

Abyssinian Ground Hornbill Breeding at Disney's Animal Kingdom Lodge: Finding a suitable alternative to hand-rearing second chicks

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Abyssinian ground hornbills (*Bucorvus abyssinicus*) (AGHs) have been residents of Disney's Animal Kingdom Lodge (DAKL) in Lake Buena Vista, FL since the year it opened in 2001. They have shown off their collected treasures and delighted guests with their vibrant personalities for many years. Within the last five years they have also become integral members of the AGH breeding population.

AGHs form monogamous pairs that mate for life. In the wild, the female lays two eggs

within a 4-6 day period in an empty tree cavity and relies on the male to bring her food during incubation and for the first few weeks after the egg hatches, at which time the female leaves the nest and joins the male in the role of hunting for food. After a 37-41 day incubation the first egg hatches, followed by the second egg 4-6 days later. AGH chicks are competitive and the pair is only able to provide enough food for one chick. The strongest (typically the first and largest chick) out-competes its sibling for food. After several days, the second chick

dies due to lack of nourishment. In wild birds the second egg acts as a hornbill insurance policy in case the first egg doesn't hatch or the chick is not strong enough to survive, ensuring that one chick is healthy enough to reach adulthood. After the chick fledges between 80-90 days it remains with the pair learning necessary hunting and survival skills until the next year's breeding season when it is displaced from the group by the parent of its sex. The poor likelihood of survival for the second chick has led many zoos to pull the

Photo 1: Haya with both Chick #1/Hanz (day 6) and Chick #2/Franz (day 1) on 26 June 2014.
Photo by author.



Photo 2: Hanz (day 26) and Franz (day 20). Photo by author.





Photo 3: Shows keeper Yari Rodriguez feeding Franz (day 26). Photo by author.

second egg (and many times the first as well) for hand-rearing resulting in an abundance of hand-reared hornbills. As a result of their rearing, hand-reared birds are very drawn to people, appear to be less interested in their hornbill counterparts, and are less likely to breed or show less interest in rearing their chicks.

The current breeding population at DAKL consists of two pairs. Jaseri (hand-raised) and Haya (parent-reared) form the first and most successful breeding pair, while Cassanova (hand-raised) and Taabu (hand-raised) form

the second pair that has just begun showing breeding behavior over the last two years. For this paper we will be focusing on Jaseri and Haya.

Jaseri and Haya live on the Pembe savanna, a four acre multi-species enclosure. The species have changed over the years but have most recently included ankole, okapi, nyala, Thomson's gazelle, impala, steenbok, waterbuck, red river hogs, blue cranes, Egyptian geese, and Ruppell's griffon vultures. All of the mammals on the savanna are audibly

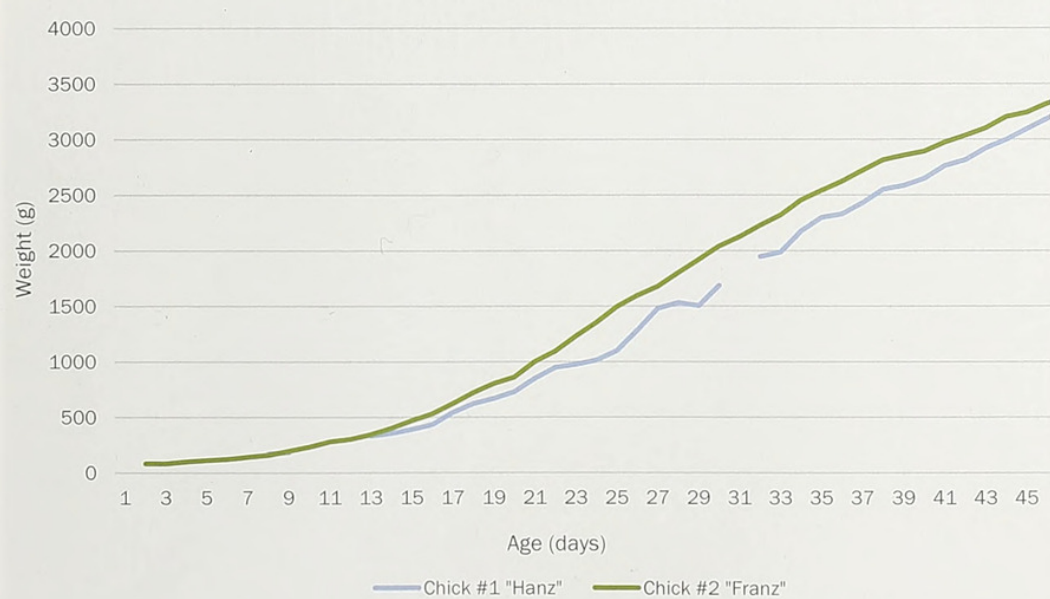
First Occurrences	#1 "Hanz"	#2 "Franz"
feeding on own	40	34
standing	48	47
walking	61	53
left hut on own	75	74

Figure 1: Shows the days that each of the chicks hit different "milestones" in their development

morning and are given their grain diets before being released back on the savanna for the remaining 22 hours each day. The AGHs have traditionally been indifferent to most of the animal inhabitants on the savanna, but are very drawn to the keepers in the area and often investigate their vehicles and make their own enrichment from any items they opportunistically steal from the vehicles. The hornbills are cued into their own holding pens each morning and again for a few hours in the afternoon to allow keepers the opportunity to work on the savanna "unassisted" by the hornbills. The hornbills receive their diets consisting of ground meat, pinkies, and mice while they are inside their pens. Both Haya and Jaseri have their own adjacent pens complete with netting on top, perching, a variety of assorted enrichment items, and large black plastic tree pots flipped over with holes cut in the side to act as huts/tree cavities. Throughout most of the year, Jaseri spends much of his pen time inside his hut, while Haya traditionally prefers to investigate the enclosure and rest on perching.

On 13 May 2011 broken egg shells were found just outside the hornbill holding pens. They were first believed to have belonged to the Ruppell's griffon vultures who had laid in years past. On 17 May 2011 Haya quickly ran into her hut when cued into holding during the afternoon and an egg was found under her a few hours later. This led the team to believe that the egg laid just days earlier most likely belonged to Haya. To ensure the egg had the best chance of survival, it was pulled for artificial incubation at the Avian Research Center (ARC) located at Disney's Animal Kingdom and replaced with at East African Crowned Crane dummy egg (the closest in size the team had to a hornbill egg). A second egg was laid on 24 May and it was also brought to ARC for incubation and replaced with a dummy. Until this point, Jaseri had been kept separate from Haya as it was unknown how he would react to the eggs. On 26 May keepers allowed him access to Haya in hopes that he would resume his natural role and bring food items to Haya as she remained on the nest. Jaseri quickly decided that the eggs made excellent toys and rolled them out of the nest and paraded them around the holding pen. As a result, he was then separated from Haya. Fortunately, it was easy for the team to play the role of the male and Haya's diet was

2014 Chick Growth Rates



placed just inside the hut twice daily and Jaseri returned to his savanna home for the duration of the incubation and chick rearing process.

The second egg at ARC was determined to be infertile, but the first egg progressed and grew as expected. On 24 June 2011 the egg began internally pipping at ARC and it was brought back to Haya and switched out with one of her dummy eggs. On 25 June the chick hatched following a 39 day incubation. This year there was a significant amount of aggression from Haya directed towards keepers as they

and attempted to pound her with his beak. Haya then retaliated with aggression directed at Alfred. Alfred was pulled on 23 November 2013. Haya removed Jolene from the group on 24 March 2014.

As of the spring of 2014 the team had not needed to worry about a second chick. Haya either laid only one fertile egg or one of the eggs died during incubation each year. On 12 May 2014 Haya laid her first egg of the season and on 17 May she laid her second. It was decided that as an experienced mother, both eggs

the labor impact to the keeper workload was also established. The team was well aware of the results of pulling the second chick for hand-rearing. A healthy chick would most likely result, but if the chick was like DAKL's three other hand-raised birds, it would be very people-focused, over-attached to the keeper team, and show little interest in remaining with other hornbills. The team looked back to 2009 when a pair of Ruppell's griffon vultures (*Gyps rueppellii*) at DAKL cared for their chick, but showed no interest in feeding it. The team removed the parents from the nest several times throughout the day and successfully fed the chick with a pair of tongs. After feeding, the sire and dam returned to the nest and both cleaned and protected the chick. The team's success in rearing the vulture chick was initially utilized in the plans for rearing our second hornbill chick. A plan was formulated to feed this hornbill chick with a pair of tongs while Haya was still on the nest. A new nest box was created with additional holes on the side to give keepers additional access points to the nest. By keeping the chick with Haya during the rearing process this allowed it to imprint on her. It was accepted that the chick would probably become more attached to the team and partially imprint, but the hope was that it would also understand that it was a hornbill. This method also appeared to be minimally time invasive so it fit the secondary goal as well. A few days before the second chick hatched keepers switched out the nest box and began acclimating Haya to a pair of tongs with no negative interactions.

Once the second chick hatched, attempts were made to feed it by reaching around Haya with the tongs. Haya was much calmer with

The goal was to raise a chick that would behave as much like a parent-reared chick as possible by minimizing imprinting from hand-rearing.

attempted to place her food just inside the hut. Keepers began entering with a small shield as protection. Observations were limited to what was seen when switching out the diets, which we initially did five times daily, but quickly changed to four times daily due to consumption. The diet was weighed both going in and out of Haya's pen to determine consumption levels and track the chick's progress. A neonate exam was performed on day 3. The chick was given a physical exam, pinioned, an Avid™ chip was placed in the breast, and blood was taken to determine the chick's sex. From this point the team remained hands-off with the chick to limit the chance of impacting Haya.

On 13 Dec 2011 (day 167) both Haya and the chick, now determined to be female and named Cecelia, were both released onto the Pembe savanna for the first time. On 17 Dec 2011 (day 172) they were introduced to Jaseri with no negative interactions and they remained a family of three until 14 April 2012 when Haya was observed aggressively chasing Cecelia. At this time Cecelia was pulled from the family group and transferred to another pen.

Keepers were aware when Haya began nesting as she spent more and more of her pen time in her hut. She was allowed to remain inside if she desired and for the next two years Haya successfully raised two more chicks, one each year. Alfred hatched on 1 August 2012 and Jolene hatched 14 July 2013. Alfred was able to remain with Jaseri while Haya was sitting and raising Jolene. This was most likely due to Jaseri not chasing off Alfred before breeding season. An attempt was made to introduce Alfred to Jolene when it was time to release her on the savanna. Alfred showed significant aggression towards Jolene and chased her

would remain under Haya for incubation. On 18 June 2014 the first egg began to externally pip and it hatched on 20 June. The second egg began to externally pip on 24 June and hatched on 26 June.

In the days leading up to the second egg hatching, keepers and managers began talking about the likelihood of both eggs hatching (the second egg was candled by Aviary staff shortly before the first egg hatched and it was determined to be fertile and growing) and discussed the options on rearing the second chick. The goal was to raise a chick that would behave as much like a parent-reared chick as possible by minimizing imprinting from hand-rearing. A secondary goal to minimize

Photo 5: Hanz (day 96) meeting dad, Jaseri for the first time and begging for food. Photo by author.





Photo 6: Hanz (day 179) on savanna. Photo by author.

the team than she was the first year, but she became very aggressive towards the tongs reaching into her nest at that time. Keepers were able to get a few pieces of food to the second chick the first few days, but it became evident that the chick was not able to get enough food feeding through this method. On day 3 keepers forced Haya out of the nest box and briefly pulled the chick outside the nest box for feeding. It consumed half of its allotment for the feed and was returned. Keepers watched and Haya quickly returned to the nest box to keep her chicks warm. The keeper team observed throughout the day to confirm that Haya was still not feeding the chick and on day 4 this method became the norm. Four times daily, two keepers entered the pen to feed the second chick. At the first feed each day, both chicks were pulled for weighing. The first chick was immediately returned to the nest and the second chick remained out for a keeper to feed it with the tongs. During the feeds, the second keeper kept a visual on Haya and rewarded her with crickets. The goal was to make keepers entering her pen as positive an experience as possible for Haya.

Throughout this time, keepers intermittently set up a Go-Pro® camera to observe Haya and her chicks. The team hoped to observe Haya feeding both chicks. If it could be determined that both chicks were receiving sufficient food from her, the plan was to back off on the feedings of the second chick. Unfortunately, when Haya didn't immediately knock the camera down (cameras are fun toys after all) it was observed that she was exclusively feeding the first chick. However, she remained

protective of the second chick and made sure to keep it warm and secure.

The chicks were raised on a similar schedule to the previous chicks. They had their neonate exams 2-3 days after hatching and were fed intermittently throughout the day. Blood DNA results indicated that both chicks were male. Hanz (the first chick) and Franz (the second chick) progressed as chicks had before with the exception that we were more hands-on with these birds due to our hand-feeding of Franz and were able to learn many of their firsts such as when they are able to feed themselves, stand, walk, and when they first leave the nest occurred (Figure 1). The daily weights obtained will hopefully become a valuable tool in future years, but due to past "hands-off" management, we have very limited data from previous years for comparison.

As the chicks grew, Haya began spending more and more time off the nest and exploring her pen. This was normal behavior for her in years past. We eventually gave her access to a larger pen during the day to allow her room to forage and hunt on her own. The chicks first left the hut on their own at 75 days (Hanz) and 74 days (Franz). Their activity levels were low at first, but they were observed gaining strength and spending more time walking as opposed to resting while out in their pen. Jaseri was introduced to the group at 90 days (Franz) with no negative interactions. At this point both Haya and Jaseri were observed feeding whichever chick would approach them and beg for food. On 21 Oct 2014 (day 117 for Franz) all four hornbills were introduced to the Pembe savanna.

One notable difference was observed in both Hanz and Franz which differs from chicks in the past. Once introduced to the savanna, rather than constantly remaining near their parents, they frequently had been observed remaining together, yet apart from Haya and Jaseri. This was most apparent at night when Haya and Jaseri chose to sleep on the ground up against a wall for protection (Haya about 15 feet away from Jaseri) and both Hanz and Franz chose to roost on a piece of deadfall away from the adults. This behavior lasted for the first month that they were on the savanna before both boys began sleeping with Haya as our previous chicks had. They spent more time with the adults than out together, but appeared to be a more independent pair. This is most likely the unusual result of growing up with a sibling. We continue to monitor the boys for any differences observed between them and previous chicks.

At this point in time, both Hanz and Franz appear to be well adjusted hornbills. Hanz began his time on the savanna as a very

curious hornbill who was interested in watching the staff, but suddenly took on the behavior of a parent-reared bird and no longer chooses to frequent the areas around the keeper team. Franz picked up where Hanz left off and has become increasingly curious about us. The team has taken steps to ignore his pleas for attention and this approach appears to help to some extent.

On 12 March 2015 aggression was first observed from Haya towards Hanz and Franz. On 28 March the pair was separated from her until she laid eggs inside and was then re-introduced to Jaseri on the savanna with no negative interactions. The team plans on sending them to another facility before Haya and her most recent 0.1 AGH chick, Delilah, are introduced back to the Pembe savanna later this year.

Conclusion

Abyssinian ground hornbill chick rearing has been a success at Disney's Animal Kingdom Lodge both when chicks are reared entirely by their dam and when the dam is assisted by keeper staff. We feel like we accomplished both of our 2014 goals in the rearing of our second chick, Franz. By leaving him with his brother and dam he was able to observe natural hornbill behaviors from day 1 and learned to socialize with conspecifics. While some imprinting on the keeper team is apparent, Franz displays more natural AGH behaviors than our three hand-raised birds. Overall, the time the keeper team spent to rear Franz with Hanz and Haya was minimal. The team was already spending a few minutes prepping Haya and Hanz's diets at each feed, so they multi-tasked and fed Franz at the same time. Each feed lasted approximately five minutes. The only additional staff hours put in were when a second keeper was required to occupy Haya while Franz was fed. The team utilized this keeper for several months, but looking back has decided that if we hatch two chicks again, this will probably only be necessary for a few weeks. We do acknowledge that each dam is unique and this may not be an option with each pair or female. With such promising results we encourage other keeper teams to consider this rearing method as a preferable alternative to hand-rearing.

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