

THE TOXICITY OF COPPER TO LAMPAM JAWA
(*Puntius gonionotus*)

HING LEE SIANG

FACULTY OF APPLIED SCIENCE AND TECHNOLOGY
UNIVERSITI KOLEJ
(UNIVERSITI PUTRA MALAYSIA)
TERENGGANU

1997

THE TOXICITY OF COPPER TO LAMPAM JAWA
(*Puntius gonionotus*)

by

HING LEE SIANG

*Dedicated to my beloved parents
for all their love and sacrifices*

This project report is submitted
in partial fulfilment of the requirements for the degree of
Bachelor Science (Marine Science)

FACULTY OF APPLIED SCIENCE AND TECHNOLOGY
UNIVERSITI KOLEJ
(UNIVERSITI PUTRA MALAYSIA)
TERENGGANU

1997

1100023981

ACKNOWLEDGEMENTS

I would like to express my greatest appreciation to my supervisor, Prof. Madya Dr. Noor Azhar b. Mohamad Shazili, for his invaluable guidance, advice, support, generosity and time. Without his supervision, this project might not have been possible. I am also indebted to my second supervisor, Prof. Dr. Law Ah Theem for his helpful comments and encouragement.

I am also grateful to Mr. Liew Hock Chark for his comments on statistical analyses. My appreciation also forward to Pn. Kartini, En. Yaakob, Tn. Hj. Hosni, En. Sulaiman and En. Ghani for their kindness and technical assistance when I was conducting this research project.

My deepest gratitude goes to my Dad, Mom, Brothers, Sisters, Sister-in-law and Brother-in-law for their moral support and patience through my years in Universiti Pertanian Malaysia.

Last but not least, I would like to thank all my friends especially Siew Theng, Mohd. Zulkamal, Hamezan, Asmawi, Idham, Hafiz and Clarence who have helped me and supported me through the running of my project.

ABSTRACT

Sub-acute continuous flow and acute static toxicity test studies were performed on *Puntius gonionotus*. *Puntius gonionotus* were exposed continuously to copper for 22 days using a continuous flow toxicity testing system, as well as tested over 15 days in a static with renewal system with the objective of determining the LC50 value for copper over an extended testing period. Probit, Spearman-Kärber and graphical methods were used to calculate the LC50 depending on data suitability. Results of the 48-h, 96-h, 366-h and 504-h LC50 and its 95% confidence limits for sub-acute continuous flow toxicity test were 0.057 (0.04 - 0.08), 0.043 (0.03 - 0.06), 0.033 (0.02 - 0.06) and 0.033 (0.02 - 0.06) respectively. For acute static toxicity test, the 48-h, 96-h, and 366-h LC50 and 95% confidence limits were 0.08 (0.07 - 0.10), 0.07 (0.06 - 0.08), and 0.05 (0.04 - 0.06). No mortalities were observed in control tanks and in test solutions of 0.018 ppm copper after 22 days exposures. As such the threshold concentration for copper to lampam jawa is estimated to be about 0.018 ppm. Fish in 0.018 ppm copper accumulated significantly more copper than fish in control tanks with the former accumulating copper up to $41.240 \pm 17.166 \mu\text{g/g}$ dry weight, and the latter having a background value of $7.080 \pm 3.645 \mu\text{g/g}$ dry weight. This revealed that threshold concentration suggested here should not be directly converted and applied to water quality criteria. Further study need to carry out with longer test period in order to know the long-term effect of copper to organism. In addition, toxicant concentrations in natural waters are temporally variable and are not in constant concentrations as employed in the laboratory.

ABSTRAK

Kajian ketoksikan aliran berterusan sub-akut dan kajian ketoksikan statik akut kuprum telah dijalankan ke atas *Puntius gonionotus*. Dalam sistem kajian ketoksikan aliran berterusan, *Puntius gonionotus* telah didedahkan kepada kuprum secara berterusan selama 22 hari, dan selama 15 hari dalam kajian ketoksikan statik di mana pertukaran air dilakukan setiap 2 hari. Objektif kajian ini ialah untuk menentukan nilai LC50 (kepekatan median maut) bagi kuprum bagi satu tempoh kajian yang telah dipanjangkan. Untuk memperolehi nilai LC50, analisis data dilakukan dengan menggunakan sama ada probit, Spearman-Kärber atau kaedah-kaedah grafik bergantung kepada kesesuaian data tersebut. Keputusan LC50 dan 95% selang keyakinan untuk kajian ketoksikan aliran berterusan bagi 48 jam, 96 jam, 366 jam, dan 504 jam adalah masing-masing 0.057 (0.04 - 0.08), 0.043 (0.03 - 0.06), 0.033 (0.02 - 0.06) dan 0.033 (0.02 - 0.06). Manakala untuk kajian ketoksikan statik akut, keputusan LC50 dan 95% selang keyakinan untuk 48 jam, 96 jam dan 366 jam adalah 0.08 (0.07 - 0.10), 0.07 (0.06 - 0.08), dan 0.05 (0.04 - 0.06). Tiada kematian ditunjukkan dalam tangki kawalan dan dalam tangki ujian 0.018 ppm kuprum selepas pendedahan selama 22 hari. Ini menunjukkan kepekatan ambang kuprum untuk lampam jawa dianggarkan lebih kurang 0.018 ppm. Daripada hasil kajian pengumpulan kuprum dalam badan ikan, didapati ikan yang terdedah kepada 0.018 ppm kuprum, mengumpulkan 5 kali lebih banyak kuprum berbanding ikan di dalam tangki kawalan. Ini menunjukkan kepekatan ambang kuprum yang dicadangkan melalui kajian ini tidak boleh digunakan terus dalam pembentukan kriteria kualiti air. Kajian lanjut harus dijalankan dengan masa ujian yang lebih lama untuk mengetahui kesan jangka panjang kuprum terhadap organisma. Tambahan lagi, kepekatan kuprum di dalam air semulajadi adalah berubah-ubah dan bukan secara konstant seperti mana yang telah dijalankan di dalam makmal.