number of hosts per patch primarily by changes in movement rather than by changes in reproductive rate. Variation in the beetle:host ratio, among patches differing in the number of hosts, suggests that every host within the population may not have the same risk of attack. We next evaluated the consequences of variation in the number of beetles per host for rates-of-change in beetle- and host-populations. The *per capita* rate of change of the beetle population was slightly lower in 1-plant patches, but constant across other levels of host density in 4-, 8- and 16-plant patches. The lower growth-rate of beetle populations in single-plant patches was associated with a male bias (1.4:1) in sex ratio. The beetle population depressed plant-yield by a constant proportion across all levels of host-density indicating there was no density dependence in the size of the beetle effect. We draw the following conclusions about the pattern of beetle distribution, its causes, and its consequences for insect- and plant-population dynamics. Spatial heterogeneity and insect dispersal led to variation among patches in the number of beetles per host, but the magnitude of variation was not sufficent to significantly aggregate risk to hosts, either by imposing density dependence in positive effects of host-on-beetle populations, or by imposing density dependence in negative effects of beetle-on-host populations. Thus strong and stable supression of ragwort does not arise as a result of spatial heterogeneity and searching behaviour within fields, where plant-insect interactions spiral down to local extinction. An alternative possibility is that regulation occurs on more global scales through spatial heterogeneity and migratory movement between fields in a landscape. Density dependence does appear to be operating within the local host-population; in a patchy world, resources can often limit plant population growth, even at very low average densities characteristic of successful biological control.

Impact of a gall-forming rust fungus, *Uromycladium tepperianum*, on populations of an invasive tree, *Acacia saligna*, in South Africa

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A gall-forming rust fungus, *Uromycladium tepperianum*, first released in South Africa in 1987, has been artificially established on *Acacia saligna* trees at more than 150 localities in the Western and Eastern Cape Provinces of South Africa. Following further natural wind-dispersal of the fungus, it is now present throughout most of the range of the weed. Monitoring of weed populations at eight localities in the Western Cape Province showed that populations at all sites decreased in density by 80-94% six or seven years after the fungus was established, unless the area was burnt, which stimulated seed-germination and growth of seedlings. The number of seeds in the soil seed-bank has stabilized at most sites indicating a reduction in annual seed-production by the tree.

Measuring the intensity of herbivore pressure on goldenrods, *Solidago* species

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A new protocol for measuring herbivore pressure is illustrated by studies on goldenrods (*Solidago altissima/canadensis*) in New York where the plants are native and harbour a diverse fauna of at least 103 species of phytophagous insects. Pyrethroid insecticides were applied on a staggered-triennial schedule to produce plants that escaped herbivory in different years. By comparing plant performance in the controls with the various insecticide treatments, it was possible to measure the annual variation in both the contemporaneous and cumulative

impacts of insects. The protocol provides two independent estimates of herbivore pressure which serve to check for artefacts associated with procedures for herbivore-removal and associated with potential errors related to the timing of censuses. This experiment also made it possible to calibrate the results from an extensive survey at 22 sites over a six-year period to measure the spatial variation in herbivore pressure. These results demonstrate that: (i) only a small proportion of the insect species that are adapted to feed on goldenrods ever reach sufficient densities to cause significant damage; (ii) flower production is more sensitive to herbivore attack than vegetative growth; (iii) the total herbivore pressure exerted by the dominant insects caused no detectable reductions in contemporary plant-performance in over 75% of the censuses; but, (iv) the cumulative effects of these chronic low-levels of herbivory are sufficient to lower plant-fitness and to limit the competitive dominance of goldenrods in successional plant communities. Investigations must be continued for several years to detect the full impact of herbivores on perennial plants.

Biological control of *Mimosa pigra* begins to work

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Mimosa pigra (Mimosaceae) is a native of Mexico, Central and South America. It was probably introduced into Australia as an ornamental plant at the Darwin Botanical Gardens in the late 1800s and, since reaching its favoured habitat on the coastal floodplains during the 1970s, has become an extremely invasive weed, completely changing ecosystems. It has a major impact on conservation, primary industry, tourism and traditional Aboriginal use of wetlands in the Northern Territory, and threatens all wetlands of tropical and sub-tropical Australia. Seven insect species and one pathogen have been imported into Australia from Mexico or Brazil and released in an attempt to control the weed. All have become established. The tip-boring gracillariid moth *Neurostrota gunniella* is ubiquitous and is reducing seed-production. The stem-boring sesiid moth *Carmenta mimosa* is beginning to spread and promises to be more damaging, especially to edge-plants and regrowth following fire or bulldozing. The impact of these species, plus the potential of the newly-established bud-feeding weevils *Coelocephalapion aculeatum* and *C. pigrae*, the coelomycete pathogen *Phloeospora mimosae-pigrae* and species still under evaluation in quarantine, was discussed.