UNIVERSITI PUTRA MALAYSIA

EFFECT OF WATER EXCHANGE RATE ON THE GROWTH PERFORMANCE AND SURVIVAL OF KERAI LAMPAM, Hypsibarbus wetmorei x Barbonymus gonionotus

MUHAMMAD FAIZ SYAHMI BIN ROSLAN

FP 2013 102

EFFECT OF WATER EXCHANGE RATE ON THE GROWTH PERFORMANCE AND SURVIVAL OF KERAI LAMPAM, *Hypsibarbus wetmorei* x *Barbonymus gonionotus*

MUHAMMAD FAIZ SYAHMI BIN ROSLAN

156740

This project report is submitted in partial fulfillment of the requirements for the degree of Bachelor of Agriculture (Aquaculture)

DEPARTMENT OF AQUACULTURE, FACULTY OF AGRICULTURE
UNIVERSITI PUTRA MALAYSIA
SERDANG SELANGOR

2013

CERTIFICATION OF APPROVAL

DEPARTMENT OF AQUACULTURE

FACULTY OF AGRICULTURE

UNIVERSITI PUTRA MALAYSIA

Name of student : Muhammad Faiz Syahmi Bin Roslan

Matric number : 156740

Program : Bachelor of Agriculture (Aquaculture)

Year : 2013

Name of supervisor : Mr. Abdullah Abd Rahim

Title of project : Effect of Water Exchange Rate On The Growth Performance and Survival of Kerai Lampam, *Hypsibarbus wetmorei* x *Barbonymus Gonionotus.*

This is certified that I have examines the final project report and all corrections have been made as recommended by the panel of examiners. This report compiles with the recommended format stipulated in the AKU4999 project guidelines, Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia.

Signature and official stamp of supervisor:

_____

(Mr. Abdullah Abd Rahim)

Date:

ACKNOWLEDGEMENTS

Assalamualaikum W.B.T

Praise to Allah SWT, The Almighty, as without His blessing this research would not have been possible. I am most grateful to Him for giving me the strength and patience to complete my final year project.

I would to like to convey my gratitude and appreciation for those who have been involved directly or indirectly in order for me to complete my final year project. First and foremost, I would like to thank Mr. Abdullah Abd Rahim, my supervisor, who has guided, advised, commented and encouraged me in all aspects of the study. I would like to extend my appreciation to all staffs at the Aquaculture Research Station, UPM Serdang, who were always there, willing to provide information as well as cooperation whenever needed.

Last but not least, I would like to extend my sincerest appreciation to my family, especially both my parents (Mr. Roslan Saad and Mrs. Norehan Amran) and my siblings, for their timeless love, encouragement and inspiration. I also want to thank all my classmates and friends, especially Adiba Akmal Lokman and Saw Gim Leng, for their concern, help, moral support and encouragement throughout the duration of this project and throughout our study years. To those whom I have failed to mention, you are not forgotten. Thank you once again.

ABSTRAK

Kesan kadar pertukaran air terhadap prestasi pertumbuhan dan kelangsungan hidup kerai lampam, *Hypsibarbus wetmorei* x *Barbonymous gonionotus* telah dikaji. Kesan pertukaran air pada parameter kualiti air juga telah dikaji. Eksperimen ini telah dijalankan selama dua bulan di Stesen Penyelidikan Akuakultur, Jabatan Akuakultur, Fakulti Pertanian, Universiti Putra Malaysia, Serdang, Selangor. Eksperimen ini melibatkan empat rawatan. Rawatan melibatkan tiada pertukaran air (Rawatan 1), pertukaran air setiap hari (Rawatan 2), pertukaran air mingguan (Rawatan 3) dan pertukaran air sekali dalam dua minggu (Rawatan 4). Setiap rawatan mempunyai empat replikasi. Setiap akuarium diisi dengan 60L air. Semasa pertukaran air, 30% air akuarium telah digantikan dengan air paip yang telah nyahklorin. Anak kerai lampam telah dipenuhi dengan kepadatan 20 ekor/akuarium (333 ekor/m^3). Pelet buatan dengan 42% protein telah diberikan sebanyak 5% daripada berat badan ikan. Anak kerai lampam dari sekali dalam dua minggu pertukaran air menunjukkan pertumbuhan lebih tinggi dari segi jumlah berat badan (TWG) (1.29 ± 0.15g), berat badan harian (DWG) (0.03 ± 0.00g) dan kadar pertumbuhan spesifik (SGR) (2.55 ± 0.28g) berbanding dengan rawatan lain. Walau bagaimanapun, dari segi kelangsungan hidup, tiada pertukaran air dan pertukaran air harian menunjukkan peratusan tertinggi dengan 93.75%. DO dikekalkan diatas 4mg/L, dengan suhu di antara 25 hingga 27˚C dan bacaan pH antara 6.1 – 8.2. Kepekatan TAN sepanjang eksperimen adalah antara 0 hingga 2.63mg/L. Tiada tanda-tanda tekanan ketara kelihatan pada anak kerai lampam sepanjang tempoh kajian. Kekeruhan meningkat di antara 1.29 hingga 90.65NTU sepanjang tempoh eksperimen. Secara keseluruhannya, berdasarkan kepadatan benih dan keadaan semasa eksperimen ini dijalankan, adalah disyorkan bahawa pertukaran air tidak perlu untuk menternak benih kerai lampam bagi mencapai tahap pertumbuhan yang boleh diterima dalam tempoh 6 minggu.

ABSTRACT

The effect of water exchange rate on the growth performance and survival of kerai lampam, *Hypsibarbus wetmorei* x *Barbonymous gonionotus* was studied. Effect of water exchange on water quality parameters was also investigated. The experiment was conducted for two months at the Aquaculture Research Station, Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, Serdang, Selangor. The experiment involved four treatments. The treatments were zero water exchange (Treatment 1), daily water exchange (Treatment 2), weekly water exchange (Treatment 3) and once in two weeks water exchange (Treatment 4). Each treatment had four replicates. Each aquarium was filled with 60L of water. During water exchange, 30% of the aquarium water was replaced with dechlorinated tap water. Kerai lampam fingerlings were stocked at a density of 20 pieces/aquarium (333 fingerlings/m^3). Artificial pellets with 42% protein were given at 5% of body weight. Kerai lampam fingerlings cultured in once in two weeks water exchange showed higher total weight gain (TWG) (1.29±0.15g), daily weight gain (DWG) (0.03±0.00g) and specific growth rate (SGR) (2.55±0.28g) compared to other treatments. However, in term of survival, no water exchange and daily water exchange showed the highest percentage of survival with 93.75%. DO was maintained above 4 mg/L, with temperature ranged between 25 to 27˚C and pH reading between 6.1 to 8.2. The TAN concentration throughout the experiment ranged between 0 to 2.63mg/L. No noticeable stress symptoms were observed on the fingerlings throughout the experimental period. Turbidity increased as the experiment progressed and ranged from 1.29 to 90.65NTU. Overall, it is recommended that under the studied stocking density and conditions, water exchange is not necessary to nurse kerai lampam fingerlings with acceptable growth for a period of 6 weeks.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS / SYMBOLS

DO	Dissolved oxygen
TAN	Total Ammonia Nitrogen
FCR	Feed conversion ratio
TWG	Total weight gain
DWG	Daily weight gain
SGR	Specific growth rate
SPSS	Statistical Package for Social Science
ANOVA	Analysis of variance
%	Percentage
˚C	Degree Celcius
g	gram
L	liter
mg	milligram
mg/L	milligram per liter

CHAPTER 1

INTRODUCTION

1.1 Background of study

Kerai lampam is a hybrid fish species that was produced from research conducted since 2004 (Anon., 2004). Kerai lampam is a hybrid of male kerai kunyit (River carp), *Hypsibarbus wetmorei* and female lampam jawa (Silver barb), *Barbonymus gonionotus*. Each parent species have their unique characteristics, morphologically and biologically. For kerai kunyit, the species can be easily identified by the yellowish coloration on their lower abdomen but their growth rate is low. Unlike kerai kunyit, lampam jawa is a species with faster growth rate. The hybridization of both species yielded a new species with attractive appearance and faster growth rate. To date, there are not many studies on kerai lampam.

In Malaysia, kerai lampam species is endemic to Pahang River (Chew & Zulkafli, 2012). Lampam jawa is widely distributed in South East Asia, which include Vietnam, Thailand, Cambodia, Lao, Malaysia, Indonesia and Bangladesh. It

grows well on low protein diets, whether feeding on certain aquatic plants or given supplementary feeding (Bentsen *et al*., 1996).

According to Rainboth (1996), kerai kunyit was commonly found at mid water to bottom depths of medium-sized streams in forest. Kerai kunyit is not known to migrate, but may move upstream during periods of high water levels. On the other hand, he also stated that, lampam jawa was also commonly found at mid water to bottom depth in rivers, streams, floodplains, and occasionally in reservoirs. He further proposed that lampam jawa preferred standing water habitats instead of flowing waters. Lampam jawa can also survive in shallow, turbid waters and grows to table size in as little as three to four months (Gupta & Rab, 1994).

Water exchange can be both beneficial and detrimental. Too much water exchange may increase labor and water supply cost as well as causing stressful condition to aquatic species cultured due to fluctuation in water parameters. Zero water exchange, on the other hand, may lead to increasing concentrations of nutrients and organic matter in the culture system. Accumulation of toxic waste product such as ammonia will affect the survival of kerai lampam and increase mortality. Thus, the purpose of this research was to study the effect of water exchange rate on growth performance, as well as the survival rate of kerai lampam and also how it could affect water quality of the culture system.

1.2 Objectives

1. To investigate the effect of water exchange rate on the growth performance and survival of kerai lampam.
2. To determine the effect of water exchange on water quality parameters in kerai lampam culture tanks.

REFERENCES

Andrews, J. W., Knight, J. H., Page, J. W., Matsuda, Y., and Brown, E. E. (1972) Interactions of stocking density and water turnover on growth and food conversion of channel catfish reared in intensively stocked tanks. Prog. Fish-Cult., **33**: 197-203.

Anonymous (2004) Transformasi Perikanan, Peneraju Ekonomi Negara. Berita Perikanan. Jabatan Perikanan Malaysia, Vol. 80.

Backiel, T. (1978) Some density relationships for fish population parameters. In: S.D. Gerking (Editor), Ecology of Freshwater Fish Production. John Wiley and Sons, New York, NY, pp. 279-302.

Baker, M. N. and Tharwat, A. A. (2006) Effect of stocking density and manuring rate on Silver carp (*Hypophthalmichthys molitrix*) reared in earthen ponds, Journal of The Arabian Aquaculture Society, Vol 1(2).

Baker, R. F., and Ayles, G. B. (1990) The effect of varying density and loading level on the growth of Arctic charr (*Salvelinus alpinus L*.) and rainbow trout (*Oncorhynchus mykiss*). World Aquacult., **21**: 58-61.

Balarin, J. D., and Haller, R. D. (1982) The intensive culture of tilapia in tanks, raceways and cages. In: Muir, J.F. and Roberts, R.J. (eds.). Recent Advances in Aquaculture. Croom Helm Ltd., London, pp. 266-345.

Bentsen, H. B., and Olesen, I. (2002) Designing aquaculture mass selection programs to avoid high inbreeding rates. Aquaculture **204**: 349-359.

Bjornsson, B. (1994) Effects of stocking density on growth rate of halibut (*Hippoglossus hippoglossus L*.) reared in large circular tanks for three years. Aquaculture, **123**: 259-270.

Boyd, C. E. (1979) Water Quality in Warmwater Fish Ponds. Auburn University, Agriculture Experiment Station, Auburn, AL, 359 pp. 276

Brett, J. R. (1979) Environmental factors and growth. In: Hoar, W.S., D.J. Randall, and J.R. Brett, (eds.). Fish Physiology, vol. 8. Academic Press, New York. NY. pp. 599- 675.

Buck D. H. (1956) Effects of turbidity on fish and fishing. Transactions of the 1956 North American Wildlife Conference, **21**: 249-261.

Cnaani, A., and Levavi-Sivan, B. (2008) Sexual Development in Fish, Practical Applications for Aquaculture. Sex. Dev. ; **3**:164–175.

Cheatham, C. K. (2009) Responses of Nitrifying Bacteria to Aquaculture Chemotherapeutic Agents. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Chew, P. C., and Zulkafli, A. R. (2012) Sperm cryopreservation of some freshwater fish species in Malaysia. In I. Katkov (Ed.), Current Frontiers in Cryopreservation.

Cho, S., Dietrich, M., Brown, C., J., P., Clark, C., A. and Block, G. (2003) The effect of breakfast type on total daily energy intake and body mass index : Results from the Third National Health and Nutrition Examination Survey (NHANES III). J Am Coll Nutr ; **22(4):**296-302.

Faizul M. I. M., Christianus A. (2013) Salinity and Stocking Density Effect on Growth and Survival of *Barbodes gonionotus* (Bleeker, 1850) Fry. Institute of Bioscience, University Putra Malaysia.

Fox, M.G. and Flowers, D., D. (1990) Effect of fish density on growth, survival and food consumption by juvenile walleyes in rearing ponds. Trans. Amer. Fish. Soc., **119**: 112-121.

Green, B., W., Teichert-Coddington D., R., and Boyd, C., E. (2000) Water exchange to rectify low dissolved oxygen. In: K. McElwee, D. Burke, M. Niles, X. Cummings, and H. Egna (Editors), Seventeenth Annual Technical Report. Pond Dynamics/Aquaculture CRSP, Oregon State University, Corvallis, Oregon.

Gupta, M.V. and Rab, M. A. (1994) Adoption and economics of silver barb (*Puntius gonionotus*) culture in seasonal waters In Bangladesh. ICLARM Tech. Rep. 41,39 p.

Gregory, R. B. (1977) Synthesis and total excretion of waste nitrogen by fish of the periophthalmus (mudskipper) and scartelaos families. Comp. Biochem. Physiol. A**57**: 33 – 36.

Hargreaves, J. A. (1998) Review: Nitrogen biogeo- chemistry of aquaculture ponds. Aquaculture **166**: 181 – 212.

Hiraswa, Y. (1985) Economics of shrimp culture in Asia. In: Y. Taki, J.H. Primavera and J.A. Llobrera (Editors), Proceedings of the First International Conference on the Culture of Penaeid Prawns/Shrimps. SEAFDEC Aquaculture Department, Iloilo, The Philippines, pp. 131- 150.

Hitzfelder, G. M., Holt, G., Fox J. M. and McKee D. A. (2006) The effect on rearing density on growth and survival of Cobia, *Rachycentron canadum*,larvae in a closed recirculating aquaculture system. J. World Aquacult. Soc., **37**:204-209.

Huang, W.B. and Chiu, T.S. (1997) Effects of stocking density on survival, growth, size variation and production of Tilapia fry. Aquac. Res., **28**: 165-173.

Imanpoor, M.R., Ahmadi, A. R., and Kordjazi, M. (2009) Effects of stocking density on survival and growth indices of common carp (*Cyprinus carpio*). Iranian Scientific Fisheries Journal, **18(3):** 1-9.

Jana, B.B. and Chakrabarti, R. (1993) Life table responses of zooplankton (*Moina micruraurz* and *Daphnia carinata King*) to manure application in a culture system. Aquaculture, **117**: 274 - 285.

Jhingran, V. G. (1991) Fish and Fisheries of India, 3rd ed. Hindustan Publishing Corporation, Delhi, India, PP: 727

Jobling, M. (1983) Effects of social interactions on growth rates and conversion efficiency of Arctic charr, *Salvelinus alpinus L*. J. Fish Biol., **22**: 577-584.

Kjartansson, H., Fivelstad, S., Thomassen, J. M., and Smith, M. J. (1988) Effects of different stocking densities on physiological parameters and growth of adult Atlantic salmon (*Salmo salar L*.) reared in circular tanks. Aquaculture, **73**: 261-274.

Koebele, B. P. (1985) Growth and size hierarchy effect: an experimental assessment of three proposed mechanisms; activity differences, disproportional food acquisition, physiological stress. Environ. Biol. Fish., **12**: 181-188.

Mann, R. H. K. (1991) Growth and Production. In : Cyprinid Fishes : Systematic biology and exploitation, Chap. 16 (I. J. Windfield and J. S. Nelson, eds), Chapman and Hall, London, 456-482.

Marimuthu K., Umah R., Muralikrishnan S., Xavier R., and Kathiresan S. (2011) Effect of different feed application rates on growth, survival and cannibalism of African catfish, Clarias gariepinus fingerlings. Emirates Journal of Food and Agriculture **23**:330-337.

McGee, M.V. and Boyd, C.E. (1983) Evaluation of the influence of water exchange in channel catfish ponds. Trans. Am. Fish. Sot., **112**: 557-560.

Miao, S. (1992) Growth and survival model of redtail shrimp *Penaeus penicillates* according to manipulating stocking density. Bull. Inst. Zool., Academia Sinica, **31**:1-8.

Mihelakakis, A., Tsolkas, C., and Yoshimatsu, T. (2002) Optimization of feeding rate for hatchery produced juvenile gilthead sea bream Sparus aurata. J. World Aquacult. Soc. **33**:169-175.

Morii, H., Nishikata, K., Tamura, O. (1978) Nitrogen excretion of mudskipper fish *Periophthalmus cantonensis* and *Boleophthalmus pectinirostris* in water and on land. Comp. Biochem. Physiol. A **60**: 189 – 193.

Ng, W. K., Lu, K. S., Hashim, R., and Ali, A. (2000) Effects of feeding rate on growth, feed utilization and body composition of tropical bagrid catfish. Aquacult. Internat. **8**:19–29.

Odum, E. P. (1959) Fundamental of Ecology 2nd ed. W. B. Saunders Company, Philadelphia and London, 546pp.

Osman M. A., Mohamed M. A. M., Ali M. H. H., Al-fify A. D.G. (2010) Assesment of Agriculture Drainage Water Quality to be used for Fish Farm Irrigation. Faculty of Agriculture, Cairo University Giza, Egypt.

Phaohorm, S. (1970) The study of biology, feeding and growth of *Puntius gonionotus* (Bleeker). Annual Report, Bangkok, Thailand, pp: 19-33.

Rainboth, W.J. (1996) Fishes of the Cambodian Mekong. FAO Species Identification Field Guide for Fishery Purposes. Food and Agriculture Organization, Rome.

Rafiee, G., Saad, C. R. (2005) Nutrient cycle and sludge production during different stages of red tilapia (*Oreochromis* sp.) growth in a recirculating aquaculture system. Aquaculture **244**: 109 – 118.

Rachmatika, I., Nasi, R., Sheil, D., and Wan, M. (2005) Fish fauna in Bulungan Research Forest (BRF) Malinau, East Kalimantan, CIFOR, Bogor, Indonesia.

Refstie, T., and Kittelsen, A. (1976) Effect of density on growth and survival of artificially reared salmon. Aquaculture, **8**: 319-326.

Refstie, T. (1977) Effect of density on growth and survival of rainbow trout. Aquaculture, **11**: 329-334.

Render, B. D., and Stickney, R. R. (1979) Acclimation to ammonia by Tilapia aurea. Trans. Am. Fish. Soc., **108**: 383- 388.

Schreck, C. B. (1981) Stress and compensation in teleostean fishes: Response to social and physical factors. In: Pickering, A.D. (ed.). Stress and Fish. Academic Press, London. pp. 295-321.

Siddiqui, A.Q., Howlader, M. S., and Adam, A. B. (1991) Effects of water exchange on *Oreochromis niloticus* (L.) growth and water quality in outdoor concrete tanks. Aquaculture **95**: 67-74.

Siddiqui, A.Q. and Al-Harbi, A. H. (1999) Nutrient budget in tilapia tanks with four different stocking densities. Aquaculture.**170**: 245-252.

Singh, T. (1997) Common culture practices for cyprinids in Asia. Southeast Asian J. Trop. Med. Public Health ;28. Suppl., **1**:73-6

Smith, H.T., Schrek, C. B., and Maughan, O., E. (1978) Effect of population density and feeding rate on the fathead minnoca (Pimephales promelas). J. Fish Biol., **12**:449-455

Spotte, S. F. (1970) Fish and Invertebrate Culture. Wiley-Interscience, New York.

Srisuwantach, V. (1981) Induced breeding of Thai silver barb (*P. gonionotus* Bleeker). SAFIS manual No. 10, Eng. Transl, South-East Fish Dev. Center, Thailand.

Vasagam K., K. P., Suresh, A., V. and Chamberlain, G., W. (2009) Growth performance of blue shrimp, *Litopenaeus stylirostris* in self-cleaning microcosm tanks. Aquaculture **290**: 236– 242.

Vasile A. (2008) The Implications of Water Chemical Properties from the Breeding Nursery Pond on the Fish Pathological State. Innovative Romanian Food Biotechnology **2**, 25 – 29.

Westers, H. (1970) Carrying capacity of salmonid hatcheries. Prog. Fish-Cult., **31**: 43-46.

Yap C. K., Chee M. W., Shamarina S., Edward F. B., Chew W. and Tan S. G. (2011) Assesment of Surface Water Quality in Malaysian Coastal Waters by Using Multivariate Analyses. Sains Malaysiana **40(10)**: 1053–1064.