

FISH COMMUNITIES OF PAYA BUNGOR,
WITH NOTES ON ITS DEVELOPMENT,
MANAGEMENT AND RECREATIONAL USE


MOHD. AZMI AMBAK

DOCTOR OF PHILOSOPHY (FISHERIES)
UNIVERSITI PERTANIAN MALAYSIA

1984

ABU KHAIR MOHAMMAD MOHSIN, Ph.D.
Faculty of Fis Marine Science
Universiti
43400
Selangor D

tesis
SH 328 .M6 1984



1000402658
Fish communities of Paya Bungor, with notes on its
development, management and recreational use / Mohd. Azmi
Ambak.

N. 24407
M
3/6/02



IRS - 3048

PERPUSTAKAAN SULTANAH NUR ZAHIRAH
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

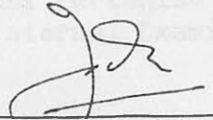
Lihat sebelah

SH
328
M6 52
1984

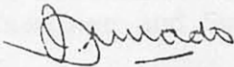
HAK MILIK
PERPUSTAKAAN KUSTOMER

HADIAH

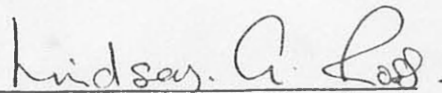
It is hereby certified that we have read this thesis entitled "Fish Communities of Paya Bungor, with notes on its development, management and recreational use" by Mohd. Azmi bin Ambak, and in our opinion it is satisfactory in terms of scope, quality and presentation as partial fulfilment of the requirements for the degree of Doctor of Philosophy.



ALANG P. ZAINUDDIN, Ph. D.
Assoc. Professor/Dean of Graduate Studies
Universiti Pertanian Malaysia
(Chairman Board of Examiners)



JOSE IRENEU DOS REMEDIOS FURTADO, Ph. D.
Science Advisor
Commonwealth Secretariat
LONDON
(External Examiner)



LINDSAY GLENN ROSS, Ph. D.
Lecturer and Course Director
Aquaculture and Fishery Management
Institute of Aquaculture
University of Stirling
UNITED KINGDOM
(External Examiner)

FISH COMMUNITIES IN PAVA SUNGAI, WITH
NOTES ON MANAGEMENT

Ang Kok Jee

ANG KOK JEE, Ph.D.
Associate Professor
Faculty of Fisheries and Marine Science,
Universiti Pertanian Malaysia
(Internal Examiner)

A. K. M. Mohsin

A. K. M. Mohsin, Ph.D.
Associate Professor,
Faculty of Fisheries and Marine Science,
Universiti Pertanian Malaysia.
(Internal Examiner and Supervisor)

Dr. Azmi bin Azah

This thesis submitted in partial fulfillment of the
requirements for the degree of Doctor of
Philosophy in the Faculty of Fisheries and
Marine Science, Universiti Pertanian Malaysia.

December 1984

1003402033

ACKNOWLEDGEMENTS

FISH COMMUNITIES IN PAYA BUNGOR, WITH
NOTES ON ITS DEVELOPMENT, MANAGEMENT
AND RECREATIONAL USE

First and foremost, I would like to express my gratitude to Dr. Abu Shair Mohamed Sultan who devoted much of his time and energy in supervising my work and making sure that it goes without a hitch. Without his constant encouragement this thesis will never be written.

I am also grateful to Dr. S. B. Salls who acted as my consultant supervisor, for his advice and suggestions on research methodologies.

A vote of thanks are also due to Professor Dr. Nayan Ariffin, the Vice-Chancellor and Universiti Pertanian Malaysia who provide research fundings and facilities by carrying out the investigations.

I also wish to thank Dr. Nelson Marshall of University of Rhode Island and Dr. John Munro of ICLARM for securing necessary funds from U.S. Sea Grant and FAO respectively, for my course work at URI and subsequent data analysis at ICLARM. For my thesis writing at University of Stirling, I had the privilege of getting British Council's GICM fellowship for which I am thankful.

While at ICLARM, Manila, I was greatly indebted to Dr. Daniel

A thesis submitted in partial fulfilment of the
requirement for the degree of Doctor of
Philosophy in the Faculty of Fisheries and
Marine Science, Universiti Pertanian Malaysia.

Dr. M. J. Wilson and Dr. L.C. Huss who made my stay at the University of Stirling worthwhile and meaningful.

December 1984

1000402658

1000402658

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to Dr. Abu Khair Mohammad Mohsin who has devoted much of his time and energy in supervising my work and making sure that it goes without a hitch. Without his constant encouragement this thesis will never be written.

I am also grateful to Dr. S. B. Saila who acted as my consultant supervisor, for his advice and suggestions on research methodologies.

A vote of thanks are also due to Professor Dr. Nayan Ariffin, the Vice-Chancellor and Universiti Pertanian Malaysia who provide research fundings and facilities for carrying out the investigations. I also appreciate the help given by Dr. Nelson Marshall of University of Rhode Island and Dr. John Munro of ICLARM for securing necessary funds from U.S. Sea Grant and FAO respectively, for my course work at URI and subsequent data analysis at ICLARM. For my thesis writing at University of Stirling, I had the privilege of getting British Council's CICHE fellowship for which I am thankful.

While at ICLARM, Manila, I was greatly indebted to Dr. Daniel Pauly and Miss Deng Palomares who helped and advised me in running computer programmes for analysing my data. I am also obligated to Dr. R. J. Roberts and Dr. L.C. Ross who made my stay at University of Stirling worthwhile and meaningful.

The support from the staff of the Faculty are also acknowledged especially Encik Saad Mat and Encik Fazli Shah Abd. Rahman who contributed much during field investigations.

Finally, praises are due to God, the Almighty, for giving me life without which this work will never be carried out.

ACKNOWLEDGMENTS	iii
TABLE OF CONTENTS	v
LIST OF TABLES	xiii
LIST OF FIGURES	xvii
LIST OF PLATES	xx
ABSTRACT	xxi
CHAPTER 1. INTRODUCTION	1
Needs for Recreation	1
Outdoor Recreation	1
Recreational Fishing	2
Objectives and Definitions	3
Role and status of Recreational fishing	4
in Developed Countries	4
Economic value of Recreational Fishing	5
National Economic Impact	5
Local Economic Impact	6
Trends in Recreational Fishing	7
Recreational Fisheries in Malaysia	20
Present Status	20
Potentials for Development	21
Human Resources	22

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	v
LIST OF TABLES	xii
LIST OF FIGURES	xvi
LIST OF PLATES	xx
ABSTRACT	xxi
CHAPTER 1 INTRODUCTION	1
Need for Recreation	1
Outdoor Recreation	2
Recreational Fishing	3
Objectives and Definitions	3
Role and status of Recreational Fishing in Developed Countries	4
Economic Value of Recreational Fishing	7
National Economic Impact	7
Local Economic Impact	8
Trends in Recreational Fishing	9
Recreational Fisheries in Malaysia	10
Present Status	10
Potentials for Development	12
Human Resource	12

	Page
Water Resources	14
Management Expertise	17
The Scope of the Problem	18
Paya Bungor Development Plan	21
Objectives of Study	23
CHAPTER 2 DESCRIPTION OF THE STUDY AREA	25
General Description and Physiography	25
Sampling Stations	32
Station A (white water system)	33
Station B (brown water system)	50
Station C (in between Stations A and B)	56
Discussions on the Ecological Properties of Paya Bungor	64
Physico-chemical characteristics	64
Benthic macroinvertebrates	70
Microinvertebrates	76
Phytoplanktons and Primary Production	83
Vegetation	87
CHAPTER 3 ANALYSIS OF THE FISH POPULATION IN PAYA BUNGOR	90
Introduction	90
Monitoring Population Parameters for Fisheries Management	91
Patterns of species Abundance and Diversity	93

	Page
Species Richness	95
Heterogeneity	96
Equitability	96
Measures of species abundance and diversity	97
Species Richness Indices	97
Heterogeneity Indices	101
Equitability Indices	103
Dynamics of Fish Populations	105
Basis of the theoretical models	105
Mathematical Representation and Estimation of the Parameters	107
Growth	107
Tag-Recapture Studies	112
Length-Frequency Analysis	113
Mortality	116
Parameter Estimations from Length Data	117
Materials and Methods	121
Preliminary Investigations and Findings	121
Sampling Procedure	123
Sampling Sites and Sampling Program	123
Description of Sampling Gears	124
Gill Nets	125

	Page
Trammel Nets	125
Discussion of Gear Used	126
Species Composition and Seasonal Abundance .	127
Patterns of Distribution	128
Spatial and Temporal Distribution . . .	128
Specific Distribution	129
Community Diversity	132
Feeding and Food Habits	134
Length-weight Relationships and Condition	
Index	135
Estimation of Growth Parameters from	
Length-Frequency Data	138
Estimation of Mortality from Length	
Frequency Data	140
Total, Natural and Fishing Mortality . .	140
Selection Patterns	142
Patterns of Recruitment	144
Results and Discussions	144
Species Composition	144
Relative and Seasonal Abundance	151
Patterns of Distribution	162
Spatial and Temporal Distribution	
Patterns	167
Specific Distribution Patterns	171

	Page
Community Diversity	176
Trophic Status of the Fish Fauna	189
Length-weight relationship and Condition	
Index	196
Length-weight relationships for the	
three major species	196
Length-weight relationship of	
<i>Amblyrhynchichthys truncatus</i>	196
Length-weight relationship of	
<i>Thynnichthys thynnoides</i>	201
Length-weight relationship of	
<i>Puntius schranenfeldii</i>	203
Condition Index of <i>Amblyrhynchichthys</i>	
<i>truncatus</i> , <i>Thynnichthys thynnoides</i> and	
<i>Puntius schwanenfeldii</i>	211
Condition Factor	211
<i>Amblyrhynchichthys truncatus</i>	211
<i>Thynnichthys thynnoides</i>	211
<i>Puntius schwanenfeldii</i>	212
Growth	214
<i>Amblyrhynchichthys truncatus</i>	214
<i>Thynnichthys thynnoides</i>	217
<i>Puntius schwanenfeldii</i>	218
Mortality Parameters and Selection	
Patterns	232

	Page
<i>Amblyrhynchichthys truncatus</i>	234
<i>Thynnichthys thynnoides</i>	234
<i>Puntius schwanenfeldii</i>	241
Patterns of Recruitment for	
<i>Amblyrhynchichthys truncatus</i> , <i>Thynnichthys</i>	
<i>thynnoides</i> and <i>Puntius schwanenfeldii</i>	243
<i>Amblyrhynchichthys truncatus</i>	243
<i>Thynnichthys thynnoides</i>	245
<i>Puntius schwanenfeldii</i>	245
Summary	246
CHAPTER 4 MANAGEMENT OF FISH POPULATIONS IN	
PAYA BUNGOR	260
General Considerations	260
Fish Production in Natural and Man-made	
lakes	261
Past Experience in the Management of	
Natural and Man-made lake Fisheries	265
Characteristics of the fish populations in	
Paya Bungor	267
Consequences of the proposed Paya Bungor	
development plan on fish populations	270
Management Option for Paya Bungor	274
Improvement of the proposed Paya Bungor	
development plan	274

	Page
Recreational Fishery Management	278
Identification of suitable sport	
species	279
Induced breeding and subsequent larval	
rearing of sebarau, <i>Hampala macrolepidota</i>	
van Hasselt for stocking purposes	281
Induced breeding and larval	
production	281
Larval rearing	284
Other Considerations	286
CHAPTER 5 CONCLUSION	289
PLATES	292
LITERATURE CITED	295
APPENDICES	318

LIST OF TABLES

	Page
I. Average seasonal ranges of air temperature, rainfall and relative humidity in Paya Bungor.	30
II. List of microinvertebrates from Station A.	49
III. List of microinvertebrates from Station B.	55
IV. List of microinvertebrates from Station C.	63
V. Summary of the Effect of pH values on Fish.	66
VI. Concentrations of ammonia (NH_3 + NH_4^+) which contains an un-ionised ammonia (NH_3) concentration of 0.0025 mg per litre.	69
VII. Seasonal abundance of zooplanktons in Paya Bungor.	77
VIII. Checklist of Phytoplankton in Paya Bungor.	85
IX. List of vegetation for Paya Bungor.	88
X. List of Fish Species in Paya Bungor.	147

	Page
XI. Occurrence of Fishes at various Stations in Paya Bungor.	150
XII. Percentage Composition of Ichthyofauna using several Fishing Methods	153
XIII. List of Fish Species Abundance in Paya Bungor, January 1982 to December 1982.	154
XIV. Working sheet for the Construction and Estimation of Parameters of the log normal distribution curve for Paya Bungor's ichthyofauna.	173
XV. Working sheet for the Construction and Estimation of parameters of the log normal distribution curve for stations A, B and C.	177
XVI. Indices of Species Diversity in Paya Bungor and at various stations.	190
XVII. Seasonal variations of species Diversity in Paya Bungor and at various stations.	191
XVIII. Feeding and Food Habits of Fishes in Paya Bungor.	195

	Page
XIX. Seasonal variations in length-weight relationships of <i>Amblyrhynchichthys truncatus</i> in Paya Bungor.	200
XX. Seasonal variations in length-weight relationships <i>Thynnichthys thynnoides</i> in Paya Bungor.	206
XXI. Seasonal variations in length-weight relationships of <i>Puntius schwanenfeldi</i> in Paya Bungor.	210
XXII. Seasonal variations of relative condition for the three major species in Paya Bungor.	215
XXIII. Length frequency of <i>Amblyrhynchichthys truncatus</i>	219
XXIV. ELEFAN 1 runs of <i>Amblyrhynchichthys truncatus</i>	222
XXV. Length-frequency of <i>Thynnichthys thynnoides</i>	225
XXVI. ELEFAN 1 runs for <i>Thynnichthys thynnoides</i>	226
XXVII. Length-frequency of <i>Puntius schwanenfeldii</i>	227

LIST OF FIGURES

	Page
1. Map of proposed development plans for Paya Bungor.	25
2. Monthly water level at Paya Bungor Lake.	26
XXVIII. ELEFAN 1 runs for <i>Puntius schwanenfeldii</i>	230
XXIX. ELEFAN 1 output derived from length-frequency data of <i>P. schwanenfeldii</i> , <i>A. truncatus</i> and <i>T. thynnoides</i> .	231
XXX. Comparative values of growth parameters in some tropical Freshwater species.	233
XXXI. Comparative values of natural mortality and M/K index of selected tropical freshwater species.	244
XXXII. Recruitment Pattern for <i>Amblyrhynchichthys truncatus</i> in Paya Bungor.	247
XXXIII. Recruitment Pattern for <i>Thynnichthys thynnoides</i> in Paya Bungor.	249
XXXIV. Recruitment Pattern for <i>Puntius schwanenfeldii</i>	251
XXXV. Major Reservoirs in Peninsular Malaysia.	262
16. Seasonal abundance of macroinvertebrates in Paya Bungor.	71
17. Seasonal abundance of macroinvertebrates in Station C.	61
18. Seasonal fluctuations of benthic invertebrates (per m ²) at Paya Bungor Lake from March 1962 to December 1962.	73
19. Seasonal variation of Mollusc in Paya Bungor.	74
20. Seasonal abundance of Chironomids and other dipterans in Paya Bungor.	75

LIST OF FIGURES

	Page
1. Map of proposed Development Plans for Paya Bungor.	22
2. Map of Paya Bungor showing three sampling Stations, A, B and C.	26
3. Bathymetric map of Paya Bungor.	27
4. Monthly fluctuations of water levels in Paya Bungor.	28
5. Monthly fluctuations of Temperature in Paya Bungor.	35
6. Monthly fluctuations of dissolved oxygen concentrations in Paya Bungor.	36
7. Monthly fluctuations of pH in Paya Bungor.	37
8. Monthly fluctuations of total alkalinity.	38
9. Monthly conductivity values of Paya Bungor.	39
10. Monthly variations of chloride concentrations in Paya Bungor.	40
11. Monthly variations of sulphate concentration in Paya Bungor.	41
12. Monthly variations of phosphate-phosphorus.	42
13. Monthly variations of nitrate-nitrogen.	43
14. Monthly variations of ammonia-nitrogen in milligrams per litre.	44
15. Seasonal abundance of macroinvertebrates in Station A.	47
16. Seasonal abundance of macroinvertebrates in Station B.	53
17. Seasonal abundance of macroinvertebrates in Station C.	61
18. Seasonal abundance of macroinvertebrates in Paya Bungor.	72
19. Seasonal fluctuations of benthic invertebrates (per m ²) at Paya Bungor Lake from March 1982 to December 1982.	73
20. Seasonal variation of Mollusc in Paya Bungor.	74
21. Seasonal abundance of Chironomids and other Dipterids in Paya Bungor.	75

	Page
22. Seasonal abundance of microinvertberates in Paya Bungor.	79
23. Seasonal abundance of Protozoa in Paya Bungor.	80
24. Seasonal abundance of Rotifers in Paya Bungor.	81
25. Seasonal occurrence of Cladocerans in Paya Bungor.	82
26. Seasonal occurrence of Copepods in Paya Bungor.	83
27. Showing Preston's log normal distribution curve.	100
28. Abundance of Fish species in Paya Bungor January 1982 to December 1982.	155
29. Abundance of Fishes in Station A, January 1982 to December 1982.	156
30. Abundance of Fishes in Station B, January 1982 to December 1982.	157
31. Abundance of Fishes in Station C, January 1982 to December 1982.	158
32. Relative abundance of Fish Family in Paya Bungor.	159
33. Seasonal abundance of Fishes in Paya Bungor.	163
34. Seasonal abundance of Fishes in Station A.	164
35. Seasonal abundance of Fishes in Station B.	165
36. Seasonal abundance of Fishes om Station C.	166
37. Diurnal Distribution of Fishes in Paya Bungor.	169
38. Diversity Indices at various times of Day.	170
39. Log-normal Distribution of Fishes in Paya Bungor (with abcissae in logarithm to the base 2).	174
40. Log-normal Distribution of Fishes in Paya Bungor (with abcissae in natural logarithm	175
41. Log-normal distribution of Fishes in Stations A and B.	178
42. Log-normal distribution of Fishes in Station C.	179
43. Canonical log-normal distribution of Fishes in Paya Bungor (using logarithm to the base of 2)	180
44. Canonical log-normal distribution of Fishes in Station A (using logarithm to the base of 2)	181

	Page
45. Canonical log-normal distribution of Fishes in Station B (using logarithm to the base of 2)	182
46. Canonical log-normal distribution of Fishes in Station C (using logarithm to the base of 2)	183
47. Canonical log-normal distribution of Fishes in Paya Bungor (using natural logarithm)	184
48. Canonical log-normal distribution of Fishes in Station A (using natural logarithm)	185
49. Canonical log-normal distribution of Fishes in Station B (using natural logarithm)	186
50. Canonical log-normal distribution of Fishes in Station C (using natural logarithm)	187
51. Seasonal patterns of species diversity at various locations in Paya Bungor	192
52. Length-weight relationship of <i>Amblyrhynchichthys truncatus</i> (Insert - log transformation)	198
53. Length-weight relationship of males and females of <i>Amblyrhynchichthys truncatus</i>	199
54. Length-weight relationship of <i>Thynnichthys thynnoides</i>	204
55. Length-weight relationship of male and female <i>Thynnichthys thynnoides</i> .	205
56. Length-weight relationship of <i>Puntius schwanenfeldii</i>	208
57. Length-weight relationship of males and females of <i>Puntius schwanenfeldii</i> .	209
58. Seasonal variations in relative condition for the three major species in Paya Bungor.	216
59. Length-frequency of <i>Amblyrhynchichthys truncatus</i> showing growth curves.	220
60. Restructured length-frequency for <i>Amblyrhynchichthys truncatus</i> showing growth curves.	221
61. Length frequency of <i>Thynnichthys thynnoides</i> showing growth curves.	224
62. Restructured length-frequency for <i>Thynnichthys thynnoides</i> showing growth curves.	225
63. Length-frequency of <i>Puntius schwanenfeldii</i> showing growth curves.	228

	Page
64. Restructured length-frequency for <i>Puntius schwanenfeldii</i> showing growth curves.	229
65. Length growth curves for the three species in Paya Bungor.	234
66. Catch curve for <i>Amblyrhynchichthys truncatus</i> .	236
67. Selection patterns of <i>Amblyrhynchichthys truncatus</i> .	237
68. Catch curve for <i>Thynnichthys thynnoides</i> .	238
69. Selection patterns of <i>Thynnichthys thynnoides</i> .	239
70. Length converted catch curve for <i>Puntius schwanenfeldii</i> .	240
71. Selection patterns of <i>Puntius schwanenfeldii</i> .	237
72. Recruitment patterns for <i>Amblyrhynchichthys truncatus</i> .	248
73. Recruitment patterns for <i>Thynnichthys thynnoides</i> .	250
74. Recruitment patterns for <i>Puntius schwanenfeldii</i> .	252
75. Showing Paya Bungor with new proposed plan.	277

LIST OF PLATES

PLATE		Page
1A	Kelesa, <i>Saleropages formosus</i>	292
1B	Kelah, <i>Tor tambroides</i>	292
2	Sebarau, <i>Hampala macrolepidota</i>	293
3A	Toman, <i>Channa microlepis</i>	294
3B	Haruan, <i>Channa striatus</i>	294

An abstract of the thesis presented to the Senate of Universiti Pertanian Malaysia in partial fulfilment of the requirements for the Degree of Doctor of Philosophy.

FISH COMMUNITIES IN PAYA BUNGOR, WITH
NOTES ON ITS DEVELOPMENT, MANAGEMENT
AND RECREATIONAL USE

by

Mohd. Azmi bin Ambak

December, 1984

Supervisor : Abu Khair Mohammad Mohsin, Ph.D.

Faculty : Fisheries and Marine Science

Paya Bungor Lake is presently being developed into a recreational area by Pahang State Economic Planning Unit. As a contribution to provide a basis to ensure its sound development and management, an 18 month field study was conducted. This thesis presents (a) the general description of the limnological and other ecological properties of Paya Bungor, (b) the analysis of the fish populations including species composition, abundance, distribution patterns, community structure and the population dynamics of the major species, and (c) proposals for the management of Paya Bungor with emphasis on recreational fisheries.

Paya Bungor comprises of 12 families and 43 species of freshwater fishes and is dominated by the cyprinids. Riverine species accounts for more than 80 per cent of the species

composition. The three most dominant species are *Amblyrhynchichthys truncatus*, *Thynnichthys thynnoides* and *Puntius schwanenfeldii*.

The pattern of seasonal abundance indicates influence of physico-chemical parameters like water level (WL), water temperature (T) and conductivity (C). Their relationship was formulated and simplified into an equation. The fish populations of Paya Bungor are highly-heterogenous and they exhibit spatial and temporal patterns of distributions, mostly related to feeding. However the pattern breaks down during breeding season. The distribution of fish communities fits both log-normal and canonical log-normal distribution rather well, reflecting a large assemblies of species existing in Paya Bungor. Seasonal variations in the community diversity are noted mostly accounted by fluctuations in water level.

A large proportion of the fish species are carnivorous, followed by omnivores and detritivores. However, in terms of population abundance, the detritivores constitutes almost sixty per cent of the total population in Paya Bungor. Together with the omnivores, they comprise 85 per cent of the total fish population, corresponding to the fish community in the middle and lower reaches of rivers.

The growth of the three major species, *Amblyrhynchichthys truncatus*, *Thynnichthys thynnoides* and *Puntius schwanenfeldii*, reflected by the length-weight relationships, are isometric for the two former species and allometric for the latter species. The von Bertalanffy's Growth Formula for the three species are computed,

The coefficients of total mortality, natural mortality, fishing mortality and the exploitation rate for the three major species were also calculated. The mean age of first capture for *T. thynnoides* and *A. truncatus* is about one year old and by the time they reach about 1½ years old, they can be fully retained by the fishing gear. On the other hand, *P. schwanenfeldii* exhibits low fishing mortality but are retained much earlier in life, at the age of nine months. However this species also remains in the exploitable size range for only about six months.

There appears to be a single recruitment season for *A. truncatus* occurring during periods of high water. In contrast, although *T. thynnoides* also has a major recruitment season, it occurs during dry season when the water level is low. *P. schwanenfeldii* is recruited almost all the year round.

With regard to the proposed Paya Bungor Development Plan, a few drawbacks were identified which can cause several adverse effects on the existing fish populations. Several management options for Paya Bungor were also proposed.

Abstrak tesis yang dikemukakan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebahagian daripada keperluan untuk Ijazah Doktor Filosofi.

"FISH COMMUNITIES IN PAYA BUNGOR, WITH
NOTES ON ITS DEVELOPMENT, MANAGEMENT
AND RECREATIONAL USE"

oleh

Mohd. Azmi bin Ambak

Disember, 1984

Penyelia : Abu Khair Mohammad Mohsin, Ph.D

Fakulti : Perikanan dan Sains Samudra

Tasik Paya Bungor sedang dibangunkan sebagai kawasan rekreasi oleh Unit Perancang Ekonomi Negeri Pahang. Sebagai sumbangan terhadap asas pembangunan dan pengurusan tempat tersebut, kajian selama 18 bulan telah dijalankan. Tesis ini mengandungi (a) penerangan am mengenai ciri-ciri limnologi dan ekologi Paya Bungor, (b) analisis populasi ikan termasuklah komposisi spesis, kelimpahan corak taburan, struktur komuniti serta dinamik populasi spesies major, dan (c) cadangan-cadangan pengurusan Paya Bungor dengan penekanan ke atas perikanan rekreasi.

Paya Bungor mengandungi 12 famili dan 43 spesies ikan air tawar dan cyprinid adalah yang terbanyak sekali. Spesies ikan sungai mengandungi lebih daripada 80 peratus daripada komposisi

-spesies keseluruhan. Tiga spesies yang terbanyak ialah *Amblyrhynchichthys truncatus*, *Thynnichthys thynnoides* dan *Puntius schwanenfeldii*.

Corak kelimpahan bermusim menunjukkan pengaruh parameter fiziko-kimia seperti paras air, suhu dan kekonduk air. Perhubungan ini boleh diringkaskan kepada satu persamaan. Populasi ikan di Paya Bungor adalah sangat heterogen dan ia menunjukkan corak taburan spatial dan temporal, kebanyakannya berkaitan dengan cara memakan. Walau bagaimana pun corak ini tidak terjadi pada musim membiak. Taburan komuniti ikan lengkap kepada kedua-dua taburan log-normal dan canonical log-normal agak baik, membayangkan spesies yang banyak terdapat di Paya Bungor. Variasi bermusim dalam pelbagaian komuniti didapati kebanyakan disebabkan oleh turun-naik paras air.

Sebahagian besar daripada spesies ikan adalah karnivor diikuti oleh omnivor dan detritivor. Walau bagaimana pun, dari segi kelimpahan populasi, detritivor mengandungi hampir enam puluh peratus daripada jumlah populasi ikan di Paya Bungor. Bersama dengan omnivor, kedua-duanya mengandungi 85 peratus daripada jumlah populasi ikan, ada kaitannya dengan komuniti ikan di bahagian tengah dan hilir sungai.

Tumbesar bagi ketiga-tiga spesies major, *Amblyrhynchichthys truncatus*, *Thynnichthys thynnoides* dan *Puntius schwanenfeldii*, yang ditunjukkan oleh perhubungan panjang-berat, adalah isometrik bagi dua spesies yang pertama dan alometrik bagi spesies yang ketiga. Formula tumbesar von Bertalanffy untuk ketiga-tiga spesies tersebut telah dikira.

Koefisien bagi jumlah kemortalan, kemortalan semulajadi, kemortalan menangkap ikan dan kadar pengeksploitan untuk ketiga-tiga spesies major juga telah dikira. Umur min bagi tangkapan pertama bagi *T. thynnoides* dan *A. truncatus* adalah lebih kurang satu tahun dan bila sampai umur lebih kurang $1\frac{1}{2}$ tahun, mereka boleh ditangkap oleh alat menangkap ikan. Sebaliknya, *P. schwanenfeldii* menunjukkan kemortalan menangkap ikan yang rendah tetapi boleh ditangkap dengan menggunakan alat menangkap ikan lebih awal, semasa berumur sembilan bulan. Walau bagaimanapun spesies ini masih berada dalam julat saiz yang boleh dieksploitasi dalam masa lebih kurang enam bulan.

Terdapat cuma satu musim pengrekrutan bagi *A. truncatus* yang terjadi semasa paras air tinggi. Sebaliknya, walau pun *T. thynnoides* juga mempunyai musim pengrekrutan major iaitu semasa musim kemarau bila paras air rendah. *P. schwanenfeldii* direkrutkan hampir sepanjang tahun.

Mengenai Rancangan Pembangunan Paya Bungor, beberapa kelemahan telah dikenalpasti yang boleh menyebabkan beberapa kesan buruk ke atas populasi ikan yang ada. Beberapa pilihan pengurusan bagi Paya Bungor dicadangkan.