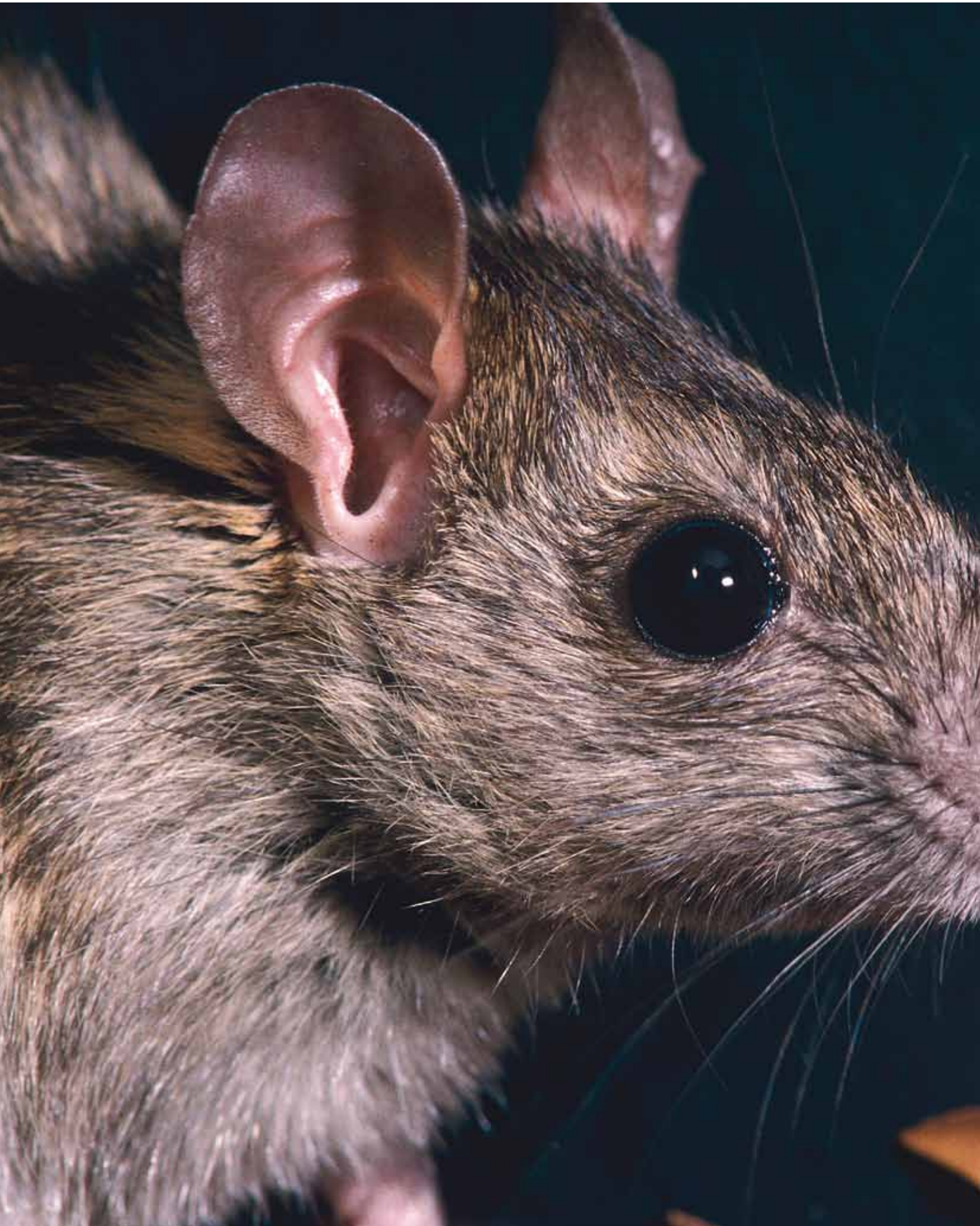


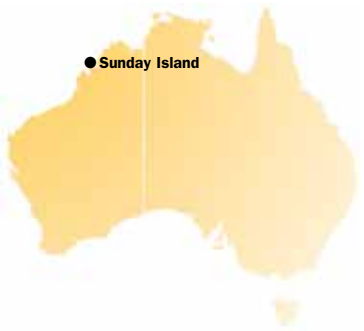
The mysterious case of the black rat on Sunday Island

As they plied the island-studded coastline of the Kimberley, early explorers and nagivators had long referred to problems with rats. Given the threat introduced black rats pose to fragile island ecosystems, the Department of Environment and Conservation set out to determine the level of threat on Sunday Island, or Iwany. Yet such a task produced unexpected results, and created something of a mystery.

by Russell Palmer, Damon Pyke, Paul Meek and Viki Cramer

The Sunday Island group—just off the eastern tip of the Dampier Peninsula in the Kimberley—marks the entrance to King Sound. This area of treacherous tides, swirling seas and seemingly desolate islands is the home of the saltwater Bardi Jawi people, who knew how to harvest the abundant resources of the surrounding ocean and passed on this knowledge over generations of teaching and storytelling.

Despite the area's remoteness, it wasn't long before other cultures began mixing with the Bardi Jawi, and exerting their influence on the area. Europeans first visited Bardi Jawi country when buccaneer and explorer William Dampier entered King Sound aboard the *Cygnet* in 1688. Later, the discovery of rich pearling grounds in the 1880s heralded the beginning of sustained contact between Bardi Jawi people, Europeans, Malays and Japanese. By 1899, a non-denominational mission was established by Sydney Hadley on Sunday Island, known to the Bardi Jawi as Iwany. The mission housed hundreds of Bardi Jawi people over the years of its existence and generated profitable exports of pearl and trochus (*Trochus* spp.) shell.



But with ships came rats. Black rats (*Rattus rattus*) are a commensal species in that they benefit by living alongside human habitation. In close association with the spread of human settlement, this unwelcome neighbour has spread across the globe. Black rats have colonised more than 80 per cent of the world's island groups, spreading some of the worst diseases that affect humans and devastating native wildlife populations.

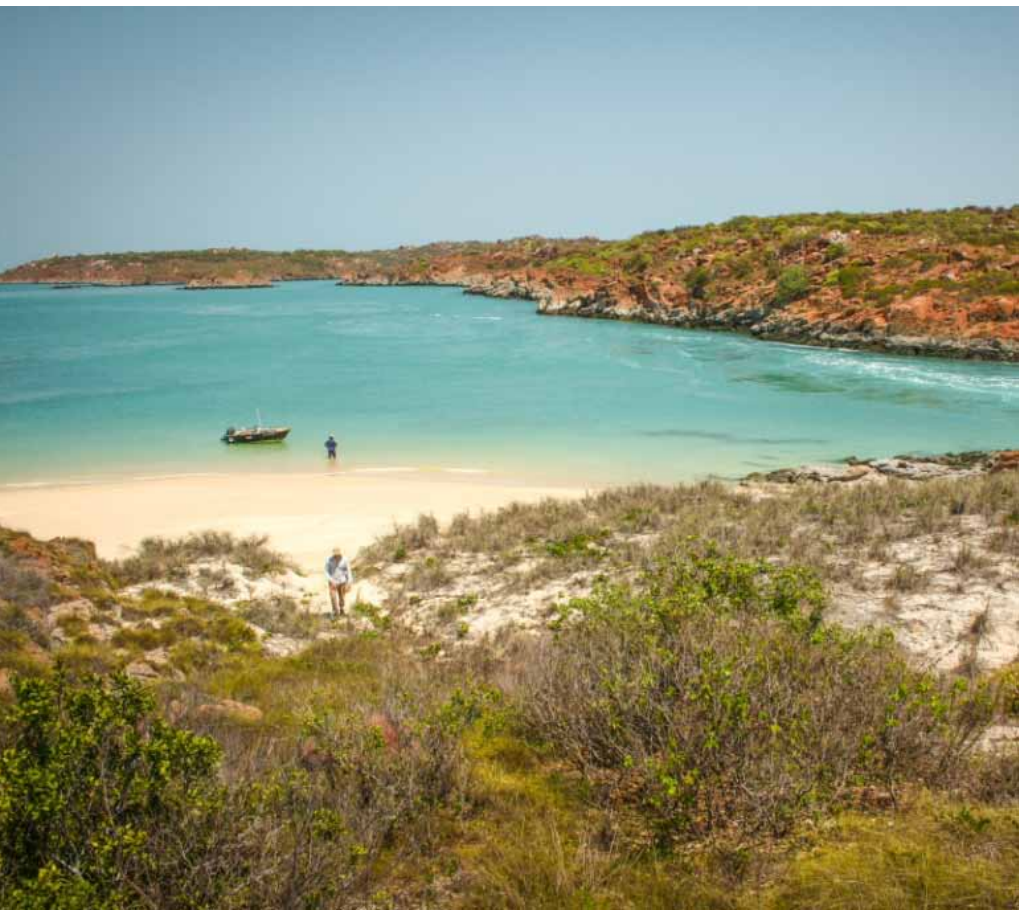
Invasive rats are now routinely eradicated from islands for conservation purposes. Black rats have been successfully eradicated from more than 30 islands in Western Australia and from over 200 worldwide. To continue this work, the Department of Environment and Conservation (DEC) needed to determine if black rats occurred on Sunday Island or surrounding islands and, if so, to put plans in place to reduce their menace.

Rat records

The historical literature certainly highlights the presence of rats along the Kimberley coast. Visiting ships were infested by rats, a fact evident in the journals of the early navigators and mariners. During his four voyages charting Australia's northern coasts between 1817 and 1822, Captain Phillip Parker King experienced significant problems at the hands—or should we say teeth—of the rats living on the *Mermaid*. While they were in Admiralty Gulf in the Kimberley in 1819, rats gnawed holes in the ships' water casks, reducing the water stores to a fortnight's supply. King and his crew failed to find any local supplies of water and had to sail to Timor for resupply.

Not all seafarers of the north-west loathed rats on their vessels. Pearl luggers plying their trade along the Kimberley coast and in King Sound were also riddled with vermin, including rats. In his book *The White Divers of Broome*, John Bailey recorded that "a rat-free boat was thought to be a disaster because rats kept the cockroaches down. If a boat had no rats, the crew might moor the vessel at a certain creek where, on a quiet night, a few might be enticed aboard".

The notorious waters of the Sunday Island group also claimed their fair share



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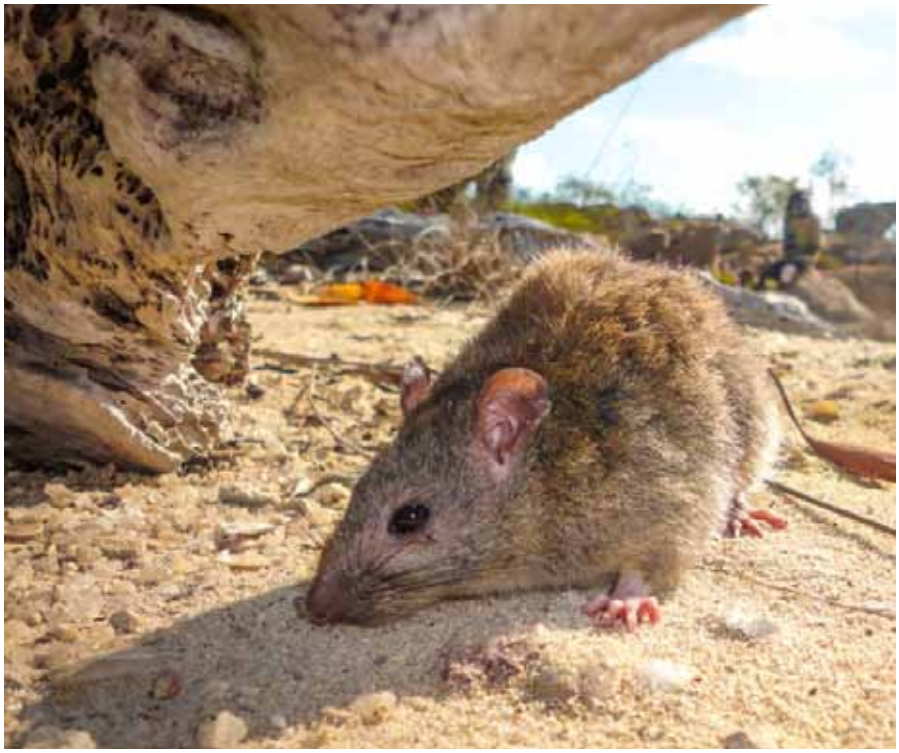
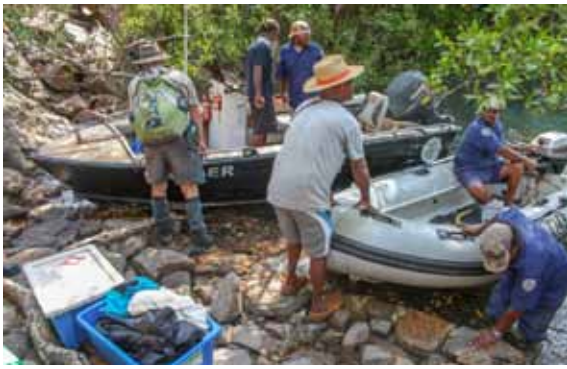
Main Black rat.
Photo – Marie Lochman
Inset Nilagoon beach and exposed reef at low tide.

Left Setting a camera at Dean Island (Inyjanoo) with Sunday Island in the background.
Photos – Damon Pyke





Above A mosaic-tailed rat takes shelter after release.
Photo – Paul Meek

Top right Ranger Chris Sampi and Reggie Thomas checking out a large male mosaic-tailed rat.

Centre right The survey team bringing gear to the Sunday Island mission entrance (Moori).

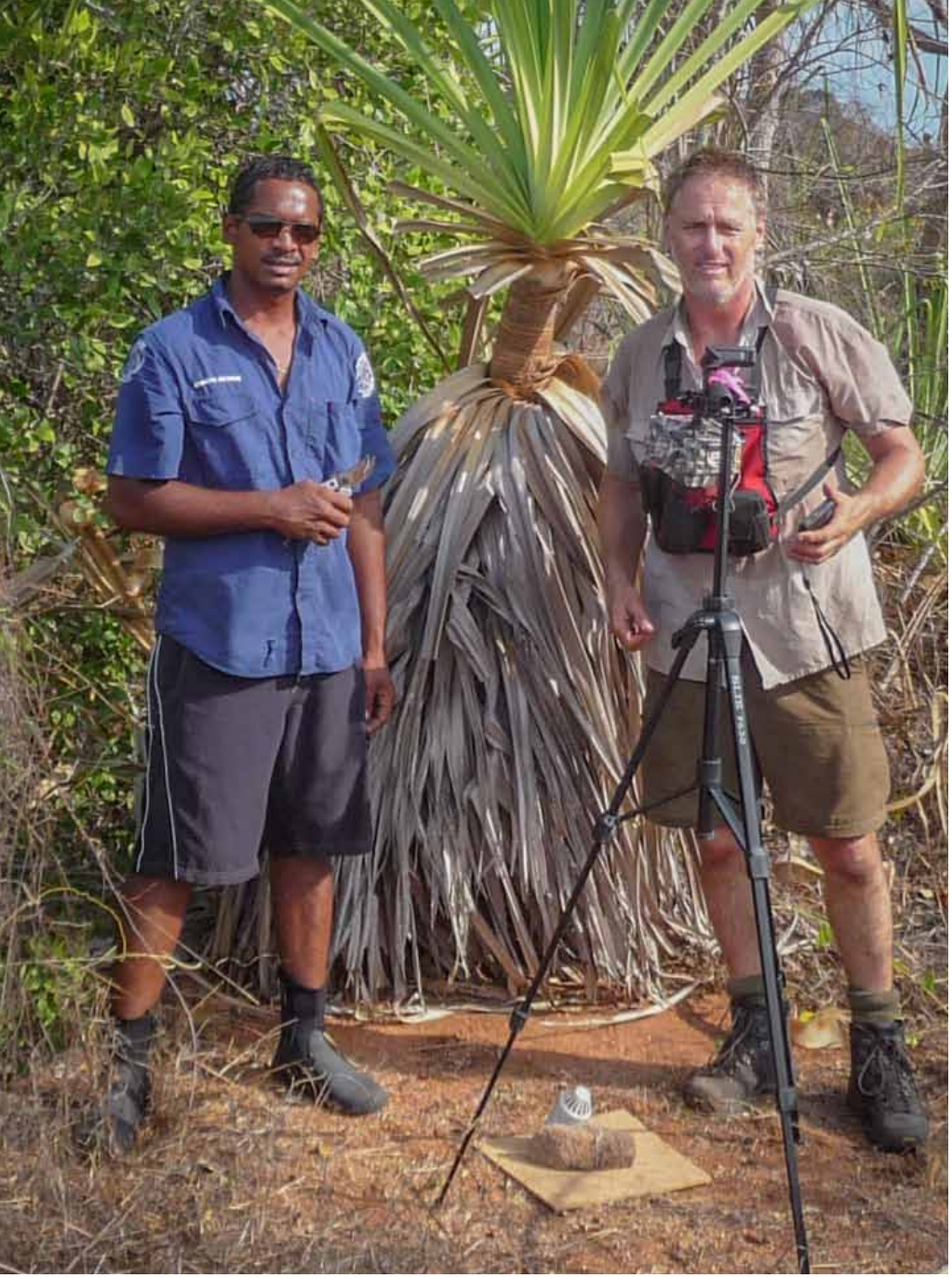
Right – The Bardi Jawi Rangers at Middle Beach, Ardyaloon.
Photos – Damon Pyke

of these rat-infested vessels, with at least five being wrecked there between 1890 and 1935. The *Ritie* came to grief on Poolngin Island next to Sunday in 1923, potentially allowing black rats ashore.

On Sunday Island, rats apparently arrived soon after the mission was established. A search of the Western Australian Museum catalogues revealed that WH Bird, a teacher at the mission school, donated two young black rats to the museum in April 1909. In 1911, the commander of the survey vessel the HMS *Fantome*, JD Nares, gave the name 'Rat Island' to one of the islands near where Dampier anchored in 1688. Several years later, explorer and medical practitioner Herbert Basedow complained about the hordes of rats that overran the sheds where his equipment was stored at Derby wharf while they waited for the arrival of the *Rita*. The *Rita* was the mission cutter chartered to collect Dr Basedow for his 1916 'Northwest Expedition'. Only four days into this journey, they noticed numerous unwelcome associates aboard, the largest of which were rats, so the *Rita* was thoroughly overhauled and cleaned at low tide at the mission landing in a protected cove on the north-west side of Sunday Island. "We rested under the verandah of the Missionary's house for the night, but, weary as we were, there was not much sleep to be had on account of the numbers of black rats which ravaged the place in the night," he recorded.

But were all of these ravagers black rats, or was it a case of mistaken identity? Although the first biological survey team to visit the island in 1982, some 20 years after the mission closed, found two black rats at Nilagoon on the southern end of Sunday Island, they also trapped 10 native mosaic-tailed rats (*Melomys burtoni*) on Sunday and East Sunday. The field guides at the time stated that male mosaic-tailed rats, known to the Bardi Jawi as 'miijo', should weigh a maximum of 65 grams, but the mosaic-tailed rats on Sunday Island were giants, weighing up to 172 grams. At this size, black rats and mosaic-tailed rats are easily confused—they both have a tail longer than their head–body length (a key diagnostic measure for telling *Rattus* species apart). However, each species has a distinctive scale pattern on their tails that lets scientists easily differentiate between the two. Without close inspection, one species of rat is easily mistaken for the other. And not many of the early explorers and naturalists wanted to get that close to a rat.

The Nilagoon site, now the site of an outstation with roughly 10 buildings and sheds constructed in the early 1990s, was surveyed again during the Kimberley Islands Biological Survey



Left Ranger Dwayne George and Paul Meek setting up an infrared camera over a bait set to attract rodents.
Photo – Russell Palmer/DEC

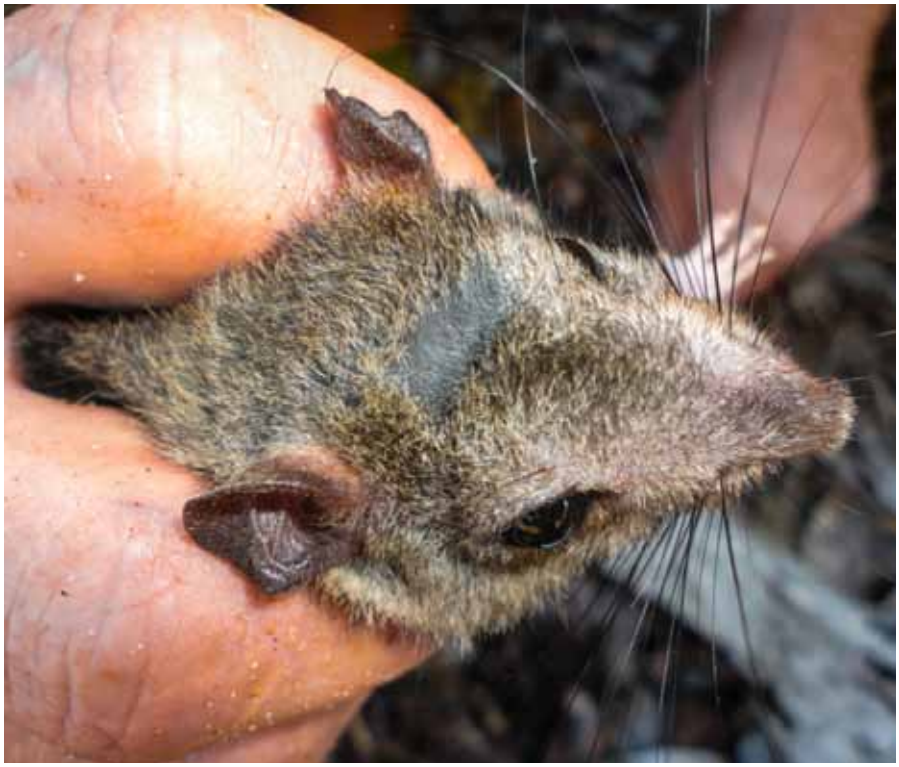
Below left Ranger Wesley Hunter and Reggie Thomas take in the view from Goorlilbooloon, south of Nilagoon.
Photo – Damon Pyke

(see 'Treasures of a sunken coastline: a biological survey of the Kimberley islands', *LANDSCOPE*, Winter 2008) in June 2009. Seven mosaic-tailed rats were captured in five nights of trapping, but no black rats were detected.

Mission black rat

With support from the federal government Caring for our Country program, DEC has sought to eradicate exotic rodents from a number of islands in WA. However, before starting eradication measures on Sunday Island, DEC needed to conclusively establish whether black rats were still there. To do this, staff enlisted help from the Bardi Jawi Rangers (see 'Working together for dugong conservation', *LANDSCOPE*, Autumn 2010), who are responsible for supporting the management of land and sea across their native title area, including the Sunday Island group. This area includes approximately 1,100 square kilometres of land with 200 kilometres of coastline, and 2,000 kilometres of sea. Rangers' work covers cultural and natural resource management, including weed control, biodiversity monitoring, vine thicket protection, turtle and dugong monitoring, fire management, coastal patrols, environmental education with schools and tourist cultural awareness talks.

With the approval of traditional owners, full support of the rangers, and the expertise of camera-trapping expert Paul Meek from the University of New England, DEC set about conducting a survey on Sunday Island in October 2012. Our team also included traditional owner Reggie Thomas, to provide advice on culturally important areas that should be avoided.



Above left A captured mosaic-tailed rat, with its head marked to identify repeat captures.
Photo – Paul Meek

Above The distinct pattern of a mosaic-tailed rat's tail.
Photo – Kirsty Quinlan/DEC

Although nobody has lived on Sunday Island since the late 1990s, we expected that our best chance of detecting black rats would still be where people had lived in the past—the mission, with its freshwater wells where wild bananas still flourish, and Nilagoon Outstation. We armed ourselves with cage traps, instead of the more convenient Elliott traps used on most mammal surveys, as black rats tend to avoid entering these enclosed aluminiun box traps. We also took more than 60 remote cameras, which enabled us to target a bigger area on the island. However, the cameras also presented a new challenge, as we would need to use diagnostic features other than the fine scale patterns on rat tails to positively separate the species.

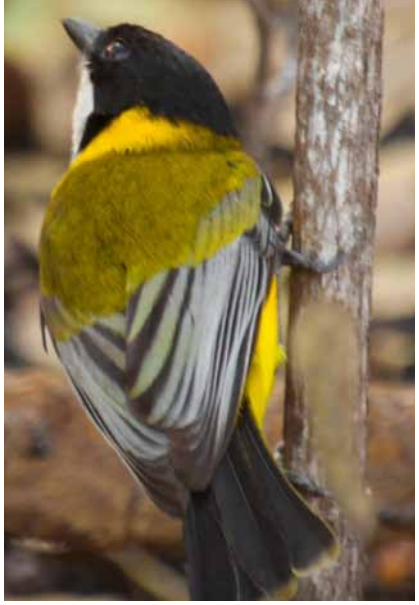
We hoped that the rats would be hungrier in the late dry season, and therefore attracted more readily to baits in traps or placed in front of the cameras. Also, a substantial portion of the island had been accidentally burnt by fires in July, meaning any rats present on the island were likely to be concentrated in the unburnt patches, which were mostly near the coast, including the fringing mangroves and rugged rocky sandstone country. The downside to the fires was the lack of shade, meaning there were few places we could take respite from the blistering late dry season heat.

And the rats cometh

The team set up camp at Nilagoon Outstation, the site of the last confirmed black rat records 30 years earlier. The first night, as we sat wearily around the camp fire after a hot day of setting up camp and lines of cage traps, a few rats began to emerge from the buildings that surrounded us. Thinking that we would have little chance of catching the rats by hand, we decided to let the cage and remote-camera traps we had just set do their work. That large-sized rats with long tails were living in rafters of the buildings—where we expected the cosmopolitan black rat to live—did not appear to be good news for the island's biodiversity.

Like Dr Herbert Basedow almost 100 years before us, our next eight nights camped at the outstation were sometimes sleepless as the rats climbed up onto the tables and rummaged through any food that we forgot to put away in containers. They loved our boxes of cereal. Like many island creatures, the rats showed little fear of us, and the longer we stayed the cheekier they got. The upside of this growing nonchalance of the outstation's rats was that it enabled us to get close enough to inspect the vital diagnostic feature separating black rats and the native mosaic-tailed rats—the scale pattern on their tails. Once a rat was spotted in the beam of a head torch, it was often possible to reach out and hold the end of its tail for a brief moment to get in a look at the scale pattern, rather than grab the animal and risk being bitten. And it was not just the rats that became increasingly relaxed in our presence; just as he was about to 'tail' a young rat one night, Paul Meek was startled to have a children's python (*Antarasia childreni*) literally snatch the rat out of his fingers, and proceed to swallow it.

We observed, trapped and captured images of only the mosaic-tailed rats at Nilagoon Outstation. The story was the same for our three cage trap



Left The bynoe's gecko (*Heteronotia binoei*) is one of 19 species of terrestrial reptile known from Sunday Island.
Photo – Trevor Sampi

Above Mangrove golden whistlers (*Pachycephala melanura*) are highly conspicuous on Sunday Island, in appearance and sound.
Photo – Damon Pyke

and remote-camera trap-lines radiating out from the outstation, located in mangroves, coastal dunes with beach spinifex and rugged King Leopold sandstone hills. At the old mission on the western side of the island, we set cage traps in the mangroves, around the wells and in the unburnt wild banana patch in the valley. (The missioners' building on the hill top was avoided due to asbestos.) Remote cameras were also used here and in some of the remaining buildings that were the homes of the Bardi Jawi people. Cameras were left in place for more than 30 days.

In spite of the presence of fresh water, shelter and ripening bananas, we detected only a handful of mosaic-tailed rats. We caught nothing at the mission landing where black rats were ejected from the *Rita* during Basedow's expedition. Cameras placed by boat on all the major sandy beaches on Sunday and East Sunday islands also failed to snap any pictures of black rats. Likewise, cameras placed on 14 other smaller islands throughout the Sunday group for 30 days, including Rat and Poolngin, failed to detect any black rats.

And the ecological winner is …

Our work on Sunday Island has raised a number of intriguing historical and ecological questions about the presence of black rats on the island, and about their ecological interactions with the native mosaic-tailed rat. Undoubtedly, black rats were present on Sunday Island historically, but their ability to populate and flourish on the island is likely closely linked with the island's European history. Although rats may well have 'jumped ship' on the islands of King Sound during the visits of Dampier and the pearlers, it may not have been until the mission was established in 1899 that black rats, with their preference for human environments, could establish large populations. In the vegetable gardens and where goats and cattle were grazed around the mission, and in the mission buildings themselves, black rats would have been more successful than the similarly sized mosaic-tailed rat.

The hordes of rats that kept Dr Basedow sleepless some 20 years later were most probably black rats. During the time of the mission, we expect that black rats expanded into the 'richer' rat habitat found in the Nilagoon area in the south of the island. Once the mission closed in 1962, the continual disturbance that humans cause through agriculture and other activities was removed and, even though some of the buildings remained, the conditions that favour black rats over mosaic-tailed rats were removed. With the human presence advantage gone, black rats appear to have been out-competed by mosaic-tailed rats, and it seems that native rats also took a liking to living in the buildings. Sunday Island may not be totally free of black rats, but the island appears to be in hands of a superior native competitor.

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