

## Multitrophic Interactions in Biological Control: Evaluating Shifts in the Competitive Ability of *Lagarosiphon major* as Influenced by Herbivory and Parasitism

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### Abstract

*Lagarosiphon major* (Ridley) Moss (Hydrocharitaceae) is a submersed aquatic macrophyte, indigenous to South Africa, and poses a significant threat to water bodies in Europe, New Zealand and Australia. Dense infestations of *L. major* in invaded ranges readily out-compete indigenous submerged species, altering the ecology of freshwater systems. Laboratory studies have also shown *L. major* to be a superior competitor. A recently discovered ephydrid fly from South Africa, *Hydrellia lagarosiphon* (Diptera: Ephydridae), has been investigated as a potential control agent against *L. major*. Often, the subtle effects of herbivory have a significant impact on the competitive ability of invasive plants, therefore the impact of feeding by *H. lagarosiphon* on the competitive interactions between *L. major* and *Myriophyllum spicatum* L., a submerged aquatic plant native to Eurasia, was evaluated using an inverse linear model. The results showed that herbivory by *H. lagarosiphon* reduces the competitive ability of *L. major* in favour of *M. spicatum*, providing further support for *H. lagarosiphon* as an effective biological control agent. Parasitism of *Hydrellia* species by braconid parasitoids is well documented, and could be realized in the field should *H. lagarosiphon* be released. Therefore competitive interaction between the two plant species under the influence of *H. lagarosiphon* and a parasitoid wasp, *Chaenusa* Haliday sp. (Hymenoptera: Braconidae) was also examined. The addition of the parasitoid reduced the impact of herbivory by the fly on *L. major*, thereby shifting the competitive balance in favour of *M. spicatum*. This study highlights the need to evaluate multitrophic interactions in biological control programmes, particularly those where the agents are known to be susceptible to parasitism.