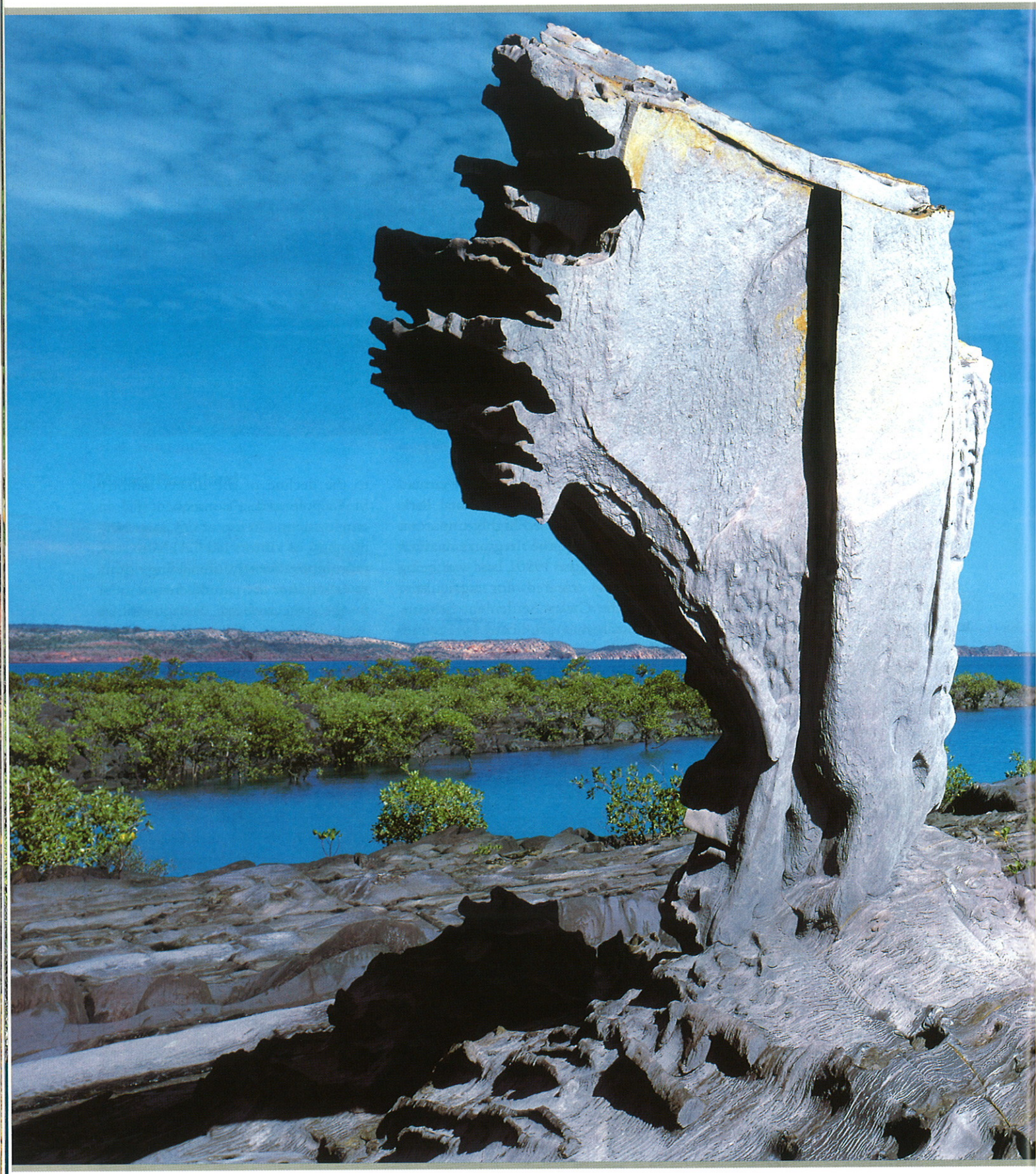


Treasures of a sunken coastline:

a biological survey of the Kimberley islands

Biological surveys are revealing a rich suite of plants and animals in the spectacular and remote Kimberley islands.

by Lesley Gibson, Norm McKenzie, Tony Start, David Pearson and Russell Palmer

The ancient rocky ranges, plains and spectacular coastline of Western Australia's Kimberley region form a rich tapestry of landscapes inhabited by tropical plants and animals. However, the area's relative isolation and rugged terrain, particularly in the north-west, has restricted comprehensive assessments of its flora and fauna. Biological surveys in such environments are expensive and, consequently, knowledge of the region's biodiversity is limited.

The only previous systematic biological survey of the area focused on rainforest patches across the region and revealed a rich diversity of plant and animal species. The survey was led by the then Department of Conservation and Land Management, now the Department of Environment and Conservation (DEC), and also involved a Wunambal elder, the late Geoffrey Mangglamarra, who contributed his extensive knowledge of plants, animals and country to the project. This survey highlighted the fragility of the Kimberley to human-related impacts such as the pervasive influence of cattle and wildfire. The south and east Kimberley have experienced pronounced changes to the landscape since European arrival. A wave of extinctions among medium-sized or 'critical weight range' mammals occurred during this time.

Weeds, introduced stock such as cattle, donkeys and pigs, and changed fire regimes, now characterised by extensive and intense fires (see 'Fire in the Kimberley', *LANDSCOPE*, Autumn 2008), have contributed to loss of biodiversity in the Kimberley. Repeated burning and erosion due to over-grazing simplifies the vegetation and weeds choke natural vegetation. The imminent invasion of the cane toad from the Northern Territory into WA is likely to add further pressure to already modified and vulnerable ecosystems.

Significance of the islands

The impacts of these threatening processes have not been equally felt across the Kimberley. The high rainfall, near-coastal region of the north-west has been more resilient, and the Kimberley region's many islands in particular have been sheltered from many mainland disturbances. Created by the drowning of an ancient coastline, these islands collectively support representative examples of much of the adjacent mainland's geology and vegetation communities. As such, they are likely to be important refuges for fauna, including species that may be susceptible to cane toad impacts. Some islands may also act as future safe-havens for translocated species that are threatened on the mainland.

The islands are not only important for their biodiversity values, but also for their cultural values. Many Aboriginal elders lived on country into their teenage years before meeting Europeans and are familiar with the plants and animals of the islands. Aboriginal people maintain strong connections to the region and all of the islands are under native title claim. Each tribal language group has its own knowledge system that includes names and ecological knowledge for plants and animals.

In recent years, the coastal region of the Kimberley has increasingly been exposed to disturbances associated with casual visitors, tourism, fishing, aquaculture, mining, and oil and gas exploration. While these industries offer potential economic benefits for local Aboriginal communities, they also place increasing pressure on Aboriginal people to manage their country. As

Previous page
Main Weathered siltstone on an island in the Buccaneer Archipelago, which will be surveyed in 2009.
Photo – David Bettini
Inset Scaly-tailed possum.
Photo – Andrew Burbidge

Above Feral donkeys have had a great effect on parts of the Kimberley but many of the islands have been sheltered by these and other influences.
Photo – Dennis Sarson/Lochman Transparencies

Left Middle Osborn Island.
Photo – Lesley Gibson

Left Camp site on Middle Osborn Island.
Photo – Lesley Gibson/DEC

Below left Monjon rock-wallaby on Bigge Island.
Photo – David Pearson/DEC

disappeared throughout much of the Kimberley, with remaining populations concentrated in the north-west of the region. Two mammal species endemic to the Kimberley—the tiny monjon rock-wallaby (*Petrogale burbidgei*) and scaly-tailed possum (*Wyulda squamicaudata*)—are restricted to the north-west as is the golden-backed tree rat (*Mesembriomys macrurus*), which was once more widely distributed in northern Australia.

Cane toads pose an additional threat to some of these mammals, as evidenced by the decline in northern quoll populations in the Northern Territory. Similarly, the survey focuses on frogs, goannas, snakes, large skinks and dragons because it is thought that they may be particularly vulnerable to toads. For instance, monitoring in the Top End has shown that populations of the monitor lizard (*Varanus panoptes*) have collapsed following the arrival of cane toads. Since islands potentially provide refuges for such species, the importance of locating any island populations is clear.

While on the islands, opportunistic records of birds are collected to improve overall knowledge of their distributions. Some carnivorous and omnivorous birds such as raptors are potentially threatened by toads, while some granivorous birds, such as the Gouldian finch, are declining across northern Australia due to altered fire regimes. The surveys will also involve the study of land snails, which are endemic in areas of the Kimberley mainland due to their limited mobility. Land snails on the islands are likely to show similar species diversity and indeed some species may only occur on a single island or rock outcrop. Consequently, populations of land snails are particularly susceptible to the impacts of fire and other factors that affect their sheltered habitat. And it's not just the snails at risk—they are likely to be indicators for other animals of limited mobility. Distributional information for these species will help assess the impacts of proposed mining or other industrial developments.

Frequent burning and erosion threaten many plant species and communities in the Kimberley. Identification of plant species also helps to characterise the habitats of the survey sites and allows for comparison with habitats on the mainland and other islands. Site-based vegetation descriptions also form benchmarks for monitoring island environments and understanding future change.

Survey set up

Given the isolation, rugged topography and limited access, field trips to the north-west Kimberley are logistically demanding and each trip requires careful planning. Wet and dry season surveys need different strategies, largely dictated by the weather. Helicopters are the preferred means of transport as they are the most efficient way of transporting teams to, and between, islands in this environment. Dry season surveys involve three teams, each comprising two vertebrate zoologists, a land snail specialist, a botanist and at least one local Aboriginal traditional owner. Each team shifts to a new survey site every six days. On the bigger islands two sites are surveyed,

Background right West coast on Bigge Island. *Photo – David Pearson/DEC*

Below right DEC Research Scientist David Pearson with an olive python. *Photo – Patricia Handasyde*

such, traditional owners are keen to work with DEC to gain access to new research that can help in future management of the islands.

Currently, many of the islands are unallocated Crown land and have been effectively unmanaged. However, as native title holders return to country and take on management responsibilities, there are opportunities to develop management strategies incorporating conservation and sustainable development. This will help to ensure that the biodiversity and cultural values of the Kimberley islands are protected. A good knowledge base of what is already there in terms of flora and fauna will underpin these management decisions.

Survey preparation

In December 2006, DEC, in collaboration with the Kimberley Land Council, Western Australian Museum and Australian Museum, started preparations for a biological survey of these remarkable islands. The project was jointly funded by the Western Australian and Australian governments, with three dry season (winter) and wet season (summer) surveys planned over three years. There are hundreds of islands along the Kimberley coast, with 155 of them bigger than 100 hectares, 22 more than 1,000 hectares and nine exceeding 2,500 hectares (two of which are nearly 20,000 hectares). While most of the islands are big enough to support a diversity of plants and animals, only a small subset could be sampled within the project's time frame. Nineteen of the biggest islands were chosen, especially those with a variety of geological surfaces and those at varying distances from the coast (and therefore variable distances from land-based threats). The information gained from studying the islands will help predict where plants and animals may occur on other islands and test assumptions that the islands provide microcosms of the adjacent mainland.

While there is information on plants and animals for some islands, most previous studies have been opportunistic or focused on particular types of species. This survey aims to expand knowledge of six ecologically and biogeographically different components of biodiversity across the variety of islands present.

What will be surveyed?

Logistically, it is impossible to sample every component of biodiversity on the islands. This survey focuses on mammals, birds, reptiles, frogs, land snails and plants. These groups are most at risk from threatening processes affecting the mainland, including the arrival of cane toads. Mammals such as possums, bandicoots, quolls, small wallabies and rodents have

Top Moving camp on Bigge Island.

Right Laying traps on Bigge Island.
Photos – David Pearson/DEC

Above Material is set up on the island to encourage animals into traps.
Photo – Russell Palmer/DEC

and each team surveys three sites in one dry season field trip.

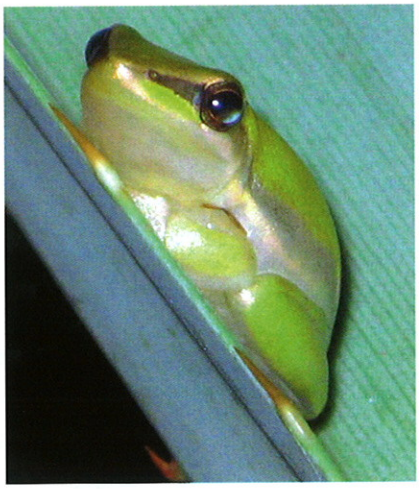
The helicopter schedule is coordinated from a base camp on the mainland. Here, the base camp team also manages communications, food and water supplies, and deals with any emergencies. Due to limited space on the helicopter, camping and personal items are kept to a minimum, with water and survey equipment making up the bulk of transported gear. It usually requires at least three trips in a helicopter to place a team on an island.

Preliminary selection of island sites is made using local knowledge, inspection of satellite imagery and a reconnaissance flight. The aim is to place each team within walking distance of as many habitat types as possible. A number of alternative sites are presented to the traditional owners for their consideration so teams avoid culturally sensitive sites.

Once on the ground, the team works together to set trap lines. One line of alternating box (Elliott) and cage traps are set to capture ground mammals in each habitat type. Two lines of four funnel traps (a modified fish trap) with low fly-wire fences to direct animals into the funnels are also set up on each mammal trap line. Funnel traps are effective at catching reptiles, particularly snakes. Setting traps can be hard work and time consuming as lines can extend across boulder slopes and up rock faces. Spotlighting at night is also used to detect mammals and nocturnal reptiles such as geckos, and ultrasonic equipment is used to record the echolocation calls of bats for later identification. Aside from the vertebrate trap lines, at least one plant quadrat of 50 by 50 metres is also established in each habitat type, within which all species are recorded. Land snails, which aestivate during the dry season, are actively searched for by raking, lifting rocks, digging and examining tree crevices, mainly in densely vegetated areas such as rainforest patches. Some reptiles are also captured this way.

All sites are re-sampled in the wet season, but the focus is primarily on frogs, land snails and plants. As frogs and land snails are more active in the wet, there is a good chance of finding additional species to those recorded in the dry season. Extra plant species are also likely to be discovered as many annuals only live during the wet season and many others only flower at this

Left Sylvia Djanghara pressing plants.
Photo – Tricia Handasyde



Below left Northern grass frog (*Litoria bicolor*).
Photo – Russell Palmer

Below Pale field rat (*Rattus tunneyi*)
Photo – Andrew Burbidge

time. Again, islands are accessed by helicopter, but the team is based on the mainland and each site is visited for one day or night so that teams return to a base camp each day.

Indigenous participation

The Balanggarra, Uunguu, Dambimangari, Mayala and Bardi-Jawi native title claims cover all the islands earmarked for survey, stretching from Adolphus Island in the east to Sunday Island in the west. Accordingly, close liaison with the relevant traditional owners who speak for these islands is imperative. Not only is it important for survey scientists to be aware of culturally sensitive areas that should be avoided, but a survey such as this provides training opportunities for traditional owners who are interested in learning about survey techniques and the flora and fauna of their country. Through collaboration with the Kimberley Land Council, the island survey employs traditional owners who help the survey team in all their activities, particularly by providing important guidance about appropriate places to situate camp sites and trap lines.

Results so far

In the dry season of 2007, Boongaree, Bigge, Katers, South West Osborn, Middle Osborn and Sir Graham Moore islands were surveyed. These islands were again sampled in February 2008 at the height of the wet. Based on preliminary data, 36 reptile, 19 frog and 18 mammal species have been recorded from the surveyed islands. New vertebrates were detected from all six islands, and several were recorded for the first time on islands off the Kimberley coast. Approximately 40 species of land snails were collected, with at least 11 undescribed species and one new genus found.

Species identifications are yet to be finalised for most groups but, in terms of mammals, the highest species richness was recorded from Bigge Island, the largest island of the six sampled. Among the species on Bigge were the mammals: monjon rock-wallaby, northern quoll (*Dasyurus hallucatus*) and scaly-tailed possum. The Kimberley rock rat (*Zyzomys woodwardi*) was the most commonly caught species, occurring on all but one island. The pale field rat (*Rattus tunneyi*) was abundant on Boongaree, while the mosaic-tailed rat (*Melomys burtoni*) was common on Sir Graham Moore. A small carnivorous marsupial, the red-cheeked dunnart (*Sminthopsis virginiae*), was recorded for the first time on the Kimberley islands. The herpetofauna—reptiles and frogs—highlight was the addition of 23 species to the survey list for Sir Graham Moore Island, four of which were new to the islands.

Where to next?

Working southwards, the teams are now focusing on islands in the Bonaparte Archipelago and will target the Buccaneer Archipelago in May and June 2009. Adolphus Island in Cambridge Gulf will be surveyed in 2008, and wet season surveys of these islands will be conducted in 2008-2009. This exciting project will provide the first detailed and comprehensive fauna and flora information for many islands along the Kimberley coastline. The information collected will guide future land managers, both Aboriginal and non-Aboriginal, to make sound management decisions for many decades to come.

Lesley Gibson, Norm McKenzie, David Pearson and Russell Palmer are all research scientists based at the Department of Environment and Conservation's (DEC's) Wildlife Research Centre in Woodvale. Tony Start was also based at the centre and has recently retired. Lesley Gibson is coordinating the Kimberley island survey and can be contacted on (08) 9405 5152 or by email (lesley.gibson@dec.wa.gov.au).

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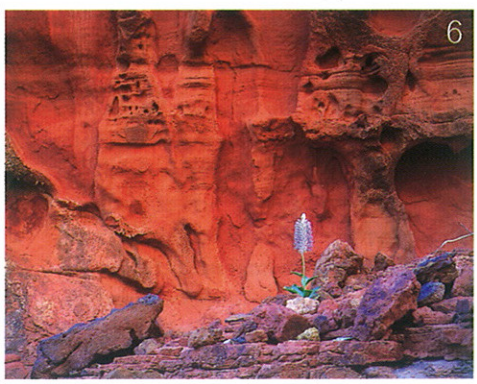
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