

# Design and provision of nest boxes for echo parakeets *Psittacula eques* in Black River Gorges National Park, Mauritius

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## SUMMARY

Nest boxes have been provided for echo parakeets *Psittacula eques* in order to overcome a shortage of natural tree cavities and to facilitate intensive conservation management of this critically endangered species. Despite initial refusal to use nest boxes, a high percentage of successful nesting attempts now occur in them. In the 2006/07 breeding season, 73% of nests in which eggs were laid were in nest boxes (n= 56); 71% of attempts in nest boxes that season were successful in fledging chicks.

## BACKGROUND

The critically endangered echo parakeet *Psittacula eques* 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 a combination of habitat loss and introduction of predatory mammals. Habitat destruction (less than 1.3% of Mauritius' native forest remains) and the introduction of exotic mammals, including ship rats *Rattus rattus* and crab-eating macaques *Macaca fascicularis*, has had a devastating effect on indigenous flora and fauna. Ship rats and macaques are efficient predators of echo parakeet nests (as well as those of other native birds). Introduced birds such as Indian mynah *Acridotheres tristis* and ring-necked parakeet *Psittacula krameri* are also now common and compete with echo parakeets for food and nesting sites. By 1986 the echo parakeet population was estimated to be only eight to 12 individuals. However, due to the discovery of previously unrecorded breeding groups it is now believed that the minimum population may have never been less than 20. The present wild population of echo parakeets is restricted to an area of less than 40 km<sup>2</sup> of remnant native upland forest within the Black River Gorges National Park situated in south-west Mauritius (Fig. 1).

Echo parakeet conservation efforts were initiated by the Forestry Service and International Council for Bird Preservation (now BirdLife International) in the early 1970s, and intensified under the auspices of the Mauritian Wildlife Foundation (MWF) and the Mauritius Conservation Unit (later the National Park and Conservation Service) in 1987. Techniques employed in an attempt to bolster the dwindling population include habitat protection and habitat improvement in fenced and weeded forest (known as Conservation Management Areas), rat control around nests, manipulation of breeding pairs including egg harvesting and chick fostering, supplementary feeding and provision of nest boxes. From 1997 onwards emphasis was on protection of nest sites (from predators, competitors and weather), manipulation of wild broods, regular examination of active nests and weighing of chicks, rescuing sick or underweight chicks, and hand-rearing and release of birds back into the wild.

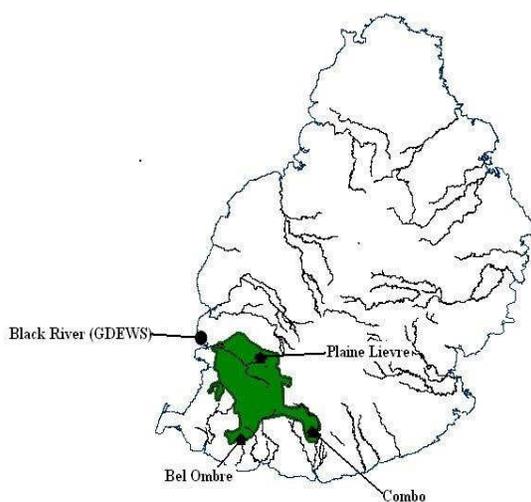
All known echo parakeet nesting sites are managed in order to increase breeding success (e.g. rat proofing, and eviction of a wide range of nest competitors e.g. white-tailed tropicbird *Phaeton lepturus*, rats, Indian mynah, ring-necked parakeet, bees *Apis* spp. and yellow wasp *Polistes hebraeus*).

Other factors suppressing the echo parakeet population probably included: food shortage due

to forest clearance and degradation, competition from introduced species; predation; and shortage of suitable tree nest cavities. In an attempt to address the latter, wooden nest boxes were provided in the early 1970s and early 1990s but none were used prior to the 2000/2001 breeding season. This case study describes the subsequent uptake of nest boxes and advances in echo parakeet nest box design.

## ACTION

**Nest box provision:** Prior to the 2000/2001 breeding season, echo parakeets had not used any of the nest boxes that had been provided throughout the forest in which the very small population persisted within the 6,800 ha Black River Gorges National Park in south-west Mauritius (Fig. 1). A variety of types had been designed and installed, ranging from wooden boxes (including square, rectangular, triangular designs and hollowed out tree trunks) to 10 inch (25 cm) PVC pipes. In 2000/2001 nest boxes were used by echo parakeets for the first time. This may have been a consequence of released captive bred birds having been familiarized with nest boxes when kept at the captive breeding centre in Black River. Following this, parakeets started using boxes of any design, including PVC pipes. Since 2001, there has been considerable effort to design the ideal nest box.



**Figure 1.** Black River Gorges National Park (indicated in green), Mauritius - the current global range of the critically endangered echo parakeet.

**Nest box design:** The nest box design for echo parakeets has advanced considerably over the years and that developed by the 'Echo Parakeet Field Team' in 2005 can be seen in Figure 2. It consists of a long rectangular wooden box (65 cm high) divided in two compartments (an entrance chamber and the chick rearing chamber). Untreated pinewood is used for construction to avoid incidental poisoning of parakeets by wood preservatives (as the parakeets have a tendency to chew on the wood). The wood is planed to ensure tight fitting joints. Oversize posi-drive screws are used and screwed tight so that all joints are well sealed. In addition, PVA glue is used to ensure that all joints are waterproof. Only brass fittings are used (as these are very resistant to corrosion). Linseed oil is applied over the whole box to improve water resistance and prevent rotting. A metal sheet cover is added to the roof so as to provide further protection from rain. Previously dowelling was also inserted to act as a perch.

A modified 2007 box incorporates a hinged door that can be closed which enables birds to be locked inside for capture. Termites reduce the longevity of nest boxes considerably. To address this problem, attachment mounts made of 2 x 2.5 inch (c. 5 x 6 cm) recycled plastic 'planks' were trialled. Comparisons with wooden attachments have shown that these reduced tunnelling into the nest boxes to a great extent. In the past, boxes held by wooden supports were passage ways for termite tunnelling, reducing the life of boxes. Wooden supports (which even though were treated) also rotted quickly. Unfortunately, the company in Mauritius supplying the plastic planks closed down therefore an alternative will have to be sought. Hollow, uncoated square section aluminium tubes, 5 x 5 cm (2 x 2 inches cross-section) will be trialled in 2007 as a replacement.



**Figure 2.** Improved nest box for echo parakeets with metal covered roof. (Photo:Paul Freeman)

## CONSEQUENCES

The minimum wild and captive echo parakeet population has increased significantly from 30 birds estimated during the 1994/1995 season to an estimated 340 birds at the end of the 2006/7 breeding season.

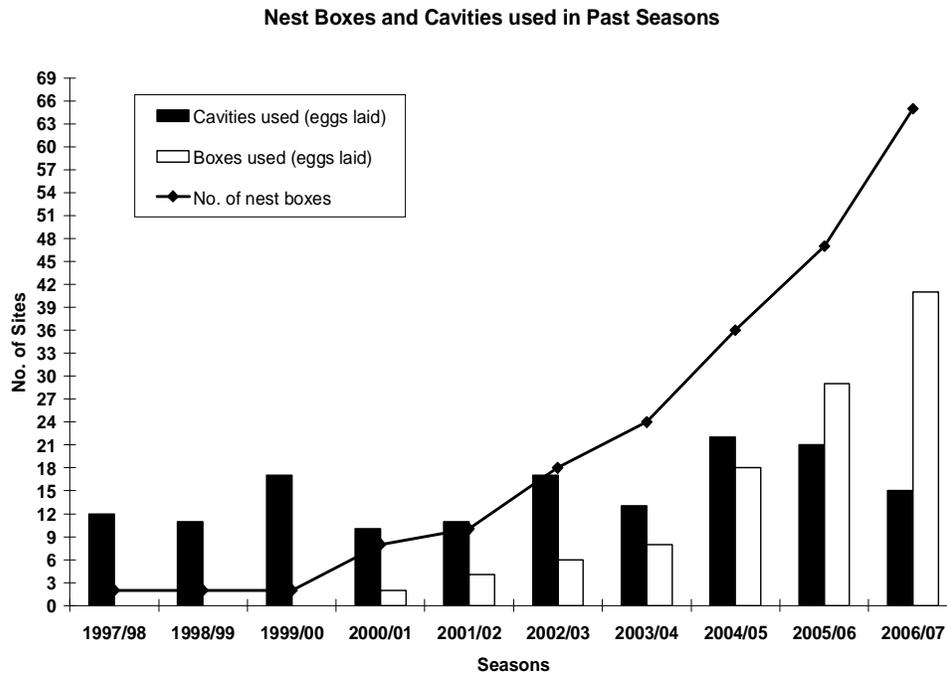
This increase could not have been possible without a suite of management actions including supplementary feeding, disease monitoring and control, captive breeding, predator control, modification and maintenance of natural cavities, and nest box provision.

In 2005/6, of the 47 artificial nest boxes available, 29 were used by echo parakeets for egg laying. At least five other boxes were prospected but not used. In 2006/07 41 of a total 65 nest boxes were used. In this breeding season 73% of sites in which eggs were laid were nest boxes (Fig. 3).

In the 2005/6 season 12 wild females (as opposed to those originating from captive bred stock) nested in boxes. A total of 18 wild males paired with females using nest boxes and there were nine fully wild pairs. In 2006/07 this had increased to 23 wild females nesting in boxes. Seventeen of these birds were paired with wild males. The number of birds using nest boxes will almost certainly continue to increase as more birds reach breeding age. By 2006, there were more nests in nest boxes than natural cavities. In the 2006/07 breeding season, 15 cavities vs. 41 boxes had eggs laid in them.

**Conclusions:** The adoption of nest boxes by a large proportion of the echo parakeet population is a huge step towards ensuring a continuously increasing wild population. It addresses natural nest site shortages until large scale forest restoration is well advanced when as trees age, more natural nest sites will gradually become available. The Echo Parakeet Conservation Team continues to perfect the nest box design and to seek solutions that will increase the longevity of the boxes.

In addition to addressing suspected shortage of natural nest sites, the nest boxes facilitate population management interventions e.g. improved protection from rats (rat proofing), reduction of competition from nest-site competitors (modification to size of entrance, or branching in front of entrance e.g. to make landing by white-tailed tropicbirds difficult), closing off cavities perilous to management staff and replacing with safe boxes cavities to climb to and replacing with more accessible cavities.



**Figure 3.** The number of nest boxes and natural cavities used by echo parakeets in each breeding season (1997/98 to 2006/07) showing the increase in the number of nest boxes provided and increase in uptake of boxes by the parakeets.

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