Scheller 1997

VT ETD COLLECTION

Title page for ETD etd-52297-202145

Type of Document	Master's Thesis
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URN	etd-52297-202145
Title	The Effect of Dieoffs of Asian Clams (Corbicula fluminea) on Native Freshwater Mussels (Unionidae)
Degree	Master of Science
Department	Biology
Advisory Committee	• Dr. Don Cherry, Committee Chair • Arthur L. Buikema, none • Mary M. Yeager, none • Richard J. Neves, none
Keywords	• Asian Clam • Freshwater Mussels • Unionidae • Ammonia Toxicity
Date of Defense	1997-06-06

Availability	unrestricted

Abstract

There is a great deal of concern about the declining freshwater mussel fauna of North America. Although deteriorating water quality and habitat degradation may account for much of the decline, it has been suggested that the exotic Asian clam, Corbicula fluminea, may be having an effect on native unionids. Negative impacts may result directly from competition or indirectly, because of Corbicula population crashes that release ammonia and reduce dissolved oxygen in the sediment.

Laboratory tests were conducted to determine the relative sensitivity of native mussel and Asian clam life stages to unionized ammonia, and mussel glochidia were the most sensitive (24-hr LC50 of 0.11 mg/L NH3-N). Juvenile and adult mussels were similarly sensitivity, with average 96-hr LC50's of 0.49 and 0.52 mg/L NH3-N, respectively. Adult C. fluminea were the least sensitive, having an average LC50 of 0.80 mg/L NH3-N. The EPA standard test organism, Ceriodaphnia dubia, had one of the lowest LC50's (0.07 mg/L NH3-N) of the five species, and the fathead minnow, Pimephales promelas, had the highest (1.18 mg/L). The differing sensitivities of the various life stages are important when trying to determine the impact of an Asian clam dieoff. If a dieoff occurs at a time of year when the more sensitive life stages, such as glochidia are present, then the impact on mussel recruitment may be greater.

Two miniature artificial stream tests were used to determine the effect of clam density on dieoff rate, ammonia production and dissolved oxygen levels. Only clams at the highest density of 10,000/m2 experienced 100% mortality. Unionized ammonia levels exceeded 4. mg/L, and dissolved oxygen levels dropped below 1.0 mg/L during the dieoff. The amount of unionized ammonia produced was twofold greater than the concentration that produced an LC50 in adult C. fluminea and ~40 times greater than the LC50 for V. iris glochidia. Factors thought to have contributed to the C. fluminea dieoff were flow rate, low dissolve oxygen levels, temperature and perhaps ammonia. A complete dieoff did not occur until flow was stopped and dissolved oxygen concentrations began to drop. One-hundred percent mortality occurred in 38 days for the first test, and 21 days in the second test. Higher water temperatures in the first test (26±oC) compared to the second test (average 21.7oC) are thought to have resulted in the faster dieoff.

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