

EXECUTIVE SUMMARY

Under the DAMOS Program, the tiered approach to monitoring dredged material at open water disposal sites in New England includes bioaccumulation analyses, which are performed with relatively large infaunal polychaetes, crustaceans, and bivalves (Germano et al. 1994). While this approach provides important information about availability of contaminants for uptake by long-lived species, it is not useful for evaluation of the early environmental effects of disposal. Organisms used for standard bioaccumulation analyses are typically encountered during the final phase of recolonization (Stage III; Rhoads and Germano 1982). The initial colonizers of dredged material mounds are small polychaetes (Stage I). These small worms (< 0.5 mg) are of first-order importance as food for larger predators. They are the ideal "early warning" indicators for disposal site bioaccumulation monitoring; however, collecting sufficient Stage I taxa tissue for extensive chemical analysis is a formidable task and has not been accomplished to date.

In a Phase I feasibility study, a worm "isolator" was designed, and found to be effective at driving worms out of the sediment (Williams and Rhoads 1994). This study was the first attempt to remove large quantities of small worms from their tubes and surrounding sediment. The goals of the present Phase II bioaccumulation study were to evaluate the extraction efficiency of the worm isolators developed in the Phase I laboratory study, and to determine the yield (wet weight biomass) of worm tissue per unit sampling effort. In addition, bioaccumulation in these worms was evaluated by (1) analyzing the contaminant concentrations in an associated surface sediment sample and (2) analyzing worm tissue samples for those contaminants that were elevated in the ambient sediment.

The results of the second phase of the bioaccumulation study indicated that Stage I organisms can be collected in sufficient quantity for chemical analysis. Three g (wet weight) of worm tissue were collected in 10 hours of sampling using the worm isolator at an estimated ambient density of approximately 600 worms/m². Extrapolating to a peak density of 200,000/m², approximately 200 g wet weight of tissue potentially could be obtained in the same time, more than enough for precise chemical analyses. As a result of the field studies, a new worm isolator was designed which would expedite the process of collecting the worms from the isolator.

Chemical results from the sediment sample were used in the Theoretical Bioaccumulation Potential (TBP) equation (EPA/ACE 1991) to predict bioaccumulation in the collected worm tissue. Tissue contaminant concentrations were much lower than predicted using the TBP; it was apparent that the current TBP model may not accurately predict bioaccumulation in Stage I organisms. Although the TBP calculation is a useful concept for extrapolating bioaccumulation potential of sediment-dwelling organisms, further empirical data need to be collected to calculate an appropriate contaminant accumulation factor for Stage I organisms.