Effects of ammonia toxicity on stream biota in north Queensland

Thesis submitted by

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ABSTRACT

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 LC_{50} values for the two fish species were 1.31 mg NH_3 – N L^{-1} for barramundi (*Lates calcarifer*) and 1.99 mg NH_3 – N L^{-1} for the eastern rainbowfish (*Melanotaenia splendida splendida*). The 96-hour LC_{50} value for freshwater shrimp (*Caridina nilotica*) was 1.53 mg NH_3 – 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 NH_3 – 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.

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