

Island on the edge

Justin Gilligan

An environmental catastrophe is unfolding on Christmas Island, the site of Australia's latest suspected mammal extinction. The unique wildlife of the island is struggling to cope with the impact of humans and introduced pests.



Credit: Justin Gilligan

To most Australians, the name Christmas Island is synonymous with its offshore immigration detention centre, and the desperate attempts by asylum seekers to reach Australian soil in crowded, unseaworthy vessels.

But there is another, less well known story from this jungle-clad outpost of Australia that is just as controversial. Over the past few years, Christmas Island -has witnessed an exponential loss of endemic species – those found nowhere else in the world – despite the fact that 63 per cent of its 135 km² is protected as national park. The unique biogeography and remoteness of the island – an isolated volcanic peak in the northern Indian Ocean that is closer to Indonesia than Australia – has intensified the environmental impacts of more than a century of phosphate mining, the introduction of invasive species and an overcrowded detention centre.

‘No simple solutions’

Evidence of Christmas Island's rich biodiversity can still be seen, from the lush crown of rainforest to the surrounding deep blue waters of the Indian Ocean. Within the forest, endangered seabirds such as Abbott's booby (*Papasula abbotti*) feed their young, land crabs scuttle through the leaf litter, and freshwater springs snake through the porous limestone subsoil. Seawards, the thin ribbon of coral reef encircling the island is home to endemic marine fish hybrids, and majestic whale sharks (*Rhincodon typus*).

Since humans first built permanent settlements ~120 years ago, the island's flora and fauna have faced a growing

number of threats, culminating in a wave of extinctions and species declines from the 1980s onwards. The Christmas Island National Park was declared in 1980, with the central aim of protecting and maintaining the island's biological diversity.

Australia's Director of National Parks coordinated an audit of the island's biodiversity between 2003 and 2007. The ensuing Christmas Island Biodiversity Monitoring Program report¹ noted the island's biodiversity as internationally significant, with 253 endemic species, 167 of which have national conservation significance, and 110 that are listed as 'protected' under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). The report concluded that Christmas Island's biodiversity is 'unlikely to be matched by any other small island in Australia or any other national park in Australia'. But the report also raised concerns about the future, given that four of the island's five endemic mammal species are now extinct, seven endemic plant species have been lost forever, and the remaining populations of endemic reptiles are in rapid decline.

In response to the biodiversity audit, a Christmas Island Expert Working Group published a report² in September 2010, which asserted that 'the conservation problems on Christmas Island are pervasive, chronic and increasing and, unfortunately, will not have simple solutions.'

Unfortunately, as the Expert Working Group pointed out, the island's national park recovery and conservation management plans have been poorly implemented, if at all, and have proved inadequate. A lack of staff and funding, combined with the island's complex governance – which includes various federal, state and private agencies – has further hindered conservation management efforts.

Phosphate mining impacts

The Christmas Island phosphate mine has had the greatest single impact on biodiversity. Since mining for phosphate – widely used in fertilisers – began in the 1890s, around a quarter of the island's rainforest has been cleared. Abandoned mine areas are barren and infested with introduced weeds.



Credit: Justin Gilligan

To address this problem, Parks Australia has established the Christmas Island Minesite to Forest Rehabilitation Program, aimed at restoring natural vegetation in previously mined leases. According to Christmas Island National Park Manager, Mr Mike Misso, the program has been a success.

'We've raised 24 native forest species from seeds and cuttings in our nursery, and so far we've planted more than 300 000 trees over 143 ha,' Mr Misso says. The rehabilitation work also aims to minimise the impact of wind turbulence from cleared mine sites on endangered Abbott's boobies and endemic Christmas Island frigate birds (*Fregata andrewsi*).

Phosphate mining has also impacted the marine environment, with phosphate dust from the mine's processing mill and loading dock entering the ocean.

Recent research by marine biologist Mr Jean-Paul Hobbs, a PhD student with the ARC Centre of Excellence in Coral

Reef Studies based at James Cook University, has revealed that Christmas Island has the most combinations of hybrid marine fishes in the world³. The island lies on a biogeographic boundary, where Indian and Pacific Ocean marine species converge. This has led to interbreeding and hybridisation.

Mr Hobbs has found that phosphate runoff from mining operations is polluting the water and smothering corals. In 2008, the island's reef suffered an outbreak of coral disease⁴, with the greatest mortality occurring in areas of phosphate runoff.

'There is no way you would be allowed to dump all this fertiliser on a reef in mainland Australia,' says Mr Hobbs. 'There would be a public outcry'. As he points out, the Great Barrier Reef is regulated and protected by management agencies and state and federal government programs, in which millions of dollars are allocated to minimising pollution and fertiliser runoff. On Christmas Island, however, phosphate pollution remains unregulated.

A significant step towards conservation of the island came in July last year, when Peter Garrett, then Minister for Environment Protection, Heritage and the Arts, rejected an application by Phosphate Resources Limited to extend phosphate mining on Christmas Island.

'I have come to the conclusion that this proposal cannot go ahead without unacceptable impacts on the island's biodiversity,' said the Minister at the time. While this announcement was a big step forward, Phosphate Resources Limited is still free to mine under existing lease conditions until 2019.



Credit: Justin Gilligan

Ants v. crabs

According to the 2010 report of the Expert Working Group on biodiversity, Christmas Island is an example of 'invasional meltdown' or 'ecological cascade', which may have been triggered by a continuing decline in populations of the famous Christmas Island red crab (*Gecaroidea natalis*). The red crab is known for its spectacular seasonal mass migration, during which tens of millions of these bright red animals stream from the forest to the sea to breed.

Ecologically, the red crab is regarded as a keystone species, because it determines much of the rainforest's ecological function, structure and community composition. However, since the 1990s, as many as 20 million red crabs have been killed by 'super colonies' of a pest species that is now dominating the island's ecology – the yellow crazy ant (*Anoplolepis gracilipes*). This ant species arrived on the island between 1915 and 1934 by cargo ship among poorly quarantined goods. The island still lacks a quarantine facility, although the Australian Quarantine Inspection Service maintains a small team there.

Yellow crazy ants 'farm' scale insects on rainforest trees so that they can feed on honeydew secretions. The lack of natural predators for both the scale and ants has led to the formation of yellow ant super colonies, numbering thousands of individuals per square metre. These ants kill red crabs and other native invertebrates by spraying formic acid onto them.

Attempts have been made to eradicate the ants using the insecticide Fipronil. In 2009, Parks Australia targeted crazy

ant super colonies using aerial baiting by helicopter. According to Mr Misso, this reduced colony densities by more than 99 per cent. But, as the Expert Working Group has pointed out, using Fipronil to control yellow crazy ants is not a satisfactory long-term solution. Parks Australia is currently working with Latrobe University to develop a biological alternative. ‘The aim is to control the scale insects, which provide the ant’s major food source,’ says Mr Misso.

Every summer, red crabs release billions of eggs into the sea. The eggs hatch into free swimming larvae, which spend a month drifting in ocean currents; this planktonic soup attracts seasonal aggregations of whale sharks to the area. Dr Mark Meekan of the Australian Institute of Marine Science is using the latest in tagging technology to study the whale sharks’ migratory movements. His research shows that Christmas Island is an important seasonal nursery area for juveniles of these gentle giants, with the crab larvae being a major food source during their stay.

‘The data we’re collecting at Christmas Island contributes to the global puzzle, and is particularly important considering this species [the whale shark] is listed as ‘vulnerable to extinction’ by the International Union for Conservation of Nature,’ says Dr Meekan.



Credit: Justin Gilligan

Farewell pipistrelle?

Christmas Island’s most recent species loss was an inch-long winged creature weighing just three grams – the Christmas Island pipistrelle bat (*Pipistrellus murrayi*).

Research scientists and National Park staff warned years ago that this species would become extinct by 2008. In February 2009, Dr Lindy Lumsden – Principal Research Scientist with the Arthur Rylah Institute for Environmental Research, and foremost authority on this species – reported that only 20 bats remained on Christmas Island. The federal government allocated funding to establish a captive breeding program, but that proved too little, too late. No bats have been detected via ultrasonic bat detecting stations since late 2009. The species has now been presumed extinct – the first mammal extinction in Australia in 53 years.

How did this happen? Scientists believe habitat loss from the construction of the detention centre, along with predation or disturbance by introduced species such as the common wolf snake (*Lycodon aulicus capucinus*), giant centipede (*Scolopendra morsitans*), yellow crazy ant, black rat (*Rattus rattus*) and feral cats (*Felis catus*) could all have contributed to the decline.

The pipistrelle is the latest in a series of Christmas Island mammal extinctions that have included Maclear’s rat (*Rattus maccleri*), the bulldog rat (*Rattus nativitarus*) and the Christmas Island shrew (*Crocidura trichura*), not seen since 1985, despite extensive surveys. The Christmas Island flying fox is the last remaining endemic mammal, with its population decline triggering attempts to have this species listed as vulnerable under the EPBC Act.

As populations of introduced reptiles take over habitat, the four remaining native species are struggling to keep a foothold. A small grey and black gecko with bright yellow eyes, known as Lister’s gecko (*Lepidodactylus listeri*), is on the cusp of extinction – literally a handful remain. A recommendation by the Expert Working Group to develop captive

breeding programs may be the last hope for species such as the gecko and the Christmas Island flying fox.

Detention centre impacts

When constructed in 2006, the \$400 million Immigration Detention Centre destroyed significant habitat, including the last foraging grounds of the pipistrelle bat. The centre was initially designed to house around 400 asylum seekers, yet has accommodated many hundreds more in tents. An additional freshwater bore has since been sunk to cope with the increased demand. Some local residents are concerned about the impact of the bore on nearby internationally important wetlands and popular beaches.



Credit: Justin Gilligan

The impact of the detention centre on the island's biodiversity is yet to be fully determined. Currently, the federal government is not required to meet its environmental obligations under the EPBC Act concerning the construction and running of the detention centre, because the centre has been deemed a 'national priority'.

Meanwhile, the daily drive to work by the detention centre's 300 fly-in, fly-out workforce is decimating the island's robber crab (*Birgus latro*) population, which is also affected by yellow crazy ants. The robbers are the world's biggest terrestrial invertebrates, and Christmas Island is home to the largest remaining population.

'The trends are worrying,' says Parks Australia's Mr Misso. 'There were 854 [robber crab] fatalities last year, despite a publicity campaign to alert the community to the increasing mortality.'



Credit: Justin Gilligan

Future prospects

Christmas Island's extraordinary diversity and abundance of crabs inspired Sir David Attenborough to label the island's red crab migration as one of the planet's 'greatest wildlife spectacles'. So, are there prospects for establishing an ecotourism industry that may help protect the island? Christmas Island is often referred to as the Galapagos of the Indian Ocean. However, while the unique wildlife of the Galapagos Islands is protected to ensure the future of its ecotourism industry, the conservation of Christmas Island's unique landscapes and wildlife has clearly been compromised.



Credit: Justin Gilligan

At the moment, the best prospects for conservation of the island's biodiversity lie within the 32 recommendations made by the Expert Working Group in 2010. The group's advice was summarised in one sentence: 'Protect the integrity of Christmas Island ecosystems from further unwanted introductions, prevent additional detrimental changes to the landscape, and establish better environmental governance and management frameworks for the island'.

Justin Gilligan is a freelance writer.

More information

Christmas Island National Park: www.environment.gov.au/parks/christmas

¹ Director of National Parks (2008). Christmas Island Biodiversity Monitoring Program: December 2003 to April 2007. Report to the Department of Finance and Deregulation from the Director of National Parks.

² Christmas Island Expert Working Group (2010). Final Report of the Christmas Island Expert Working Group to the Minister for Environment Protection, Heritage and the Arts.

³ Hobbs J-PA, Frisch AJ, Allen GR and Van Herwerden L (2009). Marine hybrid hotspot at Indo-Pacific biogeographic border. *Biology Letters* 5, 258–261.

⁴ Hobbs J-PA and Frisch AJ (2010). Coral disease in the Indian Ocean: taxonomic susceptibility, spatial distribution and the role of host density on the prevalence of white syndrome. *Diseases of Aquatic Organisms* 89, 1–8.

From **ECOS** online <http://www.ecosmagazine.com/?paper=EC10072>