

THE CONSERVATION OF THE ECHO PARAKEET *Psittacula eques* of MAURITIUS

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The World Parrot Trust has supported the conservation of the Echo or Mauritius Parakeet for three years and several articles and notes have appeared in *PsittaScene* about this highly endangered species. In this article we summarise the information which is to appear in a longer paper which has been submitted to the *Dodo*, *Journal of the Jersey Wildlife Preservation Trust*.

The Echo Parakeet is the last surviving native member of its genus in the Western Indian Ocean. Other parakeets existed on the Seychelles, Rodrigues and Reunion but became extinct in the last century.

The Echo Parakeet did not attract conservation attention until the 1970s. The local naturalists R. Chevreau de Montléhu and France Staub studied the parakeet in the early 1970s. Subsequently both were instrumental in helping to focus attention on this species and were able to provide much background data on the ecology and status of the species for the decade before the start of the conservation project.

The conservation effort did not start until 1973 and initially was primarily aimed at the Mauritius Kestrel, and subsequently the Pink Pigeon and Echo Parakeet. The parakeet however received the least attention due primarily to a shortage of funding. Year around work on the parakeet started in 1987 and continues.

History of the Population's Decline

On pristine Mauritius the parakeet was probably found throughout the island and to judge from the relatively frequent mentions in the early accounts it was a common bird.

By the 1940s and 1950s it was limited to the south-west in and around the Black River Gorges extending as far as the centre of the island, a range of about 200km². The population at this time was not known but it has been suggested that in the 1930s and 1940s there were about 50-75 birds.

In the early 1970s there were estimated to be 30-50 birds. The 1986-1987 estimate was put at only 8-12 individuals with only three known females. Since then the population has increased, the wild

population in March 1992 consisted of at least 16 birds: seven adult males (almost certainly more), a juvenile male, four adult females, a yearling juvenile (possibly more exist) and three recently fledged young. We suspect the population to be 16-20 individuals. During the latter half of the 1970s and throughout the 1980s the population has been limited to about 50 km² in and around the Black River Gorges.

Habitat destruction

This has been the main cause of the parakeets decline. The island was once mostly covered in forest. During the 18th and 19th centuries as the human population increased the demand upon the forest grew, and areas of forest were cleared to make way for agricultural land. Between 1835 and 1850 the human population doubled and by 1860 it had trebled. It was during this same period, between 1835 and 1846 when more than half the remaining forests were felled. By 1880 only about 3.6% of the island was covered by primary forest.

In the 1940s areas were cleared for tea plantations, by 1972 54.6km² was under tea and most of this had been former parakeet habitat. At the same time other areas of parakeet habitat were being cleared for pine and other soft wood plantations. The most devastating blow for the parakeet was the clearing of key areas of dwarf forest on Plaine Champagne and surrounding areas between 1973-1981. This last project largely financed by the World Bank destroyed 30.6 km² of important foraging habitat. In 1973 at the start of this project there were probably 30 or more parakeets, by 1981 when this work was completed there were less than ten birds known.

Cyclones

These affect the parakeets by causing direct mortality during the storm and by post-cyclone food shortages and consequent starvation. Parakeet populations are badly affected by cyclones, following Cyclone Claudette in late 1979 the encounter rate dropped to 38% of the pre-cyclone figure. On the island of Puerto Rico in the West Indies the Puerto Rican Parrot population was halved by Hurricane Hugo in 1989, when the 47 or more parrots were reduced to no more than 23.

With the present population of parakeets at such a low level a bad cyclone hitting Mauritius in the next

few years could kill all the remaining parakeets.

Disease and Inbreeding Depression

These are real but unquantified threats that may be affecting the parakeets. A c.21 day old chick rescued from the failing nest on 5 December 1991 was under weight, anaemic and had lesions in both ear orifices and in its nostrils caused by the burrowing of nest fly maggots. Without our intervention it is highly unlikely that it would have survived another day. There was the remains of a second younger chick in the nest that had succumbed a few days earlier.

The rescued chick was successfully reared in captivity but when between seven and eight months old it developed a condition similar to French moult where the tail and primary feathers broke off, the broken feathers having a shattered or chewed appearance at the base. This bird still survives in captivity but is unable to fly.

There is apparently a much lower survival rate among female parakeets. During the last two decades the population has been skewed to males with ratios of between 3-5:1 being recorded. Historically the sexes were probably equally represented.

Habitat Protection

The need to protect the habitat of the echo parakeet has always been a very high priority. Most of the parakeet habitat is State Land although much of this has been used for deer hunting/ranching and forestry. These and recreation, such as hiking and tourism, have been considered as the main uses for the land which is mostly too rugged for efficient agriculture. The idea to turn the area into a national park was first voiced by the late Sir Peter Scott in 1972 and the plan was later developed in 1975 in an official report. The plan was shelved until 1988 when it was resurrected as part of the World Bank environmental investment program for sustainable development. The Jersey Wildlife Preservation Trust acted as advisors to this program and were represented by John Hartley. The plans for the park have been drawn up. It is hoped that the park will be officially proclaimed in the next year.

The park will include the Black River Gorges and surrounding forests, encompassing all the contiguous state lands in the region



Echo Parakeet photographed in 1972. Photo: L.R. Chevreau de Montléhu.



Macchabe forest, the last stronghold of the Echo Parakeet

and covering about 4,000 ha. The primary purpose of the park will be conservation.

Supplemental Feeding

Seasonal food shortages were first suggested as a problem in 1979 and the first attempt at supplemental feeding was in June and July of that year. Many different ways of feeding the parakeets have been tried. So far the most consistently successful means of feeding the parakeets is to provide food in simple rectangular wire-mesh baskets erected 6-8m above the ground. These are attached to a simple wooden frame so that the birds can easily perch on them to feed. This method has been successful since February 1991. It seems probable however that before many parakeets will take food out of the basket they have to learn to eat the food while hanging naturally in the tree or to learn from already habituated parakeets. Initially the parakeets fed on starfruit which they undoubtedly recognised, but have subsequently tried several other fruits and vegetables.

Baskets have attracted parakeets almost daily during the winter months. Three birds regularly visit our baskets but we have seen seven different birds in the area. The vast majority of food taken has been starfruit but other foods such as acorn squash, pear, apple and grapes have been sampled.

Most commercially available fruit and vegetables have been offered at one time or another but many are unsuitable for a variety of reasons. Grapes were often used because they resembled native fruits and the parakeets will eat them although they also attracted Mauritius Merles (Black Bulbuls) to the feeding stations. These are often aggressive towards the parakeets and chase them from feeding sites. Apple is also very palatable to Mauritius Bulbuls and is also a favoured food of rats. Most fruit and vegetables are palatable to monkeys and troops of these pass near the feeding stations quite regularly.

These studies illustrate how

difficult it has been to get the parakeets to accept supplemental food. More work needs to be done to find out how to provision the whole population. We shall experiment further on rat and monkey proofing feeding sites and hope to construct feeding towers in the forest.

Supplemental feeding is potentially of great value to the parakeets and constant food availability may bring the birds into better breeding condition and help them overcome food shortages in winter or after cyclones. There is no evidence that the individuals who regularly use the feeding stations are totally dependent on the supplemental feeding. They continue to feed on a wide variety of naturally occurring plant species.

Although some parrots will readily take provisioned food, when we started we knew of no cases where supplemental feeding had been used to help a failing population of parrots. There are however several instances where parrots readily take provisioned food or exploit an artificial food source. In Australia many species of parrots including cockatoos, rosellas and lorries visit bird tables to take food placed out for them. The galah has increased dramatically in numbers and distribution in Australia by feeding on wheat either in the fields or from animal feeds. In southern England the feral ring-necked parakeet population only survives because it feeds on bird tables during the winter months.

In recent years supplemental feeding has increasingly been considered as a safe and relatively straight forward management technique. Inspired by our work on the parakeet and other species, supplemental feeding is now used as part of the conservation effort for the Kakapo on Little Barrier Island. In 1991 these birds successfully raised two young birds, the first breeding for several years.

Nest Cavities and Nest Boxes

Echo parakeets nest in tree holes,

either vertical or horizontal cavities. Some sites are used annually. We believe good nest sites to be at a premium, a view held by many workers in recent years:

The parakeets may be limited by a shortage of potential nest cavities due to competition with hole-using species. In the face of competition Echo parakeets will relinquish their cavities to mynah birds and Ring-necked Parakeets. The single nesting attempts in 1980 and 1981 failed when the birds were displaced by mynahs. Further to these Black Rats, bees and White-tailed Tropic-birds also use parakeet nest holes. The high level of nest site competition is demonstrated by the fact that in 40 nest box years, 22 (55%) were occupied by alien animals. A former Echo Parakeet nest hole used in the 1989/90 season was occupied by Ring-necked Parakeets during the 1991/92 breeding season.

Black Rats have been recorded around all parakeet nest sites throughout the year, often living in the same trees that the birds nest in. Large species of native tree may produce cavities suitable for parakeet nests, but may have smaller cavities elsewhere in the tree that rats can use. Parakeet nests are often an easy target for rats. A failed nest in the 1990-1991 breeding season contained rat droppings and the broken remains of two eggs.

Good quality sites which are secure and of the correct dimensions are probably very scarce and potentially may be used for many seasons. In the Puerto Rican parrot some nest cavities may be used for 20 years or more.

Natural cavities are often destroyed in cyclones. The cyclone of 1975 destroyed 9 (38%) of the 24 known parakeet nest cavities. Since cavities may be in dead trees or limbs they often decay and become unusable after only a season's use.

This has happened to two of the three cavities lost since 1987. Three cavities have been lost in 17 cavity years (18%). A higher rate of loss than the values quoted for other parrot species.

The loss of cavities in native trees is being offset by the production of new ones as the old forest trees die off or are damaged by cyclones. However, many mature trees are not being replaced, so in the long term the number of cavities available to the parakeets is declining.

After cavities are lost or the parakeets are usurped by nest competitors the parakeets remain in the territory and appear to have difficulty in finding alternative nest holes even though some may be available. A similar phenomenon has been recorded for the Puerto Rican Parrot.

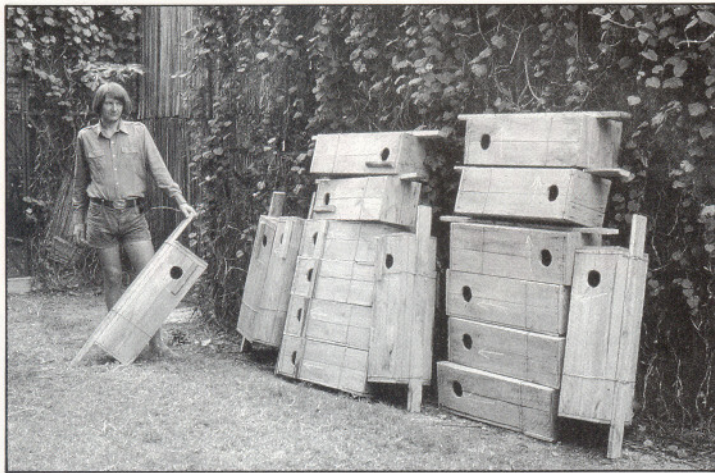
In an attempt to address the problem of few available nest sites, nest boxes have been placed in the forest since 1974. None of these nest boxes were ever used by Echo Parakeets but one of the first boxes ever erected was prospected by a pair.

It is probable that these boxes were not the ideal dimensions for parakeets or attractively positioned. Nest-boxes made of hollowed out seasoned pine logs are now being erected in areas where pairs of parakeets have been seen prospecting or are likely to breed. The dimensions of these are based on the measurements of parakeets nest cavities and are 24 x 24 x 45cm with an entrance hole 9cm in diameter. We are also making wooden boxes 22.5 x 22.5 x 50cm deep or if they are to be horizontal boxes, 70cm long. Substrate in these boxes is made of crushed termite nest.

The argument for continuing to provide nest boxes is very powerful. Studies on the Green-rumped Parrotlet have shown that by



Female Echo Parakeet leaving the nest, October 1975. Photo: L.R. Chrevreau de Montléhu.



Carl Jones and some nest-boxes ready to be placed in the forest

providing nest-boxes the number of breeding pairs increases. Nest-boxes also have the advantage that they can be made more secure than natural holes and birds nesting in them are more likely to fledge young and brood sizes may be larger.

Breeding Success

Breeding success in the Echo Parakeet is relatively poor. Between 1973 and 1983 less than half of the pairs attempted to breed in any year and of those that did try and breed only 40% succeeded in fledging any young (an average of 0.63 young/breeding attempt). Since 1987 breeding success has improved, and a larger percentage of the population has attempted to breed annually. Breeding was proven in ten out of 17 pair years. Productivity has also improved with an average of 1.3 young per breeding attempt.

The fertility and hatchability of Echo Parakeet eggs is good, out of 18 eggs 16 (89%) were fertile. If we exclude a fertile egg that was depredated then 14 (93%) of these 15 fertile eggs hatched. Fledging success is more difficult to put figures to since some of the birds have been harvested. However we can provide a reliable estimate, out of 12 eggs laid (11 of which were fertile) it is likely that six birds would have fledged.

The poor breeding success recorded in the Echo Parakeet population during 1973-1983 is probably attributable to the destruction of some of its main foraging areas during this period. The population is likely to have been severely food stressed. The recent improvement has probably been due to the population stabilising at a much lower level and the parakeet's exploitation of different food sources.

Improving Breeding Success

There are several options available for improving breeding success and to increase the productivity of egg laying pairs. It has been demonstrated that many species of birds will lay replacement clutches

should their first breeding attempt fail. In the Echo Parakeet we have experimented by harvesting eggs and young for captive breeding and subsequently some of the birds have recycled.

Harvesting of clutches Echo Parakeets have produced clutches of 1-3 eggs, with a mean clutch size of 2.25. Complete clutches have been harvested twice and the birds recycled on both occasions. On one occasion they laid in the same cavity but on the second chose an unknown cavity and the replacement was not realised until the fledged young were discovered. The inter-clutch interval was recorded once. The clutch was removed on 4 November and the female started incubating her replacement clutch on 25 November. Since Echo Parakeets usually start incubation with the second egg we can assume an inter-clutch interval, from the removal of the first clutch to the laying of the first egg in the second clutch, of 18-21 days.

Harvesting of broods Complete, healthy, broods have been taken on four occasions. The first two were both of two young and were taken in 1974 and 1975. As far as we are aware the adults were not monitored to see if they recycled. On the two occasions where the pair were followed after the removal of the young one pair recycled. This recycling was not detected until after the chicks had fledged, but by back-dating using known incubation and fledging times the period between the removal of the brood and the start of the replacement clutch was similar to the inter-clutch interval recorded above. The pair that did not recycle nested late in the season.

Since 1987 brood size has been recorded 7 times in the nest or at fledging and was 1-3, with a mean brood size of 1.86.

Eleven young have been reared under foster ring-necked parakeets and the nestling period was 48-69 days.

These studies illustrate that there is plenty of scope for

developing different management techniques. If the opportunity arises we shall use proven good parents to raise eggs or chicks from less successful pairs thereby insuring that all the pairs continue to be genetically represented in the population.

Multiple-clutching has rarely been tried with wild parrots and we have been unable to find any documented cases. This technique has been widely used in captivity by parrot breeders, but has yet to be used very intensively. Some experiments have been done to increase the egg production of captive Puerto Rican and Hispaniolan Parrots by double clutching and egg pulling. One female Hispaniolan Parrot produced a total of 21 eggs in a single season during a sequential removal experiment.

Captive Breeding

Captive breeding has long been regarded as one of the best options for the survival of the parakeet. In the late 1970s and early 1980s the situation for the Echo Parakeet looked very grave and captive breeding was viewed by most as the last hope for the species. A resolution passed at the ICBP World Conference on Parrots held in St Lucia in 1980 recommended that all the remaining Echo Parakeets be captured for captive breeding. The adult birds proved difficult to catch and the harvesting of eggs and young is the best hope for obtaining stock for captive breeding.

The parakeets used to be fed on a standard parakeet diet high in seeds, including sunflower, canary, millet, pine nuts and peanuts. The parakeets became very fat on a seed diet. All of these are now excluded

and they are fed entirely on a fruit, vegetable and leaf diet. High energy foods are not fed, favoured foods include, starfruit, bilimbi, badamier, ochra, fresh peas, green beans, apple, orange, cabbage, lettuce, pomegranates and acorn squash.

Echo Parakeets are able to readily convert carbohydrates into fats. This may be an adaptation to the dry winter months when the parakeets feed on leaves, unripe fruits and other low energy food. The parakeets seem to have an ability to utilize a high percentage of the nutrients present in the food and in captivity if fed on high energy foods they become obese.

To overcome the problem of obesity we are planning to build a large L shaped aviary 200ft long 15ft wide and 12ft high with smaller breeding units built off it. This will allow us to keep the birds together as a flock which we feel will enhance normal pair formation and social behaviour.

Ring-necked Parakeets have been maintained at the Government Aviary Since 1979 where they have been used as model species on which to practice management techniques and for foster parents. The harvested eggs and six of the young were reared by these foster Ring-necked Parakeets. Model species have been used in other captive breeding projects and Hispaniolan Parrots were used as models for Puerto Rican Parrots. The Orange-bellied Parrot project personnel first practiced extensively with Rock Parrots and Blue-winged Parrots and subsequently used Rock Parrots as foster parents for Orange-bellied Parrots. The value of closely related models in any captive breeding project for endangered species can



A pair of Echo Parakeets courtship feeding, October 1975. Photo: L.R. Chreuveau de Montléhu.



Our forest camp from where the Echo Parakeet work is conducted



An adult male Echo Parakeet in a *Calophyllum parviflorum* bush, July 1979

not be overstated.

Although Ring-necked and Echo Parakeets are closely related, the Ring-necked Parakeets are far easier to manage and more hardy.

Some Final Thoughts

The conservation of the Echo Parakeets has been hampered by a lack of data on the biology of the bird and a lack of information on the management of parrot populations. With the increasing rarity of a large number of parrot taxa there is a very real need to rapidly develop sound management practices for this group in the wild and captivity.

A review on the management of wild parrot populations needs to be compiled. Studies on maximising productivity by egg pulling, double clutching and fostering need to be conducted.

It is encouraging to note the parallels between the Echo Parakeet project and the Puerto Rican Parrot and the Orange-bellied Parrot conservation projects and how there has been a convergence of ideas on the way to manage these critically endangered parrot populations.

It has been suggested that the Echo Parakeet is in imminent

danger of becoming extinct. Findings in recent years seem to show that this may not necessarily be the case. It is worth commenting on the fact that many island bird populations may exist for many generations at a very low level. There are several examples from New Zealand, West Indies, Hawaii and the Mascarenes showing that even very small populations are often restorable and no population, provided there are still males and females surviving should be regarded as beyond salvation.

Acknowledgements

The project is a joint one between the Conservation Unit of the Ministry of Agriculture Government of Mauritius and non government conservation organisations. We would like to thank the Wildlife Preservation Trusts, Mauritius Wildlife Appeal Fund, World Parrot Trust and The Parrot Society.

Postscript

Interested in a job in parrot conservation?

Kevin Duffy who does the field work on the parakeet leaves us in March 1993 at the end of the breeding season, following nearly three years working on the project. We are looking for someone between the ages of 25-30 who would need to start with us in August 1993 at the beginning of the breeding season, and will remain on the team for eleven months with the option of renewing their contract. Interviews for this post will be held in Britain in June or July.

Finding a replacement for Kevin will be difficult since we are looking

for someone with a wide range of skills. We require a first rate fieldworker who is physically fit, a good tree climber, and who possesses some avicultural skills. Duties will include careful fieldwork and monitoring of the wild birds, the provisioning of the wild birds with supplementary food, providing and maintaining nestboxes and poisoning rats. A four wheel drive vehicle is provided for fieldwork.

The successful applicant will be expected to live in the field in a tented camp shared with 3-5 other fieldworkers/students working on other projects. Being part of a team means that the successful applicant will need to be able to take on camp duties including cooking and camp maintenance.

The job is not in the least bit glamorous and not very well paid. Camp is at 2,000 feet, during winter it rains a lot and temperatures may drop to 7-10 degrees C. In summer it is hot and we may get cyclonic rains, humidity frequently reaches 100% for days on end. The camp floods nearly every summer season.

Working as part of a team in a developing country means that you have to be pleasant, diplomatic and with a good sense of humour. There is definitely no room for free-spirits or *prima-donnas*.

If you feel that this is the job for you and possess these skills then write with a full c.v. to Carl G. Jones, Project Director, La Mivoie, Tamarin, Mauritius, Indian Ocean.