



Department
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Food & Rural Affairs



Llywodraeth Cymru
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Progress with Weed Biocontrol Projects

CABI - UK

November 2021

Cover image: *Lysathia* sp. beetles on *Myriophyllum aquaticum* in quarantine at CABI

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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 (biocontrol) of invasive, non-native aquatic and riverside weeds. Additional financial support for this research has been provided by the Environment Agency, the Canal & River Trust, private water companies, the MoD, and a number of Wildlife Trusts and Local Authorities (* see also footnote for additional funders). Biocontrol 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. This will help to meet statutory and policy commitments, both at a UK government level and within the Devolved Administrations (DAs). This control method is already providing sustained and highly successful management of the invasive exotic water fern *Azolla filiculoides* through *Stenopelmus rufinusus*, 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*), **floating pennywort** (*Hydrocotyle ranunculoides*) and **parrot's feather** (*Myriophyllum aquaticum*), 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**, for early season inoculation of infestations of the weed, to ensure ongoing biocontrol. The sale of any of these species in the UK is an offence due to their highly invasive nature. This is the 13th in a series of annual summary notes on progress made and covers the time frame from April 2021 to the end of November 2021. <http://www.invasive-species.org/united-kingdom/>

Japanese knotweed (*Fallopia japonica*)



Releases of the Kyushu line of the psyllid *Aphalara itadori* (from 2010 onwards) demonstrated safety, and reproduction was observed on *F. japonica* at several release sites, with some overwintering recorded; however, long-term establishment and persistent overwintering have proved elusive. To tackle these issues, better climatically-matched psyllid cultures, which were observed to cause extensive and severe leaf-curling damage in Japan, were collected from Murakami, further north in Japan. Host-specificity testing showed that the Murakami line is also a specialist on Japanese knotweeds. After Defra approval for release was obtained in 2021, the line was released at one *F. japonica* and *F. x bohemica* site, respectively, during the summer. Field monitoring showed curling damage on plants at both of these sites, being particularly heavy at the *F. x bohemica* site. Monitoring is currently underway. Initial studies of this leaf-curling on *F. x bohemica* suggests that adults are a key stage in the process. The Murakami psyllid was also released in the Netherlands in late 2020 and in Canada in 2021, and field results are now being shared between all countries. The Kyushu psyllid line was also released at *F. japonica* sites in north-east England for the Tees River Trust and monitoring is currently ongoing.

The leaf-spot fungus *Mycosphaerella polygoni-cuspidati* is under evaluation for use as a mycoherbicide as studies showed that the pathogen can cause restricted disease symptoms on selected non-target plant species under quarantine conditions and is thus not suitable for classical biocontrol. Basing a potential mycoherbicide on a single-mating type isolate would prevent reproduction, persistence and spread of the fungus in the field and allow for targeted applications. A European patent held in the name of the Secretary of State protects the idea with registration in twelve individual countries; further international patent applications are pending. Following Defra approval for release from quarantine, experimental field trials, licensed by the Chemical Regulations Division, have been conducted with the agent at CABI, Egham from 2019 to 2021. Collated trial data are currently being analysed and the results will allow an assessment of the pathogen's performance under more natural conditions and inform further research. Experimental work has also been undertaken to establish how best to retain agent virulence as well as ensure good shelf life and effective delivery in the field. Collaboration with private industry is ongoing 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 but without side effects.

Floating pennywort (*Hydrocotyle ranunculoides*)



A positive Pest Risk Assessment (PRA) peer review and consultation process has culminated in Ministerial approval to release the weevil *Listronotus elongatus* into the wild in England. A shipment of weevils was received from Argentina and upscaling of the culture through a generation has begun in anticipation of release from quarantine. Molecular characterisation of pennywort populations from 26 representative regions across the country (as well as samples from the native range) is ongoing. National and international stakeholder engagement and communications have been maintained to promote and support the project, raising funds and helping to identify strategic and suitable release sites for the spring/ summer of 2022. Work to develop an Open Data Kit (ODK) application is underway, which will ensure monitoring data is efficiently and consistently captured going forward. In order to better understand the weevil's overwintering behaviour and capabilities, small scale experimental studies will be undertaken both in

the field and on site at CABI. Successful weevil and plant stock maintenance across facilities this winter, together with further imports from Argentina, should facilitate early season rearing efforts and, in turn, allow for timely field releases of weevils in numbers in 2022. This will maximise the weevil's chances of establishment, impact and spread and will contribute to the long-term control of pennywort populations in England.

Himalayan balsam (*Impatiens glandulifera*)



A strain of the Himalayan balsam rust fungus *Puccinia komarovii* var. *glanduliferae* from India, was approved for release into the wild in the UK in July 2014. However, due to the presence of some rust-resistant populations, an additional rust strain from Pakistan, which was found to infect a different subset of Himalayan balsam populations, was approved for release in 2017. To date, the rust has been released at more than 50 sites in England and Wales and in 2020, it was released into Scotland for the first time. Pre-release susceptibility testing, to ensure the most virulent and pathogenic strain is released at each site, and an updated release strategy involving working with Local Action Groups across the country, has significantly increased infection levels in the field. Although early days, the results are encouraging; the rust has established at numerous sites, successfully overwintered with the development of good levels of leaf infection during the following growing season and spread naturally more than 100 metres. The rust continues to be released at compatible sites, however, in order to counter the presence of resistant populations and achieve full control, additional rust strains are required. Key regions in the native range harbouring strains more likely to be fully compatible with UK populations were identified through molecular analysis. Collaborators in Pakistan surveyed these key areas for new rust strains in 2021 and exported rust-infected plant material to CABI in the autumn. Unsusceptible Himalayan balsam populations will now be tested against the new rust strain in CABI's quarantine laboratories.

Water fern (*Azolla filiculoides*)



Azolla survived the winter relatively well into 2021 and demand for the Azolla weevil, *Stenopelmus rufinasus*, which is mass reared at CABI was high all season with shipments continuous over the summer. This small weevil feeds specifically on Azolla and in high densities can cause local eradication of the weed. As in recent seasons, several Azolla infestations were brought under effective control by naturalised populations of the weevil in regions that had recently received significant weevil introductions without further releases, demonstrating the valuable underlying control exerted by this effective agent. By targeting Azolla outbreaks in a timely manner, it is possible to limit impacts and preserve the biodiversity of freshwater ecosystems. www.azollacontrol.com

Australian swamp stonecrop (*Crassula helmsii*)



The gall-forming mite, *Aculus crassulae* (Eriophyidae) was approved as a biocontrol agent against *Crassula helmsii* in August 2018 following the acceptance of the PRA detailing the research conducted to date on the mite. Field trials with the mite were initiated in September 2018 with the inclusion of additional sponsors from the water industry. Mites were released at two new sites in 2021 bringing the total number of release sites across England and Wales to 12. At the release sites, mites have been observed infesting plants within and close to release plots, and the number of mite-infested plants has generally increased over the course of the summer. Overwintering studies at CABI have also provided evidence that *A. crassulae* can survive and develop sustainable populations under UK environmental conditions. Efforts are now needed to increase the population density of mites at release sites to enable establishment and subsequently, impact. During winter 2021/22, additional sites will be assessed for their suitability as potential release sites in England and Wales.

Aculus sp. adults and eggs within a *Crassula* bud.

Parrot's feather (*Myriophyllum aquaticum*)



Following an initial feasibility study to assess its potential for biocontrol earlier in 2021, parrot's feather has now been included as a new target for biocontrol in the UK. A leaf-feeding beetle, *Lysathia* sp., which has previously been released in South Africa and provides good control of parrot's feather there, was imported from South Africa in September 2021. Safety testing and life-cycle studies with this beetle are currently underway in CABI's quarantine laboratories. Molecular studies are also taking place to understand the genetic diversity of parrot's feather in the UK. Collaboration has been established with the Fundación para el Estudio de Especies Invasivas (FuEDEI) in Argentina, where parrot's feather originates.

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*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