(Botryosphaeriales), *Myrothecium* (Hypocreales), *Passalora* (Capnodiales) – two species; *Pseudocercospora* (Capnodiales) – three species; *Pseudocercosporella* (Capnodiales), *Phoma* (Pleosporales), *Ramularia* (Capnodiales)); (b) anthracnose (*Colletotrichum* (Sordariales) – two species); (c) black mildew (*Meliola herteri* (Meliolales)); and (d) rust (*Uropyxis rickiana* (Pucciniales), *Prospodium* (Pucciniales) – two species). Several of the leaf spot fungi and one anthracnose fungus cause severe diseases on cat's claw and may prove useful for biocontrol, but particular emphasis is presently being given to the rust-causing species *U. rickiana* as this forms damaging galls on leaves, fruits and stems and has already been proven to infect plants grown from seeds originating from Australia. Results of ongoing inoculation studies are documented. Despite a significant fungal diversity having been unravelled, it is expected that more intensive surveys will extend this list even further.

Candidate agents from South Africa for the biological control of fireweed, *Senecio madagascariensis*, in Australia

D. Egli* and T. Olckers

School of Life Sciences, University of KwaZulu-Natal, Private Bag X01, Scottsville 3209, South Africa. daniellaegli@hotmail.com

Fireweed, *Senecio madagascariensis* (Asteraceae), native to southern Africa and Madagascar, has become invasive in Australia, Hawaii (USA), South America and Japan where it invades pastures, resulting in decreased productivity and poisoning of livestock. Following genetic evidence that Australian and Hawaiian *S. madagascariensis* were closely matched with plants from KwaZulu-Natal, South Africa, efforts to locate suitable biological control agents are now focussed in this region. This study was thus aimed at identifying and quantifying the herbivorous insect community associated with *S. madagascariensis* in KwaZulu-Natal. Twenty-one sites were sampled to determine the relative abundance and distribution of these herbivores. Seasonal surveys were also carried out at selected sites in order to determine the insects' seasonal abundance and potential to inflict sustained damage. Some 64 insect herbivore species were found on *S. madagascariensis*, with Diptera, Coleoptera, Hemiptera and Lepidoptera comprising the most common orders. The most frequently encountered and abundant species included eight capitulum-feeders, 14 stem-borers and two external foliage feeders. The insect herbivore fauna on *S. madagascariensis* is similar, in relation to taxa (families) and feeding guilds, to those of other plants in the Asteraceae, some of which have been targets of successful biological control programs. Given these precedents in weed biocontrol, there are thus several potential agents for *S. madagascariensis*. The most promising agents are two capitulum-feeding species (Lepidoptera: Pyralidae and Diptera: Tephritidae), four stem-boring species (Diptera: Agromyzidae and Tephritidae, Coleoptera: Curculionidae, Lepidoptera: Tortricidae) and one defoliating, and possibly root-feeding, species (Coleoptera: Chrysomelidae: Alticinae). While Hawaii has no native *Senecio* species, Australia has a diverse native *Senecio* flora and will thus have stringent host-specificity requirements. Surveys of additional South African *Senecio* species as well as laboratory host-range tests are necessary to determine which species would be best suited for release in Australia.

Flowering rush: a new biocontrol project for North America

Jennifer E. Andreas*[1], Hariet L. Hinz[2], Patrick Häfliger[2], Peter Rice[3], Jenifer Parsons[4] and Greg Haubrich[5]

[1]*Washington State University, Puyallup Research and Extension Center, 2606 W Pioneer, Puyallup, WA 98371, USA. jandreas@wsu.edu*
[2]*CABI Switzerland, Delémont, Switzerland.*
[3]*University of Montana, Missoula MT, USA.*
[4]*Washington Department of Ecology, Yakima WA, USA.*
[5]*Washington Department of Agriculture, Yakima WA, USA.*

Flowering rush, *Butomus umbellatus* (Butomaceae), is an aggressive invasive plant that rapidly colonizes freshwater aquatic systems. It is becoming an increasing concern in many North American states and provinces and is poised to become a substantial problem in several major waterways, despite ongoing eradication efforts. Although appropriate chemical and mechanical control methods continue to be explored, they have thus far been relatively ineffective, creating concerns that the flowering rush populations will continue to expand and spread without restriction. In looking for possible control methods, we are taking a proactive approach by pursuing potential biological weed control agents and have formed the 'Flowering Rush Biocontrol Consortium' to coordinate the project. Flowering rush is an excellent candidate for biocontrol because it is the sole genus and species in the family Butomaceae, which may increase the likelihood of finding a host-specific insect. Emphasis will be placed on finding rhizome-feeding insects since flowering rush populations in the western USA are predominantly the vegetative

reproducing triploid cytotype. In 2013, a preliminary test-plant list was developed and foreign exploration began in Europe. The literature indicates that two fungal pathogens and 18 insect species are known to utilize flowering rush. Four of these species are recorded as monophagous and include two beetles, *Bagous nodulosus* and *Bagous validus* (Coleoptera: Curculionidae), and two flies, *Metopomyza ornata* and *Hydrellia concolor* (both Diptera: Agromyzidae). Field surveys in Germany and the Czech and Slovak Republics resulted in the collection of several insect species, including the leaf- and rhizome-mining beetle, *B. nodulosus*. In 2014, surveys will be conducted to find additional potential agents and host-specificity testing will begin using *B. nodulosus*.

Natural enemies of Mexican sunflower, *Tithonia diversifolia*, in Mexico and their potential as biological control agents in South Africa

Khethani V. Mawela* and David O. Simelane

Agricultural Research Council-Plant Protection Research Institute, Private Bag X134, Queenswood 0121, South Africa.
mawelak@arc.agric.za

Mexican sunflower, *Tithonia diversifolia* (Asteraceae), native to Mexico, has become invasive in tropical and subtropical countries including South Africa, hence the initiation, in 2007, of a biological control programme against the weed in South Africa. Between the years 2007 and 2012, a number of surveys have been conducted in Mexico with the aim of sourcing natural enemies of *T. diversifolia*. As a result, eight phytophagous insect taxa were recorded and collected at different localities and provinces in Mexico on *T. diversifolia*. The natural enemy complex of *T. diversifolia* comprised: a leaf-feeding butterfly, *Chlosyne* species (Lepidoptera: Nymphalidae); a shoot-boring moth (Lepidoptera: Totricidae); a stem-boring beetle, *Canidia* species (Coleoptera: Cerambycidae); two species of stem-boring weevils, *Rhodobaenus* species and *Lixus* species (Coleoptera: Curculionidae); an unidentified leaf-mining moth (Lepidoptera: Gracillaridae); a leaf-feeding beetle, *Physonota maculiventris* (Coleoptera: Chrysomelidae); and an unidentified flower-feeding moth (Lepidoptera). The most damaging natural enemies in the field were the shoot-boring moth, the leaf-feeding butterfly and the leaf-defoliating beetle *P. maculiventris*. The damage caused by the other potential agents ranged from negligible to moderate. Although the butterfly, *Chlosyne* species, and the unidentified shoot-boring moth were highly abundant, damaging and widely distributed in Mexico, host-specificity tests conducted on these insect species indicated that they had wide host ranges, often attacking some varieties of cultivated sunflower *Helianthus annuus* (Asteraceae). *Physonota maculiventris* was highly damaging, although its distribution was mainly confined to areas near Comitan city in Mexico. However, pre-release studies on *P. maculiventris* have shown that the beetle is suitable for release in South Africa for biological control of *T. diversifolia*.

Biological control of an Australia weed in the United Kingdom: the host specificity and biology of natural enemies of *Crassula helmsii*

Sonal Varia*[1], Marion Seier[1], Suzy Wood[1], Richard Shaw[1], Robin Adair[2], John Ireson[3], and Richard Holloway[3]

[1]*CABI, Bakeham Lane, Egham, Surrey, TW20 9TY, United Kingdom. s.varia@cabi.org*
[2]*Australis Biological, PO Box 151, Bittern, Victoria, Australia.*
[3]*Tasmanian Institute of Agriculture, New Town Research Laboratories, 13 St John's Avenue, New Town, Tasmania 7008, Australia.*

Crassula helmsii (Crassulaceae) or Australian swamp stonecrop is a semi-aquatic species that was introduced from Australia to the United Kingdom (UK), in the 1900s, as an oxygenator for garden ponds. Since then it has spread through Western Europe, smothering native plants and altering vulnerable habitats of native species. The conventional control of this invasive plant presents problems due to its high tolerance to extreme environmental conditions and its ability to grow in terrestrial, emergent and submerged forms. The recent introduction of the 'European Water Framework Directive' requires European waterways to reach a 'good ecological status'. The biological control of invasive plants such as *C. helmsii* has been funded by the UK government to help achieve these aims. Exploratory surveys in Australia have revealed previously undocumented natural enemies with potential as biological control agents for *C. helmsii*: (i) a stem-mining fly, *Hydrellia perplexa* (Diptera: Agromyzidae), which damages both submerged and emergent vegetation is currently undergoing host-specificity testing in quarantine; and (ii) a promising eriophyid mite (*Aculus* species) (Acari: Eriphyiidae) which reduces the vigour of *C. helmsii* by restricting the growth of secondary shoots and potentially limiting the terrestrial spread of this weed. The biology of *Aculus* species is being investigated in quarantine and in the native range of Australia. Several interesting plant pathogens are also