Robo**R**ange**R**

Elwyn Dennis
2024

The Nutshell

Colonists came.

They brought with them not only the animals that they used, but those that they missed, that were familiar in the preferred landscapes from which they came.

Some introductions were less deliberate, transported but not released by settlers. Rattus rattus among them.

Animals, iconic in their original environments, became altogether too successful in Australia's island-paradise-for-feral-animals: few predators, largely disease free for exotics, minimal competition, lots of space.

Easy to elbow in on unprepared marsupials.

The introduced got out of hand.

Methods for reducing rabbit numbers were developed; methods for controlling foxes and cats.

As the variety and populations of introduced pests grew so did the light industries spruiking specific techniques to deal with specific pests under specific circumstances. 'Solutions' grew to encyclopaedic.

Introduced animals have mostly only been of concern when they threaten profit or inconvenience human occupation.

Efforts to eradicate become casual once pest animal numbers drop low enough to ease economic threat and domestic inconvenience.

Unattractive, time consuming, costly, destructive, often cruel, final clean ups lose urgency. Rarely happen. The upshot is that feral animal management simply improves conditions for the lucky survivors.

To completely muddy the issue, perhaps explaining it, we maintain cultural attachments to the critters. Easter Bunnies. Bambi. Industrious honey bees. Clever foxes. We insist on attaching affection to these environmental monsters.

All control measures, past and present, share one characteristic.

They haven't eradicated any species of feral animal.

Introduced pests are all still nibbling or gnawing, pecking or sucking, compromising attempts to preserve Australian native biodiversity.

The opportunity to halt the depletion of this continent is a shining incentive in the face of bleakness.

The Need

Australia has been modified to support European purpose without reference to the nature of the land or the slightest nod to the successful husbandry of indigenous people.

We know better now, but have habits.

Without digesting ‘urgent’, our biota is likely to become the provenance of zoos, botanical gardens and historic documentaries.

This is not an exaggeration and has not been an exaggeration for so long that one wonders if we have the capacity to adapt.

The double whammy of climate change and depleted ecosystems challenge plant and animal.

Our best chance is to stabilise the landscape which will then be better able to absorb changes.

Effective responsibility must happen faster than traditional educational processes will allow.

Because of our long disconnect from country, we need a lot of help.

We need informed (AI driven) conservation tools. We need assistance right now while we learn to increase the depth of our identity.

If present trends continue, Australians are liable to sacrifice continental biodiversity by the end of this century.

There is no debate; settlers and descendants have been cavalier about the well being of indigenous ecosystems.

Simple justice, Fairness suggest that “Western” bits of Australian culture and technology be recruited to resolve this self-imposed sustained assault on our land.

ROBO**R**ANGE**R**

RoboRangeR, fifty meters above, was a nearly invisible speck due to light belly against bright sky. (Ground camo pattern topside to slip past eagles.)

Almost invisible. And quiet.

The robot was the result of late epiphany, computer aided design, precise printing machines and commitment beyond professional category. Its propulsion was silent to most ears; little energy lost aggravating air.

***

An aside, our example:

“Five Winds’’ was a 125 hectare property in ‘rubbish’ country in Victoria’s west. It had been an increasingly unsuccessful subsistence farm for over a century.

Under new direction, the last fifty years had seen the property return slowly to the only thing it did really well—be bush. Slow largely because of introduced pests.

The “Five Winds” RoboRangeR was nicknamed RogeR by resident caretakers—owners in English land law.

***

RogeR dropped into canopy, vanished into limbs and leaves, hovered.

Agility was based on the perceptive systems and near-navigation capabilities of raptors, bats and dragonflies.

Infrared sensors were supplemented with sonar, radar, lidar.

The hover was a step called *Confirmation* in the programming.

Images were clear from survey height. RogeR rarely descended from on high because of false identification.

But to be sure, a second stage of verification was requisite from closer—around twenty-five meters.

In reality, *Confirmation* was an imperceptible pause, pieces of a second. On board AI, purpose trained and trimmed, was fast.

A 99% match was required to activate *Targeting*.

Native antichinus resemble Rattus rattus more closely that most native animals resembled anything feral. Both species spent as much time as possible under cover. Both are predominately nocturnal. Their sizes overlapped somewhat. Their effects on the ecosystem could not be more disparate.

RoboRangeR analysed body movement during *Identification,* done from survey height. No mistaking the difference between antichinus and rat there.

When I*dentificatio*n revealed a feral, RogeR descended to initiate *Conformation*.

Sounds were distinctive too, but, like most wild animals, these two species were discrete most of the time when out and about, though sounds of foraging often aided RogeR.

In the event of a rejected match, RogeR noted the site, gave itself instruction to return for later look.

RoboRangeRs avoided non-target species, left the ground surface undisturbed, and were undeterred by difficult terrain, dense tree stands or lack of light. Tireless.

RogeR verified seven rabbits. The RoboRangeR focused on the nearest, adjusting orientation, aiming. The blow gun's barrel as long as the drone's diagonal, allowing for 'never miss' accuracy at these distances.

(RoboRangeR's operating system disabled the final step, *Shoot,* in deteriorating conditions: rising wind, heavy rain, unusual heat, or when its power source was reduced to the last 10%, reserved for returning to dock and transferring data.)

The *Target* and *Shoot* bits of the drone's brain had been 'released from military custody'. Tweaked to positive and practical.

After two weeks, RogeR had eliminated 70% of "Five Winds" rabbits. (Plus two foxes and a cat.) Two weeks usually removed rabbits altogether from a property this size, but this was granite boulder country, impregnable rabbit refuge—until RogeR.

The puff of compressed air was picked up by the those sound-basket ears, alerting the rodent, which flatted against the ground, body still, readied for flight.

Without time to confirm alarm, the animal's system was frozen and it retired painlessly without a sound, without moving.

A second member of the family succumbed without preliminary precautions against possible danger.

Nudging its position again on three axis, RogeR targeted a third rabbit which succumbed while nibbling emerging shoots of locally endangered lambs tail, Ptilotus spathulatus.

Three down.

Unidentified unease triggered flight down the rabbit hole for the remaining rodents. Rabbits are with us still because they are cautious and come hard-wired alert. And because they breed like….

After five days, long enough for casual alarm to drop from rabbit attention, RogeR would return.

Once the warren was inactive, the rabbit flag would be removed from this site and archived with associated data.

However, this spot had generated a pest plant flag: cape weed, thistles and horehound collared the warren. RogeR would return.

The drone whipped back up through branches, avoiding everything including an indignant scrub wren, returned to surveillance height. *Agility* was always running when RoboRangeRs were flying. (Running during flight? Somehow English makes sense most of the time.)

RogeR resumed browsing its *Designated*, "Five Winds" boundaries. Creaking land law meant it was still easier to do most environmental management within private property boundaries.

RogeR docked just on dark.

The drone had spent its 10 darts, retiring rabbits from two other warrens. As time went on, RogeR returned with spare darts. There was celebration when RogeR came back with a full magazine for the first time.

The docking station implemented *Data Transfer,* uploading flight data, mostly video, to its waiting computer partner where every flight was stored on the “Five Winds” data base.

Weekly, “Five Winds” home base passed new data to community base, which relayed to district base monthly, to a state base quarterly and was added annually to the public National Flora and Fauna Survey. (Which hosted the innovative site-specific-best-practice index for conservation curators.)

Much was revealed through mining data gathered by distributed RoboRangeRs.

RoboRangeR could be charged, equipped and launched every four hours.

The operating system allowed an initial intense *Knock Down*, a ‘one-off’ sweep function over forty-eight hours (for “Five Winds”), targeting the three villains from which few environments are free: rabbits, foxes, cats.

After initial knockdown, RogeR adopted a calculated kill rate, avoiding unhealthy numbers of corpses at any one place or time since excess nutrients over even a fairly short period can trigger leisurely sequences of ecological imbalance.

Flights dedicated to ‘seek and destroy’ were usually soon reduced to weekly, then monthly. Finally RogeR hunted only in response to alerts from routine survey data.

Getting rid of rabbits was not the whole job done.

Once RogeR went for four days without spotting any sign of skeletal ferals, the operating AI would suggest swapping for the spray pack harness. Or to no harness (default survey mode) if things were under control.

Caution: Don't try this at home unless you are an experienced user.

RoboRangeRs were the only practical method for cleansing feral honey bee hives from high hollows in the bush.

Orchestrated safely by *Burn (*a subroutine associated with the spray pack) three spaced visits delivered measured and focused flame to a hive leaving nesting hollows clean for traditional tenants.

Burn could also be used to quicken formation of hollows developing in trees, living and dead. Critical where nesting sites are limited for disinherited natives.

With a single swoop, RoboRangeR provided the foundation that finally allowed responsible conservation management from newbies arriving full of optimism but few clues.

(Limited dart trajectory, on top of system precautions, meant that RoboRangeR could be used in settled areas, removing often unrecognised urban reservoirs of detrimentals.)

Concerned landowners, often lacking the prodigious experience and knowledge, perceptions and skills required to nurture the bush, can now utilise RoboRangeRs.

Fear of fire is a great example of new landowners not allowing themselves to approach, let alone apply, effective conservation management techniques.

Without leaving a single tyre print, or disturbing a single sugar glider, RogeR produced weekly maps of plant and animal occurrence and number. Made topological maps including detailed boulders, outcrops, creek beds, kangaroo trails. Maps of developing detrimental densities, of struggling ground cover. RoboRangeRs noticed erosion before it was seeable. Made maps of hollows, burrows, nests, webs, cauls, and scats. Maps of dry fuel loads.

Extracted and submitted images of arthropods and amphibians, fungi an lichens contributing substantially to the scientific identification of small life forms.

Though they sorted urgent problems quickly, worked themselves out of a job so to speak, RoboRangeRs were perpetually useful in landscape management.

General information:

Burn functions are restricted to line of sight caretaker clearance.

Burn was judicial, informed by sensors feeding the AI with temperature and humidity, kind and calories of fuel, adjacent circumstances, air movement, weather forecast, previous burns. Some days, RogeR wouldn't spay nothin', wouldn't burn nothin'.

RoboRangeRs became ubiquitous in recovering landscapes.

In other places there were darts and dosages for camels, donkeys, horses. For water buffalo. Bloody cane toads.

Within seven years of wide introduction, RoboRangeRs had spot sprayed buffel grass out of transgress after it was well on the way to swallowing subtlety balanced landscapes.

Australia began to bloom.