

**NURSING OF AFRICAN CATFISH (*Clarias gariepinus* Burchell, 1822) FRY FED
WITH FRESHWATER MUSSEL (*Cristaria plicata* Leach, 1815) MEAL**

by

ANGELICA STO. DOMINGO SOLIGAM

**An Undergraduate Thesis presented to the faculty of the College of Fisheries
in partial fulfillment of the requirements for the degree of**

BACHELOR OF SCIENCE IN FISHERIES

**DEPARTMENT OF AQUACULTURE
COLLEGE OF FISHERIES
CENTRAL LUZON STATE UNIVERSITY
Science City of Muñoz, Nueva Ecija
Philippines**

2019



COLLEGE OF FISHERIES
CENTRAL LUZON STATE UNIVERSITY
Science City of Muñoz, Nueva Ecija

NURSING OF AFRICAN CATFISH (*Clarias gariepinus* Burchell, 1822) FRY FED WITH FRESHWATER MUSSEL (*Cristaria plicata* Leach, 1815) MEAL

by

ANGELICA STO. DOMINGO SOLIGAM

Undergraduate Thesis presented to the Faculty of the
College of Fisheries in partial fulfillment of the
Requirements for the degree of

BACHELOR OF SCIENCE IN FISHERIES

APPROVED:


LORENZ J. FAJARDO
Adviser

01-22-19

Date


JHON CHRISTIAN P. SUYOM
Critic

1-22-19

Date

NOTED:


LORENZ J. FAJARDO
Department Chair

01-22-19

Date

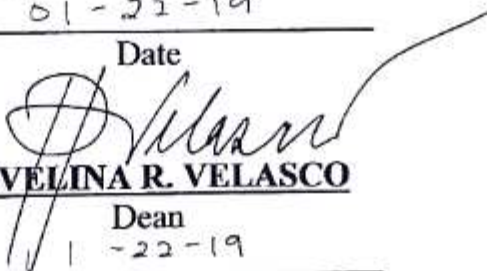
RECORDED:


LORENZ J. FAJARDO
College Research Coordinator

01-22-19

Date

ACCEPTED:


RAVELINA R. VELASCO
Dean

1-22-19

BIOGRAPHICAL DATA



Personal Data

Name	Angelica S.D Soligam
Birthday	April 12, 1997
Birth Place	Brgy. San Pedro, Sta. Rosa, Nueva Ecija
Address	Brgy. San Pedro, Sta. Rosa, Nueva Ecija
Parents	Prudencio C. Soligam and Marilyn S.D Soligam

Educational Attainment

Elementary	San Pedro Elementary School San Pedro, Sta. Rosa, Nueva Ecija
Secondary	Sto. Rosario National High School Sto. Rosario, Sta. Rosa, Nueva Ecija
Tertiary	Central Luzon State University Science City of Muñoz, Nueva Ecija

ACKNOWLEDGEMENT

The author is thankful to those people who have extended their valuable help, knowledge and encouragement for the accomplishment of this study.

First and foremost, to GOD in heaven, for the uncountable love, forgiveness, guidance, blessings and wisdom provided.

To the author's family, to her parents, Mr. Prudencio C. Soligam and Mrs. Marilyn S.D Soligam; siblings, Alexander, Billy Joe, Prudencio Jr, Justine, and Diana; nephew and niece, Daniel Zaiffer and Samantha Nicole for their love, care, support, valuable encouragement and giving her inspiration to finish this study.

To her adviser at the same time College Research Coordinator, Dr. Lorenz J. Fajardo and her critic, Mr. Jhon Christian P. Suyom for the knowledge, guidance, kindheartedness and patience in reading and editing her manuscript despite their busy academic schedules.

To her former adviser, Dr. Karl Marx A. Quiazon, for the guidance, support, valuable ideas and knowledge he shared throughout the study.

To former College Research Coordinator, Dr. Remedios B. Bolivar, for providing valuable insights, technical knowledge and ideas for the betterment of this paper.

To Dr. Emmanuel M. Vera Cruz, the Director of the Freshwater Aquaculture Center, for allowing the author to use circular tanks and quantity that require for African catfish fry used in the study.

To all the faculty members of the College of Fisheries: Dr. Ravelina R. Velasco, Prof. Janet O. Saturno, Ms. Claire Samantha T. Juanico, Ms. Rea Mae C. Templonuevo,

Prof. Rodora M. Bartolome, Prof. Alvin T. Reyes, Dr. Apolinario V. Yambot, Dr. Jose S. Abucay, and other new faculty members Mr. Jemuel S. Doctolero and Mr. Jaypee S. Samson for the knowledge, skills and other learnings they have imparted to the author.

To Mrs. Jodecel C. Danting, the OIC, Center Chief of BFAR-NFFTC, for allowing the author to collect freshwater mussels from the center's ponds.

To Ms. Julieta D. Holasca, Mr. Ruel E. Gabales and Mr. Felipe G. Doctor for their help and kindness during the conduct of this study.

To her dorm mates, classmates and friends for their encouragement, wisdom and cheering up the author to pursue her study.

To her roommate, Ms. Merry Ann R. Gacer, Ms. Charmay D. Luis, Ms. Jennyvie U. Gayap and former roommates Ms. Jomarie Shane I. Escudro for their friendship, happiness and care they have shared.

Special thanks to Ms. Melissa Valentino for helping the author during the termination of her study.

ANGELICA STO. DOMINGO SOLIGAM

TABLE OF CONTENTS

	Page
LIST OF FIGURES	viii
LIST OF TABLES	ix
LIST OF APPENDIX FIGURES	x
LIST OF APPENDIX TABLES	xi
ABSTRACT	xii
INTRODUCTION	1
Background of the Study	1
Statement of the Problem	3
Significance of the Study	3
Objectives of the Study	4
Scope and Limitation of the Study	4
Time and Place of the Study	4
REVIEW OF RELATED LITERATURE	5
Freshwater Mussels	5
Bivalves as Feed Ingredients	6
Proximate Analysis on Mussels	8
African Catfish	9
MATERIALS AND METHODS	11
Experimental Fish	11
Experimental Unit and Design	12
Collection of Freshwater Mussels	13
Feeding Preparation	14
Feeding	14
Data Gathered	14
Formulae	15
Statistical Analysis	15
RESULTS AND DISCUSSION	16
Growth Performance	16
Final Total Body Length	17
Gain in Weight	17
Average Final Body Weight of Fry	17

Specific Growth Rate	18
Absolute Growth Rate	18
Survival Rate	18
SUMMARY, CONCLUSION AND RECOMMENDATIONS	21
LITERATURE CITED	22
APPENDICES	26

LIST OF FIGURES

Figure No.	Title	Page
1	African catfish (<i>Clarias gariepinus</i> Burchell, 1822) fry	11
2	Experimental Layout	13
3	Paste form of freshwater mussel	14

LIST OF TABLES

Table No.	Title	Page
1	Treatments used in the study	12
2	Growth performance and survival rate of African catfish fry	16

LIST OF APPENDIX FIGURES

Appendix Figure No.	Title	Page
1	Cleaning of circular tank	30
2	Sampling of African catfish	30
3	Freshwater mussel meat	31
4	Feeding of African catfish fry	31
5	Weighing of African catfish fingerlings	32
6	Final sampling of African catfish fingerlings	32

LIST OF APPENDIX TABLES

Appendix Table No.	Title	Page
1	Initial mean weight and length of African catfish fry	27
2	Final mean weight and length of African catfish fry	27
3	Survival rate after days of nursing	28
4	Analysis of variance in average final weight of fish, final total body length, gain in weight, specific growth rate, absolute growth rate, and survival rate	29

NURSING OF AFRICAN CATFISH (*Clarias gariepinus* Burchell, 1822) FRY FED WITH FRESHWATER MUSSEL (*Cristaria plicata* Leach, 1815) MEAL

ABSTRACT

The study was conducted to determine the growth performance and survival rate of African catfish (*Clarias gariepinus*) fry fed with freshwater mussel meal during 21 days of nursing period. The experimental treatments were; T1 (Commercial feeds), T2 (80% freshwater mussel + 20% cornstarch), T3 (60% freshwater mussel + 40% cornstarch).

Result of the study showed that African catfish fry fed with commercial feeds (T1) obtained the highest survival rate (94.67%) and final total body length (5.26 cm). On the other hand, African catfish fry fed with 80% freshwater mussel meal (T2) obtained the highest gain in weight (1.34 g), average final body weight (1.36 g), absolute growth rate (AGR) (0.06 g/day) and specific growth rate (SGR) (8.33 %). While African catfish fry fed with 60% freshwater mussel meal (T3) obtained the lowest final total body length (4.78 cm), gain in weight (1.10 g), average final body weight (1.11 g), absolute growth rate (AGR) (0.05 g/day), and specific growth rate (SGR) (8.15 %) but highest in survival rate (80%) than treatment T2 (61.33%). Despite these differences, analysis of variance showed no significant difference in all treatment groups. Based on the result of the study, the growth performance and survival rate of African catfish fry fed with commercial feeds (T1) had no significant difference from fry fed with freshwater mussel meal (T2 and T3).

^v Undergraduate thesis presented to the faculty of the College of Fisheries, Central Luzon State University as partial fulfillment of the requirements for the degree of Bachelor of Science in Fisheries. Prepared in the Department of Aquaculture under the supervision of Dr. Lorenz J. Fajardo.

LITERATURE CITED

- Allan, G.L., K.C. Williams, D.M. Smith, C.G. Barlow and S.J. Rowland. 1999. Fishmeal replacement for shrimp and fish feeds in Australia. *Int. Aquafeed*, 4:10-16.
- Aldridge, D.C., T.M. Fayle and N. Jackson. 2007. Freshwater mussel abundance predicts biodiversity in UK lowland rivers. *Aquatic Conservation Marine and Freshwater Ecosystems*, 17: 554-564.
- Abdelhamid, A.M. Mehrim, A.I. Radwan, I.A. and A.F. Abdelhamid. 2014. Reducing the cannibalism among newly hatched African catfish, *Clarias gariepinus*, fry by grading. Retrieved from September 14,2018
- Bostock, J., B. McAndrew, R. Richards, K. Jauncey, T. Telfer, K. Lorenzen, D. Little, L. Ross, N. Handisyde, I. Gatward, and R. Corner. 2010. Aquaculture: global status and trends. *Philosophical transaction royal society B*, 365, 2897-2912
- Bovendeur, J., E.H. Eding and A.M. Henken. 1987. Design and performance of a water recirculation system for high-density culture of African catfish, *Clarias gariepinus* (Burchell, 1822). *Aquaculture*, 63: 329-353.
- Chakraborty, S., M. Ray and S. Ray. 2008. Sodium arsenite induced alteration of hemocyte density of *lamellidens marginalis* an edible mollusc from Indian. *Clean*, 36(2): 195-200.
- Davies, S.J. and A. Gouveia. 2008. Enhancing the nutritional value of pea seed meal (*Pisum sativum*) by thermal treatment or specific isogenic selection with comparison to soybean meal for African catfish, *Clarias gariepinus*. *Aquaculture*, 238: 116-122.
- El-Sayed, A.F.M., 1998. Total replacement of fish meal with animal protein sources in Nile tilapia, *Oreochromis niloticus* (L.), feeds. *Aquaculture Research*, 29(4): 275-280.
- EL-Haroun E.R., 2007. Improved Growth Rate and Feed Utilization in Farmed African Catfish *Clarias gariepinus* (Burchell 1822) Through a Growth Promoter Biogen⁷ Supplementation. *Journal of Fisheries and Aquatic Science*, 2: 319-327.
- Gatlin, D.M., F.T. Barrows, P. Brown, K. Dabrowski, T.G. Gaylord, R.W. Hardy, E. Herman, G. Hu, A. Krogdahl, R. Nelson, K. Overturf, M. Rust, W. Sealey, D. Sconberg, E.J. Souza, D. Stone, R. Wilson and E. Wurtele. 2007. Expanding the utilization of suitable plant products in aquafeeds. a review. *Aquaculture Research*, 38(6): 551-579.

- George, C. and P.T. Mathew. 1996. Biochemical and nutritional evaluation of yellow clams. Central institute of Fishery Technology, 33(1): 41-45.
- Graf, D.L. and K.S. Cummings. 2007. Review of the systematics and global diversity of freshwater mussel species (Bivalvia: Unionoidea). Journal of Molluscan Studies, 73(4): 291-314.
- Hamad, A.E. 2014. Morphometric characteristics of *Clarias gariepinus* from lake nubia (Sudan). International journal of advanced research in biological sciences, 1(4):72-77.
- Haylor, G.S. 1993. Aspects of biology and culture of the African catfish *Clarias gariepinus* (Burchell, 1822) with particular reference to developing African countries. Blackwell scientific publications, 4:235-294.
- Hoffman, L.C., J.F. Prinsloo, and G. Rukan. 1997. Partial replacement of fishmeal with either soybean meal, brewers yeast and tomato meal in the diets of African sharptooth catfish *Clarias gariepinus*. Retrieved from http://www.wrc.org.za/Lists/Knowledge%20Hub%20Items/Attachments/5111/1997_Vol_23_no_2_1009_abstract.pdf on June 20, 2018.
- Huisman, E.A. and C.J.J. Richter. 1987. Reproduction, growth, health control and aquacultural potential of the African catfish, *Clarias gariepinus* (Burchell 1822). Aquaculture, 63: 1-14.
- Kurnia, A.I., E. Purwanto and E. Mahajoeno. 2010. Exposure copper heavy metal Cu on freshwater mussel (*Anodonta woodiana*) and its relation to Cu and protein content in the body shell. Nusantara Bioscience, 2(1): 48-53.
- Lal, K.K., R.K. Singh, V. Mohindra, B. Singh, A.G. Ponniah. 2003. Genetic make-up of exotic catfish *Clarias gariepinus* in India. Asian Fish Science, 16: 229-234.
- Liu, J., B. Gu, J. Bian, S. Hu, X. Cheng, Q. Ke and H. Yan. 2008. Antitumor activities of liposome-incorporated aqueous extracts of *Anodonta woodiana* (Lea, 1834). Eur. Food. Res. Technol., 227: 919-924.
- Magoulik, D.D. and L.C. Lewis. 2002. Predation on exotic zebra mussels by native fishes: effects on predator and prey. Freshwater Biology, 47(10): 1908-1918.
- Musa, S.M., C.M. Aura, C.C. Ngugi and R. Kundu. 2012. The effect of three different feed types on growth performance and survival of african catfish fry (*Clarias gariepinus*) reared in hatchery. Retrieved from <https://www.hindawi.com/journals/ism/2012/861364/> on March 5, 2017.

- Nyina-Wamwiza, L., B. Wathelet, J. Richir, X. Rollin and P. Kestemont. 2010. Partial or total replacement of fish meal by local agricultural by-products in diets of juvenile African catfish (*Clarias gariepinus*): growth performance, feed efficiency and digestibility. *Aquaculture Nutrition*, 16: 237–247.
- Nwanna, L.C. 2003. Nutritional value and digestibility of fermented Shrimp head waste meal by African catfish *Clarias gariepinus*. *Pakistan Journal of Nutrition*, 2(6): 339-345.
- Obirikorang, K.A., H.A. Madkour, D. Adjei-Boateng. 2014. A study of intra-cohort cannibalism in juveniles of the African catfish, (*Clarias gariepinus*) under controlled conditions. *International Journal of Science and Technology*, 3(1) 23-26
- Patnaik, B.B., T.H. Wang, S.W. Kang, H. Hwang, S.Y. Park, E.B. Park, J.M. Chung, D.K. Song, C. Kim, S. Kim, J.S. Lee, Y.S. Han, H.S. Park, and Y.S. Lee. 2016. Sequencing, de novo assembly, and annotation of the transcriptome of the endangered freshwater pearl bivalve, *Cristaria plicata*, provides novel insights into functional genes and marker discovery. *PLOS ONE*, 11(2): 1-28.
- Santos, B.S., F.C. Vesagas, M.C. Tan, J.C. Jumawan and J.P. Quilang. 2015. Status assessment of *Clarias* species in the Philippines: Insights from DNA barcodes. *SCIENCE DILIMAN*, 27:2, 21-40
- Saiful, N.I., C. Lumenta and J. Sampelakalo. 2015. Kijing Taiwan flour substitution in 3-5 cm tilapia fish feed formulation. Retrieved from <https://www.bing.com/search?q=Kijing+Taiwan++Flour+Substitution+in+3-5+cm+Tilapia+Fish+Feed+Formulation&pc=MOZD&form=MOZLBR> on March 5, 2017.
- Saiful, N.I., and C. Lumenta. 2014. Proximate analysis of Kijing Taiwan carcass (*Anodonta woodiana*) in wet and dry forms. *Budidaya Perairan*, 2(3): 45-53.
- Sicuro, B., S. Mioletti, C. Abete, S. Amedeo, E. Panini and G. Forneris. 2010. Potential utilisation of farmed freshwater mussels (*Anodonta anatina* and *Unio mancus*) in Italy. *Cuban Journal of Agricultural Science*, 44: 409-411.
- Sotolu, A.O. 2010. Growth performance of *Clarias gariepinus* (Burchell 1822) fed varying inclusion of leucaena leucocephala seed meal. *Tropicultura*, 28(3): 168-172.
- Tidwell, J.H., and G.L. Allan. 2001. Fish as food: aquaculture's contribution. *European Molecular Biology Organization Rep.*, 2(11): 959-963.

- Verreth, J., E.H. Eding, G.M. Rao, F. Huskens and H. Segner. 1993. A review of feeding practices, growth and nutritional physiology in larvae of the catfishes *Clarias gariepinus* and *Clarias batrachus*. *Journal world aquaculture society*, 24: 135-144.
- Vaughn, C.C. and C.C. Hackenkamp. 2001. The functional role of burrowing bivalves in freshwater ecosystems. *Freshwater Biology*, 46: 1431–1446.
- Watters, G.T. 1997. A synthesis and review of the expanding range of the Asian freshwater mussel *Anodonta woodiana* (Lea, 1834) (Bivalvia: Unionidae). *Veliger*, 40: 152-156.
- Yildirim, Y.B. and F. Turan. 2010. Effect of exogenous enzymes supplementation in diets on growth and feed utilization in African catfish, *clarias gariepinus*. *Journal of animal and veterinary advances*, 9(2):327-331
- https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/cwt/guidance/445.pdf
- <https://thefishsite.com/articles/the-benefits-of-fish-meal-in-aquaculture-diets>
- <https://feedipedia.org/node/208>
- <http://www.fishbase.org/glossary>