fishing day for stationary gears sampled in the Cabusao area, 1980-1981.

Item	Gear type: Fish corral (₱)	Fish corral (%)	Liftnet (₱)	Liftnet (%)	Filter net (₱)	Filter net (%)
Gasoline	7	18	41	34	–	–
Gas (kerosene/LPG)	4	11	33	28	0.50	9
Oil	–	–	1	1	–	–
Labor	20	53	–	–	–	–
Repairs/parts	2	5	4	3	1.40	25
Others (includes food and cigarettes)	5	13	41	34	3.70	66
Total	38	100	120	100	5.60	100

Table 6. Costs and earnings of fish corrals *(baklad)* sampled in the Cabusao area, 1980-1981.

	1980 June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	1981 Feb.	Mar.	Apr.	May	Annual totals	Monthly average[1]
Total value of catch (₱)	2,242	2,603	1,558	1,997	not operating				1,731	2,867	3,177	16,175	2,311	
Total operating expenses (variable costs) in ₱	1,058	960	669	551					425	866	850	5,379	768	
Gasoline	215	221	102	114					69	130	176	1,027	147	
Gas (LPG)	104	88	71	66					48	100	108	585	84	
Labor	480	460	400	320					260	500	480	2,900	414	
Repairs/parts	88	43	10	–					–	19	–	160	23	
Others (includes food and cigarettes)	171	148	86	51					48	117	86	707	101	
Monthly net revenue (₱)[3]	1,184	1,643	889	1,446					1,306	2,001	2,327	10,796	1,543	
Average price (₱) received per kg[4]	2.16	2.20	1.70	2.15					4.35	4.19	2.25			2.47

[1] Average for months of operation only.
[2] Labor is paid a ₱10 daily wage rather than a share of the net revenue.
[3] This amount represents the owner's share because labor has already received its share in the form of a daily wage.
[4] Total value of catch ÷ total catch per month (from Table 1).

Table 7. Costs and earnings of stationary liftnet *(bukatot)* sampled in the Cabusao area, 1980-1981.

	1980						1981						Annual	Monthly
	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	total	average[1]
Total value of catch (₱)	1,242	2,362	5,368	985			not operating						9,957	2,489
Total operating expenses (variable costs) in ₱	677	1,411	2,043	598									4,729	1,182
Gasoline	306	544	956	311									2,117	529
Gas/kerosene	248	509	794	145									1,697	424
Oil	11	21	14	4									49	12
Repairs/parts	40	–	102	72									214	53
Others (includes food and cigarettes)	73	337	178	66									653	163
Monthly net revenue (before sharing) (₱)	565	951	3,325	387									5,228	1,307
Average price (₱) received per kg[2]	2.30	1.92	3.11	2.27										2.53

[1]Average for months of operation only.
[2]Total value of catch ÷ total catch per month (from Table 1).

Table 8. Costs and earnings of filter nets *(biyakus)* sampled in the Cabusao area, 1980-1981.

	1980							1981					Annual	Monthly
	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	totals	average
Total value of catch (₱)	604	1,233	588	744	497	436	482	388	121	646	901	1,044	7,682	640
Total operating expenses (variable costs) in ₱	67	120	61	259	96	73	67	77	32	67	72	66	1,057	88
Gas (LPG)	7	19	9	15	11	3	–	–	–	10	6	10	88	7
Repairs/parts	9	33	–	189	38	–	–	–	–	–	–	–	269	22
Others (includes food and cigarettes)	51	69	52	55	48	70	67	77	32	57	67	56	699	58
Monthly net revenue before sharing (₱)	537	1,113	527	485	401	363	415	311	89	579	829	978	6,625	552
Average price (₱) received per kg[1]	1.28	2.00	1.65	1.45	.98	1.13	1.58	1.26	1.15	1.49	1.67	1.52		1.47

[1]Total value of catch ÷ total catch for the month (from Table 1).

PRICES RECEIVED

The average monthly price received by owners or operators can also be calculated for each gear from the catch value (Tables 6-8) and total catch (Table 1). These prices indicate that the stationary gears are catching low-priced species (Tables 6-8). Average prices for the fish corral and liftnet which catch similar species, were ₱2.47 and ₱2.53, respectively. During March and April, the fish corral operators received in excess of ₱4/kg, and we suspect that this may be due to the fact that the liftnets did not operate during this period due to rough weather. The average monthly price received by filter net owners or operators was only ₱1.47/kg, reflecting the low value of their mixed catch.

Sharing Systems

The sharing system formerly used for fish corrals in Castillo was locally known as *socio-industrial.* As the term suggests, a partnership was involved. The owner provided the initial capital for constructing the fish corral and purchasing the necessary equipment and the crew provided the labor. Over time, part of the share that normally went to labor was withheld by the owner as laborer's contribution to the investment cost until 50% of the investment cost was paid for. The crew's contribution to capital investment was made on a regular basis. For example, if there were five fishing days in one week, the crew received shares for two days and the owner withheld the other three. The owner and crew would then eventually be equal partners sharing the net revenue 50-50 after deducting operating expenses.

According to Castillo fishermen, this unique sharing system began to break down about 1970 and by 1980 was replaced by a system of daily wage payment to labor. Under the earlier sharing system, the crew had complete responsibility for handling the gear and selling the catch since owners often did not go fishing. The owner had to rely exclusively on his partners. Untrustworthy partners apparently resorted to selling part of their catch elsewhere to the detriment of owners. The seasonal nature of the fish corral's use contributed to this behavior because it led to lack of permanent partners. Nowadays, owners themselves handle the selling and disposal of the catch. Partners (who are now only laborers) are paid ₱10 daily after the catch is disposed. The monthly net revenue figures shown in Table 6 therefore represent the owner's share after the labor payment is made part of the operating costs. This daily sharing system for fish corrals is shown in Fig. 4.

In contrast, filter nets and stationary liftnets use the basic 50-50 sharing system that is common to other municipal gears. Partners who provide the labor for these two gears thus share in the risks of poor catch (and the windfalls of good catch) unlike the fish corral laborer who gets ₱10 daily regardless of the value of the catch. The liftnet crew usually consists of 4 members; one *buso mayor* (leader of the crew) and three laborers. Most owners of stationary liftnets do not go fishing. The *buso mayor* receives an incentive share from the owner (equivalent to 5% of the net revenue) in addition to his share as a regular crewman (Fig. 5).

Depending upon its size, the filter net requires only one or two fishermen to operate. Consequently, whether any sharing system is used depends upon whether or not the owner goes fishing himself. In the former case, the full net revenue accrues to the owner. In the latter case, the net revenue is divided 50-50 between the owner and partner(s). In our sample, 50% of the filter nets were owner-operated and 50% were operated by partners. The sharing system of those gears using partners is shown in Fig. 6. The filter nets represented by this diagram were more productive than those which were owner-operated. The owner-operated gear had an average daily net revenue of ₱31.55, all of which went to the owner. The owner's share of net revenue for the larger filter nets (Fig. 6) was ₱19.39 if he did not go fishing or ₱29.09 if he took the place of one of the two laborers.

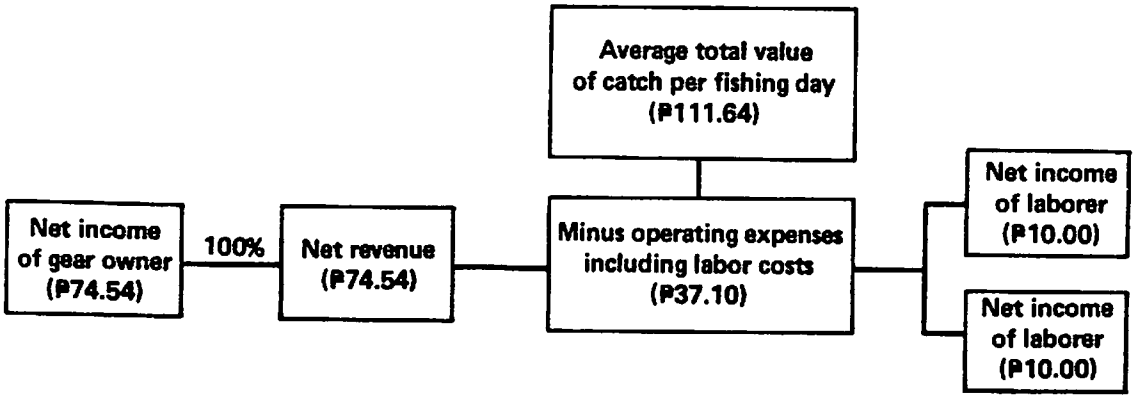

Fig. 4. Daily sharing system for fish corrals (1980-1981). This is a fixed wage system for labor.

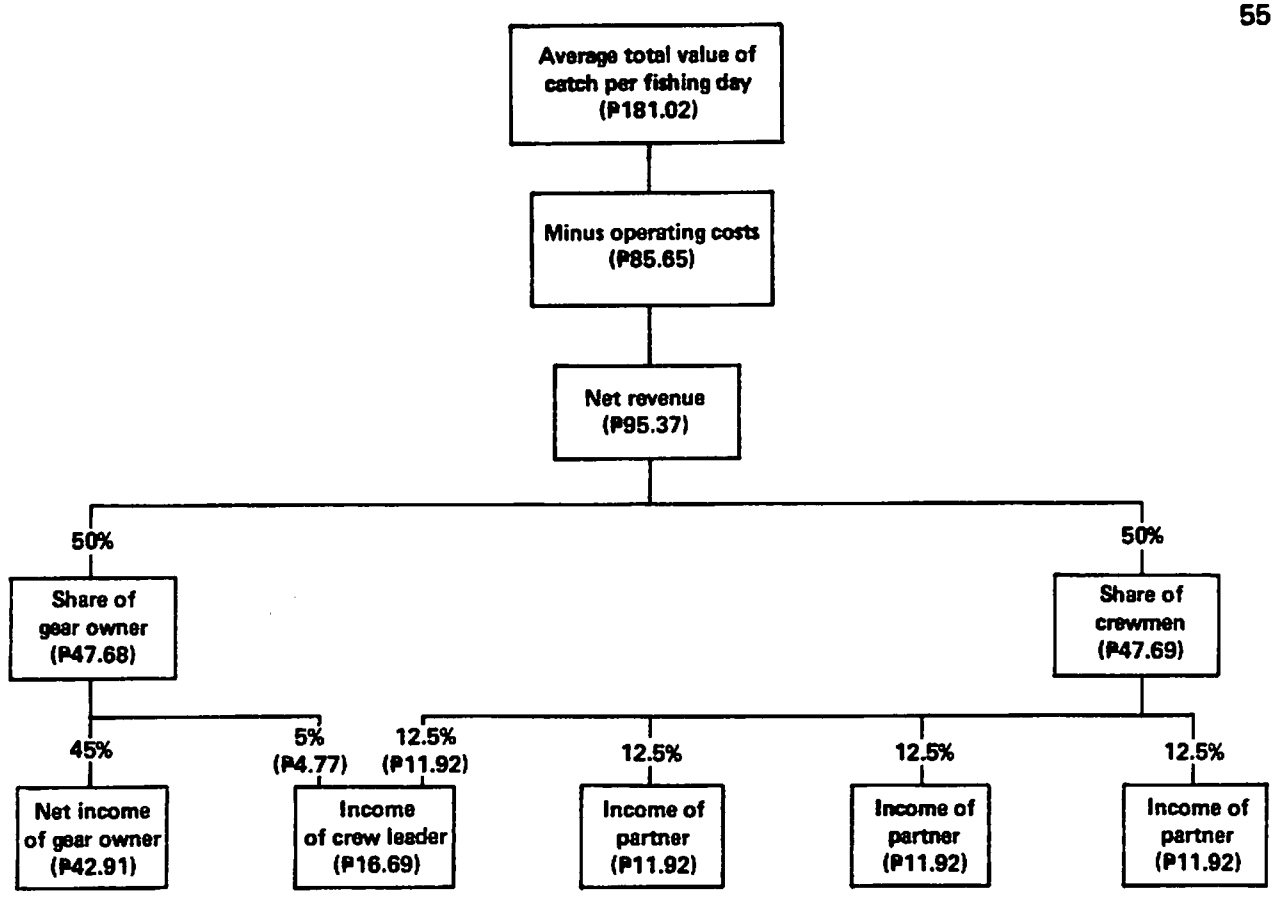

Fig. 5. Daily sharing system for stationary liftnets (1980-1981).

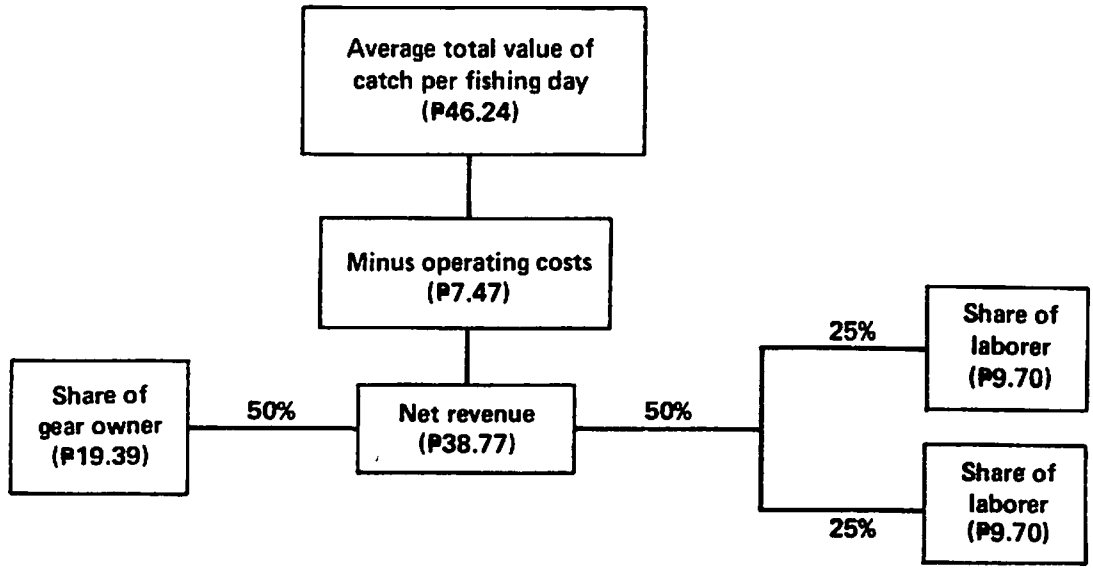

Fig. 6. Daily sharing system for filter nets owned by non-fishing owner and using two fishermen (1980-1981).

Returns to Capital and Labor

The normal procedure for calculating costs and returns is to treat the production unit (in this case the fishing unit) as a whole. In this paper, however, the net incomes of owners and partners (laborers) are treated separately as representing returns to capital (after deducting fixed costs) and labor, respectively. The residuals are then compared with the respective opportunity costs to determine whether pure profits or losses are being earned by the stationary gears.

MONTHLY INCOME

The previous section presented incomes on a daily basis; Table 9 summarizes the income data on the more usual monthly basis. It is important to note that neither the income of owners nor the income of laborers shown in this table represents their true earnings. In the case of owners, certain fixed costs must be paid out of monthly net income; laborers are expected to work free of charge a few days each month on gear maintenance and repair. One final point is that the monthly net income figures shown in Table 9 represent those months when fishing took place (seven months for the fish corral; four months for the liftnet; and 12 months for the filter net). These monthly incomes are sustained year-round only if the fishermen involved shift to other gears, as is often the case.

In addition to their incomes through the wage or sharing systems, fishermen who man these stationary gears are also able to supplement their families' diet by fishing with hook and line from the gear structure. We have no estimate of the value of these in-kind earnings.

Table 9. Monthly net incomes in pesos of owners and partners (laborers) for stationary gears, Cabusao area, 1980-1981.

	Fish corrals	Liftnets	Filter nets using 1 fisherman[1]	Filter nets using 2 fishermen
No. months of operation	7	4	12	12
No. fishing days per month	20.7	13.8	13.3	17.8
Owners[2]				
Non-fishing owner	1,543	592	n/a	345
Owner/operator	1,750	822[3]	420	518
Partners				
Buso-mayor	n/a	230	n/a	n/a
Other laborer	207	164	n/a	173

[1]Owner-operated only.
[2]Owners must still pay for fixed expenses out of their monthly net income.
[3]Assumes that the owner also serves as *buso-mayor* or leader of the crew.

RETURNS TO CAPITAL

These can be calculated by deducting the pertinent costs from the share of net revenue that accrues to owners. This share is shown as annual net income of gear owners in Table 10 for each of the stationary gear types. From this amount must be subtracted all fixed costs such as depreciation and the various licenses and permits. Depreciation is calculated on the straight-line zero-salvage-value method and is based on the 1982 replacement costs of the gear on the assumption that the owner must set aside this amount annually if he is to be able to replace his gear as it wears out. Unlike gill-netters (see Yater, this report), the owners of stationary gears incur no further operating costs after sharing. Routine maintenance and repair are either charged as an operating expense before sharing or, if not, we assume that the depreciation is sufficient to cover them. It is important to avoid double counting of maintenance and repair (Elliston 1978). Subtracting these fixed costs from

Table 10. Annual returns to capital in pesos for stationary gears, Cabusao area, 1980-1981.

	Fish corrals	Liftnets	Filter nets[1]
No. fishing days per year	145	55	187
Daily net income of gear owners	74.54	42.91	17.71
Annual net income of gear owners	10,808	2,360	3,313
Annual costs of owner			
Fixed costs:			
Mayor's fee	60	20	20
License fee	20	50	35
Amonojador fee	10	10	10
Depreciation[2]	5,539	5,373	1,457
Total costs:	5,629	5,453	1,522
Residual return (loss) to owner's capital, labor and management:	5,179	(3,093)	1,791
Less opportunity costs:			
of investment capital[3]	608	884	230
of own labor	640	400	480
Total opportunity costs:	1,248	1,284	710
Owner's pure profit (loss):	3,931	(4,377)	1,081

[1] Average for both 1-man and 2-men filter nets, in contrast to Fig. 6 which represents 2-men filter nets only.
[2] From Tables 2-4. Based on current replacement cost.
[3] Nine percent of average acquisition cost as in Tables 2-4.

the annual net income of gear owners leaves the residual return (or loss) to owner's capital, labor and management. To determine pure profit the opportunity costs of labor and capital are subtracted from this residual. If the amount remaining is positive, a pure profit (rate of return in excess of the opportunity cost of capital) is earned; if it is negative there is a loss.

Opportunity cost of capital is estimated to be 9% of the original investment cost, or the amount of interest that can be earned on savings at the local rural bank in Cabusao. It represents the income foregone because the fisherman chose to invest his capital in fishing gear, rather than put it in the bank.

Opportunity cost of the owner's own labor represents the income foregone by working for no remuneration on his fishing gear instead of in an alternative income-generating activity. We estimate that owners spend 16, 10 and 12 days per year on work related to their fish corrals, liftnets and filter nets, respectively, over and above their actual fishing time (if any). This time includes such activities as purchase of bamboo, supplies and preparation of food for the crew. An opportunity cost of ₱40 per day (the daily income for a fish processor) was used to estimate the annual opportunity cost of owner's own labor. These amounts along with opportunity cost of capital were subtracted from the residual return to owner's capital, labor and management to estimate pure profit or loss.

After taking all these fixed and opportunity costs into account, our results show that owners of fish corrals and filter nets earned a pure profit while the owners of stationary liftnets incurred a loss during the study period.

Because we thought that 1980-81 may be an unusual year for the liftnets, we attempted to calculate the hypothetical owner's profit or loss had the season extended the full seven months. In a normal year, monthly catch may be higher in the 'missed' months than in the four months we observed. Based upon trawler catch of anchovies (the major species caught by liftnets) which was twice as high during March-May than during June-September and assuming constant operating costs per fishing day, annual net income of owners would increase to ₱7,465. Thus they still incur

a pure loss of ₱556. Crew income would have almost doubled, however. There are further indications that these Cabusao liftnets were atypical in 1980-1981 from a 1982 feasibility study conducted by the Land Bank of the Philippines by the Tinambac Rural Workers organization which showed that liftnets would be profitable (B. Cervantes, pers. comm.). For that study it was assumed that groups of liftnet operators would share the use of *bancas*, thus reducing their individual costs, and increasing profitability.

RETURNS TO LABOR

In addition to work actually performed during the fishing operation, laborers also assist with net repair and other maintenance chores for which they receive no remuneration. To obtain a clear picture, therefore, of whether labor is earning an income comparable to that which can be earned in other activities these additional days must be taken into account (Table 11).

The opportunity cost of labor was estimated to be ₱10 per day which is the wage that an ordinary carpenter is paid in Cabusao. It also represents the amount that an ordinary laborer on a fish corral would be paid for one day's work.

Table 11. Returns to labor in pesos for stationary gears, Cabusao area, 1980-1981.

	Fish corrals	Liftnets	Filter nets[1]
No. fishing days per year	145	55	187
No. gear repair days per year	25	13	25
Total working days per year	170	68	212
Major fisherman *(buso mayor)*			
Daily income	n/a	16.69	n/a
Annual net income	n/a	918	n/a
Less opportunity cost[2]	n/a	680	n/a
Pure profit (loss)	n/a	238	n/a
Other fisherman (laborer)			
Daily income	10.00	11.92	11.81
Annual net income	1,450	656	2,209
Less opportunity cost	1,700	680	2,120
Pure profit (loss)	(250)	(24)	89
Pure profit (loss) to labor per fishing unit:	(500)[3]	166[4]	(702)[5]

[1] Average for both 1-man and 2-men filter nets, in contrast to Fig. 6 which represents 2-men filter nets only.
[2] Estimated to be ₱10 per working day (fishing plus gear repair).
[3] Crew consisting of 2 ordinary laborers.
[4] Crew consisting of 1 *buso mayor* plus 3 ordinary laborers.
[5] Crew consisting of 2 ordinary laborers.

The resulting comparisons show that the *buso mayor* on a liftnet earned more than his opportunity wage. The other fishermen (laborers) on corrals and liftnets earned slightly less than their opportunity costs and those using filter nets earned slightly more. Taking the whole gear crew complement into account, laborers on liftnets and filter nets earned a small pure profit; laborers on fish corrals were losing relative to their opportunity costs. The labor requirement of the fish corrals is sporadic by season and by phase of the moon covering only a few hours of each fishing day and therefore may permit other part-time employment (C. Bailey, pers. comm.). Consequently, a some-

what lower labor opportunity wage than ₱10 daily may be more appropriate for these gears, in which case the pure loss to labor would disappear.

RETURNS TO THE FISHING UNIT

Taking pure profits and losses of both capital (Table 10) and labor (Table 11) into account on an annual basis, we found that fish corrals and filter nets earned pure profits of ₱3,431 and ₱1,215, respectively, while during the period of study, stationary liftnets in the Cabusao area incurred pure losses of ₱4,211.

Conclusions

The costs and earnings of the three major stationary gears that operate in San Miguel Bay—fish corrals, liftnets and filter nets have been documented in the preceding sections. Incomes of ordinary fishermen who work these gears range from ₱164 to ₱207 per month during those months when the gears are operating. The filter nets operate year-round, but during the months when liftnets and fish corrals do not operate, fishermen who normally work them seek employment with other gears. Earnings from these gears are thus highly seasonal for owner and crewmen alike.

There are some interesting contrasts between the liftnets and the fish corrals. Both fish for much the same species, though the catch per fishing day of the liftnet is 50% higher. They also receive comparable prices per kg of catch. The much higher operating costs of the liftnet (it is the most energy intensive of the three stationary gears), however, result in losses. Lower energy costs contribute to substantial profits for the fish corral. The sharing systems are quite different, with fish corral laborers paid a daily wage and the liftnet crew sharing in the more common 50-50 sharing system. The co-existence of profits to owners of fish corrals and wages lower than opportunity costs to laborers implies an imbalance in the sharing of proceeds that can only be maintained by the power of owners.

The high (relative to other gears) profits of owners of the fish corrals may relate to the owners' role in the community. In many cases, these owners are processors who invest in fish corrals to assure themselves of supply for their processing (salting) activities. Often processors are the financiers behind the visible fish corral operators, who have borrowed bamboo and other materials in-kind from the processors to whom they sell their catch at a lower price. The sharing system for fish corrals thus favors owners over laborers.

Over and above the possible benefits in the form of higher prices that may have accrued to fish corral operators due to reduced competition from liftnets, these pure profits earned by owners of fish corrals and filter nets may be a function of their stationary nature in that their existence in a body of water makes it impossible for others to use the same space. Common property and open access conditions do not hold in this case (but there may be significant externalities from overcrowding), and if either municipalities or *amonojadors* are actually limiting access, we would expect to find such pure profits occurring. However, we found no evidence to show that restrictions were being placed on access. If they were, we would have expected to find that either the license or permit fees or the *amonojador's* fee were higher than their presently low levels.

It appears that a combination of numerous factors including advantages of location, low operating costs and the failure or unwillingness of the licensing authorities to extract more of the rent (pure profit) of the fishery for themselves contribute to the higher pure profits of fish corrals. At present there appears to be no relationship between licensing fees and gear profitability as far as stationary gears are concerned, and municipalities may be missing an opportunity to increase their revenues through increased license fees for fish corrals, especially.

Finally, it should be noted that unlike the mobile gill-netters and mini trawlers which have fishing ranges throughout the Bay, these stationary gears may be characterized by locational differences in catch and profitability. While Cabusao gill-netters and mini trawlers are believed to be representative of the Bay as a whole, our stationary gear sample is probably less so.

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