

**The Toxicity of Ammonia to Atlantic Silverside (*Menidia menidia*) and
Ghost Shrimp (*Palaemonetes pugio*)**

by

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Abstract

Ammonia is known to be toxic to aquatic organisms. The national water quality criteria for ammonia in the marine environment have been established to protect aquatic organisms from the toxicity of ammonia. Discharge into Chesapeake Bay has not yet been regulated under this criteria. Ammonia limits of 1-2 mg/L total ammonia have been proposed for the marine waters in Virginia based on the national criteria of 0.035 mg/L of un-ionized ammonia. The limits have been questioned because the criteria were calculated using toxicity data from both freshwater and saltwater species, rather than solely from saltwater species. More ammonia toxicity tests need to be conducted to expand the database with saltwater species in order to develop a reliable and appropriate limits for ammonia discharge.

Two saltwater species, one marine fish, Atlantic silverside (*Menidia menidia*), and one marine invertebrate, ghost shrimp (*Palaemonetes pugio*), were tested in acute and 7-day chronic tests. The acute tests for the Atlantic silverside were performed at three levels of salinity in order to develop a better understanding of the relationship between ammonia toxicity and salinity levels.

The acute LC₅₀ values for both species were determined and compared to values in the literature. The 48-hour LC₅₀ values for the Atlantic silverside were 1.50, 1.17, and 1.08 NH₃ mg/L at salinities of 14, 22, and 30 ppt, respectively. The 96-hour LC₅₀ for the ghost shrimp was 1.66 NH₃ mg/L. The species mean acute values (SMAVs) for the Atlantic silverside (2% difference) and the ghost shrimp (31% difference) were compared to previous test results.

The no-observed-effect-concentration (NOEC) was 0.48 NH₃ mg/L for the Atlantic silverside based on growth, and 0.33 NH₃ mg/L for the ghost shrimp based upon growth. The acute-chronic ratio for the ghost shrimp was 7.56. The refined national chronic criterion of un-ionized ammonia was 0.056 mg/L according to the test data from this research.

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