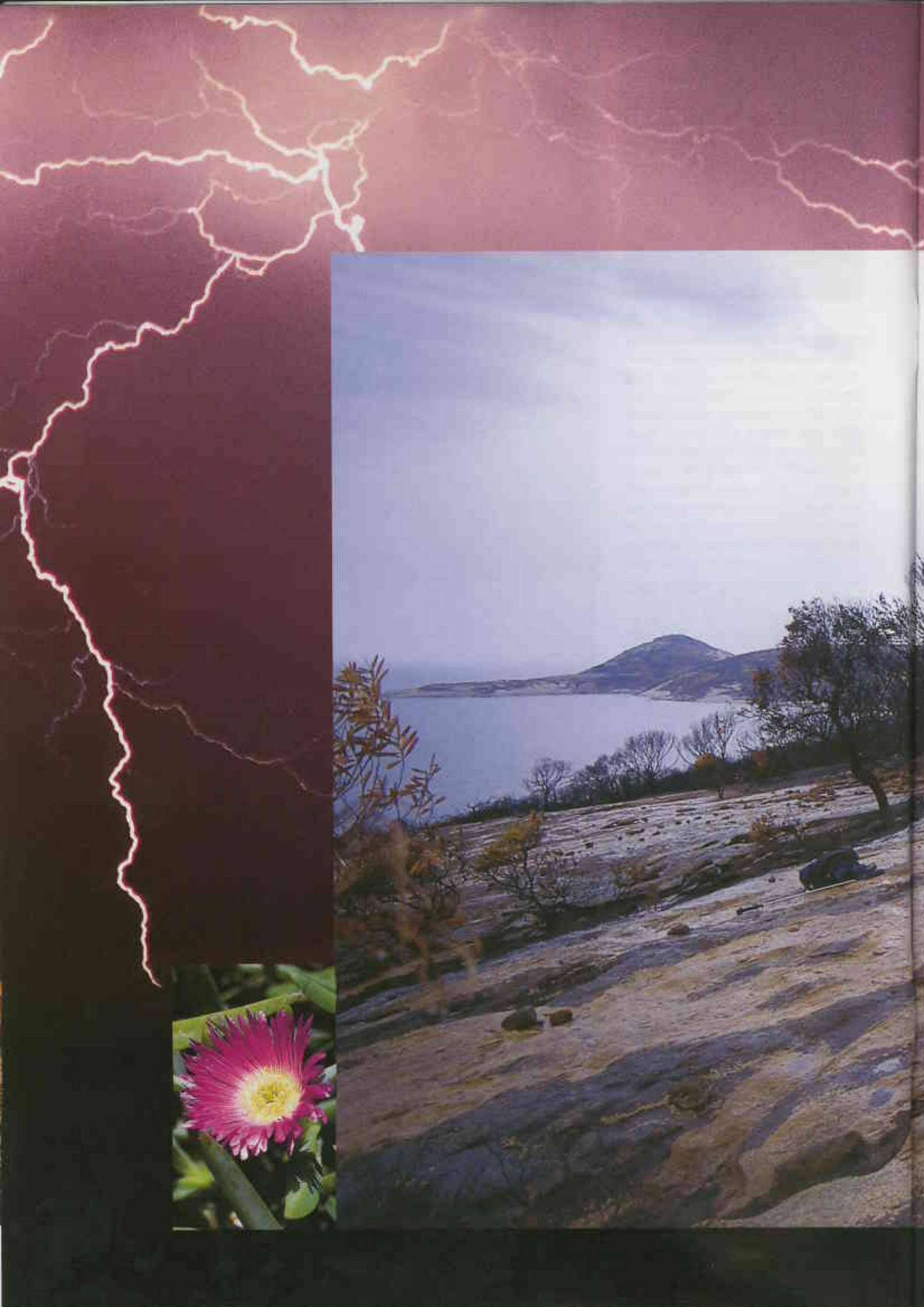

FIRE IN THE ARC

Conservation and land managers face a dilemma: whether or not to intervene in naturally-occurring fires on isolated islands. A lightning-ignited fire in March 2002 on Mondrain Island, in the Archipelago of the Recherche near Esperance, provided interesting information about the effects of these fires on the island's wildflowers and wildlife.

by David Pearson, Steve Hopper, Anne Cochrane, Sarah Comer and Alan Danks

Offshore from Esperance and Cape Le Grand National Park, rounded granite islands rise from the foaming water like a stationary pod of giant whales. These islands form the Archipelago of the Recherche, a chain of more than 100 islands stretching east from near Esperance to Israelite Bay, named by French explorer Rear-Admiral D'Entrecasteaux in 1792 after one of his ships. All of the islands are nature reserves, but most are rarely visited. Landing is difficult; beaches are rare, big swells are the norm and much of the ocean between the islands is uncharted.

Smouldering question

It is hard to imagine that wildfires would ever occur on these islands because of the lack of potential ignition sources (particularly people) and the often low and salt-pruned vegetation (though pockets of dense forest and shrubs do occur on larger islands). However, fires do occur infrequently and the immediate impacts can be dramatic and, in turn, generate longer-term effects not yet understood. The question is, should we intervene in the fire regimes of islands or leave them to burn? The answer is rarely a simple yes or no. Islands may have significant assets that need protection, such as the naval base on Garden Island, the oilfield on Barrow Island and tourism infrastructure on Rottnest Island. But what about the hundreds of other islands around the WA coast? How should fire be managed (or not managed) on these islands?

A recent wildfire on Mondrain Island, in the Archipelago of the Recherche, provided an opportunity to study the impacts of fire on its wildflowers and animals. Mondrain is the second largest island of the archipelago, around 6.5 kilometres long and 2.5 kilometres at its widest. On 6 March 2002, local charter operator Peter Hudson saw several bolts of lightning strike the high granite peaks on Mondrain Island. A short while later, smoke and flames were visible.

The fire burnt for several weeks and, at times, the glow could be seen in Esperance, 42 kilometres to the north-west. Initially, the Department of Conservation and Land Management (CALM) allowed the wildfire to burn, believing that forecasted rain together with rock barriers on the island would extinguish it. When this did not happen, it was decided to put firefighters with hand tools and backpack sprays ashore, to see if they could supplement natural firebreaks (such as rock outcrops) and stop the fire spreading to the northern part of the island. However, the extremely dense vegetation, rugged terrain and constantly shifting winds made it impossible for the number of available

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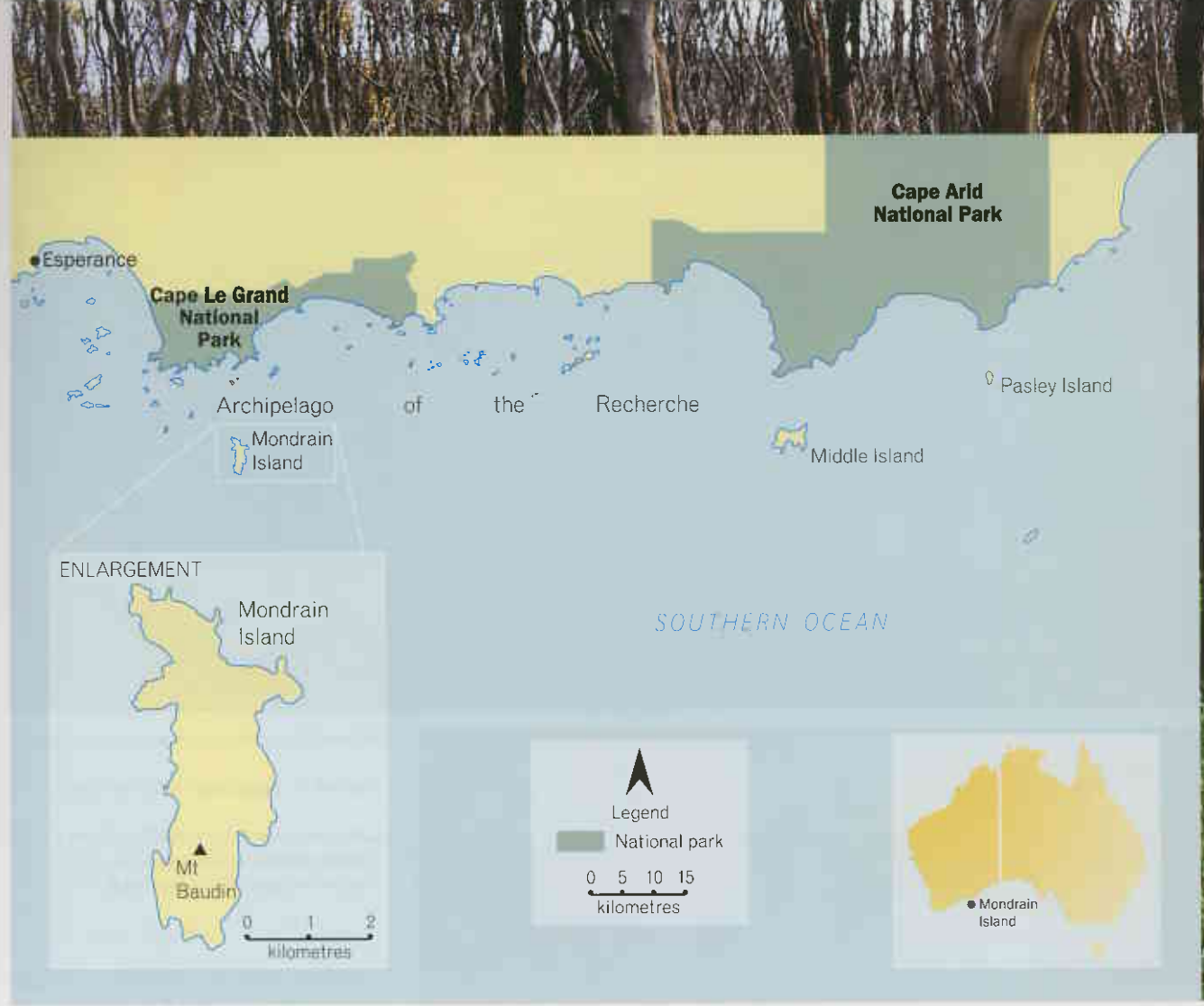
Main Volunteers Lisa Ang and Gaby Martinez on Mondrain Island shortly after the March 2002 fire.
Photo – David Pearson/CALM
Inset Karkalla (*Carpobrotus rossii*).
Photo – Steve Hopper
Background Thunderstorm lightning.
Photo – Jiri Lochman

Top Mondrain Island.
Photo – Jiri Lochman

Left Mondrain Island, with pincushion plants (*Borya nitida*) in the foreground.
Photo – David Pearson/CALM



firefighters to develop a narrow firebreak across the island. A deterioration in weather led to dangerous fire behaviour and rough seas, forcing their departure from the island before the fire could be contained. Eventually, the fire went out after burning about 90 per cent of the island's vegetation.

Fire history

This was not the first fire on Mondrain Island. When the island was attached to the mainland between 10,000 and 11,500 years ago, Aboriginal people would have used fire to assist with clearing bush and hunting. Since the arrival of Europeans, a number of fires have been recorded in the archipelago, most deliberately lit by passing sailors, sealers or fishermen, or by pastoralists seeking to provide feed for sheep that were grazed seasonally on easily accessible islands.

In 1802, during a voyage from Plymouth to Sydney, Matthew Flinders recorded that his crew set fire to Mondrain Island and burnt most of it. Another large fire was recorded in January 1944 by a local skipper and naturalist G P Whitley. They observed groups of small birds fleeing towards the mainland, and watched flames dance around the granite peaks. Landing on the island's north-eastern end, they saw large numbers of fleshy-footed shearwaters that had been killed by the fire. This fire continued for several more weeks, consuming around 60 per cent of the island's vegetation.

Island life

Since excursions to Mondrain Island in 1904 and 1906 by Museum collector J T Tunney, a range of ornithologists, botanists and other scientists have visited to study its plants and animals.

Between 1995 and 2000, several expeditions were undertaken by CALM and WA Museum staff to study the island's rock-wallabies and reptile fauna. The Recherche rock-wallaby (*Petrogale lateralis hacketti*) occurs on three islands, including Mondrain, and these were surveyed by live trapping and direct observation. They proved to be abundant across the island, sheltering in caves and boulder piles, but eluded efforts to capture them despite juicy apples being used as bait.

These visits confirmed the existence of three snake species on Mondrain Island: death adders, crowned snakes and a dark form of the carpet python. A range of skinks and geckoes were located primarily by searching under granite slabs, and a frog, Glauert's froglet (*Crinia glauerti*), was captured for the first time on an island in the archipelago. Hence, a good understanding of the flora and vertebrate populations on the island had been gathered before the March 2002 wildfire.

Ashes to ashes

In April 2002, CALM staff and volunteers arrived on Mondrain Island to study the impacts of the wildfire. From the boat, the island looked dark and foreboding. Large blackened areas contrasted strongly with the paler granite outcrops. As we set up camp among the ash and burnt shrubs at the northern end of the island, the twittering of scrub-wrens indicated

Above Burnt thicket on Mondrain Island.

Far left A shearwater killed by fire.

Left A regenerating grasstree (*Xanthorrhoea platyphylla*).
Photos – David Pearson/CALM

that the fire had not consumed all life. That evening we walked up through the stark, blackened trees and were surprised to see a rock-wallaby and two bush rats scampering through the ash back to their burrows. The next morning revealed large numbers of crowned snakes basking in the sun and the occasional skink. In many areas, the ground was littered with dead seabirds, predominantly fleshy-footed shearwaters killed as they tried to locate or escape from their burrows. Nevertheless, chicks heard calling from the burrows suggested that, despite the fire, some adult birds were still returning at the end of a day's fishing to feed their young.

In some areas, the fire had been particularly intense, and turning over granite slabs revealed large numbers of dead skinks overcome by the heat. Three rock-wallabies, two death adders, crowned snakes and a carpet python were found incinerated. In other areas, the fire had been cooler, perhaps burning slowly at night, and patches of vegetation were left unburnt. Green sprouts were already appearing, especially from grasstrees growing in heath on the top of the island.

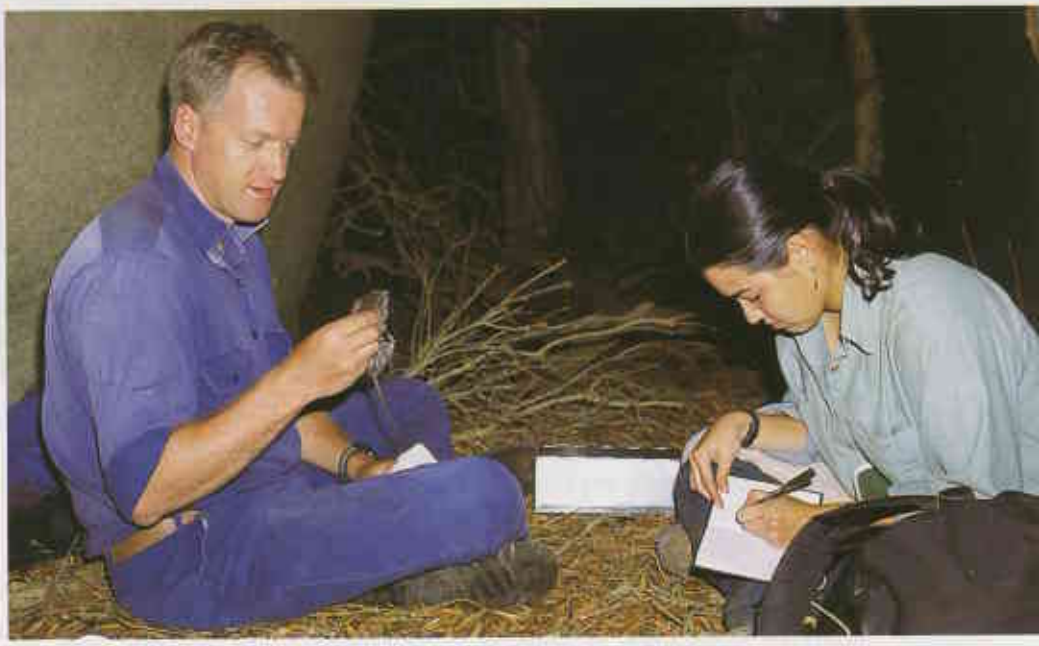
While the fire had been devastating for nesting seabirds, many other birds had survived. Nests of peregrine falcons and white-breasted sea-eagles were found intact, protected by their rocky locations. Several groups of the threatened Recherche Cape Barren goose were seen grazing on regrowth in burnt areas.

When we climbed over the spine of the island to the western side, we found large areas of unburnt vegetation interspersed with rock outcrops, where numerous rock-wallabies basked in the afternoon sun. While the fire would have caused a short-term food shortage, resprouting and reseeding plants would soon provide nutritious fodder for these agile animals.

We searched hard for carpet pythons, but only found a few. Crowned snakes seemed to have survived successfully. One morning, when the clouds parted briefly, 30 crowned snakes were counted. They probably escaped the fire by fleeing down burrows or rock crevices—their low energy requirements enabling them to fast for long periods until their prey (small lizards) were able to recover. In contrast, no live death adders could be found. These slow-moving ambush predators rely on camouflage and their ability to lie very still in leaf litter before launching

Above A carpet python crosses a burnt area.
Photo – David Pearson/CALM

Above right A pincushion plant (*Borya nitida*) and seedlings of tapeworm plant (*Platysace compressa*) germinated after the fire.
Photo – Steve Hopper



Right David Pearson and Gaby Martinez record details of a bush rat caught on Mondrain Island.
Photo – CALM

deadly, short-range attacks on lizards or young rodents. The fire probably caught many out in the open. The long-term recovery of the death adders on Mondrain Island will be of considerable interest, since fire may be an important agent causing local extinctions on islands.

Botanical bonanza

In November 2002, another visit was made to the island by CALM staff and botanist Steve Hopper to examine the floral responses to the fire and further document the impact of the fire on the reptiles.

Before this expedition, 250 native plant and seven weed species had been collected during two major floral surveys of Mondrain Island. We managed to find 133 native and eight weed species, including 33 native species not previously collected, bringing the total number of flowering plants known from the island to 283 native and nine weed species.

Several new records were short-lived plants that flower best in the first years after a fire. These included Sheath's gyrostemon (*Gyrostemon sheathii*), Hooker's sida (*Sida hookeriana*), large-flowered rulingia (*Rulingia grandiflora*), Swan River rulingia (*R. cygnorum*), Symon's bush-tomato (*Solanum symonii*), seashore pelargonium (*Pelargonium littorale*), Knight's gompholobium (*Gompholobium knightianum*), coral vine (*Kennedia coccinea*) and Australian bindweed (*Convolvulus angustissimus*). The king leek orchid (*Prasophyllum regium*) propagates by means of buds below the soil surface. While long-lived, the king leek orchid usually flowers only in the first year after fire, and scattered individuals were found on Mondrain Island in 2002. Orchids in dense unburnt vegetation included the greenhood *Pterostylis* aff. *nana* and the donkey orchid *Diuris pulchella*. Rare perennial natives included mohan (*Melaleuca viminea*), blind grass (*Stypandra glauca*) and winged boronia (*Boronia alata*).

We even found a eucalypt not previously recorded on Mondrain Island—a subspecies of Jerdacuttup mallee (*Eucalyptus goniantha* subsp. *notactites*). It is clear that more work is required to produce a complete inventory of the island's flora. While we did not locate any species endemic to the island, the mignonette orchid (*Microtis* sp.), found by Jim Willis in

INJUSTICE RECTIFIED BY NAMING BAUDIN PEAK

Mondrain Island has the highest peak (222 metres) in the Archipelago of the Recherche, yet this had not been named. After some discussion, Steve Hopper wrote to the Geographic Names Committee of the Department of Land Information in August 2003 as follows:

'I understand that the highest peak on Mondrain Island at its south end is unnamed. I write to recommend consideration by the Geographic Names Committee that this granite peak be named Baudin Peak for Post Captain Thomas Nicolas Baudin (1754–1803), leader of the French scientific expedition to Australia in the years 1801 to 1803.

'Baudin's accomplishments on this expedition are not recognised, to my knowledge, through named landmarks. He died in Mauritius on the return voyage, and was not mentioned by name, let alone treated kindly by the author of the official account of the voyage, zoologist François Peron, who himself is commemorated in several place names along the Western Australian coast.

'The famous meeting of Baudin's expedition with Flinders's *Investigator* at Encounter Bay in South Australia on April 8, 1802 was a great disappointment to Baudin, as he was en route from Tasmania to complete the hydrographic survey of the southern Western Australian coastline from King George Sound eastwards. Undoubtedly, he would have mapped the Recherche Archipelago in great detail had not Flinders already completed most of the task.

'Flinders is commemorated by Flinders Peak on Middle Island, the tallest eminence on the largest island in the Archipelago, south of Cape Arid. Mondrain Island is the second largest island of the Archipelago. Naming its highest peak would be an appropriate historical reference to the achievements of Baudin in mapping substantial parts of the WA coastline and complement the naming of Flinders Peak, signalling the great rivalry between Baudin's expedition and that of Flinders.'

After no objections were raised by local organisations, Baudin Peak was officially named on 3 February 2004.

Top Buds and fruit of the Bald Island marlock (*Eucalyptus conferruminata*).

Above Fruits of two species of fire-stimulated, short-lived small shrubs (*Rulingia*).
Photos – Steve Hopper

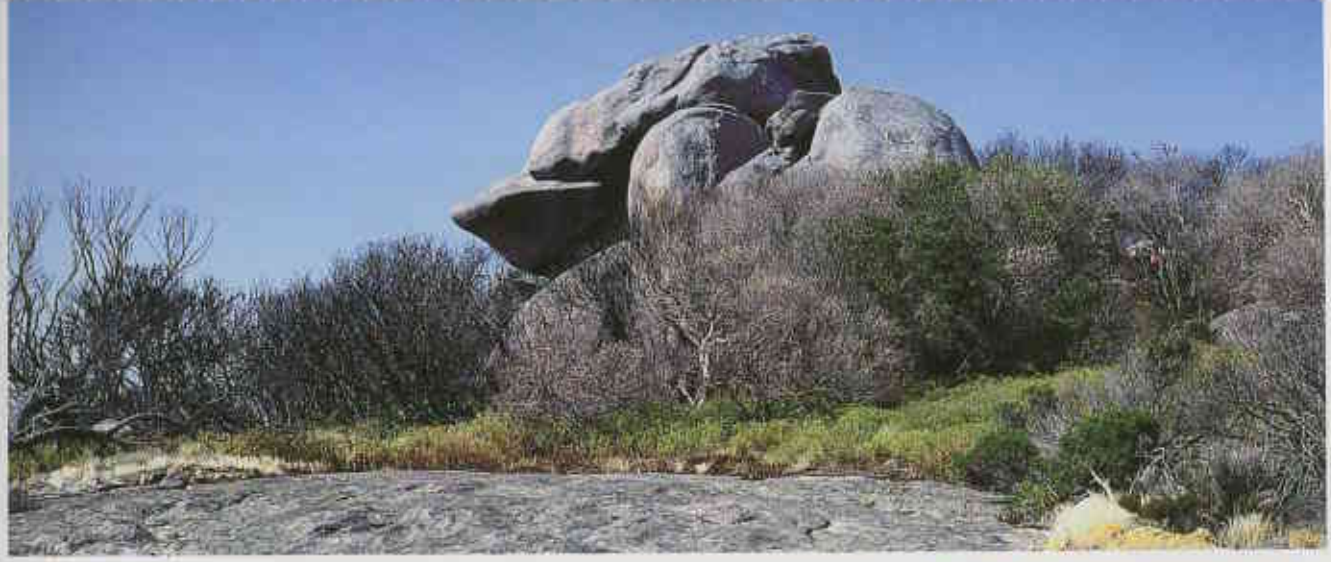
1950 and again by us, may be an undescribed species not currently known from the adjacent mainland.

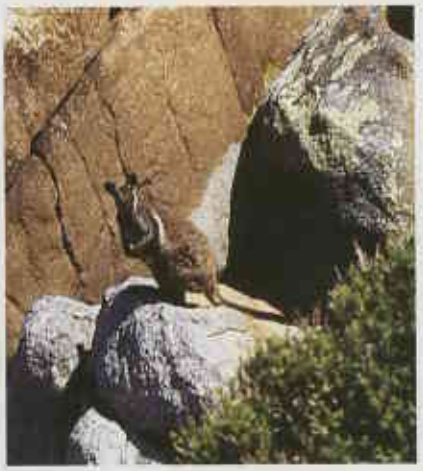
Our data supported Arthur Weston's hypothesis that long-term fire exclusion does not necessarily alter the quality or composition of plants and wildflowers, or their communities, in the South-West. Many species recorded after the 2002 fire weren't collected by Jim Willis, who sampled the Mondrain flora in the same month (November) as we did, but burnt six years before (in 1944). Short-lived, post-fire species must have persisted on Mondrain in the soil seed pool or as underground tubers during previous surveys, waiting for the next burst of nutrients and light to carpet the soil following rare fire events.

Before the fire, CALM Esperance staff had observed that dryandra, grasstree and sheoak communities were in poor condition, with no evidence of juveniles. It was reassuring that all the fire-sensitive shrubs produced seedlings in 2002, despite the last major fire on Mondrain Island having occurred in 1944. Fire intervals of 60 years or more are clearly not a problem for such species, despite the structural decline of adult plants and the absence of seedlings in long-unburnt vegetation. We need to be cautious with fire regimes in such remote places as these islands, as they provide invaluable benchmarks to study biodiversity largely unaffected by human fire-lighting for more than 10,000 years.

The fire had stimulated germination in many fire-responsive plants, including a number of short-lived herbs. These island populations may be genetically distinct from mainland populations of the same species, because of their isolation and small population size, and are likely to be valuable for the conservation of species diversity. During the visit, seeds were collected from eight plant species, including two priority-listed plants. One of these, a resprouting speargrass, *Austrostipa exilis*, had not previously been recorded on the island. Seeds from seven of these species are being sent to the Millennium Seed Bank Project in the United Kingdom for safe storage, as well as being conserved at CALM's Threatened Flora Seed Centre in Perth (see 'Our frozen future', *LANDSCOPE*, Winter 2001).

Monitoring plots were established on the island to record the long-term recovery of the flora, and cycles of plants that set seed then disappear until the next fire. Sites for plots were selected to represent the three main vegetation associations on the island. Life history strategies of plants in these plots were recorded, with a mixture of resprouters and reseeders in all plots. They will be revisited at various intervals to record changes in the





Top Rocks on the summit of Baudin Peak on Mondrain Island.

Above left One of the few sources of fresh water on Mondrain Island, a large rock pool 20 centimetres deep on Baudin Peak. Its floor is covered in submerged meadows of mudmats (*Glossostigma drummondii*) and quillworts (*Isoetes drummondii*). *Photos – Steve Hopper*

Above The Recherche rock-wallaby in typical habitat.
Photo – David Pearson/CALM

vegetation communities over time. Similar plots have been established in long-unburnt vegetation on Bald Island (near Mt Manypeaks), which is similar in size to Mondrain. As Bald Island has not been burnt for more than 100 years there will no doubt be a completely different suite of plants observed should a wildfire ever occur.

To burn or not to burn

Leaving wildfires to burn on islands appears to be an attractive option, as it is 'natural' and appears to have little detrimental effect on island plant communities. However, when native animal species become rare or disappear on the adjoining mainland, island populations become increasingly valuable for conservation. Most islands lack introduced predators such as the fox and feral cat and, as such, provide relatively safe havens and reservoirs for the return of mammal species to former mainland habitat if required. Drought and potential climate change may make some of these islands more vulnerable to fire and hence endanger their wildlife. Managers will have to carefully review the conservation values of particular islands and, sometimes, make decisions to intervene in fires if they could potentially burn a large percentage of the island.

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