The use of copper strips to exclude invasive African giant land-snails *Achatina* spp. from echo parakeet *Psittacula eques* nest cavities, Black River Gorges National Park, Mauritius

Tatayah R.V.V., Malham J. & Haverson P.
Mauritian Wildlife Foundation, Grannum Road, Vacoas, Mauritius, Indian Ocean

SUMMARY

A practical method of excluding non-native African giant land-snails *Achatina* spp. from trees containing bird nesting cavities was developed on Mauritius following previous snail incursions in two successive breeding seasons that proved fatal to four echo parakeet *Psittacula eques* chicks. The use of a copper strip attached below nest cavities in susceptible trees has to date proved a successful exclusion technique.

BACKGROUND

The critically endangered echo parakeet *Psittacula eques* (Fig. 1) is the last surviving parrot of several endemic psittacids that formerly inhabited the Mascarene Archipelago. Echo parakeets were once common on Mauritius but began to decline in numbers and range in the mid 1800s, primarily due to habitat loss and predation from introduced mammals. Exotic birds such as Indian mynah *Acridotheres tristis* and ring-necked parakeet *Psittacula krameri* are also now common and compete with the echo parakeet for food and tree-cavity nest sites. By 1986 the echo parakeet population was estimated to be between eight and 12 individuals. However, due to the discovery of previously unrecorded small breeding groups it is now believed that the minimum population may have never been less than 20.

Echo parakeet conservation efforts were initiated by the Forestry Service and International Council for Bird Preservation (now BirdLife International) in the early 1970s and were intensified by the Mauritian Wildlife Foundation (MWF) and the Mauritius Conservation Unit (later the National Park and Conservation Service) in 1987 in response to this drastic decline. Techniques included: habitat protection and habitat improvement in fenced and weeded forest Conservation Management Areas; rat control around nest sites; manipulation of breeding pairs (including egg harvesting and chick fostering); supplementary feeding; and provision of nest boxes. From 1997 onwards emphasis was placed on protection of nest sites (from predators, competitors and weather), manipulation of wild broods, regular nest examination and weighing of chicks, rescuing sick or underweight chicks, and hand-rearing with subsequent release of chicks back into the wild.

Figure 1. Echo parakeet in the Black River Gorges National Park, Mauritius. (Photo: Jason Malham)

Recently in two consecutive breeding seasons (2002/03 and 2003/2004) the Echo Parakeet Conservation Team discovered young echo parakeet chicks (four in total) dead in two different tree nest cavities at Bel Ombre, southwest Mauritius. These chicks appeared to have been killed by African giant land-snails *Achatina spp.* Two giant snail species (*A.fulica* and *A.panthera* syn. *A.immaculata*) have been introduced to Mauritius (Fig. 2) from mainland Africa, probably in the late 1700s. Although they are reported as plant pests on the island and predators of smaller native snails, they had never been recorded to be fatal to birds. In both parakeet mortality incidents, the snails were on the chicks at the time of discovery. One of the tree cavities had a relatively low entrance at about 4 m above ground level, whereas the second had an entrance 8 m above the ground. Post-mortem did not indicate any other possible causes of death. It is believed that snails entered the nest cavities in search of food or shelter, moved over the chicks, incidentally covering the beaks of the young birds, the resultant slime deposition and physical blockage of the nostrils by the snail 'foot' leading to suffocation. Therefore an effective and practical solution to exclude giant snails had to be sought.

Figure 2. *Achatina fulica*, one of two African giant snail species introduced to Mauritius. (Photo: MWF)

ACTION

Study area: The present wild population of echo parakeets is restricted to an area of less than 40 km² of remnant native upland forest within the 6,800 ha Black River Gorges National Park (BRGNP) in south-west Mauritius. The locality where the echo chick mortality incidents occurred due to smothering by giant snails was within a conservation area at Bel Ombre in the southwest of the National Park (Fig. 3).

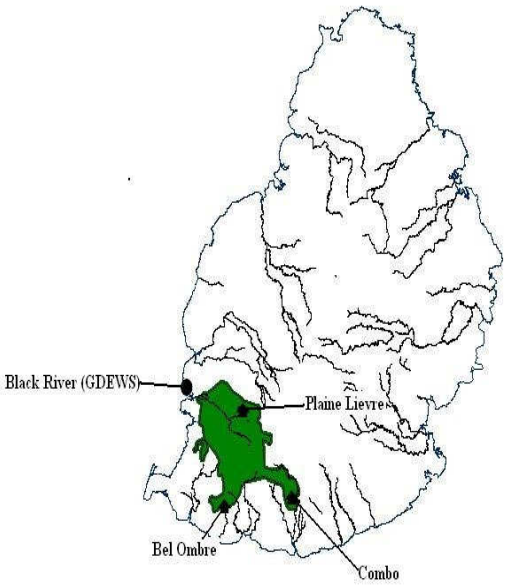

Figure 3. Black River Gorges National Park, (indicated in green) Mauritius

Literature search: It was considered impractical and unfeasible to exclude African giant snails *Achatina* spp. from nesting cavities through nest cavity modifications and the usual nest protection techniques (e.g. plastic sheeting, cones, pruning of branches) as already employed by MWF. A literature search indicated that land snails are deterred by the static surface electricity that some metals (e.g. copper) produce. A humane exclusion trial was therefore conducted.

Snail exclusion trials: A sheet of copper was purchased and strips (50 mm wide) cut. Four strips were laid flat on a wooden board to form a square copper grid; additionally a grid of two parallel strips was also trialed. Adult *Achatina* snails collected from the wild were then placed inside the grid. No snails crossed the copper grid up to 4 days after placement (after which snails were removed) indicating that the small electric shocks from the metal surface (or some other mechanism) provided an effective barrier to snail movement. In this trial, two parallel strips were more effective than a single strip. It seems that if a snail could stretch its foot over the single strip it could successfully cross.
However, field trials revealed that one copper strip around a tree trunk on a more-or-less vertical aspect, seemed to suffice.

Copper strip placement: Following this trial, at the start of the 2004/05 breeding season (ongoing), a copper strip was placed around the tree below the entrance of the two echo parakeet nest cavities prone to *Achatina* invasion and where chick mortalities had earlier occurred (Fig 4). Five other tree cavities thought to present the same risks were also protected in this way as a precautionary measure.

CONSEQUENCES

Since the use of the copper strip guards from the start of the 2004/05 season, there have been no cases of echo parakeet chick deaths attributable to *Achatina* over the subsequent three parakeet breeding seasons. Likewise there has been no evidence of giant snail incursions into either of these two nest cavities. The five other tree cavities that were thought to present similar risks and also likewise protected, have also remained snail-free.

Conclusions: The use of copper strips placed around tree trunks to prevent introduced giant *Achatina* snails from accessing nest cavities appears to be an effective and practical exclusion technique. This exclusion method is also potentially useful in other field conservation initiatives e.g. where endangered native snails need to be protected from predatory snails.

The echo parakeet has been one of the most intensively managed avian species in the world. As a result of a whole suite of conservation interventions, including the use of copper strips to exclude snails, the minimum wild and captive echo parakeet population has increased significantly from an estimated 30 birds in the 1994/1995 season to around 340 birds at the end of the 2006/7 breeding season.

Figure 4. The first echo parakeet cavity where chick death attributable to *Achatina* was recorded, showing the entrance above the rat guard (black plastic), the copper strip and the rubber flap over the entrance hatch. (Photo: Jason Malham)