

Letter From the Desk of David Challinor
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Birds that evolve on islands, especially where terrestrial predators are scarce or nonexistent, tend to expand their territories until they occupy all appropriately available space. Being so isolated, however, has a number of consequences, one of which occurs when a new exotic predator suddenly arrives. The naïve bird is frequently extirpated, especially when the predator is human and accompanied by its attendant carnivorous mammals, dogs, cats, pigs, goats, rats, etc. The record of extirpations of endemic Pacific island birds by early Polynesian settlers is well-documented. This month's letter is about the perilous decline of two bird species, one in Bermuda and the other in New Zealand, that came close to extinction when exposed to humans, but now through the efforts of dedicated individuals seem to be on the road to recovery.

A year ago this month, I wrote about David Wingate's work with the cahow (*Pterodroma cahow*), a pigeon-sized, hole-nesting seabird once thought to have been extirpated about 1650. In 1951, after a long search instigated by the discovery of a recently dead cahow, about 10 pairs of these seabirds were found occupying nest holes. The good news is that during my June 2002 Bermuda visit, I learned that 36 petrel chicks fledged in the 2001-02 breeding season, more than in any year since their rediscovery in 1951. On the opposite side of the globe, Don Merton and his colleagues report similar success with increasing the remnant population of New Zealand's endemic kakapo (*Strigops habroptilus*), a nocturnal, flightless giant parrot (2.5 kg). Once found throughout the archipelago and numbering in the millions, a concerted search of several years during the 1970's turned up a kakapo in a remote part of the South Island fjordlands. Further intensive rummaging in the area turned up 17 more, but they were all aged males. Prospects for saving the world's largest parrot seemed dim until New Zealand's "Wingate" Don Merton and his team discovered a breeding colony of 200 on Stewart Island, a large 115,000 km² (5,800 mi.²) island 50 km (31 mi.) off the south coast of South Island. This island is heavily forested, which allowed the parrot to survive by hiding during the day and feeding by night. Its behavior contrasts with the cahow, which feeds during daylight hundreds of miles north and west of Bermuda and then returns at night to regurgitate fish and squid to feed its young. Both species are long-lived' cahows surviving 40 or 50 years and the parrots allegedly close to a century. There are differences, however: the petrels seem monogamous, whereas the parrots reproduce by a lek system, a breeding strategy also used by some African antelopes (Uganda kob - *Adenota kob thomasi*), and several species of grouse. Using this strategy, the males defend a specific area (a lek) in sight of and sometimes adjacent to competing males. A receptive female chooses the male with which she wants to breed by entering his lek. Rival males display their status by excluding other males from their lek and luring females by displays and/or calls.

Both kakapos and cahows had few predators (mostly owls) until humans arrived on their islands. Humans could easily catch the fat chicks to eat, but both bird species probably would have survived if they faced only human predation. It was their accompanying mammals that pushed both these bird species to the edge of extinction. Pigs, dogs, cats, and especially rats were the most devastating predators as they all are extremely hard to control. In New Zealand, Europeans imported stoats, weasels and ferrets, all predatory mustelids that further exacerbated the kakapos' decline, which had begun with the Maori's arrival and that of the accompanying kiore or Polynesian rat. In Bermuda, many of the same human-dependent predators also consumed the eggs and nestling cahows. Today, an additional Bermuda predator is the introduced cane toad (*Bufo marinus*). This extraordinarily adaptive giant toad is native to Central and South America, but has been introduced to Caribbean islands as well as Florida as a biological control agent. The cane toad grows up to eight inches long. Not only are its eggs poisonous, but its skin is toxic and can kill a dog or cat that grabs it in its mouth. Cane toads prey on cahow chicks in their burrows during the day and have been present on Bermuda's Nonsuch Island, a reserve, for years. Thus a prime cahow nesting site has remained unoccupied.

The weak link in the toad's life cycle is its need for fresh water in which to lay its eggs. The one fresh water pond (artificial) on Nonsuch has now been ringed with a meter high stiff plastic barrier to keep out the toads. Nightly, gloved wardens patrol the fence and carefully collect the frustrated toads. The island should be rid of them after another breeding season; over 400 were collected since mid-April 2002.

Such vigorous measures were also initiated in New Zealand to save the kakapo. The breeding colony of 200 birds on Stewart Island was thought to be safe, until further research showed it was slowly being wiped out by feral cats. It took 15 years ('82 to '97) to remove all the surviving parrots on Stewart to other islands believed to be free of cats, stoats and European rats. Sadly, these supposed havens still harbored Polynesian rats (*Rattus exulans*), which cannot compete successfully with the two introduced European species (*Rattus rattus*, the black or ships' rat, and *R. norvegicus*, the common brown or house rat). The kiore were eating the parrots' eggs and chicks. When only 50 birds were left in 1995, Merton and his volunteers began to monitor every nest they could find and began a massive trapping program to control the kiore. By 1999, the team had removed all the surviving kakapo on Stewart Island to two small islets still free of terrestrial predators, one at each end of South Island—470 miles apart.

With the birds theoretically safe from rats, the next step was to stimulate breeding. Careful observation had shown that kakapos breed only every three or four years, and that egg laying was correlated with bumper crops of fruit from local forest trees, such as southern beach (*Notofagus*) and particularly a large conifer called rimu (*Dacrydium cupressinum*), which bears nut-like seeds. Kakapos have a low metabolic

rate and can survive on a meager diet of plant parts, but to breed they need the extra energy furnished by a good mast year. Merton and his crew tried supplemental feeding from strategically placed hoppers throughout the forest. The birds enjoyed the handouts, particularly walnuts and almonds, but still they would not breed. The scientists learned that the rimu trees sent some kind of signal to the birds that they were ready to produce a bumper crop of mast and when the birds received this message, lekking started. By the time the rimu seed crop was dropped, the females were prepared to lay. By now, every nest was monitored around the clock and if a chick failed to thrive, it was whisked away to be hand-raised. The team also learned they could induce double clutching by removing the first set of eggs for artificial incubation, thereby doubling production. Supplemental feeding of the females, however, tended to result in the hatching of more male chicks than female, not an uncommon phenomenon in birds.

In April 2001 it was evident that there would be a mast year for rimu on Codfish Island, so all the females on Maud Island in the north were transferred south to Codfish. A total of 21 females were then watched around the clock. In September 2001 (early spring), supplemental feeding began, but only in small amounts to keep the females trim. By December (summer time), the males were attracting the hens to their leks for breeding and the first copulation occurred on Christmas Eve. All but one old female bred. Each nest was monitored so that whenever the female left the nest (often a hollow at the base of a tree) to forage at night, the chicks were scooped out for a health check. Although all 20 females laid eggs, just over a third were infertile. These eggs were replaced with fertile ones obtained through double clutching earlier in the season. To help ensure survival of late hatching chicks in a clutch, the volunteers switched chicks around so that all the young in a clutch would be about the same size and would thus not have to compete with older, larger and more aggressive siblings.

All this effort paid off and only two of 26 chicks that hatched died. Without such human interference, only about one-half the chicks would have fledged. The feeding strategy was also successful and about one-half were female. Finally, a hand-reared female successfully mated and laid an egg, putting to rest a myth that such birds would/could not breed. Thus, 2002 was a very successful year for the kakapo project, with females over 50 years old still breeding. There are now 86 kakapos and if the population keeps expanding—the immediate goal is about 200 breeding birds—where can they be placed? Other rat-free islands in New Zealand are being sought, with Wingate and colleagues also seeking potential new nesting sites for the cahow in Bermuda. This breeding season (2001-02), 36 cahow were fledged from 59 established pairs, up from the original 10 in 1951.

It is encouraging to know that rare species are being saved, but such successes have important philosophical implications. We tend, for example, to devote our energy to relatively visible species without which the world would indeed be poorer. We must

remember that in the normal course of events, changing conditions beyond our control will cause some plants and animals to disappear often without our realizing that they have gone. As humans, I believe we are stewards of life and are responsible for protecting it. That means that we cannot assume that the globe is ours to do with as we wish, but rather we must keep in mind our responsibility to future generations.

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P.S. Much of the information on kakapo restoration came from a fascinating article by Stephanie Pain in New Scientist 1 June 2002, Vol. 174 No. 2345 pp.32-37.