



Progress with Weed Biocontrol Projects

CABI in the UK

November 2016

Introduction

Since April 2011, Defra has been funding specialist scientists to investigate the scope for biological control of invasive, non-native aquatic and riverside weeds. The technique 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, and thus to help meet requirements of the EU Water Framework Directive.

We are targeting **Australian swamp stonecrop** (*Crassula helmsii*), **Himalayan balsam** (*Impatiens glandulifera*) and **floating pennywort** (*Hydrocotyle ranunculoides*). These projects complement CABI's on-going work on the biocontrol of **Japanese knotweed** (*Fallopia japonica*) and **water fern** (*Azolla filiculoides*). This is the sixth in a series of annual summary notes on progress made and covers the time frame to the end of November 2016.

Japanese knotweed (*Fallopia japonica*)



Previous mass releases of the psyllid (2010-2013) have had limited success in establishing large populations at eight isolated release sites. The initial focus of the work was to prove that the psyllid has no untoward effects on native flora and fauna, and to date there has been no observable negative impact on native species. In 2014, a replicated caged field trial revealed the safety of the agent for native invertebrates if present in high densities. The evidence was reviewed and a new licence was issued permitting the release of psyllids at riparian sites which are thought to be better for their establishment. During summer 2015 and 2016 an intensive release and monitoring campaign has been conducted in collaboration with Local Action Groups and Local Authorities at 18 sites (9 in 2015) across England and Wales. Adults were found in all sites with lower abundances towards the end of the season. Early establishment (nymph stage) was observed at most of sites together with no significant impact in the recipient environment. During spring 2016 overwintering was only confirmed in one Southern site. For the first time, releases using winter morph adults and a new psyllid strain (higher field adaptability) were carried out in autumn 2016. Further monitoring will be conducted in spring 2017 to confirm successful overwintering and establishment of the agent in the UK.

The potential of the leaf-spot fungus (*Mycosphaerella polygoni-cuspidati*) has been extensively studied but not taken further as a classical biocontrol agent due to the ability for one of its spore stages to a non-target plant species under quarantine greenhouse conditions. However, the discovery of mating types mean that a mycelial formulation of one mating type could be used as a mycoherbicide and both UK and International patent applications have been submitted and now published in the name of the Secretary of State. The next step will be proof of concept for which funding is being sought.

Water fern (*Azolla filiculoides*)



A mild winter allowed Azolla to survive unscathed into 2016 with the plant becoming widespread and abundant in England and Wales. The extent of Azolla infestation has resulted in high early demand for the Azolla biocontrol weevil, *Stenopelmus rufinusus*, which is mass reared at CABI (www.azollacontrol.com). This small weevil feeds directly on Azolla and in high densities can cause local eradication of the plant. The weevils are specific to Azolla and after clearing a site of the weed the adults will either die out or disperse to seek out more.

Weevil shipments began at the start of summer and record orders this year necessitated scaling-up of weevil-rearing activities at CABI, with more than 50,000 weevils hand collected and shipped by the end of the season. By targeting Azolla outbreaks in a timely manner it is possible to limit the extent of infestations and redistribution of the weed, bringing about economic savings, reducing leisure impacts and preserving the biodiversity of freshwater ecosystems

Floating pennywort (*Hydrocotyle ranunculoides*)



The draft Pest Risk Assessment (PRA) submitted to Defra/Fera in April 2016 was well received but highlighted the need to complete specificity studies and gather evidence on the weevils' establishment potential in the UK. To this end, host range testing has been ongoing and a number of previously elusive, rare native species have been successfully sourced. The weevil continues to show significant preference for its host, *H. ranunculoides* and further tests in less artificial plant exposure are underway to further establish safety towards very closely related native, non-target plant species. The final PRA will be submitted in March 2017. If the research continues to indicate that *Lissonotus elongatus* is indeed safe and suitably adapted for the UK, and the PRA is accepted by the regulators, then a release into the environment may be considered for some time in 2017, with a view to more widespread releases and monitoring in 2018.

Himalayan balsam (*Impatiens glandulifera*)



In 2014 CABI completed the host-range testing of the Himalayan balsam rust *Puccinia komarovii* var. *glanduliferae* from India, which proved the rust is a true specialist on its host. In total, 75 plant species of importance to Europe were tested including native, ornamental and economically important plant species. A Pest Risk Assessment (PRA) which fully detailed the research conducted on the host range, life-cycle and ecology of the rust was submitted to Fera in 2014. The PRA underwent further evaluation by the European Commission's Standing Committee on Plant Health and following their feedback Ministers approved the release of the rust on the 27th July 2014. The rust was released at 3 sites in 2014, and in 2015, at 25 sites in 10 counties across England and south Wales. The rust was found to spread on to adjacent field plants, and the overwintering spore stage subsequently developed at many sites, but the rust did not over winter. In 2016 work focussed on establishing the rust at fewer sites, and developing a robust release strategy based on emerging knowledge and studies. Infection in the field has been very high at some sites in 2016, and successful overwintering is anticipated. The spread and impact of the rust will be monitored over the next few years.

Australian swamp stonecrop (*Crassula helmsii*)



The Australian gall forming mite, *Aculus* sp. (Eriophyidae) which is new to science, has been prioritised as the biocontrol agent for the control of *Crassula helmsii*. Host range testing is now complete and research is now focussed on understanding the biology and temperature requirements of the mite. Results of the host range testing have demonstrated that the mite only infects and damages its host, *C. helmsii* while other important plant species in the UK are not affected by the presence of the mite. In 2016, a draft Pest Risk Assessment (PRA) detailing the research conducted to date on the mite was submitted to Fera for review and a final version will be resubmitted early in 2017 following the completion of studies on the establishment potential of the mite. If the PRA is accepted by the regulators, the mite may be released into the wild in field trials which could take place as early as summer 2017.

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