PROTECTING NORTH AMERICA'S WETLANDS FROM COMMON REED

Locations	Canada, United States
Dates	01/01/1998 - Ongoing

Summary

Common reed is one of the most widespread plant species in the world. It is invasive in North America where it forms large monocultures in wetlands and along riverbanks and lakesides, which reduce native biodiversity. One reason for its dominance is an absence of natural enemies to control its vigour and spread. CABI is studying several stem-mining moths not currently present in North America to see whether they would be safe and effective biological control agents if introduced.

The problem

Although common reed (*Phragmites australis*) beds in Europe are often valuable and endangered ecosystems, elsewhere the plant can be invasive. In the last decades, common reed has spread dramatically in North America, displacing native plant species and reducing biodiversity in the process.

Genetically, common reed is extremely diverse. Studies at Yale University in the USA examined variations in the genetic structure of common reed samples from around the world. These showed that the plant spreading and displacing native common reed in North America is a population that has been introduced from Europe. Native North American common reed has also been recognized as distinct from reed in other parts of the world. Two North American subspecies were identified: *P. australis* subsp*. americanus* and one found only from the Gulf Coast, *P. australis* subsp*. berlandieri*.

Current control measures are time- or cost-intensive and do not provide a sustainable solution. Biological control by introducing specific natural enemies from the invasive reed's area of origin in Europe is a promising alternative. Given the close relationship between the invasive and native reeds in North America, any introduced biological control agent would need to be very specific and at least prefer, or develop better on, the introduced, invasive common reed compared with the native subspecies.

What we are doing

In 1998, at the invitation of Bernd Blossey (Cornell University, USA) and Richard Casagrande (University of Rhode Island, USA), CABI began investigating the potential for biological control of common reed.

The specificity of a natural enemy reflects how closely its evolution has been linked to that of its host (how coevolved they are). Surveying in the area of origin of a target weed is a good way of finding coevolved natural enemies.

During the first two years of the project, we conducted surveys at 15 sites in Europe to collect natural enemies of common reed in the area of origin of the reed that is invasive in North America. We identified eight shoot- or rhizome-mining moths and one chloropid shoot fly as priority candidates for biological control.

We selected four shoot-mining noctuid moths (*Archanara geminipuncta, A. dissoluta, A. neurica* and *Arenostola phragmitidis)* and the shoot fly (*Platycephala planifrons*) for further studies on life history and impact, which formed part of a PhD study by Patrick Häfliger. The aim of the studies was to assess whether these species could reduce the impact of the invasive reed in North America without damaging native reed.

Results so far

Two shoot-mining moths are being concentrated on – *Lenisa (Archanara) geminipuncta* and *Archanara neurica*. Results from tests showed that both species can develop on the native North American subspecies of reed, but not on any other of the 41 species tested.

Our finding that both insects can develop on the two native subspecies does not rule them out as potential biocontrol agents – laboratory tests and especially no-choice tests often provide very conservative results. Therefore, we exposed plants to female moths in a natural setting in Switzerland to test their egg-laying behaviour (open-field oviposition tests). The introduced invasive reed was much preferred. A further safeguard, at least for *P. australis* subsp*. americanus*, lies in its life history. Unlike the introduced reed, this native subspecies sheds most of its leaf sheaths in autumn. So, if eggs were laid on the native reed, they would have no protection from winter conditions and would suffer high mortality. We do not expect the second native subspecies, *P. australis* subsp*. berlandieri*, to be vulnerable since neither of the two moths is likely to occur as far south as the plant in the U.S.

We are testing the rearing of both moth species on an artificial diet. For *A. neurica,* this has worked well, while no *L. geminipuncta* were able to complete development solely on an artificial diet so far. In 2021, we improved the rearing success of *L. geminipuncta* considerably by rearing early instar larvae on stems

	of common reed, and late instar larvae on an artificial diet. A field release of *Lenisa geminipuncta* and *A. neurica* was accepted in 2019 for Canada and recommended by the Technical Advisory Group for Biological Control Agents of Weeds in the U.S. In 2020, the first releases of pupae of *A. neurica* took place in Canada, and since 2021, we have been shipping thousands of eggs and hundreds of pupae every year to support ongoing releases in Canada. The monitoring and establishment look very promising so far.
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