Examining Ecological and Ecosystem Level Impacts of Aquatic Invasive Species in Lake Michigan Using An Ecosystem Productivity Model, LM-Eco

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Ecological and ecosystem-level impacts of aquatic invasive species in Lake Michigan were examined using the Lake Michigan Ecosystem Model (LM-Eco).  The LM-Eco model includes a detailed description of trophic levels and their interactions within the lower food web of Lake Michigan.  The LM-Eco modeling construct has been applied in two phases to investigate ecosystem-level responses and effects corresponding with aquatic invasive species.  The first phase includes examining the effect of the invasive species *Bythotrephes longimanus* on individual zooplankton species based upon extensive field data collected at multiple locations in Lake Michigan.  Field data collected at 15 sampling stations within Lake Michigan over a series of 8 sampling cruises throughout a 2 year period demonstrated that over 65% of zooplankton species exhibited a decline with the occurrence of *Bythotrephes* in the sample.  The LM-Eco model was successfully applied to simulate the trends of *Bythotrephes* and zooplankton abundance as observed in the collected field data.  A second phase of the LM-Eco modeling construct focuses on benthic organisms including the invasive dreissenid mussels, zebra mussel (*Dreissena polymorpha*) and quagga mussel (*Dreissena bugensis*), as well as the native amphipod *Diporeia*.  Application of the second phase of the model allows for investigation of trends for interaction between nutrients, dreissenids, *Diporeia*, zooplankton and phytoplankton dynamics.  Model simulations allowed for examination of interactions between the invasive and native species on a resolution of 5km by 5km locations throughout Lake Michigan.  Analysis was completed as a time series specific to individual field sampling locations within the lake, and also on a lake wide scale.