



The chronic toxicity of emamectin benzoate to three marine benthic species using microcosms

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Abstract

The commercial farming of Atlantic salmon, *Salmo salar*, may require the periodic application of emamectin benzoate (EB) treatments to reduce the effects of biological pests, such as sea lice. As a result, EB is detected in sediments beneath these fish farms at considerable levels. Literature sediment toxicity data for EB for marine benthic species is only available for 10-day sediment toxicity tests, which might be too short to assess field effects. Here, we present a whole sediment toxicity test to determine 28-day mortality and growth effect concentrations for the non-target polychaete worm *Arenicola marina*, the crustacean *Corophium volutator* and the clam *Cerastoderma edule* using a marine microcosm setup.



Results indicate that no concentration-dependent increase of mortality and growth rate was apparent to *A. marina* and *C. edule*. But for *C. volutator*, a concentration-dependent increase in mortality was observed, resulting in a calculated 28-d LC50 of 316 $\mu\text{g}/\text{kg}$ dry sediment (95% confidence interval: 267 – 373 $\mu\text{g}/\text{kg}$ dry sediment). There were significant effects on *C. volutator* growth rate at concentrations of 100 $\mu\text{g}/\text{kg}$ dry sediment and above (NOEC = 30 $\mu\text{g}/\text{kg}$ dry sediment). These observations show that *C. volutator* is more sensitive to EB than *A. marina*, which differs from results reported in previous studies. Comparison to the most sensitive NOEC (30 $\mu\text{g}/\text{kg}$ dry sediment) found for *C. volutator* (organisms of 8 – 11 mm length), shows that the Environmental Quality Standard, derived by the Scottish Environment Protection Agency in 2017 which based on freshwater species data (NOEC = 1.175 $\mu\text{g}/\text{kg}$ dry sediment), are relatively strict and is sufficiently protective for the marine species tested in this paper.

Key words: Sediment bioassay, Emamectin benzoate, Benthic invertebrates, *Arenicola marina*, *Corophium volutator*, *Cerastoderma edule*, Marine environment



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