Ornithology from the lakeshore

Antipodean attractions

On this occasion, I report from a faraway shore, that of the beach of Paihia, a touristy town in New Zealand's magnificent Bay of Islands. Darwin arrived here on this very beach in 1835, part of his famous journey, for a nine-day visit to the country. It did not leave a good impression: "I am disappointed in New Zealand, both in the country and its inhabitants", he wrote on 27 December to his sister Caroline.

Unlike Darwin, I love this place. New Zealand is a captivating country, especially for ornithologists. No, you will not be able to add many species to your life list, but those you'll meet will likely leave a lasting impression. You can stand on a beach at night, and watch a Southern Brown Kiwi *Apteryx australis* just a few meters away. The bird probes its bill deep into the sand and makes a turning motion. An inverted cone appears that quickly fills with falling amphipods. The kiwi gobbles them all up. You can stand in a dense forest and clap your hands to get the attention of a South Island Robin *Petroica australis*. With your foot, you clear some leaf litter. The curious robin flies closer and lands on your shoe: a suitable vantage point to watch for invertebrate prey. You can visit a small island, with the Auckland skyline in view (see also Piersma 2016), and watch a Kōkako *Callaeas wilsoni* move through the vegetation, not unlike a squirrel. You can marvel about its wattlebird family members, the saddleback or tīeke *Philesturnus* sp. and the Huia *Heteralocha acutirostris*, the latter now extinct, but living on in textbooks as the species with the most extreme sexual dimorphism in bill shape. Or have a look at the endemic Wrybill *Anarhynchus frontalis*, the only bird with a laterally-curved bill, used to reach insect larvae under stones along the braided rivers where it breeds.

In 1840, five years after Darwin's visit and almost 200 years after New Zealand had been discovered by the first European, the Dutch navigator Abel Tasman, Britain formally annexed the islands and established a permanent settlement in what would become New Zealand's capital city, Wellington. European colonists, probably driven by a desire to make a home far from home, brought with them many of the bird species familiar from English country gardens (together with many other animals and plants). In the 1860s, so-called acclimatisation societies were established, with the explicit goal to introduce non-native species that would enrich the local flora and fauna, which was considered deficient. When you now arrive in Christchurch or Auckland, the first bird you are likely to see is not a robin, but a European Blackbird *Turdus merula* or a Dunnock *Prunella modularis*. Before you hear a Bellbird *Anthornis melanura* in a patch of native bush, you probably will have heard a Chaffinch *Fringilla coelebs* or a Song Thrush *Turdus philomelos*. Before encountering the native Morepork *Ninox novaeseelandiae*, I first spotted a Little Owl *Athene noctua*.

Sad as this may now seem, we can at least thank the acclimatisation societies for keeping careful notes about the number of birds released. About 100 individuals for the Greenfinch *Chloris chloris*, about 1000 for the Blackbird. This information, together with data from the New Zealand nest record scheme, was used by Jim Briskie, a scientist at the University of Canterbury, and his then student Myles Mackintosh for a study on the consequences of inbreeding. They showed that egg hatching failure increased with decreasing numbers of individuals released in the 19th century (Briskie & Mackintosh 2004). They also compared data on hatching failure of the same species between the introduced population in New Zealand and the source population (usually in Britain). If less than about 200 individuals had been released, hatching failure in the introduced population was much higher than in the source population. Thus, although all species spread quickly throughout New Zealand and are now present in vast numbers, the initial population bottleneck affects embryo mortality more than a century later. This is somewhat surprising and adds to a long-standing controversy about the importance of purging of deleterious recessive alleles during a bottleneck (see e.g. Frankham *et al.* 2001, Crnokrak & Barrett 2002, Robinson *et al.* 2018).

Visiting New Zealand as an ornithologist comes with mixed feelings: from fascination for endemic species with unique traits to sadness about all those that have been forever lost, from amazement about the omnipresence of introduced species to hope and respect for the people who do not give up trying to save what is left. Read the obituary of the flightless, mouse-like Stephens Island Wren *Traversia lyalli*; Galbreath & Brown 2004), and the saving of the world's most endangered bird, the Black Robin *Petroica traversi*; Butler & Merton 1992), and you'll know what I mean. Think about the six genera of moa (order Dinornithiformes), the largest one reaching 3.6 m and weighing

about 230 kg (and presumably tasting way too good), and the formidable Haast's Eagle *Hieraaetus moorei* that preyed upon them. In a spectacular example of rapid change, the world's largest raptor apparently evolved from one of the world's smallest extant eagles, the Australian Little Eagle *Hieraaetus morphnoides* (Bunce *et al.* 2005).

For tens of millions of years, New Zealand's wildlife evolved in the absence of mammalian predators. In the second half of the 13th century, the first humans arrived by canoe. The Māori, the indigenous Polynesian people of New Zealand, brought with them the Polynesian Rat *Rattus exulans*. These early rats probably wiped out flightless species such as the Snipe-rail *Capellirallus karamu* and the Owlet-nightjar *Aegotheles novazelandiae*. Later, with the European explorers came the Brown Rat *Rattus norvegicus* and the Black Rat *R. rattus*. These rats caused declines in the population of the Polynesian Rat, but also in those of most native species, birds and bats alike. The worst was still to come. The acclimatisation societies decided that it was useful to introduce commercially valuable species, including game, and so they introduced the Rabbit *Oryctolagus cuniculus* and the Australian Brushtail Possum *Trichosurus vulpecula*. The results were disastrous, and the remedy even worse. In 1876, New Zealand passed the 'Rabbit Nuisance Act' and introduced Stoats *Mustela erminea* to control the rabbits. The stoats, however, quickly turned their deadly attention to the native birds with their untroubled disposition, thus starting a dramatic decline that led both to extinction and to some of the world's most astonishing rescue efforts.

Poison with the innocuous name '1080' was soon going to play a major role in controlling mammalian pest species, especially possums, rats and stoats. First used in 1954, it became widespread as early as 1957. 1080 is nothing else than the brand name of a synthetic form of sodium fluoroacetate, a biodegradable compound that naturally occurs in plants in Western Australia and kills all mammals. Currently, New Zealand uses a whopping 80% of the world supply. Despite long-standing and ongoing controversial debates and protests from animal right groups and others, the large-scale use of 1080 remains the sole hope for most of the native bird species. In areas where 1080 has recently been dropped – typically done by helicopter – populations of species such as the Tomtit *Petroica macrocephala*, the South Island Robin and the Yellow-crowned Parakeet *Cyanoramphus auriceps* quickly recover, only to decline again when no more poison is used. Putting out the poison resembles the definition of a Sisyphean task, except that one hopes it is not futile.

The organization that implements the task is known throughout the country as DoC, the Department of Conservation. Launched on April Fool's Day in 1987 by then Prime Minister David Lange, it brought together professional ornithologists (and other biologists) and park and reserve managers, with the aim to protect New Zealand's natural and historic heritage, as well as to provide recreational opportunities. In 1991, DoC introduced species recovery plans, including for the charismatic Kōkako, kiwi and Kakī or Black Stilt *Himantopus novaezelandiae*. Strategic plans were made to control pest species, such as the possum, but also wasps and weeds, to establish predator-free offshore island sanctuaries, to manage more of the threatened species, and to increase support for scientific research. Well-known stories include the rescue of the Kākāpō *Strigops habroptila*, a nocturnal, flightless, long-lived, lekking parrot that only breeds every so many years, when a particular tree (the Rimu *Dacrydium cupressinum*) carries fruit. Once on the brink of extinction, the entire remaining population was moved to predator-free islands in the south and the current population of over 150 individuals remains intensively managed (Clout & Merton 1998). When the famous male Kākāpō Richard Henry died at 80, it made the local headlines (www.treehugger.com/natural-sciences/legendary-parrot-who-saved-his-species-dead-at-80.html). This year, the Rimu carry lots of fruit. Females laid 200 eggs, of which only 89 were fertile, and so far 52 chicks have hatched and survived. If you want to know whether the population will break the 200 mark this year, please check the website www.facebook.com/KakapoRecovery.

Many a New Zealand biologist works closely with DoC, from simply obtaining permits for fieldwork to carrying out elaborate, conservation-relevant projects. One such project sought to redefine genetic rescue. Briskie & Mackintosh (2004) had shown that the size of founder populations determined levels of hatching failure, not only in introduced species as explained above, but also in native species that had been translocated to predator-free islands to save them from extinction. Small islands full of the native endangered birds are nice enough, but conceal a high risk of extinction due to severe inbreeding depression. Genetic rescue aims to mitigate the effects of inbreeding in small, genetically depauperate populations by introducing outbred individuals. That it works has been shown convincingly (e.g. in a small, Swedish population of the European Adder *Vipera berus*; Madsen *et al.* 2004), but what if outbred individuals no longer exist? Jim Briskie and his doctoral student Sol Heber, working with South Island Robins, came up with the idea to

exchange individuals between two highly inbred island populations. Nearly four decades earlier, five robins from different parts of New Zealand had been released on each of Allports and Motuara Islands after they were cleared of predators. Now the birds suffered from inbreeding depression, but after reciprocal translocation, genetic diversity increased. Hybrid juveniles had a higher probability to survive and recruit in the breeding population, were endowed with higher quality sperm and showed better immunocompetence (Heber *et al.* 2013). This is just an example of a small study in a country where conservation is written big. How big? In 2016, the conservation minister announced an initiative to eliminate all mammalian predators from New Zealand by 2050. Moving from Sisyphos to Hercules, as it were.

My fascination with New Zealand brings me back to my favourite birds, the waders. In primary schools in Nelson, a small harbour city in the sunny part of the South Island, teachers celebrate the return of the Bar-tailed Godwit *Limosa lapponica* with their pupils. Students of bird breeding behaviour can be excused for focusing on the few months this species spends in the Arctic, and most ornithologists will remember the first documentation of their non-stop, more than 11,000 km flight from Alaska to New Zealand (Gill *et al.* 2009), but let us be clear: these Bar-tailed Godwits spend most of their life near Nelson or on another New Zealand mudflat and tidal roost. Not only do they come back year after year to the exact same winter holiday mudflat, they arrive in and depart from New Zealand on a schedule as regular as that of European pensioners in Mallorca (Conklin *et al.* 2013).

Darwin's assessment of New Zealand might be best blamed on his chronic seasickness and illnesses picked up during his long journey. Although he never returned, he did change his mind about the country. In his writings to German geologist and explorer Julius von Haast, who had provided him with information on New Zealand's vertebrate fauna, Darwin wrote "there is hardly a point in the world so interesting". I agree and I cannot help wondering what New Zealand's standing in the story of evolution would be if Darwin would have had closer encounters with the country's endemic birds.

South Island Robin *Petroica australis* on Ulva Island, which was declared free of predators in 1997 (photo Bart Kempenaers).

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