

Updates on Biocontrol Initiatives for GB in the UK

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13th Local Action Groups Workshop



History of GB biocontrol initiative

- Since 2011, Defra-funded, in partnership with Welsh Government and NE, work on biocontrol of Japanese knotweed, Himalayan balsam, Australian swamp stonecrop and floating pennywort
- Mass-rearing and supplying the water fern weevil at cost to ensure ongoing biological control
- Support from EA, Canal & River Trust, private water companies, the MoD, a number of conservation groups, trusts and Local Authorities, Canadian and Dutch stakeholders
- In 2021 carried out feasibility studies on parrot's feather and *Ludwigia* spp.
- In 2022 carrying out feasibility studies on Elodea, Buddleia, Carpobrotus and tree of heaven – outcome of stakeholder workshop
- Proposal for further funding from Defra for FY 2022/23, also including new targets; follow on funding to be decided

Japanese knotweed – psyllid, *Aphalara itadori*

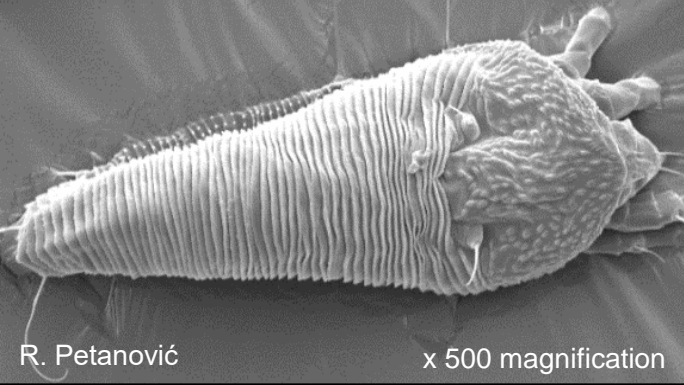
- Long-term releases including riparian sites since 2015
- Integrated with RAPID LIFE – releases at 13 sites in 2018; monitoring 2018-20. Some overwintering in 2019, but very low numbers. Establishment too low for population persistence; psyllid density too low for impact
- Informed by field releases and lab studies, climate key to psyllid
- Psyllid collected from climate-matched area in Japan (Murakami) in 2019- severe leaf curling damage observed. Studies show this psyllid is the same species as original strain (Kyushu) and is host-specific
- Murakami psyllids prefer *F. x bohemica* over *F. japonica* in lab studies
- Release of the Murakami psyllid granted by Defra in Jan 2021 → released at *F. japonica* and *F. x bohemica* sites near CABI
- Damage found at both release sites, severe damage in the *F. x bohemica* population
- Overwintering morph was found in the *F. x bohemica* population in 2023

Psyllid damage in the field (Murakami strain)



Himalayan balsam – rust fungus, *Puccinia komarovii* var. *glanduliferae*

- *Puccinia komarovii* var. *glanduliferae* approved for release in England and Wales in 2014, released across England, Wales & Scotland
- Two strains of the rust (ex India and Pakistan) – pre-release testing required to determine susceptibility, not all populations infected
- A molecular analysis pinpointed key regions for additional surveys. Three new strains collected from NE Pakistan in 2022. Work underway to get strains established in lab
- Rust released at 5 sites in 2022, continued releases of the rust in GB anticipated for 2023, particularly Wales (up to 33 sites depending on site susceptibility)
- Releases made possible through the help of LAGs and landowners who released and monitored the rust over growing season
- Continuing to see good leaf infection in the field and overwintering of the rust, 2022 sites to be monitored in spring
- Rust showing adaptation to UK field conditions but impact of rust long-term, may take 5-10 years



Australian swamp stonecrop – mite, *Aculus crassulae*



- *Aculus crassulae* – gall forming mite from Australia. Approved for release in the wild in 2018. Mites now released at multiple sites in England and Wales
- Mites previously proven to overwinter at release sites but affected by late frosts killing plants hosting overwintering mites in the past.
- In 2022, mites overwintered at 5/8 release sites – good progress!
- Mites starting to spread and colonise new *Crassula* plants within sites, some excellent spread (>30m)
- Extreme high temperatures affected some releases in 2022
- The most suitable release sites are where emergent plants are available for mites all year round (or only submerged short-term)
- New sites under consideration with funding from Welsh Gov. and others.
- 2023 focus will be on releasing mites at the most suitable sites aiming to establish self-sustaining and robust mite populations

Floating pennywort - weevil, *Listronotus elongatus*

- *Listronotus elongatus*, leaf feeding and stem mining weevil approved for release in England in autumn 2021. First field releases made in Nov/Dec 2021
- Monitoring in spring and summer revealed good weevil survival. Final results of the semi-contained study (polytunnel) confirmed good larval impact potential
- In 2022 > 2700 weevils were released across 12 sites in England (March-October), from Sussex to Yorkshire. Monitoring undertaken for weevil survival, development, spread and impact as well as examination of non-targets plants
- Weevils recorded developing at all release sites, with greatest impact and spread (>35m) associated with more southerly and/or earlier releases
- Higher number of generations (up to 3) achieved when greater number of degree days are acquired. Stunted, yellowing pennywort and collapsing mats recorded where weevil numbers were high
- Collaborations with Angling Trust, British Canoeing, EA and field managers have been essential for year-round material collection and networking with problem holders
- Funding for releases at new sites /monitoring of existing sites being identified for 2023. Dutch interest remains high





Parrot's feather – beetles *Lysathia* sp. & *Listronotus marginicollis*

- Biocontrol feasibility study carried out in 2021
- Two beetles of interest: *Lysathia* sp. & *Listronotus marginicollis*. Host-range testing carried out for both in South Africa
- Host-range testing of *Lysathia* sp. with prioritised plant species now underway in quarantine. Some non-target feeding
- Partnership with collaborators in native range established – field surveys
- Aiming to ship *L. marginicollis* weevil from Argentina in 2023 for further testing



Biocontrol feasibility dossiers

Ailanthus altissima (Tree of heaven)

- Deciduous ornamental tree native to north-east and central China/Taiwan.
- Invasive species of concern in Europe and Canada
- Subject of classical biocontrol study by CABI CH since 2020 and a mite from China, *Aculus taihangensis*, is under evaluation for Canada. A weevil and Verticillium wilt are under consideration/ use elsewhere
- Test plant list compilation for the UK and review of potential for the UK/Europe

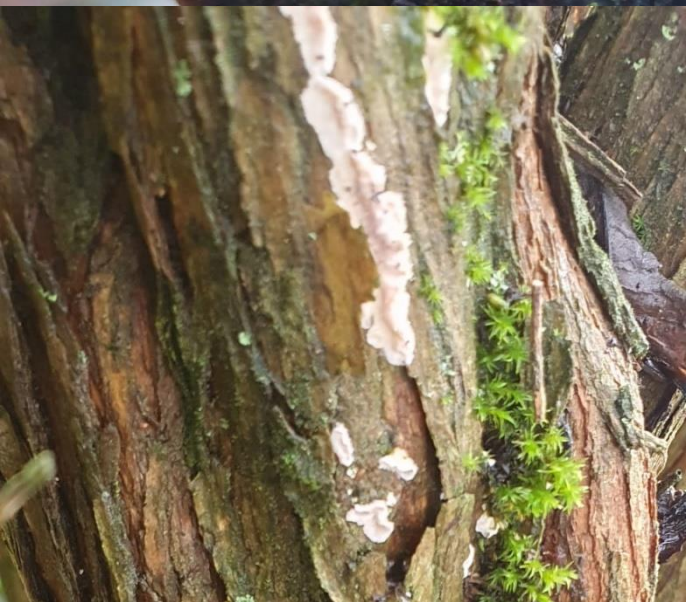
Buddleja davidii (Butterfly bush)

- Popular and widespread ornamental from China and Japan
- Invasive alongside and on railway lines, brownfield sites, urban wasteland and road verges
- First release of leaf weevil, *Cleopus japonicus* as classical biocontrol for buddleia in New Zealand in 2006
- Test plant list compilation for the UK and review of potential for the UK/Europe



Rhododendron ponticum

- Not a suitable target for classical biological control, but cut-stump mycoherbicide approach to prevent re-sprouting could have potential
- Wood-rotting basidiomycete *Chondrostereum purpureum* widely used for this approach
- Field survey in Devon and Cornwall conducted to source strains of the pathogen associated with *R. ponticum*
- Based on morphological appearance *C. purpureum* identified and collected from two sites and currently established as in vitro cultures for future research



Buddleja davidii part 2

- The Silver leaf fungus, *Chondrostereum purpureum* is widely used as mycoherbicide
- A successful field survey was conducted in Reading to source an isolate associated with *B. davidii*
- Further morphological and possible molecular identification will be carried out
- Previous non-buddleja derived isolates will also be assessed further and alternative application techniques will be trialled

Carpobrotus edulis

- Biocontrol feasibility review and natural enemy assessment supported by Natural England
- UK survey for natural enemies – Cornwall and Isles of Scilly – mostly generalists and low impact
- Primary target South African scale insect known to have significant impact on *C. edulis* in USA – *Pulvinariella mesembryanthemi*
- Scale found on *C. edulis* in Isles of Scilly and Lizard Peninsula and now in culture at CABI
- Native/naturalised parasitoids apparent in scales – collected and identified
- Scale insect impact and reproduction assessment under controlled conditions

Next steps:

- CLIMEX assessment of scale for UK
- Scope additional agents in South Africa with collaborators – pathogens and invertebrates
- Test plant list for *C. edulis* UK biocontrol study
- Potential native range survey



Elodea nuttallii and *E. canadensis*

- Literature review and feasibility study
- Field surveys for natural enemies in UK
- Surveys focussed in south-east England region so far
- No signs of attack or decay of plant material at any sites
- Nematode extractions and microscopic inspections
- Further surveys in early spring where possible





Thank you for your support in 2023

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