Australian Government
Department of Agriculture and Water Resources

# Biological Control of Sagittaria

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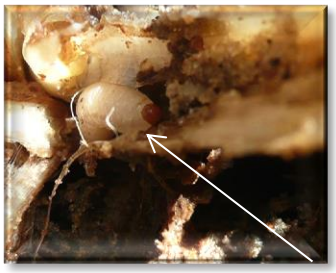
**The problem:** *Sagittaria platyphylla* (sagittaria, delta arrowhead), is a serious aquatic weed of irrigation channels, drains, creeks and wetlands. It forms dense and extensive thickets, which increase siltation and impede water flow. Despite intensive herbicide control programs, sagittaria continues to be an ongoing issue due to the ability of plants to regrow from tubers and submersed rosettes. Sagittaria produce copious amounts of seed which disperse downstream and can remain dormant in the mud for several years.

**Phase 1:** The Victorian Government initiated a biocontrol program against both *S. platyphylla* (sagittaria) and *S. calycina* (arrowhead) in 2009/10 to identify natural enemies from the weeds' native range in the southern USA.

Three weevil species show great promise due to their impact on seed and tuber viability and plant survival.



The larvae of the **crown-boring weevil**, *Listronotus sordidus,* feed within the root crowns causing plants to turn yellow, collapse and die within three weeks. It takes less than three larvae to destroy a plant. Females can lay over 100 eggs during the growing season. If released into Australia, the crown-boring weevil would increase plant mortality and reduce the density of sagittaria populations.

A crown-boring weevil grub feeding within a sagittaria plant.

Fruit-feeding weevils

The larvae of the **fruit-feeding weevil**, *Listronotus appendiculatus*, feed on developing fruiting heads. Weevils reach high densities causing significant losses in seed output and viability. If released into Australia, the fruit-feeding weevil would help reduce sagittaria and arrowhead spread and seedling recruitment.

Damaged fruit

The larvae of the **tuber-feeding weevil**, *Listronotus frontalis,* feed within the sagittaria tubers. Each larva can consume up to three tubers as it grows. If released into Australia, the tuber-feeding weevil would reduce tuber viability.

A tuber-feeding weevil larva (left) and a pupa, adult and damaged tuber (right).

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# Sagittaria Biocontrol Agent Risk Assessment

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**Phase 2:** Prior to release into Australia, the biocontrol agents must undergo stringent testing to ensure they do not attack native and or economically-important plant species. Referred to as **Host Specificity Testing**, this research provides critical information used by the Australian Government to assess the safety of proposed biological control agents.

The sagittaria fruit-feeding, crown-boring and tuber-feeding weevils have all now been imported from the USA into the insect quarantine facility at AgriBio, Centre for AgriBioscience in Bundoora, Melbourne. Host specificity testing has commenced on the fruit-feeding and crown-boring weevils, while the tuber-feeding weevil was imported only recently (December 2016).

Host specificity testing trials are conducted within the quarantine glasshouse at AgriBio.

The weevils will be exposed to a selection of Australian native and ornamental plant species closely-related to the two weedy sagittaria species. A range of tests will be conducted to see if the weevils can feed, lay eggs and develop from larval stages to adults on the test species.

**No-choice tests** involve caging weevils in containers (left) or potted plants (right) on each test species to assess weevil feeding, egg-laying (oviposition) or larval survival. This is the most stringent form of host specificity testing undertaken.

**Future Directions (2017 to 2020):**

- Complete host specificity testing of the three sagittaria agents in AgriBio's quarantine facility.
- Undertake genetic studies and bioclimatic modelling to determine the ecological host range of the crown-boring weevil.
- Pending approval for release by the Australian Government, undertake a mass rearing and release program.

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