

Updates on Biocontrol Initiatives for GB in the UK

Sonal Varia, Djami Djeddour, Daisuke Kurose, Corin Pratt, Marion Seier

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13th Local Action Groups Workshop

History of GB biocontrol initiative



Department
for Environment
Food & Rural Affairs

- 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
- In 2021 carried out feasibility studies on parrot's feather and *Ludwigia* spp.
- Support from EA, Canal & River Trust, private water companies, the MoD, a number of conservation groups, trusts and Local Authorities, Canadian and Dutch stakeholders
- Proposal for further funding from Defra for FY 2022/23, also including new targets; follow on funding to be decided
- Mass-rearing and supplying the water fern weevil at cost to ensure ongoing biological control

Biocontrol of Japanese knotweed using the 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 likely too low for population persistence; psyllid density too low for impact
- Informed by field releases and lab studies, climate appears 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 local to CABI
- Curling damage found at both release sites, severe damage in the *F. x bohemica* population
- Released Kyushu psyllid in North-East England funded by Tees River Trust



Psyllid damage in the field (Murakami strain)



Biocontrol of Japanese knotweed using the leafspot pathogen *Mycosphaerella polygoni-cuspidati*

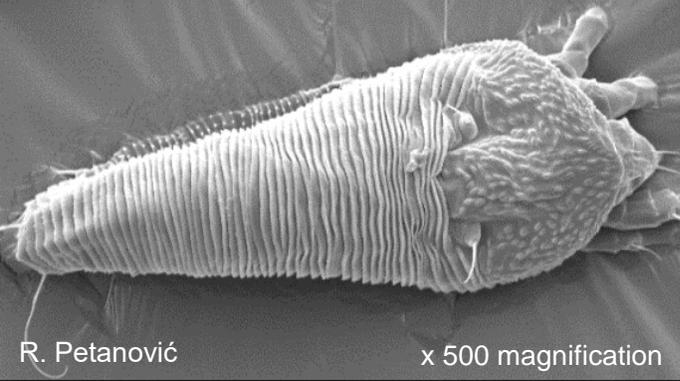
- Pathogen currently not considered as a classical agent due to potential non-target impact
- Proof-of-concept research undertaken to evaluate agent as a potential mycoherbicide based on mycelial strands for targeted application without risk of establishment and spread
- Idea protected by European patent held in the name of the Secretary of State/Defra, additional international patent applications pending
- Selected strain approved for release from quarantine in 2019, experimental field trials undertaken from 2019 to 2021 showing that pathogen can infect under field conditions; however, more research needed into increasing pathogens virulence/impact in this situation
- Currently working in collaboration with the private sector supported by funding from Defra and Dutch stakeholders (until end 2021)





Biocontrol of Himalayan Balsam (*Impatiens glandulifera*) using the rust *Puccinia komarovii* var. *glanduliferae*

- *Puccinia komarovii* var. *glanduliferae* approved for release into England and Wales in 2014
- Rust released across England, Wales & Scotland
- Two strains of the rust currently in use (ex India and Pakistan) – pre-release testing required to determine susceptibility, as not all populations infected
- Working to obtain new strains from Kashmir following molecular analysis. A new strain was collected from Azad Kashmir (Pakistan controlled side) in 2021 and testing will continue in 2022
- Rust released at 30+ sites in 2021, continued releases of the rust in GB anticipated for 2022 (depending on site susceptibility)
- Rust releases made possible through the help of local action groups and landowners who released and monitored the rust over growing season
- Introduced the use of a monitoring app in 2021 to aid with recording rust in field
- Good leaf infection at new sites and seedlings will be monitored this year to determine if rust persisted
- Rust showing adaptation to UK field conditions but impact of rust long-term, may take 5-10 years



Biocontrol of Australian swamp stonecrop (*Crassula helmsii*) using the mite *Aculus crassulae*

- *Aculus crassulae* – gall forming mite from Australia. Approved for release in the wild in 2018. Mites now released at 12 sites in England and Wales
- Mites previously proven to overwinter in field experiments and at release sites but late frosts killed many of the plants hosting overwintering mites in spring 2021.
- Mites shown to spread (slowly) and colonise new *Crassula* plants within sites
- The most suitable release sites are where emergent plants are available for mites all year round (or only submerged short-term)
- Protected sites under consideration with funding from NE – please contact us if you have a suitable site.
- App in development for 2022 to allow easier post-release monitoring
- In 2022 focus will be on releasing mites at the most suitable sites aiming to establish self-sustaining and robust mite populations
- New open access paper published: Varia, S., Wood S. V., Allen, R.M.S. & Murphy S. T. (2022) Assessment of the host-range and impact of the mite, *Aculus crassulae*, a potential biological control agent for Australian swamp stonecrop, *Crassula helmsii*. *Biological Control*. 167

Biocontrol of floating pennywort (*Hydrocotyle ranunculoides*) using the weevil, *Listronotus elongatus*



Volunteer clearance-National Trust, Angling Trust, EA and British Canoeing



Collecting molecular samples
Credit: Charles Hughes (CRT)



- Weevil *Listronotus elongatus* approved for release in England following positive PRA review and period of stakeholder/public consultation
- Shipment of weevils received from Argentina in September 2021 and being maintained at CABI with plans to mass rear for release in early summer
- Collaborations in England have been key to supply of pennywort material for rearing of weevils and site selection/administration for future releases-continuing to work closely with many stakeholders
- Overwintering experiments being undertaken in a polytunnel at CABI to monitor weevil survival and performance. Preliminary, small scale field release also undertaken in the Colne Valley to investigate overwintering behaviour/capacity
- Funding from Natural England has allowed work to progress on the molecular characterisation of pennywort populations across England (and from native range). Dutch stakeholders to fund piggy back work to evaluate their populations/susceptibility to the weevil
- Funding opportunities being actively pursued for first “proper” field trial releases with potential sites in Sussex, Yorkshire, Midlands and Surrey in 2022
- Open Data Kit app being developed in house to improve quality, replicability and analysis of monitoring data (photos, videos, imageJ etc)



New targets: Biocontrol of parrot's feather (*Myriophyllum aquaticum*)

- Biocontrol feasibility study carried – there is good potential for the UK
- Two beetles: *Lysathia* sp. & *Listronotus marginicollis*. Host-range testing carried out for both in South Africa
- *Lysathia* sp. released in SA in 1994 and provides good control
- Host-range testing of *Lysathia* sp. with prioritised plant species now underway in quarantine
- Partnership with collaborators in native range established – field surveys
- Aiming to ship *L. marginicollis* weevil from Argentina in 2022 for further testing



New targets: Biocontrol of *Ludwigia* spp. Creeping water primrose

- Native to South America, complex taxonomy
- On-going eradication in UK; impossible in other regions, particularly France and Belgium
- High management costs and ecological damage once well established
- Prioritised natural enemies – weevils, rust fungi, planthopper
- Biocontrol feasibility study carried out
- Working to develop project with European partners
- Partnership with collaborator in native range established – field surveys and host range testing



Thank you for your support in 2021

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