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Eat or be eaten

ANTS are renowned for their ability to find food and quickly recruit an army of nestmates to the scene. But foraging is a particularly dangerous pastime, and the benefits of a good feed must be weighed against the threat of predation.

To look at the some of the behaviours that might influence this decision, Mark Elgar and Julianne Halley from the University of Melbourne and Monash University, examined the response of Argentine ants (*Linepithema humile*) to different disturbances while foraging.

The pair soaked cotton wool in honey diluted in water – 15%, 50% and 85% – and placed the food source outside nest entrances. Then, in a series of experiments, they looked at the response of individual ants and groups of ants to disturbance, while they were feeding. These disturbances included a puff of air containing ant alarm pheromone and touching individual ant's abdomens with a blade of grass.

Elgar and Halley found that as the value of the potential food source increased, individuals were more likely to take risks, taking longer to leave a foraging area and resuming feeding faster. The bigger the group of ants at a food source – correlated with the quality of the food – the faster disturbed ants resumed eating. However the more ants that were disturbed, the longer it took for individuals to resume feeding.

The scientists say that reducing the risk of predation is an important feature of the feeding behaviour of most animals. The influences of food quality, group numbers and nestmate behaviour on foraging decisions may thus allow foraging groups of ants to maximise food intake while minimising deaths to workers.

Halley JD and Elgar MA (2001) The response of foraging Argentine ants, *Linepithema humile*, to disturbance. *Australian Journal of Zoology*, 49:59–69.

Wendy Pyper 10.1071_ISSN0311-4546EC108p34a

Ancient journeys

SCIENTISTS are using modern molecular tools to help unravel the evolutionary origins of New Zealand's plants and animals.

Dr Geoff Chambers and his colleagues at the Institute for Molecular Systematics, Victoria University, Wellington, have investigated the biogeography of three different groups in New Zealand: the geckos, the cicadas and the parakeets.

New Zealand began to split from Gondwana about 80 million years ago and reached its present position some 20 million years later.

It has experienced varying degrees of separation from other landmasses during its geological history as well as dramatic changes in size and shape.

Chambers says the origins of groups such as the New Zealand geckos, cicadas and parakeets can be described in terms of vicariance or dispersal. Their ancestors first arose in Gondwana, or they were derived *in situ* after Zealand broke away from Australia (vicariance), or, they or their ancestors arrived later by transportation across the ocean from some other landmass (dispersal).

'Analysis of DNA sequences indicates that New Zealand geckos are an ancient Gondwana group with a common ancestor that scuttled about on the old supercontinent before New Zealand split off,' Chambers says. 'The group's many (37-odd) species have evolved since then.'

To put this in perspective, the New Zealand geckos began to diverge from one another about 22.8 million years ago, at about the same time that deer branched away from the cow/goat line on their particular evolutionary tree. The split between the green geckos and the brown geckos is much more recent.

In contrast, the country's cicadas, which occur in all sorts of habitats, had a dual origin, neither of which is in Gondwana — so those geckos of old never stalked these particular cicadas. It seems that the founding ancestors of the New Zealand cicadas arrived as migrants from both New Caledonia, to the north, and from Australia, to the west. This dispersal and subsequent evolution probably occurred relatively recently in geological terms, less than 25 million years ago.

The picture for kakriki (*Cyanoramphus)* parakeets is different again. Other scientists have proposed that these colourful parakeets – which occur not only in New Zealand, but also on islands ranging from subantarctic to tropical – dispersed there from New Zealand as a centre of origin.

DNA analyses of this and similar genera suggests that the kakriki parakeets originated in Australia. They found their way to New Zealand via Caledonia, where they have dispersed to other islands and undergone rapid evolution into several species, in the past 500 000 years or so.

'This history of rapid colonisation is unusual as parrots are an ancient group in which vicariance rather than dispersal is the general rule,' Chambers says.

Chambers GK Boon WM Buckley TR and Hitchmough RA (2001) Using molecular methods to understand the Gondwana affinities of the New Zealand biota: three case studies. *Australian Journal of Botany,* 49:377–387.

Steve Davidson 10.1071_ISSN0311-4546EC108p34b

Heathland remnants greater than 500 hectares in area, containing several species of banksias, support abundant heathland and bushland birds.

Disturbed birds

SCIENTISTS often study the impact of human disturbance on wildlife, but the withdrawal of humans from the environment can also have an impact.

To see what effect the cessation of disturbance had on birds, Dr Andrew Fisher of Charles Sturt University at Bathurst surveyed open woodland habitat along a revegetated gradient in the central tablelands of New South Wales.

'There is unprecedented on-ground activity across agricultural landscapes in the form of tree planting and associated fencing of native vegetation, in order to arrest land degradation or for wildlife corridors,' Fisher says.

'Understanding what birds do when the disturbance ceases has implications for future restoration strategies.'

Fisher surveyed six sites within red stringybark and inland scribbly gum woodland that had previously been cleared for livestock. The sites were in various stages of regeneration: early, advanced and relatively undisturbed.

He found that sites in the early stages of regeneration – with open spaces – had the greatest number of birds and species, while the relatively undisturbed sites had the least. This finding highlights the need to look beyond species richness when formulating management strategies for birds.

'While not advocating a return to clearing and grazing, some intentional thinning of saplings may be required as regeneration proceeds, in order to create a mosaic of habitats,' Fisher says.

Fisher AM (2001) Avifauna changes along a *Eucalyptus* regeneration gradient. *Emu* 101:25–31.

Wendy Pyper 10.1071_ISSN0311-4546EC108p34c

Birds in the heath

FRAGMENTATION of wildlife habitat as vegetation is cleared for urban development, cropland or pasture is a familiar story, and the coastal heathlands of subtropical eastern Australia are no exception.

Interestingly, though, heathlands are patchily distributed in nature, often forming part of a larger mosaic also containing sedgeland, wetlands, open woodland and forest.

Could animals that have evolved in heathlands be pre-adapted for survival in patches of habitat, or are such fragments of habitat a tenuous last foothold for wildlife?

Is there perhaps a progressive change in the bird community as habitat island size decreases or a distinct threshold size marked by an abrupt change in bird fauna?

Ecologists Tara Martin, of CSIRO Sustainable Ecosystems, and Carla Catterall, of Griffith University investigated the effects of fragmentation on heathland birds along the north coast of New South Wales.

They compared abundance and species composition of birds in residential suburbs, sugar cane crops and in four sizes of heathland remnants (1–2 ha, 5–10 ha, 20–50 ha, and more than 500 ha) during both summer and winter.

The overall effect of converting heathland to residential and cane habitat was a distinct change in species composition and reduced species richness.

Heathland remnants smaller than about 5 ha did not provide suitable habitat for many bird species that are known as 'natural-vegetation-dependent' species, but they did seem to suit birds that are more characteristic of open or developed lands.

At the other extreme, remnants greater than 500 ha in area, containing several species of nectar-rich banksias, supported many species, and high densities, of typical heathland and bushland birds.

The scientists concluded that many heathland bird species manage to persist in habitat fragments as small as 5 ha or so, but that this depends heavily on the state of the surrounding land.

Species such as the white-cheeked honeyeater and little wattle bird may be able to persist in small heathland remnants thanks to their habit of moving between suitable nectar-rich heathland patches, but sufficient remnant patches need to exist in the region for this island hopping to occur.

Residential and agricultural activities in surrounding areas can also lead to altered fire regimes, nutrient influxes from fertiliser use, weed invasions and lowering of water tables due to drainage.

These factors are likely to gradually change the vegetation in smaller heathland remnants and eventually render them unsuitable for heathland birds.

Martin TG and Catterall CP (2001) Do fragmented coastal heathlands have habitat value to birds in eastern Australia? *Wildlife Research,* 28:17–31.

Steve Davidson 10.1071_ISSN0311-4546EC108p34d

Mammals and pesticides

AUSTRALIA's Plague Locust Commission uses the insecticide fenitrothion to control locust populations in arid and semi-arid areas of the continent.

Fenitrothion is a broad-spectrum insecticide used against many insect pests and disease vectors around the world (including those responsible for malaria and yellow and dengue fever). With some exceptions, it has not generally been linked to persistent residues and it does not seem to accumulate in food chains, but it is a toxic substance.

The effect of this aerial spraying on invertebrates has been studied, but what is the impact on non-target vertebrates such as mammals, birds, reptiles and amphibians?

At this stage, no one really knows, but Paul Story, of the Plague Locust Commission, is keen to find out. As a starting point, he and a colleague, Michelle Cox, of the University of Sydney, have reviewed what we know of the effects of organophosphorus and carbamate insecticides on vertebrates.

Exposure to these insecticides is normally indicated by a lowering of the activity of an enzyme known as cholinesterase in the blood of the animal. The authors' global literature review indicates that effects of the pesticides on vertebrates can include impaired temperature regulation, changes in levels of activity and aggression, and reduced food and water intake. So even initially sublethal effects have the potential to inhibit reproduction and survival.

From mostly overseas experience, both individual animals and animal populations can be affected as population dynamics may suffer disruption and species composition of communities can be altered, with the most sensitive species becoming locally extinct in areas of highest contamination.

The burning question – exactly what effect is locust spraying having on Australia's unique and diverse animals – remains unanswered. But Story is working with scientists at the University of Wollongong who have established techniques for determining cholinesterase levels in vertebrate blood and tissue samples.

Story P and Cox M (2001) Review of the effects of organophosphorus and carbamate insecticides on vertebrates. Are there implications for locust management in Australia? *Wildlife Research*, 28:179–193.

Steve Davidson

Paul Story

The red-cheeked dunnart is one of the small mammals of interest as it eats insects and has the ability to gorge feed.

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