

PRELIMINARY OBSERVATIONS ON THE OTTER TRAWL FISHERY OF MANILA BAY

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ONE TEXT FIGURE

ABSTRACT

Early in 1957, the Section of Hydrology and Fisheries Biology of the Philippine Bureau of Fisheries started a program for reevaluating the trawl fishery in Manila Bay to compare the results obtained from previous studies by Warfel and Manacop (1950). This paper is a preliminary report covering the first three-year period from 1957 through 1959 based primarily on the data gathered by the technical staff of the above-mentioned Section who joined the fishing trips of commercial vessels fortnightly, each trip lasting from 3 to 5 days.

The otter trawlers were primarily of the design and type previously mentioned by Warfel and Manacop (1950). It was found that there has been a slight increase in the number of fishing vessels operating in Manila Bay during the period under review with a resulting decrease in the total average catch. A classification of fish caught, based primarily on the commercial method, was used in this study, classifying the catches into hoyá, shrimp, squid, slipmouth, lizard fish, and miscellaneous group. It has been shown that there has been a decrease in the catch per hour drag from 1957 to 1959. There has been noted also a direct correlation between the boats operating in the Bay and the seasons of the year.

It is believed that the Manila Bay trawl fishery has reached its maximum development and this led to a change of gear for catching pelagic fish outside Manila Bay, namely, the *basnigan* and the introduction of twin engines into larger trawlers to enable them to catch more pelagic species in the Bay. Analyses of the catch of four fishing vessels representing typical size groups support the foregoing conclusion.

INTRODUCTION

The major net fisheries of Manila Bay are of three types, namely: the otter trawl, the baby trawl, and the *basnigan* (bagnet) fisheries.

Early in 1957, the Section of Hydrology and Fisheries Biology, Division of Fisheries Research, started a program of reevaluating the trawl fishery to determine the condition of the fishery and compare the results with those obtained by Warfel and Manacop (1950). Observations on the otter trawl fishery of Manila Bay which were started have yielded some noteworthy results and are being continued to the present.

This report is based on the results of the study during the first three-year period from 1957 to 1959. A total of 66 fishing trips, aboard 35 commercial vessels, was undertaken by the members of the technical staff of the Section of Hydrology and Fisheries Biology who joined these fishing trips fortnightly for 3 to 5 days at most. Data collected from these fishing cruises were used in this report.

The otter trawls are normally operated in the deeper parts of not less than 7 fathoms in Manila Bay. They use nets of the converted beam trawl type and are called the *mestizo* type of net. The mesh size of the cod ends of the nets ranges from 1 to 1½ inches with the nets themselves measuring from 50 to 65 feet on the headrope. Recently, with the introduction of the twin-engine trawlers in Manila Bay this type of net has proved most effective.

For our study, observations on the following were made: size and power of fishing vessels, the catch composition, total catch landed, analysis of the monthly catches, recent improvements in the otter trawl, and the catching ability of different sizes of trawling vessels. Surface and bottom water samples are taken for salinity and phosphate studies, and data on temperature are recorded during the hauling of nets. This hydrographical portion of the study will be discussed in the final report.

SIZE AND POWER OF FISHING VESSELS

The otter trawl fleet operating in Manila Bay in 1957 consisted of 50 trawls operating monthly on the average, with a total of 604 boat-months operating during the year. There has been a slight increase in the number of boats in the

TABLE 1.—Number of otter trawls operating in Manila Bay.

Year	Average number of boats operating monthly	Number of boat months per year
1957.....	50	604
1958.....	53	637
1959.....	56	669

fishery, increasing the boat-months per year correspondingly (Table I). Each trawler is of the launch type, which was originally a war-salvaged tugboat, a "W and T" or a "PT" boat, converted for trawling. In 1958-59 the twin engine

was introduced into some trawlers. This increased the cruising speed from 3 to 4 knots per hour. In 1960 this was widely accepted and adopted by this industry.

The engine now commonly used is a 125-h.p. *Greymarine* with a normal towing speed of 1½ to 2 knots. A great number of trawlers are locally constructed vessels of *sampan* type. All the vessels used for this study ranged from 32 to 65 gross tons.

CATCH COMPOSITION

The catch of the otter trawlers consists of a great variety of fish numbering over 100 species representing more than 30 families, so that a detailed sorting is not possible. The grouping used by the fishery in sorting the catch as soon as it is hauled follows. The fish are sorted and placed in wooden trays in single layers and iced. The catches are roughly sorted into groups depending mostly on size, namely:

1. *Hoya*—consisting of first class fish (pomadasids, lutjanids, carangids, groupers, and others);
2. *Halo*—consisting of second class fish (nemipterids and goat fishes, and others);
3. *Samot*—consisting of third class fish (mojarras, small hairtails, and others);
4. *Sapsap*—slipmouths of several species;
5. *Kalaso*—lizard fishes of several species;
6. *Hipon*—shrimps of several species; and
7. *Pusit*—squids

However, for purposes of this study, sorting was done in six categories, namely: (1) *hoya* (2) shrimp (3) squid (4) slipmouth (5) lizard fish (*Saurida*) and (6) miscellaneous. Figure 1 shows the monthly breakdown of catches in kilograms per 10-hour drag (in per cent) for the years 1957 thru 1959, based on an average of two trips per month.

Hoya.—Perusal of the data based on the catches separated into the six categories seems to indicate that for the three-year period under review, the catches in 1959 have a high percentage of first class fish *hoya* forming from 35% to 41% of the total catch.

Normally, during the period from 1957 to 1958, this group fluctuated from 22% to 37% except in April when a high

percentage of 57% was recorded. It was noted also that there is a higher catch of this group during the start of the dry season (October to November) probably indicating a higher concentration of the larger fish in the deeper water preparatory to spawning migration outside of Manila Bay.

Shrimp.—It appears that the shrimp resources have dwindled greatly during 1959. The catch of shrimps is closely associated and was highly correlated with the rainy season. While the shrimp catch in 1957 was from 8.5% to 14.7%, the highest percentage being taken in August, it was between 7.5% to

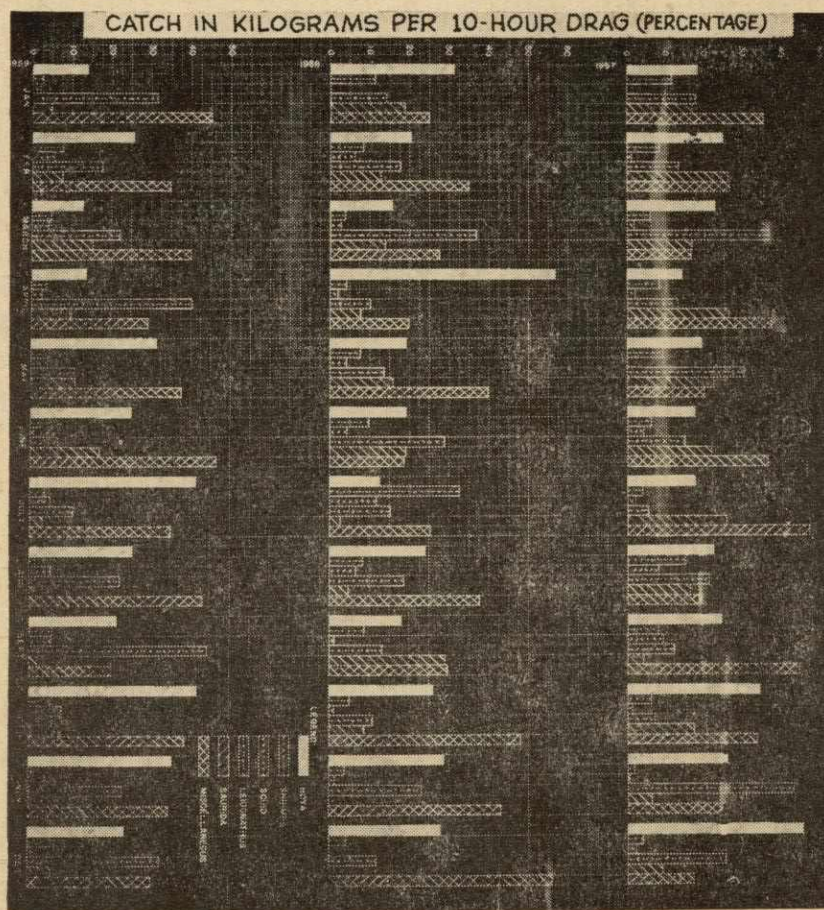


FIG. 1. DISTRIBUTION OF THE CATCHES OF OTTER TRAWLERS IN MANILA BAY IN KILOGRAMS PER 10-HOUR DRAG FROM 1957-1959 IN PER CENT.

32.5% in 1958, the highest being in July. It also has the highest percentage yield of a single group during the month.

However, in 1959, the shrimp catch dwindled to as low as 1.5%. The lowest then was during the month of August. It appears that during this year, the percentage of shrimp caught during the dry season was higher (October-7.7%) than during the rainy season contrary to what has been observed in the two preceding years.

Squid.—Small quantities of squids are taken by trawl and in 1957, the months of August and September showed a percentage of squid catch, 8% and 9%, respectively.

In 1958, the catch during the first half of the year was nil except in February. The highest was during the months of July and August. During 1959 the squid catch was high most of the months, the highest being in October. The lowest was in June. From this data, it appears that squid is a sporadic visitor of the Bay probably entering the Bay in shoals depending upon the available food supply or species of small fish on which they depend upon as food. Although it is expected that as a pelagic species it could be prevalent during the summer months when the water salinity is high, the fact that during some years, the maximum catch occurred during the months of low water salinity shows that the presence of squid in the Bay depends more upon the available food supply and/or prevailing water currents carrying food organisms.

Slipmouth.—In 1957, a high percentage of *Leiognathus* was recorded during the months of March, May, August, November, and December, followed alternately by months of low catches. During 1958, the highest catches were made in March, June and November, and in 1959, in January, April, August, September, November and December. The data on *Leiognathus* species catch show the importance of this group as the mainstay of the trawl fishery in Manila Bay. A definite trend is noted in which there appears a cycle of high and low catch showing variable availability of the group which may run much lower than $\frac{1}{4}$ to $\frac{1}{2}$ of the peak of the cycle. As has been shown by analysis of the catch composition of the trawl by species of *Leiognathus*, definite species may become predominant for one period and disappear totally from the catch after reaching a peak of abundance only to be replaced by another species which may then become dominant a few months later. Perusal of the months when *Leiognathus* species was predominant in

the catch shows no correlation with the rainy or dry season. More studies are needed to determine the causes of variation in availability.

Lizard fish (Saurida).—This is one of the most important groups of fish taken by otter trawls, the catch being high during the dry season from 16.7% to 26.2% and decreasing during the wet season. In 1958, while the catch was also high during the first half of the year (dry season) and devended slowly during the second half, a very high average (29.0%) was recorded for the month of September which is the highest for the group during the period under review. In 1959, there appears to be a great decrease in the availability of lizard fishes and except for the catch in March (15.2%) and in June (17.1%) the percentage composition of the lizard fishes was in most cases below 10% and in fact just above 1% during October and November indicating a great decrease in the lizard fish population.

Miscellaneous Fish.—The great bulk of the catch consisting of small sizes of the various species available to trawlers are classified under this group. In almost all months of the year throughout the period under review, this group forms a big portion of the catch. In 1957, for example, for 8 months during the year, the catch percentage fluctuated from 46.4% in July to 24.6% in November whereas in 1958, for 10 months, the catch was from 24% in July to 55.9% in December. In 1959, for 10 months the group formed the dominant catch of the total landings. This volume of catch indicates that the miscellaneous group taken by trawling in Manila Bay, is really a form of industrial fishery for fish meal comprising about $\frac{1}{3}$ to almost $\frac{1}{2}$ of the total catch. Nevertheless, only a small percentage of this group is converted into fish meal because the majority of the catch is sold in the public market or if in poor condition of preservation, it is sold for the manufacture of fish sauce.

CATCH LANDED

Table II shows the average monthly landings of otter trawlers operating in Manila Bay for the three-year period based on the average catches of vessels which had been accompanied by our research team during the fishing operations. A definite trend of decrease in the catch per hour drag has been noted from the start of the study in 1957 which was 16.16 kgs. (per hour drag) to 12.15 kgs. in 1959. This may

be attributed to the increase in the number of units that operated from 1957 to 1959, and a proof of overfishing in the area.

TABLE II.—Average landings of Otter trawls in Manila Bay in 1957-59.

Year	Catch rate per hour	Monthly average landings	Annual average landings
1957	16.16 kgs.	546,176 kgs.	6,554,116 kgs.
1958	13.32 kgs.	509,066 kgs.	6,108,798 kgs.
1959	12.15 kgs.	506,658 kgs.	6,079,903 kgs.

The average monthly and annual landings which are related to the number of boats in operation show a downward trend in the average catch in 1959 indicating that the fishery has probably reached its maximum development, such that adding more fishing vessels has not increased but rather decreased the annual average landings of the previous years. Because of this development, in 1960 there has been an exodus of trawlers to fish outside Manila Bay.

ANALYSIS OF MONTHLY CATCH

Table III shows a comparison of the monthly landings of all trawlers operating in Manila Bay for the three-year period. It may be noted that there are more trawlers in operation during the second half of the year than during the first half. This may be explained as follows:

TABLE III.—Computed monthly trawl landings in Manila Bay as average from the three year data (1957-59).

Month	Average number of boats operating per month	Monthly average catch per boat in kilograms	Computed average monthly landings of all trawlers
January	49	7,867 kgs.	382,632 kgs.
February	48	6,814	322,233
March	47	10,786	505,382
April	50	10,730	543,689
May	60	10,225	620,027
June	48	9,034	432,917
July	53	9,191	480,068
August	51	9,908	501,959
September	57	9,482	534,202
October	58	12,638	733,125
November	58	12,269	719,688
December	59	8,033	491,685

During the first half of the year when the Northeast monsoon is on, many trawlers fish outside of Manila Bay going to the southern fishing grounds because of favorable weather

conditions allowing them to fish farther. During the later part of the year, the Southeast monsoon prevents the fishing vessels from fishing outside Manila Bay. It will be noted, however, that the higher average catch per vessel is made during the months of October and November at the termination of the SW monsoon season. This season brings rain which has contributed a great amount of runoff adding to the fertility of the bay waters. This higher catch after the monsoon season may also be explained by the inefficient trawling operations during the months when the SW monsoon is on and the typhoons are most prevalent making trawling difficult. It is interesting to note that the least average catches are made on December, January and February which also coincide with the coolest months of the year. However, larger and better fish (hoya) are caught during the same period. Whether the water temperature has an effect on the availability of bottom fish in the Bay has not yet been established. However, immediately after the onset of the dry warm months, March, April, and May, the average catch per vessel increased much more than the average catch during the cooler months of the year. The average catch of 9,000 tons during the rainy months from June to September, appears to be fairly uniform.

RECENT CHANGES IN THE MANILA BAY FISHERY

After 1959, many trawl operators noted that a decreasing amount of catch per unit effort was apparent. This led to changes in the trawl fishery of the Bay in the following direction:

- 1) an increase of trawling power of vessels by installing an extra engine, thereby increasing the towing power twice.
- 2) a total abandonment of the trawl for *basnigan*, (bagnet fishery) a better and more lucrative gear suited for pelagic fishing outside Manila Bay.

It has been noted that the otter trawlers in Manila Bay and *basnigan* vessels operating in northern Palawan are primarily owned by the Navotas-Malabon fishing community at the suburbs of Manila. Very recently, the upsurge not only in the size of vessels but also in the number of units and carrying capacity of the bagnet gear may be correlated with the decrease of otter trawlers operating in Manila Bay.

The introduction, therefore, of the twin-engine otter trawlers in 1960 was a success, for pelagic fish species,

which used to be caught only sporadically by this gear, as roundscad, *Decapterus*; chub mackerels, *Rastrelliger*; gizzard shads, *Anadontostoma chacunda*; and sardines, *Sardinella* formed a major catch of the trawlers and preliminary results showed that there is an apparent increase in the catch rate to 13.7 kgs. per hour drag in 1960. At the moment, therefore, there is a greater trend for the conversion of single-engine to twin-engine trawlers.

Since then, there has been a consistent increase in the quantity of pelagic fishes caught by trawlers indicating the success in the use of more power for otter trawlers to enable them to catch more pelagic species. Inasmuch as great speed has a tendency to raise the net from the sea bottom the catch of shrimps has dwindled correspondingly during the period.

A COMPARISON OF THE CATCHING ABILITY OF FOUR TRAWLERS OF DIFFERENT SIZES OPERATING IN MANILA BAY

A comparative study of four otter trawlers was conducted to determine the catching ability of each size group. These vessels represent various types of the majority of otter trawlers operating in Manila Bay. Table IV shows the fishing vessels selected for this purpose.

TABLE IV.—Comparison of four types of otter trawlers used in Manila Bay

Name of boat	Weight gross ton	Length meters	Trawling power or capacity horse power	Engine type
1. Ildefonso I	18.77	17.15	80	Kinoshita
2. Ildefonso IV	48.37	29.59	80	Kobe
3. Leonor V	60.43	20.44	160	Superior
4. Doña Luisa D	83.85	22.00	325	Atlas Imperial

The representative fishing vessels selected were of varying engine power. The M/V *Ildefonso I* and the M/V *Ildefonso IV* are equipped with slow-speed, heavy duty engines; whereas the M/V *Leonor V* and the M/V *Doña Luisa D* are equipped with high-speed, heavy duty engines.

All these fishing boats use the commercial otter trawl net of the *mestizo* type, with a size of 65 to 80 feet on the footrope. The mesh size on the cod end of their net varies from 1 to 1.5 inches.

Figure 2 shows the superiority of M/V *Doña Luisa D* in the catching ability test over the other fishing boats under study. Owing to its powerful engine, it can attain a faster towing speed. This boat is quite efficient in catching the more elusive, bigger and fast-swimming pelagic species, but not so efficient in catching shrimps, squids, and other mud-burrowing species. The M/V *Leonor V* fishes similarly as the M/V *Doña Luisa D*, although not as powerful as the latter. On the other hand, the slow-towing fishing vessels, the M/V *Ildefonso I* and the M/V *Ildefonso IV* can hardly get the more elusive, pelagic, fast-swimming species, but are quite efficient in catching shrimps, squids and mud-burrowing fish (flatfishes, turbot, lizard fishes, etc.).

From this comparative study, the following observations were noted:

1. The faster the towing speed of the fishing vessel, the more efficient it is in catching the pelagic species, as *Rastrelliger*, *Decapterus* sp., etc., and the fast-swimming large species, as the leather jacket (*Scomberoides*), barracudas (*Sphyraena*), porgy (*Lethrinus*), etc.

2. On the other hand, the slow-towing fishing vessels, are more efficient in catching shrimps, squids and mud-burrowing fish or slow-moving species, as the lizard fishes, turbot, soles, etc., because the net can scrape the sea-bottom better.

From these observations, the fisherman can adjust or select the type of engine suitable for use in the fishing ground, depending on the species commonly available in the area.

LITERATURE CITED

WARFEL, W. E. AND P. R. MANACOP 1950. Otter trawl explorations in Philippine waters U. S. Fish and Wildlife Service, Res. Rep. 25, 49 pages, 33 tables, 16 figs.

TIEWS, K. AND P. CACES-BORJA 1959. On the availability of fish of the family Leiognathidæ Lacepede in Manila Bay and San Miguel Bay and on their accessibility to controversial fishing gear Phil. Jour. of Fisheries, Vol. 7, No. 1 pp. 59-87.

ILLUSTRATION

TEXT FIGURE

FIG. 1. Distribution of the catches of otter trawlers in Manila Bay in kilograms per 10-hour drag from 1957-1959 in percent.