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NUTRIENT BEHAVIOR, PRIMARY PRODUCTION, AND
INFAUNA IN A RIVER SYSTEM WITH INPUTS FROM
FISHPOND EFFLUENTS

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College of Science
University of the Philippines
Diliman, Quezon City

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**^{e/}NUTRIENT BEHAVIOR, PRIMARY PRODUCTION, AND
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EFFLUENTS**

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*Nutrient behavior, primary production, and
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Abstract

This dissertation has assessed the environmental conditions in Sta. Rita River, a river estuary used as a discharge and irrigation area for approximately 316 has of fishponds. The study has estimated nutrient concentrations and fluxes both in the water column and in the sediments, related nutrient levels to seasonal variation (wet and dry), measured primary productivity and assessed the composition and spatial distribution of infauna. These objectives have been attained to elucidate scientific knowledge on nutrient behavior and primary production in a river system affected by fishpond effluents, which may be used to provide insights for management.

On the average, nitrate and ammonia concentrations increased to 3.1 μM and 14 μM during the wet season (September 1997) from 0.4 μM and 7.4 μM during the dry season (February 1997), while phosphate decreased from 5.4 μM to 1.3 μM . The increase in nitrate concentration indicates freshwater input while the decrease in phosphate values imply less of freshwater influence but more from ponds and domestic wastes. Nutrient trends and fluxes indicate that tidal oscillation and advection are important processes in the river. Porewater concentrations of ammonia reached an average level of 3,018 μM in September 1997 from a level of 2,000 μM in June 1993. Computations done using benthic flux estimate and nutrient concentration in the water column showed that it may take a minimum of 15 days for phosphate, 13 days for nitrite, and 0.3 day for ammonia to replace the standing stock of these nutrients in the water column using the highest benthic flux estimates. This indicates that nutrients regenerated in the sediments could be important in the inventory of nutrients in the water column. The higher average gross

primary production in 1997 ($41 \text{ mg C m}^{-3} \text{ hr}^{-1}$ for dry season and $111 \text{ mg C m}^{-3} \text{ hr}^{-1}$ for wet season) than in 1993 ($34 \text{ mg C m}^{-3} \text{ hr}^{-1}$ for wet season) may be attributed to increased nutrient input from the fishponds along Sta. Rita River.

Sta. Rita River has been used as a discharge and irrigation area of fishponds for the last 5 to 8 years. Within this span of time, it may be possible that the infauna community structure in this river estuary has been altered. Consequently, low number of infauna individuals were observed and opportunistic species like oligochaetes and polychaetes have dominated over the other groups of infauna (e.g. nematodes, copepods, amphipods).

TABLE OF CONTENTS

	Page
List of Appendices	viii
List of Tables	ix
List of Figures	x
Abstract	xii
Chapter 1. Introduction	1
Literature Review	4
Statement of the Problem	11
Objectives of the Study	12
References	13
Tables	17
Figures	23
Chapter 2. Nutrient behavior and productivity in a river system	29
affected by fishpond effluents	
Introduction	30
Materials and Methods	30
Results and Discussion	31
References	36
Chapter 3. Variations in the bio-physico-chemical parameters of a river	37
system affected by fishpond effluents during dry and wet seasons	
Abstract	38
Introduction	39
Materials and Methods	40
Results and Discussion	41
References	50
Figures	52

Chapter 4. Porewater concentrations and benthic fluxes of nitrite, ammonia, and phosphate in a river system affected by fishpond effluents	63
Abstract	64
Introduction	65
Materials and Methods	66
Results and Discussion	67
References	75
Tables	78
Figures	82
 Chapter 5. Composition and spatial distribution of infauna in a river system affected by fishpond effluents	 89
Abstract	90
Introduction	91
Materials and Methods	92
Results and Discussion	93
References	100
Tables	103
Figures	106
 Chapter 6. Summary and Conclusion	 111

LIST OF APPENDICES

	Page
<i>Appendix</i>	
A Ammonia determination	118
B Nitrate determination	121
C Nitrite determination	124
D Phosphate determination	126
E Determination of organic carbon in the sediment	128
F Chlorophyll-a / Phaeophytin a determination	130
G Dissolved oxygen determination	133
H Organic matter determination using Walkley-Black Method	138
I Grain size analysis using Pipette method	140
J Raw Data	143

LIST OF TABLES

		Page
<i>Table</i>		
1-1	Oxidation states of nitrogen	17
1-2	Total phosphorus and inorganic phosphate (μ M) at selected stations in Tampa Bay Tributaries October 1958 – December 1959	18
1-3	Specific forms of C, N, P and S in river-borne material	19
1-4	Natural levels of N and P in riverborne material	20
1-5	Natural ranges of C, N, P, and S export rates in major rivers	21
1-6	Concentrations of N and P species in rivers affected by human activities	22
4-1	Textural grade of sediments in Sta. Rita River	78
4-2	Rates of sediment-water exchanges of nutrients for selected rivers	79
4-3	Range of benthic flux and average nutrient concentration in the water column for Sta. Rita River	80
4-4	Comparison of horizontal fluxes and benthic fluxes (multiplied by river depth) of nutrients in the upstream and downstream portions of Sta. Rita River	81
5-1	Classification and number of individuals of infauna collected at Sta. Rita River (September 1997)	103
5-2	Number of individuals of macrofauna and meiofauna (by Taxon Group) collected at Sta Rita River (September 1997)	104
5-3	Grain size analysis	105

LIST OF FIGURES

<i>Figure</i>	Page
1-1 a The aquatic nitrogen cycle	23
1-1 b Transformations within the nitrogen cycle in estuarine systems	24
1-2 Energy – increasing and –decreasing steps of the nitrogen cycle	25
1-3 The phosphorus cycle	26
1-4 Map showing sampling stations in Sta. Rita River	27
1-5 Nutrient pathway (input-output relationship) and intervening factors in Sta. Rita River	28
2-1 Map showing sampling stations in Sta. Rita River	31
2-2 (a) Horizontal profiles of depth and salinity in Sta. Rita River during ebb (●) and flood (O) periods plotted against distance along Sta. Rita River (Feb 1997); (b) Horizontal profiles of depth and salinity in Sta. Rita River plotted against distance along Sta. Rita River (Sep 1997)	32
2-3 (a) Nutrient, chlorophyll a and particulate organic carbon concentrations plotted against distance along Sta. Rita River (Feb 1997) during ebb (●) and flood (O) periods; (b) Nutrients concentrations plotted against distance along Sta. Rita River (Sep 1997)	33
2-4 (a) Fluxes during ebb (●) and flood (O) periods plotted against distance along Sta. Rita River (Feb 1997). Positive flux (+) means import or retention of nutrients in the river. Negative flux (-) refers to export or removal of nutrients from the river; (b) Fluxes plotted against distance Sta. Rita River (Sep 1997)	34
2-5 Average (◇) and net (■) fluxes plotted against distance along	35
3-1 Map showing sampling stations in Sta. Rita River	52
3-2 Horizontal profiles of depth plotted against distance along	53
Sta. Rita River in the dry season during flood & ebb periods (a), as average values in the dry season (b), and for the wet season (c).	
3-3 Horizontal profile of salinity in Sta. Rita River at different sampling periods...	54
3-4 Total suspended solids (TSS) plotted against distance for the dry season during flood and ebb periods (a), as average values in the dry season (b),	55

	and for the wet season (c).	
3-5	Horizontal secchi depth profiles in Sta. Rita River at56 different sampling periods	
3-6	Particulate organic carbon (POC) plotted against distance for the dry57 season during flood and ebb periods (a), as average values in the dry season (b), and for the wet season (c).	
3-7	Dissolved oxygen plotted against distance at 3 stations in Sta. Rita River58 during dry (a) and wet (b) seasons	
3-8	Chlorophyll plotted against distance in Sta. Rita River for the dry season59 during flood and ebb periods (a), as average values in the dry season (b), and for the wet season (c).	
3-9	Gross primary productivity at 3 stations of Sta. Rita River during60 dry (a) and wet (b) seasons	
3-10 a	Nutrient concentrations, primary productivity, and chlorophyll61 at 3 stations of Sta. Rita River during dry season (February 1997)	
3-10 b	Nutrient concentrations, primary productivity, and chlorophyll62 at 3 stations of Sta. Rita River during wet season (September 1997)	
4-1	Map showing sampling stations in Sta. Rita River82	
4-2	Nutrient porewater concentrations at stations 1 (a), 6 (b), and 12 (c)83	
4-3	Fishpond layout showing representative pond84	
4-4	Nutrient porewater concentrations in the pond compartment85	
4-5	Benthic fluxes at the three stations of Sta. Rita River86	
4-6	Levels of chlorophyll-a, gross primary productivity, and average nutrient87 porewater concentrations in Sta. Rita River	
4-7	Chlorophyll-a, POC, and TSS plotted against distance in Sta. Rita River.....88	
5-1	Map showing sampling stations in Sta. Rita River106	
5-2	Fishpond layout showing representative pond107	
5-3	Number of infauna groups in Sta. Rita River108	
5-4	Total number of infauna and nutrient porewater concentrations at109 different stations in Sta. Rita River	
5-5	Number of infauna vs. nutrients (NO ₂ and NH ₃) in Sta. Rita River110	

Introduction

A river estuary is a saline mixing zone between freshwater and seawater (Church, 1986). It is considered a transition zone for aqueous solutions and solid phases to interact and some reactions occurring have important effects on the oceanic cycles of many elements (Burton and Liss, 1976). These reactions include biological processes, flocculation, sedimentation, adsorption, desorption, diagenesis, remobilization and redox processes (Troup and Bricker, 1975; San Diego-McGlone, 1992). Some river estuaries are hydrologically dominated more by tidal and wind action than by river flows resulting in lengthy flushing times from weeks to a year. In tidally dominated estuaries, two zones are important, these are the turbidity maximum and productivity maximum (Church, 1986). Microconstituent reactants such as nutrients can be processed in tidal estuaries firstly by geochemical processes (e. g. flocculation, ion exchange) associated with the turbidity maximum, and secondly by biochemical processes associated with the productivity maximum (Sharp et al., 1984). Sources of microconstituent reactants may be primary or secondary. The former is associated with riverine or atmospheric introduction that includes natural weathering or anthropogenic mobilization.

A river estuary or estuaries in general are considered the most productive of aquatic ecosystems due to its association with anthropogenic inputs and nutrients therein are important in sustaining high rate of production in the coastal waters. The importance of river estuaries can not be underestimated because they are the reaction vessels through which land-derived materials pass before entering the sea. These materials originate from