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Handrearing Palm Cockatoos

by Christine Sheppard, Curator and
Wendy Turner, Assistant Curator
New York Zoological Society

The palm cockatoo (*Probosciger aterrimus*) is a large, black parrot found primarily in New Guinea. Its range extends into parts of Indonesia and Australia (Forshaw, 1978). Named for its fondness for palm fruits, the species is notable for its beak, larger, both absolutely and proportionately, than that of any other parrot. The beak allows consumption of hard shelled nuts in addition to fruits and seeds. However, although very little data exist, it does not appear that palm cockatoo diets differ significantly from those of species with less formidable bills. The forces leading to the evolution of the beak are, therefore, not known.

The species has been recorded in captivity, although rarely, since early in this century. Although captive pairs have laid eggs, they were generally reported to have deserted or destroyed them. Successful breeding has not been common and until recently hand-rearing has been entirely unsuccessful (Young, 1986). Smith (1985) reported the first successful handrearing in England, which occurred in 1984. In 1986, two palm cockatoos were hatched and handreared by the New York Zoological Park. A bird hatched at Paradise Park, Honolulu, was also successfully handreared by Joyce Ferguson. A chick from a pair in Denton, Texas was handreared by Rosalie Snell and an additional chick was reported in Miami.

Development of replicable hand-rearing techniques for this species is important. Like most psittacines, the palm cockatoo is threatened by trapping for the pet industry and by habitat destruction. The palm cockatoo has been selected for long term propagation and management by AAZPA and a significant number of these birds have been registered in the studbook.

Management of Adults

A female palm cockatoo was donated to the New York Zoological Park in June of 1981. This bird was sent to

the New York Zoological Society's Wildlife Survival Center on 22 September 1982. A male was confiscated by USDI in 1980 and went to the Brookfield Zoo. It was transferred to the National Zoo in 1982, then sent to the Wildlife Survival Center on 4 April 1983. The birds have been paired since July 1983.

The birds are housed in an outdoor flight 32 feet long by 8 feet wide, sloping from 12 feet to 10 feet in height. The aviary has twelve similar flights. Part of the flight extends into the aviary proper, providing protection from the weather. There is a heat lamp above this covered section, which is turned on if the temperature drops below 50 degrees F. The rest of the flight is open and planted with grasses. The birds are fed twice a day. The morning pan consists of a variety of fruit, vegetables and nuts. A prepared parrot seed mix (Feed and Seed Co., Jacksonville, FL) is given in the afternoon. The food is supplemented with calcium carbonate and Avia brand vitamins (Nutra-vet Research Corp., Poughkeepsie, NY).

The pair were provided with a variety of nest boxes and logs. In April of 1985, the first egg was laid in a natural oak log. The egg disappeared two days later. A second egg was laid in May of 1984 in this same nest. The egg was removed from the nest and set in an incubator. The egg was fertile, but failed to hatch.

In 1986, the pair abandoned the nest they had used the previous year. All eggs were laid in an artificial nest box 4 feet high by 2 feet wide by 2 feet long. The entrance hole was 10 inches high by 5 inches wide, starting two inches below the top of the box. The box was filled with wood shavings to within three inches of the bottom of the nest hole. The nest box entrance was soon widened by the male. He has continued to make the entrance larger throughout the year. By mid-December, the front of the box was completely open from the level of the shavings to the top of the box and

some of the side was gone as well. Wild palms are reported to build a layer of sticks into the nest cavity and this has also been reported from captive animals. This pair, however, did not use sticks at all.

On 30 January, 1987, a broken egg was found on the ground under a perch. In February, another broken egg was found, on the ground beneath the nest box. It was felt the female might not feel secure in the nest box now that it was so open. Another nest box, of the same dimensions, was installed at the other end of the cage. The next egg was laid in this new box.

**Incubation and handrearing,
St. Catherines**

Eight eggs were laid in 1986. All eggs were removed from the nest and set in a wooden forced air incubator (American Lincoln Incubator Co., New Brunswick, NJ) at 99.5 degrees F with an 85 degree wet bulb. A dummy egg was placed in the nest after each egg was removed, but the adults never showed any sign of incubating it. The incubation period was usually 30 days, though one chick hatched at 32 days, the difference being due to a longer time from pip to hatch.

One chick hatched on 2 June and died the same day. Another hatched on 1 July and died two days later. Because one chick died of pneumonia, we decided to make some changes with the third chick and not raise it in the way parrots are traditionally hand-raised. Palm cockatoo chicks hatch with absolutely no down. They never have down, the pins growing out of bare skin. We thought that, perhaps, because of this lack of insulation, they might need temperature and humidity conditions similar to those required when raising softbills.

The third chick hatched on 6 August. It was kept in the Roll-X incubator that we use for a hatcher. The temperature was lowered from 97.5 to 95 degrees F on day two; the humidity was 92 degrees F wet bulb. At these settings, the chick was very slow to process food and did not look healthy. A nor-

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mal chick's skin is a bright pink color. If the skin turns pale, it is a clear indication that the chick is not doing well. Due to the behavior of the chick, the temperature was increased back to 97.5 degrees F and the chick's condition improved. The chick was moved to an Isolette infant incubator on day 10, when it outgrew the Roll-X. Through a process of trial and error, we determined that the ideal temperature for the growing chick was 96 degrees F with a wet bulb reading of 85 to 87. Any attempts to lower the temperature or humidity resulted in signs of stress. We initially fed the chick a cereal based diet that we have used successfully hand-raising several species of psittacines. This formula proved not to work for palm cockatoos. The chicks had difficulty in processing it. We switched to a formula developed by Chris Sheppard for use in hand-raising Pesquet's parrots. This is the formula we have continued to use. Detailed records were kept on amounts fed, weights, growth records, behavior and stages of development.

Another chick hatched on 1 September. This chick was raised using the same regimen we developed for the previous chick, which was still alive and growing. As has been reported in the literature, palm cockatoo chicks are very susceptible to bacterial and fungal infections. Therefore, exceptional care was taken to keep their environment as clean as possible. Feeding implements and nests were sterilized. Food items were kept refrigerated until needed and the formula was prepared just prior to feeding. Despite these precautions, both chicks developed *Candida* infections in early September. The infections were extremely resistant to treatment. It was decided to send both chicks to New York Zoological Park where they could be monitored by the veterinary staff. The older of these chicks died within three days but the younger gained weight and eventually fledged. Another chick hatched on 6 November and it was sent to New York to be hand-raised. This chick also fledged.

Handrearing, Bronx Zoo

At the Bronx Zoo, chicks were again maintained in infant isolettes at 96 degrees Fahrenheit. This temperature was maintained until each chick was quite well feathered (about 60 days). Attempts to reduce temperature before this point caused symptoms of distress. Chicks were initially kept in plastic "berry boxes," lined with paper towels

and toilet paper, which were changed frequently. The toes of very young chicks were always curled into a loose "fist." After 10 to 14 days the toes relaxed. At this point, chicks were placed in containers consisting of two short cylinders, one of which could fit part way into the other (Sheppard, in prep). A piece of rubberized mesh (Neotex matting, Thomas Scientific) was placed between the cylinders, forming a surface which was comfortable for the chick but permitted droppings to pass through. Cylinders of several sizes were used, constructed of plastic storage containers and buckets, cut in half. This system was used until the weight of the chick caused the rubber mesh to bow (about 400 to 450 grams). At this time, the chicks were feathered out. The chicks were gradually accustomed to standing on a cork bark substrate. The isolette temperature was gradually lowered about 10 degrees Fahrenheit at this time. Chicks were then moved to box cages, measuring four feet on a side and four feet high, furnished with a perch and with cork bark.

Diet

Chicks were fed measured amounts of a liquid diet, using syringes of appropriate size. The size was changed as the amount per feeding changed. With large amounts, a catheter tip was used on the syringe, to help direct food into the mouth. The initial diet used was as listed below:

Ingredient	Proportion
Hi-pro monkey chow (ground and sifted)	1
Sweetened applesauce	1
Egg cream	1**
Water	4

(* ** egg cream whole, peeled hard-boiled egg, equal weight of water, 1 ml. safflower oil, 0.5 grams calcium carbonate, water, whipped in blender to the consistency of mayonnaise)

A diluted formula was fed during the first three days. An initial feeding of 0.3 cc's was followed by gradually increasing amounts. Chicks were fed every three hours from 6 a.m. to midnight. Chicks were monitored to make sure the crop was clearing. In no case was more than 0.9 cc fed to a day old chick. It was our experience that chicks processed food more quickly during the morning, so morning feedings were slightly larger than night feedings, after the first few days. Our goal was for the crop to empty completely, at least once a day, usually overnight. The total amount of diet fed

per day was not increased unless a chick was empty in the morning.

As chicks aged, the number of feedings was decreased. When a feeding was omitted, the total amount fed per day was held constant. Early in development, feedings were spaced regularly throughout the day, with feeding intervals slightly shorter in the morning. At weaning, one feeding at a time was omitted and the total fed per day also decreased. Morning feedings were omitted first, since chicks were hungry after fasting overnight, and were more likely to pick up food items. Our first chick seemed to thrive but did not gain weight quite as quickly as we thought it should. After thirty days, the diet was evaluated by the Bronx Zoo nutritionist, Dr. Ellen Dierenfeld, and was found to be balanced and complete for all nutrients. However, when the first chick was 36 days old the diet was reformulated to increase energy levels; a small amount of sugar was added, as follows:

Ingredient	Proportion
Hi-pro monkey chow	1
Sweetened applesauce	1
Egg cream	1
Sugar	0.2
Water	4

The revised diet was used until the first chick fledged, at 140 days, 775 grams.

The second chick was initially reared on this same diet. A severe candida infection developed in this bird, however, following an accidental temperature shock, when the chick was 52 days old. To make the crop environment less hospitable to candida, the diet was changed, omitting simple sugars as much as possible. The fat content of the diet was increased substantially, to make the diet richer, as the bird could only process small amounts of food and lost weight for a considerable time. We have subsequently concluded that these diet modifications were a mistake and may have exacerbated the problems that the bird was experiencing.

Where the first chick reached a stable weight at about day 80, the second chick did not reach a stable weight until about day 120. At that time, we did not know whether this represented a sex related difference in fledging weight, or if body weight as well as fledging time was retarded by illness. We now feel that the difference in fledging weights was sex related. At one year, our older chick has reached 1,000 grams and the second chick is about 800 grams, close to the species

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averages for male and female. This will have to be confirmed by laparoscopy or karyotyping.

Pans containing pieces of monkey chow, apple and carrot were placed in the chick's isolette, starting at day 80 (for the first chick); chewing and playing with pieces began soon after, although coordination of foot and beak was slow to develop. As a chick began to feed itself, hand feeding was slowly decreased. Full self feeding was reached at about 140 days in the first chick and slightly later in the second chick. This agrees generally with the schedule of development reported by Muller (1975), for chicks reared by parents at Taronga.

Chicks were allowed to spend some time each day on a free standing perch; tentative flights began at about day 100 for the first chick and at about day 140 for the second chick.

Disease Control

Palm cockatoos are apparently extremely vulnerable to infections by bacteria and fungus. This has been the primary obstacle to handrearing in the past (Muller, 1985; Smith, 1985) and was the major difficulty experienced at both St. Catherine's and New York. Candida infections were treated with ketakonazole (10 mg/kg, BID) and with nystatin (350,000 units/kg). In some cases it took weeks for an infection to completely clear up. Frequent crop washes, especially when the rate at which chicks processed food slowed down, proved to be the best method of control.

Development

Feathers — as mentioned above, hatchling palm cockatoos have no down. By the time their eyes open, at 10 to 14 days, pin feathers are already beginning to appear on the wings and head. At three months, feathering is essentially complete except for the tail, which does not complete its growth until after fledging.

Muller (1975) reported that the breast feathers of the palm cockatoo chicks reared at Taronga had yellow edges. Smith (1985) noted that specimens in the "National Collection at Tring" showed the same kind of barring, although the origin of these specimens is not mentioned. Handreared birds described by Smith, however, lacked barring and he suggested that a dietary deficiency might be involved. None of the palm cockatoo chicks reared by New York Zoological showed barred plumage. However, a chick

reared in Texas did show barring and examination of feathers from this bird indicate that it is a normal feather pattern, not the result of dietary problems. It has been suggested that the different juvenile plumages may represent a subspecies difference, although this has not yet been confirmed.

Beak — at hatching, the beak is unpigmented and appears pinkish white. The upper mandible is considerably shorter than the lower and sports a very prominent egg tooth. By 14 days, black pigment begins to appear in the upper mandible which, by now, is about the same length as the lower. These bill proportions are maintained until the self-feeding stage is attained, at about three months. At this time, the upper mandible still does not extend past the lower. The majority of the upper mandible is black, with the tip and the culmen still white. We have not yet ascertained at what age the entire bill becomes black. After fledging, the upper mandible begins to grow down past the lower. At six months, however, the notch has not yet developed. At six months of age, our older chick snapped 5 to 10 mm off the end of the upper mandible. By four months later, however, the bill was again correctly formed. At eleven and thirteen months, the upper mandibles of our two chicks measured 85 and 91 mm respectively.

Conclusion

A primary key to success with handrearing palm cockatoos is recognition of their early requirement for temperatures and humidities higher than those commonly used for psittacines. Our experience shows that chicks can tolerate quite a range of diet composition. Any kind of stress is likely to trigger an episode of infection and in this palm cockatoos prove to be more delicate than many other species. Good information now exists concerning the requirements for nesting of captive adult palm cockatoos. More and more captive pairs have been reported to show breeding behavior and egg laying (Young, 1986). Development of good hand rearing protocols is an essential component of long term management for this species.

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Chick at 25 days.

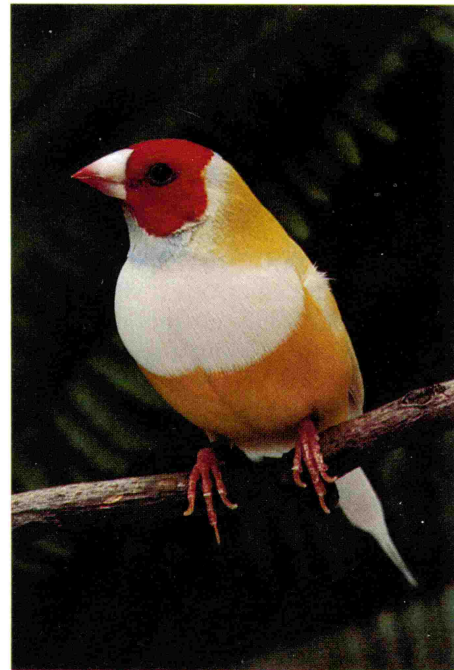
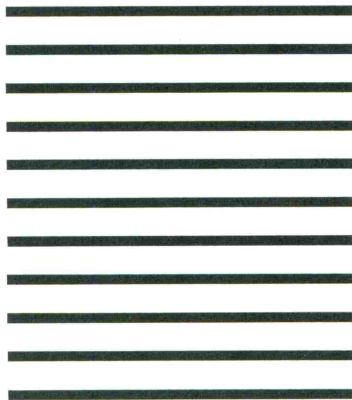


Chick at 90 days.



Chick at ten months.

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