



Oenpelli python.

Some inhabitants of the region, which has a high diversity of rare, endangered, or restricted species.



Giant cave g



Calaby's mouse.

Conservation values of the Top End



The Kakadu dunnart, found almost exclusively within Kakadu Stage III.

In June 1987, the federal government gazetted Stage III of Kakadu National Park in the Northern Territory, comprising 4479 square kilometres to the south of Stages I and II.

About one-third of it — including the gold-rich Coronation Hill — was labelled a 'Conservation Zone'; mineral exploration could proceed there. In December 1989 this was reduced to 46 sq. km, with the remainder being incorporated in Kakadu National Park.

Although some have described the conservation zone as 'clapped-out buffalo country', surveys carried out recently by scientists from CSIRO's Division of Wildlife and Ecology for the Australian National Parks and Wildlife Service (ANPWS) show that, far from being degraded, the vegeta-

tion, soils, and animal populations remain largely as they were 200 years ago.

Looking at the whole of Stage III, Dr Dean Graetz found that only 5% was affected by buffalo and only 1% substantially eroded. And wildlife researchers Dr Dick Braithwaite, Dr John Woinarski, Mr Nick Gambold, and Ms Karina Menkhorst found a diverse collection of habitats — some of which are not represented in other reserves — containing many rare and endangered animals, including two unique to the area.



ko.



Stage III's stony hills and granite ridge habitats are poorly represented in any other reserve.

Hooded parrot.



Downstream of the proposed mine-site — the South Alligator River wetlands.

The large field team of researchers from the Division and the ANPWS (see the box on page 18) have strong views about the conservation values of the Top End, including Stage III. They see the region as our continent's last bastion against the environmental changes wrought by European settlement.

Our last chance?

As Australians are increasingly coming to recognise, the prosperity we've gained from the sheep's back and the wheat bushel has come with a substantial ecological cost; only

relics of the pre-European environment remain intact. In the smaller bushland remnants of the temperate south-east and south-west, along with the arid inland, the long-term future for many birds, mammals, and other animals is in doubt.

By contrast, the one large area where Australia's original plants and animals have not been despoiled by widespread changes in vegetation and the spread of pests like the fox and the rabbit is the tropical north. Ironically, the isolation that has protected the region from change has also discouraged

intensive ecological research. But the few studies that have been carried out show that neither the abundance nor the diversity of animals has altered much since 'HMS Beagle' sailed into Darwin in 1839.

Dr Braithwaite's and Dr Woinarski's wildlife survey of Stage III has added much to our scant knowledge of the region. With the government's deferment of a decision about mining Coronation Hill, their report will, in the months ahead, make an important contribution to the debate about the area's future. (The results of the Resource



Coronation Hill, and the surrounding landscape.

Assessment Commission's inquiry into the conservation zone are due to be presented to the Prime Minister by 26 April 1991.) The scientists would also like to see their study used as a contribution to the development of a conservation plan for the whole continent.

They see a danger, and considerable difficulty, in trying to measure (in response to development proposals) the intrinsic value of relatively small areas like Coronation Hill. It's an approach that can, for example, ignore the value of such an area to animals that use it as an integral part of a wider landscape — such as those that migrate along river habitats and between adjacent escarpments. The scientists also believe that we should take a national perspective and focus our conservation efforts on the geographical regions that now harbour the highest concentrations of rare and endangered species.

They argue that it is only when we take this larger view that we can sensibly tackle the problem of determining and protecting what is rare. Are we in a position to make that broad-scale judgment now? Unfortunately we are not. For most groups of animals and plants we simply don't have enough information about their status and distribution. However, the scientists have recently looked at the two groups we know most about — birds and mammals — as a guide to what could be done.

Using a Royal Australian Ornithological Union list — compiled from the field notes of thousands of bird-watchers — they plotted the distribution of 52 rare and

endangered species to get a tally for every $1^\circ \times 1^\circ$ quadrat in Australia. The resulting map shows that these species are concentrated in four main areas: the Top End, Mallee, coastal New South Wales, and coastal south-western Australia.

Dick Braithwaite and John Woinarski consider that the last three regions are on

Wildlife survey: Kakadu, Stage III

The Australian National Parks and Wildlife Service contracted the Division of Wildlife and Ecology to undertake the wildlife survey. Dr Dick Braithwaite and Dr John Woinarski co-ordinated it, undertaking the field work between September and November 1988 (the dry season) and between February and May 1989 (the wet season).

The survey revealed a very high diversity of rare, endangered, or restricted species — two frogs, four bats, nine reptiles, three rodents, and seven marsupials, including two mammals and a lizard new to science. The distribution and types of animals differed from those in Stages I and II of Kakadu National Park, and more so from those in the Katherine Gorge National Park and the area around Pine Creek. For most animal groups, the overlap with Stage III declines gradually with distance east and west, and more sharply southwards as the annual rainfall decreases.

Apart from low numbers of individuals of some medium-sized mammals, the survey team considered that the distribution and abundance of species remain much as they were 200 years ago. They believe that the recent reduction of buffalo numbers should

the list because each has suffered extensive habitat modification. They explain inclusion of the Top End — a region that has not undergone this modification — by suggesting that, even before European settlement, a few of the 'wet tropical' species were probably restricted and in low numbers. Some species have retreated to the Top End following environmental degradation in the south. And others, whose numbers have recently declined, may be at risk because of habitat changes following grazing or alteration in the frequency and intensity of fire.

To prepare a similar map for mammals, the scientists turned to the 1988 International Union for the Conservation of Nature Red List of Threatened Mammals, combined it with distribution maps of the species from Strahan's Complete Book of Australian Mammals, and tallied the number of listed species across a $2^\circ \times 2^\circ$ grid. On the same-sized quadrats they also plotted the former ranges of mammal species that have become extinct (or locally extinct) since European colonisation.

When viewed together, the three maps provide a graphic illustration of Australia's conservation past and our possible conservation future. Central Australia in particular — as reported in *Ecos 63* — has been a

aid the recovery of those mammal populations that have been particularly vulnerable to buffalo-induced habitat changes.

The current exploration zone contains most of the stony hills and granite ridge habitats that are poorly represented in any other nature reserve. According to the scientists, these habitats, along with the areas where the sandstone massif of Arnhem Land converges with the Marrawal plateau (the locality of Coronation Hill and other mineral deposits), are particularly important for species conservation. The Marrawal-Arnhem Convergence is an area of extremely high habitat diversity and appears to be a crossover zone for animals migrating within the escarpment and along the edge of rivers.

The scientists considered that the main threats would come from contaminants accidentally spilling into the South Alligator River system, animals drinking from tailings dams containing cyanide, and the physical disturbance associated with mining and its infrastructure, such as the impact on the maintenance of rare, wet forest habitats due to the mine's heavy consumption of groundwater.

mammalian graveyard. When we look at the demise of the desert mammals along with the past and current status of rare and endangered animals in Australia's Top End, we can clearly see that, in our tropics, we still have time to develop a conservation strategy that can benefit from past mistakes.

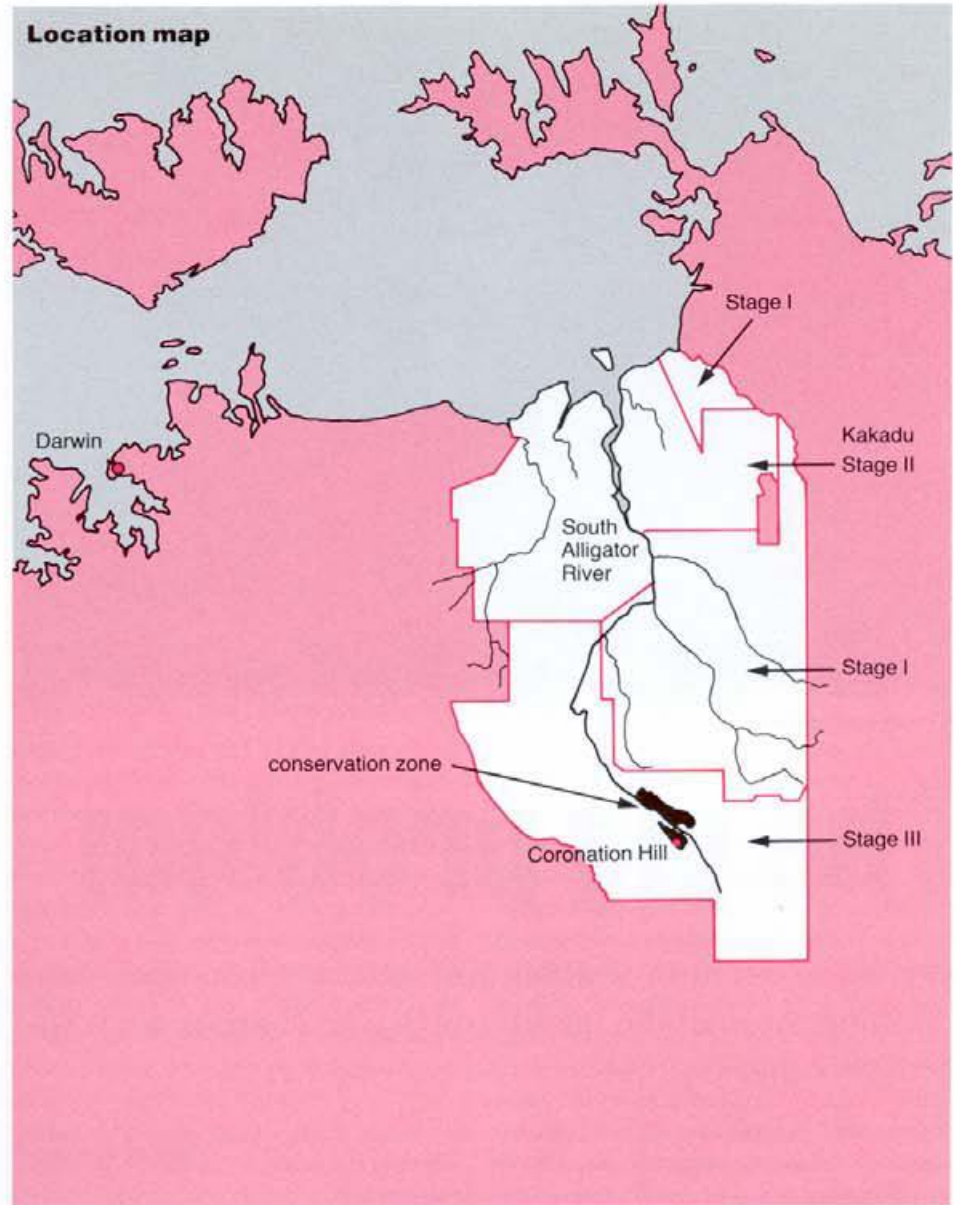
Kakadu, Stage III?

And what of Kakadu, Stage III? To begin, how does the animal diversity compare with that in other parts of tropical Australia? To find out, the scientists compared species tallies in Stage III with biological survey results from 15 other localities across north-western Australia. They discovered that only one other location — the combined Stages I and II of Kakadu — had more species of terrestrial vertebrates than the 380 known to occur in Stage III.

Critics have suggested that biological surveys in the other areas were not comparable, biasing the results in favour of Stage III. The researchers admit that the more limited nature of the survey work outside Kakadu is a problem. They agree that neither mining nor any other development proposal can be adequately assessed without detailed surveys. They argue that lack of knowledge about the susceptibility of individual species is a reason for planners to err on the side of caution.

Dr Braithwaite and Dr Woinarski argue that, in many proposed developments, the risks posed to animals using the project area and its surrounds are not clear. In cases where species are not known to occur

'It's done what in the bag?' Some of the Stage III survey team. Left to right: Karina Menkhorst, John Woinarski, Nick Gambold.



elsewhere, this uncertainty should lead decision-makers to make prudent choices. In the absence of adequate information

describing the way in which potential development will affect particular species, and on how critical the project area is to their survival, approval for developments may be a reckless course.

In cases such as Coronation Hill, where competing values — conservation *versus* development — are very substantial, they suggest that the research needed to accumulate sufficient detailed information has to be on a similar scale — far outstripping the short-term inventory survey that is characteristic of environmental impact statements.

David Brett

More about the topic

Coronation Hill, Kakadu Stage III — assessing the conservation value. R.W. Braithwaite and J.C.Z. Woinarski. *Australian Biology*, 1990, **3**, 3–13.

Conservation foci for Australian birds and mammals. J.C.Z. Woinarski and R.W. Braithwaite. *Search*, 1990, **21**, 65–8.