

# Integrated management of hydrilla with two biological control agents and a herbicide

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## ABSTRACT

When left unmanaged, the invasive aquatic weed hydrilla [*Hydrilla verticillata* (L. f.) Royle; Hydrocharitaceae] causes serious environmental and economic impacts by choking out native plants and impeding flood control, navigation, and recreation. In Florida, millions of dollars are spent annually to control infestations of hydrilla, primarily with herbicides. However, during the past 15 yr, some hydrilla populations developed resistance to two of the most used aquatic herbicides. Since 2010, we have been testing a novel integrated weed management (IWM) system for hydrilla control that integrates selective insect herbivory by the hydrilla tip miner *Cricotopus lebetis* Sublette (Diptera: Chironomidae) with a disease-causing fungal pathogen [*Mycocleptodiscus terrestris* (Gerd.) Ostaz.] (Mt), and the reduced-risk aquatic herbicide imazamox. Over a period of 2 yr, field testing of the two biological control agents and imazamox was performed in four limnocorrals (1 m diam. by 1 m depth) installed in man-made ponds naturally infested with hydrilla to determine the most effective combination for use in hydrilla management. Establishment of the biological control agents and hydrilla damage were measured by collecting apical meristem samples and harvesting the hydrilla to count turions and calculate biomass. *Cricotopus lebetis* and Mt together and the two biological control agents in combination with imazamox caused the most damage to hydrilla, both in terms of short-term damage to apical meristems and long-term damage through reduced turion production and biomass. Overall, these findings indicate that a combination of different biological and chemical tactics can be used for integrated management of hydrilla.

**Keywords:** Chironomidae, *Cricotopus lebetis*, fungal pathogen, hydrilla tip miner, *Hydrilla verticillata*, imazamox, *Mycocleptodiscus terrestris*.

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