

# Young turks

**Steve Davidson reckons brush-turkey chicks are the solitary street kids of the rainforest.**

**T**he Australian brush-turkey belongs to a family of birds – the megapodes – that has evolved a breeding strategy like no other bird group.

No elaborate nests or tree hollows for these rainforest dwellers. Brush-turkeys don't even incubate their eggs. Instead, the male builds a large mound of leaf litter and other organic material in which the hen lays and buries numerous thin-shelled eggs. These are incubated at about 34°C, by heat-releasing microbes, as the mound material decomposes.

After a long incubation, at depths of 40–150 centimetres, the hatchlings remarkably dig their way out of the mound and strive to survive without any parental care.

While working at Queensland's Griffith University, animal behaviourist Dr Ann Göth was intrigued by the special challenges endured by these intrepid chicks, and their behavioural adaptations.

How do they escape the mound without suffocating? How do they know what to eat? Without the benefit of vigilant parents, do they recognise different predators and know how to react to save themselves?

'I was keen to study these composting birds with their striking red and yellow necks and non-interventionist parenting methods and it has proved a rewarding topic,' Göth says.

'Brush-turkey chicks are like young fish and reptiles in that they are highly precocial (advanced at birth) and form no bonds with parents. This makes them ideal subjects for studies on innate, or inborn, as opposed to learned behaviour.'



Self sufficient: a chick scratches for food in rainforest leaf litter.

## Escape artists

The difficult 'childhood' of brush-turkeys begins soon after hatching.

Buried in the mound, the chick uses its strong legs to break out of its shell, unlike most birds, which peck their way out.

Observations of newly hatched chicks buried 40 cm deep in a heated perspex box revealed, for the first time, that on average it takes the chicks 40 hours to reach the surface. Some take up to 55 hours.

After hatching, the chick moves just enough to form a small cavity in the mound soil in which it remains motionless for about 16 hours. During this resting time the little chick dries its plumage, loses the inner egg membrane, and aerates its lungs and air sacs.

The chick spends the next 21 hours or so digging upwards in short bouts, moving on average just 3.6 mm an hour. It

maintains the small cavity around itself and rests, preens and pecks at things in the soil, including invertebrate food items.

In the final 64–120 minutes of its journey, the chick makes a last dash for the surface, tunnelling much faster than before (170 mm an hour), by almost non-stop digging and vigorous pushing.

So although the chicks miss out on the doting care seen in fowls and pheasants, they are relatively safe from predators during the first two days of life, ensconced in their mobile underground capsules.

It is a different story once they reach the surface, where they tend to lead a solitary, hazardous lifestyle, in thick vegetation.

Working with Dr Darryl Jones, Göth has found that the chicks can form social bonds with other chicks that they meet at unpredictable times, but this seems to occur rarely.

## The experiment showed that in brush-turkey chicks the alarm calls of other rainforest birds have indeed replaced those of absent parents.

Virtually all social behaviour in the species seems to occur without the benefit of social learning and few behavioural changes occur as the chicks develop. The researchers explain that gradual development of social behaviour in most bird species serves to avoid aggression. Young birds that behave like adults could well be regarded as rivals by assertive, territorial adults and suffer the consequences.

Since brush-turkey chicks don't initially form groups with adults, they are not at risk of offending adults, so do not need to 'hide' such behaviours.

### Fear of predators

Göth investigated predator recognition in brush-turkey chicks to see how they manage once they leave the mound.

'Hatchlings of most bird species behave naturally only when kept with parents or other chicks and this makes it difficult to distinguish between direct responses to predators and responses influenced by parents or other hatchlings. Megapodes are the obvious exception,' she says.

She tested the response of two-day-old turkey chicks to predators in a semi-natural

setting: a large, temporary outdoor aviary within a rainforest north of Brisbane, Queensland.

The naive hatchlings were exposed to a range of potentially scary predators or stimuli: a live cat and dog, a rubber snake resembling a red-bellied black snake and a plywood silhouette of a grey goshawk. Control objects consisted of similar, yet less-realistic cardboard objects.

The experiment also tested whether the chicks respond to recorded alarm calls of a songbird from the same habitat – the yellow-throated scrubwren – because auditory cues are often important in predator-prey interactions.

Göth thought that chicks might take note of the warning calls of other bird species in lieu of parental calls, since brush-turkey adults, unconventional to the end, do not utter any alarm calls of their own.

The chicks responded to a flying predator, the mock bird of prey, by crouching and freezing, a common reaction in related species, and they stayed that way for some time after the raptor disappeared. The cat also caused crouching, while the snake and dog stimuli mostly

triggered running behaviour. All these responses occurred without the benefit of learning and are therefore innate.

Although the chicks reacted differently to the four predators, oddly enough, in each case, they did not respond differently to the predators and their cardboard controls. This indicates that something other than the species of the predator is evoking the responses – perhaps size, speed and/or height.

For example, any aerial stimulus, within a certain size and speed, probably causes chicks to crouch. If in doubt, it is better to take evasive action than to waste time on identification!

The observed responses – general rather than species-specific – also make sense for brush-turkeys because they have co-evolved with a range of predators (many now extinct) that differed in size, speed and behaviour, rather than with just a few predator species.

### Alarming results

The experiment showed that in brush-turkey chicks the alarm calls of other rainforest birds have indeed replaced those of absent parents.

When they heard the alarm call of songbirds, indicating the approach of an enemy, chicks stopped what they were doing and looked around with their heads stretched upwards. Most young fowl-like birds react in this way, but typically to alarm calls of their parents or siblings rather than other songbirds.

The findings indicate that in conservation management of brush-turkeys and related species, such as the endangered malleefowl and the orange-footed scrubfowl, a lack of predator recognition or training should not be cause for concern when translocating chicks. Availability of cover is more important.

An adult male on his incubation mound. Brush-turkey parents put great effort into mound building but leave hatchlings to fend for themselves.



An earlier attempt at reintroducing malleefowl in New South Wales failed when most of the captive-raised birds were killed by foxes. This study suggests that a lack of cover may have been a more important factor than an inability to respond to the predators.

### Trick or treat?

Without parents to show them where and what to eat, how do newly hatched brush-turkey chicks find and identify food? Can they tell food from other objects? What are their preferences and which factors trigger feeding?

After conducting 'choice tests' on hatchlings, Göth and her colleague Dr Heather Proctor found that, although they most likely have excellent colour vision, in common with other day-active birds, the chicks showed no preference between red, green, blue and yellow beads.

Chicks pecked about equally at all four colours, so food colour appears unimportant. This would be a sensible adaptation, given that chicks can hatch in various habitats and different months of the year, making the types (and colours) of food on offer, such as fruit, quite unpredictable. An innate preference for one or two colours would restrict the chicks' food intake.

Despite never seeing food particles before, however, the chicks chose mealworms, then fruit, then seeds, then pebbles.

The scientists concluded that the chicks have an innate preference for aspects (releasing stimuli) that most foods have in common, such as contrast against the background, a reflective surface, or movement (as in invertebrates).

These appear to control the initial trial-and-error search method, and mediate learning as the chick gains experience. This is known as 'released-image recognition learning'.

So while naive chicks were initially seen to peck at all sorts of objects, including food particles, feathers, their own claws, knot-holes and droppings, they soon learned which tasted best.

### Consummate composters

A picture emerges of a bird that has evolved an extraordinary breeding strategy in which the adults expend their repro-



Brush turkey parents are strictly non-interventionist.

ductive effort on producing many large eggs and building and maintaining a large natural incubator in the form of the mound, but devote no time or energy to the hatchlings.

Lacking parental care, the chick needs to be precocial, independent and resourceful and it inherits some unusual behaviours for surviving in the rainforest. Some of these pre-existing behaviours change as the brush-turkey ages and learns from experience.

Worldwide, there are 22 megapode species, all occurring in the Australo-Pacific region. Considering that nine of these are listed as endangered or vulnerable, and that little is known about the needs of young megapodes, new information on chick ecology and behaviour will assist in their conservation and management.

For example, in all captive-breeding programs involving release of megapode chicks within a few hours of hatching, nearly all have died. We now know that at this tender age the chicks would normally still be safe underground, and that chicks should be released at about 40 hours old.

### More about brush-turkeys

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Dr Ann Göth now works in the Department of Psychology, Macquarie University.

**Abstract:** The Australian brush-turkey has evolved an extraordinary breeding strategy in which the adults expend their reproductive effort on producing many large eggs and building and maintaining a large natural incubator in the form of a mound, but devote no time or energy to the hatchlings. Lacking parental care, the chick needs to be precocial, independent and resourceful and it inherits unusual behaviours for surviving in the rainforest. Some of these pre-existing behaviours change as the brush-turkey ages and learns from experience. New information on chick ecology and behaviour will assist in their conservation and management. For example, when translocating chicks, availability of cover is more important than parental training in predator recognition.

**Keywords:** Australian brush-turkey, megapodes, nests, hatchlings, predator recognition, alarm calls, food preferences.