The Corytheola Cristata Chronicles: Trials and Successes of Hand-rearing Great Blue Turacos

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"Success is not built on success. It's built on failure, it's built on frustration. Sometimes it's built on catastrophe." Sumner Redstone

Brief History

- Appear in US zoos in 1950s and 1960s
- 1st breeding at Houston Zoo
- High mortality rates
- Nashville Zoo received a WC pair in 1/2009.

Unfortunately, high mortality rates with chicks have always been a huge obstacle for any facility lucky enough to work with them, and therefore have never become kept regularly.

Chapter 2011: The Beginning

Parent reared in Aviary

- First eggs 7/2/11 & 7/5/11.
- Staff monitored chicks from a distance
- 7/7/11 – no movement observed with chick #2
- Chick #1 thrived and fledged in the aviary

After 2 years of being in the Croft Aviary, Nashville Zoo has their first eggs in July.
Staff monitored chicks with binoculars to reduce any stress to parents. Both chicks were bright & alert, with excellent feed responses.
July 7th – no movement was observed with chick #2, and had unfortunately died.
Chick #1 continued to do well and fledged while in the aviary.

Chapter 2012: 3's a crowd

- Beginning of April, 2 chicks hatch and are raised with no issues by the parents and the juvenile
- 8/21 the 2011 chick was lost
- 2012 chicks moved to another exhibit
- #2 died at 5 months of age, Chick #1 sent to SAZ

Our first clutch in 2011 didn't give us much to worry about and since we were still new to this species, there wasn't much that we changed for 2012. Our 2011 chick was still present when our pair laid their 2nd clutch.
The beginning of April, 2 chicks hatched and were raised with no issues by the parents and the assistance of the juvenile chick.

Late August, the 2011 chick started being chased with moderate aggression from the parents. The keeper staff ended up having to catch the bird up for medical care, which later crashed due to capture myopathy.

To reduce similar risk of aggression from the parents the 2012 chicks were moved once seen eating and drinking on their own regularly, to another exhibit.

Chick #2 was lost shortly after the move due to weakness and thin body condition. And upon necropsy also revealed severe enteritis.

Chick #1 survived and was sent to SAZ.

Chapter 2013: The Trials of Hand-rearing Intervention

Clutch 1

- 1st chick started to appear lethargic and non responsive at day 7
- 2nd chick died at day 5

Clutch 2

- 1 of 2 eggs hatched
- Pulled at 17 days

Clutch 3

- 1st chick pulled at 6 days, died at 22 days
- 2nd chick died at day 4

2013 was the first year we started to intervene and hand rear chicks, only after we started noticing chicks failure to thrive.
First clutch. The 2nd chick died at day 5. At the same time we decided to pull the 1st chick as it started to appear lethargic and non-responsive at day 7.
We were able to keep our first hand-reared chick Zuri, (now at SeaWorld Orlando, Discovery Cove) alive following the SDZ protocol, along with extensive medical care.
2nd clutch was laid in March.
We monitored the single chick by collecting weights every couple days. This chick was then pulled at 17 days due to weight loss, loose stools, and irregular feeding from parents. This chick was severely dehydrated – sub q fluids were given regularly along with 1ml oral fluids between feeds.
A similar protocol and veterinarian care was given as previous hand reared chick.
- Zara survived and is now at Houston Zoo.
3rd clutch hatches mid June. 2nd chick died at day 4 due to sepsis (pseudomonas and E. coli).
1st chick was pulled at 6 days due to parental neglect.
This chick exhibited the same issues as previous chicks. Distended Colum, dehydration, loose stools, lack of interest in food.
We really tried keeping this chick alive, chick had zero feed response and had to be tube fed throughout many us and downs. This chick died at 22 days and the necropsy report indicated Enteritis/Pneumonia aspiration.

2011-2013 Summary

Parent reared in aviary – *Pulling chicks as symptoms start to show

YEAR	CLUTCH/ EGGS	CHICKS	SURVIVING
2011	1/2	2	1
2012	2/4	4	1
2013	3/6	5	*2

From 2011-2013 while our pair was in our aviary, we had a total of 11 chicks hatch and 4 survive, with chicks being parent reared and hand-reared (only after showing signs of distress).

Chapter 2014: Joint Custody

Co-parenting off-exhibit

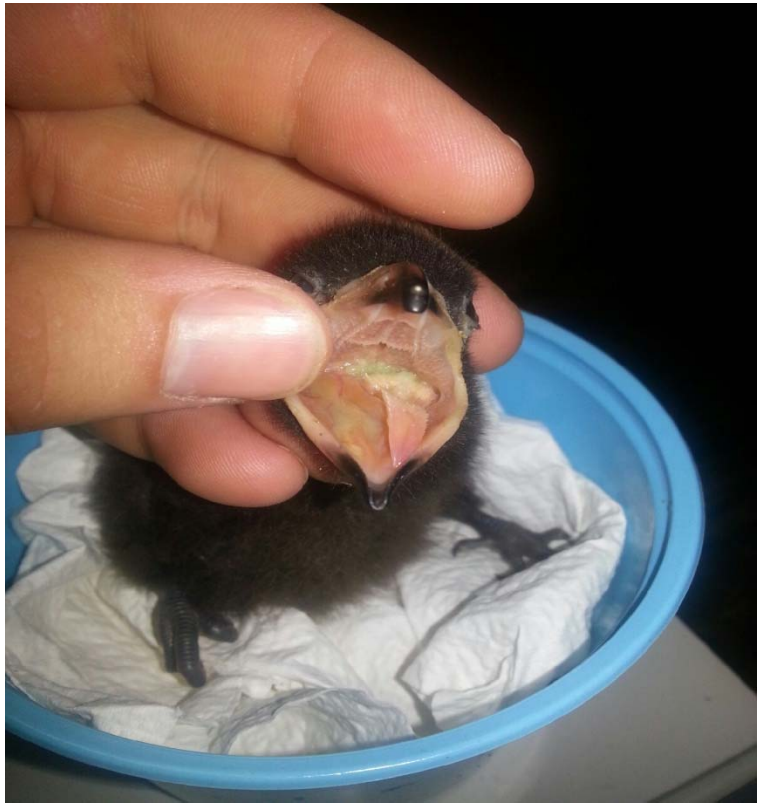
- Pair moved off exhibit
- Keepers pulled chicks to get daily weights, give oral medications, sub-q fluids if needed, collect fecals, and return back to nest daily
- 1st clutch: 1 chick survived w/parents and supplemental care from keepers
- 2nd clutch: 2 chicks, 0 survived

2014 Pair moved off exhibit to hopefully better manage chicks by being more hands on before they start showing signs of distress.
Our pair is fairly calm and allow us to remove chicks on an as needed basis to administer additional care.
Only 1 chick out of the 2 clutches survived that year, with supplemental care given by staff.

Chapter 2015: The Year of Learning

Artificial incubation / Hand-rearing

- Keepers start pulling eggs before hatch date to be hand-reared from day 0
- 4 clutches / 9 eggs / 8 chicks / 2 survived
- Followed protocols from SDZ, Houston, and SAZ
- Start medicating around day 5 once chicks start showing signs of clostridial infections, gram + rods, diarrhea, and dehydration
- 3 Critical Stages:
  - Day 3-5
  - Day 10-15
  - Day 24-30



2015: Management and staff decided to start pulling eggs to incubate and hand rear from day 0. We allowed the parents to incubate almost to hatch date, and would then pull to allow hatching in incubator. This year we had more clutches than normal, along with one clutch having 3 eggs, so we were really able to learn from the success and failure of each chick.

Again we were using protocols from SDZ and Houston, and later with SAZ who had some success with a protocol. With each clutch, we adjusted our protocols by trying to think outside of the box, with extremely limited success. We changed formulas from old home made type recipes, commercial hand-rearing diets, emergency care formulas, along with adding additional items (ex: spirulina, calcium, ficus juice, and the worst a poo slurry).

Chicks regularly would start to show signs of distress between day 3-5. Lethargic, dehydration, diarrhea, gas, fecals w/ strong odor. Gram - rods start showing up around day 5.

Out of the 8 chicks we only had 2 survive from separate clutches. Chicks died at multiple ages, but we noticed that there are 3 critical stages. Days 3-5, days 10-15, and Days 24-27. With each chick, we would work closely with our vet staff to treat more effectively and learn when and what was needed to help the chicks get over each critical stage.

Contributions to Turaco Mortality		
Necropsy Findings	Number of Times Noted	Parent or Hand-reared?
Sepsis	7	Both
Enteritis	6	Both
Bacterial overgrowth	3	Both
Thrown from nest	2	Parent-reared
Aspiration pneumonia	2	Both
Dehydration	2	Both
Trauma	1	Parent-reared
Chronic proventriculitis	1	Parent-reared
Capture myopathy	1	Parent-reared
Post-mortem consumption	1	Parent-reared
Yolk coelomitis	1	Parent-reared
Diarrhea	1	Hand-reared
Lymphohistiocytic inflammation	1	Hand-reared
Acute aspiration	1	Hand-reared
Diffuse gliosis of brain	1	Hand-reared
Vacuolar hepatopathy	1	Hand-reared
Note that most chicks presented more than one symptom at time of necropsy 1 issue ≠ 1 chick Total chicks: 18		

We understand that veterinarians prefer to not treat without medical reason. Pay attention to the top 3, as these were almost always the main cause of death for any chick. After each necropsy we noticed similar trends, which were also the same issues being faced at other institutions. With these similar contributions to Turaco mortality over the years, especially with this years defeat, we had a new approach for the next season, which we hoped may or may not become a game changer with the captive breeding of the Great blue turaco.

Chapter 2016: Changing the Rules

- Hand reared and co-parented chicks
- 4 clutches, 8 eggs, 8 chicks, 6 survived
  - 1st chick lost due to being marked for identification
  - 2nd lost due to heat exhaustion/dehydration at 36 days

We had 2 hand-reared and 2 co-parented clutches, with a total of 8 chicks.
Out of the 8 chicks born, we lost 2, neither due to our current protocol. One was lost after being marked for identification by staff, and later being thrown from the nest with marked foot being removed. The 2nd was lost due to heat exhaustion/dehydration in the middle of summer. (Both of these chicks were from the same clutch).

Nashville Zoo Great Blue Turaco Chick Protocol

- Medicate with antibiotic(s) from day 0
- 10% BW Hydration feeds
- Regular fecal checks

What you WANT	What you DON'T WANT
Bright pink mouth	Light pink – pale mouth
Well hydrated	Stringy saliva – dehydrated skin
Good fecals (consistency of formula)	Fecals with strong odor, runny, or dry and compact)
Bright and Alert, vigorous feed response	Lethargic, no interest in food

So this is the part we are all here for: Our protocol is actually pretty straight forward and consists of 2 major changes.

The first being medicating with antibiotics (enrofloxacin) from day 0 - 14, due to high bacterial loads and enteritis upon necropsy on so many chicks. This is sometimes extended if chicks start to show any signs of an off balance gram +/- seen in fecal stains.

The 2nd being hydration feeds, due to constant dehydration issues. We started out with 10%BW of distilled water per day, with great success. Occasionally, we have had to also offer sub-q fluids if needed if we start to see any stringy saliva and/or mouth tissue not being bright pink.

Additionally, check fecals on a regular basis, your vet techs may hate you, but as we all know fecals can tell us a lot. The main concern to watch for is the odor of the fecals. If a strong odor is detected, it is submitted and checked for clostridium (special gram + rod), and if positive they are then started on a round of metronidazole, in addition to the enrofloxacin.

Prior to this protocol other signs would be excessively runny stools – explosive diarrhea, but have not had to be addressed since then.

Hand-rearing vs Co-parent

Hand-rearing

- Hand-rearing formula w/ pureed papaya.
- Gradually weaned to soft fruit diet by 3.5 weeks
- Hydration feeds of 10%BW total per day
- Medications:
  - Antibiotic(s) enrofloxacin, metronidazole
  - Bene-bac

Co-parent

- Adult diet w/ soaked Mazuri parrot pellet, spiked head of romaine lettuce
- Hydration feeds of 10%BW total per day BID
- Medications:
  - Antibiotic(s) enrofloxacin, metronidazole
  - Bene-bac
  - Sub-q fluids if needed

Our hand-rearing vs co-parent protocol really only have ONE HUGE difference in my opinion. The fact that we don't have to feed every few hours. When hand-rearing, we use Higgins rice based formula. We initially switched to this at one point in 2015 thinking that chicks were suffering from enteritis due to a possible corn/wheat allergy, or not being able to process these items. Unfortunately, chicks still ran into the same issues. But we did like the consistency of the formula and continue to use it.

In addition to the formula we add pureed papaya, and hydration feeds are spread out thru the day vs just twice a day.

With co-parenting the only difference is we add soaked mazuri parrot pellet to the adult diet, along with offering a head of romaine lettuce that the parents start feeding regularly around day 7 or earlier.

SUCCESS: 100% Chick Survival Rate

These are the 4 chicks that were hand-reared, with 100% chick survival rate. Even though chicks imprint fairly easily, we believe this can work in favor to the captive care of the species. Reason being that they are much less neurotic and are unlikely to suffer from capture myopathy, during any routine work ups. The co-parent chicks are still calm around keeper staff, but still don't do too well while in hand.

What NOW?

Even though we have taken a small step forward by keeping these chicks alive, we still have a long way to go.

- Why do these chicks have such low immune systems at hatching?
- Are they missing something dietary?

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