



FOREST FOCUS

NUMBER 23
REVISED

APRIL 1980
JUNE 1983



SAD DAY FOR NATIVE FAUNA • HISTORIC EVENTS



▲ *The numbat, together with a number of other species, appears to have suffered a severe decline in numbers.* (Lyndon Schick)



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Number 23, April 1980
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Typesetting by Filmset.

Histograms by Forests Department Mapping Branch, Cartographic Section.

Printed in Western Australia by the Government Printing Office.

AT ISSN 0049-7320

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A sad day for native fauna

P. E. S. CHRISTENSEN

Many of us have come to take for granted the comparative rarity of our native fauna. If we consider the problem at all, we tend to blame agricultural clearing and its destruction of the natural habitat for the extinction of some species and the relative scarcity of others, and yet large areas of relatively undisturbed natural habitat still exist, for example the area of state forest. Why, then, are animals such as the numbat, possum, native cat, woylie, quokka, tammar wallaby and other species of medium-sized marsupials comparatively rare?

Some old-timers relate how they once earned a living by selling possum skins; others maintain that they fed scraps to the woylies when these animals came hopping into the circle of light cast by their campfires at night. Where are all these animals now? Are the old-timers exaggerating?

No, these tales are not exaggerations. Both records of possum skin sales and diaries giving accounts of the woylie (*Bettongia penicillata*) exist. Other evidence of the recent abundance of many species of medium-sized marsupials in the South-West is available, to those who care to seek it, in the form of sub-fossil remains, the bones and teeth of quokkas (*Setonix brachyurus*), ringtail possums (*Pseudochairus peregrinus*), brush-tailed possums (*Trichosurus vulpecula*), native cats (*Dasyurus geoffroii*), short-nosed bandicoots (*Isodon obesulus*) and others in blowouts and caves along the south coast. All the evidence suggests that these animals were common until recent times. Why, then have they all but disappeared?

Ecological studies of forest fauna over the last decade shed some light on this intriguing question. The story that emerges is at once fascinating and frightening: fascinating because

of the insight it provides into the complex inter-relationships that exist in ecological communities, and frightening because some species of native fauna are facing extinction, among them our state's fauna emblem, the numbat (*Myrmecobius fasciatus*).

The animal that provided us with the essential clues that helped to solve the mystery is the woylie or rat-tailed kangaroo. This animal, once widespread across the southern part of the continent, has been on the list of rare and endangered species for some time now.

It was in 1970, while investigating the presence of a colony of tammars (*Macropus eugenii*) near the Perup River east of Manjimup, that I caught my first glimpse of this animal. Only minutes after the start of a night-time spotlight traverse, we spotted a small kangaroo-like animal hopping along the forest track ahead of us, head held low and back arched. None of us had ever seen a woylie before, but it was unmistakable from the descriptions in reference books. That night, over a period of just two hours, we sighted three more woylies, numerous possums, both brush-tailed and ringtail, and other animals as well. It was a fauna bonanza!

FOOTNOTE

In the few short years since the first publication of this article in April 1980, we have begun to record a reversal of the trends noticed in the early 1970s. Although there has been no appreciable decrease in fox numbers, some species of native fauna, notably the woylie and the numbat, have increased in numbers again. Possums appear to be staging a slower recovery and bandicoots and the native cat could also be on the increase in certain areas.

These trends are being watched with interest; could it be that we have misinterpreted the role of the fox, or are the fauna adapting to high fox numbers? A more likely explanation may be that populations of some of our native fauna undergo cyclic fluctuations, high numbers, then a decline or "crash" in the population, followed by a gradual increase in numbers again over a period of years. Such fluctuations are a not uncommon feature of animal populations in many parts of the world.

If this interpretation is correct then the role of the fox assumes particular significance during times of low population when a species is especially vulnerable. These questions are currently being investigated as they are of particular significance to the management of modern fauna populations, restricted in their distribution by man's development. A part of this programme includes the re-establishment of new colonies of the woylie in other areas of State Forest. Consideration is also being given to expansion of colonies of the tammar wallaby.

Front cover

Woylies are relatively slow-moving animals and are no match for foxes or dogs on open ground. (Darryl Blackshaw)

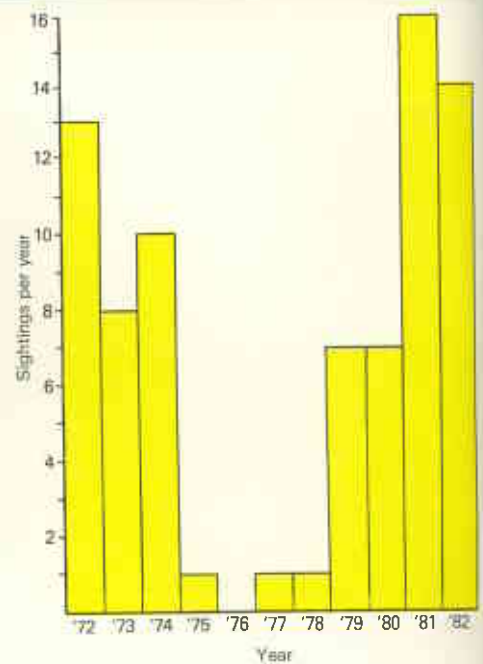
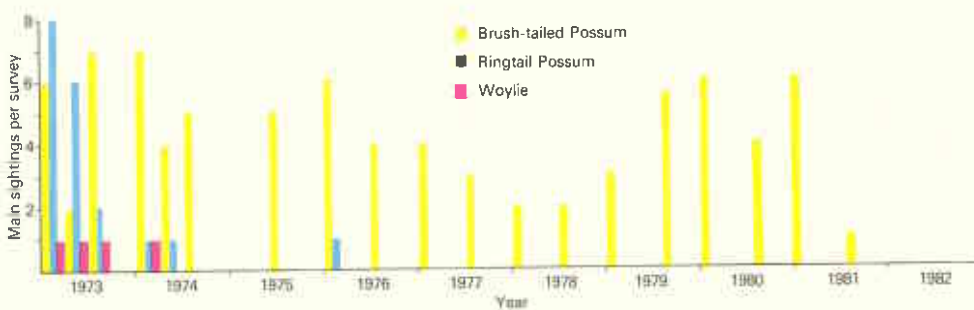


▲ The tamar wallaby. The restricted mainland distribution of this animal is largely due to predation by the fox. (Dale Watkins)

▼ The native cat, once widespread throughout the South-West is becoming rare because its prey species have been drastically reduced in numbers by foxes. (Tom Leftwich)



SPOTLIGHT SIGHTINGS OF THREE SPECIES ALONG A 3.2 km ROUTE IN THE NORTHERN PERUP FAUNA PRIORITY AREA



The number of incidental sightings of the numbat in the Perup F.P.A.

As a result of further spotlight traverses and a programme of exploratory trapping, an area of approximately 40000 ha between the Perup and Tone Rivers was set aside as a Fauna Priority Area within state forest (see *Forest Focus* No. 10). Unique in the South-West, the Perup Fauna Priority Area contains populations of a wide range of native animals, many of them now present only in a few other isolated areas.

Suddenly, in 1973 and 1974, the numbers of ringtail possums in the northern sector of the Perup area dropped dramatically. At first this was thought to be the result of an epidemic disease and it was hoped that numbers would soon recover. Cyclic fluctuations, often due to epidemic disease, are not uncommon among animal populations, and there seemed to be no cause for undue alarm.

It was soon discovered, however, that not only the ringtail possums had dropped in numbers, but also the woylies. By 1976 intensive trappings had failed to locate a single animal and none was seen on spotlight surveys. Other species such

as the native cat, the short-nosed bandicoot and the numbat also appear to have suffered a severe decline in numbers. What kind of epidemic disease would affect such a wide range of native marsupials?

The woylie was of special concern, because it was already on the rare and endangered species list. As it was still common in the south of the Perup F.P.A., permission was obtained from the Fisheries and Wildlife Authority for an attempt to re-introduce it to the northern area.

Following the successful trial release of an animal fitted with a radio transmitter, 52 woylies from the south were released into the north in October, 1977. Six were fitted with radio transmitters so as to keep track of their movements.

After several months most of the woylies had disappeared from the area, including the six fitted with radio transmitters. Where had they all gone? One of the latter was tracked to a fox's den, where the transmitter was discovered still transmitting from among the grisly remains of the animal. Bones and other remains of at least three more woylies, four young tammar wallabies, three brush-tailed possums and a young kangaroo (*Macropus fuliginosus*) were also located in the vicinity of the den. In addition, we had definite evidence that at least two other animals fitted with radio transmitters had been taken by foxes. Foxes appeared to be the problem.

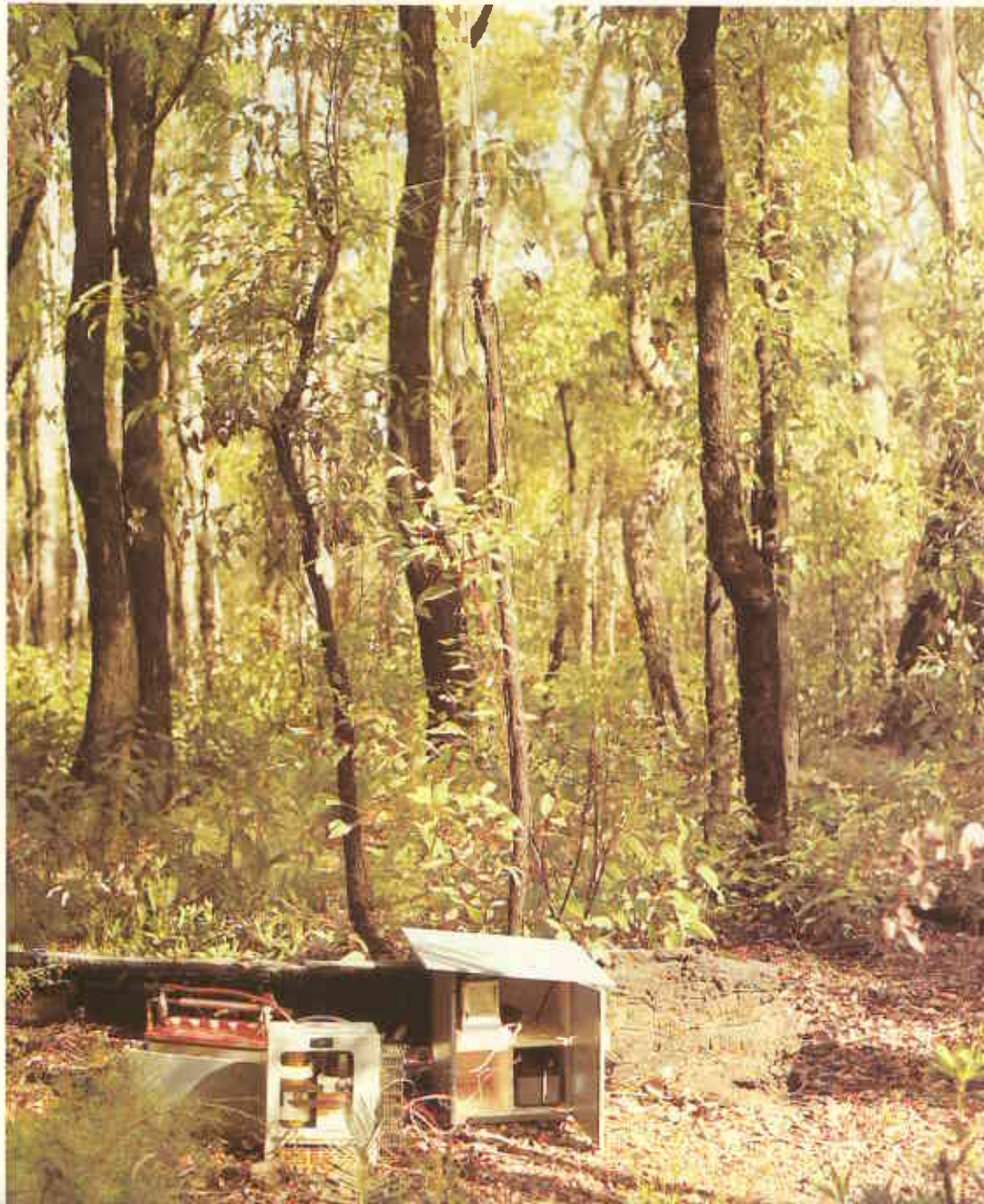
Why should the foxes suddenly become a problem? They have been present in this area of the South-West since at least the 1930s but until now have not been a cause for concern.

A three-year study of the woylie and the tammar in the south Perup had shown the fox to be a major predator of both these species (Table 1). However, foxes took only



▲ Small radio transmitters attached to animals by means of a collar, enable researchers to keep them under constant surveillance. (Tom Leftwich)

▼ Radio recording station monitoring signals emitted from a transmitter attached to a woylie. By this means it is possible to obtain a continuous record of an animal's movements. (Tom Leftwich)





young animals, surplus to the population, and both the tammar and the woylie lived in balance with the introduced predator.

What happened to upset the balance between the woylie and the fox in the north of the Perup during 1973? And how was it that the woylie could maintain a natural balance with the fox in the south Perup whereas it was unable to do so in the north?

The answer to the first question lies in the sudden and spectacular increase in the fox population of the south-west of the state. The increase began in 1973 and since then a high population has been maintained. Evidence of the increase and of the year when it started is provided by data from two rabbit studies carried out by the Agricultural Protection Board, one at Cape Naturaliste and the other near Chidlow. The data clearly show a big increase in the fox population in both areas during this period.

While conclusive evidence is available only from these two areas, it seems certain that the increase is widespread throughout the South-West. Anyone at all interested in natural history cannot have failed to notice the high numbers of foxes killed on roads in the South-West in recent years.

Together with the increase in fox numbers, Table 2 also shows the decrease that occurred in 1972 and 1973 in the broad-scale use of 1080 poison for rabbit control. These data

Top: Woylie wearing radio transmitter collar. (Anon.)

Middle: Fox's den in the Perup forest. Rabbits on the nearby farms supply their staple diet but native fauna are also taken whenever possible. (Tom Leftwich)

Bottom: Skulls of native animals found near fox's den in the Perup area; top row—tammar, centre—brush-tail possum, front—woylies. (Tom Leftwich)

TABLE 1

MORTALITIES RECORDED DURING A THREE YEAR STUDY SHOW THAT THE FOX IS A MAJOR PREDATOR OF BOTH THE WOYLIE AND THE TAMMAR IN THE PERUP AREA

Source of data	Probable cause of death					
	European fox		Native cat		Wedgetail eagle	
	Woylie	Tammar	Woylie	Tammar	Woylie	Tammar
Animals with radio transmitters attached	9	1	4	—	—	—
Other deaths recorded during the study	6	6	3	—	1	5*
TOTAL	15	7	7	—	1	5

* Skulls found underneath an eagles nest.

TABLE 2

DATA SHOWING THE DRAMATIC INCREASE IN SPOTLIGHT SIGHTINGS OF FOXES IN TWO AREAS FOLLOWING THE REDUCTION OF BROAD-SCALE 1080 RABBIT POISONING

Year	Poisoning*	Cape Naturaliste data	Spotlight Foxes/100 km
			Chidlow area
1968	8066	Nil	—
1969	6800	Nil	—
1970	4900	Nil	—
1971	5500	—	—
1972	4600	—	—
1973	2600	—	2.4
1974	700	4.9	17.2
1975	50	5.1	19.2
1976	93	5.7	31.1
1977		3.8	37.1
1978		8.2	34.9

* Packs of 1 shot 1080 poison laid in the Shires of Margaret River, Busselton and Capel. Similar reductions have taken place in other South-West shires.

Data supplied by A.P.B.

provide the clue to the cause of the increase in the fox population. It is well established that the fox may suffer secondary poisoning and die after eating rabbits poisoned with 1080 bait. We cannot be certain that this is the only reason for the increase in foxes, but the correlation between the two events, the phasing out of the rabbit poisoning programme and the increase in the fox population, suggests that there is a connection between them.

In any case, whatever the reason for the increase in the fox population might be, it seems certain that it is this increase that has upset the precarious balance between the fox and the woylie as well as other medium-sized marsupials.

We may now move on to our second question: why have the woylies and other species in the south of the Perup not suffered the same fate as those in the north?

The answer appears to be relatively simple. Detailed studies have shown that the woylie lives only in areas where there is a reasonably dense ground cover of low clumpy shrubs. In places where the understorey is too open, or conversely where it is too dense, no woylies are found. The few remaining woylies in the north, the progeny of those released in 1977, now occupy the only area of reasonably dense ground cover in the northern Perup. The remainder of this area, where there are no woylies, has a more open understorey.

Woylies are comparatively slow-moving animals, and in the open are no match for a fox or a dog. They rely on being able to outwit their pursuer in dense cover where they are familiar with every track and hiding place.

This was brought home graphically when on one occasion a dog put up a woylie only feet away and immediately gave chase. But almost at once the dog lost it from sight in the dense cover and had to abandon the chase.

The short-nosed bandicoot, an even slower animal that requires denser ground cover than the woylie, is a similar example. Like the woylie, it has now disappeared from the north Perup but it is still common in south coastal areas where the understorey is very dense. Unfortunately, it is too dense for the woylie; otherwise it would provide a good refuge for this animal also.

In short, the recent decline in species of medium-sized native animals may be attributed to an unprecedented increase in the fox population. Drastic population declines have occurred recently in some of the best fauna areas of the South-West, areas which all have a fairly open understorey: the Perup forest, Dryandra forest and Tutaning reserve near Pingelly.



But why is it that until this recent decline, many species of native fauna were still abundant in these areas? In other apparently suitable forest habitats, native animals have been rare since the introduction of the fox in the 1930s. How could populations in these areas withstand the impact of the fox when elsewhere they could not?

One possible explanation provides a fascinating insight into the complexities of ecological relationships.

Sodium fluoroacetate, the active constituent of the rabbit poison 1080, a poison originally developed to poison rats in America, occurs naturally as a toxic compound in many species of Western Australian plants of the genus *Gastrolobium*. Dense and extensive thickets of gastrolobium species are a feature of the fauna-rich areas of Dryandra, Perup and Tutanning.

Research being carried out by scientists of the Agricultural Protection Board has shown that many species of fauna native to the southwest of Western Australia have a very high degree of tolerance to this poison compound. For example, the Western Australian race of the brush-tailed possum can tolerate doses of sodium fluoroacetate over one hundred times that which will kill its otherwise identical counterpart in eastern Australia. Other animals such as the tammar and the woylie appear to be even more tolerant to the poison.

◀ *Top: Remains of fox killed by 1080 poisoning. (Tom Leftwich)*

Middle: Typical ground cover in good woylie area, southern Perup area. Note the clumped distribution of the vegetation.

(Tom Leftwich)

Bottom: Open understorey typical of the northern Perup area. Since the increase in foxes such open areas no longer support woylie populations.

(Tom Leftwich)

In contrast, introduced mammals are extremely sensitive to the compound, minute doses being sufficient to kill animals as large as sheep and foxes. Introduced predators such as the fox may suffer secondary poisoning after eating native animals that have fed on the leaves, seeds or flowers of these plants. On record is the case of a farmer who lost his pigs after feeding them woylies accidentally trapped in rabbit traps.

In areas where poisonous species of gastrolobium grew, native animals tolerant to the poison were able to exist in reasonable numbers, protected by the poison plants. Foxes that strayed into these areas soon died after eating native animals and while the fox population remained low the native animals in these areas were safe. Since the dramatic increase in the fox population that began in 1973, however, foxes that are poisoned in this way may be replaced by an almost inexhaustible supply of foxes from surrounding areas. As a consequence native species, even in these refuge areas, have now declined drastically in numbers and remain under constant pressure from the foxes.

In summary we may now re-trace events since the first settlement by Europeans.

From the early days following the arrival of European man until earlier this century, species of native fauna



Top: Dense understorey typical of many high-rainfall southern forest areas. Such cover provides protection for the short-nosed bandicoot but is too dense for the woylie. (Tom Leftwich)

Middle: Dense thickets of poisonous gastrolobium species are a feature of many good fauna areas of the South-West, e.g., Dryandra and Perup forests. (Tom Leftwich)

Bottom: Young fox killed on a road through the forest. Increasing numbers of dead foxes found on roads in recent years provide evidence of the population explosion. (Tom Leftwich)



▲ *The ring-tailed possum moves slowly on the ground when crossing from one tree to another. It is easy prey for the fox. (Brian Stevenson)*

▼ *The echidna now relatively rare in the South-West, still flourishes in Tasmania in the absence of the fox. (Brian Stevenson)*



were common in the forest and even in many of the settled areas of the South-West. Then some time between the early 1930s and the mid-1940s, depending on locality, there occurred a widespread decline, particularly of medium-sized native mammals such as the woylie, the quokka, the brush-tailed and ring-tail possums, the tamar and the numbat. This decline in the native fauna follows closely on the advent of the fox in the early 1930s, and the evidence points to the fox as the culprit.

It should be mentioned here that prior to this time there had already been two declines in native fauna. The first of these, a widespread and general decline, was recorded in the late nineteenth century in the inland areas to the north and east of the forested South-West. The second, a more localised decline in some species only, appears to have occurred in the South-West in about 1909 and was recorded in the Lake Muir area.

A marasmus or wasting disease is generally believed to have been responsible for the first decline. The pattern of spread of decline does not, however, appear to be entirely consistent with the disease theory.

An alternative explanation is that the increase and spread of the domestic cat played a dominant role in both these early decreases in the native fauna. The influence of the cat on native fauna is often underrated. In the later years, following the spread of the fox throughout the South-West, the role of the cat as a major predator of native fauna may have diminished to some extent, its numbers perhaps being kept in check by fox predation on young kittens.

The fox is thought to have spread into Western Australia from Victoria, following approximately the same path of invasion as the rabbit. It was first sighted 100 miles west

of the South Australian border in 1915 and by 1925 was reported to be distributed around the coastline as far north as Geraldton. After 1925 its spread was rapid, especially in pastoral areas, and by 1931 foxes were in every southern district. Bonuses had been paid on fox scalps throughout the South-West by 1934.

If the fox alone had been introduced it would almost certainly have reached a natural balance with the native fauna, which would have remained reasonably abundant. However, the presence of other introduced species, particularly the rabbit, a species well adapted to predation by foxes, enabled the fox to survive in relatively high numbers, which in turn kept the native fauna in most places at very low levels. The greatest numbers of native fauna occurred in areas where extensive thickets of poisonous gastrolobium plants grew and on offshore islands where, in the absence of the fox, good populations of medium-sized animals still survive today.

For example, the largest island, Tasmania, which somehow escaped the introduction of the fox, still has a rich and varied fauna. The woylie's cousin, *Bettongia gaimardii*, and many other species of medium-sized marsupials are still numerous there. The brush-tailed possum is so common that last year alone a quarter of a million pelts were taken for the fur trade by commercial trappers and shooters. Wallabies are a pest of major proportions in forestry, and control measures have to be used against them.

The second major episode occurred during the early 1950s, when the introduction of broad-scale rabbit poisoning using 1080 baiting appears to have resulted in a limited revival of some species of fauna. There are records of an increase in native fauna in Dryandra forest at



this time, and brush-tailed and ring-tail possums were reported to have increased in numbers in several areas. This appears to have been due to the decrease in fox populations resulting from the broad-scale poisoning programme.

The final chapter, a further decline in native fauna, perhaps the most drastic so far, has followed the reduction in broad-scale rabbit poisoning using 1080 during the early 1970s. This followed the introduction of the rabbit flea which provided a more efficient method of transmission of the rabbit disease myxomatosis, so that poisoning is no longer necessary. This decline is most serious in the more open forest types such as the jarrah and wandoo forests where the animals are unable to escape predation easily. The formerly fauna-rich forest areas of Dryandra and Perup are seriously depleted, and populations of many forest and woodland species including the numbat and the woylie are now at dangerously low levels.

If this summary of events is correct, and there is every indication that it is since it fits all the known facts, then many species of native fauna are in danger.

Conditions have changed in the South-West since the advent of European man 150 years ago. Animals that managed to survive in conditions to which they had become

▲ *The brush-tailed possum is vulnerable to fox predation because it often leaves the trees to forage on the ground.* (Tom Leftwich)

perfectly adapted over millions of years cannot cope with the present situation. The state forests, reserves and parks of the South-West form a small area in comparison with the vast areas once available to the native fauna. These confined conditions aggravate the threat of the fox, and many native species can no longer maintain themselves without assistance from man. A programme of active management based on sound research data is essential. However, such data are not yet available. Furthermore, the problems associated with such a programme would appear to be considerable.

It is theoretically possible to reduce the number of foxes once again by poisoning. This may prove to be more difficult than at first it seems. A limited and localised selective poisoning programme, using 1080 to kill the foxes, has been initiated in the Perup area in conjunction with the Agricultural Protection Board, but so far it has shown little sign of success, for foxes migrate into the areas as quickly as those within them can be eliminated.

There is the possibility of increasing understorey density by the use of intense fires in selected areas,



▲ *The short-nosed bandicoot, formerly widespread, is now restricted to areas of dense undergrowth.* (Lyndon Schick)

thereby creating a safer habitat for the fauna. This may be possible in some areas, but without some reduction in fox numbers first it seems unlikely to provide the answer.

Finally, there remains the possibility of some form of biological

control of the fox, similar to that used so effectively against the rabbit. This is an alternative fraught with problems, but it may prove to be the only practical long-term solution.

Whatever the future may bring, it

seems unlikely that any form of management will ever restore the jarrah and wandoo forest fauna to their former levels of abundance. At best, and if we are lucky, we may manage to save most species from extinction. (1)