



UNIVERSITI PUTRA MALAYSIA

***GROWTH PERFORMANCE OF TIGER GROUPER JUVENILES
(*Epinephelus fuscoguttatus* Forsskal) WITH VARYING STOCKING
DENSITIES IN OPEN FLOW-THROUGH AND CLOSED SYSTEMS***

REZA SALARI

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By

REZA SALARI

**Thisis Submitted to the School of Graduate Studies, Universiti Putra
Malaysia, in fulfillment of the Requirements for the Degree of Master of Science**

January 2013

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DEDICATIONS

To my most beloved wife, Touran,
for her support of all of my endeavors, regardless of how seemingly outlandish,
throughout my life. I greatly appreciate her patience, understanding
and support over the years.

The logo of the University of Petroleum & Minerals (UPM) is visible as a large, semi-transparent watermark in the background. It features a shield with a red and white design, including a book and the acronym 'UPM' in a red box at the top.

To my lovely children, Nima and Parnya,
for making everything worthwhile.

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To my parents, my elder brother Ali and my dear sister Fatemeh, for the support,
their true love, constant trust, principle guide and making me into the person I am
today.

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

**GROWTH PERFORMANCE OF TIGER GROUPEL JUVENILES
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REZA SALARI

January 2013

Chairman: Associate Professor Che Roos Saad, PhD

Faculty : Agriculture

Two tests were carried out in the present research work to examine the influence of the nursery rearing period as a critical phase on minimizing the cannibalism issue in the aquaculture industry. The relationship between a range of stocking densities and fish growth rates in different flow-through conditions of water (open flow-through and closed-system) was additionally scrutinized. The aim was to determine the optimum stocking density and appropriate water flow system for *E. fuscoguttatus* juveniles to survive. Observations were made from December 2010 to February 2011 at the Marine Finfish Production and Research Center, Tg. Demong, Besut, Terengganu.

The purpose of the initial experiment was to study how various stocking densities in open flow-through water affect the critical rearing phase of tiger grouper juveniles. The densities studied are 1fish/l (T1), 3fish/l (T2), and 5fish/l (T3). Following the 42-day nursery stage, the fish grown in the T2 condition had the top final mean body

weight (10.45 ± 0.17 g), as well as the utmost total length (84.92 ± 3.04 mm). The variation noted with respect to the Specific Growth Rate, Feed Conversion Ratio, Daily Weight Gain and Protein Efficiency Ratio between T2 and the other treatments was $P < 0.05$. The outcome of this experiment therefore indicates that fish stocked at a density of 3 fish per liter demonstrated enhanced size frequency, growth and final biomass in contrast to the other two stocking densities. Yet, negligible statistical disparities of $P > 0.05$ were noted for the condition and survival rearing among various treatments during six nursery weeks in the open flow-through water system.

A separate trial assessed the effects of varying stocking densities in the critical developing stage of *E. fuscogattatus* juveniles in a closed system. To determine the aptness in nursing early juveniles leaving the hatchery, the three grouper juvenile treatments utilized in this second experiment were 1fish/l (T1), 3fish/l (T2) and 5fish/l (T3). After 42 culture days in the closed system experiment, differences found for weight, length, and other growth parameters of fish reared at 1, 3 and 5fish/l were insignificant at $P > 0.05$.

The growth of young grouper juveniles in various nursery culture systems was recorded following 42 days of tending. Generally, according to the results, the final mean body weight and total length, Specific Growth Rate and Feed Conversion Ratio were numerically superior in the open flow-through structure, with 10.45 ± 0.17 g, 84.92 ± 3.04 mm, $13.05 \pm 0.12\%$ and 1.22 ± 0.04 in contrast to the closed system, in which the values were 6.90 ± 0.19 g, 69.42 ± 1.37 mm, $12.17 \pm 0.44\%$ and 1.38 ± 0.03 , respectively. Besides, in the flow-through water system, the fish grew at a higher rate numerically (0.184 - 0.25 g·f⁻¹·d⁻¹) than those in the closed system (0.160 - 0.164 g·f⁻¹·d⁻¹). No difference in the development and survival of fish in both system densities was noted. This study thus recommends the use of an open flow-through system for

culturing tiger grouper juveniles, as it seems to be more efficient than a closed system.



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

**PRESTASI PERTUMBUHAN JUVANA KERAPU HARIMAU (*Epinephelus
fuscoguttatus* Forsskal) DENGAN PELBAGAI KEPADATAN STOK DALAM
SISTEM ALIRAN AIR TERBUKA DAN SISTEM TERTUTUP**

Oleh

REZA SALARI

Januari 2013

Pengerusi : Profesor Madya Che Roos Saad, PhD

Fakulti : Pertanian

Satu kajian yang tertumpu pada tempoh penternakan nurseri sebagai fasa kritikal untuk mengurangkan masalah kanibalisme dalam industri akuakultur telah dijalankan. Kajian ini telah dijalankan dalam dua eksperimen untuk mengkaji kesan, serta korelasi antara densiti stok yang berbeza dan kadar pertumbuhan ikan dalam pengaliran air yang berbeza (aliran palung terbuka dan aliran tertutup). Tujuannya ialah untuk mencari kadar kemasukan ikan yang optima bagi aliran air yang berkenaan untuk meningkatkan pertumbuhan dan kelangsungan hidup juvana *E. fuscoguttatus* dari Disember 2010 hingga Februari 2011 di Pusat Penyelidikan Pengeluaran Ikan Marin, Tg. Demong, Besut, Terengganu.

Kajian pertama adalah untuk menentukan kesan kemasukan ikan (ketumpatan) yang berbeza dalam keadaan aliran air terbuka terhadap juvana kerapu harimau semasa tempoh penternakan kritikal. Tiga ketumpatan yang berbeza telah disediakan; i)

seekor ikan seliter (T1), ii) tiga ekor ikan seliter (T2), dan iii) lima ekor ikan seliter (T3). Selepas 42 hari fasa nurseri, ikan yang ditenak pada kepadatan tiga ekor ikan seliter menunjukkan berat akhir badan tertinggi dengan min $10.45 \pm 0.17g$, dan panjang tertinggi sebanyak $84.92 \pm 3.04mm$. Terdapat perbezaan yang signifikan ($P < 0.05$) untuk kadar pertumbuhan spesifik (SGR), nisbah pertukaran makanan (FCR), pertambahan berat harian (DWG) dan nisbah kecekapan protein (PER) antara T2 dan rawatan lain. Berdasarkan keputusan eksperimen ini, ia telah mendapati bahawa, kepadatan stok 3 ekor ikan / L menggalakkan pertumbuhan yang lebih baik, kekerapan saiz dan biomas akhir berbanding dengan kadar stok lain. Walau bagaimanapun, tiada perbezaan yang bermakna ($P > 0.05$) dalam kadar hidup dan faktor keadaan telah didapati antara rawatan yang berbeza selama 6 minggu peringkat nurseri dalam keadaan aliran air terbuka.

Satu lagi eksperimen telah dijalankan untuk mengkaji kesan densiti kemasukan yang berbeza dalam tempoh pemeliharaan kritikal juvana *E. fuscogattatus* dalam sistem akuakultur kitaran tertutup. Untuk mencari kesesuaian dalam pendederan awal bagi juvana selepas penetasan, tiga rawatan bagi juvana ikan kerapu telah digunakan dalam eksperimen ini : i) T1-satu ekor ikan seliter, ii) T2-tiga ekor ikan seliter dan iii) T3- lima ekor ikan seliter. Selepas 42 hari tempoh pemeliharaan dalam eksperimen ini, tiada perbezaan yang signifikan ($P > 0.05$) telah dikesan bagi panjang, berat, dan parameter tumbesaran yang lain bagi ikan yang dipelihara dalam semua rawatan. Prestasi pertumbuhan awal juvana kerapu di bawah sistem nurseri yang berbeza pada densiti kepadatan yang berlainan telah dinilai pada awal dan selepas 42 hari tempoh penternakan.

Secara amnya keputusan jelas menunjukkan bahawa, dalam sistem aliran terbuka prestasi pertumbuhan, ikan memperoleh min berat badan akhir, min jumlah panjang

akhir, kadar pertumbuhan spesifik dan nisbah pertukaran makanan adalah lebih baik dengan nilai $10.45 \pm 0.17\text{g}$, $84.92 \pm 3.04\text{mm}$, $13.05 \pm 0.12\%$ dan 1.22 ± 0.04 masing-masing jika dibandingkan dengan ikan dalam sistem aliran tertutup dengan nilai minnya ialah $6.90 \pm 0.19\text{g}$, $69.42 \pm 1.37\text{mm}$, $12.17 \pm 0.44\%$ dan 1.38 ± 0.03 , masing-masing. Dari sudut yang lain, kesan sistem kultur terhadap pertumbuhan adalah berbeza, dimana ikan dalam sistem aliran air terbuka mempunyai kadar pertumbuhan yang lebih tinggi ($0.184 \text{ } 0.25\text{gf}^{-1}\text{d}^{-1}$) dibandingkan dengan ikan dalam sistem aliran tertutup ($0.160\text{-}0.164 \text{ } \text{gf}^{-1}\text{d}^{-1}$). Tidak ada perbezaan pada perangkaan dalam pertumbuhan dan kemandirian dalam kepadatan antara kedua sistem. Daripada kajian ini, adalah disyorkan bahawa penggunaan sistem aliran air terbuka untuk pengkulturan juvana kerapu harimau mungkin lebih cekap berbanding sistem aliran air tertutup.

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and moral support towards this achievement. Above all, to GOD almighty for making the study possible.



I certify that a Thesis Examination Committee has met on 16 January 2013 to conduct the final examination of Reza Salari on his thesis entitled “Growth Performance of Tiger Grouper Juveniles (*Epinephelus fuscoguttatus* Forsskål) with Varying Stocking Densities in Open Flow-Through and Closed Systems” in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U. (A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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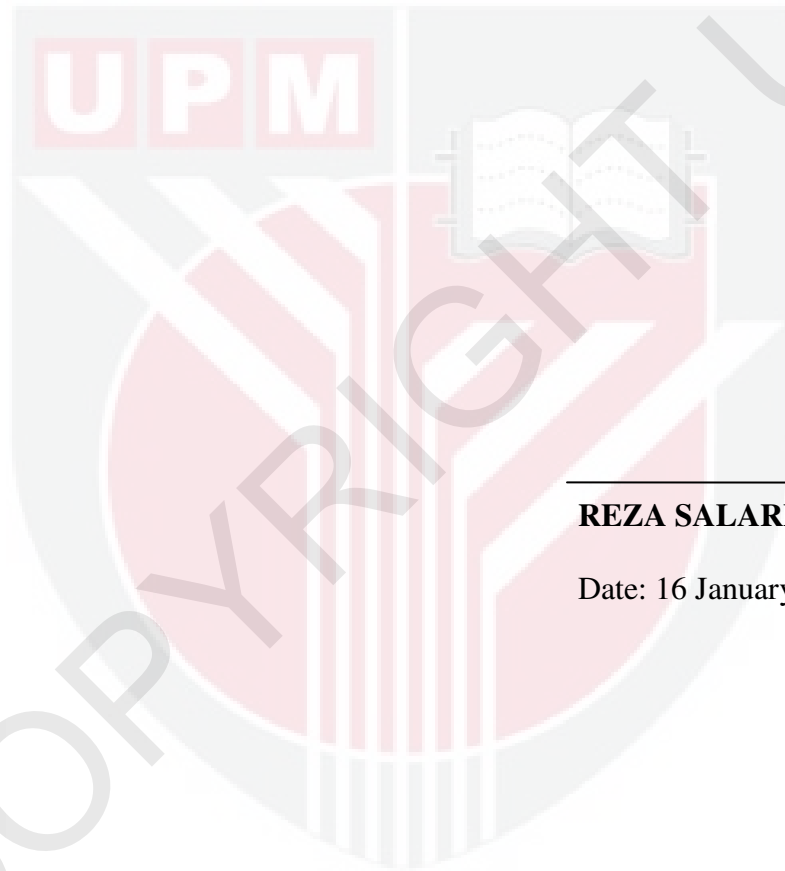
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Date: 16 January 2013

DECLARATION

I declare that the thesis is my original work except for quotations and citation which have been duly acknowledged. I also declare that it has not been previously, and it is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



REZA SALARI

Date: 16 January 2013

TABLE OF CONTENTS

	Page
DEDICATIONS	ii
ABSTRACT	iii
ABSTRAK	vi
ACKNOWLEDGEMENTS	ix
APPROVAL	xi
DECLARATION	xiii
LIST OF FIGURES	xvii
LIST OF TABLES	xviii
LIST OF ABBREVIATIONS	xix

CHAPTER

1	GENERAL INTRODUCTION	1
	1.1 Study Background	1
	1.2 Stocking Density	2
	1.3 Production System	3
	1.4 Problem Statement	4
	1.5 Objectives	5
2	LITERATURE REVIEW	6
	2.1 Classification of <i>Epinephelus fuscoguttatus</i> (Forsskål, 1775)	6
	2.2 Grouper	7
	2.3 Tiger Grouper	8
	2.4 Geographical Distribution and Economic Status of Tiger Grouper	9
	2.5 Habitat and Biology	11
	2.6 Types of Aquaculture Systems	12
	2.6.1 Flow-Through Systems	13
	2.6.1.1 Open Aquaculture Systems: Sea-cage (active feeding)	15
	2.6.1.2 Open Aquaculture Systems: Sticks, ropes, racks and cages (passive feeding)	16
	2.6.2 Recirculation (closed) systems	16
	2.7 Discharge classification	18
	2.7.1 Discharge in Open Flow through Systems	18
	2.7.2 Discharge in Closed Aquaculture Systems	19
	2.7.3 Discharge in Semi-closed Aquaculture Systems	20
	2.8 Stocking Density	20

2.8.1	Stocking density in closed system	24
2.8.2	Stocking density for rearing grouper juveniles	26
2.9	Rearing process of Grouper juvenile	27
2.9.1	Facilities and equipment in rearing juveniles	30
2.9.2	Water-quality management	30
2.9.3	Management of cannibalism	31
2.9.4	Grading	32
2.9.5	Feed management of juvenile	33
2.9.6	Feeding frequency	34
2.9.7	Disinfection for grouper nurseries	34
3	GENERAL METHODOLOGY	35
3.1	Location of study	35
3.2	Experimental Design and Setup	35
3.3	Growth Analysis	37
3.4	Water Quality Management	38
3.5	Statistical Analysis	39
4	EFFECTS OF DIFFERENT STOCKING DENSITIES ON THE GROWTH AND SURVIVAL OF TIGER GROUPEP (<i>Epinephelus fuscoguttatus</i>) JUVENILES IN AN OPEN FLOW-THROUGH SYSTEM	40
4.1	Introduction	40
4.2	Materials and Methods	41
4.2.1	Source of Fish	41
4.2.2	Experimental Design and Setup	41
4.2.3	Water Quality Monitoring	43
4.2.4	Statistical Analysis	43
4.3	Results	44
4.3.1	Water Quality Parameters	44
4.3.2	Growth performance	44
4.4	Discussion	46
5	EFFECTS OF DIFFERENT STOCKING DENSITIES ON THE GROWTH AND SURVIVAL OF TIGER GROUPEP (<i>Epinephelus fuscoguttatus</i>) JUVENILES IN CLOSED SYSTEM	49
5.1	Introduction	49
5.2	Materials and Methods	50

5.2.1	Source of Fish	50
5.2.2	Experimental design and setup	51
5.2.3	Water Quality Monitoring	53
5.3	Results	53
5.3.1	Water Quality Parameters	53
5.3.2	Growth Parameters	53
5.4	Discussion	56
6	GENERAL DISCUSSION AND CONCLUSION	58
	REFERENCES	62
	Appendix A	70
	Appendix B	71
	Appendix C	73
	Appendices D	75
	Appendix E	76
	BIODATA OF STUDENT	80