

The Effects of Contaminants on Sperm Quality and Intersex Condition of Smallmouth Bass in the Potomac River

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Abstract: Intersex is a gonadal abnormality in which both testicular and ovarian tissues are present in an organism known to be gonochoristic. This condition has been observed in several locations, one of which is the Potomac River. There are several chemical contaminants with endocrine disrupting properties that have been suggested as possible contributors to intersex. The purpose of this study is to analyze what contaminants are present, and to determine if these have any effect on sperm quality or intersex severity in smallmouth bass (*Micropterus dolomieu*) in the Potomac. Samples were collected by boat electrofishing in May 2006 from three sites in the South Branch of the Potomac River and one site in the Gauley River. The three South Branch sites are in areas with historically high intersex occurrence. The site on the Gauley serves as the control site. Gonads were collected from 38 male fish. Samples were split, sent to USGS Lafayette Science Center for testing of sperm quality parameters such as motility, viability, count and maturity, and maintained at USGS Leetown Science Center for histological analysis. Sperm morphology was analyzed and rank of severity of intersex was assigned for each sample. Data from a separate study involving passive samplers deployed by the USGS and West Virginia DEP provided contaminant information for our sampling sites. Kruskal-Wallis analysis indicates that there are significant differences among sites with regard to motility ($P = 0.011$), progressive motility ($P = 0.001$), viability ($P = 0.039$), and intersex ($P < 0.001$). The severity of intersex within the experimental sites follows the pattern of contamination, with Petersburg being highest, Springfield being lowest, and Moorefield intermediate. Regression analysis shows there are significant relationships between motility and intersex ($R^2 = 0.322$, $P < 0.001$), progressive motility and intersex ($R^2 = 0.117$, $P = 0.041$), and viability and intersex ($R^2 = 0.153$, $P = 0.015$). This indicates that contamination is contributing to intersex severity, and increasing intersex severity is contributing to a decline in sperm quality in the South Branch of the Potomac River.

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