

Breeding the hoopoe (*Upupa epops*) at Disney's Animal Kingdom

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Hoopoes (*Upupa epops*) are one of the most distinctive birds in the world. A migratory species, they are found in season throughout most of Europe, Asia and Africa and cannot be mistaken for anything else within that range. The hoopoe has traditionally been treated as a single species within the order Coraciiformes. Recently, however, various authors have suggested separating the hoopoe into two or more species and even its own order, Upupiformes (del Hoyo, Elliott and Sargatal, 2001). In the wild, hoopoes are almost completely insectivorous and use their long beak to probe into the ground for grubs and other invertebrates (del Hoyo, Elliott and Sargatal, 2001).

Disney's Animal Kingdom received 1.1 captive-bred Eurasian hoopoes in September 1998. After a thirty-day quarantine period, they were moved into an acclimation pen inside Disney's Animal Kingdom's walk-through Africa aviary. This aviary is a heavily planted enclosure that features a large waterfall and pool at one end and contains over 20 species of African birds. Initially, upon release, the hoopoes did well but their activity gradually decreased over a two-month period. This period culminated in both birds being injured by unknown causes and their removal from the aviary. An infection led to surgery and subsequent removal of one of the female's eyes, after which both birds spent approximately seven months off-exhibit, recuperating.

When the birds were finally given a clean bill of health, the decision was made to introduce them to a different exhibit, the Asia aviary.

Disney's Animal Kingdom's Asia aviary is situated along the Maharajah Jungle Trek, a walking trail which allows guests to view Komodo dragons, Malayan tapirs, tigers, fruit bats and two species of hoofed stock as well as many species of birds. The aviary measures approximately 120 feet long by 65 feet wide by 40 feet tall. It is terraced into three levels with the majority of the exhibit being at ground level. It too is heavily planted, with fig trees, banana trees and bamboo to name a few. In addition to hoopoes, guests encounter a myriad of avian species, including great argus pheasants (*Argusianus argus*), Indian blue rollers (*Coracias benghalensis*), Amboina king parrots (*Alisterus amboinensis*), golden-crested mynahs (*Ampeliceps coronatus*), golden-backed woodpeckers (*Dinopium javanense*), crested wood partridge (*Rollulus roulroul*) and Timor sparrows (*Padda fuscata*). Food is placed in approximately 15 different locations. Diets vary, but include chopped mixed fruit, soaked Mazuri® brand parrot breeder pellets, chopped greens, seed, Millikin Meats® brand carnivore diet (mixed with the aforementioned parrot pellets) and pinky mice. Live mealworms, waxworms and crickets are also provided, in addition to a variety of wild invertebrates that are available opportunistically. A simple exclusion feeder was developed for use in the aviary. The feeder is simply a shallow pan of insect larva covered with a piece of peg-board. The hoopoes can fit their beaks through the holes of the peg-board to extract the insect larva, but other birds are unable to do so. This allows a large supply of live food to be provided directly to the hoopoes without skewing the diets of the aviary's other residents.

After a short two-day acclimation period, the male was released on July 8th, 1999, followed the next day by the female. Both birds seemed to adjust well. They initially stayed in the vicinity of their acclimation pen, but within a week they were moving throughout the aviary. Most of their time was spent foraging for food, probing into the ground for insects, grubs and worms. Although the hoopoes were fairly visible, they remained wary and timid, never approaching keepers and retreating when they were approached.

The pair continued in much the same way, shy and unobtrusive, for several months before any change in their behavior was observed. In mid-January 2000, the pair seemed to become more confident and was seen more often in the open, even venturing out onto the guest pathway. On January 16th, the male was heard doing his distinctive 3-note vocalization, “hoop-poo-poo,” for the first time. In the literature, this is referred to as his “advertisement call” (Fry, Keith and Urban, 1988). Two days later, the male was observed pursuing the female throughout the aviary, another behavior that had not been observed previously. They flew above the highest trees, coming to rest occasionally before beginning again. The next day, the male was observed entering a nestbox, approximately 20 feet off the ground. The female then investigated the same nestbox for a few seconds before entering herself. The box, constructed of plywood, was 23 inches tall, 8 inches wide and 9 inches deep with an entrance 2 inches in diameter. The distance from the bottom of the entrance hole to the bottom of the box was 19 inches.

Starting on January 20th, 2000, the male spent most of his mornings calling. He perched in a high and exposed location and call, sometimes for hours, with only a few seconds between each set of vocalizations. He also made frequent visits to the nestbox

that he had selected, sometimes calling from inside or on top of that box. Two days later, the male began to defend his chosen nest location from other birds. He routinely chased Goldie's lorikeets (*Trichoglossus goldiei*) off when they attempted to investigate the box. Two different vocalizations were heard besides the advertisement call. One was a hoarse "rasping" call, often heard during the male's pursuit of the female. The second was a high-pitched trill, sounding similar to a cricket's chirp. The trilling call was only heard three times and also accompanied the male's pursuit of the female.

Throughout January, the male continued his courtship: advertisement calling, pursuing the female and entering his chosen nestbox. As February began, the male seemed to intensify his efforts to persuade the female to enter the nestbox. He was seen advertisement calling while holding a mealworm in his beak for the first time on February 1st. At this point, he was more often seen calling from on top of or inside the nestbox than from an open location. The next day, the male was observed feeding the female for the first time. Later that day, the female was on top of the nestbox while the male was inside. In his attempts to coax her in, he even reached out and pulled on her tail. Courtship feeding and pursuit continued over the next week. On February 5th, the female was in the nestbox and for the first time was observed altering the interior. Over a 20-minute period, she steadily threw beakfuls of nest substrate (pine shavings) out of the box. The male periodically flew to the opening and fed her.

On February 7th, one of the hoopoes was observed threatening a female green junglefowl (*Gallus varius*) that approached the box. It extended its neck and swayed it back and forth, like a snake threatening to strike. This posture was seen several times over the next few weeks over the next few weeks in response to other birds' approaches.

Normally timid, the hoopoes adopted a more aggressive character when defending their nest. On at least one occasion, the male violently confronted a Goldie's lorikeet (*Trichoglossus goldiei*) and slammed into it with his body to drive it away from the nestbox.

By the second week of February, the calling of the male began to wane and both adults were seen going into and out of the box. On the 9th, what seemed to be pre-copulatory behavior was observed. The male walked up behind the female. He pecked lightly at her nape and she occasionally turned her head and pecked back at him. It seemed as if he was about to mount her, but she flew off after about 20 seconds of this interaction. This sort of courtship was repeated often over the next 3 days, with copulation always seeming imminent but never observed. Courtship feeding seemed to change as well. While not passing food items back and forth, the male would hold a food item in and out of the female's beak repeatedly before finally relinquishing it.

By the 13th of February, the female was seen in or around the nestbox more often than not, with the male bringing her food. A note was made on the 17th that the female is "rarely visible." From the 17th until the 29th, she was seen only briefly leaving the box, but on February 29th, an increase in the female's activity and journeys from the box was noted. That day, the male was seen to make 5 feeding trips to the box within 15 minutes. On March 3rd, the male was heard advertising again for the first time in about a month. An observation on March 7th seemed to point to chicks being present. A golden-backed woodpecker (*Dinopium javanense*), was foraging on the wall next to the nestbox, suddenly cocked his head. He jumped to the side of the box and tapped on it lightly. The woodpecker then looked into the entrance of the box, at which point the female hoopoe

emerged and chased him off. The woodpecker certainly seemed to have heard something and indeed both male and female hoopoes were making frequent trips to the nestbox with food. The next day, keepers were able to check the nestbox with a mirror on a pole after the female hoopoe exited. At least 2 chicks were present, but the height of the nestbox (about 20 feet) made it difficult to tell exactly how many chicks were present.

The parents continued to diligently feed their young. Other institutions had warned us that the nestbox could become quite dirty. Therefore, on the morning of the 15th, the nestbox was accessed with a ladder in order to clean out the box as well as examine and band the chicks. A total of four chicks were present, along with two olive-green eggs. Two of the chicks were significantly larger than the other two (67 and 63.9 grams vs. 49.1 and 44.9 grams) and it was assumed that the two remaining eggs represented the 3rd and 4th eggs laid. All of the chicks were covered in brown-gray down and pin feathers. The pin feathers of the crest were arranged in two parallel rows on the tops of the chicks' heads and the chicks' fleshy gape flanges were bright white. The smallest chick seemed developmentally behind the other three: its legs were more splayed and it was not as active as its siblings. Several small twigs were added to the substrate of pine shavings to give this bird something more substantial to grip, all of which were thrown out over the next few days. Despite the stories of a filthy nest, the substrate seemed to be in good shape. Although the box and its contents were malodorous, overall it appeared fairly tidy but some of the substrate was replaced. The chicks did excrete a foul-smelling liquid from their uropygial gland when handled. The parents returned to caring for the chicks within about 10 minutes of the completion of the nest check.

One week later, the chicks underwent a brief medical exam at the nest and the smallest of the clutch now appeared normal, with no sign of the splayed legs witnessed earlier. Their weights were 69.9, 84.1, 70.7 and 72.8 grams. At this time, the female was observed to be undergoing a molt, with several of her primaries missing. The molt progressed, with her losing her tail feathers, to a point where she had great difficulty accessing the nestbox. The male seemed to pick up the slack and took over the majority of the chick-feeding duties. He also began advertisement calling and investigating nest sites again.

On March 29th, the male was observed on top of the nestbox, holding a mealworm and uttering his “rasping” call. A chick was looking out of the opening and begging. The male tapped the chick’s beak with the insect, then resumed calling. This behavior was repeated several times before the chick was finally fed. The next day, two chicks had fledged. At this point, their beaks were about half the length of their parent’s, they had a few downy tufts on their crest feathers and the remnants of the white gape flanges were still barely visible. Otherwise, the chicks were difficult to distinguish from their parents. A third chick left the box the next day and the fourth left three days after that.

From the beginning, the fledglings were curious, pecking at just about everything. They were seen to investigate food items and were observed eating ants just five days after fledgling. Despite feeding themselves, the fledglings continued to beg from the parents, especially the male. On numerous occasions, all four fledglings were seen chasing the male throughout the aviary, begging for food. The male continued feeding

the fledglings for some time and was last seen to feed them on May 8th, 39 days after the first chick had fledged.

Only a week after the first chick fledged, the adults began pre-copulatory behavior again. The male was observed to feed his mate and call from their nestbox with food in his beak. On April 27th, the female was observed aggressively displacing a juvenile from the vicinity of the nestbox. By May 6th, the female was throwing shavings out of the box and by and by May 27st, a second clutch of eggs had been laid. Five chicks hatched and three of those survived to fledging. Despite some notations about cooperative breeding behavior (Fry, Keith and Urban, 1988), the juvenile hoopoes were not seen to assist their parents with their new clutch.

Some time after the second clutch fledged, the adult male hoopoe was discovered with a severely broken beak, with only about one-third of its length still intact. Several procedures were performed in an attempt to save the broken section, but proved unsuccessful. The male, along with his mate, was moved to our off-exhibit Avian Research Center, where we could more closely monitor his health and progress. Despite his obvious impairment, the pair has gone on to raise several more successful clutches in their new enclosure. Our success with this species can probably be attributed to two things. First, and probably foremost, the birds are attentive and protective parents and have given remarkable care to their chicks. The male's beak injury has not seemed to hinder his parenting ability. Second, every effort was made to provide the hoopoes with a large supply of live food, which made up the vast majority of the chicks' diet, especially in the early days.

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Bibliography

Fry, C.H., Keith, S. and Urban, E.K. (1988). *Birds of Africa Vol. III – Parrots to Woodpeckers*. Academic Press Ltd.

del Hoyo, J., Elliott, A., and Sargatal, J. (2001). *Handbook of the Birds of the World Vol. VI – Mousebirds to Hornbills*. Lynx Edicions.