

بسم الله الرحمن الرحيم



SALWA AKL



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم



SALWA AKL

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



SALWA AKL



بعض الوثائق الأصلية تالفة



SALWA AKL



بالرسالة صفحات

لم ترد بالأصل



SALWA AKL

SOME BEHAVIOURAL PATTERNS OF FISH UNDER ARTIFICIAL CONDITION

By

B17430

7

IBRAHIM MOHAMED FARES
(M.V.Sc., Zagazig University, 1994)

Under the supervision of

Dr.
Rabei El- S. Saleh
Professor of Vet. Hygiene
Vice dean of Faculty of Vet. Med,
Suez Canal University

Dr.
Mohamed.A. Sobieh
Professor of Vet. Hygiene
Faculty of Vet. Med,
Suez Canal University

Dr.
Zamzam H. Ahmed
Professor of Vet. Hygiene
Faculty of Vet. Med,
Suez Canal University

Dr.
Hiroshi Ueda
Associate professor and director of
Toya Lake Station for Environmental
Biology. Faculty of Fisheries,
Hokkaido University

Ph. D. Thesis Presented

To

Suez Canal University for the fulfillment of the
degree of Doctor of Philosophy in Veterinary Sciences
(Animal and Poultry Hygiene)
1998

Approval Sheet

This is to approve this dissertation by **Ibrahim Mohamed Faris** to Suez Canal University entitled "**Some Behavioural Patterns of Fish Under Artificial Condition**" For the degree of Ph.D. in Vet. Sc. has been approved in 22/08/1998 by the examined committee.

Signature

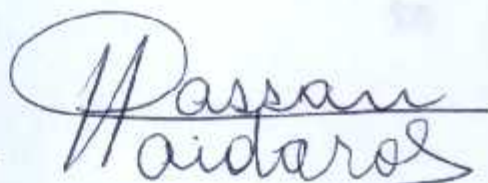
1-Prof.Dr. Abdel Kerim Mohmoud Abdel Kerim

Prof. of Animal Hygiene , Faculty of Veterinary Medecine ,
Cairo University



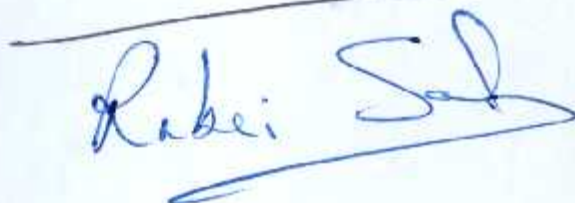
2-Prof.Dr. Hassan Abdel Aziz ^{Al}edarows

Prof. Head of Dept. of Hygiene & preventive Med. ,
Faculty of Vet Med.(Moshtohor) Zagazig University .



3-Prof.Dr. Rabei El-Sayed Saleh Hussein

Prof. and Vice Dean of Faculty of Vet.Med.
Suez Canal University .



4-Prof.Dr. Zamzam Hassan Abdel Wahed

Prof. Animal Hygiene , Faculty of Vet.Med.
Suez Canal University .



5- Prof.Dr. Hiroshi Ueda, Ph.D.

Director of Toya Lake Station for Environmental Biology,
Faculty of Fisheries, Hokkaido University .



SUEZ CANAL UNIVERSITY
FACULTY OF VETERINARY MEDECINE
Dept. of Animal Hygiene, Nutrition & Behaviour

Approval Sheet

This is to approve this dissertation by **Ibrahim Mohamed Faris** to Suez Canal University entitled "**Some Behavioural Patterns of Fish Under Artificial Condition**" For the degree of Ph.D. in Vet. Sc. has been approved in 22/08/1998 by the examined committee.

Signature

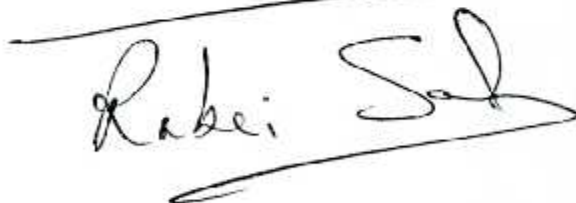
1-Prof.Dr. Abdel Kerim Mohmoud Abdel Kerim
Prof. of Animal Hygiene, Faculty of Veterinary Medicine,
Cairo University



2-Prof.Dr. Hassan Abdel Aziz ^{As} ~~Edarows~~ ^{Edarows}
Prof. Head of Dept. of Hygiene & preventive Med.,
Faculty of Vet Med. (Moshtohor) Zagazig University.



3-Prof.Dr. Rabei El-Sayed Saleh Hussein
Prof. and Vice Dean of Faculty of Vet.Med.
Suez Canal University.



4-Prof.Dr. Zamzam Hassan Abdel Wahed
Prof. Animal Hygiene, Faculty of Vet.Med.
Suez Canal University.



5- Prof.Dr. Hiroshi Ueda, Ph.D.
Director of Toya Lake Station for Environmental Biology,
Faculty of Fisheries, Hokkaido University.



**DEDICATED TO...
MY LATE FATHER,
MY MOTHER,
MY BROTHERS AND SISTERS**

Acknowledgments

First of all, the author is greatly indebted in all his work and success to our **Merciful "GOD"**.

I would like to express my deep gratitude and sincere thanks to my promoter, **Dr. R. EL-Sayed Saleh**, Professor of Vet. Hygiene and Zoonoses, and Vice Dean of Faculty of Vet., Med., Suez Canal Univ., for his faithful guidance and assistance during the course of this work.

I am highly indebted to my supervisor, **Dr. M. A. Sobieh**, Professor of Vet. Hygiene, Faculty of Vet. Med., Suez Canal Univ., for his encouragement and advice before and during the course of this work.

Cordial thanks to my supervisor, **Dr. Z. H. Ahmed**, Professor of Vet. Hygiene, Faculty of Vet. Med., Suez Canal Univ., for her encouragement and advice before and during the course of this work.

I would like to express my deep gratitude and sincere thanks to my supervisor, **Dr. Hiroshi Ueda**, Associate Prof., Faculty of Fisheries, Hokkaido University, and the director of Toya Lake Station for Environmental Biology for his faithful guidance and assistance during the course of this work.

I would like to express my great thanks to **Dr. T. Shoji**, Faculty of Pharmaceutical Science, Hokkaido University for his teaching me the electrophysiological technique and his helping during the course of the work.

My great thanks to **Dr. J. B. K. Leonard** (GSPS/NSF Postdoctoral Fellow) for her help and critical reading of the dissertation.

Great thanks to all staff members of Toya Lake Station for Environmental Biology for their help during the course of the work.

Finally, I hope to extend my appreciation to my colleagues in the Faculty of Vet. Med., Suez Canal University for their encouragement.

CONTENTS

	Page
INTRODUCTION.....	1
REVIEW OF LITERATURE.....	5
MATERIAL AND METHODS.....	16
RESULTS.....	26
DISCUSSION.....	81
SUMMARY.....	92
CONCLUSION.....	95
REFERENCES.....	97
VITA.....	111
ARABIC SUMMARY.....	

LIST OF TABLES

Table	Page
(1) Relative stimulatory efficacy (RSE; mean $\pm$ S.E.) of the olfactory neural response of Nile tilapia to different concentrations of amino acids. RSE is response standardized to the response to 10^{-4} M serine.	29
(2) Relative stimulatory efficacy (RSE; mean $\pm$ S.E.) of the olfactory neural response of masu salmon to different concentrations of amino acids. RSE is response standardized to the response to 10^{-4} M serine.	32
(3) Relative stimulatory efficacy (RSE; mean $\pm$ S.E.) of amino acids in Nile tilapia standardized to the response to 10^{-4} M serine. Groupings indicate the results of a post hoc Newman-Kuels analysis where amino acids sharing the same letter do not produce significantly different olfactory responses.	35
(4) Relative stimulatory efficacy (RSE; mean $\pm$ S.E.) of amino acids in masu salmon standardized to the response to 10^{-4} M serine. Groupings indicate the results of a post hoc Newman-Kuels analysis where amino acids sharing the same letter do not produce significantly different olfactory responses in the non-spawning period.	36
(5) Relative stimulatory efficacy (RSE; mean $\pm$ S.E.) of amino acids in masu salmon standardized to the response to 10^{-4} M serine. Groupings indicate the results of a post hoc Newman-Kuels analysis where amino acids sharing the same letter do not produce significantly different olfactory responses during the spawning period.	37
(6) Results of repeated measures analysis of variance testing for the effects of sex and amino acids on olfactory neural response in Nile tilapia.	38

(7) Results of repeated measures analysis of variance testing for the effects of sex and amino acids on olfactory neural response in masu salmon during the non-spawning season.	40
(8) Results of repeated measures analysis of variance testing for the effects of sex and amino acids on olfactory neural response in masu salmon during the spawning season.	42
(9) Results of repeated measures analysis of variance testing for the effects of season, sex and amino acids on olfactory neural response in masu salmon.	44
(10) Relative stimulatory efficacy (RSE; mean $\pm$ S.E.) of the olfactory neural response of Nile tilapia to different concentrations of mucus. RSE is response standardized to the response to 10^{-4} M serine.	46
(11) Relative stimulatory efficacy (RSE; mean $\pm$ S.E.) of the olfactory neural response of masu salmon to different concentrations of mucus. RSE is response standardized to the response to 10^{-4} M serine.	49
(12) Results of repeated measures analysis of variance testing for the effects of fish sex and mucus sex on the olfactory neural response of Nile tilapia.	52
(13) Results of repeated measures analysis of variance testing for the effects of fish sex, season, and mucus sex on the olfactory neural response of masu salmon.	54
(14) Results of repeated measures analysis of variance testing for the effects of fish sex, time of mucus collection, and mucus sex on the olfactory neural response of masu salmon.	56
(15) Results of repeated measures analysis of variance testing for the effects of fish sex, method of mucus collection, and mucus sex on the olfactory neural response of masu salmon.	58

(16) Relative stimulatory efficacy (RSE; mean $\pm$ S.E.) of the olfactory neural response of Nile tilapia to different concentrations of urine, RSE is standardized to the response to 10^{-4} M serine.	60
(17) Results of repeated measures analysis of variance testing for the effects of fish sex and urine sex on the olfactory neural response of Nile tilapia.	63
(18) Results of repeated measures analysis of variance testing for the effects of sex on the olfactory neural response to steroids (testosterone, estradiole, $17\alpha,20\beta$ -dihydroxy-4-pregnen-3-one (DHP)) and $\text{PGF}_2\alpha$ in Nile tilapia.	65
(19) The frequency (mean $\pm$ S.E.) of locomotor behaviour in Nile tilapia before and after amino acid delivery.	68
(20) The frequency (mean $\pm$ S.E.) of locomotor behaviour in masu salmon before and after amino acid delivery.	70
(21) The frequency (mean $\pm$ S.E.) of locomotor behaviour in Nile tilapia before and after skin mucus delivery.	72
(22) The frequency (mean $\pm$ S.E.) of locomotor behaviour in masu salmon before and after skin mucus delivery.	75
(23) The frequency (mean $\pm$ S.E.) of locomotor behaviour in Nile tilapia before and after urine delivery.	78

LIST OF FIGURES

Figure	Page
(1) (a) Experimental set-up for integrated olfactory neural recording. I: integrator; OB: olfactory bulb; ON: olfactory nerve; PA: pre-amplifier; RE: recording electrode; S: stimulus.	
b) Twin tungsten electrodes for olfactory nerve recording.	26
(2) Nile tilapia under electrophysiological experimental conditions.	27
(3) Experimental aquaria and stimulus delivery systems. Paper screens between successive aquaria prevent fish in adjacent aquaria from visually recognise each others behaviour.	28
(4) Relative stimulatory efficacy (RSE) of olfactory neural response of Nile tilapia to different concentrations of amino acids. RSE is response standardized to the response to 10^{-4} M serine.	30
(5) (a) Typical integrated olfactory neural response from a male Nile tilapia (TL=24.2cm, W=266g) to a concentration series of L-Serine with a logarithmic increase in stimulus concentration.	
(b) Plot of mean log male tilapia response v. log L-serine ($\square$) concentration; extrapolated regression line intersects the response to control (AFW) at point indicating the theoretical minimum detection threshold.	31
(6) Relative stimulatory efficacy (RSE) of the olfactory neural response of masu salmon to different concentrations of amino acids. RSE is response standardized to the response to 10^{-4} M serine.	33
(7) (a) Typical integrated olfactory neural response from a male masu salmon (TL=26.7cm, W=182.6g) to a concentration series of L-serine with a logarithmic increase	