



Department
for Environment
Food & Rural Affairs



Llywodraeth Cymru
Welsh Government



Progress with Weed Biocontrol Projects

CABI - UK

December 2024

Cover image: Gavin Measures, Natural England, surveying for rust-infected Himalayan balsam seedlings at release site Harmondsworth Moor

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 Ministry of Defence, and a number of Wildlife Trusts, Local Authorities and independent charities (* 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 non-native 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*), **floating pennywort** (*Hydrocotyle ranunculoides*) and **parrot's feather** (*Myriophyllum aquaticum*), and these projects complement our on-going work on the biocontrol of **Japanese knotweed** (*Reynoutria (Fallopia) japonica*). Following a Natural England-funded stakeholder workshop to prioritise new species for biocontrol research, jointly led with CABI in 2022, very early-stage research into possible biocontrol approaches for **Tree of Heaven** (*Ailanthus altissima*), **buddleja** (*Buddleja davidii*) and **rhododendron** (*Rhododendron ponticum*) has begun. Natural England is also funding CABI to undertake assessments of natural enemies associated with **Canadian and Nuttall's waterweeds** (*Elodea canadensis*, *E. nuttallii*) and **ice plant** (*Carpobrotus edulis*) regarding their potential as biological control agents. 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 release and planting out in the wild of any of these species in the UK is an offence due to their highly invasive nature. This is the 19th in a series of annual summary notes on progress made and covers the time frame from April to the end of November 2024.

Website: <http://www.invasive-species.org/united-kingdom/>

Japanese knotweed (*Reynoutria japonica*)



Whilst the original Kyushu line of the psyllid *Aphalara itadori* showed promise, attempts to achieve long-term establishment and persistent overwintering since 2010 have proved unsuccessful. To address this, better climatically-matched psyllid cultures were established from further north in Japan (Murakami line). These had been observed to cause extensive and severe leaf-curling damage on their knotweed host plants in the native range. Host-specificity testing confirmed that the Murakami line is also a specialist on knotweed species.

Defra approved the release of the Murakami psyllid line in 2021. Results of lab and 2021-2022 field studies showed the Murakami line preferred the hybrid Bohemian knotweed (*Reynoutria x bohemica*) over Japanese knotweed. Following releases in April 2023, overwintering-morphs of the psyllid were found on Bohemian knotweed showing successful overwintering. In May and September 2024, the Murakami line was again released at two Bohemian knotweed sites and has been monitored closely. Field monitoring showed multiple psyllid generations and characteristic curling damage on plants at one of the Bohemian knotweed sites during the season. The overwintering-morph of the adults were recorded in November at another Bohemian knotweed site where the psyllids were released in September, therefore there is a potential that it would survive another winter.

Floating pennywort (*Hydrocotyle ranunculoides*)



The South American weevil *Listronotus elongatus* was the 4th exotic biocontrol agent to be approved for release in England. Field trials began in late 2021 and continued in subsequent years, across a range of habitats including drainage ditches, rivers, canals and ponds, from Sussex to Yorkshire. Successful weevil overwintering was observed at 3 sites in 2023, located in the south of the country and up to the Midlands.

In 2024, weevils have been found persisting on floating pennywort populations at 12 sites, including 2 sites in the north of England in Lancashire and Yorkshire. Where weevils have overwintered for several years and multiple generations have been supported, impact and spread on the target plant has been notable. Floating pennywort biomass appears reduced across a number of sites and the plants have a less dominant, stunted growth. High weevil densities at these successful sites are also thought to have promoted their wider dispersal to new waterbodies beyond the original release areas.

The biocontrol project continues to form an important part of the national management strategy, aimed at coordinating approaches to tackle floating pennywort more effectively across catchments. Weevil establishment is the long-term goal and the field data collected annually, at different latitudes and in varied habitats, helps inform and optimise the national release strategy.

Himalayan balsam (*Impatiens glandulifera*)



P. komarovii var.
glanduliferae

The Himalayan balsam rust fungus *Puccinia komarovii* var. *glanduliferae* was approved for release into the wild in the UK in July 2014 and to date, two strains, one from India and one from Pakistan, have been released. These strains were found to infect different subsets of Himalayan balsam populations and thus, plants from potential field sites undergo pre-release susceptibility testing, to ensure the most virulent and pathogenic strain is released at each site.

Using an improved release strategy collaborating with Local Action Groups, the rust has been released widely across England and Wales and, since 2020, in Scotland. The results of the field releases are encouraging; the rust has established at sites with fully susceptible plant populations and overwinters successfully with good levels of leaf infection observed during the following growing season. Rust releases continue at compatible sites.

In order to counter the presence of resistant populations, additional rust strains are required. Key regions in the native range harbouring strains more likely to be fully compatible with those resistant UK populations were identified through a molecular analysis. Collaborators in Pakistan surveyed these areas from 2021-2023 and exported material from four sites to CABI. Assessment of the strain ex Das Khurram, concluded that the pathogenicity and virulence was similar to that of the two strains already released; consequentially evaluation of this strain was put on hiatus. Two additional strains have successfully been retrieved from storage in liquid nitrogen and are under evaluation. Approval for the release of an additional rust strain from quarantine will only be sought following limited host-range testing and, if a sufficient number of rust resistant Himalayan balsam populations are infected.

Water fern (*Azolla filiculoides*)



Stenopelmus
rufinusus

A relatively mild winter resulted in an extensive pre-order list for weevils in early 2024, as new or persistent *Azolla* infestations were observed. *Azolla* can be significantly knocked back by prolonged sub-zero conditions but seems to have survived the winter at numerous sites. *Stenopelmus rufinusus* feeds specifically on *Azolla* and in high densities can cause local eradication of the weed. In addition, *Azolla* infestations are frequently brought under effective control by naturalised populations of the weevil, particularly in regions that have recently received weevil introductions, demonstrating the 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. 2024 saw a new record for the number of weevils shipped to control *Azolla* outbreaks, with over 100,000 weevils hand collected and distributed to customers across Great Britain.

Website: www.azollacontrol.com

Australian swamp stonecrop (*Crassula helmsii*)



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

The gall-forming mite, *Aculus crassulae* (Eriophyidae) was approved as a biocontrol agent against *Crassula helmsii* in August 2018. Field release trials with the mite were initiated in September 2018 and mites have now been released across England and Wales with the support of further sponsors. Mites have successfully overwintered at several field sites in southern England and Wales where conditions are suitable and have been recorded spreading some distance from field plots. Efforts are now needed to increase the population density of mites at release sites to enable establishment and subsequently, impact.

In 2024 mites were released at sites across England and Wales and had overwintered at sites in North Wales. One site in particular had impressive results in 2024, where by the end of the summer, mites were found in high density and had dispersed some distance from the original release plot.

Options to carry out surveys to find additional natural enemies in the native range that could complement the mite are being explored, with collaborations with biocontrol scientists in Australia and New Zealand established.

Parrot's feather (*Myriophyllum aquaticum*)

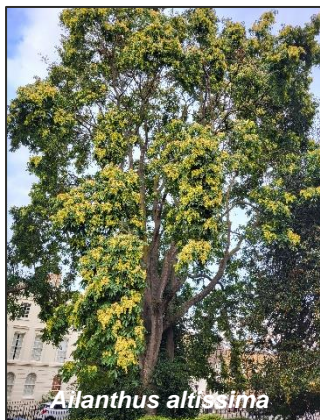


Lysathia sp.

Listronotus marginicollis

Following an initial feasibility study to assess its potential as a biocontrol target in 2021, natural enemies of parrot's feather are now under laboratory assessment for use in the UK. A leaf-feeding beetle, *Lysathia* sp. ex. Argentina, 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 with this beetle continues in CABI's quarantine laboratories to establish the beetle's potential host range in the field. More recently, the promising stem-mining weevil *Listronotus marginicollis* ex. Argentina was imported from collaborators at the Fundación para el Estudio de Especies Invasivas (FuEDEI), Argentina and CSIRO, Australia. The impact and host range of the weevil is now under assessment in CABI's UK quarantine. Parrot's feather is an important weed in multiple regions worldwide and CABI UK is actively collaborating with research partners in South Africa, Switzerland, Australia and Argentina to effectively manage this plant.

Potential new targets - Tree of Heaven (*Ailanthus altissima*), Buddleja (*Buddleja davidii*), Rhododendron (*Rhododendron ponticum*)



Work on these three potential new target species commenced in 2022. Tree of heaven is already the target of biological control programmes in North America and other parts of the world, with work focussing on the mite *Aculus taihangensis* which can cause severe damage to seedlings in continental Europe. In 2024, surveys searching for the mite and other damaging natural enemies already present in the UK continued, and the mite was found infesting tree of heaven plants in the field. These mites cause significant damage to new shoots in saplings. A rearing culture is now established at CABI and host-range testing will begin. For buddleja, the feasibility of a classical biocontrol approach was outlined in a scientific dossier, compiling literature and scientific research from countries such as New Zealand, where buddleja is already the target of a successful biocontrol campaign. An online consultation will be launched and analysed to explore public and stakeholder attitudes to the concept. Given the ornamental value of buddleja, a targeted approach using a mycoherbicide as a cut-stump treatment for *B. davidii* is pursued in parallel. The effectiveness of selected fungi to colonise stumps and prevent re-sprouting continues to be researched in small scale field trials. The same control strategy is to be assessed for *R. ponticum* due to the presence of ornamental rhododendron species and hybrids in the UK. Field survey work undertaken from 2022 to 2023 has sourced a number of UK native wood-rotting fungi associated with the invasive shrub, including *Chondrostereum purpureum*. Given its history of being used as a cut-stump treatment for other invasive woody species, inoculation studies have focussed on this fungal species and rhododendron stumps treated in 2024 will be monitored over the coming months.

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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 Southwest England*