

WASTE EXCRETION OF MARBLE GOBY  
(*Oxyeleotris marmorata* Bleeker)-A CRITERION  
FOR DESIGNING A  
RECIRCULATING AQUACULTURE SYSTEM

LAM SU SHIUNG

MASTER OF SCIENCE  
UNIVERSITY MALAYSIA TERENGGANU

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Lam Su Shiung.

PERPUSTAKAAN SULTANAH NUR ZAHIRAH  
UNIVERSITI MALAYSIA TERENGGANU (UMT)  
21030 KUALA TERENGGANU

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**BUKukan MILIK**  
**PERPUSTAKAAN SULTANAH NUR ZAHIRAH UMT**

**WASTE EXCRETION OF MARBLE GOBY (*Oxyeleotris marmorata* Bleeker)  
– A CRITERION FOR DESIGNING A RECIRCULATING AQUACULTURE SYSTEM**

LAM SU SHIUNG

JUNE 2007

Professor Mohd. Armi Arshad, Ph.D.

Professor Low Ah Thiam, Ph.D.

Associate Professor Ir. Ahmad Isahak, M.Sc.

Institute of Tropical Aquaculture

LAM SU SHIUNG

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**WASTE EXCRETION OF MARBLE GOBY (*Oxyeleotris marmorata* Bleeker)  
– A CRITERION FOR DESIGNING A  
RECIRCULATING AQUACULTURE SYSTEM**

**LAM SU SHIUNG**

**JUNE 2007**

**Chairperson** : Professor Mohd. Azmi Ambak, Ph.D.  
**Member** : Professor Law Ah Theem, Ph.D.  
Associate Professor Ir. Ahmad Jusoh, M.sc.  
**Institute** : Institute of Tropical Aquaculture

Marble goby (*Oxyeleotris marmorata* Bleeker), a freshwater food fish with its high demand and price, has a great potential as a profitable commercial aquaculture candidate in Malaysia and Southeast Asia region. With respect to their good prospect, this study was conducted to collect growth and waste excretion data that would be of value for the design and management of a more effective recirculating aquaculture system (RAS) for growout production of this fish due to poor growth performance and disease problems shown by conventional cage and pond culture systems.

The first part of this study is to investigate the growth performance and feed utilization of marble goby fed with different diets (live food and minced fish) and cultured individually in different partitioned tank design attached to a simple RAS for 3 months in the interest

of exploring the suitability of culturing the fish in the proposed design. Live food, particularly tilapia (*Oreochromis niloticus*), was found to be the preferential diet for marble goby by showing the best growth and feed utilization, while culturing the fish individually in spacious partitions with PVC tubes (Big-P tubes) associated with RAS was proved to be suitable for marble goby rearing (100% survival and better growth). This culture system design was able to prevent overcrowding and cannibalism in marble goby.

The second and third parts of this study are to characterize the waste excretion of marble goby under the effects of different diets (live food and minced fish), fish body weight (50 – 600 g), and feed ration (4 - 8% BWd<sup>-1</sup>). Total ammoniacal-N (TAN = NH<sub>3</sub> + NH<sub>4</sub><sup>+</sup>), urea-N, nitrite-N, nitrate-N, total-N (TN), organic-N (ON), feces-N, 5-day biochemical oxygen demand (BOD<sub>5</sub>) and total suspended solid (TSS) produced from marble goby were determined over a 72-h excretion period. Under given experimental conditions, the results showed that feed type had significant influence on the waste excretion rates, with marble goby fed live tilapia exhibiting significantly ( $P < 0.05$ ) the lowest amount of waste excretion and N loss comparable to those of fish fed live carp (*Cyprinus carpio*) and minced scads (*Decapterus russellii*). This indicates further that feeding marble goby with tilapia would cause less adverse effects on water quality and is thus a suitable diet for this species. On the other hand, the waste excretion rates of starved marble goby were found significantly ( $P < 0.001$ ) and strongly ( $r: 0.69 - 0.92$ ) inverse-related to the fish body weight, and the relationship may be expressed as power functions. In contrast, the waste excretion rates of fed marble goby were found significantly ( $P < 0.001$ ) and strongly

( $r$ : 0.86 – 0.97) correlated to the intake of feed ration (%BW  $d^{-1}$ ), but were not strongly ( $r$ : 0.55 – 0.87) affected by fish body weight. The relationship between the waste excretion rates and feed ration may be expressed as linear functions. The mathematical relationships obtained can be used to predict the waste loading rate for designing a RAS for marble goby under different fish sizes and feeding conditions.

In this study, the waste excreted by the fish, irrespective of fish size, is composed of nitrogenous excretion (TAN, Urea-N, ON, Feces-N), and productions of dissolved biodegradable organic substances ( $BOD_5$ ) and TSS ( $TSS_{Feces} + TSS_{water}$ ). The mean rates of nitrogenous excretion were in the range of 404 - 571, 93 - 120, 18 - 37, 54 - 145 mg N  $kg^{-1}d^{-1}$ , respectively, while 1416 – 2361 mg DO  $kg^{-1} d^{-1}$  (6.1 - 35.1 mg  $L^{-1}$ ) for  $BOD_5$  and 2338 – 6472 mg TSS  $kg^{-1}d^{-1}$  (17 - 55 mg  $L^{-1}$ ) for TSS productions. About 45 - 71% of the nitrogen consumed in food was excreted and its rate depended mainly on the feed type. TAN occupied the greatest part (73 - 85%) of daily total nitrogenous waste excretion. Urea-N accounted for 13 - 21% of the total nitrogenous waste excretion indicating that it is an important nitrogenous excretory end-product in marble goby. The overall waste excretion data presented in this study can be served as a general basis and tool for designing a RAS for this species. Implications for the requirement and design of a recirculating aquaculture system for marble goby are discussed based on the waste excretion data obtained from this study.