Breeding the Crowned Hornbill at the Houston Zoological Gardens

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The Bird department of the Houston Zoological Gardens received a newly imported pair of Crowned Hornbills *Tockus alboterminatus* in October 1989. This arboreal species is a resident of southcentral and southeast African riparian, montane, and coastal forests. The birds are rather plain in appearance compared to some of the other *Tockus* hornbill species, however, they have their own appeal. The upperparts, head and neck are a dusky brown, with the feathers of the back of the head and neck shaggy and white-tipped; it is the appearance of this feathering which presumably gives them their common name. The breast is grayish, beneath this the rest of the underparts are snow white and the tail is tipped in white (Fry, Keith, Urban, 1988).

The birds can be sexed visually, primarily by their eye color. The iris of the males are red and the females a light yellow. Additionally, the male is a bit larger in overall size. The bills of both sexes are a translucent orange-red, with a narrow creamy yellow band at the base, with the male having a larger ridge or small casque atop his bill (MacLean, 1993).

After a thirty-day quarantine at the zoo the birds were housed in their own 12 ft. long, x 10 ft. wide x 7 ft. high exhibit in a row of outdoor aviaries where they remained for 17 months. Throughout this period they excavated wood shavings from a horizontal plywood nestbox and even began plastering food items and feces, with their bills, around its opening. The staff was very encouraged by this behavior as this is the beginning of the typical hornbill mode of reproduction. This type of behavior leads to the female being immured in the nest cavity with an opening reduced to only a narrow slit, through which the male feeds her during the entire nesting period. However, while at this location the birds never progressed past this initial stage.

In April 1991, the pair was moved to a mixed species exhibit measuring 20 ft. long x 20 ft. wide x 12 ft. high in a new series of outdoor aviaries, The Fischer Bird Gardens. They were joined by a pair of White Headed Buffalo Weavers *Dinamellia dinamella* and a pair of Hottentot Teal *Anas punctata* as cagemates. The hornbills have always been fed small balls of *Nebraska Brand Bird of Prey Diet*, soaked dog, cat and primate chows and a chopped fruit mix (papaya, cooked sweet potato, apple, grapes, soaked raisins) and chopped greens. An assortment of live food was offered daily: mealworms, waxworms, crickets, furred and pinkie mice. The birds are also adept at catching a variety of wild insect prey on their own. In addition, the hornbills have been observed eating sunflower seeds and perhaps other seeds.
from the Buffalo Weaver's diet.

When we transferred the hornbill we moved their original nestbox (24 in. long x 12 in. wide x 13 in. deep) into their new quarters. Shortly thereafter, two other nestboxes were added in the exhibit in case the first one was not to their liking. One was a vertical 37 in. long x 14 in. wide x 13 in. tall plywood box with a natural tree knothole having a six inch diameter opening attached near the top of the box as the nest entrance. The other was a 13 in. diameter hollow palm log, again placed vertically with the entrance near the top.

Over the course of the next two years our pair exhibited a variety of courtship and breeding behaviors. The male feeding the female, the male chasing the female, the male trying to lure the female to the nestbox with food and high-pitched calls, each bird entering the nestboxes and pulling woodshavings out, and again plastering around the nest openings. These are all typical hornbill behaviors. However, the birds never seemed to get "over the hump," their activity would increase for a while and then activity would taper off. The bird staff finally decided we had been patient long enough and began consulting a number of zoo professionals for advice.

These discussions resulted in two suggestions for the breeding of Tockus species in captivity. First, the nestbox entrance should be very small. The opening should just be wide enough for the birds to fit their bills through. Secondly, the nest entrance should be located toward the bottom of the box rather than the top of the box so that the female can reach the entrance from a brooding position. With these in mind, a 13 in. long x 13 in. wide x 19 in. tall nestbox was constructed of half inch plywood. A teardrop shaped opening, four inches tall and two inches wide, was made on the lower third of the nestbox face. The box was equipped with a shelf in the upper third which allowed the female to jump to if frightened.

On July 29, 1993, the nestbox was installed in the night/winter shelter of the exhibit at a height of approximately seven feet. The male Crowned Hornbill showed immediate interest in the new nestbox, making a gurgling vocalization at the box and even making false plastering motions at the opening with an empty bill. On August 6, we discovered that the birds began plastering around the entrance with Bird of Prey diet, and they excavated some of the wood shavings out of the nestbox. On August 8, the female was sitting in the nestbox and the entrance was beginning to get smaller. Later that day, the male was observed carrying live food back into the night shelter, presumably to feed her, as he would have to continue to do throughout the remainder of the nesting period. Several days later the nest opening was reduced to a half of an inch wide and three inches tall. The male began offering pieces of bark from an old nest log and pieces of bamboo screening to the female as well as food items. The bark, bamboo and female's own feathers were later discovered to be the lining of the nest.

On September 17, the male had...
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Keepers (L-R) Denise Brucchieri, Jim Dobberstine and Ric Urban weighng chicks, the oldest 30 days.

become unusually aggressive or agitated by the normally acceptable presence of the keeper near the nestbox. Alarm calling and swooping towards the head of the keeper was a sure clue something was going on. With caution the nestbox was visually checked through the slit in the entrance. The keeper discovered a calm, brooding female and one pink, naked and really ugly chick and at least one more egg. Later in the day, vocalizations of at least two chicks were heard and confirmed by a visual check. A third egg hatched four days later, as confirmed by a visual check through the access door on the side of the box. The regular diet was increased to satisfy the insatiable appetite of the residents of the nestbox. A fresh diet was offered twice daily. Live foods were increased and dusted with calcium powder. The chicks were very vocal when the male came to the box with food. Sometimes the feeding sessions sounded very aggressive. When the chicks were around 11 days of age, the male began supplementing the prepared diet with other types of live foods. This was discovered by looking closely at the debris below the nestbox. Pieces of roaches, moths and bees were found among the feces and bark pieces. At 15 days of age, the box was opened for the first time since the chicks hatched. They were plump and their eyes were open. The nestbox was lined with bark pieces, pieces of bamboo screening and molted feathers from the female.

On October 22, 1993, after 76 days of confinement in the box, there were signs that the female was breaking out. As the female was shipping away at the plaster, the chicks were trying to reseal the entrance. The chicks were 36 days old at this time. Twelve days later, the nest entrance began to widen once again. The first chick came out of the nestbox 49 days after hatching. The other two immediately plastered the entrance. Chick 1 weighed 214.2 grams at 7:15 A.M. on November 5. Chick 2 emerged at day 50, November 6, 249.0 grams in weight at 8:36 A.M. The final chick emerged November 9, around 1:30 P.M. at 247 grams in weight. The most amazing sight to see was a chick struggling to emerge from its secure domicile and to be able to fly immediately into the waiting world outside. The next most amazing sight was seeing five Crowned Hornbills flying together throughout their exhibit. The chicks look like the adults when they emerge except for the eye color and casque shape and size. The eyes are gray in color and the casques are not developed yet. Three
weeks out of the box early visual signs for sexing the young become clear. A characteristic of sexual dimorphism is throat skin coloration. Female hornbills have been described as having greenish yellow throat skin; while the male hornbills have been described as having dark red or black throat skin (Fry, Keith, Urban, 1988). Chick 1 was beginning to show a carolina-blue skin patch just behind the lower mandible or throat skin. Although the throat skin was not greenish yellow we accepted this as a female characteristic. Chick 2 was showing male throat skin; and chick 3 was still hard to tell, possible male.

Forty days after the chicks emerged from the box, there was again plastering activity at the entrance. The female was vocalizing quite a bit and the male was taking food to the nest entrance and making a gurgling vocalization in an attempt to lure the female hack to the nest. The activity lasted just a day.

At three months of age the chicks seem to be old enough to visually sex. Even though the eye colors at first glance appear to be gray, there is a hint of color when the lighting is right. The more significant sign seemed to be the throat patch. Chick 1 was a female, and Chicks 2 & 3 were male. The chicks were very inquisitive, investigating every little nook and cranny of the exhibit, snatching insects from the wire and bamboo, and dismantling the buffalo weaver nest to get to whatever was in the nest chamber. By the fourth month of age, the chicks appeared mature enough to sex by eye color in good light. The female's eyes (Chick 1) were a lighter gray, almost yellow; while the males' eyes (Chicks 2 & 3) were a grayish red. The throat skin was a very distinguishable mark, once seen never forgotten.

The time arrived to finally test the theory of usually determining sexes by eye color and throat skin. On February 4, 1994, 141 days since the first egg hatched, the birds were taken to the zoo veterinary clinic to be laproscoped. At this visit they were measured, weighed, banded with metal bands and bled for routine testing. The veterinarian confirmed the visual sexing: a female and two males. The female proved to be the smaller bird weighing 30 grams less than the males. The bill was also slightly smaller and less developed.

The Crowned Hornbill is one species which is rarely represented in collections in North America. They do not look as flashy as the their larger counterparts but they still carry the same attributes aviculturists look for when selecting from the Bucerotidae Family. Crowned Hornbills enhance a mixed species exhibit with their size and graceful flight. However, these hornbills will not allow any other species to raise young in the same exhibit. Eggs and chicks of other residents quickly become part of a Crowned Hornbills' diet when discovered. The staff of the Bird Department of the Houston Zoological Gardens will continue to collect data on the captive reproduction and management of this species and apply the information to the continuing work with both Asian and African Hornbill species.

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Literature Cited

Products Mentioned
Nebraska Brand Bird of Prey, Central Nebraska Packing, Inc., North Platte, NE 69101
Primate Dry Biscuits, Hill's Pet Products, Topeka, KS 66601

Crowned Hornbill
Tockus alboterminatus
Comparison Bill Data and Fledge Weights

Bill Length 64.6 66.65 72.4
Bill Width 13.7 16.2 19.98
Bill Depth 28.7 30.6 30.6
Fledge wt. 214.2 249.0 247.0

November, 1993

Bill Length 72.1 72.35 66.1 79.52
Bill Width 28.1 29.1 18.0 16.1
Bill Depth 32.3 32.6 39.4 39.6
Fledge wt. 220.0 250.0 195.0 216.0

July, 1994