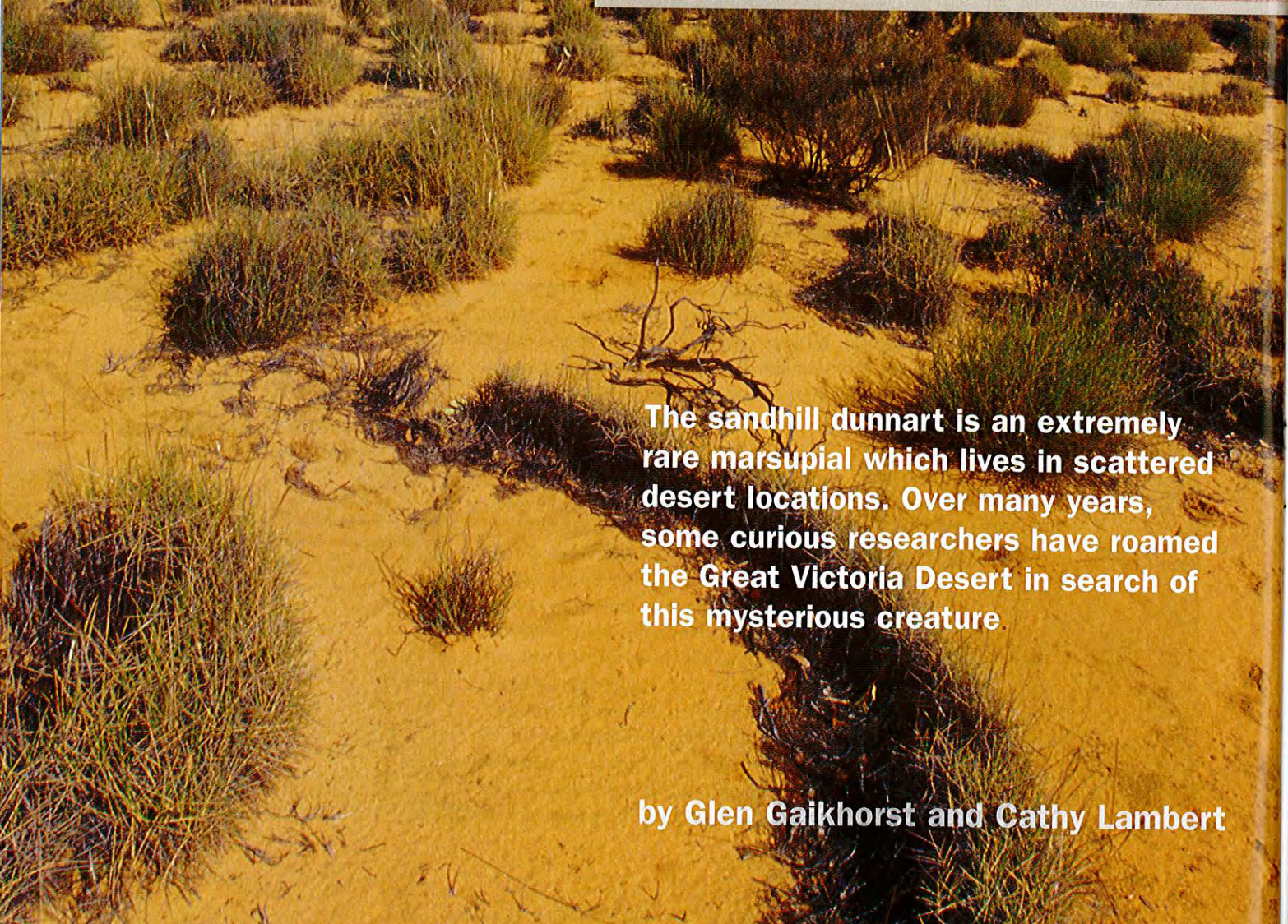
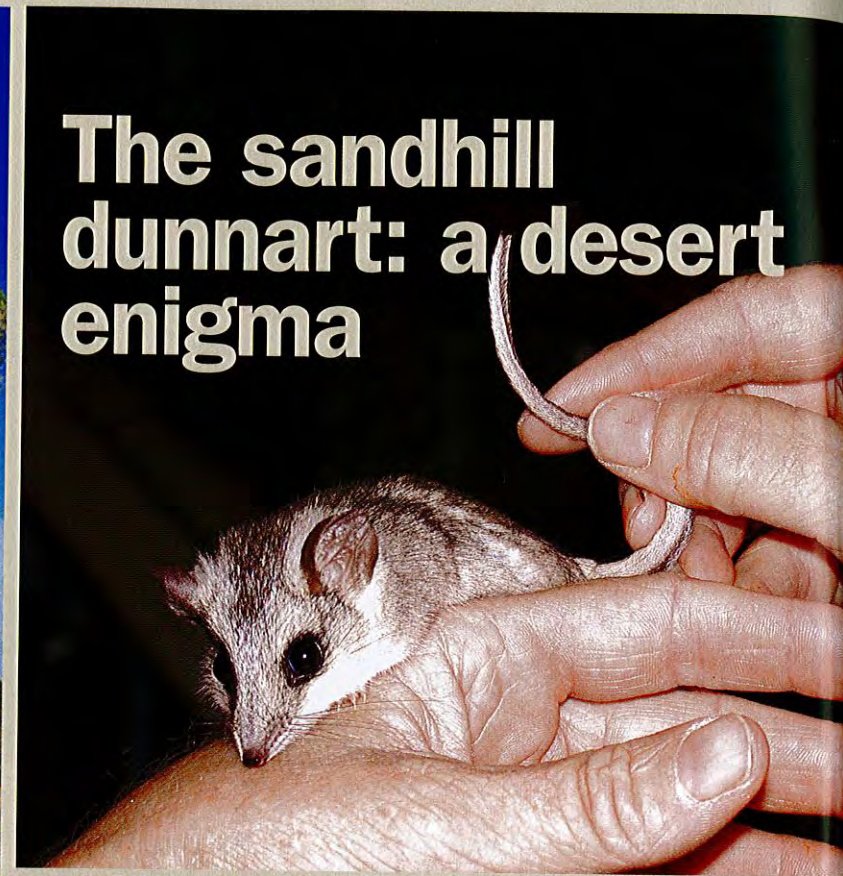


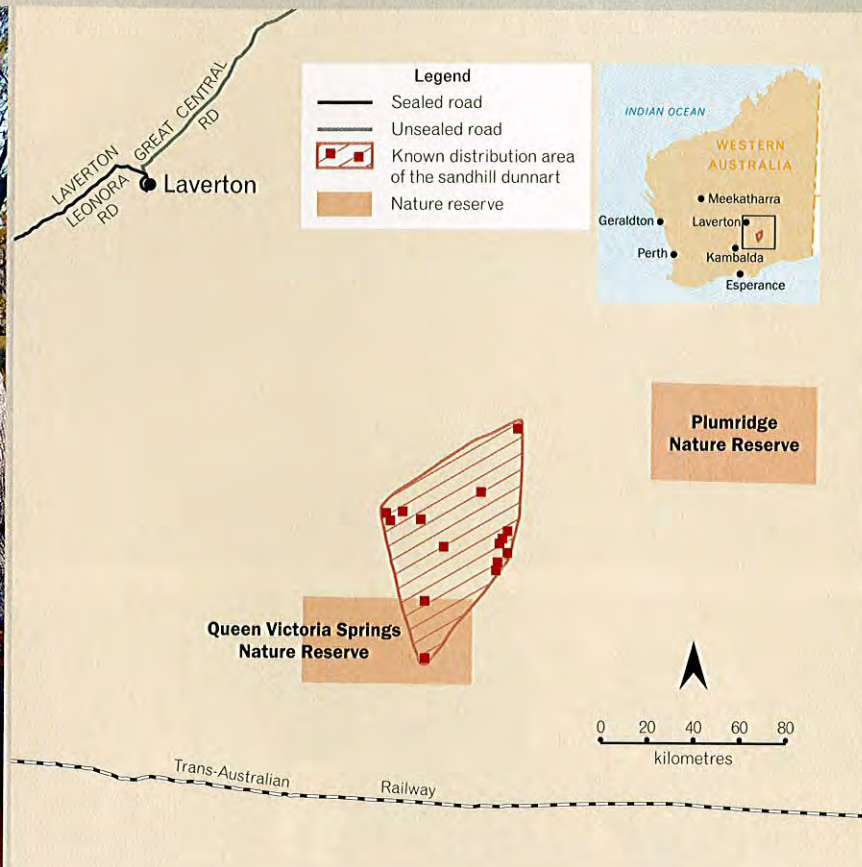
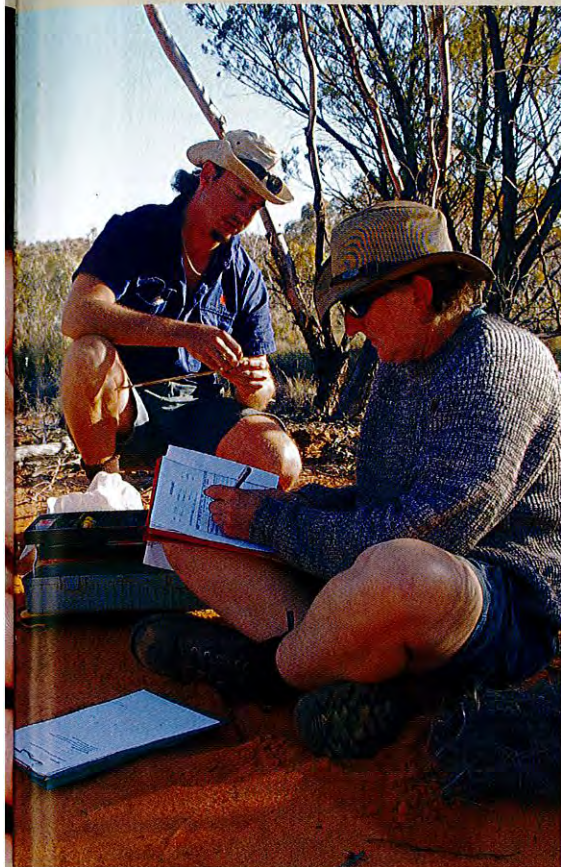


The sandhill dunnart: a desert enigma



The sandhill dunnart is an extremely rare marsupial which lives in scattered desert locations. Over many years, some curious researchers have roamed the Great Victoria Desert in search of this mysterious creature.

by Glen Gaikhorst and Cathy Lambert



The sandhill dunnart (*Sminthopsis psammophila*) is a small, endangered, carnivorous marsupial currently found in only a handful of isolated locations in arid and semi-arid Western and South Australia. In fact, in 2000, fewer than 30 individuals had ever been seen.

This tantalising rarity and lack of knowledge about the species captured the imaginations of two Perth Zoo staff members and led them on an eight-year quest to find out more. Volunteering their time with other keen naturalists, they trekked into Western Australia's Great Victoria Desert 11 times, spending up to two weeks at a stretch studying this elusive creature.

Rarely seen

Sandhill dunnarts were first discovered by European settlers when a single specimen was captured in 1894 near Lake Amadeus in the Northern Territory. Apart from this one individual, and a skull found in an owl pellet from a cave near Uluru, Rock, the animals have never been

seen again in the Northern Territory. In fact, it was doubted that they would ever be seen anywhere again, until their rediscovery in 1969 on the Eyre Peninsula in South Australia, some 75 years later.

A population was also discovered in the south-western corner of Western Australia's Great Victoria Desert in 1985. Staff from the then Department of Conservation and Land Management, a predecessor to the Department of Environment and Conservation, located a population in Queen Victoria Springs Nature Reserve in 1987, with several individuals found over a few years, until the area was destroyed by fire (see 'Endangered', *LANDSCOPE*, Spring 1992). They have since been found very sporadically in other locations in both South Australia and WA. The total number of known captured individuals is probably about 100.

Why so special?

Apart from its rarity, the sandhill dunnart is quite large in comparison to other dunnart species, ranging in

weight from 30 to 55 grams. Only one dunnart species is larger, the endangered Julia Creek dunnart (*S. douglasi*). The sandhill dunnart is also quite easy to distinguish from other dunnarts because it has a row of dark hairs on the underside of the tip of its tail, giving it a comb or feather-like appearance.

The sandhill dunnart seems to have quite specific habitat requirements which relate to the quality of the spinifex in which they live and the time since it was last burnt. The spinifex clumps must be old enough to have gained sufficient size to provide shelter from predators and probably the extremes of temperature, but not so old that they

Opposite page

Main Great Victoria Desert.

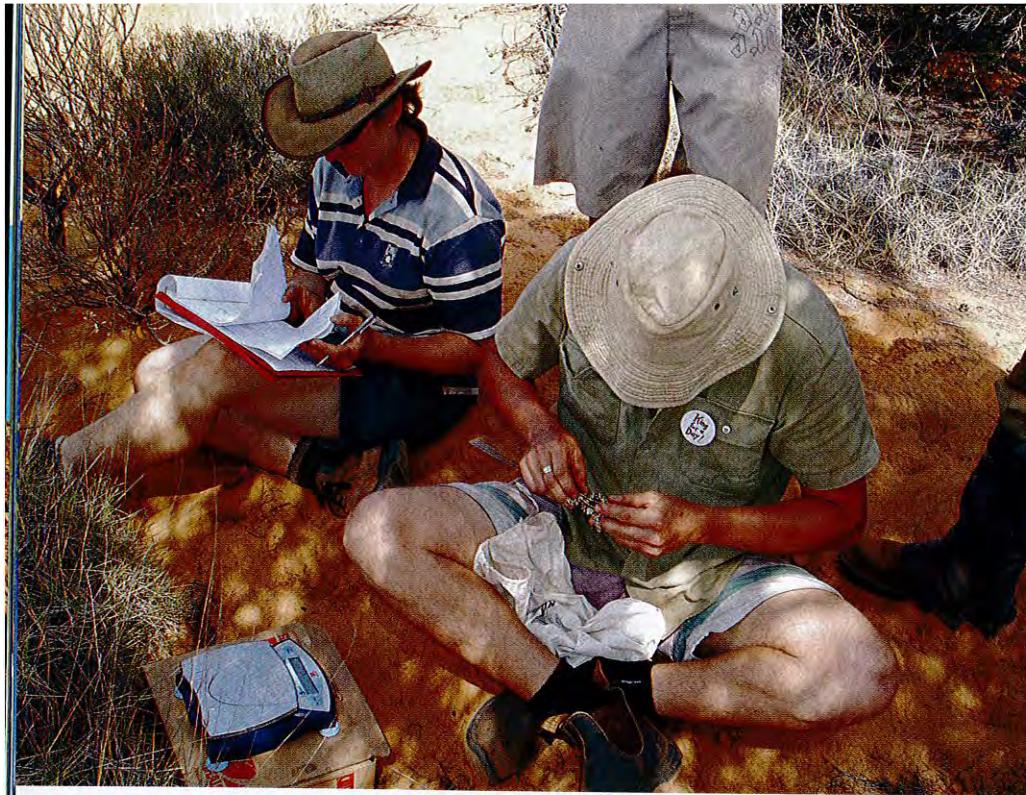
Photo – Jiri Lochman

Inset The unique tail of the sandhill dunnart.

Photo – Cathy Lambert

Above Recording captured specimens.

Photo – Glen Gaikhorst



have begun to deteriorate and become loose and open. The sandhill dunnart is also found most often where the mid- and over-storey are not too open and on yellow or yellow-orange dunes, undulating sandplain, or occasionally on flat sand-plain with dune systems nearby. Mallee (*Eucalyptus youngiana* and *E. concinna*) and marble gum (*Eucalyptus gongylocarpa*) are common over-storey species in sandhill dunnart habitat.

Roughing it in the Great Victoria Desert

Spending two weeks in the desert, hundreds of kilometres from the nearest town, television and shower, sleeping in swags and carrying all the food and water you need may not be everyone's cup of tea. But to others this is the description of heaven. Indeed there was no shortage of volunteers for the trip to research the sandhill dunnart, with some 50 people taking part in the study.

The desert is a beautiful place: peaceful, ancient and in most areas relatively untouched. The plants and wildlife are unique and specially adapted to the harsh conditions of the area, and discovering their many wonders far outweighs the chore of digging 60-centimetre-deep holes in the sand dunes to place traps.

The study area is located about 350 kilometres north-east of Kalgoorlie in the Great Victoria Desert. It is a hot and persistently dry desert with an average annual rainfall of between 150 and 250 millimetres. Rainfall across the region is largely unpredictable and highly variable from year to year, and may develop from summer storms coming down from the north, or from winter fronts coming up from the south. It can get very hot in summer with a mean maximum temperature range of 32 to



Top left Measuring and recording specimens.

Photo - Cathy Lambert

Centre left Bush camp for two weeks.

Photo - Steffi Kuckartz

Left Sandhill dunnart habitat in the Great Victoria Desert.

Photo - Glen Gaikhorst



Above An adult male sandhill dunnart.
Photo - Cathy Lambert

35 degrees Celsius, but with individual days much hotter. During winter, the night-time temperature commonly falls below zero.

There is no permanent surface water in the Great Victoria Desert, other than the occasional human-made reservoir. Pinjin Lake and Queen Victoria Springs are human-modified and periodically have water in them, while several gnamma holes and shallow rock pools provide the only ephemeral water to wildlife.

Desert diversity

The term 'desert' may conjure up images of barren, shifting sands, but the Great Victoria Desert is so ancient that life has found a way to colonise it in an amazing testament to evolution, diversity and survival. Instead of just bare sand, there is a spectacular array of mixed shrublands, woodlands and stretches of mallee and mulga country, often with an abundance of harsh spiky spinifex that provides not only food, but a safe haven from predation for an extraordinary diversity of reptiles and small mammals.

On more than one occasion, sandhill dunnarts were observed climbing up to the top of a spinifex clump before finding a good way in and then burrowing down and out of sight.

Native rodents were seen chewing the more juicy bases of the needle-like leaves and two-lined dragons (*Diporiphora reginae*) sat perched among the spikes waiting for a spider or fly to come their way, before darting inside the clump for cover when startled. It was a surprise to many of the volunteers that the delicate-looking western pygmy possum (*Cercartetus concinnus*) was also found in the harsh conditions, but the desert in bloom is a wonderful sight and, along with supplying nectar for food, the blossoms sustain an insect population that these delightful creatures thrive on.

Changing goals

At the time the study began, both sites where sandhill dunnarts had previously been recorded in WA had been destroyed by fire. The first aim, therefore, was to establish whether the species was still present in the State. Then, if a stable population could be found, the plan was to study its ecology over a number of years.

Although it was found that fires in the region had been very frequent and extensive, within a couple of years two new populations had been found outside the previously known range of the species. Both populations appeared to be in good health, with pouch young

and independent juveniles found. In 2005, these two sites became the core of a long-term ecological study, and permanent pitfall traps were established. These permanent traps were made of sturdy PVC tubing, rather than the thin flexible plastic ones routinely used, and so could be left in the ground for many years without deterioration, capped securely between visits.

Unfortunately, before this could be done, wildfires claimed these populations too. A massive fire burned both sites (which were 25 kilometres apart) and left a devastating burn scar of thousands of hectares. The study changed scope at this point and it was decided to extend the surveys further, focusing on the species' abundance and distribution in the region and also on the reproductive biology of the species in captivity.

Captive breeding

Between 2000 and 2008, 17 individual sandhill dunnarts were captured. Although this doesn't sound like many for the effort involved, it



Above Pouch-young, 39 days old.
Photo - Glen Gaikhorst

Above left Six-day-old pouch-young.
Photo - Bradie Durell

Left A juvenile female sandhill dunnart, 45 days old. Even at this young age it is possible to see her pouch.
Photo - Bradie Durell

was actually an immensely satisfying result, considering the rarity of the species. In October, one of the females was found to be carrying eight small pouch-young and another had active teats indicating she had young in a nest somewhere. These observations, along with a handful of others from similar studies, were all that was known from which to piece together a picture of the reproductive pattern of the sandhill dunnart. In 2005, permission

was gained to bring two pairs into captivity to try to find out more.

A small breeding and research program operated at the Perth Zoo between 2005 and 2007 which aimed to fill in some of the gaps that existed in the knowledge of the sandhill dunnart's reproductive biology. Oestrus cycles were monitored and faecal samples were collected to assess hormonal changes associated with mating and birth. Understanding factors such as

the time of year these animals breed, how many litters they can have in a season, their gestation period and how long young are dependent can help land managers preserve the species.

Six litters were produced over three seasons, and observations and measurements were taken of the growth and development of the young. The oestrus cycle of the females, the gestation period and the growth and development of the young were all determined.

Threats

The main threats to the survival of the sandhill dunnart in WA are fire frequency and size, introduced pests and, potentially, the recent establishment of mining in the area. Fires occur very frequently, mostly ignited by lightning strikes, with some destroying vast areas



Above Crested dragon (*Ctenophorus cristatus*).

Above right Black-naped snake (*Neelaps bimaclatus*).

Right Central military dragon (*Ctenophorus isolepis citrinus*).
Photos - Glen Gaikhorst



at a time. Often very little unburnt remnant habitat remains where animals can survive until the burned landscape returns to a useful age. In the case of sandhill dunnarts, this age is about eight to 10 years. Although fire is necessary to regenerate spinifex that has become old and sparse, the large scale and frequent nature of these fires is a concern and probably the most serious threat to the dunnarts.

Foxes and cats are present in the Great Victoria Desert and continue to be a threat to wildlife in the area. Traces of these introduced predators have been observed at all study sites and on occasions they have raided traps in an attempt to catch fauna. In recent years, natural resources have been discovered in the region with several exploration and mining programs being initiated in the area. As the known area that

sandhill dunnarts occupy in WA is quite small, good management of these human impacts will be required to protect the species.

Other significant fauna

The Great Victoria Desert is an area where species from the south-west merge with those from desert complexes. As such, the area has become well known for its wildlife diversity. This includes vegetation and, to a greater degree, lizards and small mammals. Seventy-three reptile species, nine small mammals, one amphibian and 58 bird species were recorded during the study, including some interesting range extensions for some species and signs and sightings of some other quite rare animals.

Significant finds included a southeasterly extension of the known range of the desert mouse (*Pseudomys desertor*) and a southerly extension for a burrowing skink, *Lerista taeniatus*. There was also a rare sighting of a south-west woma (*Aspidites ramsayi*), identified by its unusual colour pattern.

The team also dug trenches on dunes and found signs that the elusive itjaritjari, or southern marsupial mole (*Notoryctes typhlops*), had been passing through. This quite bizarre-looking

creature is blind, has well developed front legs with huge claws and 'swims' below the surface, back-filling its tunnel as it moves forward. It feeds mostly on underground invertebrates, but perhaps on reptiles as well (see 'Mysterious sand swimmers', *LANDSCOPE*, Winter 2003).

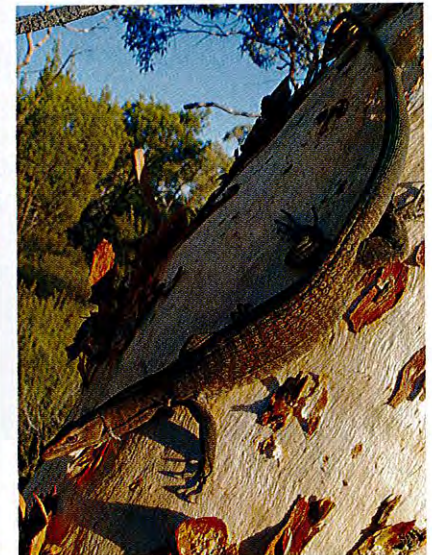
The southern marsupial mole rarely comes to the surface, so one of the best ways to know if it has been in an area is to dig a trench on the north side of a dune and a little way down from the crest, and then leave it for a day or two for the sun to dry it out. When looking at the smoothed sides of the trench, if



Left The team making pit traps.
Photo – Cathy Lambert

Below left A well-earned rest in the evening in the Great Victoria Desert.
Photo – Steffi Kuckarzt

Below Black-headed monitor (*Varanus tristis*).
Photo – Glen Gaikhorst



a mole has moved through in the past, loosened soil caused by its tunneling will have dried out faster than the surrounding compact sand and a small telltale circle of lighter coloured sand can be seen. Trench digging can be hard, but the excitement of finding signs of a creature that most people will never see was well worth the effort.

An active mulgara (*Dasyurus cristicauda*) burrow, complete with scats and fresh footprints, was also found but despite surrounding the area with traps, the little beast eluded capture. There were also sightings of the scarlet-chested parrot, princess parrot and naretha blue bonnet which are now rare in parts of their former range.

Plans for recovery

Sandhill dunnarts are currently only known from Yellabinna Regional Reserve and the upper Eyre Peninsula in South Australia and in four relatively closely grouped locations within the Great Victoria Desert in WA. Following a year-long study of the species across South Australia and WA, a recovery plan was produced for the sandhill dunnart in 2001. More survey work is currently being carried out in South Australia by the Department of Environment and Heritage which will hopefully continue to increase the knowledge about this little-known and fascinating species.

Glen Gaikhorst is currently a zoologist with GHD Pty Ltd in the ecology and marine group, but at the time of these studies was the supervisor of Perth Zoo's Native Species Breeding Program. He can be contacted by email (glen.gaikhorst@ghd.com.au).

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