



Department
for Environment
Food & Rural Affairs



Llywodraeth Cymru
Welsh Government



Progress with Weed Biocontrol Projects

CABI - UK

November 2018

Cover image: CABI and Yorkshire Water staff at the site where the mite *Aculus crassulae* was released for the control of *Crassula helmsii* in September 2018.

Introduction

Since April 2011, Defra in partnership with the Welsh Government and Natural England has been funding specialist scientists to investigate the scope for biological control of invasive, non-native aquatic and riverside weeds. Additional financial support for this research has been provided by the Environment Agency, two private water companies (South West Water and Yorkshire Water) and a number of Wildlife Trusts and Local Authorities (* see also footnote for additional funders). Biological control has the potential to play an important role in protecting aquatic and riparian habitats where chemical and mechanical control options are impractical or prove to be prohibitively expensive, and thus to help the UK to meet its commitment to the EU Water Framework Directive and towards other legislation and policies, both at a UK government level and within the Devolved Administrations (DA's). This control method is already providing sustained and highly successful management of the invasive exotic water fern *Azolla filiculoides* through *Stenopelmus rufinasus*, a weevil native to the Americas which was introduced into the UK together with the weed.

CABI is targeting **Australian swamp stonecrop** (*Crassula helmsii*), **Himalayan balsam** (*Impatiens glandulifera*) and **floating pennywort** (*Hydrocotyle ranunculoides*), and these projects complement our on-going work on the biocontrol of **Japanese knotweed** (*Fallopia japonica*). CABI is also mass-rearing and supplying the **water fern weevil** at cost, for early season inoculation of infestations of the weed, to ensure ongoing biological control. This is the tenth in a series of annual summary notes on progress made and covers the time frame to the end of November 2018.

Japanese knotweed (*Fallopia japonica*)



Mass releases of the psyllid *Aphalara itadori* (2010-2013) led to limited establishment at eight isolated sites. In 2014, a caged field trial confirmed the safety of the agent for native invertebrates. A new licence was thus issued permitting releases at riparian sites thought to offer better conditions for establishment. During 2015 and 2016 a release and monitoring programme was conducted in collaboration with Local Action Groups at 18 sites across England and Wales. Adults were found at all sites with lower abundance towards the end of the season and minimal overwintering survival. In autumn 2016, releases using winter morph adults and newer psyllid stock were carried out. Surveys undertaken in spring 2017 confirmed overwintering survival at sites across the UK. Psyllid cultures made up of newer psyllid stock and reared from outdoor overwintered adults were prioritised for release at 16 sites in England and Wales in 2017, however field establishment and overwintering success were low, with challenging environmental conditions. In conjunction with the EU RAPID LIFE programme, widespread releases have been made in England in 2018 using a combination of approaches. Establishment appears limited and further analysis of field data is currently underway. Winter morph psyllid releases have been made to encourage overwintering survival.

The leaf-spot fungus *Mycosphaerella polygoni-cuspidati* is currently under evaluation for use as a mycoherbicide after studies showed that the pathogen could cause restricted disease symptoms on a couple of non-target plant species under quarantine greenhouse conditions, thus not being suitable for classical biocontrol. Such potential mycoherbicide would be based on a single-mating type isolate to prevent the fungus from reproduction, persistence and spread in the field. To protect the idea, UK and International patent applications held in the name of the Secretary of State have been filed and published, and are under examination. "Proof of concept" research has continued under quarantine conditions, while feed-back on a Pest Risk Assessment (PRA) to extend this research to experimental field trials is awaited from the relevant UK authorities. Talks with private industry have commenced and it is hoped that ultimately a product can be developed to control Japanese knotweed which would be applied in much the same way as a herbicide.

Water fern (*Azolla filiculoides*)



Despite a harsh winter that knocked back persistent *Azolla* populations, reports of *Azolla* infestations were frequent from mid spring. The extent of *Azolla* infestation led to fairly high early demand for the *Azolla* biocontrol weevil, *Stenopelmus rufinasus*, which is mass reared at CABI. This small weevil feeds specifically on *Azolla* and in high densities can cause local eradication of the weed. The harsh winter conditions also affected weevil mass rearing, delaying early shipping, however, peak weevil production by mid-summer was achieved. As in 2017, reports were received this year of *Azolla* infestations being brought under effective control by naturalised populations of the weevil in regions that had recently received large weevil introductions by CABI, demonstrating the valuable underlying control exerted by this effective agent. By targeting *Azolla* outbreaks in a timely manner it is possible to limit the extent of infestations, bringing about economic savings, reducing leisure impacts and preserving the biodiversity of freshwater ecosystems. www.azollacontrol.com

Floating pennywort (*Hydrocotyle ranunculoides*)



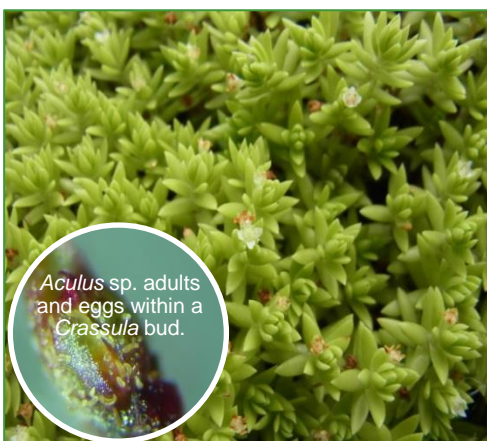
An intensive rearing effort over the summer allowed for a good number of the favoured *Lissonotus elongatus* weevils to be cultured. Consequently, the specificity testing has resumed apace, with almost all the 14 outstanding non-target plants having been tested and increased replication carried out on *Apium repens* to consolidate susceptibility data. The remaining few plants will be tested over the next month. Export from Paraguay, just 30km across the river from the field sites in Argentina, has finally been approved and a shipment will be hand-carried to the UK in early 2019. Further tests will be carried out on this weevil population to consolidate cold tolerance data and establishment potential, as well as confirming its specificity and impact are equivalent. Results will be used to update and strengthen the PRA. In addition, further studies are planned with the aim to establish the realised risk posed by the weevil to key non-target species in a more natural testing arena.

Himalayan balsam (*Impatiens glandulifera*)



In 2014 CABI completed the host-range testing of the Himalayan balsam rust *Puccinia komarovii* var. *glanduliferae* from India, on 75 plant species, which proved the rust is a true specialist on its host. A PRA which fully detailed the research conducted on the host range, life-cycle and ecology of the rust was approved by Defra and the European Commission's Standing Committee on Plant Health. Following their feedback Ministers approved the release of the rust in July 2014, and the rust was released at 3 sites. The releases have continued in subsequent years (25 in 2015, 10 in 2016, 22 in 2017 and 10 in 2018) in 15 counties across England and South Wales. The rust has now established at some release sites; successfully overwintering with the development of good levels of leaf infection during the following growing season and natural spread of more than 20 meters. The level of rust infection achieved in the field has improved significantly following a new release protocol and the matching of weed biotypes with rust isolates. Although these are early days, the results are encouraging. The spread and impact of the rust will be monitored over the next few years.

Australian swamp stonecrop (*Crassula helmsii*)



The mite, *Aculus crassulae* (Eriophyidae) has been under consideration as a biocontrol agent for the control of *Crassula helmsii* since 2012. A Pest Risk Analysis (PRA) detailing the research conducted to date on the mite was submitted to Defra in 2017 and in 2018 it was reviewed by several groups including by Natural England, the Scottish Government, an expert scientific panel and public consultation. Following this, it was granted ministerial approval and a licence to release the mite from quarantine conditions was issued. The mite has now been released at three initial sites in the UK, in Yorkshire, Devon and Kent and the overwintering of mites at these sites will be assessed in the spring. Supplementary releases of the mites at these sites and at additional sites with subsequent monitoring will occur in spring and summer 2019.

*Footnote: Prior to 2011, funding for this research has also been provided by the Scottish Government, predecessor bodies of the Welsh Government, Network Rail, Cornwall Council, the Regional Development Agency of South West England and British Waterways (now Canal & River Trust)

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