

## **Assessment of Dredging-Induced Sedimentation Effects on Winter Flounder (*Pseudopleuronectes americanus*) Hatching Success: Results of Laboratory Investigations**

Walter J. Berry<sup>1</sup>, Norman I. Rubinstein<sup>1</sup>, Elizabeth K. Hinchey<sup>2</sup>, Grace Klein-MacPhee<sup>3</sup>, and Douglas G. Clarke<sup>4</sup>

Historically of significant commercial and recreational value, winter flounder (*Pseudopleuronectes americanus*) stocks have declined steadily over the last 20 years and are currently at an all-time low. Although overfishing and climate change have been implicated, habitat alteration and dredging impacts have also been identified as potential threats because winter flounder eggs are demersal (bottom oriented) and adhesive. In response to a specific concern that winter flounder eggs might be susceptible to detrimental impacts when exposed to elevated sedimentation rates, seasonal constraints have been imposed on many dredging projects in northeastern estuaries. Such constraints can substantially increase the costs of dredging. Previous laboratory experiments have indicated that viable hatch of winter flounder eggs can be reduced when the eggs are buried by as little as one half of one egg diameter (~ 0.5 mm of sediment), but these experiments were not specifically designed to measure the effects of burial. In the present study three laboratory experiments were performed to determine the effects of sedimentation on hatching success. In each experiment recently spawned (3-5 days after fertilization) eggs were exposed to clean, fine-grained sediment at five or six treatment depths including a control (no sediment), dusting (< 0.5 mm), and treatments with depths up to 9.3 mm (>10 egg diameters) of sediment until hatch. Despite variability among experiments, a trend of decreased hatching success and increased time to hatch with increasing sediment depth relative to controls was observed. Percent total hatch of eggs exposed to  $\leq 1.0$  mm of sediment was not statistically different from that of the controls. Percent total hatch was highly variable in eggs buried in approximately 3 mm of sediment, whereas few eggs hatched successfully when buried in > 3mm of sediment. Delayed hatch (compared to controls) was observed in eggs buried in as little as 1 mm of sediment. Overall, these results confirm that winter flounder eggs are vulnerable to burial in sediments. Recent studies have shown that at least some winter flounder eggs are found in depositional areas in several estuaries. Potential interactions between elevated sedimentation rates caused by multiple sources (e.g., storm and wind-wave resuspension, ship traffic, and dredging operations) and spawning activity should be considered whenever dredging projects occur in proximity to winter flounder spawning habitat. Restrictions should then be based on probable exposures to increased sediment deposition as determined by predictive models and empirical data.

**Key words:** Winter Flounder; *Pseudopleuronectes americanus*; demersal eggs; dredged material disposal

Statement of purpose: The lack of information about the effects of sediment deposition on winter flounder eggs has led to the taking of a conservative approach to the protection of this species. The information coming from this study on the depth of deposition which impacts winter flounder eggs should help regulators make better-informed decisions about management practices applied to dredging operations in the vicinity of winter flounder habitat.

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<sup>1</sup>U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, 27 Tarzwell Drive, Narragansett, RI 02882, 401-782-3101 (phone), [berry.walter@epa.gov](mailto:berry.walter@epa.gov); [namron1@cox.net](mailto:namron1@cox.net)

<sup>2</sup>U.S. Environmental Protection Agency, Great Lakes National Program Office, Chicago, IL 60604, 312-886-3451 (phone), [Hinchey.Elizabeth@epamail.gov](mailto:Hinchey.Elizabeth@epamail.gov)

<sup>3</sup>Department of Environmental Mangement, Jamestown, RI 02835, 401-423-1945 (phone), [gracemac1@verizon.net](mailto:gracemac1@verizon.net)

<sup>4</sup>US Army Corps of Engineers, Engineer Research and Development Center, Vicksburg, MS 39180, 601-634-3770 (phone), [Douglas.G.Clarke@usace.army.mil](mailto:Douglas.G.Clarke@usace.army.mil)