



Chattanooga Zoo at Warner Park Special Inspection March 2, 3, & 4, 2011

Special Inspection Performed by:

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Summary:

The special inspection team investigated the circumstances of 8 animal deaths at the Chattanooga Zoo that had occurred in December 2010 and January 2011. We were asked to determine if there was a common connection or if they were random accidents that simply happened within a short period of time. We were further asked to note what the zoo might do to help prevent similar accidents in the future. Two snow leopards, two Indian muntjac, two common marmosets and two *Sulcata* tortoises died at the Zoo between December 10th 2010 and January 12, 2011. We did not find an overall common thread relating the incidents. We could only find a connection between the two *Sulcata* deaths which appears to be inadequate winter housing. The Zoo plans to immediately finish a new tortoise exhibit and holding building so that by next winter the tortoises will have improved winter housing. The two marmosets were not fed for two days (Jan 1 and 2, 2011) by Zoo staff due to an administrative error. Both marmosets had significant liver disease and weight loss that originated/preceded the events of Jan 1, 2, & 3, 2011. The etiology (the actual cause) of the liver disease has yet to be diagnosed, but Callitrichid hepatitis is highly suspected. The timing of the remaining deaths appears to be a coincidence. This report describes some of the policy and procedure changes the Zoo has made since to avoid similar errors in the future.

For the purposes of this report, the team interviewed the following individuals:

Dardenelle Long, Zoo Director
Rick Jackson, Director of Maintenance and Exhibit Design
Kirk Parker, General Curator
Morgan Manning, Creative Director
Chris Downey, Keeper
Laura Lomenick, Keeper
Catlin Robinson, Keeper
Patricia Benson, Keeper
Monty Wilson, Keeper
Anthony L. Ashley, Jr., DVM, DABVP, Consulting Veterinarian

Intro to the Chattanooga Zoo:

The Chattanooga Zoo at Warner Park is a small 13 acre zoo established in 1937. It is located in Chattanooga, Tennessee. On October 1, 2010 the Friends of the Chattanooga Zoo assumed responsibility for the operation of the Zoo under an agreement with the city of Chattanooga. The Zoo's annual operating budget is \$1.2M. Half of the budget is provided by the city and the balance is generated through earned revenue. Staff consists of 50+ positions during the summer/season and 32 to 35 individuals during the winter. There are 12 keeper positions – 9 full-time and 3 part-time. The collection is approximately 112 species and 600 specimens. Roughly half the collection is made up of Kihansi spray toads (*Nectophrynoides asperginis*). Annual attendance at the zoo is 240,000. The Metropolitan Statistical Area (MSA) for Chattanooga is 350,000 residents and the city receives about 3.0M visitors per year. Admission is \$8.00 for adults, \$6.00 for seniors and \$5.00 for children and children under 3 years old are admitted free.

Timeline of events:

Date	Event
Dec 10, 2010	Male muntjac dies, necropsy performed next day by Dr. Ashley, consulting vet to the Chattanooga Zoo
Dec 15, 2010	Hugo the spur thighed tortoise found dead; sent to University of Tennessee at Knoxville (UT) for necropsy
Jan 3, 2011	Common marmoset discovered with broken arm, anesthesia, arm set. Other common marmoset removed from exhibit and both placed in hospital
Jan 4, 2011	Common marmoset (without broken arm) found dead; sent to UT for necropsy
Jan 5, 2011	Common marmoset with broken arm found dead; sent to UT for necropsy
Jan 8, 2011	Snow leopard keeper reports bulge noted in female; general curator notifies consulting vet and director
Jan 9, 2011	Female muntjac reported not eating and bloated; female snow leopard reported did not eat
Jan 9, 2011	Female muntjac anesthetized, dies; necropsy performed by Dr. Ashley
Jan 9, 2011	Two deceased snow leopard cubs discovered in exhibit
Jan 10, 2011	Female snow leopard gives birth to live cub between 2 and 3 am
Jan 12, 2011	Tank the spur thighed tortoise found dead; sent to UT for necropsy
Jan 24, 2011	Hank the male chimpanzee found dead; sent to UT for necropsy
Jan 24, 2011	Complaint #1 received by AZA via the AZA web site
Jan 26, 2011	Complaint #2 received by AZA via the AZA web site

Animal Deaths:

For each animal death we have presented the facts as we understand them, our analysis of the staff's response, our review of the medical/necropsy records and our observations.

Snow leopard:

Snow leopard cub deaths – concern that zoo management waited too long to prepare for the birth of a litter of snow leopards.

- There was a recorded breeding early Oct. 2010.
- Staff didn't believe that this breeding would result in a pregnancy because it was a month to a month half ahead of normal breeding times.
- Staff had observed breeding during the normal breeding season (Dec through Feb) the previous year which did not result in an observed pregnancy/birth.
- On or about Jan 6, 2011 keeper noticed that the cat had started to show a "bump" (abdominal enlargement). Keeper also noticed some behavioral changes such as the male and female were resting together and the male was protective of the female.
- On Jan 7, 2011 keeper continued to notice bump
- On the 8th of Jan 2011 the general curator observes the cat, notifies the director of possible pregnancy via email at 6:10pm. The male and female are separated for the night in off exhibit housing.
- On the 9th of Jan 2011 both the male and female snow leopards were locked outdoors on exhibit. We believe that placing both animals together on exhibit was a reasonable decision. There was no other place to hold the male while off exhibit preparations were being made.
- Staff was making preparations – including creating a barrier between the two off exhibit holding areas so that male wouldn't have access to the cubs- for an impending birth
- While the preparations were being made staff kept the female snow leopard under observation.
- On Jan 9, 2011 female snow leopard delivered two cubs outdoors, both cubs were dead when discovered by keeper staff, at the end of the work day. One cub was discovered on top of the rockwork in the exhibit and the other cub was found in the chute to the off exhibit holding area.
- Female snow leopard delivered third cub early the next day in the off exhibit holding area (Jan 10, 2011 between 2 and 3 am) and this cub survived. Mother showed good maternal instincts with this cub.
- The Zoo's consulting vet performed gross necropsies on the cubs that were found dead. The cubs had been cleaned (afterbirth removed), were not stillborn, showed no congenital defects but died shortly after birth. No milk was found in the stomach. It seems likely that maternal abandonment/neglect played a significant role.
- No histo-path was done on either cub so the exact cause of death cannot be determined.

Our observations:

- We believe that the staff handled the situation appropriately.
- The cubs should have been sent to the Zoo's pathology service for necropsy (University of Tennessee at Knoxville, School of Veterinary Medicine). This would have allowed for a more precise determination of the cause of death which would have left no room for speculation.
- The general curator advised us that the Zoo will now plan each year to have the off-exhibit holding area prepared by December for a possible birth, whether or not actual breeding has been observed.

Indian Muntjac:

Male

The concern is that during an after-hours holiday event where guests were allowed to bring their pet dogs to the zoo – a dog barking adjacent to the exhibit spooked the male muntjac causing him to have a seizure and fall into a small water feature which resulted in his death.

- This event has been a long standing tradition at the Zoo and, until this year, there had not been any problems with the animal collection as a result of pet dogs being in the Zoo.
- On Dec 10th, 2010 during an after-hours event the male Indian muntjac was discovered by a guest lying on the ground in its exhibit. The guest notified a staff member and staff immediately responded to the exhibit. The muntjac was lying next to a small water feature. The ventral half of the animal was wet and it was presumed that the animal had been wading in the water feature. The consulting vet was contacted by phone. The muntjac was moved into an off exhibit holding stall so that it could be warmed up. Rectal temperature was 92°F. Animal subsequently died before the vet arrived at the Zoo. Presumptive diagnosis was hypothermia.
- The Zoo's consulting vet performed a gross necropsy. No significant findings were found on necropsy.

Our observations:

- The muntjac exhibit is small and shaped like a right triangle. The exhibit is roughly 20 ft from front to back at the base of the triangle and does not have a great deal of vegetation for cover for the animals. In addition there is a large electrical transformer that forms part of the perimeter of the exhibit. The transformer has sharp fins on the exhibit side and is not appropriate as a barrier.
- It is possible that a barking dog could contribute to a chain of events that resulted in the muntjac's death.
- The male muntjac should have been sent to the Zoo's pathology service for necropsy (University of Tennessee at Knoxville, School of Veterinary Medicine). This would have allowed for a more precise determination of the cause of death which would have left no room for speculation.

- Due to the size of the exhibit, the low barrier fence along the guest path, the lack of room for an appropriate flight response and lack of cover for retreat we would suggest that the Zoo consider not putting Indian muntjac back in this exhibit. This exhibit is not ideal for animals that have a strong flight response.
- As a result of this accident the zoo has discontinued this event.

Female:

The concern is that zoo management did not notice that the female Indian muntjac had stopped eating, and had an enlarged abdomen.

- On Jan 9th, 2011 the Zoo staff contacted the consulting vet to report that the female Indian muntjac was eating less, slightly bloated but still defecating. He was contacted a few hours later by staff and informed that her condition had worsened. The consulting vet came into the Zoo at 6pm. He anesthetized the muntjac so that a stomach tube could be inserted to decompress the rumen.
- Female dies within minutes of being anesthetized. Zoo's consulting vet performs a gross necropsy on the female. The muntjac died from a twisted intestine.

Our observations:

- The Zoo staff acted appropriately, timely and professionally.
- The Zoo staff did everything possible to diagnose and save the animal's life. Diagnosis of twisted and devitalized intestine in a ruminant has a very poor prognosis.

Common marmosets:

Concerns are that zoo management failed to properly feed or water a pair of common marmosets for 4+ days. When the keeper entered the enclosure on the 3rd of Jan 2011 the marmosets "attacked" the keeper and, in defending himself from the marmosets, he accidentally caught one of the animals in a keeper service door and broke its arm. When the animals were transferred to the hospital for treatment – they were allowed to gorge on food which subsequently caused their death.

- The marmoset that was not injured died on the 4th of Jan and the animal that had the fractured arm died on the 5th of Jan.
- Zoo management freely admits that a mistake was made and the animals were not fed or watered for two days (January 1 and 2). The mistake was made because of two reasons – the general curator (who does not normally make the keeper schedule) created the keeper schedule for Jan 1. Unlike a regular work day, the schedule for the first of Jan had three shifts of two keepers. The shifts overlapped so that any work with Class 1 animals (such as the snow leopards) could be accomplished by four keepers. The animals were not fed on the 2nd of Jan

because a new area work schedule had been implemented by management and no one realized that the marmosets had been inadvertently left off the schedule.

Our observations:

- We reviewed the keeper area notebooks for areas 4 and 1n8. We could not determine from the daily reports whether the animals had been fed on the 31st of Dec.
- We interviewed the keeper that was assigned to care for the marmosets on the 31st of Dec. The keeper told us that she just couldn't remember back that far as the routine hadn't changed yet and that the part-time keepers sometimes offer to take care of that area and may have on the 31st. One part-time person we interviewed said she definitely didn't care for the marmosets on that day. The other was not available for us to question. Regardless, the assigned keeper was convinced that the animals had been cared for on the 31st of Dec.
- Based on the keeper interviews we feel reasonably confident that the animals were not fed for two days.
- Based on the medical records we feel that the marmosets were appropriately cared for in the hospital.
- Zoo management has taken the following steps to ensure that this mistake cannot happen again: new keeper daily report forms are now being used in each area, the daily reports have a checklist of the specimens in that area, there is a white board in the keeper break room that significant changes are reported, supervisors review and initial the daily reports at the end of each day, and there are now regular keeper meetings to provide for more communication.
- The marmosets were sent to the University of Tennessee at Knoxville, School of Veterinary Medicine for necropsy service and received a thorough exam. The results indicate that both of the marmosets had hepatic necrosis and one had bacterial sepsis. Both animals showed significant weight loss. The weight loss had occurred over a long period of time – not as a result of not having been fed for two days. Additional tests for Callitrichid hepatitis (LCMV) are still pending.

Spur thighed tortoise (two males):

Concerns were that a male spur thighed tortoise was improperly housed (insufficient heat) over the winter and not weighed routinely by zoo management. Zoo management missed that the animal was ill because weights were not routinely collected.

- Tortoises are illegal to have as pets in Tennessee so that the zoo receives lots of donations.
- Two spur thighed tortoises died this winter – one on Dec 15, 2010 and one on Jan 12, 2011.
- Both tortoises were sent to the UT necropsy service and received thorough exams.
- The tortoise Tank (died on Jan 12, 2011) appeared to have died as a result of a colonic impaction.
- The tortoise Hugo (died on Dec 15, 2010) had acute atrial emphysema but no cause was ever determined.

Our observations:

- Tortoises are housed in several locations over the winter. One group is currently in the quarantine room in the animal hospital bldg and another group is housed in the basement of the education bldg.
- Animals should not be housed over the winter in the quarantine as a matter of procedure and per AZA guidelines.
- One group of tortoises is housed in a supply storage area in the basement of the education bldg. While most of the supplies in the storage area did not pose a threat to the tortoises – bottled bleach was stored on a shelf and should a bottle leak could cause a problem. We recommended to the director that another location be found for either the supplies or the tortoises.
- Neither location is completely adequate for winter housing of the tortoises. The tortoises have outgrown their winter holding facilities. A winter housing location should be established for the tortoises before next winter. At the exit interview the director informed us that she had directed her staff to find an outside contractor to complete the work on the unfinished tortoise exhibit.

Our overall observations:

- We do not see any medical or management connection between six of the eight deaths. Based on our observations, our understanding of the events, and our review the Zoo's medical/necropsy records: the two tortoise deaths appear to be a result of substandard winter housing. The two marmosets not being fed for two days was the result of an unfortunate administrative error, but not the cause of their death. Both marmosets had significant liver disease and weight loss that originated/preceded the administrative error on the 1st and 2nd of January 2011. The actual cause of the liver disease has yet to be diagnosed, but Callitrichid hepatitis is highly suspected. We believe that the remaining four deaths (2 snow leopards and 2 Indian muntjac) to be an unfortunate series of unrelated events.
- Zoo management should upgrade the winter holding for tortoises prior to next winter.
- The Zoo should send deceased animals to their necropsy service to collect tissue samples and to photograph the animals during the gross necropsy for future reference.
- When medical issues were discovered by Zoo staff and the consulting vet – they worked promptly and appropriately to resolve the problem.
- The Zoo has implemented additional measures to prevent animals from being harassed by dogs by eliminating the holiday event, by better communication through regular keeper meetings, updated keeper report forms, and improved supervision by the management staff.
- The zoo will have a veterinary technician as of 14th of March. The veterinarian now comes twice a week instead of once a week.
- The zoo has a new pest control provider – Orkin. We reviewed their proposal to the Zoo and believe that it is a much improved program than what they had before.

- The Zoo has acquired another shot gun and dart rifle as per the recommendation of the last AZA inspection. The presence of the additional firearm and dart rifle are not reflected in the animal escape policy document. This document should be updated. We also suggested that the zoo consider obtaining a soft gun case for the shotgun stored in the admin bldg. This would allow the gun to be transported in public areas without unduly alarming guests and/or collection animals.
- The Zoo is making a concerted effort to routinely gather weights on collection animals.