Department for Environment Food & Rural Affairs

Llywodraeth Cymru
Welsh Government

NATURAL ENGLAND

CABI

Progress with Weed Biocontrol Projects

CABI - UK

March 2025

Cover image: *Hydrellia perplexa* on *Crassula helmsii*, CABI quarantine facilities, UK

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 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 20th in a series of annual summary notes on progress made and covers the time frame from December 2024 to the end of March 2025**.**

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 that the Murakami line prefered the hybrid Bohemian knotweed (*Reynoutria* x *bohemica*) over Japanese knotweed. Therefore, this line was released onto Bohemian knotweed in April 2023 and overwintering-morphs of the psyllid were found the following spring showing successful persistence. In May and September 2024, the Murakami line was again released at two Bohemian knotweed sites which were monitored closely. Results showed multiple psyllid generations and characteristic curling damage on plants at one of the sites during the season. The psyllids were shown to inhibit the plant growth, which was significant for the side shoots compared to the control plants. The overwintering-morph of the adults was already recorded at both Bohemian knotweed sites in November 2024; therefore there is potential that the psyllids will again survive the winter which will be assessed in April 2025.

Floating pennywort (*Hydrocotyle ranunculoides*)

The specialist weevil, *Listronotus elongatus*, was approved for release in England in 2021 and has since been released at 22 sites. Regular monitoring at different times of the year remains crucial to understanding the performance of weevils across varying and complex aquatic environments. Winter survival and population build-up is essential for the weevil's long-term establishment and to achieve sustained impact on floating pennywort. In 2024, weevils were found to have successfully overwintered at 12 sites and were continuing to reduce the growth of the plant and to disperse beyond the original release areas.

In early summer 2025, all existing sites will be assessed for weevil survival and subsequently for ongoing impact and wider dispersal. Analysis of site climatic data from autumn 2024 into late spring 2025 will also provide valuable insights into the cold stress thresholds at which survival might be compromised, particularly at northerly locations.

The focus over the winter months has been to maintain a healthy colony of weevils in containment, to support seasonal mass rearing efforts and facilitate introduction to new catchments, as well as any supplementation across existing sites. Biological control offers an effective and long-term solution for floating pennywort and can complement conventional approaches to help deliver a coordinated national management strategy.

Himalayan balsam (*Impatiens glandulifera*)

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 in collaboration 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 plant 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. Assessment of the strain ex Das Khurram, Pakistan, concluded that its pathogenicity and viurlence was similar to that of the two strains already released. Consequently, evaluation of this strain was put on hiatus and a strain of the rust ex Dhundi, India is currently under evaluation. If a sufficient number of rust resistant Himalayan balsam populations were found to be infected by any additional rust strain(s) approval for the release from quarantine will only be sought following host-range testing against a number of key non-target species.

Water fern (*Azolla filiculoides*)

Throughout winter 2024-25 there has been a steady stream of enquiries regarding Azolla biocontrol, 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 rufinasus* 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*)

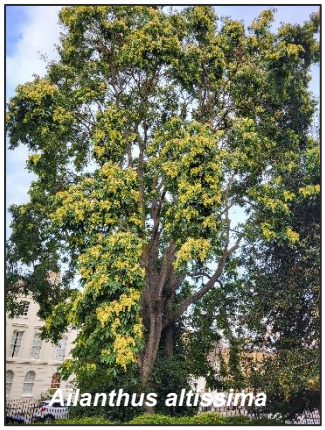
The gall-forming mite, *Aculus crassulae* (Eriophyidae) was approved as a biocontrol agent against *Crassula helmsii* in August 2018. Field release trials with the mite were initiated in September 2018 and mites have now been released across England and Wales with the support of further sponsors. At several field sites in southern England and Wales, where conditions are suitable, mites have successfully overwintered 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. Further releases were made at sites across England and Wales in 2024 and the mite has 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. Mites will continue to be released at sites in England and Wales in 2025.

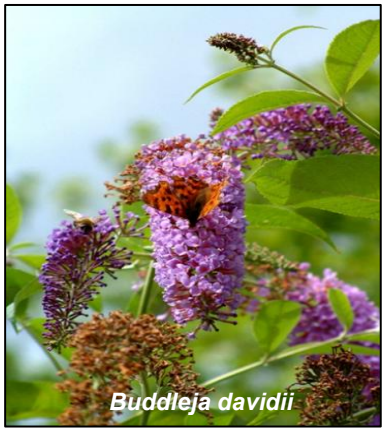
Options to carry out native-range surveys to find additional natural enemies that could complement the mite are being explored, with collaboration with biocontrol scientists in Australia and New Zealand established. The stem-mining fly *Hydrellia perplexa,* a potential additional agent, has now been shipped to CABI to resume its safety testing and clarify the risk posed to the native species, *Crassula aquatica*.

Parrot's feather (*Myriophyllum aquaticum*)

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. In 2024, 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. Studies into the molecular characteristics of the target weed and its close relatives are also being undertaken. 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 and more mature plants. A rearing culture is now established at CABI and host-range testing has begun. 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 2024 has sourced several UK native wood-rotting fungi associated with the invasive shrub, including two strains of *Chondrostereum purpureum.* Given its history of being used as a cut-stump treatment for other invasive woody species, inoculation studies have focussed on this latter fungal species. During 2024 rhododendron stumps were treated at different times in the year and are currently being monitored long-term for re-sprouting and decay.

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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*