mice massacre

Help for Gough Island's birds

GOUGH ISLAND'S birds are under siege. Introduced house mice eat around one million eggs and chicks each year, threatening the existence of several bird species found nowhere else. But the good news is that plans are being developed to eradicate the mice in 2019. If all goes well, Gough will retain its status as the world's most important seabird island. **Ben Dilley** and **Delia Davies** report their experiences on the front lines. >

GOUGH ISLAND is spectacular: 65 square kilometres of rugged volcanic mountains and precipitous valleys rising sheer from the sea. It lies on the edge of the Roaring Forties in the South Atlantic, midway between South Africa and Argentina, and is administered by Tristan da Cunha, a UK Overseas Territory. Often regarded as the world's most important seabird breeding island, Gough supports literally millions of seabirds of 23 species, three of which breed almost exclusively on Gough: the Tristan Albatross, Atlantic Petrel and Macgillivray's Prion (see *African Birdlife*, May/June 2014, p. 10). It is also home to two endemic landbirds: the Gough Bunting and Gough Moorhen.

At 380 kilometres south-southeast of Tristan, Gough is seldom visited by Tristan islanders. Access is limited by the rough seas and steep, boulder beaches. Its exposed western coastline thwarted even the hardiest of adventurers who hunted seals throughout the Southern Ocean in the late 18th and early 19th centuries. Gough was virtually the only island where substantial numbers of sub-Antarctic fur seals survived the sealing era, and the island still supports the world's largest population of this species. However, the sealers left their mark on Gough Island: by accidentally introducing house mice *Mus musculus*, they triggered an ecological disaster that only now can we attempt to rectify.

Birds that live on oceanic islands have evolved in the absence of land-based predators, because most terrestrial animals were unable to colonise these remote specks of land. When humans reached these islands, they often introduced predators such as cats, rats and even snakes, with catastrophic impacts. Unable to appreciate the danger posed by these strange new arrivals, island birds were easy prey. As a result, more than 90 per cent of bird extinctions in the past 500 years have been of island species.

Until relatively recently, house mice were not considered a serious threat to seabirds; there were just a few records of mice nibbling the eggs and chicks of storm petrels at California's Farallon Islands and Blue Petrels on Marion Island. It was only in 2001 that Richard Cuthbert and Erica Sommer first suspected that mice were having a significant impact on Gough Island's birds. Fatal attacks on Tristan Albatross chicks were confirmed in 2004 by Ross Wanless and Andrea Angel, who also filmed mice killing chicks of Atlantic Petrels and Great Shearwaters. In 2013–14 we spent a year on this incredible World Heritage Site and returned with horrifying new evidence of just how pervasive the level of mouse predation is.

We wanted to assess how the mice's predatory behaviour affects the 16 burrow-nesting petrel species that breed on the island. To do so we installed infrared cameras in the underground nest chambers of as many petrels as we could find. This was technically challenging, because most CCTV systems can't withstand the wet and muddy island conditions. >

below *A female Tristan Albatross sits next to her chick which is being eaten by mice. Having evolved on oceanic islands in the absence of land-based predators, these birds are unable to appreciate the danger posed by these strange new arrivals.*

left *Gough Island is often regarded as the world's most important seabird island. Its densely vegetated terrain is home to thousands of surface-nesters like this Atlantic Yellow-nosed Albatross, but most of the breeding birds are burrow-nesting petrels that only emerge at night.*

previous page *When this Common Diving Petrel chick hatched it was the size of a golf ball. Here it is 13 days old and a bit bigger, and although still no match for a hungry mouse, this chick did survive to fledge.*

above *Macgillivray's Prions were recently discovered breeding on Gough Island. Even though the birds breed in midsummer, the mice were relentless and all the monitored chicks in Prion Cave died within weeks of hatching.*

top *Great Shearwaters breed in summer when the mice are less desperate for food, yet some chicks still fell prey to mice.*

MORE THAN **90 PER CENT OF BIRD EXTINCTIONS** IN THE PAST 500 YEARS HAVE BEEN OF ISLAND SPECIES

We ended up building our own system, using cameras fitted with 120˚ wide-angle lenses to film the tight interior of a burrow and illuminated by 12 infrared LEDs diffused with kitchen wax wrap and fixed in place with wood glue. After the prototypes were shredded by inquisitive mice within days of installation, we realised that these mice play mean, and we encased each unit in PVC plumbing pipe and used lots of epoxy.

The early summer months were fairly quiet and although we did film mice attacking and killing Soft-plumaged Petrel and Great Shearwater chicks, incidents were relatively infrequent. The only Common Diving Petrel chick discovered wasn't attacked, despite mice regularly visiting the nest chamber and hassling the tiny chick which, at least initially, was much smaller than the mice. However, by midsummer the mice were starting to take their toll. All the Macgillivray's Prion chicks in Prion Cave were killed within weeks of hatching. As winter approached and alternative food supplies for the mice dwindled, the carnage escalated. The Atlantic Petrel is a large, robust gadfly petrel, yet all seven chicks which hatched in the burrows being filmed were killed within a day of hatching. In one case the mice pulled a hatching chick from its eggshell while it was still being brooded by its parent.

In monitored nests of Broad-billed Prions, which lay their eggs in late winter, the birds also failed to raise any chicks. In this instance both eggs and chicks were targeted. Burrow-nesting petrels frequently leave their eggs unattended for a few hours, which is not a problem as the eggs can tolerate short-term chilling. However, it does create an opportunity for hungry mice, which soon gnaw their way into the eggs.

Our observations confirmed that house mice are significant predators of petrel eggs and chicks on Gough Island and that species are impacted irrespective of when they breed (but winter breeders definitely fare worse, at least among the larger species). Mice are effective predators, killing chicks within hours of hatching while still brooded by their parents, and also tackling large chicks many times their body size. However, small species probably are at greater risk. We couldn't find any nests of the four storm petrel species that breed on Gough and, based on trends in the numbers coming ashore at night, populations of Grey-backed, White-bellied and Black-bellied storm petrels have been particularly hard hit.

Gough is also home to three species of albatross. Currently, mice have little impact on the two summer-breeding species, killing only the occasional chicks of Sooty and Atlantic Yellow-nosed albatrosses. However, the much larger Tristan Albatrosses rear their single chick through winter, and they are particularly prone to attack. This is even more worrying because, apart from one or two pairs on Inaccessible Island in the Tristan archipelago, Gough is the sole breeding site for this Critically Endangered species.

We noticed that large, seemingly healthy chicks alongside the path to Gonydale would be gone three days later, leaving only an empty nest. By placing motion-activated trail cameras at nests, we were able to confirm that mice were not only wounding the chicks but killing them outright. It seems incredible that a 50-gram mouse can kill an albatross chick weighing more than a hundred times its own weight, but the camera doesn't lie.

Attacks start when a single mouse gnaws at a spot on the chick's body, commonly its rump or back. The chick would occasionally try to shake the mouse loose, but the rodent would keep returning until it had created a small, open wound. Once the flesh is exposed, other mice join in, further enlarging the wound. After a few nights the chick dies, and the carcass is usually scavenged by skuas or giant petrels. Our cameras revealed that more than 90 per cent of chicks were killed by mice. In 2014, fewer than 10 per cent of Tristan Albatross breeding attempts were successful. In the absence of introduced predators, these birds usually rear about 70 per cent of their chicks.

Ross Wanless suggested that mice are particularly problematic for birds when they are the only introduced predator. Under these conditions, mice attain very high densities (close to 300 mice per hectare) in summer. As winter sets in, food resources for mice dwindle, forcing them to seek alternative sources. Unfortunately, seabird chicks are an easy target. Burrow-nesting petrels and prions leave their chicks alone a few days after hatching. Since they breed in underground burrows and caves these chicks are protected from the elements on these cold and wet islands and are out of reach of predatory skuas and giant petrels, but they are an easy meal for predatory mice. The high density of mice, together with the abundance of seabird chicks in winter, apparently has selected for this predatory behaviour.

Eradicating mice from an island as large as Gough requires the use of helicopters to disperse rodenticide bait over the entire island.

The good thing about islands is that eradication is a viable option – provided adequate measures are put in place to prevent subsequent reintroductions. Scientists from the UK BirdLife partner, the Royal Society for the Protection of Birds (RSPB), and from the Percy FitzPatrick Institute at the University of Cape Town have been studying the feasibility of eradicating mice by using helicopters to spread rodenticide bait over the entire island. Such initiatives have been successful on other sub-Antarctic islands.

In June 2015 the RSPB announced phase 1 of the Gough Island eradication attempt. If the £7.6-million funding required can be secured and all complex logistical arrangements go according to plan, it is hoped that the actual bait drop will occur in the winter of 2019. A successful operation will see the recovery of one of the world's most important seabird islands. ◆

FURTHER READING

Davies, D., Dilley, B.J., Bond, A.L., Cuthbert, R.J. and Ryan, P.G. 2015. 'Trends and tactics of mouse predation on Tristan Albatross Diomedea dabbenena chicks at Gough Island, South Atlantic Ocean.' Avian Conservation and Ecology, *10, 10.5751/ACE-00738-100105.*

Dilley, B.J., Davies, D., Bond, A.L. and Ryan, P.G. 2015. 'Effects of mouse predation on burrowing petrel chicks at Gough Island.' Antarctic Science, *DOI: 10.1017/S0954102015000279.*

MEGA MICE
The size factor

Rats are well-known predators of seabird chicks but, prior to the observations on Gough Island, mice were thought to be too small to pose a serious threat to seabirds.

Gough's mice are unusual in that they are 50 per cent larger than other island populations of house mice, which might give them an edge when it comes to tackling seabird prey.

Genetic studies show that the mice introduced to Gough probably originated from England or France, and that they owe their large size to rapid selection of a suite of about 20 genes since they became isolated on Gough Island. However, the recent spate of mouse attacks on albatross and petrel chicks on Marion Island in 2015 (see *African Birdlife*, May/June 2015, p. 18) shows that large size is not a prerequisite for attacking seabirds. The house mice on Marion Island are similar in size to mice throughout most of their range.