

AN EVALUATION OF THE FISHERY RESOURCES OF LAGUNA DE BAY*

MEDINA N. DELMENDO

ABSTRACT

An evaluation of the fishery resources of Laguna de Bay was conducted by the Freshwater Investigation Unit. The study was undertaken from 1961 to 1963.

The evaluation was based on the catch data of the major fishing gears used in the lake. These were the gill nets (*pante*), fish corrals (*baklad*), drive-in-nets (*seket*), push nets [both motorized (*turo*) and manual (*sakag*)], shrimp brush shelters (*bonbon ng hipon*), drag seines (*pukot*), and snail dredges (*kalad-kad suso*). Net-run and landed fish catch samples were collected from these gears.

The evaluation revealed that the aggregate annual production of fish in Laguna de Bay during the period of study averaged 82,881,595 kg valued at P24,976,980.

The main part of this evaluation is a discussion of the production of the seven most important fishing gears in the lake.

INTRODUCTION

Laguna de Bay is the largest body of freshwater in the Philippines. Since time immemorial, the lake has been used for navigation and fishing purposes. The former activity is not of much importance at present due to great advances in land transportation facilities. However, fishing has tremendously increased as a result of population growth. A census made in 1963-1964 on the fishing activity in Laguna de Bay revealed that there were about 13,000 full-time fishermen that fish in the lake (Table 2). Considering that the area of this body of water is 90,000 hectares, a fisherman operates within approximately

* Presented at the 12th Session of the Indo-Pacific Fisheries Council, Honolulu, Hawaii, 1966, as IPFC/C66/TECH40.

six hectares of water surface area. This is quite an over-crowded situation. The better fishing outfits, therefore, have greater chances of catching more fish per operation. As a result, mechanization of fishing gears in Laguna de Bay has become popular. The fishing intensity and the fishing pressure also increased. With these conditions, the fishery resources of the lake have become heavily exploited. The lack of management measures to safeguard the maintenance of sustained maximum yield of the lake's resources could naturally result in the continued decline of natural stocks, particularly those of the desirable species in the fishery.

Laguna de Bay is a municipal water. However, its management is usually delegated to the national government. It is unfortunate that no uniform policy is exercised by the various municipalities that have jurisdiction over their respective adjacent waters. On top of this, fishing outfits are not registered, since the majority of them are used for sustenance fishing. Fishing operations in Laguna de Bay take place round the clock. Bigger mechanized outfits operate during early mornings or late evenings while smaller non-mechanized fishing paraphernalia operate at daytime along the shores of the lake. Revenue collection on fish caught is practically non-existent. This situation also makes data collection for purposes of evaluation of the fisheries of the lake more difficult.

Under these circumstances, management measures to manipulate stocks to increase fish production could not be formulated due to lack of basic information. As an initial attempt toward this goal, the Limnology Project conducted an evaluation of the aquatic resources of Laguna de Bay with the aid of the United Nations Technical Assistance Board. This was undertaken to determine the amount of fish production in the area, in weight, quality, and value. At the same time, studies on the biology of species and fish population are being conducted by the Limnology Staff to serve as an overall basis for management.

METHODS AND PROCEDURES

Laguna de Bay was divided into four physical areas designated as Areas I, II, III, and IV (Fig. 1). Each area was assigned to two fieldmen who made monthly collections of fish catch data from landing areas and net-run samples from various fishing gears. Other in-

formation collected were on the types of fishing gears, fish length, weight, number and value of fish caught, fishing intensity, price per kilogram of catch and species composition of the catch.

A fishing gear census was conducted annually to ascertain the magnitude of fishing activity and to arrive at an estimate of the total fish production in the entire lake.

RESULTS AND DISCUSSIONS

The annual fishing gear census conducted from 1963 to 1964 revealed that there were 41 types of fishing gears that operate in Laguna de Bay (Table 1) totalling 9,740 units. Of this number, 59.3% or 5,784 gears operated all year round; 36.4% operated for a period of six to 10 months and 4.3% operated for three to five months during the year.

These fishing gears may be classified into two major groups, namely, stationary and non-stationary or mobile gears. Tables 1 and 3 show that stationary gears totalled 2,136 and represented 20% of the total number of fishing gears in the area. The rest were mobile gears, both motorized and non-motorized. Table 2 shows the total number of fishermen engaged in fishing operations in Laguna de Bay.

The collection of samples from landed catches was very difficult due to the lack of regular and definite landing places for fish caught in the lake. In view of this, the time-consuming net-run sampling method was employed to get a fair estimate of the fish production. In an area as large as Laguna de Bay, data collection by net-run sampling of all types of gears in operation during the day was next to impossible. The problem was compounded by the limited number of men in the field to perform the task. Nevertheless, in this investigation, the major gears were consistently sampled and certain localized fish landing areas round the lake were visited to determine total fish production in Laguna de Bay.

There are seven types of gears that are considered the major fishing gears operating in Laguna de Bay. These are the fish corral, gill net, drag seine, push net, drive-in-net, snail dredge and brush shelter.

The Fish Corral (Baklad) Fishery

The average number of fish corrals that operated in Laguna de Bay was 1,024 per year. Fishing intensity averaged 376,588 fishing

days per year. The catch per unit of effort during the period averaged 18.75 kg valued at ₱10.06 per fishing day. The annual production based on baklad catches alone from July 1961 to December 1963 averaged 4,380,456 kg valued at ₱2,761,572 per year. For the three-year period (July 1961-December 1963), a total of 11,316,188 kg valued at ₱6,903,940 was obtained.

The catch composition of this gear was mainly the *Therapon plumbeus* or *ayungin* which represented 78% by weight of the total catch. The remaining 22% consisted of goby (21%) and carp, mudfish, and catfish (1%). The average size of *therapon* caught in 1961 was 98 mm in total length; in 1962, 103 mm and in 1963, 106 mm. These figures indicate that the smaller fishes suffered heavier exploitation in 1961 than in other years.

For gobies caught in 1961, the total average length was 166 mm; 205 mm in 1962; and 203 mm in 1963. The small size of fish caught in 1961 indicated the same heavy exploitation on the smaller groups of the species as in the *Therapon*.

Despite the considerable difference in the average size of *therapon* and goby caught in 1961 as compared to the average size of those caught in the other years, there was no significant difference in the amount of fish production from year to year. During the whole period covered by this report, *therapon* and goby consistently represented 99% of the total catch of the fish corrals while the mudfish, carp, and other miscellaneous species represented only 1%.

The Gill Net (Pante) Fishery

One of the major non-stationary types of fishing gears in Laguna de Bay is the gill net. There were 1,720 units of this gear with an approximate average length of 400 m. The mesh size of this net ranged from 3.0 to 12.0 cm. Studies showed that 22.2% of 1,252 gill nets operated for 12 months during the year. The catch of the net with small (3.0-4.0 cm) mesh-size consisted of *therapon* and goby. Intermediate (4.5-7.0 cm) mesh-sized net catches consisted of snakeheads and catfishes, while the large-meshed (7.5-12.0 cm) net catches consisted of big snakeheads, carps, catfishes and milkfish.

For the gill net of mesh-size 3.0-4.0 cm, the annual average catch per unit of effort during the period of study was 15.0 kg; for the nets of intermediate mesh-size, 4.5-7.0 cm, the average was 9.6 kg; and for the nets of the largest mesh-size, 7.5-12 cm, the average

was 14.2 kg. The average size of *therapon* caught in the 3.0 cm mesh-sized nets was 117 mm and in the medium mesh-sized nets was 125 mm.

The average size of goby caught was 250 mm in total length; that for catfish was 260 mm. Taking into consideration all the gill nets operated in the lake during the period of this investigation (July 1961-December 1963), an estimated fish production of 16,831,395 kg valued at ₱21,194,199 was realized. The average annual production was 6,732,552 kg valued at ₱8,477,676. Fishing intensity average 534,330 fishing days per year. Catch per unit of effort was 12.3 kg valued at ₱15.49 per kg for the period.

The Drive-in Net (Seket) Fishery

A fishing gear census revealed that there were 240 units of mechanized drive-in nets in Laguna de Bay. As used by the Laguna de Bay fishermen, the nets ranged from 14 to 20 mm mesh-stretched. The legal size limit put up for regulatory measures for this particular gear was 27.0 mm to 30.0 mm. A comprehensive sampling of this gear's catches was undertaken from August 1961 to December 1963. During the period, the total goby production was 13,778,100 kg valued at ₱7,577,955. The catch per unit of effort for this gear was 120 kg while the fishing intensity averaged 48,600 fishing days per year. The size of goby caught ranged from 55 mm to 330 mm, with an average of 176 mm. The annual fish production based on drive-in net catches was 5,511,240 kg valued at ₱3,031,182 for the period.

All the preceding figures reveal the tremendous exploitation of the goby fisheries of Laguna de Bay by the drive-in nets alone. Since there were only 240 mechanized drive-in nets, one can only conclude that they are very effective. This effectiveness maybe attributed to the use of very fine meshes of the nets.

Motorized Push Net (Turo) Fishery

There are 1,010 motorized push nets that operate in Laguna de Bay. Their net meshes range from 8 to 35 mm. The catch composition of this gear was composed of fish and shrimps. The average annual fish production of motorized push nets during the period (January 1962 to December 1963) was 61,877,610 kg valued at ₱8,302,795. The total fish production was 123,755,220 kg valued at ₱16,605,590. The main fish caught were *therapon* with sizes ranging from 25 mm to 160 mm in total length. The size range of

the goby caught was 40 mm to 130 mm with an average of 68 mm in total length.

On the other hand, shrimp caught by the same gear showed an average production of 34,007,843 kg valued at ₱9,862,274 for the two-year period of study. The average annual production of shrimp was 17,003,921 kg valued at ₱4,931,137. The catch per unit of effort was 108 kg while the fishing intensity was 303,580 fishing days per year.

Shrimp Brush Shelter (Bonbon ng Hipon) Fishery

Another gear used in catching shrimp in Laguna de Bay was the "bonbon ng hipon" or shrimp brush shelter. In the 1963 census, there were 614 units of shrimp brush shelters consisting of 44,952 pieces in the lake.

Production of shrimp by this gear during the two-year period of study (January 1962 to December 1963) averaged 2,921,624 kg valued at ₱1,261,719. The catch per unit of effort was 6.6 kg. The average fishing intensity was 190,080 fishing days per year. The average annual shrimp production from this gear was 1,460,812 kg valued at ₱630,859.

Manual Push Net (Sakag) Fishery

There were 1,067 units of manual push nets in operation in Laguna de Bay. Shrimps were the main catch of this gear. The average catch per unit of effort ranged from 5.4 kg to 5.9 kg. The average fishing intensity was 228,249 fishing days per year. The estimated total production of shrimp from this gear for the period January to December 1963 was 1,262,592 kg valued at ₱343,225. The average shrimp production from this gear was 631,476 kg valued at ₱171,612.

The Drag Seine (Pukot) Fishery

In Laguna de Bay, 177 units of seines operated during the period of study. There were three kinds of seines used in the lake, namely, the motorized or mechanized drag seine (*pukot-laot*) and two types of the manual drag seine, the mudfish seine (*pukot-dalag*) and the therapon seine (*pukot ayungin*). The "pukot laot" consisted of 16 units; the "pukot-dalag", 91 units; and the "pukot ayungin", 60 units. The catch composition of drag seines were both *therapon* and mudfish. The motorized drag seine showed larger quantities of fish

catch. This consisted mainly of mudfish and catfish. In a four-year period (January 1960-December 1963), the average catch of motorized drag seine was 3,288,600 kg valued at ₱2,827,363. The catch per unit of effort was 217 kg with a value of ₱187. The fishing intensity was 3,780 fishing days per year. The average annual fish production amounted to 822,150 kg valued at ₱706,840.

The size of the therapon in the catch ranged from 50 mm to 170 mm with an average of 109 mm. On the other hand, the size of goby ranged from 60 mm to 380 mm with an average of 220 mm. The size of mudfish ranged from 90 mm to 720 mm with an average of 246 mm while the carp ranged from 320 mm to 900 mm with an average of 660 mm.

The manual drag seines were of two types, mudfish and therapon seines. As the names of these gears imply, they catch mainly mudfish and therapon respectively, although there were other species mixed with the catch. The mudfish seine produced an annual average of 1,064,025 kg valued at ₱995,265 during the period. The catch per unit of effort for this gear was 53 kg valued at ₱47.05. The total fish production for the period of study amounted to 4,526,100 kg valued at ₱3,981,063. The size of the mudfish ranged from 85 mm to 600 mm with an average size of 344 mm. The fishing intensity was 21,150 fishing days per year.

On the other hand, the therapon seine produced an estimated average of 9,974,250 kg valued at ₱2,806,600 at the time. The catch per unit of effort was 178 kg with a value of ₱50.29. The average annual fish production was 2,493,562 kg valued at ₱701,650. The size of the therapon caught by this gear ranged from 30 mm to 140 mm with an average of 87 mm. A comparison of the catch compositions of these gears showed that the *therapon* represented the majority of the catch in number and the greatest bulk in weight. It was followed by the white goby. Carps were less in number but their greater individual and aggregate weights made up for the deficiency, particularly in the catches of motorized drag seines.

Snail Dredge (Kaladkad suso) Fishery

There were 1,005 units of snail dredges counted during the census. These operated all year round. This particular gear provides the duck farming industry with duck food. This consisted primarily of snails. A separate report on this matter showed that the average

rate of removal of aquatic organisms by snail dredge amounted to 2,753 kg per hectare per year. Catch composition of snail dredges was composed of 65.4% snails, 2.5% clams and 32.1% miscellaneous organisms. The total snail production of the entire lake is therefore 247,770,000 kg. This is channeled to the 4,324 duck farms in Laguna de Bay. Total duck population is over half a million.

TOTAL FISH PRODUCTION

The estimated annual fish production from the seven major types of fishing gears during the period of study (1961-1963) were as follows:

Fish Production

Types of Fishing Gear	Estimated Total Catch	
	Weight in kg	Value in Pesos
Fish Corral (<i>Baklad</i>)	4,380,456	₱ 2,761,572.00
Gill net (<i>Pante</i>)	6,732,552	8,477,676.00
Drive-in net (<i>Seket</i>)	5,511,240	3,031,182.00
Motorized push net (<i>Turo</i>)	61,877,610	8,302,795.00
Drag seine (<i>Pukot laot</i>)	822,150	706,840.00
Drag seine (<i>Pukot dalag</i>)	1,064,025	995,265.00
Drag seine (<i>Pukot ayungin</i>)	2,493,562	701,650.00
Estimated annual production	82,881,595	₱24,976,980.00

Shrimp Production

Types of Shrimp Gear	Estimated Total Catch	
	Weight in kg	Value in Pesos
Motorized push net (<i>Turo</i>)	17,003,921	₱ 4,931,137.00
Shrimp brush shelter (<i>Bonbon ng hipon</i>)	1,460,812	630,859.00
Manual push net (<i>Sakag</i>)	631,476	171,612.00
Estimated annual production	19,096,209	₱ 5,733,608.00

Based on the above data, the aggregate annual production of fish in Laguna de Bay averaged 82,881,595 kg valued at ₱24,976,980. This means that a hectare of lake area produced 921 kg of fish per

year valued at ₱277. The amount of fish produced does not include those by other minor gears operating in Laguna de Bay (Table 4).

Shrimp caught by the motorized and manual push nets and the brush shelter had an annual average of 19,096,209 kg valued at ₱5,733,608. These figures are conservative production estimates on the shrimp fishery of the lake (Table 5). The fish and shrimp production in Laguna de Bay, therefore, is approximately 1,140 kg per hectare per year.

If the catches of all the 41 types of fishing gears could be sampled for an adequate length of time, a more accurate overall fish production estimate in Laguna de Bay may be obtained.

Nevertheless, the preceding production estimates are valid enough to be used as bases for any recommendatory action. Limited as they are, having been culled from the catches of only seven out of 41 types of fishing gears, the fact remains that the first seven types of gears are the major gears in operation in the lake. Moreover, these are the gears used for semi-commercial scale. The commercial productive values of all the other gears are negligible and not included in this report.

It appears that the total fishery production of Laguna de Bay is very high considering that it is a natural water condition. Production in terms of weight is really high. However, in terms of money value, the returns per hectare is very low because the sizes of the individual fishes are very small.

Hence, the market value is also less. The 13,000 full-time fishermen in Laguna de Bay during the period of investigation derived a per capita gross income of ₱1,921 per year or approximately ₱150 monthly. This income is good enough for a fisherman with a small family especially if the day's fish needs of the family are obtained from each day's fishing operation. This deduction is applicable if a fisherman uses or operates the major gears discussed in this report.

SUMMARY AND RECOMMENDATIONS

The data obtained in the evaluation of Laguna de Bay provide information on the condition of the fishery resources in the area and its production.

It has been found that the lake is being subjected to high fishing pressure considering the fact that a fisherman operates within a little more than six hectares of water surface if boundaries per fisherman is to be made. Fishing takes place virtually day and night. There are 13,000 full-time fishermen. A total of 41 types of fishing gears consisting of 9,740 units are operated in the lake, of which 80% are mobile gears and 20% are stationary gears.

The species composition of the catches of most gears that are operated in Laguna de Bay showed the dominance of *therapon* and the white goby except the drive-in net which is primarily composed of the latter species. Generally, the quality of fish obtained in the lake is quite poor due to the small size of the fish caught.

The overall fish production of Laguna de Bay is estimated at 82,881,595 kg valued at ₱24,946,980 per year. Based on this data, it is estimated that fish production per hectare is about 900 kg of fish per year.

Another important resource of the lake is the shrimp fishery. It is estimated that Laguna de Bay produced a total of 19,096,209 kg valued at ₱5,733,608 per year.

The snail dredge fishery is one significant aspect of the aquatic resources of Laguna de Bay. It supports the duck farming industry along the shores which produces the famous "balut". *Balut* is an incubated duck egg that is cooked with the developing embryo.

There are 1,005 units of snail dredges that operate in Laguna de Bay. The annual production of snail is estimated at 2,753 kg per hectare. This provides duck feed for the 4,324 duck farms with a population of over half a million ducks. Considering the quantity of snails produced in this body of water and the industry that it supports, the snails play an important role in the economy of the area.

The above findings indicate that Laguna de Bay needs proper management to improve the quality and quantity of fish production. However, these data alone cannot provide the sole basis for management but rather they are clues for further investigations. It is recommended that evaluation work of the fishery resources of Laguna de Bay be continued to visualize the trend of fish production for at least a five-year period. This will more or less show the characteristics of fluctuation of fish production.

Studies on the fisheries by species must be conducted. Fish population dynamics must be known. At this juncture, it is not clear whether there is over-population of fish in the lake which results in over-crowding of stocks. This may be the reason why fishes are very small. On the other hand, it is possibly over-exploitation that accounts for the poor quality of fish present in the lake. Smaller young fishes dominate the composition of fish catches indicating that they are still immature.

Fishing operations in Laguna de Bay is mainly for sustenance purposes rather than for commercial endeavors. This makes fishery regulations more difficult to enforce in this particular area due to its effects on the socio-economic lives of the inhabitants.

There is an apparent need to study the biology of the different species closely to determine their life cycles, rates of growth and sexual maturities. These information will indicate whether the species are properly exploited or not and also provide the basis for fishery management work.

ACKNOWLEDGMENT

The author acknowledges the assistance of the aquatic resources personnel of the limnology project under the United Nations Technical Assistance Program, in the collection and compilation of data used in this investigation. Sincere thanks is expressed to Mr. John W. Parsons, FAO Inland Fishery Biologist for the Project, Dr. Herminio R. Rabanal, Chief, Freshwater Fisheries Division and Mr. Pedro A. Acosta, Acting Chief, Estuarine Division, for their guidance in the conduct of this study.

Last, but not least, the writer expresses sincere thanks to Dr. Arsenio N. Roldan, Jr., former Commissioner of Fisheries, for the support, encouragement and keen interest in the project. He was instrumental in the conduct and preparation of this report.

BIBLIOGRAPHY

ALDABA, V. C.

- 1931 Fishing methods in Laguna de Bay. Philippine Journal of Science, 45(1): 1-28.

-
- 1931 The kanduli fishery of Laguna de Bay. Philippine Journal of Science, 45(1): 29-59.

-
- 1931 The dalag fishery of Laguna de Bay. Philippine Journal of Science, 45(1): 41-59.

CAPCO, S.R. and P.R. MANACOP

- 1955 The *abuyan*, an improved type of goby fishing gear, used in Laguna de Bay, with notes on the composition of commercial catches. Philippine Journal of Fisheries, Vol. 3: 63-84.

FELIX, S.S. and V.T. SAN ANTONIO

- 1959 A report on "Seket" operations in Laguna de Bay. Fish. Gaz., Manila, 3(1): 2-17.

GULLAND, J.A.

- 1966 Manual of sampling and statistical methods for fisheries biology. Rome. Part I. Sampling Methods. 1-5 (FAO Manuals in Fisheries Science No. 3).

MANACOP, P.R. and S.R. CAPCO

- 1953 A goby dredge trawl fishery of Laguna de Bay, with notes on the composition of commercial catches. Phil. Jour. Fish., 2(2): 125-160.

MANE, A.M. and D.K. VILLALUZ

- 1939 The *pukot* fisheries of Laguna de Bay. Phil. Jour. Sci., 69: 397-413.

RABANAL, H.R., P.A. ACOSTA and M.N. DELMENDO

- 1964 A limnological survey of Laguna de Bay — A pilot study of aquatic productivity. IPFC 11th session. Tech. Pap., No. 46, Kuala Lumpur.

-
- 1937 The fisheries of Lake Taal, Pansipit River and Balayan Bay, Batangas province, Luzon. Phil. Jour. Sci., 63(2).

VILLADOLID, D.V.

- 1933 Some causes of depletion of certain fishery resources of Laguna de Bay. Nat. Applied Sci. Bull., 3: 251-256.

-
- 1934 Kanduli fisheries of Laguna de Bay, Phil. Islands, remedial and regulatory measures for their rehabilitation. Phil. Jour. Sci., 54: 546-552.

Table 1. Fishing gear census in Laguna de Bay
1963-1964

Fishing Gears		Duration of Operation			Total Number
Local Name	English Name	12 mos.	6 mos.	3 mos.	
Baklad	Fish Corral	824	-	1	825
Baklad Tarlac	Fish Trap	11	42	-	53
Balangingi	Fish shelter	-	7	-	7
Bakikong	Fish trap	5	2	-	7
Bicatot	Fish trap	-	100	3	103
Biwas	Pole and line	305	28	-	333
Bonbon ng dalag	Fish shelter	1	39	50	90
Bonbon ng hipon	Shrimp brush shelter	452	152	-	614
Bubo	Fish pot	2	35	15	52
Dala	Cast net	88	24	9	121
Galay	Fole and line	1	-	10	11
Kaladkad suso	Snail dredge	1,005	-	-	1,005
Kaladkad biya	Goby dredge trawl	-	221	33	254
Kilokilo	Fish trap	148	10	-	158
Kitang	Set or drift longline	181	245	51	477
Kolokotok	Drive-in net	-	8	-	8
Langga ng biya	Fish trap	11	-	-	11
Palukso	Barricade	-	3	-	3
Panaklob	Fish trap	-	2	-	2
Panape	Impounding net	-	17	-	17
Pangahig	Clam dredge	-	10	25	35
Panloob	Fish trap	1	3	5	9
Pante	Gill net	1,252	461	7	1,720
Patukba	Hook and line	1	-	1	2
Pugad-pugad	Fish shelter or trap	47	44	2	93
Pukot	Drag seine	74	94	9	177
Sakag	Push net (Manual)	201	865	1	1,067
Saklitan	Fish trap	24	1	3	28
Salakab	Cover pot	-	11	35	46
Salambaw	Lift net or lever net	-	-	10	10
Salap	Scissor's net or push net	265	148	34	447
Salapang	Spear	30	133	51	214
Selubid	Scareline	4	8	-	12
Sapatan	Shrimp brush shelter	82	50	-	132
Seket	Drive-in net (Moth)	30	210	-	240
"	" " (Manual)	-	17	-	17
Siid ng hito	Fish trap	-	-	12	12
Sukob	Frame net or cover net	15	112	6	137
Takibo	Manual seine	29	23	-	52
Takilis	Fish trap	4	55	13	72
Talabog	Baited shrimp basket	20	40	23	83
Turo	Motorized push net	671	339	-	1,010
Total		5,784	3,539	417	9,740

Table 2. Fishery census in Laguna de Bay
1963-1964

Municipalities	No. of Boats		No. of Fisher- men	No. of Depen- dents	No. of Vendors in Family	No. of Assistant Fishermen
	Mot.	Non-Mot.				
RIZAL:						
Jalajala	60	92	159	921	8	157
Pililla	10	110	135	838	20	111
Tanay	87	132	194	1,212	71	226
Baras	25	69	87	509	25	44
Morong	61	105	156	807	34	42
Cardona	226	367	509	3,953	118	522
Birangonan	261	722	753	4,212	109	965
Angono	39	69	100	555	2	83
Taytay	1	65	63	281	4	15
Pasig	75	1	60	232	4	84
Pateros	6	6	8	55	1	2
Taguig	278	467	630	3,286	173	826
Muntinlupa	119	200	365	2,374	227	170
Sub-Total	1,288	2,405	3,219	19,235	796	3,247
LAGUNA:						
San Pedro	73	177	242	1,523	153	130
Binan	27	91	129	850	103	233
Sta. Rosa	268	221	442	2,426	192	674
Cabuyao	183	119	324	2,011	143	549
Calamba	226	229	649	2,571	291	211
Los Banos	76	73	127	719	20	128
Bay	69	81	25	636	31	130
Victoria	11	23	39	168	2	16
Pila	63	95	106	529	23	313
Sta. Cruz	169	432	546	4,960	309	391
Lumban	14	136	141	684	41	44
Kalayaan	7	66	73	386	26	2
Paete	17	44	61	303	11	2
Pakil	28	237	205	1,121	9	250
Pangil	-	40	40	213	-	71
Siniloan	37	84	110	491	30	90
Mabitac	3	37	38	186	10	8
Sub-Total	1,271	2,185	3,292	19,777	1,394	3,242
Grand Total	2,559	4,590	6,511	39,012	2,190	6,489

Table 3. Classification of fishing gears in Laguna de Bay

Fishing Gears		Duration of Operation			Total Number
Local Name	English Name	12 mos.	6 mos.	3 mos.	
Baklad	Fish corral	824	-	1	825
Baklad Tarlac	Fish trap	11	42	-	53
Balangingi	Fish shelter	-	7	-	7
Bonbon ng dalag	Fish shelter	1	39	50	90
Bonbon ng hipon	Shrimp brush shelter	452	152	-	614
Bubo	Fish pot or trap	2	35	15	52
Kilokilo	Fish trap	148	10	-	158
Lungga ng biya	Fish trap	11	-	-	11
Pugad-pugad	Fish shelter or trap	47	44	2	93
Saklitan	Fish trap	24	1	3	28
Sapatan	Shrimp brush shelter	82	50	-	132
Talabog	Baited shrimp basket	20	40	23	83
Sub-total		1,622	420	94	2,136

NON - STATIONARY

Bakikong	Fish trap	5	2	-	7
Bicatot	Fish trap	-	100	3	103
Biwas	Pole and line	305	28	-	333
Dala	Cast net	88	24	9	121
Galay	Pole and line	1	-	10	11
Kaladkad suso	Snail dredge	1,005	-	-	1,005
Kaladkad biya	Goby dredge trawl	-	221	33	254
Kitang	Set or drift longline	181	245	51	477
Kolokotok	Drive-in net	-	8	-	8
Palukso	Barricade	-	3	-	3
Panaklob	Fish trap	-	2	-	2
Panapo	Impounding net	-	17	-	17
Pangahig	Clam dredge	-	10	25	35
Panloob	Fish trap	1	3	5	9
Pante	Gill net	1,252	461	7	1,720
Patukba	Pole and line	1	-	1	2
Puket	Drag seine	74	94	9	177
Sakag	Manual push net	201	865	1	1,067
Salakab	Cover pot	-	11	35	46
Salambaw	Lift net or lever net	-	-	10	10
Salap	Scissor's net	265	148	34	447
Salapang	Spear	30	133	51	214
Salubid	Scareline	4	8	-	12
Seket	Drive-in net (Mot.)	30	210	-	240
Seket	Drive-in net (Manual)	-	17	-	17
Siid ng hito	Fish trap	-	-	12	12
Sukob	Frame net	15	112	6	133
Takibo	Manual seine	29	23	-	52
Takilis	Fish trap	4	55	13	72
Turo	Motorized push net	671	339	-	1,010
Sub-total		4,162	3,119	323	7,604
All Gears - Total		5,784	3,539	417	9,740

Table 4. Estimated fish production in Laguna de Bay July-December 1961

Type of Fishing Gears (FG)	Average number of gear per year (N)	Ave. fishing intensity/year Fishing day (I)	Catch per unit of effort (Kg) (E)	Estimated Fish Production (P)	
				Weight (Kg)	Value in Pesos
Fish Corral	1,024	376,588	28.55	1,087,251	₱ 402,957.00
Gill net	1,720	534,330	11.0	2,938,815	3,614,742.00
Drive-in net	240	48,600	151.8	3,669,300	2,018,155.00
Motorized push net	***				
Drag seine (P.laot)	16	3,780	222.0	839,160	1,019,844.00
Drag seine (ayungin)	60	13,950	316.0	4,408,200	963,387.00
Drag seine (dalag)	91	21,150	46.0	972,900	818,716.00
*** No adequate sample					
T o t a l				13,915,626	₱ 8,837,761.00

January to December 1962

Fish Corral	1,024	376,588	19.19	5,246,254	3,257,006.00
Gill net	1,720	534,330	14.0	7,480,620	8,602,713.00
Drive-in net	240	48,600	98.1	4,762,800	2,619,540.00
Motorized push net	1,010	302,580	237.8	72,014,040	9,361,825.00
Drag seine (P.laot)	16	3,780	205.0	774,900	583,405.00
Drag seine (ayungin)	60	13,950	152.0	2,120,400	544,747.00
Drag seine (dalag)	91	21,150	62.0	1,311,300	1,230,718.00
T o t a l				93,710,314	₱26,199,954.00

January to December 1963

Fish Corral	1,024	376,588	16.46	4,982,683	3,243,977.00
Gill net	1,720	534,330	12.0	6,411,960	8,976,744.00
Drive-in net	240	48,600	110.5	5,346,000	2,940,300.00
Motorized push net	1,010	302,580	171.2	51,741,180	7,243,765.00
Drag seine (P.laot)	16	3,780	212.0	801,360	846,757.00
Drag seine (ayungin)	60	13,950	71.9	1,004,400	485,460.00
Drag seine (dalag)	91	21,150	56.0	1,184,400	1,185,609.00
T o t a l				71,481,983	₱24,922,612.00

Table 5. Estimated annual shrimp production in Laguna de Bay from the major shrimp gears

1962-1963

Gears	Catch per unit of Effort (kgs.)	Fishing Intensity (F.days)	1962		1963		Total Production per Gear		Average Annual Production per Gear	
			Vol. (Kg.)	Value (₱)	Vol. (Kg.)	Value (₱)	Vol. (Kg.)	Value (₱)	Vol. (Kg.)	Value (₱)
Motorized push net	108	302,580	14,456,636	4,192,424	19,551,207	5,669,850	34,007,843	9,862,274	17,003,921	4,931,137
Manual push net	5.6	228,249	536,544	118,039	726,408	225,186	1,262,952	343,245	631,476	171,612
Shrimp brush shelter	6.6	190,080	1,189,728	499,685	1,731,896	762,036	2,921,624	1,261,719	1,460,812	630,859
Estimated Annual Production			16,182,988	4,810,148	22,009,511	6,657,070	38,192,419	11,467,218	19,096,209	5,733,608

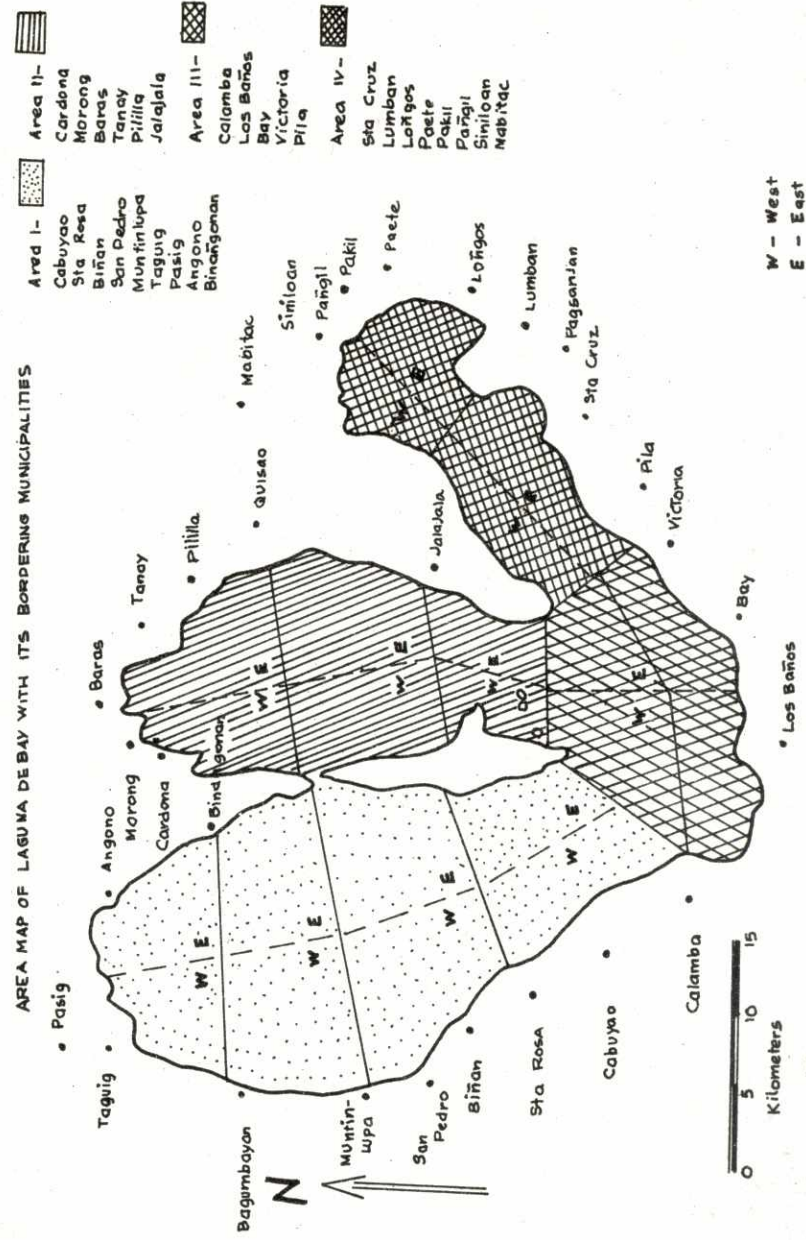


Fig. 1. Map of Laguna de Bay indicating the four areas of evaluation