Effects of ammonia toxicity on stream biota in north Queensland

Thesis submitted by

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Lethal and sublethal effects of ammonia toxicity to two north Australian fish species and one invertebrate species were investigated under laboratory conditions following the OECD guidelines for testing of chemicals. Acute toxicity was tested in a static non-renewal system at pH 9.0 and temperature around 29 °C. 96-hour LC₅₀ values for the two fish species were 1.31 mg NH₃ – N L⁻¹ for barramundi (Lates calcarifer) and 1.99 mg NH₃ – N L⁻¹ for the eastern rainbowfish (Melanotaenia splendida splendida). The 96-hour LC₅₀ value for freshwater shrimp (Caridina nilotica) was 1.53 mg NH₃ – N L⁻¹. The acute values indicate that barramundi, in particular, is sensitive to ammonia toxicity, comparable to salmonid species. Acute values for the freshwater shrimp suggest moderate sensitivity, given that invertebrates in general are more resistant to ammonia toxicity; the lethal values obtained were comparable to values reported for sensitive invertebrates. The acute values for rainbowfish indicated medium sensitivity, comparable to published values for a range of non-salmonids. There was no unequivocal evidence for gill damage resulting from acute ammonia exposure in the two fish species studied. Changes in gill structure in these fish are therefore not a strong indicator of exposure to short-term ammonia toxicity. A three-week post-exposure experiment on surviving individuals from the acute toxicity test, in uncontaminated water, indicated that exposure to acute concentrations up to 1.5 mg NH₃ – N L⁻¹ did not have any significant effects on growth in either barramundi or rainbowfish. It was possible that this was a result of compensatory growth in higher concentrations.
ETHICS APPROVAL

This project was undertaken in compliance with James Cook University Ethics Approval number A796_02.
# TABLE OF CONTENTS

List of tables ........................................................................................................................................... viii

List of figures ............................................................................................................................................. ix

Chapter 1. Introduction ................................................................................................................................. 1

Chapter 2. Literature review .......................................................................................................................... 5
  2.1 Nutrient contamination in rivers of north Queensland .............................................................. 5
    2.1.1 Introduction .......................................................................................................................... 5
    2.1.2 Seasonality of nutrient loading ........................................................................................... 7
    2.1.3 Effects of land use ................................................................................................................. 8
    2.1.4 Effects on stream biota .......................................................................................................... 11
    2.1.5 Water quality management ................................................................................................. 13
  2.2 Ecotoxicology with special reference to the toxicity of ammonia .............................................. 14
    2.2.1 Introduction ........................................................................................................................ 14
    2.2.2 Sources of ammonia .......................................................................................................... 15
    2.2.3 Local sources of ammonia ................................................................................................. 18
    2.2.4 Speciation and toxicity of ammonia .................................................................................. 20
    2.2.5 Acute effects of ammonia toxicity ...................................................................................... 26
    2.2.6 Sublethal effects of ammonia toxicity ............................................................................... 28

Chapter 3. General methods ......................................................................................................................... 33
  3.1 Test animals ....................................................................................................................................... 33
  3.2 Physico-chemistry of test water ....................................................................................................... 35
  3.3 Preservation and histology .............................................................................................................. 36
  3.4 Pilot study .......................................................................................................................................... 36

Chapter 4. Acute toxicity of ammonia ....................................................................................................... 38
  4.1 Introduction ....................................................................................................................................... 38
  4.2 Materials and methods ..................................................................................................................... 38
    4.2.1 Oxygen, pH, temperature and salinity .............................................................................. 39
    4.2.2 Ammonia test solutions ...................................................................................................... 40
    4.2.3 Statistical analysis .............................................................................................................. 41
    4.2.4 Observations of test animals – sublethal effects ................................................................. 41
    4.2.5 Histopathology of gills ....................................................................................................... 41
  4.3 Results – acute toxicity ..................................................................................................................... 42
    4.3.1 Physico-chemical variables ................................................................................................. 42
    4.3.2 Acute toxicity – shrimp ..................................................................................................... 44
    4.3.3 Acute toxicity – barramundi .............................................................................................. 46
    4.3.4 Acute toxicity – rainbow fish ............................................................................................. 48
    4.3.5 Summary from acute toxicity tests ..................................................................................... 50
    4.3.6 Histopathology of gills ....................................................................................................... 51
4.4 Discussion of acute toxicity results ........................................ 53
  4.4.1 Overview ........................................................................ 53
  4.4.2 Test conditions ................................................................. 53
    4.4.2.1 Test concentrations ...................................................... 53
    4.4.2.2 pH ........................................................................ 53
    4.4.2.3 Temperature ............................................................... 54
    4.4.2.4 Dissolved oxygen ....................................................... 54
    4.4.2.5 Salinity ................................................................ 55
  4.4.3 Test animals .................................................................... 55
    4.4.3.1 Freshwater shrimp ..................................................... 56
    4.4.3.2 Barramundi ............................................................... 57
    4.4.3.3 Rainbowfish ............................................................. 57
  4.4.4 Histopathology of gills ..................................................... 58

Chapter 5. Post-exposure effects .................................................. 60
  5.1 Introduction ......................................................................... 60
  5.2 Materials and methods ........................................................ 60
    5.2.1 Experimental set up ....................................................... 60
    5.2.2 Growth analyses .......................................................... 61
    5.2.3 Statistical analysis of growth results ............................... 62
    5.2.4 Histopathology of gills ............................................... 62
  5.3 Results - post exposure effects ............................................ 63
    5.3.1 Water quality .............................................................. 63
    5.3.2 Feeding behaviour ....................................................... 63
    5.3.3 Changes in growth ...................................................... 63
      5.3.3.1 Barramundi ........................................................... 64
      5.3.3.2 Rainbowfish ......................................................... 67
    5.3.4 Recovery of from gill damage ......................................... 70
  5.4 Discussion of post exposure results ...................................... 70
    5.4.1 Overview ..................................................................... 70
    5.4.2 Barramundi ................................................................. 71
    5.4.3 Rainbowfish ............................................................... 73
    5.4.4 Histopathology of gills ................................................. 74

Chapter 6. General discussion .................................................... 75
  6.1 Overview ........................................................................... 75
  6.2 Applicability of results ....................................................... 75
  6.3 Combined effects of ammonia and other stressors .................. 78

Chapter 7. Conclusions and future research needs ....................... 82

References ............................................................................... 84

Appendices .............................................................................. 94
# LIST OF TABLES

Table 1. Nutrient data from a study by Bramley and Roth (2002) ........................................ 8
Table 2. Method for scoring degree of epithelial lifting of secondary lamellae .... 42
Table 3. Water quality in the acute toxicity experiment on freshwater shrimp .... 43
Table 4. Water quality in the acute toxicity experiment on barramundi .......... 43
Table 5. Water quality in the acute toxicity experiment on rainbow fish .......... 44
Table 6. Summary of results from acute toxicity tests .................................................. 50
Table 7. Growth data for barramundi ............................................................................. 64
Table 8. Growth data for rainbow fish ........................................................................... 67
LIST OF FIGURES

Figure 1. Nitrate and particulate nitrogen concentrations with concurrent discharge in the Tully River 1987-2000 .......................................................... 9
Figure 2. The nitrogen cycle ................................................................. 16
Figure 3. The relationship between pH and toxicity of ammonia .................. 21
Figure 4. Percentage mortality of shrimp after 24-hour exposure .................. 45
Figure 5. Percentage mortality of shrimp after 96-hour exposure ................. 45
Figure 6. Percentage mortality of barramundi after 24-hour exposure .......... 47
Figure 7. Percentage mortality of barramundi after 96-hour exposure .......... 47
Figure 8. Percentage mortality of rainbowfish after 48-hour exposure ........ 49
Figure 9. Percentage mortality of rainbowfish after 96-hour exposure ........ 49
Figure 10. Sections of secondary lamellae from barramundi and rainbow fish that died in the acute toxicity tests ................................................. 52
Figure 11. Sections of secondary lamellae from barramundi and rainbow fish that survived the acute toxicity tests ............................................. 52
Figure 12. Sections of secondary lamellae from barramundi and rainbow fish from the control treatments of the acute toxicity tests ....................... 52
Figure 13. Increase in wet weight gain for juvenile barramundi three weeks after 96 hours’ exposure to increasing concentrations of ammonia .......... 65
Figure 14. Specific growth rate for juvenile barramundi during the three-week post exposure experiment ......................................................... 65
Figure 15. Food conversion rates (FCR) for juvenile barramundi three weeks after exposure to increasing concentrations of ammonia ............ 66
Figure 16. Total food consumption for juvenile barramundi during the three-week post-exposure experiment ............................................................. 66

Figure 17. Increase in wet weight gain for juvenile rainbow fish three weeks after the 96 hours exposure to increasing concentrations of ammonia .................. 68

Figure 18. Specific growth rate for juvenile rainbow fish during the three-week post-exposure experiment ............................................................. 68

Figure 19. Food conversion rates (FCR) for juvenile rainbow fish three weeks after exposure to increasing concentrations of ammonia .................. 69

Figure 20. Total food consumption for juvenile rainbow fish during the three-week post-exposure experiment ........................................................................ 69

Figure 21. Acute toxicity values for tested species in relation to upper protection guideline values from the USEPA (1998) and ANZECC/ARMCANZ (2000) ........................................................................ 77