

MINOR RESEARCHS AND THESIS FOR
DEGREE IN SCIENCE (PHYSICS)
IN COLLEGE, PHILIPPINES

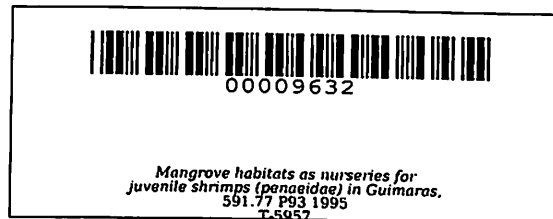
Cavite State University (Main Library)



T5957

THESIS/SP 591.77 P93 1995

✓
MANGROVE HABITATS AS NURSERIES FOR JUVENILE SHRIMPS
(PENAEIDAE) IN GUIMARAS, PHILIPPINES



JURGENNE HONCULADA PRIMAVERA
✓

A Doctoral Dissertation Submitted to the
Marine Science Institute
College of Science
University of the Philippines
Diliman, Quezon City

As Partial Fulfillment of the Requirements
for the Degree of
DOCTOR OF PHILOSOPHY IN MARINE SCIENCE

October 1995

✓
9/2/15

Table of Contents

	Page
Acknowledgements	v
Preface	vii
Table of Contents	viii
List of Figures	x
List of Tables	xi
List of Appendix Figures	xii
Abstract	xiii
Introduction	1
Chapter I. Mangroves as shrimp nurseries: Comparison of penaeid populations in riverine and island mangroves (manuscript)	4
Abstract	4
Introduction	5
Materials and Methods	6
Results	15
Discussion	23
Acknowledgements	37
References	37
Chapter II. Species and size composition of penaeid shrimps in inshore and offshore habitats (manuscript)	42
Abstract	42
Introduction	43
Materials and Methods	44
Results	51
Discussion	56
Acknowledgements	66
References	66

Chapter III. Diel activity patterns in <i>Metapenaeus</i> and <i>Penaeus</i> juveniles (<i>Hydrobiologia</i> 295: 295-302, 1995)	71
Abstract	71
Introduction	72
Materials and Methods	72
Results	78
Discussion	84
Conclusion	90
Acknowledgements	91
References	91
Chapter IV. Fish predation on juvenile penaeids: The role of structure and substrate (manuscript)	94
Abstract	94
Introduction	95
Materials and Methods	98
Results	106
Discussion	109
Acknowledgements	113
References	114
Chapter V. Stable carbon and nitrogen isotope ratios in juvenile penaeids and primary producers in a riverine mangrove in Guimaras, Philippines (<i>Bulletin of Marine Science</i> , in press)	118
Abstract	118
Introduction	118
Materials and Methods	120
Results	125
Discussion	127
Conclusion and Recommendations	131
Acknowledgements	132
Literature Cited	132
Synthesis and Conclusion	137
Bibliography	142
Appendix I	156

List of Figures

	Page
 Chapter I	
I.1. Location of study sites in Guimaras	8
I.2. Monthly water temperature, salinity and pH	12
I.3. Hourly temperature, salinity and tidal depth	14
I.4. Species composition of penaeids	17
I.5. Density of penaeids in riverine and island mangrove, and tidal flat	20
I.6. Density of all penaeids, <i>Metapenaeus ensis</i> and <i>Penaeus merguensis</i>	22
I.7. Size composition of <i>Penaeus merguensis</i> in riverine mangrove	27
I.8. Size composition of <i>Metapenaeus ensis</i> in riverine mangrove	29
I.9. Size composition of <i>Metapenaeus anchistus</i> in island mangrove	32
I.10. Size composition of <i>Metapenaeus anchistus</i> in tidal flat	34
 Chapter II	
II.1. Study sites in inshore and offshore habitats, Guimaras	46
II.2. Species composition of penaeids	55
II.3. Size composition of <i>Metapenaeus ensis</i>	60
II.4. Size composition of <i>Penaeus merguensis</i>	63
 Chapter III	
III.1. Diel activity patterns of <i>Metapenaeus anchistus</i>	74
III.2. Diel activity patterns of <i>Metapenaeus philippinensis</i>	77
III.3. Diel activity patterns of <i>Penaeus merguensis</i>	80
III.4. Diel activity patterns of <i>Penaeus monodon</i>	83
III.5. Frequency of shrimp activities during light and dark periods	86
III.6. Frequency of activities in small, medium and large shrimp	89
 Chapter IV	
IV.1. Distribution of pneumatophores in tanks	102
IV.2. Pneumatophore density and fish predation on <i>Penaeus merguensis</i> and <i>P. monodon</i>	105
IV.3. Shelter type and fish predation on <i>Penaeus merguensis</i> and <i>P. monodon</i>	108
IV.4. Sediment size and fish predation on <i>Metapenaeus ensis</i>	111
 Chapter V	
V.1. Stable C isotope ratios of producers and shrimps in mangrove habitats	124

List of Tables

	Page
Chapter I	
I.1 Comparison of penaeids in riverine and island mangrove	24
Chapter II	
II.1. Inshore and offshore Guimaras habitats and sampling gears	48
II.2. Species and size selectivity of sampling gears	50
II.3. Numbers of penaeids from Guimaras habitats	52
II.3. Size ranges of penaeids from Guimaras habitats	57
Chapter IV	
IV.1. Details of predation experiments in the laboratory	97
IV.2. Size composition of sediments in laboratory experiment	99
Chapter V	
V.1. Stable C and N isotope ratios in plants and detritus from Sibunag River	126
V.2. Stable C and N isotope ratios in shrimps from Sibunag River	128

List of Appendix Figures

	Page
Fig. 1. Island mangrove in Tandog, Guimaras	157
Fig. 2. Pocket seine samples ready for sorting	157
Fig. 3. Shrimp species used in laboratory experiments	158
Fig. 4. Set-up for diel activity experiment	158
Fig. 5. Acclimation of <i>P. merguiensis</i> and sea bass	159
Fig. 6. <i>P. monodon</i> hiding behind pneumatophores	159
Fig. 7. Riverine mangrove sites: mudbank and forest	160
Fig. 8. Benthic algae in riverine mangrove forest	160
Fig. 9. Sibunag River mangrove, Guimaras	161
Fig.10. A mangrove transect in knee-deep mud is no fun	161

Introduction

Mangroves dominate up to 75% of the world's tropical coastline between 25°N and 25°S latitude (McGill, 1959 in Odum *et al.*, 1982). Forty five percent of the estimated total world area of 16.5 million hectares of mangroves in 1983 were located in Asia (FAO, 1994).

Since then, conversion to residential, agricultural, industrial and other uses has led to the loss of mangrove forests at an alarming rate. In the Philippines alone, mangroves have decreased from half a million hectares at the turn of the century (Brown and Fischer, 1920) to 132,500 ha in 1990 (Auburn University, 1993). Brackishwater culture ponds have increased from only 61,000 ha in 1940 to over 240,000 ha in 1992 (BFAR, 1993). Around half of the mangrove loss of 279,000 ha in the 1951-1988 period can be traced to the development of 141,000 ha of culture ponds (Primavera, 1995).

A variety of mangrove products are used for fuel, construction, fishing, agriculture, paper production, drugs and beverages, textile and leather items, and food (Saenger *et al.*, 1983). Aside from these diverse goods, mangrove ecosystems support nearshore fisheries, provide coastal protection against typhoons and storm surges, reduce erosion and stabilize sediments, control flooding and pollution, and provide a habitat for wildlife.

Marine municipal fisheries in the Philippines accounted for 39% of the total 1993 fisheries production of 2.6×10^6 mt (BFAR, 1993). Annual yields of marine municipal fisheries by province have been correlated with existing mangrove areas in the Philippines (Camacho and Bagarinao, 1987). Such a positive relationship between fish/shrimp catches and mangrove/intertidal area has also been documented for Malaysia (Macnae, 1974; Gedney *et al.*, 1982), Indonesia (Martosubroto and Naamin, 1977), the U.S.A. (Turner, 1977), and Australia (Staples *et al.*, 1985).