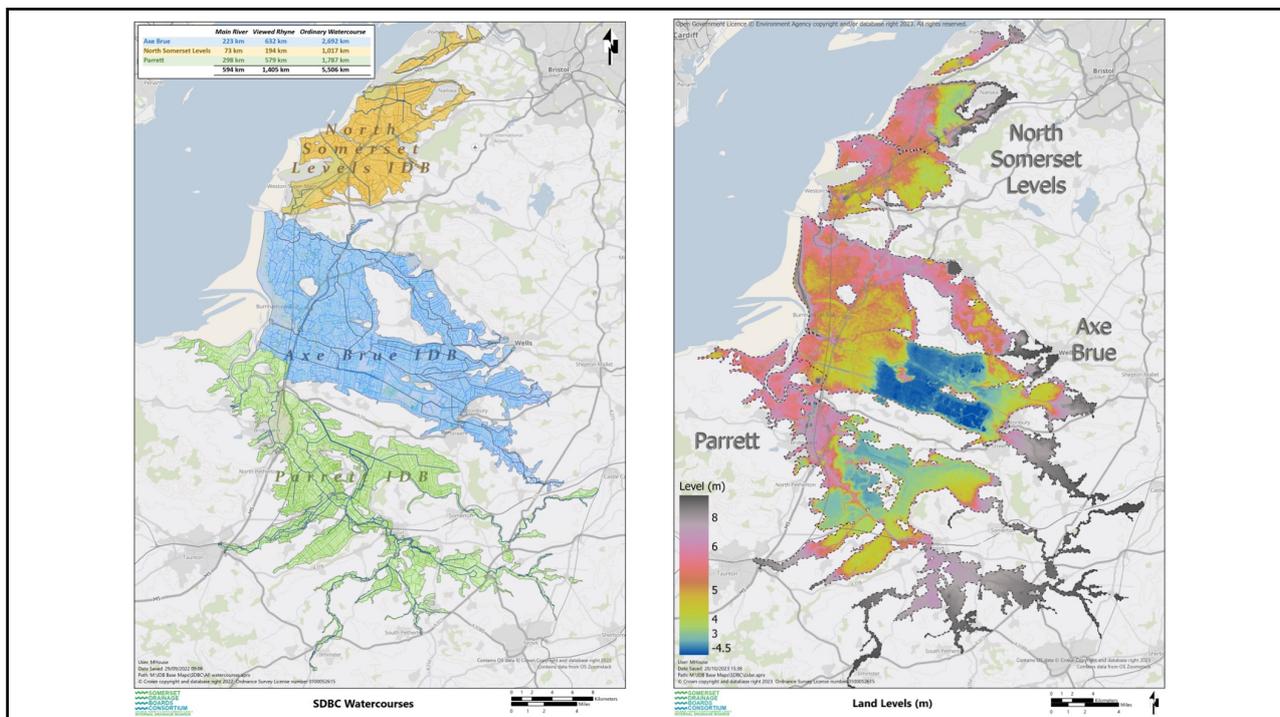




Aquatic invasive non-native plants – Floating pennywort

Philip Brewin
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Aquatic invasive non-native plants – Floating pennywort

A serious threat to water management and wetland ecology.

Failure to control can increase flood or drought risk and be harmful to the environment and public health.



“With Floating pennywort, the tiniest fragment is a disaster”

EAC Invasive Species Inquiry 2019

3

Environment Audit Committee – Invasive Species Enquiry

Invasive non-native species are one of the top threats to the natural environment.

They cost the **economy £1.8 billion per year**, yet the Government is not providing the funding needed to tackle the threat.

DEFRA estimates that between **36 and 48 new** invasive species will become established in the **next 20 years** in Great Britain.

It is **hundreds to thousands of times cheaper** to prevent invasive species from establishing, rather than tackling them once they are established.

Biosecurity and closing pathways are critical first lines of defence to prevent the introduction and spread of INNS.

There needs to be a step-change in awareness, so that the public can assist in preventing the introduction of species, spot likely invaders and aid eradication efforts.



House of Commons
Environmental Audit Committee

Invasive species

First Report of Session 2019

Report, together with formal minutes relating to the report

Ordered by the House of Commons to be printed 15 October 2019



4

Floating pennywort

- Floating pennywort (*Hydrocotyle ranunculoides*) grows at a phenomenal rate and can form dense mats that dominate watercourses.
- Favours slower moving watercourses such as those regulated by structures.
- A population can become established by a single fragment.
- Out-competes and replaces native species.
- Can increase flood and drought risk by clogging watercourses and structures.
- Can interfere with navigation and angling and there is a risk to people, wildlife, livestock and pets as it can look like dry land.
- Once established, pennywort is difficult and costly to eradicate.



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Floating pennywort control in Somerset

There are 7 locations in Somerset with floating pennywort, including main river, IDB maintained and other ordinary watercourses.

Each location has an action plan that includes the latest survey data, an assessment of the risk of spread and a strategy for management and eradication.

For all sites, the aim is containment and control, with local eradication where possible.



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Somerset Floating Pennywort Action Plan

5-Year Action Plan for the systematic approach to Floating pennywort management in Somerset.

This will be achieved by:

1. Identifying the management options and priorities for each known site.
2. Setting out coordinated actions, identifying roles and responsibilities of interested parties.
3. An annual review of actions, informed by monitoring data, to report risks and effectiveness of interventions and inform future actions.



7

Actions required to control Floating pennywort

- Quick response is essential to prevent pennywort reaching 'nuisance' levels and spreading to new areas.
- Control requires a combination of methods. The main methods are mechanical or manual removal and/or spraying with herbicides.
- **BIOSECURITY**
- Management must be followed up with a long-term monitoring programme.



8

Control activities common to all locations include:

1. **Surveillance** – all sites should be monitored a minimum of twice a year.
2. **Biosecurity** – application of suitable biosecurity measures before moving out of the affected area.
3. **Machinery** – to debulk pennywort and clear banks to allow herbicide applications.
4. **Access** – access is required throughout the year.
5. **Herbicide application** – herbicide licences are required for each site and operators need to be trained and qualified.
6. **Hand removal** – forensic searches and hand removal of fragments will increase the likelihood of successful eradication and reduce the time taken to get to that point.
7. **Adaptive management and operational techniques** – same changes to maintenance specifications and operation techniques may be required to reduce the risk of spread and therefore limit the costs of control.
8. **Awareness, training and engagement** – engagement with landowners and land/water users, and training of operational staff.

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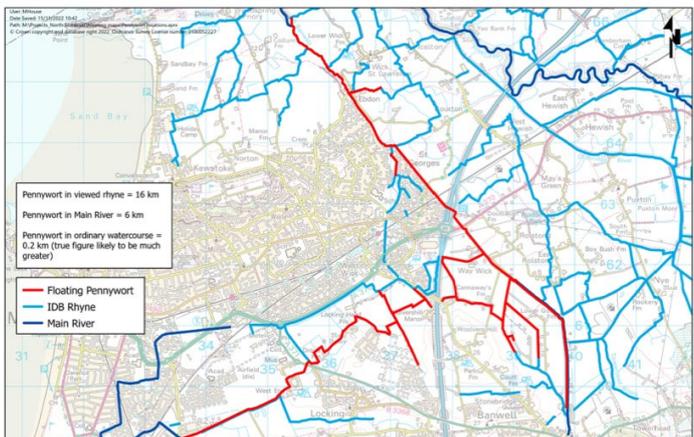
Floating Pennywort Action Plan
North Somerset Levels IDB – 2022

River Banwell, Banwell Moor, Grumblepill and Cross Rhynes

Philip Brewin
IDB Ecologist

OBJECTIVE: Manage impacts in areas where pennywort is widespread and eradication is unlikely: Banwell Moor, Grumblepill and Cross Rhynes. Prevent spread and eradicate (by 2026) in areas that are currently pennywort free or have little pennywort: Summer Lane, St Georges, Walford Avenue, Wick St Lawrence, Kewstock and Old Bridge River.

Managed by	North Somerset Levels IDB and Environment Agency
Length	22 km
Risk of Spread	High
Change in extent	Increasing
Abundance and change	Increasing
Management actions	Mechanical removal, herbicide application, hand picking, heightened biosecurity, awareness raising and monitoring.
Comments	Gradual increasing dominance and spreading to new areas: St George's, Summer Lane and Wick St Lawrence. Mechanical removal is the main control measure. IDB Rhynes maintained twice in summer. Some test spraying in St George's with promising results and monitoring and targeted hand picking and spraying in systems where pennywort is likely to spread.
Recommendations	Increase spraying programme in 2022, focusing on upstream areas and areas where pennywort is starting to spread. Monitor adjacent areas without pennywort and respond quickly to remove from any new locations: Wick St Lawrence, east of River Banwell and West Wick Rhyne.
Estimated cost of control	£50,000 per annum to manage risks and limit spread, but potentially significantly higher if eradication is the objective.



Pennywort Locations (November 2022)





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Floating Pennywort – Banwell, North Somerset



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Floating Pennywort, Park Brook, Parrett



2019 : 30 to 40 sizable clumps

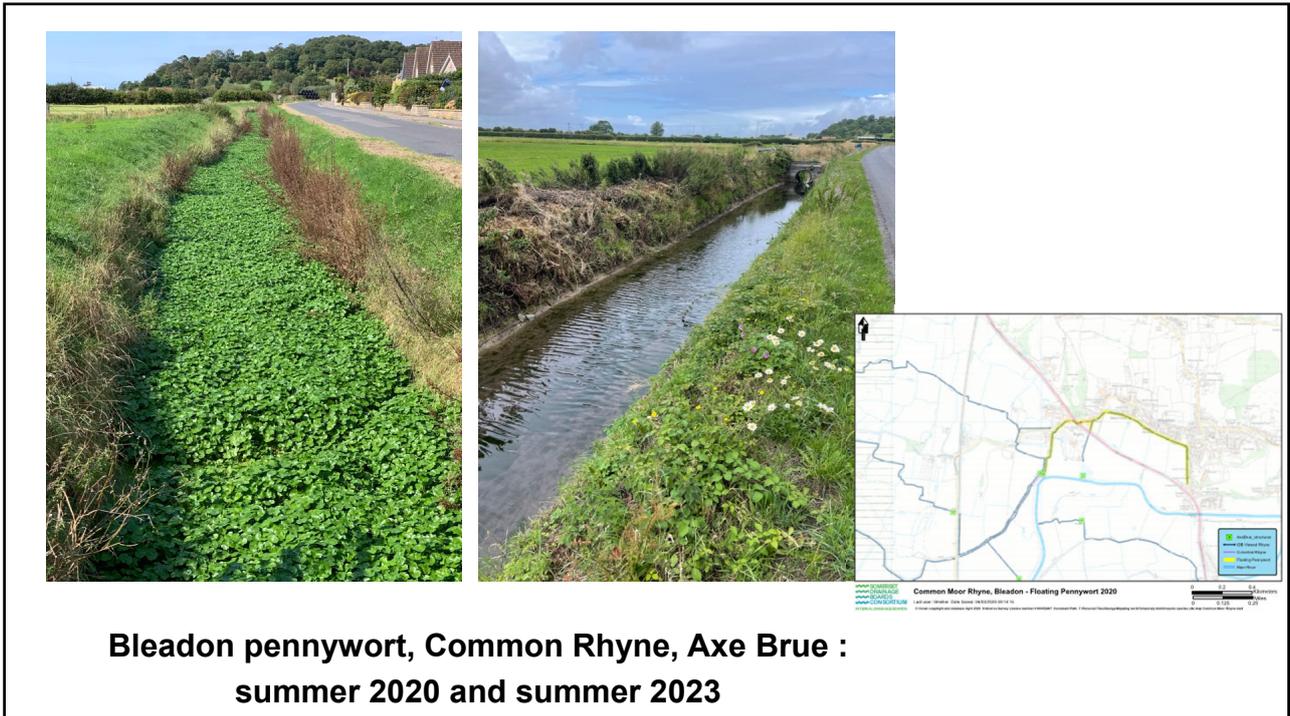


Mechanical clearance and hand picking over winter



2020 : 3 small clumps

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THE BIG 4 – aquatic invasive non-native species in Somerset

Floating pennywort

Water Primrose

Parrot's feather

Zebra mussel

Invasive species overview plan 2019

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BIOSECURITY: Check, Clean, Dry



AXE BRUE, PARNETT & NORTH SOMERSET LEVELS
INTERNAL DRAINAGE BOARDS

GOVERNANCE
BIOSECURITY POLICY

Approved by the Boards:		
Axe Brue IDB	03 Feb 2020	Chairman
Parnett IDB	03 Feb 2020	Chairman
North Somerset Levels IDB	04 Feb 2020	Chairman



<https://www.nonnativespecies.org>

Whenever you leave the water, remember to Check Clean Dry

CHECK	Check Check your equipment, boat, and clothing after leaving the water for mud, aquatic animals or plant material. Remove anything you find and leave it at the site.
CLEAN	Clean Clean everything thoroughly as soon as you can, paying attention to areas that are damp or hard to access. Use hot water if possible.
DRY	Dry Dry everything for as long as you can before using elsewhere as some invasive plants and animals can survive for over two weeks in damp conditions.



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Help slow the spread of invasive species on the Somerset Levels

Philip Brewin – Ecologist – Somerset Drainage Board Consortium

Non-native invasive species are a serious threat to water management and wetland wildlife in Somerset. The Somerset Drainage Board Consortium (SDBC) has identified four high-risk aquatic invasive species that, if not contained and controlled, have the greatest potential to impact water management and the environment. These include Floating pennywort and Water primrose, which are both recent arrivals in Somerset and very difficult to control. They grow extremely quickly in summer and can block watercourses and culverts, which can increase flood risk and deprive areas of water. They can also damage aquatic ecology by crowding out native wildlife and depleting oxygen levels in water.



Floating pennywort on Langmead Level

The four high-risk species that are the greatest threat to water management in Somerset are: **Floating pennywort, Water primrose, Zebra mussel and Parrots feather.**

We can all play a part in slowing the spread of invasive species in Somerset. The most important, first step, is to try to avoid the unintentional spread of invasive species to new locations on machinery, equipment or clothing. Using a simple "Check Clean and Dry" protocol, when moving between watercourses, will dramatically reduce the risk of spreading invasive species. Awareness of the problem and monitoring for the appearance of spreading invasive species is also essential. It is a lot easier to eradicate new outbreaks when they're spotted quickly. And finally, please do not intentionally translocate or release any plant material from garden ponds into the countryside.

The Drainage Boards are also taking action by adopting a new Biosecurity Policy for all watercourse maintenance operations and preparing an action plan for Floating pennywort control in Somerset with the Environment Agency and Natural England. Floating pennywort is currently our biggest risk and steps are being taken to limit spread and completely remove it from some established locations. Eradication of pennywort is possible, but it will take time and require sustained effort. The involvement of local communities and landowners will also be essential in helping to slow the spread of floating pennywort on the Somerset Levels.

Information on the four high-risk species is provided on the reverse of this leaflet. Please contact Philip Brewin (pbrewin@somersetdbs.co.uk) at the SDBC office for more information or to report any possible sightings of these species in your local watercourses.

The top four high-risk aquatic invasive species in Somerset

<p>Floating pennywort</p> <p>Problem: Causes a range of problems including choking drainage systems and outcompeting native wildlife.</p> <p>Known locations: Langmead Level, Bleadon, Northmoor, Weston-super-Mare, River Tone, Blind Yeo and Portbury Ditch.</p> <p>Control: Difficult to control due to rapid growth and ability to spread quickly and overwinter as small fragments. Regular mechanical removal will help prevent complete dominance and reduce water management impacts. Any cut material must be removed from the water immediately. Hand-pulling and spot spraying, with approved herbicides, can also be effective for small infestations.</p> 	<p>Water primrose</p> <p>Problem: Can have a devastating effect on aquatic habitats and result in serious impacts on water management. Rampant growth outcompetes native species and clogs waterways. Spread primarily by stem fragments but also by seeds. In the UK, it is a Rapid Response species, meaning all known sites are targeted for immediate control.</p> <p>Known locations: Pawlett Hams and Dunwear Ponds in Bridgwater.</p> <p>Control: Almost impossible to eradicate. Spraying with approved herbicides and careful mechanical removal can help reduce water management impacts by weakening the plant and making it grow more slowly.</p> 
<p>Zebra mussel</p> <p>Problem: Zebra mussel are fingernail-sized mollusc that have a distinctive dark, zig-zagged, stripes on the shell. They can block culverts and outcompete native wildlife. They are mostly spread through recreational boating and angling, when the mussels attach themselves to equipment.</p> <p>Known locations: Huntspill and Cripps Rivers.</p> <p>Control: Almost impossible to eradicate. The main aim of control is containment and avoidance of spread. Using 'Check, Clean & Dry' is most effective and, when working in known locations, cleaning machinery and equipment with hot water is essential.</p> 	<p>Parrots feather</p> <p>Problem: Easily spread from small stem fragments and vigorous growth enables it to dominate. Can choke watercourses and outcompete native wildlife. Spreading is assisted by warmer winters, which allow more of the plant to survive into the following year.</p> <p>Known locations: Aller Moor, Westhay Moor, and Berrow.</p> <p>Control: Can be eradicated by repeated mechanical removal and hand-pulling of fragments. Spraying with approved herbicides can also help, but this is usually unnecessary if infestations are small and treated quickly.</p> 

Phil Brewin
Admin · 26 May · 🌐

BE PLANT WISE! There I was, surveying ditches around Westonzoiland for invasive plants - we've had a few new outbreaks recently - when I saw a small van pull up and two ladies got out a large bucket and tipped the contents into the ditch. I rushed over and introduced myself and said who I work for and asked what they were doing. I was told it was only silt from their wildlife pond and they were looking for some snails. I explained, as calmly as possible, why I had a serious problem with this and showed them a nearby clump of floating pennywort that, in all likelihood, got there by this type of thoughtless behaviour. They were clearly concerned and left quickly, without their snails. I pulled out what they had dumped, which included an oriental lily. This is just crazy and so irresponsible. Invasive species damage our aquatic wildlife and habitats and can be very expensive to deal with once they've been released to the environment. If you have a pond, please do not translocate anything from the pond into the wild and please raise awareness with your friends of the problems caused by invasive species.



222 19 comments 124 shares

Phil Brewin shared a post
Admin · 15 July · 🌐

The Parrett Drainage Board is taking action to remove Floating pennywort from Park Brook, near Kings Lock, North Newton. Floating Pennywort is a fast growing invasive aquatic plant that we really don't want on the Somerset Levels. Please message me if you find pennywort anywhere else or have any questions?
Fact sheet: <https://hnnsi.org/assets/NNNSI/FP-ID.pdf>



Water Levels - Somerset Levels
15 July · 🌐

Making good progress with our Parrett IDB Floating pennywort control in Park Brook near North Newton. Very little found in today's survey, compared to multiple large rafts in 2019. Need to keep on it for a little longer to make sure it doesn't come back.

54 9 comments 41 shares

Phil Brewin
Admin · 18 August at 11:14 · 🌐

Water primrose - have you seen this non-native water plant? It's now in full bloom, which makes identification much easier. We already have Water primrose at 3 known locations in Somerset and we do not want it anywhere else.
Water primrose, *Ludwigia grandiflora*, was introduced into the UK as an ornamental aquatic plant, and is invading ponds, lakes, wetlands and waterbodies. It is already causing serious damage to waterbodies and wetlands elsewhere in Europe and in Japan. Water primrose forms dense mats which excludes native species, degrades amenity use and may increase flood risk. It is now banned from sale in the UK, but it has been found in a variety of waterbodies, especially, ponds, fisheries and wetlands. The Environment Agency is coordinating the eradication of existing infestations. To date, 44 sites have been found, of which, 16 are believed to have been eradicated. If you find water primrose, report it at <mailto:alert@nonnative@ceh.ac.uk>. More information on identifying water primrose is available on the NNSI website: <http://www.nonnativespecies.org/alerts/index.cfm?id=2>



54 9 comments 41 shares

Water Levels - Somerset Levels
26 August at 17:28 · 🌐

Peak Floating Pennywort growing season - a non-native water plant from South America - it can grow 20cm a day at this time of year and these photos from the River Banwell at Ebdon show just how bad it can get.



2,768 People reached 230 Engagements

Boost post

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Updates on Biocontrol Initiatives for Great Britain

Invasive Species Team, CABI

2nd February 2024

IDB Environment Day

KNOWLEDGE FOR LIFE



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Why can non-native species be invasive.....? ...because they have an unfair advantage

- Arrive in the exotic range without the natural enemies that keep them in check in their native range
 - Those native species which do attack them do not cause enough damage
 - Some of the many co-evolved insects and diseases in the native range may be safely used to control the invasive species in the new introduced range – **Classical Biological Control (CBC)**
 - This approach has been implemented across the globe for over **150 years**
 - International code of conduct, rigorous safety testing, spectacular successes and very few non-target impacts- most predictable
- **2000 releases globally, 224 weeds & 552 agents**
 - **Only 4 intentional releases in Western Europe to date**

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Water fern (*Azolla filiculoides*)

- Native to the subtropical and temperate Americas
- Introduced to the UK in 19th century as an ornamental (and repeatedly since)
- Floating freshwater weed that forms dense mats, colonisation via vegetative propagation; spore production later in the season
- Successful biocontrol in South Africa – weevil *Stenopelmus rufinasus* released in 1997. Azolla no longer poses a threat in SA
- Weevil first identified in Britain in 1921; became naturalised and widespread; considered ordinarily resident (DEFRA)
- CABI mass rears weevils in UK early in the season and ships to wide range of customers to control outbreaks – highly effective agent

KNOWLEDGE FOR LIFE

<https://www.azollacontrol.com/>

 CABI

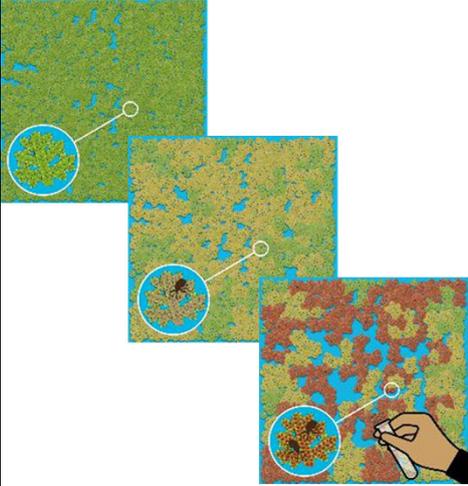
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22



- **Without the weevil** – Azolla would cost £8.4 to 16.9 million to manage annually
- **With naturalised weevil population** – costs reduced to £0.8 to £1.6 million
- **With augmentation programme** – costs reduced to £31.5 to £45.8 thousand

The arrival of *Stenopelmus rufinusus* is estimated to save around £8 - 15 million per year and the augmentation programme saves a further £0.77 - 1.5 million

Augmentation gives a **benefit : cost ratio** in the range of 44 – 88 : 1

KNOWLEDGE FOR LIFE [Pratt et al 2022 CABI Agriculture and Bioscience volume 3: 70](#) 

23

Strategic framework for reducing nutrient pollution to the Somerset Levels and Moors and site restoration

Strategy for reducing the ecological impacts of nutrient pollution in the Somerset Levels and Moors, including actions for IDBs that may be able to mitigate the impacts and reduce the very high levels of nutrient stored within wetland systems.



South Drain, Catcott Broad Drove, Azolla bloom during summer drought 2022

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Adult *L. elongatus* (0.5cm)

Eggs (exposed inset)

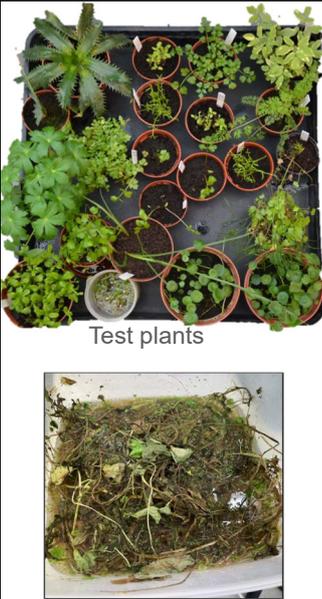
Larva mining the stem and pupa inset

Floating pennywort - weevil *Listronotus elongatus*

- Native to South America and collected in Argentina and Paraguay
- Adults feed on upper leaf surface
- Eggs (2-20) are inserted in the lower part of the petiole and larvae mine the stems and pupate in stolon
- Egg to Adult ~ 36-40 days @ 24°C (4 instars)
- Larval stage is the most impactful and significantly reduce biomass, causes collapse
- Adults live 3-4 months
- Significant impact on mats in native range

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Test plants

Damaged pennywort in the lab

Project timeline

- 2013-2019 host specificity testing of 74 spp. completed with weevils from Argentina and Paraguay
- Feeding damage, oviposition and development is significantly higher on *H. ranunculoides* than on non target plants and only FP host can sustain population
- Climatic models suggested *L. elongatus* could achieve 1 or 2 generations per year under UK climate conditions and establishment possible
- Pest Risk Assessment submitted to UK regulators and peer reviewed (Defra's non native species licencing authority, ACRE, JNCC, devolved administrations) followed by stakeholder and public consultation-year long process
- Ministerial approval in September 2021

DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS

LICENCE UNDER SECTION 16 OF THE WILDLIFE AND COUNTRYSIDE ACT 1981
FOR THE RELEASE OF *Listronotus elongatus*

NN-BCA-21-16 RELEASER'S LICENCE

The Secretary of State, in exercise of the powers conferred on them by section 16(4)(C) and section 16(5) of the Wildlife and Countryside Act 1981 ("the 1981 Act") and of all other powers enabling them in that behalf, hereby grants the following licence –

1. This licence applies in respect of the animal species known as *Listronotus elongatus* (Insecta; Coleoptera; Curculionidae), in this licence referred to as "*L. elongatus*", which have been sourced from the Provinces of Buenos Aires or Corrientes, Argentina or the Department of Misiones, Paraguay.

KNOWLEDGE FOR LIFE

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Overwintering field trials
Pevensey Levels, E. Sussex
(above) and
River Colne, Bucks (below)



Overwintering studies

Experimental study in polytunnel from Dec-May

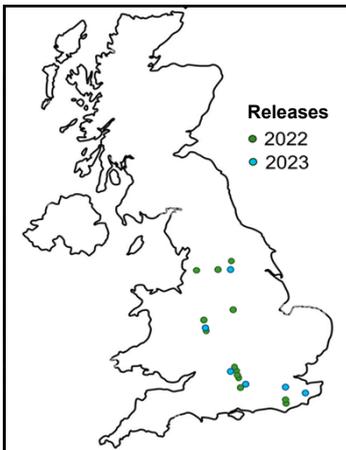
- Ten replicates of three treatments (1) clean pennywort with five mating pairs (2) egged/larval material and (3) control (no adults)
- Fortnightly checks: wet weight in all three treatments; adult survival, feeding activity, location and behaviour at the time of survey, oviposition and larval development
- Very encouraging results - feeding damage showed a significant increase over time, average biomass in egged/larval boxes was significantly reduced compared to other treatments and onset of warmer temperatures in the polytunnel associated with increased adult activity, mating and egg-laying and emergence of new generations of adults

- Field releases in the River Colne (Nov 2021) and Pevensey Levels (March 2022)



Larval box vs control box

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Floating pennywort - weevil, *Listronotus elongatus*

- Leaf feeding /stem mining weevil approved for release in England in Sept 2021. First field releases made in Nov 2021 (Uxbridge)
- **Releases** at 19 sites to date (13 sites in 2022, 6 new in 2023), with top ups at 11 sites in 2023
- **Monitoring** for weevil survival, development, spread and impact, as well as examination of non-targets plants
- **In 2023:** Overwintering confirmed at Pevensey Levels (Sussex), in the Colne Valley (2 years running) and in the West Midlands
- **Status:** Weevils recorded developing at all release sites in 2023, with greatest impact and spread (>150m) associated with more southerly sites and/or earlier releases
- Some **sites compromised** by mat movement through high flows and/or accidental removal - weevil status unknown at these sites and tbc
- **Collaborations** with local groups, Angling Trust, British Canoeing, EA and field managers have been essential for year-round material collection and site selection/prioritisation
- **2024:** Monitoring and releases to be continued + scoping of new potential sites (~£15K /site for multiple releases and monitoring)
- Feasibility of biocontrol in **Netherlands** - research and risk assessment to be prepared

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D. Djedjour



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