

On the edge



If we want to give endangered species a helping hand, we should heed this cautionary tale, says **Stephanie Pain**

OLD BLUE was a saint,” says Melanie Massaro. In her lifetime, Old Blue was the heroine of one of the most gripping tales in the annals of wildlife conservation. The cheeky little bird with the blue leg-band captured the hearts of millions and was feted around the world. Thirty years after her death, Old Blue’s name lives on. There is even a memorial plaque to remind people that she was the saviour of her species.

For decades, the rescue of the Chatham Island black robin has offered conservationists hope: no matter how bad things look, it is possible to bring a species back from the very brink of extinction. Now, however, Massaro and her colleagues at the University of Canterbury in New Zealand have discovered that the legendary team of conservationists who helped Old Blue and her offspring unwittingly nudged the black robin onto an evolutionary path that almost led to disaster. So the great success story is also a cautionary tale, with important lessons for anyone thinking of stepping in to save a species.

The Chatham Island black robin, *Petroica traversi*, is in fact not a robin. It is an all-black flycatcher with a passing resemblance to the European robin. It is native to the Chatham Island archipelago, remote dots in the Pacific

some 800 kilometres east of New Zealand (see map, p 46). The islands, which lie in the path of the Roaring Forties, are cold, battered by gales and pounded by huge seas. They were once home to many unique bird species, but following human settlement, these began to go extinct, most of them killed by the rats, cats and other alien predators brought in by settlers.

Once widespread on the islands, by the 1880s the black robin appeared to have vanished. Then in 1938 between 20 and 35 were discovered on the predator-free island of Little Mangere. Known to local fishermen as “the fort”, Little Mangere is a rock stack that rises 200 metres out of the sea, its sheer cliffs topped with a patch of woody scrub covering just 9 hectares. Despite the improbably small population, the black robin hung on there for more than 70 years. Then, in the 1970s, with the island’s woodland habitat fast deteriorating, the number dropped still further. By 1976, when the New Zealand Wildlife Service sent Don Merton to see if anything could be done, there were seven left, only two of them female.

Merton and his team became headline news when they achieved the seemingly impossible. They scaled the terrifying cliffs of Little



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Mangere to capture the remaining robins, returning the way they had come before leaping into a small boat rising and falling on the enormous swell at the base of the stack. Eventually, all the birds were transported to neighbouring Mangere, a larger predator-free island where they stood a better chance of recovery.

At first, the team simply kept an eye on the birds, hoping the number would rise. It didn't. In 1979, it dropped to just five, making the black robin the world's rarest bird. It was clear that without more help, the species would "go down the gurgler", as Merton put it.

Old Blue to the rescue

Then, Old Blue stepped up to the plate. At 8 years old she was positively ancient, and a poor breeder. Astonishingly, she dumped her mate, took up with a young male called Old Yellow and they became the only pair to breed successfully. Black robins usually lay two eggs per clutch but if they lose these they generally lay again. So Merton and his team decided to speed the production of young by removing eggs after they had been incubated for a few days and placing them under female tomtits, which would finish the job while the robins laid again. "A single female could lay up to four clutches in a breeding season so cross-fostering really speeded up population growth," says Massaro.

During the first fraught years, Merton and his team followed every move the birds made – who mated with whom, where the nests were and when and how many eggs

each bird laid. In 1990, with 100 robins – one group on Mangere and a second installed on Rangatira, a larger island with more wood and scrub to nest in – the team adopted a more hands-off approach, leaving them to breed without intervention. By 1998 there were 200 birds, the black robin was pronounced "saved" and the project ended.

The story is no longer headline news but it

Island hopping

In 1976, the last seven Chatham Island black robins were moved from Little Mangere to Mangere. Then, when numbers started increasing, a second population was established on Rangatira.



remains iconic, featuring in TV documentaries, books and countless articles. Yet 16 years after the robin was saved, the population has hardly grown. A census last year counted 287. Suitable habitat is one limiting factor, but inbreeding is also likely to be hampering recovery, and this is where Massaro's interests lie. She wants to know what happens to species that come back from near extinction with a very restricted gene pool. "The black robin is the ideal species to investigate because it went through the most severe bottleneck possible – with all today's birds descended from a single pair," she says. How has that affected them? To find out, in 2007 Massaro set off for Rangatira.

Unlike Merton's team, Massaro did not have to dice with death to reach the robins. "Little Mangere is terrible. I don't know how they got up there," she says. But getting to Rangatira is no picnic either. The deafening 2-hour flight from New Zealand in an old propeller plane ends on a tiny airstrip on Rekohu, the main Chatham Island. Quarantine procedures take three days. "To protect the wildlife everything has to be washed, disinfected and picked clean of seeds, soil, little ants and so on." Then the kit is piled into plastic buckets and loaded aboard a small crayfishing boat for the ride to Rangatira. "The final stretch as you approach the island is really rough and there's no landing place. When you get there the skipper runs the boat up on a rock platform and you have to leap from the bow." The buckets follow.

Getting around the island is awkward too. The ground is riddled with the nesting burrows of endangered petrels, so to avoid



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Following their rescue from Little Mangere (right), increasing numbers of black robins began to lay eggs on the rim of their nest

putting a boot through the roof and crushing eggs or chicks, visitors wear plywood “petrel boards”, the Rangatira version of snowshoes. “You walk like a duck, but the boards spread your weight so you don’t damage the burrows,” says Massaro. The discomforts are worth it. “You only have to go a couple of metres into the bush and the robins come out to see you.” As with so many of New Zealand’s endemic birds that evolved in the absence of predators, they have no fear of people. Finding the nests is easy too. “You just give a male a meal worm and if he has a mate sitting on a nest he takes it off to her. All you do is follow him.”

There are signs that inbreeding has taken its toll. In the six years she has been visiting Rangatira, Massaro, now based at Australia’s Charles Sturt University, has found birds with deformed beaks, some near-naked ones and several clutches of chicks with poor bone development in their legs. But from the first visit, the observation that baffled her most was seeing nests with an egg resting precariously on the rim. “I thought it was really weird. Why would a bird lay an egg where it wouldn’t be incubated?”

She asked Merton what he knew about it. He had seen the odd behaviour many times and it had puzzled him too, he told her. But in the early years of the rescue programme every egg was vital, so he and his team nudged them into the nest to ensure they were incubated. The eggs produced healthy chicks. Once intervention stopped, the team continued monitoring every nest, meticulously recording who laid how many eggs and every

instance of an egg left on the rim. Merton had 10 years of records if Massaro would like to see them.

Even a cursory look was revealing. “There were no rim eggs until 1984,” says Massaro. “At that time there were five female robins and only one laid a rim egg. But after that the habit really took off.” Within six years, more than half the females were laying rim eggs, on average one per clutch. “That suggested this odd behaviour had a genetic basis.” Egg nudging would have prevented natural selection weeding out what was clearly a harmful, or maladaptive, behaviour, leaving it free to spread rapidly through the population. “Intervention would have allowed the survival of the not-so-fit,” says Massaro. And when intervention ended, natural selection would be reinstated, explaining why rim-laying was far less common by the time she arrived on Rangatira.

A near-fatal error

Back at the University of Canterbury, Massaro teamed up with geneticist Marie Hale and mathematician Raazesh Sainudiin to look for evidence to support her suspicions. “When I looked at the pedigree I immediately thought the trait was inherited,” says Hale. But where had it originated? Did it result from a mutation in a single gene and, if so, was the mutant version of the gene dominant, meaning an individual needed just one copy to exhibit the behaviour? Or was it recessive, requiring two copies before a bird acquired the bad egg-laying habit? Using Merton’s detailed



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records and a family tree showing how every bird was related to every other, Sainudiin modelled all the possibilities to find out which one best fit the data. His results were unequivocal: the problem had started with Old Yellow, who carried one deviant but dominant copy of a gene involved in egg-laying (*PLoS One*, vol 8, p e79066).

Only 9 per cent of females now lay rim-eggs. This rapid decline is what you would expect for such a deadly trait once the conservationists’ egg-nudging ended, says Hale. Still, an intervention intended to help could easily have led to disaster. With more than half of the females laying rim-eggs in 1990, the trait was a short step from becoming universal. Once every female carried a single copy of the rim-laying version of the gene, it would have been impossible to get rid of and the survival of the species would have depended on human help – forever. “By sheer coincidence intervention ended just at the right time and the black robin escaped that fate,” says Massaro. “But it was a narrow escape.”

The rise and fall of the badly laid egg offers a salutary lesson in the potential pitfalls of offering critically endangered species a helping hand. “If you have an extremely small population you have to get the numbers up as fast as possible,” says Massaro. But with a tiny gene pool, a single maladaptive mutation can have a disproportionately large impact. “You do need to be aware that these things can creep up on you.” ■

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