Threatened Species and Their Recovery: The Challenges or the Art of Intelligent Tinkering

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The first concerns the most fascinating plant which I have ever had the privilege of studying. The Royal Horticultural Society bestows its merit awards on those plants which are outstanding species for garden culture. If ever the Society awards a wooden spoon I have the ideal candidate—*Helichrysum dimorphum*.

Discovered by Leonard Cockayne in the early part of this century, with further discovery of populations by Arnold Wall, *H. dimorphum* has only ever been found in the middle part of the Waimakariri Basin where it occurs in the rainshadow region between the alps and the front ranges. Even here it grows in only a few sites. By the 1970s only two reasonable-sized populations remained.

This *Helichrysum* is our only lianoid or scrambling member of the genus. Its grey colour and thin wiry stems make it difficult to see. It makes use of matagouri as a scaffold and scrambles up into the light as an interlacing mass of branchlets. Its unusual and perhaps unique feature in the flowering plant kingdom is that it produces two quite different kinds of leaves. One is a flat, wrinkled leaf 6 to 12 mm long and about 2 to 3 mm broad which is more or less at right angles to the stem. The other is a small scale leaf closely appressed to the stem. These are produced on the same stem at various times during the growing season so that a live stem of this plant has a succession of different leaf types.

In 1991, Bruce Pavlik, of the San Francisco Bay area and a leading rare plant physiologist, decided to do his sabbatical in New Zealand. We chose this plant and soon found that we were embarked on a very exciting piece of research into its drought tolerance and adaptability. The techniques themselves were unusual enough. We used a Schollander bomb.

This requires gathering plant material in the early hours of the morning—have you ever tried to crawl through matagouri scrub in the dark!—then inserting stem tips into a chamber which is then slowly filled with nitrogen gas up to a pressure which may reach several hundred pounds per square inch. Meanwhile your face is jammed up against the top of the chamber waiting to see the first drops of sap to exude from the end of the stem tip. It is at times like this that you wonder about your insurance and whether the maker of the instrument lavished the care on its manufacture that you assume.

What we found was quite strange. *Helichrysum dimorphum* grows in a region and a vegetation type which is prone to drought. But having evolved in this habitat and region it seems that it does everything wrong. Its associate, matagouri, flowers and fruits early and then settles down to enjoy the rest of the summer. In contrast, *Helichrysum* flowers late summer when conditions are hardest. Moreover, it appears to have no compensatory internal structure to counteract drought stress. Its stomata are "sloppy"—so much so that it may actually absorb water direct through

the leaves when it rains. It seems that the only mechanism left to combat drought is to alter leaf size and shape.

Here is a fascinating species—a species which may be a unique plant in its behaviour—yet a species which has minimal protection in the wild and for which the odds grow longer year by year. Its habitat has been fragmented beyond belief. Reproduction seems at a very low level. It has a defense system against drought which must be of only limited utility.

One of the two largest populations is under covenant, the other is unprotected. Plants are in cultivation and perhaps the best long-term chance of recovery for this species will be its preservation, at least in the short term in recreated shrublands. It can be readily propagated from cuttings which root well; propagation from seed seems somewhat more uncertain.

But its survival in recreated shrublands demands a horticultural input and up to the present the record of horticulture as a conservation tool in this part of the world has been somewhat spasmodic and irregular. I believe that we have enough knowledge to manage this plant both in the wild and in cultivation. What we may lack is the commitment to use the tools available.

My second example concerns a plant which is rather more widespread, and which is perhaps better known in cultivation. This is *Muehlenbeckia astonii*. It is only in recent years that this shrub appeared on threatened plant lists and like a Beatle's hit it rapidly climbed the charts to make it into the top listing as endangered. Surprisingly, it grows all the way from Kaitorete Spit near Christchurch to the coast of Wellington. However, within this range over 90% of known plants are in a small part of Kaitorete Spit. There are a scattering of plants in the North Island, and perhaps 25 or so plants each in North Canterbury and Marlborough, mostly as isolated individuals. At only one site that I know of is it possibly growing in intact vegetation.

Almost no young plants are known and what we have is a species made up of aging geriatrics—a situation colloquially known as "the living dead". That is not the end of the story, because the situation is repeated with a number of other dryland shrubs. A notable example is *Sophora prostrata* which is still common from Blenheim to its southerly limits in the inland Rangitata Valley and the MacKenzie country. Prostrate kowhai produces good seed but reproduction under natural conditions is very limited and for the most, populations are geriatric—another "living dead" example.

It is the unfortunate lot of both these plants along with others to occur in a much maligned and unrecognised habitat called "scrub". Rather than recognising it for what it is—a habitat rich in biodiversity—even conservationists sometimes want to convert it to forests or wetland. But within our remnants of scrub there is not only high species variation but probably also surprising genetic variation. The high level of variation in *Leptospermum* has been noted already at this conference by Warwick Harris. Preliminary work on other scrub species suggests similar untapped variation which we stand to lose unless we act quickly to protect, evaluate and grow our scrub species.

I suspect that the reason why we have relatively few extinct species in the New Zealand flora may well be because of the woody, long-lived nature of many of our plants. If so, we may be facing a extinction time bomb unless we start to pay attention to, and nurture the unique assemblage of biological diversity for which we exercise

stewardship. When these and other shrubs start to die off in large numbers it will be too late to act!

My third example is one which, in contrast, speaks of hope and opportunity, and perhaps indicates the sort of scenario which I believe will become more common in the future. This time we go to the Chatham Islands and the story is about a species which was scientifically described and named only a few years ago. This is *Cortaderia turbaria*, the Chatham Islands toetoe. It is found only on the Chatham Islands where it is a "soggy gum-boot" plant of gullies, lake margins, and wetlands. Surveys show that although once widespread on the Chathams it had retreated into a small number of sites.

I was asked several years ago to prepare a draft management plan for this species. This set out a number of steps by which the 140 or so remaining plants spread through about 12 sites, could be the subject of a recovery plan to save the species. In the absence of immediate moves to action the plan, funding was obtained from Lotteries Science funding through the Royal Forest and Bird Protection Society to undertake a rescue and recovery operation. Last year, with Simon Heppelthwaite, I visited the Chatham Islands and seed lots were obtained from several key populations.

The seed lots were divided up between a number of nurseries and botanic gardens: two at universities, two private, one zoo, one with Department of Conservation, and three botanic gardens. Arrangements were made to replant the species on two and possibly three private land sites on the Chatham Islands.

The day before presentation of this paper it was my privilege to check over 150 healthy young plants as a first step to the recovery of this special plant of the Chatham Islands. We are hopeful that many of these, augmented by plants being grown on elsewhere, can be taken to the Chatham Islands in a few months for planting out. As well, a national collection is being established at the Issac Conservation Trust property, Peacock Springs, on the outskirts of Christchurch. This will provide material for research, genetic analysis, future propagating stock, and a backup for unforeseen events in the wild.

What we are attempting to do is something rather unusual for New Zealand. I believe that we are taking the skills of enthusiastic individuals, applying their expertise, empowering them as part of a cooperative recovery programme, and making them each an integral part of the project. I do not believe that species are effectively recovered simply by government mandate, by committees, or by conservation strategies. These each have their uses, and have each played a vital role in conservation of New Zealand biodiversity, but globally conservation works best when dedicated individuals also give themselves and their time, and their dedication and enthusiasm to a project.

I have given the story of just three plants. There are a lot more out there. About 12% of the native flora of New Zealand is under threat. Important focal points in the South Island include inland Marlborough and Canterbury, central Otago, and the coastal littoral zone. Immediate habitat loss is a primary problem, but underlying this is a general deterioration in many ecosystems, and especially changes in dynamic processes at the landscape level. Very little is known of genetic variation in rare species or of processes at the genetic level. Information on ecological preferences is incomplete for some species.