

Vol. 11

JANUARY-DECEMBER 1973

Nos. 1 & 2

THE PHILIPPINE JOURNAL OF FISHERIES



Published semi-annually by the
BUREAU OF FISHERIES AND AQUATIC RESOURCES
Intramuros, Manila
1975

The PHILIPPINE JOURNAL OF FISHERIES

Official Publication of the Bureau of Fisheries and Aquatic Resources
Intramuros, Manila 2801, Philippines

Vol. 11

January-December 1973

Numbers 1 & 2

EDITORIAL STAFF

FELIX R. GONZALES
Editor-in-Chief

APOLONIA C. PASCUAL
JUSTO R. MONTEMAYOR
Managing Editors

CONTRIBUTING EDITORS

INOCENCIO A. RONQUILLO
PRISCILLA CACES-BORJA
VICTORINO T. SAN ANTONIO
PEDRO A. ACOSTA
NATIVIDAD G. MACALINCAG
AURORA B. REYES
GLORIA GUEVARA
REGINA S.J. NAPUGAN
ANSELMA S. LEGASPI
PABLO T. TAMESIS
JUAN V. LOPEZ
PONCIANO C. GUTIERREZ

ECOLOGY OF THE BENTHIC FAUNA OF LAGUNA DE BAY

ELEADORA CRUZ-MERCENE

and

FELICISIMO S. MERCENE

Bureau of Fisheries and Aquatic Resources

ABSTRACT

Benthos is one of the important links in the food chain of the fishes in Laguna de Bay. This group of organisms plays a very important role in the overall productivity of the area. The study was conducted to determine the quantity and quality of benthic organisms per unit area of the lake bottom. A discussion of the data obtained from 1962 to 1967 is presented.

INTRODUCTION

Laguna de Bay has been the subject of limnological investigations since 1960. As part of these investigations, a study of the benthic fauna was undertaken to determine the quantity per unit area of the lake bottom. This is a part of the study on the aquatic productivity of the lake. This paper is a detailed discussion of the quantitative distribution of benthic fauna in the lake. Some ecological data and observations were made to correlate with their fluctuations and distribution.

METHODS

Samples of benthos were obtained in various points of Laguna de Bay with the use of the Ekman dredge. The samples collected were screened thru a standard Tyler sieve No. 32 and preserved in 10% formalin. The organisms were sorted, weighed and identified. At the beginning of the study, 12 sampling stations established around Laguna de Bay were regularly sampled once a month. (Fig. I).

However, during the later part of investigation, additional collections along the shallow portions of the lake particularly along the vegetative areas were made for comparison. The stations established

along the littoral areas fall within the 1-m depth level. On the other hand, the stations around the lake were 4-m depth level except in Navotas which was within 20-m depth.

Weekly sampling was undertaken instead of the previous monthly interval. This modification was made due to the prevalence of aquatic insects during certain periods of the year, particularly the midges. In 1965, a thick swarm of this insect occurred along the shore towns of Laguna de Bay which became a public nuisance.

THE BENTHIC FAUNA

The composition of benthic organisms of Laguna de Bay includes snails, midges and annelids. The taxonomic classification of these organisms is shown below:

Phylum Mollusca

Class Gastropoda

Order Prosobranchiata

Family Melaniidae

Melanoides hastula Lea

Melanoides impura Lea

Melanoides scapulus Reeve

Melanoides subcancellata Boettger

Thiara (plotiopsis) granifera Lea

Thiara pugilis Lea

Family Viviparida

Vivipara angularis Muller

Family Ampullaridae

Ampullaria luzonica Reeve

Order Pulmonata

Suborder Basommatophara

Family Lymnacididae

Bulimus hungerfordiana Nevill

Lymnaea cusigiana Pflieffer

Amphipepla luzonica Beck

Amphipepla quadrasi Mollendorf

Family Elobiidae

Stenothyra quadrasi Mollendorf

Class Pelecypoda

Order Lamellibranchiata

Family Cyrenidae

Corbicula fluminae Muller

Annelids identified by Dr. Ralph Brinhurst of the Department of Zoology, University of Liverpool, England, include the following:

Phylum Annelida

Class Obligochaeta

Order Limnicolae

Family Tubificidae

Limnodrilus hoffmeisteri

Branchiura sowerbyi

Phylum Arthropoda

Class Hexapoda

Order Diptera

Family Chironomidae (Non-biting midges)

Cryptochironomus forcipatus

Polypedilum "Pentapedilum" sp.

Coelotanypus sp.

Chironomus (Dicrotendipes) sp.

Procladius sp.

Chironomus sp.

Tanytarsus sp.

Of the kinds of benthic organisms present in Laguna de Bay, snails are the most abundant. They constitute about 65% of the bottom fauna. Melaniidae is the most dominant snail in the lake.

The annelids are the second largest group comprising 22% of benthic organisms. They are largely composed of *Limnodrilus* and *Branchiura* species (Fig. 2).

The midges particularly the chironomid larvae are the most abundant among the aquatic insects in the area. This occurred in enormous swarms of the adult in 1965.

QUANTITATIVE DISTRIBUTION OF BOTTOM ORGANISMS

The Snails

The bulk of benthos collected was made of snails. A square meter of lake bottom was found to contain 470 to 6,310 snails. The peak period of abundance of the snail occurred during the months of January and February. Alonte (1929) and Mane (1929) had the same observations.

The snails are found all over the lake bottom. They are more dense in the Rizal region. The density may be due to food avail-

ability and type of bottom and other environmental factors which need further investigations. The preponderance of snail dredging operation in this portion of the lake and the lucrative condition of the duck farming industry along this area support these observations. Rabanal, *et al* (1964) stated that Laguna de Bay is a veritable snail producer. The duck food constitute 57% of snails.

THE MIDGES

The midge larvae population is represented by seven species, namely, *Tanytarsus* sp., *Chironomus* sp., *Polypedilum*, *Cryptochironomus* sp., *Coelotanytus*, *Dicrotendipes* and *Procladius* sp. The first two species are the most abundant. Based on the data collected, no significant variations occur between stations. However, there is significant difference in their quantity from month to month (Table 1). This indicates that the midges are found all over the lake bottom but they fluctuate in quantity over time. This is due also to predation by some fishes. The catfish and common carp are bottom feeders. An analysis of the stomach contents of the catfish showed 64% midges.

The average number of midges ranges from 20 to 1,040 per sqm of lake bottom. They are most dense along the vegetation zone of the lake. The peak of abundance of the larvae occurs during the months of December and January. These observations coincide with the occurrence of adult swarms of the midges along the shore town of Laguna de Bay in 1964. Such swarms indicated that a large percentage of the larvae succeeded in completing their life cycle into adults or there may be lesser mortality due to predation during the larval stage. There may be other factors responsible for their successful emergence.

The Annelids

The Annelid components of the bottom samples were composed mostly of Tubificide with *Limnodrilus* and *Branchiura somerbyi* as the dominant species. The average number of annelids ranged from 20 to 2,780 per sqm of lake bottom (Table 3).

Fluctuation of Benthos

There was a decreasing trend in the quantity of bottom organisms from 1962 to 1969. Statistical analysis of bottom organisms in

Table 2 showed that there were significant differences in the number per sqm per month. On the other hand, variations from station to station showed slightly significant differences. This indicates that the three major bottom organisms are all over the lake, irrespective of depth and location.

The great fluctuation of many organisms from month to month and year to year can be traced to pulsation or changes in the environmental conditions. Population dynamics of these benthic organisms which have both aquatic and terrestrial phases in their life history are particularly difficult to study and subject to influences from both environments.

A study of the benthic fauna of Laguna de Bay was conducted to determine the quantity of benthic organisms per unit area of lake bottom. Information here will be used as a tool in the over-all management of the fishery resources of Laguna de Bay.

At the beginning of the study, 12 sampling stations established around Laguna de Bay were regularly sampled once a month. However, in the later part of the investigations, additional collection stations along the shallow portion of the lake were sampled weekly.

Percentage composition of benthic organisms of Laguna de Bay include snails 65%, annelids 22% and midges 13%.

Statistical analysis of bottom organisms showed that there were significant differences in the number per sqm per month. On the other hand, variation from station to station showed slightly significant difference.

The abundance of the benthic fauna and its variation by station, month and year, are mostly interpreted as the outcome of the phenomena in the realm of species biology (emergence, hatching and so on) consumption by fish, chemistry of environment and other natural factors.

REFERENCES

- ALONTE, F.H., (1930). Biology of *Vivipara angularia* Muller, a common freshwater snail in Laguna de Bay. *Phil. Agriculturist*, 19 (5) 316.
- MANE, A.M., (1929). A preliminary study of the life history and habits of *Kanduli* (*Arius* sp.) in Laguna de Bay. *Phil. Agriculturist*, 18 (2) 99 — 100.

ALLAN, K.R., (1942). Comparison of bottom fauna as a source of available fish food. *Trans. Am. Fish Soc.* 71: 275-283.

MUNDIE, J.H. (1957). The ecology of the chironomidae in storage reservoirs. *Trans. R. ent. Sec. Lond.* 109: 149-232.

WELCH, S. PAUL. (1952). *Limnology*, New York, pp. 315-362.

Table I. Average number and weight of midges per month in Laguna de Bay, 1962-1967.

YEAR	1962	1963	1964	1965	1966	1967	AVERAGE
MONTH	Number : Weight (gms)	Number : Weight (gms)	Number : Weight (gms)	Number : Weight (gms)	Number : Weight (gms)	Number : Weight (gms)	Number : Weight (gms)
January	630 : -	600 : 1.96	460 : 1.21	870 : 2.61	- : -	260 : .10	564 : 1.47
February	320 : -	620 : 2.02	150 : 0.47	370 : 1.21	- : -	170 : .74	326 : 1.11
March	300 : -	580 : 1.86	- : -	450 : 1.26	- : -	390 : .28	580 : 1.13
April	220 : -	770 : 2.79	70 : 0.22	440 : 1.52	550 : 0.23	270 : .52	387 : 1.02
May	280 : -	390 : 0.70	20 : 0.01	440 : 1.21	230 : .64	90 : .61	242 : 0.63
June	400 : -	410 : 1.03	80 : 0.20	140 : -	120 : .83	- : -	190 : 0.69
July	160 : -	410 : 2.30	50 : 0.05	- : -	400 : .97	- : -	255 : 1.10
August	300 : -	710 : 4.40	130 : 0.12	- : -	150 : .17	- : -	322 : 1.56
September	260 : -	- : -	140 : 0.15	- : -	90 : .26	- : -	163 : 0.20
October	200 : -	1370 : 6.70	230 : 0.26	250 : 0.42	140 : .03	- : -	568 : 1.85
November	310 : -	620 : 2.40	460 : 0.74	- : -	180 : .20	- : -	397 : 1.45
December	610 : -	1180 : 3.91	600 : 0.82	- : -	190 : .97	- : -	645 : 1.90
AVERAGE	332 : -	650 : 2.82	220 : 0.39	420 : 1.03	227 : 0.48	236 : 0.41	534 : 1.29

Table 2. Average number of Benthic Organisms per month in Laguna de Bay, 1962-1967.

MONTH	Y E A R											
	1962	1963	1964	1965	1966	1967	AVERAGE					
January	6,740	3,090	2,830	2,740	-----	2,042	3,738					
February	6,630	2,690	2,700	2,400	-----	1,149	3,085					
March	5,060	2,140	-----	4,820	-----	1,501	3,673					
April	3,200	4,210	2,960	2,490	6,130	50	3,332					
May	3,340	2,270	4,470	2,910	3,560	1,060	2,918					
June	2,520	1,290	4,390	1,620	2,480	-----	2,460					
July	3,680	3,230	1,290	-----	5,220	-----	3,355					
August	3,000	1,700	1,160	-----	5,147	-----	4,369					
September	3,030	-----	1,670	-----	5,491	-----	4,181					
October	1,290	4,190	2,110	520	3,597	-----	2,703					
November	3,610	3,250	1,640	-----	3,523	-----	3,998					
December	4,310	2,600	2,200	-----	-----	-----	3,212					
AVERAGE	3,871	2,605	2,500	2,500	4,150	1,300	3,905					

NOTE:

----- No Sample Taken

Table 3. Average number and weight of Annelids per month in Laguna de Bay, 1962-1967.

YEAR	MONTH	Y E A R												
		1962	1963	1964	1965	1966	1967	AVERAGE						
		Number	Weight (gms)	Number	Weight (gms)	Number	Weight (gms)	Number	Weight (gms)	Number	Weight (gms)	Number	Weight (gms)	
January	70	340	0.70	60	0.33	11,290	0.83	-	-	130	0.25	376	0.30	
February	60	430	2.10	20	0.06	11,850	0.84	-	-	170	0.33	506	0.43	
March	100	11,050	3.51	-	-	14,250	2.70	-	-	140	0.61	11,360	2.07	
April	50	12,780	1.17	20	0.05	11,830	1.80	11,300	0.80	200	0.65	11,030	0.89	
May	70	11,190	1.25	130	0.54	12,140	-	11,260	3.45	240	0.37	838	1.40	
June	220	-	310	0.30	120	0.37	330	-	220	0.66	-	240	0.44	
July	130	-	190	0.31	110	0.35	-	-	870	0.67	-	325	0.44	
August	230	-	150	0.41	300	0.45	-	-	230	0.54	-	222	0.47	
September	70	-	-	-	990	0.56	-	-	220	0.94	-	246	0.73	
October	230	-	170	0.33	550	0.30	220	-	330	0.04	-	274	0.22	
November	240	-	180	0.22	530	0.60	-	-	440	0.86	-	327	0.56	
December	1,870	-	130	11,800	1.190	1,07	-	-	200	0.56	-	840	0.58	
AVERAGE	263	-	620	0.95	314	0.43	11,690	-	561	0.94	176	0.32	-	0.63

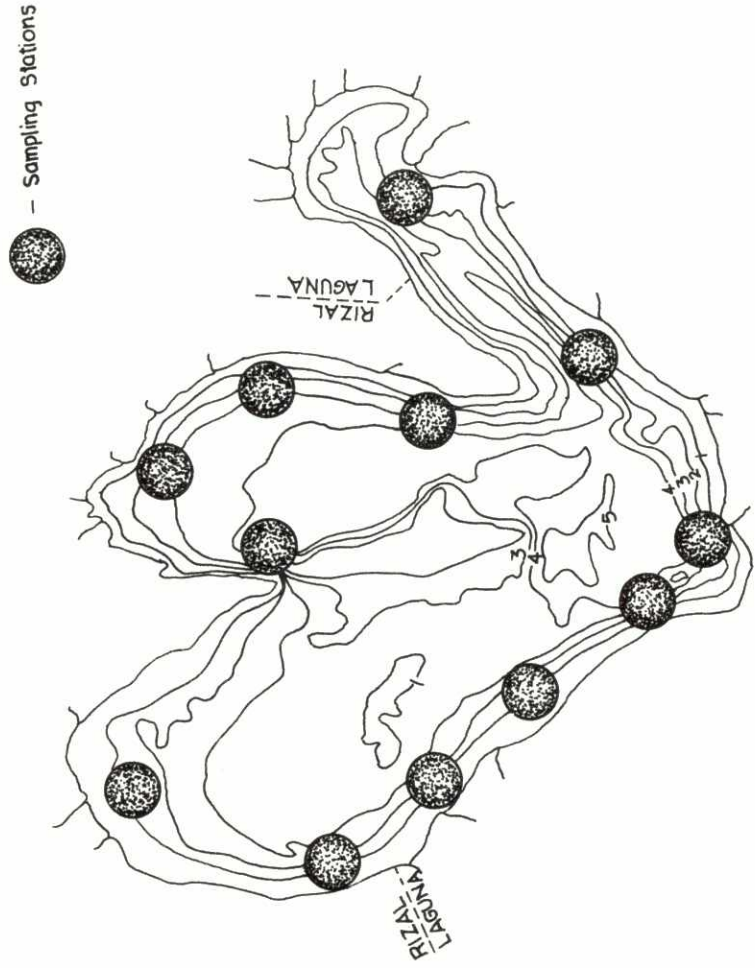


Fig. 1. Chart showing the location of sampling stations in Laguna de Bay.

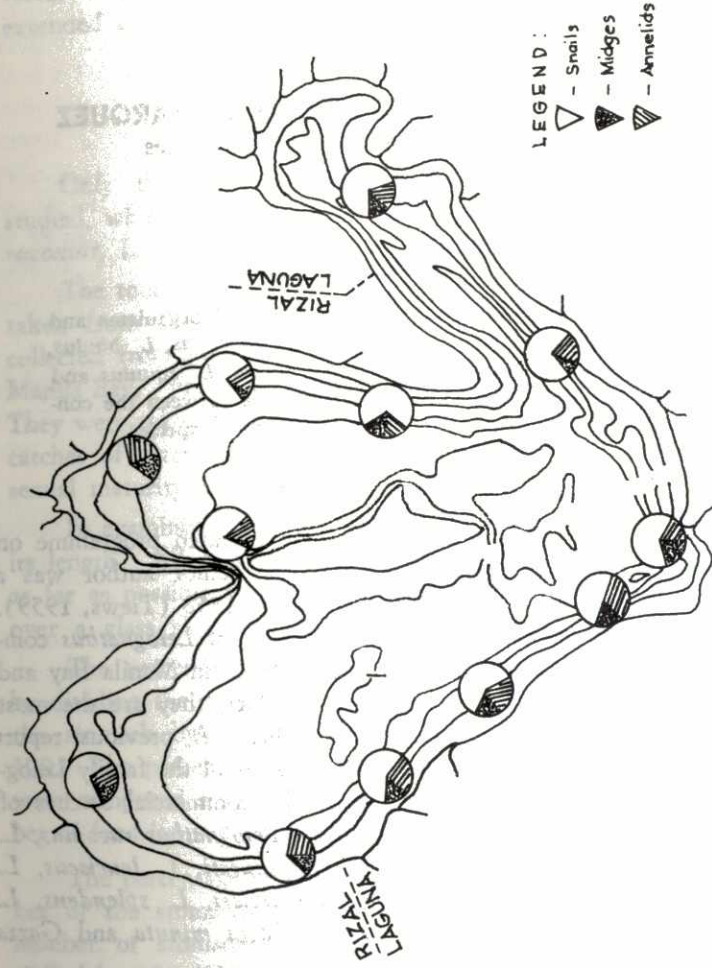


Fig. 2. Distribution of sampling stations showing the percentage composition of Benthic Organisms.