



# Classical Biological Control of Weeds in Europe – The GB experience

Dick Shaw

# Historically Europe has been a source of weeds.....& agents



Weed BCA release history after Cock *et al* (2010)

Country	Recipient	Source
Austria	0	52
Finland	0	5
France	0 (1)	120
Germany	0	52
Greece	0	33
Hungary	0	5
Italy	0	72
Portugal	0	24
Serbia	0	1
Spain	0	16
Sweden	0	3
UK	2 (inc. rust)	41
<b>Total</b>	<b>1</b>	<b>425</b>

Doesn't include Switzerland,  
Former Yugoslavia  
Turkey, Romania

Source number closer to 500  
N.B *Haltica carduorum*  
(Baker *et al* 1972)



*Aphalara itadori* Japanese knotweed psyllid,  
released in 2010

# EU opportunities

Sheppard, Shaw & Sforza (2006) *Weed Research*

Gassmann et al. (2006) *Hydrobiologia*



Species	Form	Origin	EU distribution	Genus native?	Conflict	BC history
<i>Buddleja davidii</i>	Ph	China	Temperate	No <sup>b</sup>	O	Yes
<i>Fallopia japonica</i>	Ge	Japan	Temperate	Yes	No	Yes
<i>Acacia dealbata</i>	Ph	Australia	Mediterranean	No <sup>b</sup>	O	Yes <sup>d</sup>
<i>Azolla filiculoides</i>	Hy	N America	Temp/Med	No <sup>b</sup>	No	Yes <sup>d</sup>
<i>Ailanthus altissima</i>	Ph	China	Temp/Med	No <sup>b</sup>	No	Yes
<i>Impatiens glandulifera</i>	He	India	Temperate	Yes	O	No
<i>Rhododendron ponticum</i>	Ph	S Europe	Temp/Med	Yes	O	Yes
<i>Robinia pseudoacacia</i>	Ph	N America	Temperate	No	F	No
<i>Senecio inaequidens</i>	He	S Africa	Temp/Med	Yes	No	Yes
<i>Ambrosia artemisiifolia</i>	Th	C America	Temp/Med	Yes	No	Yes <sup>d</sup>
<i>Carpobrotus edulis</i>	Ch	S Africa	Temp/Med	No <sup>b</sup>	No	No
<i>Heracleum mantegazzianum</i>	He	W Asia	Temperate	Yes	No	Yes
<i>Solanum elaeagnifolium</i>	He	S America	Tem/Med	Yes	No	Yes <sup>d</sup>
<i>Baccharis halimifolia</i>	Ph	N America	Mediterranean	No	No	Yes <sup>d</sup>
<i>Hydrocotyle ranunculoides</i>	Hy	N America	Temp/Med	Yes	No	Yes
<i>Ludwigia peploides</i>	He	S America	Temp/Med	Yes	No	Yes
<i>Crassula helmsii</i>	Hy	Australasia	Temperate	Yes	No	No
<i>Elodea canadensis</i>	Hy	N America	Temperate	No	No	No
<i>Myriophyllum aquaticum</i>	Hy	S America	Temp/Med	Yes	No	Yes
<i>Solidago canadensis</i>	Ge	N America	Temperate	Yes	No	No



# Bracken biocontrol in 1980s



2 moths safety tested

*Conservula cinisigna* and *Panotima*  
nr. *Angularis*

Highly specific and damaging with  
wide climatic niche

**BUT**

Bracken is a native species and  
provides copse-like habitat to rare  
native lepidoptera



**WRONG FIRST TARGET FOR EU**

## *Stenopelmus* vs *Azolla filiculoides*



- Rare example of inundative classical approach
- OK for use in England and Wales but Scotland would need license after WANE Act
- NL, Fr, Be all need to use “native” pops of exotic *Stenopelmus*

# Japanese knotweed



PRIVATE ROAD

NO PARKING

NO THROUGH



er and  
it the  
rch



# ALIEN INVASION



# WANTED:

## CREEPY CRAWLY FOR KNOTTY PROBLEM

Above, Dick demonstrates the strength of

behind the government's decision to identify Japanese knotweed as one

"If the fungi or insect we are testing doesn't attack members of the same

on th  
vari  
O  
step  
to be  
Unde  
also b  
agents n  
In 20  
way and  
stem-bo  
and a lea  
fungus -  
ation. Tw



# Face it suckers, the knotweed is only the start

THESE days, it's hard to find anyone who has a good word to say special instructions to destroy the Japanese knotweed. The insect is known as The

# PUBLIC ENEMY No 1

This is a warning — some stalwarts of the suburban British garden have escaped into the wild and they are wre

# Super grass



PHOTO: SWANSEA CITY COUNCIL. The plant, angling knotweed officer Sean Hathaway, covers on Swansea Marina. Below, how it might the town  
THE WEED THAT IS EATING SWANSEA

## Killing the green monster

Once the super plant Japanese knotweed takes hold, there's little to stop it. But, ... or magi weeds traint





*Aphalara itadori*



Pest Risk Analysis Necessary to free it from PHQL	W&C Act application for release Necessary to release an animal
Based on Eppo template	Brand new version for Wales & England
Internal Govt iterative review	Internal Govt iterative review
	ACRE Committee review
External Peer review	External Peer review
Public consultation (3 months)	Public consultation (3 months)
Chief Scientist advice	Chief Scientist advice
Ministerial decision for Sec. of State	Ministerial decision for Sec. of State
Release from PH quarantine licence	W&C license to release

EU Standing Committee on Plant Health Informed along the way

# Biological control of Japanese knotweed



[www.cabi.org/isc](http://www.cabi.org/isc).

## *Fallopia japonica*

- 12 year research programme
- Consortium funded
- test plant list >90spp
- Host specific psyllid- *Aphalara itadori*
- First phase field trials conducted in 2010
- 5 year monitoring and contingency programme
  - extended safety test with sub-optimal sites
- regulatory pathway for UK/EU proven
- Parallel work on leafspot fungus ongoing
- Not working yet but proposals for more appropriate release sites drafted for UK Regulator consideration

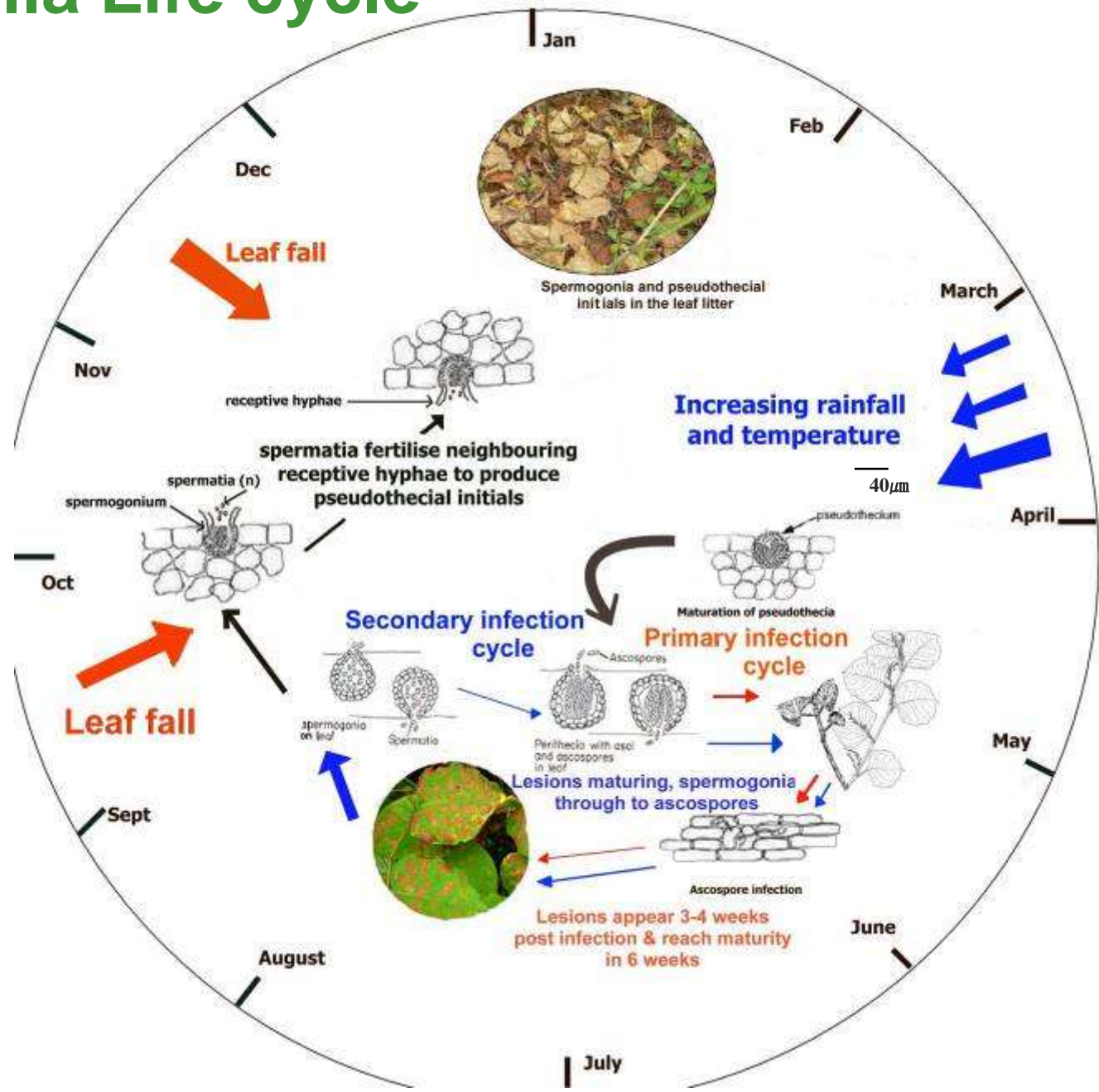


## Latest news

- Psyllid not working YET
- but releases at more appropriate riparian release sites taking place this year thanks to UK regulator
- New stock from Japan undergoing comparative trials in field cages (old stock 120 generations in Japanese summer)
- Plan to release at many more sites, perhaps with new stock
- Netherlands PRA is public on the NVWA website <http://www.nvwa.nl/actueel/nieuws/nieuwsbericht/2062681>
- Canada inching closer to release
- USA application in the bottleneck with all the rest
- Proof of concept for mycoherbicide – subject to funding

# Mycosphaerella Life cycle

- Microcyclic or reduced life cycle - only functional spores are spermatia and ascospores
- Primary source of infection is ascospores, no anamorph or macroconidial stage found
- Mycelial infection found to be comparable in lab
- Potential mycoherbicide - Patent applied for



**These are “organisms likely to be injurious to plants in the EU” and therefore it is a Plant Health Issue**

# Himalayan balsam



# Biological control of Himalayan balsam



[www.cabi.org/isc](http://www.cabi.org/isc)

## *Impatiens glandulifera*



- Only one *Impatiens* spp. native to Europe
- Started in 2006 (8 years+)
- Water Framework Directive project funded by Defra /UK Government (2010-2015)
- Autoecious rust, *Puccinia komarovii* **var. glanduliferae** (renamed as part of the project based on host range data)
- First pathogen release against a weed in Europe
- Opportunities for piggy-backing by other EU MS

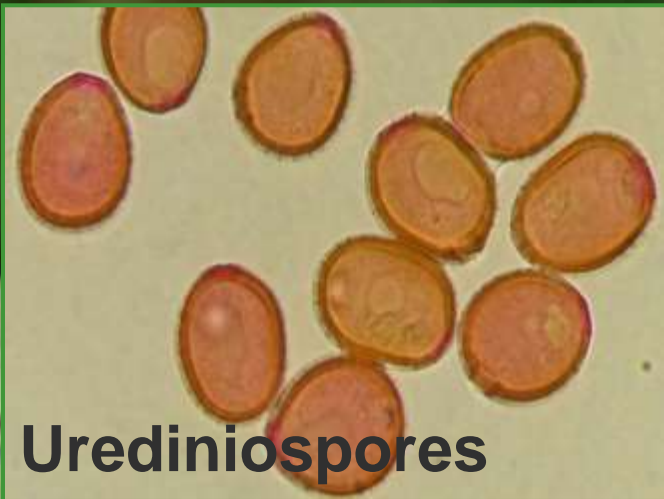




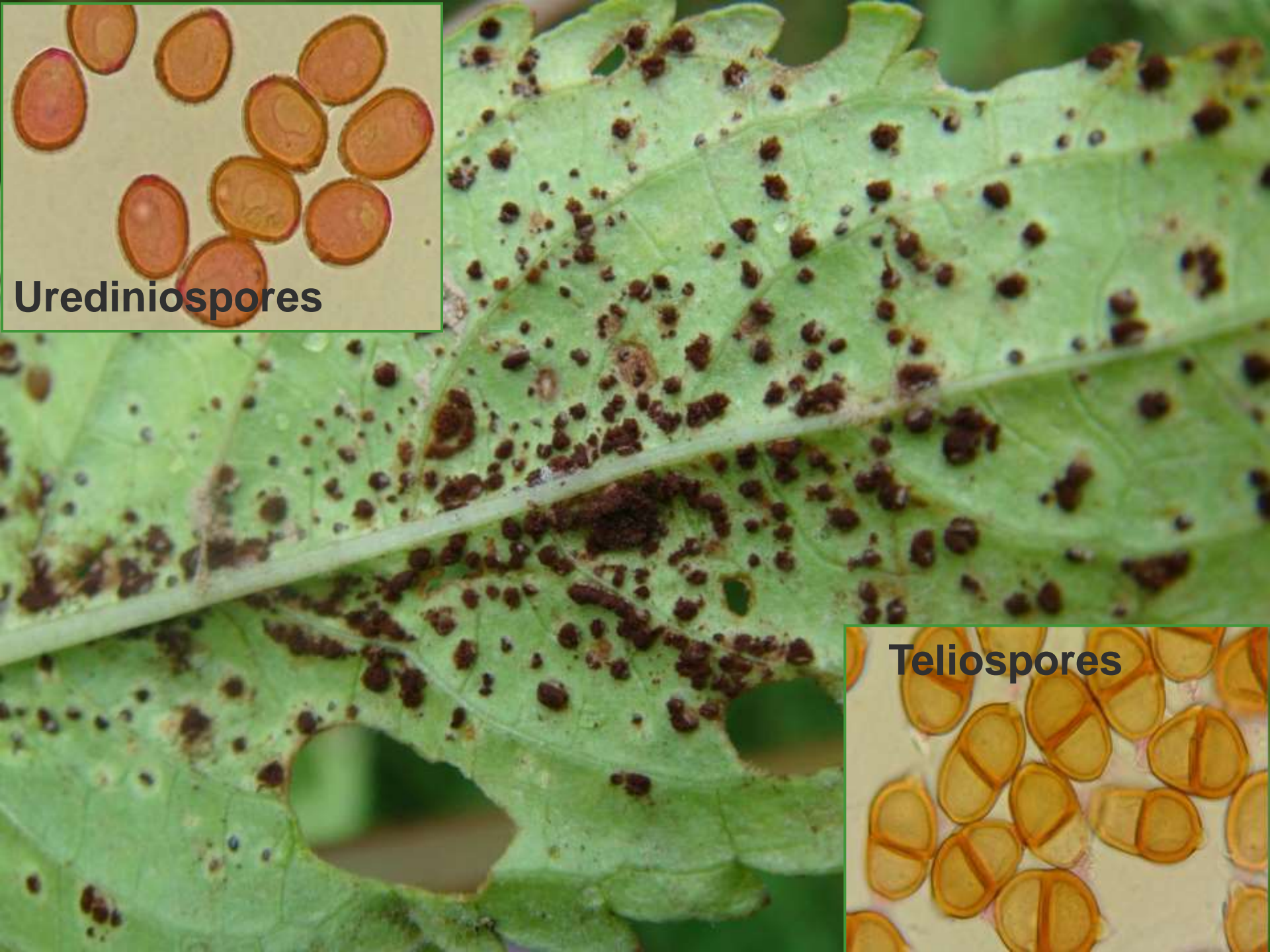


# Himalayan balsam seedling infected with aecia of *P. komarovii* var. *glanduliferae* - India





**Urediniospores**



**Teliospores**

# Approval of the PRA



Rob Tanner releasing the rust

- PRA went to UK National authority in 2013
- Team invited to SCOPH 26th June 2014
- More information required
- PRA revised to cover the whole of Europe
- Accepted by SCOPH on 18th July, without any EFSA involvement
- Ministerial approval secured on July 2014
- Released from the PH quarantine license
- Release into the field via infected plants 26th August 2014

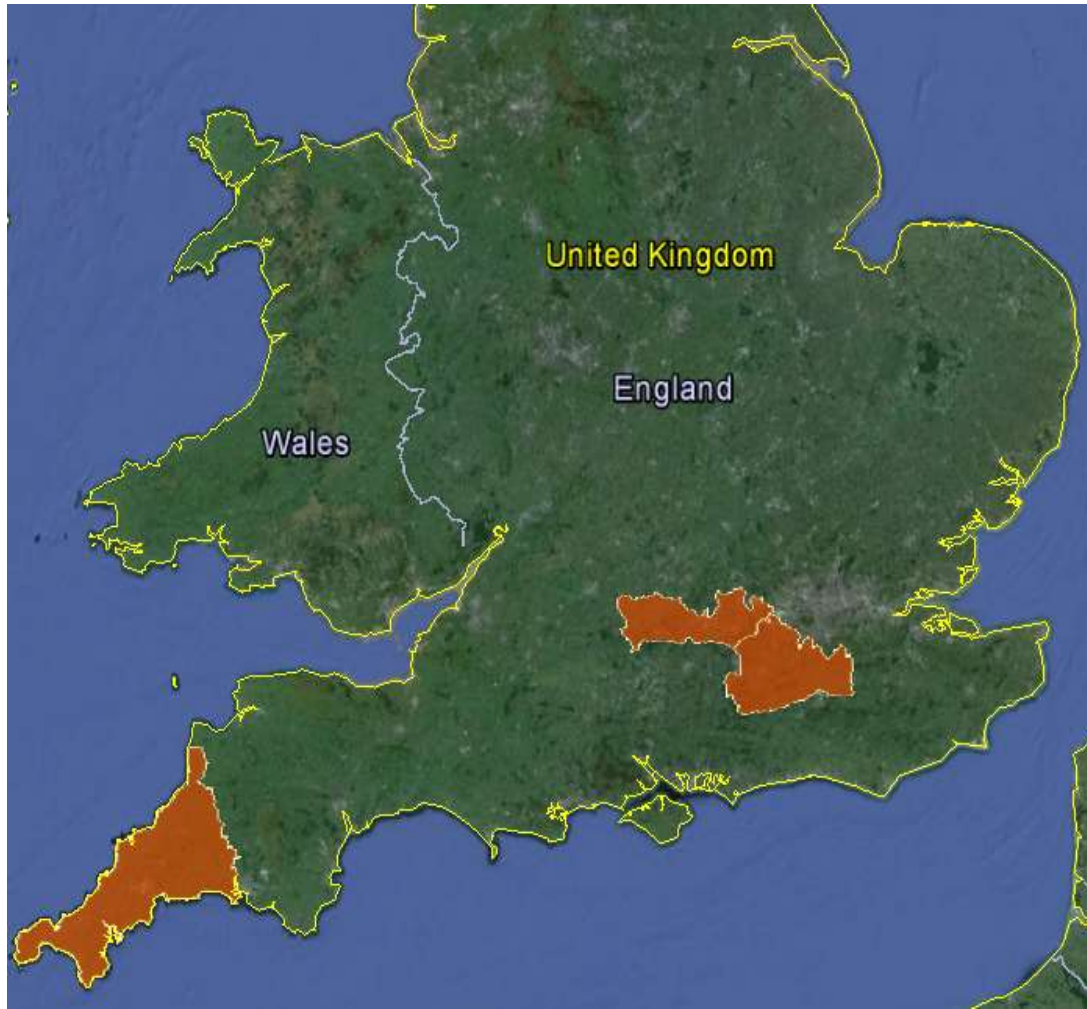
## Why is 1107/2009 not designed for classical weed biocontrol?

The Regulation for the placing of Plant Protection Products on the Market was never designed with CBC in mind

- No product
- No formulation
- No sale
- No user
- No label, no claims, no safety implications
- No placing on the market

In my opinion **only formulated products placed on the market** should be subject to PPP regulation.

# Year 1 sites: 2014



- Initial releases made following UK Ministerial approval and agreement from EC Standing Committee on Plant Health
- Natural England license needed for the plant!!
- Rust released at 3 sites late in the growing season:
  - Cornwall
  - Surrey
  - Berkshire
- Rust found to spread onto field plants and produce overwintering spore stage
- No unwanted effects

# Year 2 sites: 2015



- 19 additional release sites identified, most now with funding secured:
  - Surrey (+1 site)
  - Cornwall (+4 sites)
  - Wales (4 sites)
  - Kent (1 site)
  - Yorkshire (5 sites)
  - Tweed (4 sites)
- Paired sites: release and non-release sites (control sites) with similar habitats
- Enables us to study rust impact over time

# Rust overwinters in the field and infects seedling in the Spring!



- A Himalayan balsam stems showing early signs of warping and reddening due to *Puccinia komarovii* var. *glanduliferae* infection
- B Infected seedling elongating more than the non-infected seedlings, taking the spores above the canopy for release into air currents
- C Arrows show spermatogonia visible on stem surface, where cross fertilisation occurs to produce the next stage, aecia.



# Biocontrol of Floating pennywort



## *Hydrocotyle ranunculoides*



- Part of EU WFD project group funded by Defra
- Only 1 native *Hydrocotyle* sp. in Europe
- *Listronotus elongatus* weevil is most promising agent,
- Draft PRA should be submitted in 2016
- Other potential agents include a fly, *Eugaurax* sp. ex Argentina but exports challenged by ABS
- Opportunities for EU piggy-backing, esp. Netherlands, France and Belgium, Germany



# Biological control of Australian swamp stone crop



## *Crassula helmsii*



- Three European congeneric spp.
- Biocontrol programme began in 2010, one of the EU WFD projects
- Host range testing of 3 potential agents ongoing
  - *Hydrellia perplexa*, *Colletotrichum* sp. and Eriophyid mite (*Aculus* sp.)
- Mite is most promising
- Piggy-backing option



# Future targets

## *Ludwigia* spp Creeping water primrose



- Native to South America
- Complex taxonomy
- On-going eradication in UK, impossible in other regions, particularly France
- Very high management costs and ecological damage
- Known natural enemies thanks to previous work by FuEDEI in Argentina
- Joint Concept note produce by UK, France and Argentina



Ludwigia in a canal in France



# Conclusions

- It is possible to do biocontrol of weeds in the EU
- GB has been an early (EU) adopter of this very old technology
- We have released
  - ordinarily resident exotic insect against plant
  - exotic Insect against plant
  - fungus against plant
- We hope to release
  - A mite against plant
  - mycoherbicide
- It is a plant health issue
- It's not easy!



Westcountry  
Rivers  
Trust



www.cabi.org  
KNOWLEDGE FOR LIFE



Thank you

www.cabi.org  
KNOWLEDGE FOR LIFE