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FOOD AVAILABILITY AND STOMACH CONTENT OF FISH POPULATIONS IN SEMENYIH RESERVOIR, MALAYSIA

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By

EDUARDO D. PERALTA

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia in Fulfillment of the Requirements for the Degree of Master of Science

December 2004

UPM

DEDICATION

This piece of work is dedicated to my wife, Hazel Monica Matias- Peralta, my son, Zeckiel Matias Peralta, my family, for their support, assistance and confidence in me and for the memory of my late father.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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Faculty : Agriculture

This study was done to evaluate the food availability and stomach content of fish populations in Semenyih Reservoir, Malaysia. Samples were collected at monthly intervals from November 1998 to October 1999. Fish specimens were collected from twelve stations at the shallow littoral zone of the reservoir using various sizes of gill nets for the investigation of fish species inhabiting the reservoir and for the examination of the gut content. A total of 1,469 fish were collected from the Reservoir throughout the study. Seven species belonging to seven different families were identified. Fish community consisted of *Mystacoleocus marginatus* C&V (sia), *Hampala macrolepidota* van Hasselt (sebarau) *Cyclochelichthys apogon* C&V (merah mata), *Osteochilus hasselti* C&V (terbul), *Oreochromis mossambicus* Peters (tilapia), *Oxyleotris marmoratus* Bleeker (Ketutu), and *Mystus nemurus* C&V (baung). *Mystacoleocus marginatus* was the most dominant species, comprising 64.6% of the total number of fish sampled, followed by *H. macrolepidota* (24.8%), *C. apogon* (4.2%), *O. hasseltii* (2.6%), *O. mossambicus* (1.4%), *O. marmoratus* (1.3%), and *M. nemurus* (1.1%). Composition and frequency of occurrence of food items

have been studied. Phytoplankton, insects and zooplankton were found to be the main food items consumed of different fish species in the reservoir. While the least food items were mollusks, juvenile fish and crustaceans. *Mystacoleocus marginatus*, *Cyclochelichthys apogon* and *Oreochromis mossambicus* were largely omnivore at the time they were analyzed. While *Hampala macrolepidota*, *Osteochilus hasseltii*, *Oxyleotris marmoratus* and *Mystus nemurus* were highly carnivorous at the time they were analyzed. The phytoplankton community was composed of six different groups, (chlorophytes, cyanophytes, bacillariophytes, crysophytes, euglenoids and dinoflagellates) with a mean total density of 20.41 X 10^4 cells ml^{-1}. Among the six groups, chlorophytes was the most dominant with a mean density of 64,806.40 cells ml^{-1}, followed by bacillariophytes (51,836.28 cells ml^{-1}); cyanophytes (48,916.48 cells ml^{-1}); dinoflagellates (24,943.25 cells ml^{-1}); crysophytes (11,387.68 cells ml^{-1}) and euglenoids (2,189.59 cells ml^{-1}). On the other hand, the zooplankton community consisted of three groups, namely, copepods, cladocerans and rotifers. Zooplankton was dominated by copepods with a total density of 2,701.27 organisms l^{-1}, followed by rotifers (2,297.40 organisms l^{-1}) and cladocerans (7,16.47 organisms l^{-1}). The macrobenthos of Semenyih Reservoir was composed of mollusks, annelids and chironomids, with a mean total density of 13,658.33 organisms/m^2. Among these groups, mollusks were the most dominant with a mean density of 11,525.17 organisms/m^2; followed by chironomids (1,599.88 organisms/m^2) and annelids (533.29 organisms/m^2). Physico-chemical and biological parameters of Semenyih Reservoir were also studied. Temperature, dissolved oxygen, secchi disk visibility and pH values range from 27.55-30.00 °C, 6.63-7.33 mg l^{-1}; 50.60 - 99.80 cm; and 6.96 – 7.84, respectively. Nitrate-nitrogen, phosphate-phosphorous, silica and ammonia-nitrogen ranges from 0.09 mg l^{-1} to 0.15 mg l^{-1}, 2.71-5.26 mg l^{-1}, 0.2-0.3 mg l^{-1} and 0.06 - 0.24 mg l^{-1} respectively. One concluding sentence about the

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reservoir based on the water quality, plankton and macrobenthos composition, and fish population, Semenyih Reservoir was a mesotrophic body of water.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

KAJIAN TERHADAP KETERDAPATAN MAKANAN DAN KANDUNGAN PERUT BAGI POPULASI IKAN DI EMPANGAN SEMENYIH, MALAYSIA

Oleh

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Disember 2003

Pengerusi: **Mustafa Kamal Abdul Satar, Ph.D.**

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Kajian ini dilakukan untuk mengetahui keterdapatan makanan dan kandungan perut bagi populasi ikan di Empangan Semenyih, Malaysia. Pemungutan sampel dilakukan setiap bulan dari November 1998 sehingga Oktober 1999. Spesimen ikan telah dikumpul dari dua belas stesen di zon littoral cetek empangan tersebut menggunakan jaring insang pelbagai saiz untuk kerja pemeriksaan kandungan perut. Keputusan menunjukkan terdapat tuju spesies dalam komuniti ikan di Empangan Semenyih. *M. marginatus* merupakan spesies dominan mewakili 64.6% dari jumlah keseluruhan ikan yang dikumpul. Spesis-spesis ikan yang selebihnya adalah *H. macrolepitoda* (24.8%), *C. Apogon* (4.2%), *O. Hasseltii* (2.6%), *O. Mossambicus* (1.4%), *O. Marmoratus* (1.3%) dan *M. nemurus* (1.1%). Komposisi serta frekuensi makanan telah dikaji. Fitoplankton, serangga serta zooplankton telah dikenalpasti mejadi makanan utama pelbagai spesis ikan di empangan tersebut, sementara moluska, ikan juvenil serta krustasia merupakan jenis makanan yang paling sedikit ditemui. Ketika analisis dilakukan, didapati kebanyakan spesis seperti *Mystacoleocus marginatus*, *Cyclochelichthys apogon* dan *Oreochromis mossambicus* merupakan jenis omnivor. Sementara spesis seperti *Hampala macrolepidota*, *Osteochilus hasseltii*, *Oxyleotris marmoratus* dan *Mystus nemurus*

dimana kebanyakannya merupakan organisma karnivor. Fitoplankton dari empangan ini terdiri dari enam kumpulan, kumpulan-kumpulan tersebut mempunyai komposisi purata menyeluruh pada 20.56 x 10^4 sel ml^{-1}, di mana, klorofita adalah dominan dengan purata menyeluruh 70.54 x 10^3 sel ml^{-1} (34.30%), diikuti basillariofita dengan purata menyeluruh 51.84 x 10^3 sel ml^{-1} (25.21%), sianofita 48.92 x 10^3 sel ml^{-1} (23.79%), dinoflagellata 22.68 x 10^3 sel ml^{-1} (11.03%), Krisofita 9.48 x 10^3 sel ml^{-1} (4.61%) dan euglenoid 2.19 X 10^2 sel ml^{-1} (1.06%). Komuniti zooplankton Empangan Semenyih terdiri dari tiga kumpulan iaitu kumpulan kopepoda, kladocera dan rotifer. Ketiga-tiga kumpulan zooplankton mempunyai purata menyeluruh 5.7 x 10^3 organisma l^{-1}, dimana kumpulan dominan adalah kopepoda dengan nilaian 2.7 x 10^3 organisma l^{-1}. Kumpulan rotifer adalah kumpulan kedua terbesar dengan 2.2 x 10^3 organisma l^{-1} dan diikuti kladoceran dengan hanya 716 organisma l^{-1}. Makrobentos Empangan Semenyih terdiri dari empat kumpulan iaitu moluska, gastropoda, annelida dan kironomida dengan purata menyeluruh 13,658.33 organisma/m^2. Kumpulan gastropoda terdiri dari dua spesis , iaitu *Melanoides tuberculada* dengan 3,170.20 organisma/m^2 atau 23.21% dan *Filopaludina sumatrensis* dengan 2,844.32 atau 20.82%. *Thiara scabra* dengan 5,006.97 organisma/m^2 atau 36.66% dan *Viviparus fasciatus* dengan 503.68 organisma/m^2 atau 3.69% dari kumpulan moluska, dan kumpulan annelida dengan purata menyeluruh 533.29 atau 3.90% dan Kironomida terdiri dari 1,599.88 organisma/m^2 atau 11.71%. Kajian di Empangan Semenyih juga meliputi aspek fiziko-kimia serta parameter biologi. Mutu air empangan adalah mantap dengan suhu air pada 28.53-29.01 °C, oksigen terlarut 6.16-7.01 mg l^{-1} dan bacaan kejernihan cakera secchi 50.0-100 cm. Sementara itu, parameter-parameter kimia seperti nitrat-nitrogen berada pada kepekatan purata 0.15-0.21 mg l^{-1}, fosfat-fosforus 1.19-2.03 mg l^{-1}, ammonia-nitrogen 0.26-0.30 mg l^{-1} dan silika 0.2-0.3 mg l^{-1}. Satu fakta tambahan berkenaan empangan yang bersandarkan kepada kualiti air,

komposisi air, makrobentos serta populasi ikan, Empangan Semenyih merupakan tasik mesotrofik.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
JBA	Jabatan Bekalan Air Selangor
ca.	Approximately
°C	Temperature
NH_4-N	Ammonia-nitrogen
PO_4-P	Phosphorus-phosphate
NO_3-N	Nitrate-nitrogen
L	Liter
µm	Micrometer
m	Meter
ml	Milliliter
cm^2	Square centimeter
nm	Nannometer
mm	millimeter
cm	Centimeter
mg l^{-1}	Milligram per liter
APHA	American Public Health Association
C&V	Cuvier and Valencienes
%	Percent
g	Gram
SE	Standard error
organisms l^{-1}	Organism per liter
Cells ml^{-1}	Cells per milliliter
organisms/m^2	organisms per square meter

CHAPTER I

INTRODUCTION

Reservoirs and lakes are important in the development of a nation as they provide water supply for domestic, agricultural, industrial and other uses, electricity generation, fish supply, recreational opportunities and flood control. In Malaysia, with increasing number of dams and reservoirs being built, their role in providing fish supply as well as research fishery opportunities, to ensure sustainable fish production as well as maintenance of the original fish diversity in these water bodies (Yusoff and Ambak, 1999). The number of reservoirs in Malaysia has gradually increased due to the country's rapid industrialisation. There are 51 reservoirs in Malaysia, 46 of these are located in Peninsular Malaysia and the rest in East Malaysia (Ho, 1994).

The emergence of a reservoir, which are man-made lakes, has created impoundment's, which are productive-biological systems associated with their own fish and shellfish communities. Hence, reservoirs constitute potentially important resources for all types of fisheries including, fish culture, recreational and commercial fisheries (Oglesby, 1985). The beginning of reservoir fisheries is not certain. However, according to available information, reservoir fisheries in Southeast Asia are the oldest in the world (Seowardi and Mahar, 1987).

Studies on the feeding patterns of fish species help describe the ecological relationship of that species with the rest of the community (Caragitsou and Papaconstantinou, 1994). Consequently, knowledge of the feeding ecology of either commercial or non-commercial species is essential in implementing multi-species approaches to fishery management (Caddy 1988). Most studies on the food and