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A REPORT FOR THE DESIGNING  
AN INTEGRATED QUALITY SYSTEM

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Waste production study on marble goby (*oxyeleotris marmorata* bleeker) : a criterion for designing recirculating aquaculture system / Tan Wan Peng.

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WASTE PRODUCTION STUDY ON MARBLE GOBY (OXYELEOTRIS  
MARMORATA BLEEKER) – A CRITERION FOR DESIGNING  
RECIRCULATING AQUACULTURE SYSTEM

By

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**JABATAN SAINS KEJURUTERAAN  
FAKULTI SAINS DAN TEKNOLOGI  
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**PENGAKUAN DAN PENGESAHAN LAPORAN  
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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

**WASTE PRODUCTION STUDY ON MARBLE GOBY (*OXYELEOTRIS MARMORATA BLEEKER*) – A CRITERION FOR DESIGNING RECIRCULATING AQUACULTURE SYSTEM** oleh **TAN WAN PENG**, No.Matrik **UK7750** telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Kejuruteraan sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah **SARJANA MUDA TEKNOLOGI (ALAM SEKITAR)**, Fakulti Sains dan Teknologi, Universiti Malaysia Terengganu.

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## LIST OF ABBREVIATIONS

### Abbreviation

APHA	American Public Health Association
TSS	Total Suspended Solid
BOD	Biochemical Oxygen Demand
DO	Dissolved Oxygen
N	Nitrogen
TAN	Total Ammonia Nitrogen
%BW	Percent Body Wet Weight
RAS	Recirculating Aquaculture System

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### Appendices

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## ABSTRACT

This study was conducted to determine effect of feeding and body weight on the waste production of Marble Goby (*Oxyeleotris Marmorata Bleeker*) to help in designing the suitable types and size of treatment units in recirculating aquaculture system for the culture of Marble Goby. Parameters of waste production that been analyzed and quantified were Ammonium-Nitrogen (TAN), Total Suspended Solid (TSS) and Biochemical Oxygen Demand (BOD<sub>5</sub>). For the effect of feeding, this study showed that Marble goby fed live tilapia exhibiting significantly the lowest amount of waste excretion comparable to that of fish fed carp and scads. A peak of post-feeding TAN excretion was obtained at 6 h after feeding and returned to endogenous rate at 24 hr after feeding. Whereas, for the effect of body weight, body weight had significant influence on the endogenous waste excretion rates of Marble Goby with the small-sized Marble Goby showed significantly higher amount of waste excretion compared to larger size of Marble Goby. With X = Fish wet body weight (g), the relationships for endogenous waste excretion were: TAN (mg N kg<sup>-1</sup> d<sup>-1</sup>) = 2122.138 X<sup>-0.0489</sup> (r<sup>2</sup> = 0.958, F = 436.954, P < 0.01); BOD<sub>5</sub> (mg kg<sup>-1</sup> d<sup>-1</sup>) = 231.39 X<sup>-0.199</sup> (r<sup>2</sup> = 0.690, F = 42.183, P < 0.01). After feeding, the waste excretion rates of marble goby were not significantly affected by body weight, but were significantly correlated to the intake of feed ration (%BW d<sup>-1</sup>). With X = feed ration (%BW d<sup>-1</sup>), the post-feeding waste excretion relationships were: TAN (mg N kg<sup>-1</sup> d<sup>-1</sup>) = 11.415 X + 348.886 (r<sup>2</sup> = 0.922, F = 225.402, P < 0.01); BOD<sub>5</sub> (mg kg<sup>-1</sup> d<sup>-1</sup>) = 176.163 X + 543.342 (r<sup>2</sup> = 0.730, F = 51.348, P < 0.01). The mathematical relationship obtained in this study can be used to predict waste loading rate for recirculating aquaculture system of marble goby.

## ABSTRAK

Kajian ini dijalankan untuk menentukan kesan jenis makanan dan berat badan kepada penganalisaan pengeluaran sisa Marble Goby (*Oxyeleotris Marmorata Bleeker*) digunakan untuk perekaan dan pengurusan *recirculating aquaculture system* bagi penternakan Marble Goby. Parameter-parameter untuk pengeluaran sisa yang akan dianalisis adalah Ammonia-nitrogen (TAN), Jumlah Pepejal Terampai (TSS) dan Permintaan Oksigen Biokimia (BOD). Untuk kesan jenis makanan, kajian menunjukkan Marble Goby yang diberi tilapia hidup sebagai makanan menunjukkan amaun pengeluaran sisa yang terendah secara signifikan berbanding dengan Marble Goby yang diberi makan dengan *carp* dan *scads*. Puncak pengeluaran TAN selepas makan diperolehi selepas 6 jam berikutan Marble Goby diberi makan dan merosot ke kadar "endogenous" pengeluaran sisa selepas 24 jam. Manakala untuk kesan berat badan, didapati berat badan mempunyai pengaruh yang signifikan terhadap pengeluaran sisa bagi Marble Goby yang tidak diberi makan dengan Marble Goby yang bersaiz kecil memaparkan amaun pengeluaran sisa yang lebih tinggi secara signifikan berbanding dengan Marble Goby yang bersaiz lebih besar. Dengan X = berat badan lembap ikan (g), hubungan bagi kadar "endogenous" pengeluaran sisa adalah: TAN ( $\text{mg N kg}^{-1} \text{d}^{-1}$ ) =  $2122.138 X^{-0.0489}$  ( $r^2 = 0.958$ ,  $F = 436.954$ ,  $P < 0.01$ ); BOD<sub>5</sub> ( $\text{mg kg}^{-1} \text{d}^{-1}$ ) =  $231.39 X^{-0.199}$  ( $r^2 = 0.690$ ,  $F = 42.183$ ,  $P < 0.01$ ). Selepas diberi makan, kadar pengeluaran sisa Marble Goby adalah tidak dipengaruhi oleh berat badan secara signifikan, tetapi adalah berhubung kait secara rapat dan signifikan dengan pengambilan catuan makanan (% BW d<sup>-1</sup>). Dengan X = catuan makanan (%BW d-1), pengeluaran sisa selepas pengambilan makanan adalah: TAN ( $\text{mg N kg}^{-1} \text{d}^{-1}$ ) =  $11.415 X + 348.886$  ( $r^2 = 0.922$ ,  $F = 225.402$ ,  $P < 0.01$ ); BOD<sub>5</sub> ( $\text{mg kg}^{-1} \text{d}^{-1}$ ) =  $176.163 X + 543.342$  ( $r^2 = 0.730$ ,  $F = 51.348$ ,  $P < 0.01$ ). Hubungan matematik yang diperolehi dalam kajian ini dapat digunakan untuk meramalkan kadar beban sisa bagi RAS yang menternak Marble Goby.