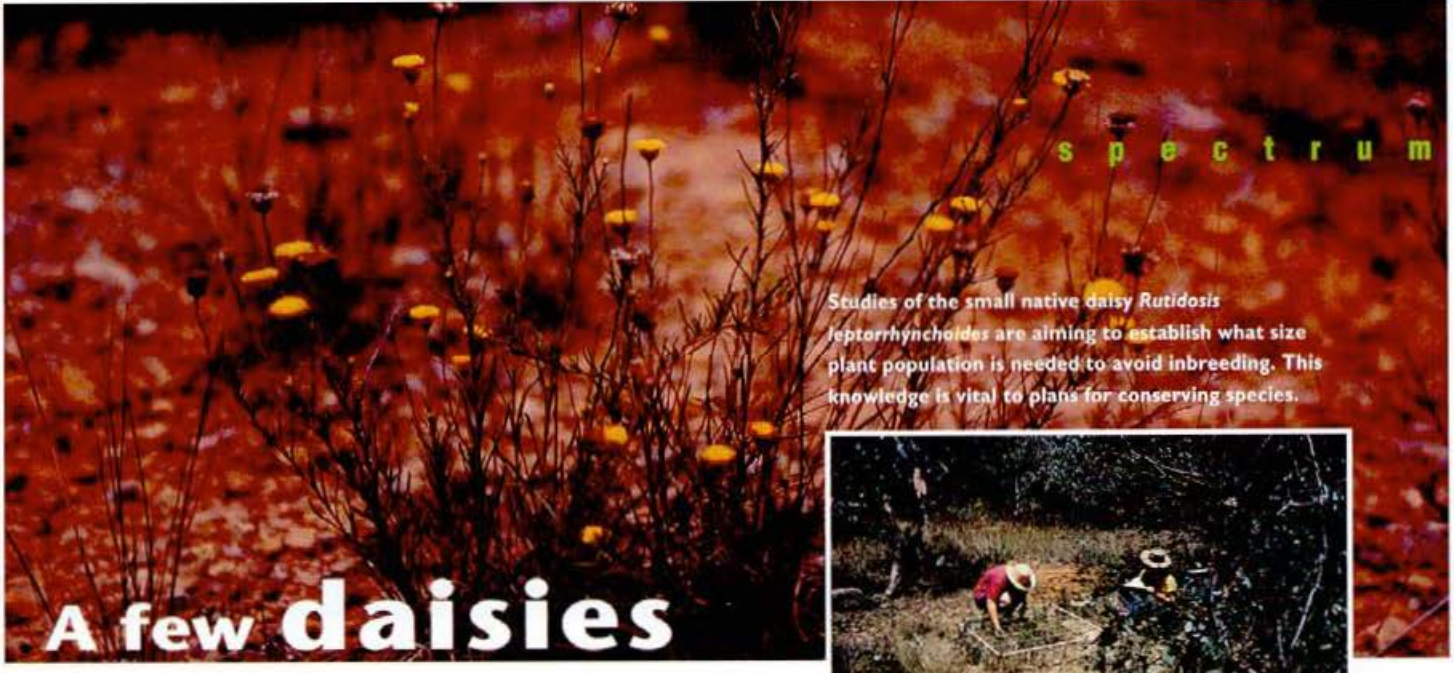


Studies of the small native daisy *Rutidosis leptorrhynchoides* are aiming to establish what size plant population is needed to avoid inbreeding. This knowledge is vital to plans for conserving species.

A few daisies short of the chain

The breakup of Australia's native grasslands is threatening individual grassland species, a team led by Dr Andrew Young at CSIRO Plant Industry has found.

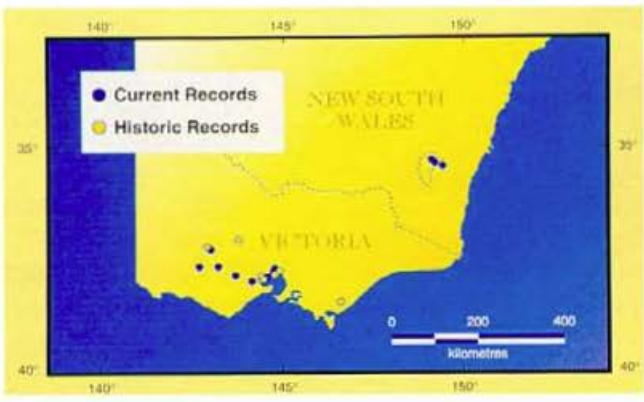
In one of the first studies of its kind in the world, researchers have used genetic marker techniques to compare the genetic composition of 20 different populations of a small native daisy, the button wrinklewort (*Rutidosis leptorrhynchoides*). They have evidence that splitting plant populations into small fragments can increase inbreeding, and decrease genetic diversity and possibly fitness.

'We are concerned about the survival of this daisy. In the long term, a lack of genetic diversity affects a plant's ability to survive conditions such as climate change,' Young says.

The study is also comparing mating patterns in two large daisy populations from near Canberra – one comprising about 10 000 and the other 100 000 plants – with those in several small populations of less than 200 plants. Two of the populations under scrutiny contain less than 10 plants.

Flowering plants can be fertilised by pollen either from other plants or from themselves. To fertilise a plant, the pollen must land on the central stigma of the flower. Under normal circumstances plants employ a number of mechanisms to ensure that the majority of pollen which reaches the stigma comes from foreign plants. But a small proportion of self-fertilising pollen is tolerated.

Within each daisy population, the team compared several specific genes in a parent plant with the same genes in its seed (offspring). The technique picked out those seeds where the genes differed from the parent plant, and so must have been contributed by pollen from another plant. From this information it was possible to work out the degree of inbreeding and outcrossing in the population.



Distribution of *Rutidosis leptorrhynchoides*, past and present.

In the large populations, self fertilisation occurs about 15% of the time. But the team found that this rate can increase to between 25 and 30% in small, isolated populations. 'Reduced population size results in genetic erosion and increased inbreeding, a situation which can lead to offspring that are not as fit as their parents,' Young says.

The team now also has evidence that this lack of outcrossing directly affects the fertility of the plants. Each daisy flower can produce one seed. In the large populations more than half the flowers contain a seed, but in small populations the researchers have found seed sets below 10%. Germination rates can also be lower.

Young thinks there may be at least two mechanisms working to cause this drop in fertility. Not only are there fewer plants with which to breed, but smaller populations, with a less showy display, may have difficulty in attracting pollinators such as bees.

In addition, the researchers have stumbled on another, unrelated difficulty for several small daisy populations in Victoria. Some individuals have undergone a genetic change, acquiring an extra set of chromosomes. While this may not affect their growth, it decreases dramatically their ability to produce fertile offspring when they mate with normal plants. This is important to know, if plants are to be transferred between populations to boost numbers and diversity.

The aim of the research project is to allow plant biologists to establish guidelines for conserving species. 'Australia, with an estimated 475 000 of the Earth's 10 to 30 million species, is one of the world's 12 "megadiverse" centres of biodiversity,' Young says. 'If we want to retain this variety of species, we have to know how big a plant population needs to be to avoid inbreeding.'

The same research team is studying the genetic structure of populations of another grassland species which has a completely different life history: the grassland pea (*Swainsona recta*). They are also building a computer model to look at the effects of inbreeding on the viability of plant populations.

Contact: Dr Andrew Young, CSIRO Division of Plant Industry, GPO Box 1600, Canberra ACT 2601, (06) 246 5318, fax (06) 246 5249, email: young@pican.pi.csiro.au.

Tim Thwaites