

## The effects of augmented water hyacinth weevil (*Neochetina eichhorniae*) populations on water hyacinth (*Eichhornia crassipes*) mat expansion rates

TED D. CENTER and GREG JUBINSKY

USDA-ARS Aquatic Plant Control, Research Center, Fort Lauderdale, Florida 33314, USA

The weevil *Neochetina eichhorniae* was introduced into the United States of America to control water hyacinth (*Eichhornia crassipes*). It has typically been evaluated based on reduction of water hyacinth biomass. Impacts on mat expansion rates have never been studied and augmentation of weevil populations has never been considered. We attempted to determine: (i) weevil effects on water hyacinth colony expansion rates; (ii) feasibility of manipulating weevil populations; (iii) densities of weevils needed; (iv) weevil effects on plant morphometry and nutrition; and (v) if induced stress can be assessed from contemporary levels of weevils on, or their damage to, existing plants. Expansion of water hyacinth colonies was influenced by weevil populations. Simulated incipient mats, initially 10 m<sup>2</sup> in size, were inoculated with none to 4000 weevils in 1000-weevil increments. Coverage in the uninoculated plot increased 5-fold to 50 m<sup>2</sup> after 157 days but decreased in the 3000-weevil plot from a high of 17 m<sup>2</sup>, attained after 84 days, to only 12 m<sup>2</sup>. All inoculation levels, even the lowest, effected reduced mat expansion. The greatest reduction was produced with 3000 weevils, but plants treated with 2000 weevils also fared poorly. Plants inoculated with 4000 weevils grew as well as those inoculated with 1000 weevils due to emigration. Leaf-length was not sensitive to herbivory, but lamina-area was. Counts of weevils or numbers of feeding scars were not good indices of herbivore pressure because effects persisted long after disparate weevil populations attained parity. We conclude that water hyacinth weevil populations could be manipulated to control incipient water hyacinth infestations if methods were available to attain large quantities or to attract large numbers of weevils to areas where control is needed.

## Mortality of *Eichhornia crassipes* (water hyacinth) in winter following summer stress by biological control agents

CARINA J. CILLIERS and MARTIN P. HILL

Agricultural Research Council, Plant Protection Research Institute, Private Bag X134, Pretoria 0001, South Africa

Water hyacinth (*Eichhornia crassipes*) is South Africa's most problematic aquatic weed. A biological control programme has been in operation against water hyacinth in South Africa for eight years with varying degrees of success. Previously, biological control programmes concentrated on water hyacinth infestations in tropical and sub-tropical areas worldwide and results indicated that effective biological control of water hyacinth requires at least 3-5 years. At the outset of the South African study it was assumed that infestations in temperate areas at high altitudes such as those on the Vaal River would not be brought under control for at least seven seasons. The rationale behind this assumption was that under these climatic conditions the insects and the water hyacinth remain dormant for approximately five months (May - September) of the year. However, after careful and detailed monitoring it would appear that the cold winters may, in fact, enhance the deleterious effects of the biocontrol agents on the plants. There seems to be a direct relationship between the stress inflicted on the plants by the biocontrol agents during summer and the ensuing mortality of the plants as a result of cold the following winter. These findings and the future of the water hyacinth control programme in South Africa were discussed.