

Progress with Weed Biocontrol Projects



CABI in the UK

May 2015

Cover image: Sonal Varia checking Himalayan balsam at Harmondsworth moor for rust infection, May 2015

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 fourth in a series of regular summary notes on progress made and covers the time frame to the end of May 2015.

Japanese knotweed (*Fallopia japonica*)



Previous mass releases of the psyllid (2010-2013) have had limited success in establishing large populations at eight licenced release sites. The initial main 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 impact on native species. However, in order to end the current restriction to a limited number of sites and gain permission to widen the releases, larger self-sustaining populations of the psyllid needed to establish so that its safety could be demonstrated. In 2014, a replicated caged field trial was set-up to assess whether adverse impacts of the psyllid occur if it is present in high densities. The experiment was successful in further reducing concerns about impacts on native flora and fauna. The evidence was reviewed by Fera and on 31st March 2015 a new licence was issued permitting the release of the psyllid at new riparian sites (subject to review by Fera) and negating the need for the previous contingency plan. Releases at these new sites will be conducted throughout the summer of 2015 with the participation of Local Action Groups.

The potential of the leaf-spot fungus (*Mycosphaerella polygoni-cuspidati*) as an additional control agent for Japanese knotweed was evaluated by assessing the susceptibility of non-target plant species towards the pathogen under quarantine greenhouse conditions in the UK. This research was complemented by field host-range studies conducted in Japan. Also investigated were the infection biology and the genetic make-up of the fungus. Under quarantine conditions the leaf-spot fungus can cause some restricted disease symptoms on a couple of non-target species native to the UK. While the significance of this in a potential field situation remains unknown, the pathogen is currently no longer prioritized as a classical agent for Japanese knotweed in the UK.

Water fern (*Azolla filiculoides*)



A mild winter has allowed *Azolla* to survive relatively unscathed into 2015 with many queries about the potential for control using the *Azolla* weevil (*Stenopelmus rufinasus*) received already this year (www.azollacontrol.com). Scaling-up of the weevil-rearing facilities at CABI over the past few years means that orders can be met swiftly to deal with *Azolla* outbreaks in a timely manner and limit the spread of the weed.

The EU-funded **RINSE** project (Reducing the Impact of Non-native Species in Europe www.rinse-europe.eu) concluded in 2014 with CABI having conducted demonstrations of the impact of *S. rufinasus* on *Azolla* across the RINSE regions (England, Belgium, France and the Netherlands), where both the weed and weevil are naturalised. The results were very positive, with the weevil providing high levels of control over the water fern at the majority of demonstration sites, and with extensive stakeholder involvement throughout. The project concluded with the submission of final reports during the summer and a closing conference in September 2014.

Floating pennywort (*Hydrocotyle ranunculoides*)



New cultures of the weevil *Lissonotus elongatus* received in May 2014 allowed for detailed safety testing to begin, including informative and comprehensive no-choice, adult feeding tests on 72 species and follow on oviposition and developmental no choice and choice testing on 6 species so far. These studies have revealed some feeding and development on non-target *Hydrocotyle* and *Apium* species, albeit to a lesser degree than on the target host *H. ranunculoides* and in extremely artificial and precautionary experimental set ups. Research is now underway to quantify this non-target impact with more detailed studies to assess the potential threat further by establishing the viability of any adults developing on non-target plants. Our collaborators in Argentina continue to assess the ecology and potential of fly complexes which mine the leaves and the petioles of *H. ranunculoides* and whose specificity to our native Apiaceae will also need close scrutiny in light of these unexpected results with the erstwhile highly promising weevil in the UK.

Himalayan balsam (*Impatiens glandulifera*)



In 2014 CABI completed the host-range testing of the Himalayan balsam rust *Puccinia komarovii* var. *glanduliferae* which proved the rust is a true specialist to 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 Defra Ministers approved the release of the rust on the 27th July 2014. The rust was subsequently released at 3 sites. Unfortunately, this was late in the season, but nevertheless the rust was found to spread on to field plants, and the overwintering spore stage developed.

During the winter, the rust was bulked-up ready for a nation-wide release and monitoring programme in England and also in Wales, in the spring of 2015. In England, 21 rust release sites have been selected across 7 counties (Berkshire, Gloucester, Kent, Middlesex, North and West Yorkshire, Northumberland and Cornwall) and four sites in Wales (Swansea and Ceredigion). The programme is currently on-going, and the spread and impact of the rust will be monitored over the next few years.

Australian swamp stonecrop (*Crassula helmsii*)



A stem-mining fly species, *Hydrella perplexa* has been under consideration since its import into quarantine early in the project. Host-specificity testing and life-cycle studies have continued and revealed that the fly has accepted the close native relative, *Crassula aquatica* as a host, causing feeding damage and showing development. More research needs to be carried out to confirm these results, however this level of non-host damage is not acceptable and therefore the fly will be rejected from any further research.

An Australian *Colletotrichum* species has also been rejected due to its wide host range. Several other damaging fungal plant pathogens collected from *Crassula helmsii* in Australia are still to be assessed for their potential as biocontrol agents. A gall-forming mite, *Aculus* sp., which has also been undergoing testing is continuing to show positive results with very little non-target feeding or development. Mites from this family are well known for their host specificity and ability to reduce plant fitness. Life-cycle studies have commenced to try and understand the complex biology of this species and further host-specificity testing is underway.

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