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The effects of predation on biological control of Eurasian watermilfoil

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Eurasian watermilfoil (EWM), *Myriophyllum spicatum* L., is an invasive aquatic macrophyte in North America. The aquatic milfoil weevil, *Euhrychiopsis lecontei*, is a native herbivore on milfoils that has been used as a biological control agent for EWM. The objective of this study was to determine if predation by sunfishes (*Lepomis* spp.) can suppress milfoil weevil populations below the density necessary to control EWM. In Lake Joanis, Wisconsin, where supplemental milfoil weevil stocking had not led to an increase in weevil density, 944 L mesh exclusion cages stocked with milfoil weevils were used to manipulate densities of small bluegill (*Lepomis macrochirus*) to 0, 2, and 4 per cage. Results indicated an inverse relationship between bluegill and milfoil weevil densities. Mean densities of milfoil weevils and mean percent of EWM stems showing milfoil weevil damage were significantly different among treatments (ANOVA, $P = 0.005$, $P = 0.0004$). The average density of milfoil weevils in cages with no bluegill was 0.31 w s^{-1} (weevils per stem). Cages with two bluegill averaged 0.02 w s^{-1} . Cages with four bluegill averaged 0.01 w s^{-1} . Stem damage ranged from 60.4% in control cages to 13.3% in cages with four bluegill. These results indicate that sunfish, even at relatively low densities, substantially reduce milfoil weevil densities and their ability to damage EWM. Protecting stocked milfoil weevils in cages could allow them to establish higher densities where they can serve as a control for milfoil in some lakes. Variable success of milfoil weevils in controlling EWM in different lakes reported in the literature could be attributable to variable densities of sunfish populations.

Key words: biocontrol, *Euhrychiopsis lecontei*, *Lepomis macrochirus*, *Myriophyllum spicatum*.