Trappings of Success

Ecological research on the population dynamics of rock-wallabies has revealed that the fox is a major threat to marsupials. The ability to trap rock-wallabies was the key to this discovery, and this was made possible by a new trap designed by CALM's Bob Bromilow. Jack Kinnear describes these engaging escape-artists and provides an encouraging update to the fox problem.

IN 1978 in the central wheatbelt, Technical Officer Mike Onùs and I commenced a survey of the last surviving populations of rock-wallabies in the South-West. We systematically inspected almost every nook and cranny for signs of rock-wallabies. We failed to find any traces of one population, another was nearly extinct, and the remainder had suffered a massive population decline

We had no clue as to what was wrong; only a daunting list of possible reasons: habitat damage, human disturbance, habitat fragmentation, drought, malnutrition, too many wildfires, not enough wildfires, viral infections, bacterial diseases, parasites, genetic deterioration due to inbreeding, foxes, feral cats, competition from rabbits - take your pick! After eight years and the addition of a new member to our team, Bob Bromilow, our evidence singled out the fox as the major reason for the decline of the rock-wallabies and for their dangerously low numbers

This research generated shock waves throughout the Australian conservation community, though it hardly surprised scientist Per Christensen. In a 1980 article in *Forest Focus* entitled 'A Sad Day for the Fauna', Per presented evidence which implied that the fox was a devastating destroyer of our unique marsupial fauna. He felt that the fox was one of the most pressing problems in Australian wildlife conservation. I concur with Per except for one small point. When the European fox was introduced into Australia, it was more than a sad day; it was a day that marked the beginning of a wildlife tragedy that is still going on today.

We confirmed Christensen's hypothesis through a simple experiment. We reasoned that if foxes were responsible for the decline of rock-wallabies then fox control should reverse the situation. This proved to be so. Under fox control the rock-wallabies increased. Moreover, they failed to increase significantly wherever we made no effort to control the fox.

Yet while the experiment was conceptually simple, it was by no means an easy task to carry out. At one stage, we almost abandoned the project. The reason? We could not reliably trap the rock-wallabies and it was absolutely essential that we be able to do so! Fortunately, Bob Bromilow joined us at this critical moment and quickly retrieved the situation.

Rock-wallabies, well adapted to life on rock-piles, became accomplished escape-artists, able to squeeze through a tiny hole in the roof of one of the early traps used by researchers, after eating the delicious apple set as bait.
Photo - Jiri Lochman▲

RARE AND ENDANGERED: SPECIES IN RECEIVERSHIP

Why do species end up endangered? This is a difficult question that can be best answered in very technical and mathematical ways. Perhaps the best explanation is to look at life as a business, with a species being in the survival business. Within a natural community, successful species stay in business because, in the long run, they retain their capacity to keep their numbers up. Endangered species are like businesses which lose their share of the market and hence decline.

Every business has assets which are normally used to produce profits, given good management and a favourable business climate. The comparable assets of species are the number of individuals (the mums and dads) in a population contributing to the production of young. Profit is generated when the offspring survive to breed, and this is reflected in population growth. Unprofitable species show no population growth even when times are good, and therefore become endangered; a situation which is similar to a business existing on the verge of bankruptcy.

Conservation ecologists may be compared to accountants called in to investigate the affairs of a business placed in receivership. Such experts examine the books in order to find out what went wrong. This is not possible when one investigates the ecology of an endangered species. The only thing an ecologist can do is to study the animals themselves. By

doing this, it may be possible to create a set of books which reveal how an endangered species is going about, and apparently failing in, its business of survival.

POPULATION ECOLOGY - BEAN COUNTING IN THE BUSH

Accountants are sometimes uncharitably referred to as bean counters. In ecology the equivalent is the population ecologist. Population ecologists deal with numbers, profit and loss to try to explain why populations increase or decrease. They collect vital statistics of populations - things like birth rates, death rates and the life-spans or survival times of animals and plants. They like to know the age structure of a population, whether it is comprised mainly of young or old individuals. They count animals to measure the rate at which a population grows or declines. If it is not feasible to count every individual in a population, they count as many as possible, then use mathematical models and computers to generate population estimates.

Censusing wildlife populations is seldom easy, because animals like rock-wallabies will not queue up to be counted, and it is pointless to ask them when they were born or who died recently. Nor is it instructive to observe their activities through binoculars; they simply stare back. It is essential to get in there amongst them to catch them, age them, measure them, examine them, tag them, then let them go without harming them, and then do it all over again at some other time. All this is standard procedure for studying marsupials. The trouble was, we were up against a different sort of animal, a very intelligent and elusive wallaby, and one that proved to be adept at evading capture.

TRAPPING ROCK-WALLABIES: CATCH-ME-IF-YOU-CAN

At first we were confident that proven trapping techniques would work. Three wire-mesh wallaby traps were set in position and baited with freshly cut apples. Next morning, we found all of the traps had worked, except that none contained

Black-flanked rock-wallabies, although once widespread, are now found only in isolated colonies in arid deserts and parts of the Wheatbelt.
Photo - Bert and Babs Wells ▲▲

A solution to the fox problem may soon be at hand, as a result of advances in biotechnology.
Photo - Courtesy of Agricultural Protection Board ▲

apples, and none contained rock-wallabies. This was disconcerting, but not too worrying, because one of the strengths of the scientific method is the process of replication and confirmation. So we tried again and we confirmed our original results - no apples and no rock-wallabies.

Our traps were high-sided with partially opened dome-shaped roofs. Nobody had ever experienced problems with wallabies escaping by this opening. Nevertheless, we decided to close off this possible avenue of escape, even if it seemed slightly silly.

We reset and baited this improved version and again we were `done' by the rock-wallabies. Analysis revealed they had squeezed through a small hole in the roof of the trap - a remarkable feat for a wallaby. Our failure to catch any was becoming a talking point. A nameless colleague equated our success rate to that of the hapless coyote in the road-runner show. Another suggested that if we planned to continue this line of research, it might be wise to invest in an apple orchard.

In desperation, we wired and stitched up our traps until they were escape-proof. Again they were set, and we caught our first rock-wallabies, three of them to be exact. But success brought no joy. All three looked as if they had just finished a ten-round bout with the wire, and all three looked like they had lost by a unanimous decision. Fortunately their condition looked far worse than it really was, and we later caught them again in perfect condition.

We had failed to appreciate that rock-wallabies live in the three-dimensional world of rock-piles, where it is just as natural to jump upwards as straight ahead. And of course they are superbly adapted to their rocky habitat; built for strength and agility, they differ from other wallabies in that they are more compact and nuggety. This explained why they were such accomplished escape-artists, and why they banged themselves about with such force in a trap.

Very chastened, we withdrew from the rock. However, we had good reasons for returning in spite of our problems, because these rock-wallaby populations were proving to be eminently suitable for conservation research. They were willing to enter traps, so they were very trappable providing that we got our act together. Thus we returned, and the catch-me-if-you-can contest was on in earnest. However, as time passed, it gradually became apparent that it was not a fair contest, because the rock-wallabies kept changing the rules; they cheated a lot, and they always won the game.

It was imperative to come up with a new trap design to prevent these muscle-bound wallabies from braining themselves. Wire materials were obviously unsuitable. We obtained some strong nylon netting normally used to make fishing nets, and it was cut and sewn to make a chamber shaped like a wind-sock closed at one end. This was attached to a door frame and extended by guy ropes attached to steel pegs driven into the ground. To reach the apple placed inside a wallaby had to step on a treadle board which released a trigger which dropped the door.

The new design worked well at first. Rock-wallabies readily entered and, when they struggled, the loosely suspended netting yielded without inflicting injury. But soon we stopped catching wallabies, and all that remained of the apple bait was a damp spot.

It seemed that we had created some apple addicts who had learnt how to steal apples without being caught. Instead of entering the trap, they pressed their muzzles against the side of the loosely-suspended netting until they made contact with the apple. They proceeded to reduce it to apple sauce, which was licked up through the netting. This explained the damp spot.

To counter this we placed a hessian curtain around the trap (except for the entrance) to obscure the bait from their beady little eyes, and we were once more in the business of catching rock-wallabies - for a while at least. Then it started all over again: no rock-wallabies, no apple, just a damp spot.

Researcher Mike Onus with a rock-wallaby. The animals are ear-tagged and then measured to determine their age and reproductive status.
Photo - Jiri Lochman ▲

The rock-wallabies were using the traps as a trampoline by jumping over the curtain to land on the netting roof. (they left their calling card in the form of a dropping on the top of the netting). This bouncing around triggered the trap and it was apple sauce time again.

By now we had run out of ideas. Our Mark III trap was working, up to a point, and it was gentle on the rock-wallabies. Using it we had progressed to the point where we were able to eliminate most causes other than fox predation, but in order to test this hypothesis we needed a genuinely reliable trap. The tangled maze of ropes, netting and anchor pegs was awkward to carry. The trigger mechanism was crude, not easily set and hopelessly erratic. At times the weight of an elephant would not trigger it, but at other times a moth fluttering by seemed sufficient.

THE BROMILOW TRAP: A MATCH-WINNING DESIGN

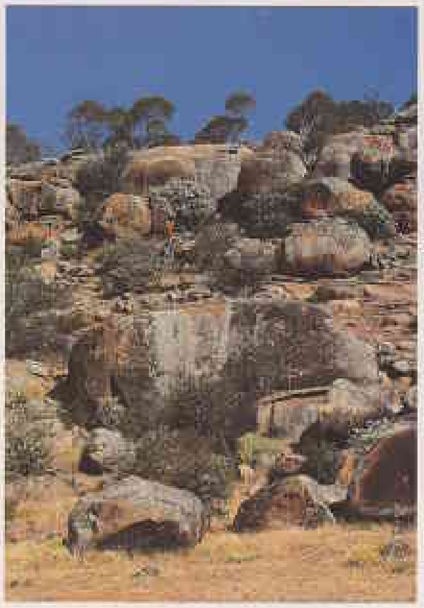
Bob Bromilow took note of this situation when he joined our research team and he offered to redesign the trap. Using his fitter and turner skills and his inventive flair, he quickly produced a design that swept away all of our previously intractable problems. Gone was the tangle of rope, netting and pegs. In its place was a complete trap that collapsed neatly and was easily carried and setup. It was still a gentle trap, but now the netting was neatly suspended from a light-weight aluminium frame which was high enough to thwart the trampoline artists. And to cap it off, the frame was tightly shrouded with hessian to obscure the apple delights from greedy little eyes. If a wallaby wanted some apple, then it could have it, but only if it entered the trap via the door - and then we had them, every time.

All of these improvements were impressive enough, but the creative part of Bob's design to my mind was the trigger mechanism. It was made from a magnetic latch of the type used to secure cupboard doors, and unlike the previous trap, it was easily set and reliable. Above all, it is a humane trap, one that we could use, much to our relief and peace of mind, without risk to our endangered friends.

A full description of Bob's trap design has been recently published in an international wildlife journal. It is known as the Bromilow Trap and requests for information about it have come from overseas.

The Bromilow Trap has been adopted by other wildlife research groups and has been used in many other locations. It has some minor limitations. For example, when native rodents are abundant, they trigger traps set for other species. After consuming the bait, they leave by chewing a hole in the netting. The woylie or rat-kangaroo can also create its own exit because, unlike most members of the kangaroo family, it has a specialised set of sharp premolars. Fortunately only a small percentage become chewers. In the case of rock-wallabies, the Bromilow Trap had one shortcoming - it made some rock-wallabies "trap-happy". Mike Onus caught certain rock-wallabies so often that he did not read the tag number - a glance at a pair of very familiar ears told him who it was.

When a wallaby steps on the treadle board the door is released and the animal ensnared.
Photo - Jiri Lochman ▲▲



Nangeen Hill Nature Reserve in the Wheatbelt is prime rock-wallaby habitat.
Photo - Jack Kinnear ▲

Bob Bromilow, the designer of the Bromilow trap.
Photo - Courtesy of the West Australian ▲

The Bromilow trap is used all over WA for a range of species. Here, it is set up on Enderby Island in the Pilbara, ready to catch rock-wallabies.
Photo - Bert and Babs Wells▲

The woylie, another rare and endangered mammal species that has been severely reduced in number because of the fox.
Photo - Jiri Lochman◄

THE FOX PROBLEM: NEW DEVELOPMENTS

When we began our study of rock-wallabies, we compared them in their endangered state to a business on the edge of bankruptcy. Over a period of four years in which we trapped and counted them, there was no profit because there was no population growth. After another four years, this time with fox control, we found them to be a very profitable species because their numbers increased dramatically.

Fox predation is not an isolated case restricted to rock-wallabies. In November 1984, we initiated another experimental fox control program in Tutanning Nature Reserve with the object of tracking the population dynamics of three rare species (the tammar wallaby, the woylie, and the brush-tailed possum). After five years of fox control, all three species have increased substantially, and we expect them to continue to do so.

We have now established that four marsupial species are at risk from fox predation. Senior Research Scientist Tony Friend's studies on the numbat extend the list to five, and it seems that the list is longer - how long, we do not yet know. These are dismal statistics, but there is a brighter side: in responding to fox control, these five species have demonstrated that they can, in business parlance, "trade out" of their receivership situation. This is a heartening discovery, for it signifies that although these species may now need help from CALM, they are not beyond recovery.

This is a very important point because these species have shown by their population growth response that they are capable in the main of looking after themselves were it not for the fox. In other words, despite all of the disturbances and environmental changes brought on by European settlement, and provided that we don't completely destroy their existing habitat, these species can flourish once again.

In bringing the fox to heel, we will have to change the ecological rules under which it is currently operating. We must introduce some effective constraints because the fox is too greedy and efficient a predator. It is not satisfied with some of the profit a prey species has to offer - it tends to take all of it and more.

What we must do is genetically engineer a solution, because we cannot wait for nature to provide one. Fortunately, a new and powerful biotechnology, forged from basic research in molecular biology, is emerging, and it is pleasing to report that the first steps are about to be taken to harness this technology and bring the fox under control.

Meanwhile, there is still a lot of trapping to be done, and with our Bromilow Traps we are now well equipped to do so.▣

Jack Kinnear is a Senior Research Scientist at CALM's Wildlife Research Centre at Woodvale, telephone (09) 405 5100. He has been researching rock-wallabies and investigating fox control since 1978.

Rock-wallabies threw down the gauntlet to scientists trying to trap them for research. Who ended up winning the catch-me-if-you-can contest?
See page 35.

Shells, tiny crabs and sundry other creatures are sure to please the curious naturalist who invades the intertidal zone at low tide. Explore the place where the shore meets the sea on page 23.

Waterbirds flock to the Vasse-Wonnerup wetlands in their tens of thousands, some travelling over 10 000 kilometres from summer breedings grounds in northern China and Siberia. *Turn to page 17.*

LANDSCOPE

VOLUME FIVE NO 3 AUTUMN EDITION 1990

Scientists will use modern technology to restore two rare and endangered mammals to an area in the Gibson Desert from which they have become extinct. *See page 10.*

It's the burning question! Is prescribed burning in spring or autumn better for the jarrah forest? Or is there another alternative? *See page 28.*

FEATURES

REGULARS

COVER

The designs of desert artist Benny Tjapaltjarri show events associated with the Pakuru or golden bandicoot dreaming in the Gibson Desert. The three central roundels depict rockholes and the others represent hills. The background dots show the vegetation of the area.

Managing Editor: Ron Kawalilak
Editor: Carolyn Thomson
Designers: Louise Burch/Robyn Mundy
Production: Karen Addison
Advertising: Tim Langford-Smith ☎ (09) 389 8644 Fax: (09) 389 8296
Illustrations: 'Swamped With Birds' - Ian Dickinson
'Seasoned With Fire' - Yeon Hee Kim
Colour Separation by Prepress
Printed in Western Australia by Kaleidoscope

Published by Dr S Shea, Executive Director
Department of Conservation and Land Management,
50 Hayman Road, Como, Western Australia 6152.