The Melanesian megapode has a naked face, often with red or pink coloration. It uses hot volcanic sand to incubate its eggs – an ancient behaviour now found in only a handful of bird species.

THE LAVA BIRDS

Meet the megapodes – ground-dwelling birds that start life beneath the sand.

By Mark Cocker *Photos* David Tipling

Clockwise from left: Megapodes excavate their nest chambers; these 550g birds can dig to impressive depths; there can sometimes be a bit of a skirmish among the birds, as they look for suitable digging spots; volcanically heated sand results in communal nest grounds; Savo Island.

The sound of our boat's engine drowned out the vast silence of the South Pacific night. It was 4am and pitch black – the only thing I could see distinctly was the whiteness of the breakers crashing and spreading onto the shore.

We were on the Solomon Islands, at a place called Savo, to see a bird that lays its eggs in the ground, like a crocodile. The embryos are warmed by the heat of volcanoes. When they hatch, the chicks, alone and unaided, have to scramble up – sometimes through 1.5m of sand – from the nest-grave in which their mothers have buried them. Parent and offspring will never knowingly meet.

The creature in question is called the Melanesian megapode – a ground-dwelling species, about the size of a chicken, with a small head, short brown wings and a spherical body that carries a deep, dark blue-black sheen. Its most notable feature is the size of its legs and feet, which explain that odd name – megapode means 'big foot'.

Megapodes form a separate ancient family called the Megapodiidae that includes 22 species, which occur from the Indian Ocean across parts of Indonesia, the Philippines and New Guinea, as far as southern Australia, then way out into the central Pacific through the array of islands known as Melanesia. Savo is among that complex of archipelagos and it is no coincidence that this spot, like much of the zone in which megapodes occur, experiences some of the highest levels of seismic activity known on Earth.

Savo is a live volcano and the megapodes have probably exploited the island's subterranean heat to incubate their eggs for millennia. In turn, the local people have learned to exploit this relationship to supply themselves with some of the most nutritious eggs produced by any avian species.

We were still in semi-darkness when Wilfred Ngasi, the chief of Agatoka village, ushered me and photographer David Tipling to a beach bordering the forest, where the megapodes lay. The locals make these sand-fields even more attractive for the birds by clearing fallen debris, while a thatched fence around the perimeter excludes predators, such as pigs, dogs and monitor lizards. Even as we took our seats behind the 'blind' we could hear the megapodes in the trees overhead, where they produced a loud, high-pitched chorus of 'yee-yeeow' notes.

In less than a minute, a megapode would go from full view to vanishing into its own excavations.

Beach burrowers

Local tradition has it that Savo's birds come from Guadalcanal, the largest of the Solomon Islands, about 15km to the south. In truth, they probably come from all directions and many islands, since sites with the necessary geothermal conditions are exceptional. There is one Melanesian megapode nesting ground called Pokili, on the island of New Britain, that drew in an estimated 53,000 birds in a single season during the 1970s. Such is the importance of these spots that, in the past, people fought running battles over control of them, sometimes with fatal consequences.

At Savo, the neighbouring villagers regulate their megapode fields amicably. Soon the birds were running freely across them to begin their morning's work. It was at this point that those remarkable feet came into their own. Finding a suitable spot, a bird would set to raking hard and, in less than a minute, could go from full view to vanishing completely into its own excavations. The scene was one of astonishing industry accompanied by a relentless hubbub of high contact notes.

The megapodes undertook adjacent diggings and pulsing jets of scraped sand would fly into the air in sequence. Each excavation proceeded in a rhythmic pattern but often with the spoil arcing in diametrically opposed directions. Several birds would occasionally be busy all in one patch, but out of sight, and it would appear as if the ground were magically digging itself.

As it goes deeper, a megapode has the challenge of removing the spoil that has accumulated at the mouth of its hole. It must routinely emerge to clear these tailings before returning to the 'coal-face'.

Hidden depths

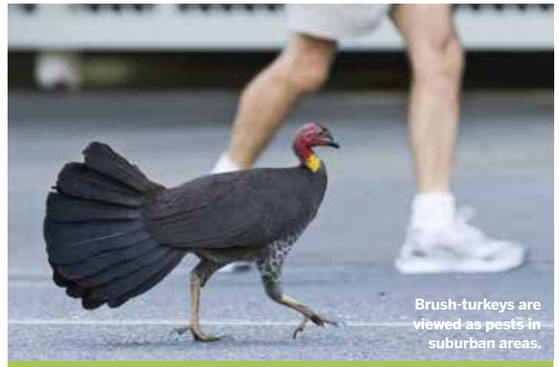
Later in the day, we were present when local people dug out the resulting cavities and it was astonishing to see the depths to which this 550g bird had descended. I even attempted to retrieve one of these eggs and vanished head-first into a burrow with only my feet showing.

It was intriguing to find that the bottom of the hole was moist and warm; it is thought that megapodes possess sensitive parts in their mouths or tongues that help them judge the substrate's temperature. The naturally occurring heat vent slowly incubates the egg and the chick emerges about 50 days later. In some species of megapode, such as the Australian malleefowl, eggs have hatched after 90 days. For comparison, the average domestic chicken takes fewer than 30.

The family, as a whole, uses two other methods of incubation aside from making the most of geothermal activity. Three species use beaches that are warmed simply by the sun, but the most common strategy is to exploit heat generated by the microbial decomposition of vegetation. Melanesian megapodes also use this method.

Some of the best egg-finders were often bathed in sweat from their exertions.

Clockwise from here: stout legs and large feet are adapted for digging and scraping; nesting grounds are fenced-off to protect megapodes; locals dig up the species' eggs, which are highly sought after; humans have waged battle for the birds' eggs.



Brush-turkeys are viewed as pests in suburban areas.

Talking turkey: Australia's industrious megapodes

Perhaps the best known of all megapodes is the Australian brush-turkey. It bucks the downward population trend common among the family and, in parts of suburban Queensland, even has 'pest' status. Birds regularly block up gardens with heaps of rotting leaves and will incorporate footballs, cans and silver spoons into their mounds. They even take over compost heaps for nests. Yet the prize winner for industry is undoubtedly the scrubfowl. Some mounds, which are probably communal and used over several generations, have been measured at 51m in circumference and 8m high, with an estimated 50 tonnes of vegetation.

Yet 12 other species gather together rotting vegetable debris, using their super-sized feet as rakes. They build it up into mounds in which to deposit their eggs. This behaviour is practised by what are probably the best known of the family, the trio that are found widely in Australia – the scrubfowl, malleefowl and Australian brush-turkey.

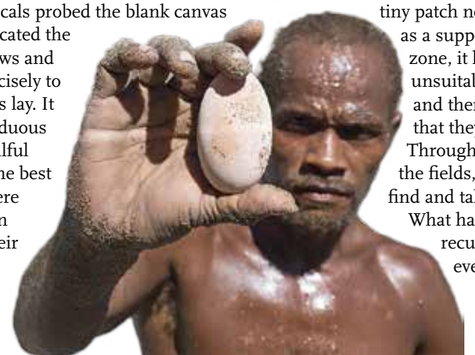
The natural assumption is that the birds inherited their incubation strategies directly from some reptilian ancestor. Yet this is now thought not to be the case. Rather, the first representatives of the family used normal avian incubation methods – that is, their own body heat – but subsequently evolved their unique alternatives.

Any similarities between megapode and crocodile behaviour are thought to be a result of convergent evolution – the process by which unrelated species independently evolve the same solution to one of life's problems. It is also assumed that the family developed the mound technique first, and then shifted later to digging burrows.

A striking aspect of the family's biology is the size of the egg and its yolk, which supplies all those nutrients that enable a chick to be self-sufficient from the moment it hatches. Melanesian megapode eggs are 100g, roughly twice the weight of a chicken egg and about a fifth of the mother's own weight. But the yolk content compared to that of a chicken is at least four times higher, making it far more nutritious.

Humans have valued the birds as precious resources for thousands of years and little has changed today on Savo. Once the megapodes had finished their morning's labours, it was the turn of the villagers, who harvest the eggs as food but also as a kind of currency, each one representing about 10 Solomon Island dollars (£1).

It's one thing to marvel at the industry of the birds, but it was almost as impressive to see how the locals probed the blank canvas of the sand, located the filled-in burrows and dug down precisely to where the eggs lay. It was no less arduous than it was skilful and some of the best egg-finders were often bathed in sweat from their exertions.



Seventy-year-old Wilfred recalled his childhood days when megapodes continued to come to lay eggs in these fields all day. Sometimes they were so numerous and so eager to reach the site that they would fly into people on the beach. But, now, like almost everywhere else in the megapode's range, Savo's human population has increased while the birds have declined.

Striking a balance

The old sustainable system, which ensured the nest grounds were left undisturbed to let megapodes breed successfully for some of the season, has all ended. Though the locals practise a modicum of restraint, leaving a tiny patch nearest to the village as a supposed harvest-free zone, it looked completely unsuitable for megapodes and there was no evidence that they ever used it. Throughout the rest of the fields, the goal was to find and take all the eggs. What happens on Savo recurs almost everywhere in this bird family's wider range – with inevitable consequences. Megapodes are now on a survival frontline and about 30 species of the family are thought to have been wiped out already in the last 1,000 years. Of today's 22 species, 12 are considered at some risk of extinction. Mercifully, the Melanesian megapode is still a bird to be found in abundance, but for how long?

The traditional nest sites found right across this region once gave rise to a wonderful symbiosis. Humans kept out predators and supervised the sand-fields, so that they met the megapodes' breeding requirements. In return, the people were blessed with an unending source of delicious eggs. What is required is the will to restore that sustainable partnership. It would be nothing short of tragedy to lose the birds that lay these golden eggs.

MARK COCKER *is a naturalist and writer. His latest book is* Our Place *(Jonathan Cape, £18.99).*

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