

Breeding and Rearing the Guira Cuckoo (*GUIRA GUIRA*) at the Houston Zoo

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Natural History

Members of the broad order Cuculiformes, Guira Cuckoos (*Guira guira*) are grouped with three species of Anis in the subfamily Crotophaginae, and they alone make up the monotypic genus *Guira*. Although these quirky cuckoos are grouped with the Anis, their social system and breeding habits in the wild differ. Ani species and the Guiras are group nesters; however, the Anis tend to form monogamous pairs within their breeding group, with the monogamous pairs laying in a communal nest. While the Guiras use a communal nest, they do not form monogamous pairs, but practice polyandry and polygyny within the group (Quinn et al. 1994). They are common in their native habitat in East-central South America, and tend to prefer scrub and second growth forests, but also inhabit grasslands where they forage together in groups for insects and other small animals (Hoyo et al. 1997).

Groups can be as large as 25 in the dry season, but breeding groups are usually less than 15 birds. *Guira* Cuckoos rarely nest as pairs (Macedo 2002). Both sexes participate in territory defense, nest building, incubation, and rearing of the young. As many as 20 eggs have been found in one communal nest; however, average clutch size is 10 and tends to vary with group size (Hoyo et al. 1997). Larger groups lay more eggs, but do not raise more young, as more eggs and chicks are removed by group members (Hoyo et al. 1997). The eggs are pale blue turquoise with white calcareous patterns overlaying the blue. Hoyo et al. (1997) suggested that these white markings may help each hen differentiate her eggs from other hens' eggs, and ensure that any egg she removes will not be her egg. However, Cariello et al. (2004) found through DNA testing that eggs with similar characteristics such as weight, length, size,

shape, and markings, were not from the same hen. It is common for group members to remove some or all the eggs from a clutch and kill very young nestlings (Macedo 2002, Macedo and Melo 1999, Quinn et al. 1994). It is thought that this is done to trigger another breeding attempt, and to increase the chance that all group members are represented in the breeding attempt.

Chicks hatch well-developed, covered with cream colored hair-like feathers, and have pink mouths with pairs of white papillae on the roof of their mouths and around the tongue (Hoyo et al. 1997). The nestlings are seldom full siblings, and are usually half siblings, or unrelated (Quinn et al. 1994). In addition to facing infanticide from their group members, chicks may also be killed by their nest-mates (Hoyo et al. 1997). Macedo (2002) found that 42 percent of eggs were lost due to ejection from the nest, and 50 percent of chicks died from infanticide. Hoyo et al. (1997) notes that only 26 percent of eggs and 55 percent of chicks survive to fledge. Nestlings become highly mobile in the nest after day three (Macedo 2002) and normally fledge around day 12-15, but may leave the nest at day five or six if disturbed (Hoyo et al. 1997, Macedo 2002). The birds usually nest only once, rarely twice a season (Macedo and Bianchi 1997). While much is known about their life in the wild, not much is written about their activity in captivity.

Houston Zoo Husbandry

The Houston Zoo started working with *Guira* Cuckoos in 1997, and had its first successful breeding in 2002. The Zoo has had success breeding *Guira* Cuckoos in a small group of two males and two females, one male and two females, and most recently, two males and one female. We have found that with these smaller groups, fewer eggs are tossed out of the nest, and very few nestlings are killed. The group of four was the first to hatch and raise their entire clutch of five eggs to fledging with minimal

keeper intervention. One of the females died of egg binding about 10 days after this clutch fledged. This bird appeared to be the dominant female, doing the majority of feeding and nest attendance. However, the remaining trio of adult cuckoos continued breeding and raised all but one of their chicks to fledge.

The Guira Cuckoos are housed outdoors in a mixed species exhibit and have access to a covered night shelter for inclement weather. They have bred successfully in two similar exhibits, Exhibit A: 7.6m x 8.3m x 4.5m and Exhibit B: 6.1m x 6.1m x 6.1m. The exhibits are covered with 5-7cm of blasting sand; each has a pool, and is planted with various trees, shrubs, and grasses. Extra perching is added as well.

Nest baskets were provided for the cuckoos and placed at various heights from 1.5m to 4m. It was soon determined that the birds preferring the higher baskets. Cone-shaped wire nest baskets measuring 25cm in diameter by 15cm deep (typically used as hanging planters), were lined with Enka mat before being hung inside the exhibit. Nests were usually available throughout the year, as lack of a nest did not discourage the birds from laying eggs. On two occasions, they tried to build their own nests, but the structure was not sufficient and the eggs fell through. Hay was provided, but the birds added feathers, sticks, grasses, and leaves to the nest.

Shortly after lining the nest with fresh leaves, the birds began to lay their eggs. Depending on the number of females per group, our cuckoos laid 3 to 9 eggs per clutch, and would re-clutch after either a failed attempt or a successful nesting period. We have had as many as three successful nests in a year. Holding availability, exhibit space, and demand by other institutions helped determine if the birds would be allowed to raise offspring. If the clutch was not wanted, the eggs were pulled and replaced with dummies. The birds sat readily on their dummy clutches. Some clutches were candled just prior to their hatch date, and dead or infertile eggs were removed. With most clutches, any eggs remaining three days after the others hatched were candled, and dead or infertile eggs were

removed. All removed eggs were included in analysis. On one occasion, a nest with young chicks was lowered from 4m to 1.5m to facilitate supplemental feedings. The adults eventually resumed care after three days of hand feeding in the nest, once the chicks had regained their strength.



Eggs were recorded as discovered, although they were not always found on the day laid. This made it difficult to predict hatch date and incubation periods. Eggs were usually laid every other day, although with two females laying, it could appear as though eggs were laid daily. Eggs laid out of the nest were sometimes returned to the nest by keepers and were counted as part of the clutch, but not as having been laid in the nest. The precise incubation periods were impossible to determine for most eggs, as it was difficult to determine the exact date a new clutch was started. The birds sat intermittently from the day the first egg was laid, and were usually sitting tight when there were two or three eggs present, even if the clutch was not complete. The eggs were not numbered, so it was hard to tell if the sequence of hatching corresponded to that of laying.

Observed incubation periods ranged from nine days to one case of 32 days. However, the 32 day incubation period was for clutch 7/02 which contained 9 eggs found over a period of 16 days. It is therefore likely that those eggs that

never hatched were the first and last laid, which makes the adjusted incubation period 16-19 days. Clutch 2/04 was monitored very closely and had an incubation period of 17 days with the fifth and final egg hatching the next morning. The average incubation period was 16-17 days, with most eggs hatching within two days of each other.

On several occasions, it was noted that some eggs looked similar, but different from the other eggs, and therefore it was assumed that both females had laid. Although, based on the work by Cariello et al. (2004), it is likely that this assumption was not necessarily correct. In fact,



eggs laid when only one female was present would sometimes be different sizes or have different patterns. After bouts of extended laying, the calcareous patterns would get lighter, or become a light white-wash over the entire egg. These were the eggs that were broken most often.

Chicks fledged early, but will leave the nest as early as day six if disturbed, and any disturbances other than hand-feeding should be avoided. When there was nest interference by the keepers, the chicks were prone to jumping out of the nest anytime after day six. With no nest interference around day six, the chicks would remain in and around the nest until around days 8-15. Chicks fledging nearer to day ten were better able to maneuver among

perches and did not crash to the floor as often as the ones that left the nest earlier. It is for this reason that ample perching for fledging should be placed in the enclosure well before fledging is expected, preferably when the chicks are less than three days old. Hay or other cushioning ground cover should be placed below the nest to prevent injuries from falling. This can be done closer to the expected fledge date as it is less intrusive. Branches allowing the young to get off the ground should also be provided. Any birds that might pose a threat to a young bird on the ground, such as curassows, should be removed or closed out of the area just before the chicks leave the nest. Chicks can be marked in the nest at an early age, but should not be interfered with after day six. It is best to band chicks after fledging to insure their legs are grown and the bands will not slip off, and so that they will not be frightened into leaving the nest prematurely. On several occasions when chicks being supplementally fed were frightened out of the nest, they were successfully returned to the nest by placing a hand over them and waiting for them to calm down before leaving quickly and quietly.

The cuckoos were fed a maintenance diet of Mazuri Parrot Breeder soaked in water, Nebraska Bird of Prey Diet (BOP) mixed 2:1 with crushed Mazuri Parrot Breeder, and a small amount of fruit mix consisting of: apples, grapes, papayas, steamed yams, and raisins.

On a regular basis their diet was supplemented with insects and other items such as hard-boiled egg and banana. Calcium powder was sprinkled over the diet infrequently. For the first seven clutches, the only change in diet when chicks were present was an increase in insects, usually mealworms. When it was noticed that the chicks in clutch 4/03 were doing poorly, they were supplementally fed parrot breeder soaked in pedialyte. When it was realized that clutch 5/03 was not being cared for by the adults, they were supplementally fed 1/5in chopped pinky mice several times a day from day 4-8. After day 8, unmixed BOP and insects were added to the hand-feeding diet. Once the chicks fledged, they received the adult diet, but insects were tossed to the birds three times a day.

Based partly on the success of clutch 5/03, all subsequent clutches have received a revised chick diet from hatch. It consisted of 1/4c parrot breeder, 1t small bird pellets, 5T unmixed BOP, 8 chopped pinks, and 10 waxworms with their heads either crushed or removed. This was all combined and soaked in 2-4oz of pedialyte until the pellets were moist and fluffy. This amount would feed 4-5 chicks. Molted mealworms were fed throughout the day as they became available. This diet was fed for the first 3 days, three to four times a day and decreased or added to as needed. From days 3-5 soaked small bird pellets were removed from the diet and 1/2in chilled crickets were added, and waxworms with heads intact could be fed. At days 5-10 mealworms regardless of their stage were fed, chopped pinky mice were reduced by one per chick, and unmixed BOP was increased. Chopped pinky mice were reduced again from day 10-15, and BOP and mealworms were increased. Ten waxworms were fed until fledging and were discontinued afterwards. At fledging, pedialyte was discontinued, although the parrot pellets were then soaked in water. From day 15-20 the chick diet was phased out and the adult diet was slowly phased in. By day 20 the chicks were given the adult diet, although mealworms continued to be fed several times a day for the next few weeks.

Breeding and Rearing

The first clutch was laid in Nov. 1997 and consisted of six eggs, but was not monitored so the outcome of the eggs was unknown. If any hatched, they did not survive long. Keepers removed two clutches in 2002 after the birds had at least partially incubated them. Due to weather or other reasons, 11 more clutches were removed and the birds were given dummies to sit on. The dummy eggs were incubated for the duration of the incubation period, sometimes longer. On three occasions, dummies were tossed out of the nest by the birds and replaced with real eggs. Keepers realized this on two of the three occasions and the live eggs were removed. The third time the cuckoos disposed of the dummies without a trace and replaced them with two live eggs (Clutch 12/03). Including the 1997 clutch, and clutch 12/03, the birds sat on 13 live clutches. These clutches represent 70 eggs, with 21 young surviving to fledge, and 15 perishing before fledging. Interestingly, most of those that died before fledging died before day 5. The Guira Cuckoos have laid 185 eggs since

coming to the Houston Zoo, 143 of which have been laid in a nest (Table 1). There have been 34 eggs found out of the nest, but whether these eggs were laid outside the nest or physically removed was not clear. If chicks were desired, intact eggs found on the ground were placed back in the nest. It appeared that the cuckoos accepted these eggs. Broken eggs were usually found early in the laying period and were not near a nest. Because of their distance from the nest, it was thought that these eggs may have been laid off a perch rather than removed from a nest. Since our breeding efforts began in 1997, the average clutch size has been 5.4 eggs, with a range from 2-9. The cuckoos did not always lay in a nest when one was present, and they would continue to lay without the presence of a nest. Obviously, this resulted in broken eggs. The most eggs were laid in 2002, and five clutches were allowed to be incubated that year. This resulted in eight chicks fledging out of 20 chicks that hatched. The cuckoos have laid eggs in every month, with the most productive months being April through July (Table 2).

Overall, 51.0 percent of incubated eggs hatched, 30.0 percent of incubated eggs hatched and fledged, and 58.0 percent of chicks survived to fledge (Table 3). Before amending our techniques, we experienced mortality near or below that of wild Guira Cuckoos. Before revising our chick diets, eight out of a possible 20 chicks survived to fledge (Figure 1a). However, since revising our chick diets in mid 2003, 80.0 percent of incubated eggs hatched, 73.0 percent of incubated eggs hatched and fledged, and 91.0 percent of chicks (13 out of a possible 16) survived to fledge (Figure 1b).

Until recently, other than occasional thin-shelled eggs, we have not had any diet-related health issues. However, one of the chicks from Clutch 10/04 was diagnosed with metabolic bone disease. This affected clutch was comprised of three eggs, two of which hatched. One chick was found dead in the nest at day 3, and the other was dehydrated. At this stage, nothing else appeared wrong with this chick. With veterinary assistance, it improved and seemed to be doing fine and the parents were taking good care of it. Its expected fledging date passed, and the chick was checked on and appeared to be doing fine and moving around well. It fledged a week late and had a weak grasp and curved leg bones. We tried calcium injections as well as physical therapy, but there was no improvement and the chick was subsequently euthanized.

Conclusion

The Houston climate is harsh. Summer temperatures frequently exceed 90 degrees Fahrenheit, with high humidity. The ambient air temperature usually feels much worse, 95-105 degrees Fahrenheit. These conditions are conducive to dehydration and infection, and in already frail chicks, only make matters worse. It is important to keep chicks well-hydrated, especially during the first three days of life. Dehydrated weak chicks are less vocal, and parents tend to ignore them. Guira Cuckoos are very frail as chicks and require constant vigilance to ensure that all is going properly. Failure to do so will almost assuredly result in death to all or part of the brood.

It is essential that the parents have ample food to feed their chicks, and that they always have access to food. A diet should be left overnight and replaced first thing each morning. Insects are a critical part of their diet, but should be limited in the first 3 days of life to prevent impaction; numerous chopped pinky mice should be fed as an alternative. Chicks gape readily, and hand-feeding may be required if the parents appear negligent. All of our chicks that were hand-fed remained in the nest in the exhibit so that they would be around other adult Guira Cuckoos. Although hand-feeding would be easier if chicks were removed from the nest and placed in a brooder, the adults may re-claim their chicks if hand-fed in the nest, as we found with one brood.

Houston Zoo Guira Cuckoos exhibited both differences and similarities to wild cuckoos. The captive cuckoos lay multiple clutches a year, whereas wild cuckoos tend to only lay once (Macedo and Bianchi 1997). Our cuckoos would re-clutch 10 days after chicks fledged or eggs failed, and would lay as many as five clutches per year. Macedo and Bianchi (1997) found that most infanticides occurred shortly after hatching, as nestlings became highly mobile near day six and energetic cost to adults increased. Interestingly, most of our dead chicks were also found early, before day five, although their deaths did not appear to be infanticides. Wild Guira Cuckoos killed and removed their young from the nest; some were found at the base of the nest tree, although most were disposed of at least 30m away from the nest tree and when found there was evidence of trauma, but no cannibalism (Macedo 2002). They were not left

in the nest, which is where most of our dead chicks were found. Most of our dead were found intact, except one that had trauma to its stomach. Five dead chicks were never accounted for; these could have been infanticides or consumed by vermin. Ailing chicks showed no signs of trauma, either. Necropsies on the dead chicks revealed that dehydration, malnutrition, and illness were the main causes of death rather than infanticide.

Macedo (2002) hypothesized that sexual selection pressures were the main causes of the Guira Cuckoos committing infanticides, which would cause the nesting attempt to be aborted, resulting in a new reproductive effort, and therefore a new chance for breeding. Perhaps our smaller group size reduced sexual selection pressures and increased the chance that all adults were breeders, and so adults may not have been as likely to kill chicks or dump eggs because the probability that they were parents to some or all of the chicks was fairly high. Obvious egg dumping was seen only in situations where there were three adults, one female and two males, and the males had to compete for the female. ■

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