

Rabbit Scourge Strips Macquarie Island Bare

Corey Bradshaw finds that rabbits are wreaking havoc on Macquarie Island, and says it's time they were eradicated.

It was good to be back on Macquarie Island, the oft-called "Green Sponge" and most southerly part of Australia, after an 18-month absence. I had returned to continue my field work examining the foraging ecology and behaviour of southern elephant seals (AS, Jan/Feb 2003, pp.24–28) with two new PhD students about to start their projects.

Our research activities are varied, but probably the most important are the daily searches of the northern beaches for seals returning from their at-sea migrations. The characteristic westerly winds were blowing across the isthmus at about 30 knots that December morning, and the beaches were littered with recently weaned elephant seals, king and gentoo penguins, giant petrels and subantarctic skuas.

I was walking south from the Australian Antarctic Program's base toward a beach we call Cabbage Cove when something odd struck me. The cabbage plants were gone!

In less than 2 years the hillsides of Cabbage Cove, so named for the lush and dense stand of Macquarie Island cabbage usually growing there, had been stripped bare. Even the tall and robust stands of tussock grass were nothing

but sad, dirty clumps of dried and matted vegetation in which tunnels had been dug throughout. At first I couldn't quite believe the change that had occurred, and then the reason for this devastation bounded ahead of me and up the slope – the introduced European rabbit.

Most Australians are familiar with the problems that introduced rabbits have caused in our country – the destruction of native vegetation, the fouling of agricultural areas, and the maintenance of introduced predators like foxes and cats. Probably few of us, however, are aware that introduced rabbits have been a long-standing problem for the more remote and seemingly "pristine" corners of the globe.

Although I had come to be rather familiar with the sight of rabbits on Macquarie Island since my first visit in 1999, I had never before noticed such blatant devastation of the plant life. What had happened in the past few years? Were other areas of the island affected equally? Was anything being done to control these pests?

Macquarie Island is a young island in terms of its geological, ecological and anthropological history. This 12,800 hectare "rock" in the middle of the Southern Ocean was only discovered in



A juvenile southern elephant seal sleeps among rabbit-denuded tussock grasses and patches of annual meadow grass.

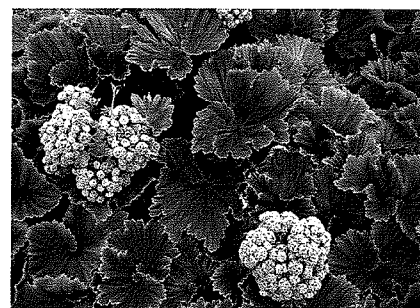
1810 and soon became a hot spot for the harvesting of seals and penguins for pelts and oil.

Inscribed as a World Heritage Area primarily for its unique geology in 1997, the island has seen a host of human and non-human visitors, among them the deliberate and accidental introductions of rabbits, cats, weka, rats, mice and many more vertebrate, invertebrate and plant species. Although some of these species have now been eradicated, such as weka and most recently cats, others remain a significant problem.

Rabbits were first introduced during the 1870s by the New Zealand sealing company Elders as a source of fresh food for the seal harvesters. A rapidly expanding and successful population of rabbits soon covered most of the 35-km-long island. It is interesting and frightening to note that Macquarie Island had been free of vertebrate herbivores before the introduction of rabbits.



Before and after: rabbit grazing cuts down the megaherb *Pleurophyllum hookeri*.



Healthy Macquarie Island cabbage.



Lush growth of Macquarie Island cabbage and tussock grass (top) have been stripped bare (below) by rabbits.

Seal and penguin harvesting ceased altogether in 1919, and it wasn't until 1948 that the first year-round Australian National Antarctic Research Expedition base was established. It was apparent to the visiting scientists that rabbits and the other feral species were doing excessive damage to the island's sensitive plant biota, so an eradication program based on shooting was eventually set in motion in the late 1960s by the CSIRO, Australian Antarctic Division and the Tasmanian Department of Primary Industry.

However, it wasn't until the late 1970s, when the population was estimated at 150,000, that the introduction of myxoma virus and its invertebrate vector, the European rabbit flea, resulted in declines of the rabbit population by an order of magnitude. However, despite the nearly annual reintroduction of the myxoma virus combined with opportunistic shooting since 1978, the rabbit population persists today.

Although the rabbit population has fluctuated in the years since controls began, the population has never again

reached pre-control numbers. During that time, research has demonstrated a number of trends.

The large decline immediately following the first application of myxoma virus resulted in more luxurious growth of the existing vegetation, although some plant species did not recover for another decade or so. The charismatic native tussock grass and the megaherb *Pleuraphyllum hookeri* both recovered as rabbit numbers decreased, suggesting that these plant species were once more widespread on the island.

The Macquarie Island cabbage showed much improvement as well, but it is the most sensitive of the larger plant species to rabbit grazing. Thus my immediate observation in Cabbage Cove seemed to suggest a recent and relatively large increase in rabbit numbers since my last visit in 2002.

Feral cats and rabbits had an interesting relationship on Macquarie Island, and the eradication of the cat population by 2002 may shed some light on the recent increases in rabbit numbers. Cats were present on the island from the 1820s onwards, so the introduction of rabbits in the 1870s provided a rich new food resource. Indeed, an analysis of cat diet revealed a rapid switch to rabbits upon their reintroduction, with fewer mice and native sea birds taken as a result.

With the introduction of the myxoma virus, the number of sick and dying rabbits again increased the proportion of rabbits eaten by cats. However, the benefit of more dying rabbits was short-lived – as soon as the major rabbit decline had occurred, cats resumed



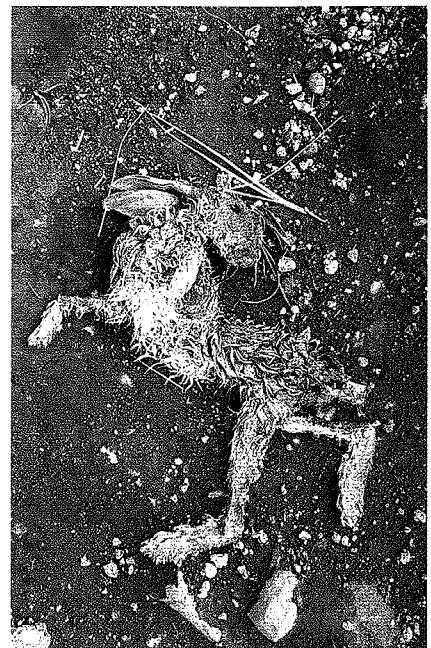
Corey Bradshaw with an endemic coastal cushion plant (*Azorella macquariensis*) growing above the reach of rabbits.

eating many of the more susceptible burrow-nesting bird species such as Antarctic prions, fairy prions, sooty shearwaters and white-headed petrels. Although we can now feel good about the eradication of cats and the associated reduction in sea bird mortality, rabbits still continue to change the biological community.

Approximately 4 years after the rabbit control began, the number of subantarctic skua breeding sites decreased by 54% on the plateau but increased by 17% in coastal areas. These results are likely to be the result of a redistribution of breeding in relation to the more-available prey resources in coastal areas, such as penguins, eggs and dead seals, after the rabbits began to decline in the higher altitudes of the island.

It also appeared to me that there has been a steady increase in the number of skua on Macquarie Island since I first started coming here in 1999. It isn't unusual to see skuas busily ripping rabbit carcasses to shreds, chasing young rabbits, or even picking apart rabbits dying from myxoma virus. Skuas are also opportunistic hunters of the smaller burrowing sea bird species, so it is

possible that the enhanced skua population may be restricting the recovery of the rarer and more-sensitive sea birds. On one recent excursion beside a small lake on the plateau where hundreds of Antarctic prions breed I noticed quite a few prion remains from skua kills. Thus, a probable outcome of the eradication of rabbits on Macquarie Island will be redistribution and reduction in these



A rabbit carcass picked over by subantarctic skuas – a common site on Macquarie Island.

scavenger-predators, and an associated reduction in sea bird mortality.

But rabbits may also serve some beneficial functions within this sensitive ecosystem. It appears that many vascular plant species have benefited from the presence of rabbits due to selective grazing of more-palatable competing species, changes in the cover of dominant species, variation in the water table



A weakened rabbit infected with myxoma virus. Vegetation on Macquarie Island recovered when myxoma virus was first introduced.



Subantarctic skuas feeding on a recently killed rabbit. Skuas may need to predate greater numbers of burrowing sea birds if rabbit populations were eradicated from Macquarie Island.

and increased opportunities for these species to colonise disturbed areas (e.g. burrowing sites and terrestrial scrapes).

The restriction of tussock grass may also provide an inadvertent reduction in the distribution of ship rats that use it as a primary habitat. Ship rats are opportunistic predators of many burrow-nesting sea birds, so an eradication of rabbits may result in an increase in both tussock and rat distribution that may lead to increased mortality for the more isolated sea bird colonies.

At several other isolated subantarctic islands where rabbits also occur, such as Kerguelen Island and Marion Island, grazing has impeded the spread of introduced plant species such as the common dandelion and turf grass. These weed species do not occur on Macquarie Island, although a number of other introduced plants have managed to establish themselves, including annual meadow grass and mouse-ear chickweed. However, the impact of introduced plants is relatively small compared with other islands elsewhere. There is no evidence that they are displacing native vegetation, and an eradication of rabbits would result in fewer disturbed sites available for

colonisation by these non-natives.

Despite the odd benefit that rabbits may engender to some plant and animal species, either directly or indirectly, I believe most people would agree that rabbits have overstayed their welcome on Macquarie Island. But where do we go from here?

As I write this, the two Tasmanian Parks and Wildlife Service rangers are actively spreading the myxoma virus and shooting rabbits in high-density areas, as they've done since the 1970s, but clearly these actions are insufficient.

In 2001 the New Zealand government completed one of the world's most ambitious pest eradication projects on Campbell Island 700 km south of New Zealand. This 11,300 hectare island, which was discovered around the same time as Macquarie Island, was home to a large population of introduced Norway rats that had been responsible for the extinction of at least three land-bird species and the near-eradication of many sea birds.

Now, several years after the project, the eradication of rats on Campbell Island is touted as a major conservation success. However, its success was due to a committed investment of more than

\$2.5 million, 19 people, two ships, five helicopters and more than 120 tonnes of cereal pellets laced with rat poison.

An eradication of rabbits and rats from Macquarie Island has been contemplated for many years, but now with the success story of Campbell Island I believe the time is ripe for action. Rabbits could be dispatched in much the same manner as the rats on Campbell Island by using cereal-based baits containing the anticoagulant brodifacoum. This, along with intensive shooting, the maintenance of myxoma virus and several years of follow-up monitoring could bring about the end of this long-term feral species.

It's now up to the Australian people to raise the necessary funds for such an endeavour, and I believe that alerting more Australians about the issue is the first step. Perhaps for the relatively modest sum of \$3-4 million we could witness the eradication of the remaining major vertebrate pests from this subantarctic jewel in Australia's crown.

Corey Bradshaw completed this research while working as a postdoctoral research fellow with the Antarctic Wildlife Research Unit of the University of Tasmania's School of Zoology. Last month he commenced work as a Senior Research Fellow with Charles Darwin University's Key Centre for Tropical Wildlife Management.