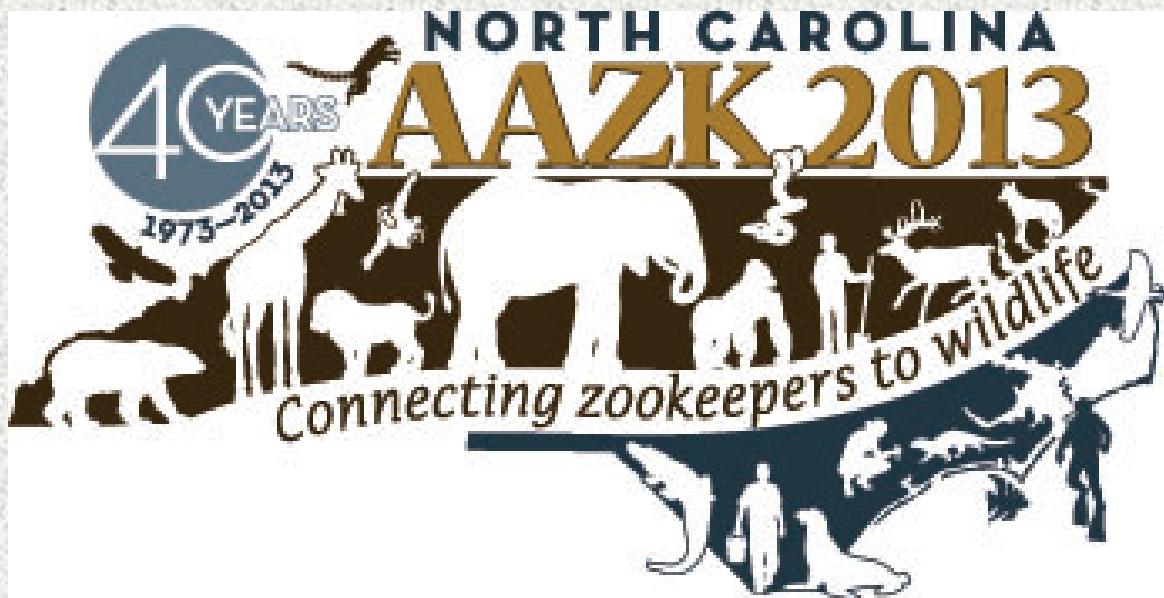


**PROCEEDINGS OF THE
40TH NATIONAL CONFERENCE
OF THE AMERICAN
ASSOCIATION OF ZOO KEEPERS,
INC.**

Paper Sessions

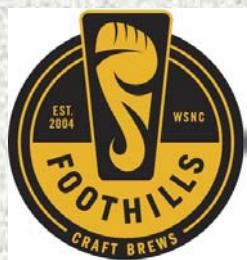
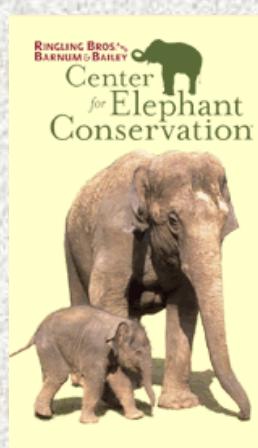
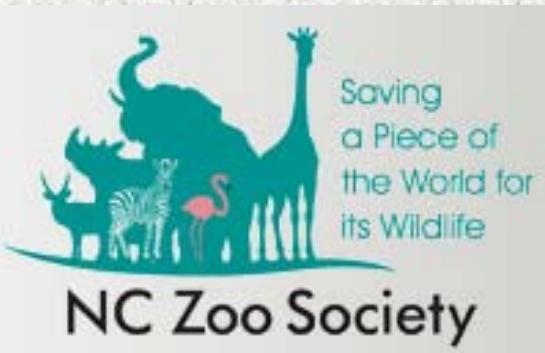


40th National AAZK Conference

Greensboro, NC

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2013 National AAZK Conference Papers

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2013 AAZK's BOWLING FOR RHINOS **"Together in Conservation"**

*Presented by Patty Pearthree
National Bowling For Rhinos Program Manager*

Introduction

The American Association of Zoo Keepers (AAZK) "Bowling For Rhinos" (BFR) fund-raiser has raised nearly **\$4.5 million** since 1990 entirely through volunteer efforts. It is the hard work and dedication of these volunteers that make the difference in wildlife conservation efforts. 2012 was a record breaking year raising over \$337,000 for conservation worldwide! In Kenya, we now protect over 1.5 million acres of white and black rhino habitat under Lewa's conservation charter. In Indonesia, we protect 1.4 million acres of crucial lowland rainforest habitat for the survival of the Javan and Sumatran rhinos and other species living in their ecosystems including Sumatran tigers, elephants, tapirs, Javan gibbons and sunbears. AAZK's BFR supports ALL 5 species of rhino plus hundreds of other endangered species from orchids to elephants that live in their habitat. Had it not been for organizations like AAZK many of these species would not be around today.

Accomplishments through Our Conservation Partners

Our support of these conservation partners has allowed them to come together in conservation to help change the world. Black rhino were only one of a number of species that were likely to go extinct by the year 2000 had it not been for AAZK's BFR support. Black rhino have doubled to around 5,000 in number with BFR support. In 1990 we protected wildlife in Lewa's 10,000 acre Ngare Sergoi Rhino Sanctuary. We now protect 3 million acres of wildlife habitat. That is 25% larger than Yellowstone National Park!

All this comes at a price. Operation costs to protect wildlife in these areas increases at 10-15% per year. Combined with the ever increasing poaching pressure, this means we need to increase our overall dollars raised. We have made a huge difference but our challenge is to keep growing bigger & better each year so all this can be saved for future generations. For additional information on rhino conservation, visit: www.rhinos.org and www.lewa.org

Together in Conservation

The best conservation programs involve long-term commitment. Since 1990, AAZK's Bowling For Rhinos has been one of the world's most successful conservation programs raising over \$4.4 million for conservation worldwide! AAZK remains committed to its conservation partners: Lewa Wildlife Conservancy (LWC), International Rhino Foundation (IRF) and Action for Cheetahs in Kenya(ACK). 100% of BFR funding is being spent on conservation programs with 98% being designated specifically for conservation projects within rhino habitat. The remaining 2% of uncommitted funds is weighted heavily to favor rhino conservation programs and has now allowed us to support the conservation programs of the Indian rhino.

We started out supporting Lewa Wildlife Conservancy in Kenya- called Ngare Sergoi back in 1990 when it was 10,000 acres. AAZK paid for fencing, surveillance airplanes, transport trucks,etc. in the early years but have since moved to supporting the toughest to fund item- operating costs. Lewa's operating cost is now \$3.3 million annually and Lewa is 72,000 acres. Lewa also now manages the 90,000 acre neighboring conservancy called Ol Pejeta. Rhinos disappeared from this area in the 1970's but Lewa reintroduced 15 black rhino in 1984. Lewa is now home to 130 rhinos, 79 black and 51 white (June, 2012) and several rhino have gone to other areas to repopulate. OL Pejeta is home to 88 black rhino, 11 Southern White Rhino and 4 of the last remaining Northern White Rhinos on the planet! Lewa is now a globally recognized conservation initiative.

Lewa's **core** rhino conservation program has always been the main focus of BFR funding. These core

operating costs now run about \$725,000 and AAZK contributes about 25 % of this annually. These funds are vital to rhino conservation and the survival of the species. AAZK's long term and continuous funding makes it an invaluable contributor to the success of LWC in conservation worldwide!

In June, 2013, Lewa Wildlife Conservancy became a UNESCO World Heritage Site and is part of the area called **Mount Kenya World Heritage Site**. This unique recognition is reserved "for places of outstanding universal value to humanity that, as such, have been inscribed on the list to be protected for future generations to appreciate and enjoy". The World Heritage Committee considered Lewa and Ngare Ndare for their outstanding natural beauty, as well as their varied and impressive ecosystems and biodiversity. Lewa and Ngare Ndare are all connected to Mount Kenya through an elephant corridor. Lewa was instrumental in the creation of this crucial migration passage that serves as a route for landscape connectivity.

Expanding Support to Indonesia

In 1994, AAZK expanded its funding efforts when it began supporting Ujung Kulon National Park in Java Indonesia to save the Javan rhino. Ujung Kulon is home to the last 25-45 Javan rhinos on earth. AAZK expanded its funding efforts once again in 1997 to include Bukit Barisan Selatan National Park (BBS) in Sumatra, Indonesia where one of the largest populations of Sumatran rhinos live. Only about 100 Sumatran rhinos remain, and because of their rapid rate of decline, they are considered the most threatened of all rhino species. All of our funding for the Indonesian rhino Programs now goes through IRF.

Currently, the IRF funds allow the operation of rhino protection units in Ujung Kulon National Park (NP), Way Kambas NP & Bukit Barisan NP. Thanks to these Patrol units there have been no cases of Rhino or large mammal poaching in these parks for several years. With less than 100 Sumatran & perhaps as few as 25 Javan rhino remaining, these Patrol units are vital to the survival of both species.

Action For Cheetah in Kenya

In 2009, AAZK's BFR began supporting ACK under the direction of Mary Wykstra. This support will add to the protection of not only cheetah but also Rhino through education and conservation of habitat that is home to both cheetah and rhino and creates a larger buffer zone of protection. See www.actionforcheetahs.org

AAZK Conservation Resource Grant Helps Save All Five Species of Rhino

Each year, the AAZK Conservation Resources Grant is awarded to an ex-situ or in-situ rhino conservation effort. In 2010 and 2011, IRF was awarded the AAZK Conservation Resources Grant of 2% of the balance of BFR funds raised. Funds provided radio collars for Indian Rhinos that were being translocated as part of the Indian Rhino Vision 2020 Program. This program aims to attain a population of 3,000 wild rhino in seven of Assam's protected areas by 2020. So now **BFR funds support all five species of rhino!**

Growing BFR Events Over 25 Years

In 1990, we raised \$138,000 from 35 chapters. Today, we have over 70 chapters participating raising over \$337,000 annually. We will soon pass the \$ 5 million raised mark and enter our 25th year of BFR! Our accomplishments are grand but we must keep pushing forward to help save wildlife for future generations. Together in conservation we can accomplish our goal and raise \$500,000 annually with 100% participation from all AAZK chapters!

2012 BFR Results

\$337,191 was raised by 71 chapters or institutions in 2012. This compares to 2011 with 280,015 raised by 65 chapters.

2013 BFR Results to date

As of the writing of this paper July 30th, chapters were just beginning to turn in funds. The **2013 winners have not been determined** since the deadline for trip winners to turn in funds is September 1st.

The 2012 Top ten Individual money raisers were:

- #1- Jennifer Gonsman of Los Angeles AAZK with \$35,500 (**won 2 week trip to Lewa**).
- #2-Ashley Orr of Dallas AAZK with \$13,901 (**won 2 week trip to Lewa**).
- #3- Gil Myers of National Capital AAZK with \$10,817(**won 2 week trip to Indonesia**)
- #4-Logan Agan of Oklahoma City with \$9,589 (**won 2 week trip to Indonesia**)
- #5- Lindsay Ireland- Detroit-\$8,500
- #6-Patty Pearthree- North Carolina- \$9,005 (but only \$6,005 by Sept. 1)
- #7-Linda Stark- Indianapolis- \$3,577
- #8- Yvette Kemp- San Diego-\$1,058
- #9-Emily Hallford- Tulsa- \$1,000
- #10-Susie Turner- Heart of Illinois- \$550

Honorary Trip winner: Heather Strawn of the Cleveland AAZK Chapter for her years of dedication to organizing the event (**won one week trip to Lewa**).

Chapter award: Kansas City- Started BFR & have bowled every year since then!

The 2012 top 3 money raising AAZK chapters were:

- #1- Los Angeles-\$35,500 (all time record!)
- #2- Dallas- \$16,417
- #3- San Diego- \$16,109

Top 10 money raising chapters since Bowling For Rhinos started in 1990:

- 1) Oklahoma City- \$247,547
- 2) Portland-\$ 229,562
- 3) Dallas-\$193,403
- 4) Detroit-\$181,622
- 5) San Diego-\$173,512
- 6) Utah- \$139,889
- 7) Philadelphia- \$135,323
- 8) Lincoln Park-\$131,057
- 9) Los Angeles- \$130,898
- 10) Indianapolis- \$123,611

Honorary BFR Trip Winner

Each year, AAZK and Lewa reward an outstanding individual who has gone above and beyond in their extraordinary effort to organize BFR events. Often times, these behind the scene efforts go unnoticed. It takes a great deal of effort to hold successful BFR events year after year. Lewa will host this winner in October at Lewa for one week.

The 2012 Honoary trip winner was Heather Strawn of the Cleveland Zoo. Heather has been one of the top 10 money raisers in the country a number of years. She has been the Cleveland BFR coordinator for nearly 10 years now raising over \$106,000 and making Cleveland one of the more successful events. She has consistently raised the most money in her chapter while she continues to organize the event. Heather's tireless efforts have not gone unnoticed in the conservation field. She was awarded with a free trip to visit Lewa Wildlife Conservancy in Kenya in October, 2013. She and a companion will be hosted by Lewa on their adventure to be first hand observers of the wildlife that benefits from Heather's hard work and dedication.

The 2013 winner will be announced at the AAZK conference this year.

Eight different chapters have been the top money raising chapter in the past 22 years. Trip winners have won trips with as little as \$850 (1995) to as much as \$35,500 in 2012. Trip winners have been from 14 DIFFERENT zoos. If we include the honorary trip, that number would be 16 DIFFERENT zoos.

See Appendix I (History of Funds Raised) on website: <http://aazkbfr.org>

See Appendix II for a comparison of events over the years.

See Appendix III for Distribution of funds

BFR Division of Funds

The first \$160,000 raised each year will continue to go to LWC. Blue Rhino Gas \$5,000 donation is split between Lewa and IRF. Once the \$160,000 plateau has been achieved AAZK shall divide the remainder of BFR funds based upon percentage under the following distribution guidelines to the following entities until a \$350,000.00 plateau is achieved:

International Rhino Foundation (IRF)	65%
Lewa Wildlife Conservancy(LWC)	25%
Action for Cheetahs Kenya (ACK)	8%
AAZK Inc Conservation Resources	2%

For BFR events that reach **\$350,000-\$500,000** in a calendar year, the financial distribution follows:

\$160,000.00	LWC Dedicated Share
\$ 50,000.00	IRF Dedicated Share
65% of Balance to IRF	
25% of Balance to LWC	
8% of Balance to ACK	
2% of Balance to AAZK Conservation Projects	

\$500,000.00 and above

45%	LWC	\$225,000.00
45%	IRF	\$225,000.00
8%	ACK	\$ 40,000.00
2%	AAZK	\$ 10,000.00

As one can see, our goal is to reach the \$500,000 annual level. All organizations benefit the more we can “grow” our events. We believe this is achievable but will take having everyone participate in some fashion every year. So come join us and let’s grow together!

Bowling For Rhinos Tips for Success

-Set a date early so that it can be advertised in as many newsletters, fliers as possible. Info should be placed in **zoo newsletters** at least 4 times, **zoo volunteer newsletters**, **zoo guild communications**, **zoo maps or fliers**, etc.

-Check with your **Chamber of Commerce** prior to setting date to find out events that could conflict. Once you choose the date, inform your Chamber of commerce.

-Use **Social media** to advertise your event

-Talk to your **zoo volunteers at an organized luncheon** to let them know they can join the event or sponsor someone (have your forms ready).

-Put registration fliers in an area where volunteers may see them-in their “check –in” area

-Talk to your Zoo Guild or other organization that helps at the zoo

-Have fliers that you can hand out so they can fill out later

-collect door prizes. Seek the big airline prizes 4-6 months in advance (write thank yous)

-Restaurants are easy to get prizes from. **Go in person with letter of donation request in hand.**

-send out **invites to previous bowlers** (addresses listed on sponsor forms from prior year or gather email

- addresses)
- ask Blue Rhino Gas folks in your area to join your event (& possibly sponsor)
 - ask Rhino Linings folks in your area to join your event (& possibly sponsor)
 - Let people know your event is **open to the public**
 - Seek **donations** for pizzas and t-shirts
 - See if your zoo will offer a **Day off work** for the team who raises the most \$ (ex. Graphics team, Maint. Team, etc)
 - Seek help from your zoo's **special events people, graphics**, etc. to get the word out.
 - circulate the current **list of prizes** as they come in wherever possible
 - INVITE CELEBRITIES** to bowl at your event (especially TV/radio- free advertising when they talk up event!)
 - Post info next to **rhino/elephant exhibits** about your upcoming event and how to join!
 - If you are going for the trip prize, let potential sponsors know they could help you win the trip!**
 - Send out letters/emails to friends and family seeking donations.**
 - Check out <http://aazkbfr.org> or <http://aazk.org/committee/bowling-for-rhinos/>
- Lewa Promo CDs & materials, "Patrols of Hope-The last Sumatran Rhino" CD, how to hold a successful event info and more can be found here. For additional Lewa promo materials, contact:** Robin Leckinger: leckingerjr@sbcglobal.net or Ginger Thompson at ginger@lewa.org and for additional IRF promo materials, contact: Bill Konstant at BKonstant@rhinos.org
- contact Patty Pearthree at: ppear3@gmail.com or 919-678-0449**

BFR Fund-raising Guidelines

- If possible, Events should be held between March 1- August 1st (optimal for PR is 1st week of May).
- I send out fliers in AKF requesting info on your upcoming event. This helps me in case people in your area call me for info.
- If interested in participating, see <http://aazkbfr.org> for information, send your event coordinator contact info, date of event,etc, and let me know the number of sponsor sheets to send: ppear3@gmail.com
- *If you have never held an event, see "how to hold an event" on the web site: <http://aazkbfr.org>.
- There is a **\$25 administrative fee** to participate, which should be made out to "AAZK, Inc." and mailed to Patty prior to obtaining sponsor forms. This fee covers indirect costs incurred by AAZK, Inc. due to BFR (phone, postage, faxes, and bank fees). Administrative fees are waived for the first year a chapter participates.
- **To win the trips, all money must be sent in to Patty by September 1st!**
- **Please try to have all money sent within 30 days of your event.**
- If a chapter does not wish to send their checks certified mail, the following is the only way to insure that your check is not cashed by anyone other than AAZK, Inc.! **Please write "For Deposit Only" on the back signature area of all checks. This will ensure only AAZK can deposit it instead of just anyone who may intercept it!**
- Please make out one check payable to **"AAZK, Inc.-Bowling For Rhinos"**, include a copy of your financial form & a copy of sponsor sheets from **all members raising at least \$1,000** and mail to:

Patty Pearthree c/o Bowling For Rhinos
 318 Montibello Dr. Cary, NC 27513
 (919) 678-0449 ppear3@gmail.com web site <http://www.aazkbfr.org/>

*It is very important to remember that we advertise **100% of all donations go towards conservation**. All donations from donors must be submitted to AAZK Bowling For Rhinos for this to be true. This means that your organization must cover any expenses for this event. This can be done by charging a fee for bowlers, through silent auctions, door prize raffles, your local organizations funds, etc.

*Anyone can join the Bowl-a-thon so **don't limit yourselves to only zoo people. However, be sure it is clear that only National AAZK members are allowed to win the trips.** If you have a potential winner,

ask them to join AAZK.

*** Blue Rhino Gas Company**

The Blue Rhino Gas Company became the **National sponsor of Bowling For Rhinos** beginning in 2004.

The Blue Rhino gas company is extremely conservation oriented and uses the white rhino as their logo.

They pledged to donate \$20,000 per year to Bowling for Rhinos through 2008. Beginning in 2009, this was scaled back to \$5,000 due to the rough economic times for gas companies. Blue Rhino is the leading cylinder gas recycler in the U.S. and keeps thousands of cylinders out of landfills each year. Some chapters have also received additional support from their local Blue Rhino Gas suppliers and the Blue Rhino Gas Company sponsors a local Bowling For Rhinos event annually in Winston-Salem, NC. See www.bluerhino.com for more information.

*Don't forget to use **Blue Rhino Gas** for any grilling needs- they help save rhinos too! Any publicity for them will help increase their future support of BFR.

Appendix II: Bowling For Rhinos Fundraising Annual Comparisons 2013

Year	Total Raised	# Events	Top Money Raisers	Amount	Chapter Affiliation	Top Chapter	Amount
1990	\$138,795	35				Portland, OR	\$14,659
1991	\$122,801	40	Patty Pearthree Brian McKenna	\$4,877 \$3,791	Indianapolis Lincoln Park	Lincoln Park	\$12,697
1992	\$99,393	47	Cara Lance Debbie Palay	\$4,977 \$1,743	Indianapolis Lincoln Park	Lincoln Park	\$11,102
1993	\$112,015	44	Richard Buthe Kathy Knowin	\$5,070 \$4,960	Philadelphia Lincoln Park	Philadelphia	\$13,168
1994	\$106,452	53	Diana Villafuerta Christine Bobko	\$3,505 \$3,146	Lincoln Park Denver	Portland, OR	\$10,821
1995	\$120,657	45	Patty Pearthree* Katrina Osborn	\$1,767 \$1,488	Indianapolis Miami Metro	Portland, OR	\$11,398
1996	\$149,249	49	Bill Nelson Jay Weston	\$5,670 \$3,498	Dallas Hogle	Dallas	\$14,757
1997	\$128,604	43	Janet Wiard Mary Wykstra-Ross	\$6,256 \$5,240	Oklahoma City Hogle	Dallas	\$10,865
1998	\$124,920	43	Norah Farnham Kirk Nemecheck	\$7,539 \$5,406	Lincoln Park Rolling Hills	Lincoln Park	\$12,653
1999	\$135,625	38	Brenda Gunder Dolora Batchelor	\$10,618 \$6,245	Rolling Hills Miami Metro	Portland, OR	\$13,311
2000	\$143,083	37	Kirsten Christensen Tim Hays	\$12,201 \$6,816	Oklahoma City Rolling Hills	Oklahoma City	\$12,201
2001	\$192,789	42	Jay Pratte Debie Mangrum	\$10,161 \$9,467	Dallas Oklahoma City	Dallas	\$17,877
2002	\$158,456	40	Victoria Zahn Bethany Lutz	\$16,607 \$9,200	Oklahoma City Hogle/Utah	Oklahoma City	\$16,607
2003	\$188,643	44	Mary	\$13,593	Oklahoma	Puget Sound	\$16,462

			McFarland Jason Peterson	\$11,500	City Hogle		
2004	\$214,271	42	Todd Bridgewater Michelle Pratt Bethany Lutz Mike Connolly	\$17,680 \$13,435 \$12,000 \$6,000	Oklahoma City Detroit Hogle Tulsa	Detroit	\$19,494
2005	\$233,950	47	Chrislyn Newton Crystal Derusha Jessica Scallan Alex Vasquez	\$18,074 \$14,000 \$9,000 \$8,706	Oklahoma City Utah Tulsa Dallas	Oklahoma City	\$18,704
2006	\$250,577	53	Amy Stepens Kelly Wilson Jane Larson Eric Flossic	\$21,025 \$18,478 \$14,200 \$13,000	Oklahoma City Detroit Utah Tulsa	Oklahoma City	\$21,025
2007	\$316,397	53	Jaimee Flinchbaugh Ruth Ann Prey Rana Bayrakci Heather Strawn	\$31,091 \$28,359 \$14,088 \$12,498	Oklahoma City Detroit Puget Sound Cleveland	Oklahoma City	\$31,091
2008	\$273,279	55	Jennifer Davis Christine James Jennifer Thomas Rue Hewett Kim Sevier	\$35,388 \$14,554 \$12,150 \$11,000 \$11,000	Oklahoma City Dallas Detroit Miami Metro Tulsa	Oklahoma City	\$35,388
2009	\$256,785	53	Nicole Miller Gina Garza	\$30,101 \$13,327	Los Angeles Dallas	Los Angeles	\$30,101
2010	\$256,420	61	Dani Cremona Melissa Kesler	\$30,000 \$15,000	Los Angeles Oklahoma City	Los Angeles	\$30,000
2011	\$280,015	65	Cori Monetti Holly Ray	\$32,000 \$14,232	Los Angeles Oklahoma City	Los Angeles	\$32,000
2012	\$337,191	76	Jennifer Gonsman Ashley Orr	\$35,500 \$13,901	Los Angeles Dallas	Los Angeles	\$35,500

*Ken Smith won trip w/ \$850 as each person can only win trip once.

Bold denotes record holders.

Appendix III: Bowling For Rhinos 2013

Distribution of Funds

Year	LWC	Indonesian Programs		ACK	AAZK Conserv ation Grant
		Through Adopt-A-Park	Through IRF		
1990	\$138,795				
1991	\$122,801				
1992	\$99,393				
1993	\$112,015				
1994	\$106,452				
1995	\$100,000				
1996	\$100,000	\$20,600			
1997	\$100,000	\$49,250			
1998	\$100,000	\$14,302	\$14,302		
1999	\$100,000	\$12,460	\$12,460		
2000	\$100,000	\$17,813	\$17,813		
2001	\$105,000	\$21,541	\$21,541		
2002	\$100,000	\$43,895	\$43,895		
2003	\$100,000	\$29,228	\$29,228		
2004	\$110,000	\$44,321	\$54,321		
2005	\$130,000	\$47,453	\$57,453		
2006	\$130,000	\$47,055	\$57,055		
2007	\$160,000	\$55,387	\$65,387		
2008	\$160,000	\$0	\$156,397		
2009	\$196,714	\$0	\$50,893	\$7,343	\$1,836
2010	\$185,355	\$0	\$61,923	\$7,314	\$1,828
2011	\$191,254	\$0	\$77,260	\$9,201	\$2,300
2012	\$206,208	\$0	\$115,850	\$13,705	\$3,426
2013		\$0			
2014		\$0			
Total	\$2,953,987	\$403,305	\$835,778	\$37,563	\$9,390



**PROGRAMMATIC AND FINANCIAL REPORT TO THE AMERICAN ASSOCIATION OF ZOO
KEEPERS.**

Submitted By: Mike Watson

Mike.watson@lewa.org
August 2013

**PROGRAMMATIC AND FINANCIAL REPORT TO AAZK FROM THE
THE LEWA WILDLIFE CONSERVANCY RHINO CONSERVATION PROGRAMME**

August 2013

The Lewa Wildlife Conservancy remains extremely indebted for the financial support from The America Association of Zoo Keepers (AAZK) through the very successful Bowling for Rhino (BFR) events. AAZK has contributed a total of **US\$ 197,449.73** towards Lewa's rhino protection and security operations over the past one year, funds that funds cumulatively make up approximately 15% of Lewa's rhino conservation programme budget. By supporting Lewa, home to 12% and 14% of Kenya's black and white rhino respectively, AAZK directly plays a vital role in helping ensure the survival of these endangered species.

The below report outlines how AAZK's generous funds were put into use over the reporting period, to enable Lewa undertake its rhino conservation and security programmes through supporting armed anti-poaching units, the tracker dog unit, aerial surveillance, ranger salaries, vehicle running costs, a radio communication center and the maintenance of Lewa's boundary fence line .

Rhino Conservation Programme



In 2012 alone, Lewa lost a total of **7** rhinos to poachers. The poaching threat continues to escalate and is attributed mainly to the rising demand for both rhino horn and elephant ivory. Rhino horn is now worth more per ounce than gold; this dramatic increase is the result of a variety of factors, most notably the growing purchasing power of the Middle East and Asian populations, as well as the sophistication of organized poaching gangs who sell these wildlife products to black market syndicates in range countries.

Lewa's impressive anti-poaching track record is renowned through-out the conservation world and can be attributed to the attention to detail and constant adaptation to meet the ever growing and changing threats from poachers. Lewa strives to addresses conceivable angles of threat to its' flagship species through the daily practice of monitoring each rhino, vigilant observation of all entry points and conservancy boundaries, round the clock maintenance of the fence line, regular aerial surveillance, and the continuous high skill training programmes of all LWC's security forces and canine units in preparedness for any potential eventuality.

Kenya Police Reservists (KPR) Armed Anti-Poaching Teams



30 members of Lewa's 126-person security team are Kenya Police Reservists (KPR), meaning that they are trained and employed by Lewa, but are licensed to bear arms by the Kenyan government and may legally respond to incidents of instability or violence throughout the region. Lewa currently has its teams deployed on a daily basis to different locations to eradicate predictability of the coverage of the Conservancy. Many of the poaching incidents experienced on Lewa in 2012 - 2013 have been successful partly due to collaboration between the poachers and some rogue employees and/or former employees. The anti-poaching units are positioned throughout the Conservancy at any given time, with one team based at headquarters as an immediate response unit, ready to deploy 24 hours a day, 7 days a week. The recently approved 8 new KPR officers will allow for greater flexibility, both in responding to incidents and in day-to-day organization of the teams activities and whereabouts.

Aside from their constant monitoring and regular responses to incidents on and off the Conservancy, Lewa's KPR teams are always upgrading and improving their operations and training. A training regime that encompasses new training skills and refresher courses has been put in place where each member of the KPR teams receives basic medical training and one person on each team attends an advance field-medical course in case of serious injuries. The teams now carry medical kits with bandages, tourniquets and other necessary supplies. Their uniforms have also been upgraded to include insulating base-layers and gloves to protect against the high-elevation bitter cold night time temperatures they at times experience.

The total cost over the reporting to effectively run the mobile KPR armed teams, including salaries, rations, medical, uniforms and allowances was **USD\$ 79,153**.

Tracker Dog Unit



Over the years, Lewa has developed a good reputation for its canine unit. This impressive team is regularly called upon by the Kenyan government to assist in a wide range of situations that require quick responses and scent tracking.

The team is now made up of four blood-hounds, Tasha, Toffee, Tony and Tiva. All four dogs are very well trained and continue to follow a daily regimen to keep them fit, alert and motivated. Tasha and Toffee have served on Lewa's security team for over a decade and are in the process of handing the reins over to Tony and Tiva. After retirement, Tasha and Toffee will move to a good home with one of Lewa's nearby families. From January to early August 2013, Lewa's tracker dog team has been used in a total of **26** security follow-ups and has provided invaluable assistance to many important situations arising within the conservancy and the boundaries contiguous to it.

The total cost to operate the four tracker dogs and their handlers over the reporting period was **USD\$ 10,758**

Aerial Back-up

Lewa's aerial surveillance continues to play a key role in all operations, supporting not just Lewa's security operations, but also partner organizations. The LWC Super Cub acts as back-up to security related follow-ups to Lewa and other conservation partners nearby such Ol Pejeta, Ol Jogi and other Northern Rangeland Trust member conservancies.

Recently, the super-cub has been particularly useful in conducting follow up to poaching incidents, stock-theft and road banditry. The aircraft is also an invaluable resource in locating missing rhino and spotting wildlife during the annual game count. Lewa's wildlife and security teams aim to locate every individual rhino each day and any lengthy disappearances sometimes indicate sickness or undiscovered poaching. This sets off all staff on high-alert. However, often, rhinos change territory due to emergence of young males who chase away the old ones or due to scarcity of pasture that is on the increase on Lewa as the Conservancy has reached its black ecological carrying capacity and needs to move some of these rhinos urgently. The ability to carry out aerial surveillance is one of Lewa's most important tools in protecting the rhino populations and combating insecurity. Without this tool, it would be impossible to provide the current high-level of wildlife protection and security responses that we currently enjoy.

Lewa recently acquired a MD 530 Helicopter which will greatly enhance response to the overwhelming poaching threat within the region, ease capture activities as well as facilitate more accurate game counts.

Over the reporting period, the total cost of operating the LWC Super Cub aircraft was **USD\$ 27,982**



Ranger Salaries

Lewa's rhino monitoring team is made up of **42** rangers that carefully monitor specific regions or "blocks" of the Conservancy. Recently in response to the escalating poaching threats, the Conservancy

has restructured its 18 blocks and reduced them to nine to increase the number of rangers in each block to four. This has ensured that the team now has a bigger presence and can conduct round the clock security on Lewa's rhino population. The rangers radio back to Lewa's operations room to report on the location of each rhino, as well as any unusual signs of human behavior or entry into the Conservancy. In previous years the block system was made up of 18 blocks, but the system has been adjusted to maximize efficiency and increase the daily protection of each animal.

Lewa's rangers are carefully trained and equipped to track the rhinos day and night. Using binoculars, they can identify each of the animals in their block based on age, ear-notching pattern, sex and behavior. In cases where the ranger teams are unable to locate an individual animal after three days, extra personnel are deployed in and around that rhino's usual range area. If the animal is still not found an aerial search is conducted, checking every corner of the Conservancy until it has been located.

The total cost to operate 42 rhino surveillance rangers patrolling the “blocks”, 21 gate guards, 11 night watchmen, two armory guards, five dog handlers, six radio operators, two wildlife capture men, and two orphaned animal handlers for this reporting period is **USD\$ 198,465**

Security Vehicles



The LWC security team has three main vehicles, one for regular rhino monitoring and the other two for the armed KPR teams. Additionally, the fence maintenance team has one tractor and a motorbike to transport personnel and materials to areas of the fence in need of repair.

As a result of the increased poaching threat, the security vehicles are driven round the clock, to monitor every member of LWC's rhino population. This level of mileage and overall wear and tear from constant usage on difficult terrain has taken a toll on these vehicles. While the Lewa workshop has done an excellent job of keeping these vehicles running safely and consistently, they will eventually need to be replaced.

AAZK's funding was used to support the running of these vehicles in 2013, total cost coming to **USD\$ 13,780.**

Radio Operation Room Communication Costs

Lewa's radio room is the linchpin of the Conservancy's security operations, providing a central point of communication for the entire region. Lewa's impressive communication unit manages all aircraft coming in and out of Lewa, as well as maintaining records of each rhino's specific movements. Most importantly, the communications' team plays a vital role in the community, where anyone can call in with tips of potential poaching plans or other threats. Through its radio communication LWC has been able to relay messages accurately and coordinate effective interventions for many security occurrences.

AAZK funding contributes to the costs of radio repairs, purchase of spare batteries, staff salaries and radio licensing. In 2013 the radio communications operation and intelligence network operations on LWC cost **USD \$ 11,463.**

Boundary Fence Maintenance

As drought continues to plague the region, LWC has increased its focus on minimizing human-wildlife conflict. In an effort to mitigate these problems we have been upgrading our boundary fence line to a predator-proof fence.

It is important to keep LWC's boundary fence well maintained to ensure the wildlife within our boundaries are safe and neighbouring community farmlands are not destroyed by wildlife. Proper fence maintenance leads to good community relations. Furthermore, due to increased threats from poachers, LWC has set up an additional security outpost which will significantly increase security on our southern border. Constant repairs and maintenance to the 147 kilometer boundary fence line are carried out on a daily basis. The fence department is manned by 24 fencers, including a trained repair team of four men.

The cost towards repair and the maintenance of the fence line inclusive of salaries, material costs, fuel, vehicle repair, and maintenance in 2012 amounted to **USD\$ 29,904.**

Total Expenditure towards Rhino Conservation Programmes

Under the LWC core rhino conservation operating budget costs that came to US\$ 1.01m for the reporting period, AAZK contributed significantly by donating **US\$ 197,449.73** towards this figure. These costs reflect the core function of LWC day to day work that specifically focuses on rhino conservation. AAZK's long term and continuous funding makes it a vital contributor to the success of LWC in its conservation initiatives. We are indebted by the support AAZK has been contributing to Lewa over the years; you have not only been partners but grown to be part and parcel of Lewa fraternity.

We are very pleased to be able to continue hosting the BFR annual winner's trip and also the honorary BFR winner's trip to LWC. It is fantastic to see the commitment of BFR members and we look forward to working with you long into the future.

We at LWC are grateful to AAZK and BFR for their continuous support.



Financial Report for Period, July 2012 to June 2013
Lewa Wildlife Conservancy
Submitted to American Association Of Zoo Keepers Bowling for Rhinos Program

Income

Funds received from AAZK BFR on 11 th August 2012	\$ 30,000
Funds received from AAZK BFR on 15 th September 2012	\$ 30,000
Funds received from AAZK BFR on 20 th October 2012	\$ 30,000
Funds received from AAZK BFR to November 2013	\$30,000
Funds received from AAZK BFR to December 2013	\$33,095
Funds received from AAZK BFR to March 2014	\$43,708
Total	\$196,804

Expenditure

AAZK contribution to salaries for KPR Anti-Poaching Team	\$41,250
AAZK contribution to boundary fence maintenance	\$15,584
AAZK contribution to Dog Section operational expenses	\$5,607
AAZK contribution to operating expenses for aerial Back-Up	\$14,583
AAZK contribution to Motor Vehicle running expenses	\$103,427
AAZK contribution to radio communication expenses	\$7,601
Total	\$196,804

Balance	Nil
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Note: AAZK contributed 49% of the total Rhino protection expenses incurred during the period

The total Expenditure incurred by LWC on Rhino protection during the period is as follows:

KPR Anti-Poaching Team	\$65,864
Dog Section	\$13,677
Aerial Back-Up-Super Cub	\$26,562
Ranger Salary	\$206,784
Boundary Fence	\$59,108
Motor Vehicle Running Cost	\$14,288
Radio Communication	\$10,459
Total Expenditure	\$396,743

Rhino Conservation: A Glass Half-Empty or Half-Full?

Bill Konstant, Program Officer
International Rhino Foundation
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The day may come when the world's rhinos are no longer under threat, but probably not for a very long time. Of the five rhino species, three are Critically Endangered according to the IUCN Red List of Threatened Species, another is Vulnerable, and only one is not considered threatened at this time, but could be if poaching continues at current levels or escalates. Looking at the conservation status of rhinos at the global level, is the glass half-empty or half-full?

The white rhino (*Ceratotherium simum*) is the most abundant of the five living species and is listed as Near Threatened by IUCN. Between 20,000 and 21,000 presently occur in 10 countries: the Republic of South Africa, Namibia, Kenya, Zimbabwe, Botswana, Swaziland, Uganda, Mozambique and Kenya. Almost all of these animals represent the southern subspecies (*C. s. simum*). Only a handful of the northern white rhino (*C. s. cottoni*) remain, two at the San Diego Zoo Safari Park, one at the Dvur Kralove Zoo in the Czech Republic, and four at the Ol Pejeta Conservancy in Kenya, the latter group representing the only potential reproductive unit. Captive populations of southern white rhinos currently number several hundred animals and are maintained worldwide.

Overall, wild white rhino populations have remained relatively stable and have actually increased slightly in recent years, even in the face of aggressive and sophisticated poaching, but the situation is almost certainly unsustainable over the long-term. The Republic of South Africa still holds the overwhelming bulk of the population, but is also the country hardest hit by the poaching crisis, with a current average of one rhino being lost every 7 hours to poachers. The slaughter and illegal trade are fueled by centuries of superstition, as well as by a rising demand for rhino horn in countries like Vietnam and China, where it is used in traditional medicine, as a supposed miracle cure for cancer, or purchased simply to convey social status. The highest priority for ensuring this species' survival is to step-up protection of wild and free-ranging populations, and for range country governments to enforce existing wildlife laws.

The black rhino (*Diceros bicornis*) is Critically Endangered and presently numbers just over five thousand animals in nine countries: the Republic of South Africa, Namibia, Kenya, Zimbabwe, Tanzania, Zambia, Malawi, Swaziland and Botswana. Three subspecies remain: the western black rhino (*D. b. bicornis*), with its stronghold in Namibia; the eastern black rhino (*D. b. michaeli*), with its stronghold in Kenya; and the southern black rhino (*D. b. minor*), with strongholds in the Republic of South Africa and Zimbabwe. More than 25 years ago, Zimbabwe's black rhino population was decreasing at an alarming rate from intense poaching. In response, in 1989, a group of concerned individuals in the US and Australia founded the International Black Rhino Foundation to help save this species in Zimbabwe. In 1993, recognizing that the crisis facing all five rhino species was not receiving the attention it deserved, the IBRF expanded its mission and became the International Rhino Foundation.

Black rhinos remain victims of heavy and sophisticated poaching activity, yet their numbers continue to slowly increase despite this ongoing threat. Normal reproduction appears to have offset mortality to some degree, and populations across the species' range have actually remained relatively stable or even increased thanks to staunch anti-poaching efforts. In Zimbabwe's Lowveld region, for example, translocations of animals from high risk to more secure areas, coupled with an intensive monitoring program, is responsible for saving hundreds of black rhinos. The highest priorities for safeguarding this

species are to bolster anti-poaching activities and to maintain intensive management of wild populations.

No more than two hundred black rhinos are currently maintained in captive breeding programs, representing the eastern and southern subspecies. IRF recently accepted responsibility for managing the latter, working both with AZA and private institutions.

The greater one-horned rhino (*Rhinoceros unicornis*) numbers more than 3,300 animals in India and Nepal, thanks to continued protection and reintroduction efforts, and is designated as Vulnerable on the IUCN Red List of Threatened Species. The wild population actually continues to increase despite renewed poaching pressure. The Indian state of Assam remains the stronghold for this species, with more than 2,400 rhinos found in Kaziranga, Manas and Orang National Parks, as well as the Pobitora Wildlife Sanctuary. Just over 250 individuals are also documented from protected areas in the states of Uttar Pradesh and West Bengal, and more than 500 greater one-horned rhinos remain in Nepal, the majority in Chitwan National Park. Approximately two hundred greater one-horned rhinos are currently maintained in coordinated managed breeding programs worldwide.

The principal recovery effort for this species is Indian Rhino Vision 2020 (IRV 2020), a joint initiative of IRF, India's Department of Environment and Forests, the Government of Assam, the Bodoland Territorial Council, WWF-India and the US Fish and Wildlife Service. Under the auspices of IRV 2020, rhino translocations from the Pobitora Wildlife Sanctuary and Kaziranga National Park have re-established the species in Manas National Park, where two dozen animals have been reintroduced and breeding has recently occurred. Poaching remains a threat, however, especially in Kaziranga National Park during the seasonal monsoons. Plans for additional moves have been put on hold until a full assessment of security measures is completed and actions to improve protection are put in place. In the interim, planning continues for eventual reintroductions to Assam's Laokhowa Wildlife Sanctuary.

Rhino specialists now believe that as few as 100 Sumatran rhinos (*Dicerorhinus sumatrensis*) may survive as fragmented populations in Indonesia's Bukit Barisan Selatan, Gunung Leuser and Way Kambas National Parks, as well as in tiny, unprotected forests of Sabah, Malaysia. This recent estimate reflects the loss of former populations in India, Bangladesh, Myanmar, Thailand and Peninsular Malaysia, declining numbers in Malaysian Borneo, and the lack of reliable population estimates from northern Sumatra. Sumatran animals represent *D. s. sumatrensis*, while remnant populations of Malaysian Borneo represent *D. s. harrisoni*. Based on all of the above, IUCN lists the Sumatran rhino as Critically Endangered, and many regard it as the most threatened of the world's rhinos due to its continuing decline. In addition, experts agree that *D. s. harrisoni* is a non-viable taxon and its remaining population(s) should be managed jointly with *D. s. sumatrensis* as a meta-population.

Sumatran rhino populations in Bukit Barisan Selatan and Way Kambas are safeguarded by Indonesia's Ministry of Forestry and Rhino Protection Units (RPUs) co-managed by IRF and its local partner, Yayasan Badak Indonesia (YABI). The RPU programs in both protected benefit significantly from annual support provided by the American Association of Zookeepers through Bowling for Rhinos and other fundraising events. Three managed breeding facilities in Indonesia, Malaysia and the United currently maintain a total of 10 Sumatran rhinos. Four of these animals are captive born: Andalas, Suci and Harapan at the Cincinnati Zoo and Botanical garden, and Andatu at the Sumatran Rhino Sanctuary.

The Javan rhino (*Rhinoceros sondaicus*) now survives only in Indonesia's Ujung Kulon National Park. The estimated population is between 35-44 individuals and may have stabilized, but the species remains Critically Endangered. There are no Javan rhinos in captivity. Historically, the species probably occurred in nine other countries - India, Bangladesh, Myanmar, Laos, Thailand, Malaysia, Cambodia, China and Vietnam – but the last individual recorded outside Indonesia was killed by poachers in Vietnam in 2010. Population estimates for Ujung Kulon National Park are based on field observations by Rhino Protection Units (RPUs), ground surveys, and data from video camera-trap research. There has been no known rhino poaching since RPUs were established in the late 1990s.

The last remaining Javan rhinos require round-the-clock protection and more suitable habitat. A significant portion of Ujung Kulon National Park is dominated by an invasive palm (*Arenga obtusifolia*), not one of the more than three hundred plants Javan rhinos are known to eat. Approximately 100 acres of experimental plots have now been cleared of invasive palms by local workers, among them people who previously lived illegally within the park's borders. New plants appearing from dormant seeds, runners and roots can reach chest height in only a matter of months, and more than 90% of the recolonizing species are rhino food plants. In the years ahead, these efforts should help increase Javan rhino numbers in Ujung Kulon so that a second, insurance population can be established. The prospects are not very good for doing so elsewhere in Java, so the next step is to search for suitable translocation sites in the species' historic range.

In summary, the overall conservation status of the world's rhinos is mixed. The white rhino outnumbers all the rest combined, but currently bears the brunt of the poaching pressure. Black and greater one-horned rhino populations are slowly recovering from historic lows and continue to increase despite record poaching levels. Sumatran rhinos are in steep decline, except where effective protection programs are in place. And Javan rhino numbers, although incredibly low, have remained relatively stable for nearly half a century. Considering all of the above, IRF regards the glass as being half full when contemplating the future for the world's rhinos. Effective programs have been put in place or being initiated. Support for these programs will spell difference between extinction and survival for all five rhino species.

Action for Cheetahs in Kenya: Community focus in the Meibae Conservancy

Mary Wykstra
Action for Cheetahs Director / Principle Investigator

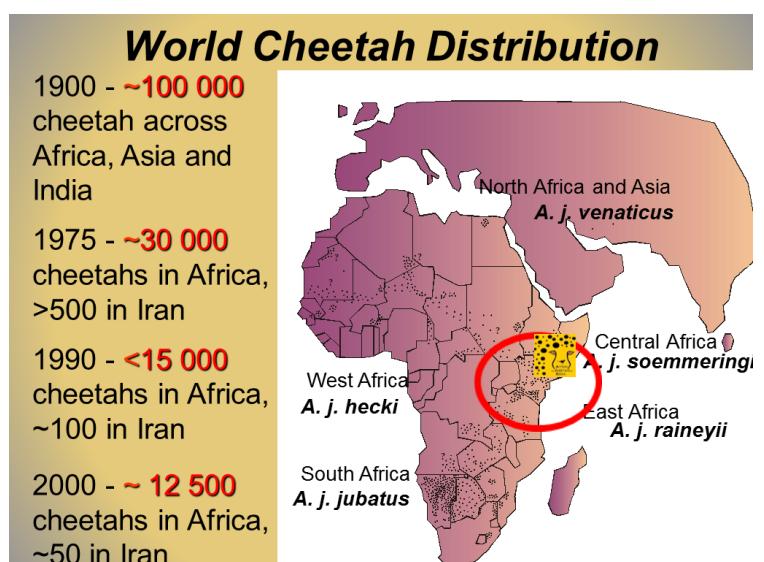
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Abstract: Action for Cheetahs in Kenya (ACK) is focused on cheetah ecology in the Meibae Conservancy. Three field officers investigate livestock losses to predators, assist with finding livestock lost in the field and assist with boma (corral) improvements to protect against night time livestock loss. Habitat monitoring includes daily patrols and weekly walking transects. Data collected from monitoring and community networking is used to develop education campaigns for schools and community meetings. Our efficiency was greatly improved through the purchase of a motorcycle for our head field officer. ACK and the Meibae Conservancy organized a stakeholders meeting to link conservation and natural resource management projects, and improve relationships between researchers and the community. Bowling for Rhino's funds are focused on the community aspect of ACK work in Meibae allowing other grants to focus on research aspects including fecal detection dog training, hormone and genetic studies, habitat monitoring and camera trapping.

ACK Mission: Promote the conservation of cheetahs through research, awareness and community participation in Kenya

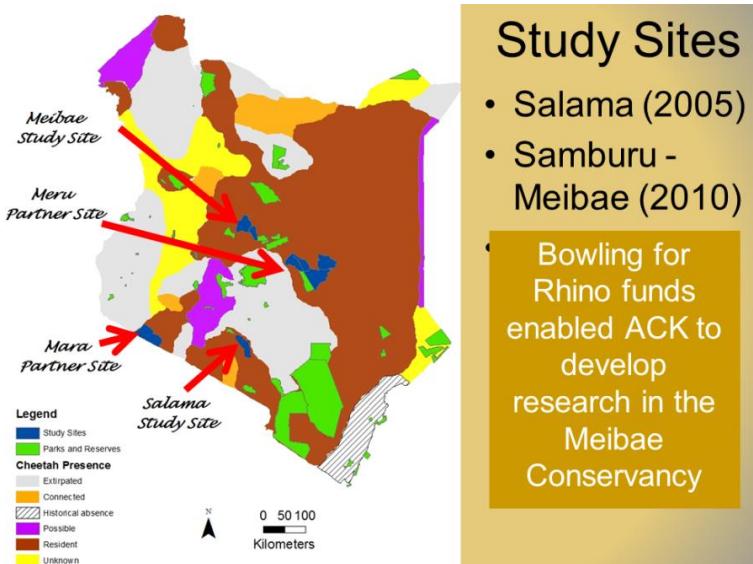
While the research side of conservation is important for decision making and project implementation... it is the community tolerance and understanding of predators that will allow cheetahs to survive for future generations.

Throughout the cheetah's home range it is vulnerable to the threats that lead to wildlife population decline. While Namibia has the strongest population estimated at around 3000 – Kenya is the central population to the whole of eastern Africa. We estimate the Kenya population to be 1200-1400 based on studies completed in 2007. The trans-boundary issues with neighboring Tanzania, Uganda, Ethiopia, South Sudan and Somalia create a contiguous population facing similar threats. Land settlement causes fragmentation to wildlife populations is the most critical issue facing the future of the cheetah.



The cheetah is a charismatic species, often used as an icon for speed and elegance. But the future of the cheetah is threatened by land fragmentation, loss of critical habitat and conflict with people. As with

most predators, the conflict over resources and space results in decline of the species. IUCN category I and vulnerable CITES. In 2013, IUCN recognized the significance of illegal cub trade in the **Conference of the Parties** meeting in Thailand stating that studies should “aim to determine the source of cheetahs in illegal trade.” The very characteristics that make the cheetah a popular icon are the characteristics that make it vulnerable. It is a specialized hunter with characteristics that are unique to the cheetah in comparison to other predators.



Completion of the National Survey in 2007 gave us an overview of the cheetah distribution and enabled us to work with KWS to identify critical areas for detailed cheetah conservation studies. Our Salama project has linked with the neighboring Athi-Kapiti ecosystem to better understand the corridor between the Nairobi environs and the Amboseli ecosystem. This area is under rapid land change (settlement, development) threatening the survival of the cheetahs in this unique ecosystem. Similar land fragmentation in northern arid lands is occurring at an alarming rate as climate change and settlement occurs around the nationally

protected areas. The Meibae Conservancy is a part of the Northern Rangelands Trust and is a vital location for cheetahs in the region. Land use change is the greatest challenge to conservation. Increasing human population, poverty and the transition of traditional and modern farming practices cause deforestation, erosion and conflict for resources between communities and with the wildlife.

ACK staff is hired from within the community. They live and work from their homes, allowing them to continue managing their own farms while integrating data collection and patrols into their lifestyles. Cosmas Wambua, the senior scientist, develops the training materials and forms, maintains the data base, and works with students and volunteers to assure consistency in data collection. Data analysis provides us with information and solutions to bring back to the community and the planning tables. A well-trained staff allows ACK administration to spend time lobbying for policy change, writing grants and publications to share information with authorities, the general public, and the scientific community. Salaries account for 30% of annual Samburu expenses.





Our research is goal oriented by first understanding the problems encountered by people living with wildlife; we develop research methods and share our findings with local communities, Kenya Wildlife Service, agriculture and livestock partners, and other experts. Through stakeholder involvement we find alternative solutions to wildlife and resource conflicts. The primary focus of academic research is in gaining understanding of cheetah health and adaptations to the changing land use. The use of radio telemetry provides the most detailed information on cheetah movements and proximity to people. To date, we have learned that cheetahs both inside and outside of parks have long distance

movements on the darkest nights – unusual for cheetahs because their eyes are adapted for daytime sight. Camera trapping evaluates presence of cheetahs and other predators and the methods that can be used for cheetah capture and radio collaring. Results from our 2012 camera trap study have given us the direction to use a robotic goat in both capture for telemetry and for non-invasive camera trap studies to avoid capture of non-target species. Cheetah fecal studies involve collection and analysis of cheetah poop to identify cheetah prey selection, stress levels and genetic relationships. 50% of our annual budget is spent on research equipment, data collection materials, and vehicle and facility maintenance.

Game counts provide information on land changes and prey base that is available. There is a critical relationship between cheetah, the dikdik (representing sustained prey base) and the scrub ecosystem. As land is being settled both the land owner and illegal harvesters taking advantage of lack of security are reducing the land cover available to both prey and predator. We typically think of the predator as the species that drives the balance of nature, but science shows that it is the presence of the dikdik that drives ecosystem stability in an undisturbed system. In a human dominated landscape, the loss of 50% of the land cover will change the ability of the dikdik to survive and will thus devastate the predator population – particularly the cheetah and wild dog.

It is not just the settlement and land changes from the farming perspective, but the network of roads that are affecting Kenya's wildlife. As a wide ranging species cheetahs are difficult to study. Dirt roads allow us to conduct track (spoor) evaluations when traffic is low. But as traffic and settlement increase, this non-invasive survey method becomes impossible. Eventually dirt roads are replaced with pavement and increased traffic results in higher speeds, unrestricted driving and highway mortality. This year in the Salama study area we lost nine cheetahs to highway accidents along the Mombasa Highway. Between 2005-11 we lost twelve in total, and in the Samburu study area, where roads are just beginning to be paved, the loss of cheetah has been at least one per year since we began documenting it in 2007.



Road loss to predators is high due to blinding lights coming at high speeds. Lion, leopard, serval and hyena are regular mortalities in both the Salama and Samburu study sites.



Highway accidents leave the cheetah population with reduced genetics, orphans and unstable populations. At the IUCN conference this year it was internationally recognized that the illegal cheetah cub trade has reached a disturbing level. Cubs are primarily taken to Arab countries and we are uncertain if they are originating in Kenya or being moved through Kenya to Somalia where the trade route is passing. Within Kenya there is a growing number of private people also believing that an abandoned cub should be picked up and raised for future release – this has been proven to be impossible due to imprinting. Currently there is a severe overabundance of orphan cubs in legal KWS holding facilities resulting in poor care. With no ability to export out of Kenya, the only solution is improvements or development of facilities in Kenya combined with efforts to reduce mortalities and cub trade.

Education and information sharing is the backbone of our work within the community. While school presentations and activities promote conservation ethics in our future leaders we also engage the out-of-school youth and the adults through community meetings, stakeholder workshops, sporting events and community development projects. 20% of BFR funds are spent on meetings, presentation materials and community events.

Involving the community and partners in research and development through management planning is essential for conservation success. The lack of control on illegal pet and part trade is closely linked to insecurity of the people. This link is encompassed in the programs developed within the Northern Rangeland Trust. Testimonials in public presentations and popular media have become a strong means of distributing conservation success stories. Conservation of the cheetah ecosystem not only promotes positive attitudes towards predators, but also encompasses the prey species and the mega-vertebrates. Elephant, rhino and lion are present in 90% of the areas of cheetah presence. Conservation of the cheetah is protection of the habitat that supports the other species.



FINANCIAL REPORT

The primary source of income for ACK activities in the Samburu study site is from Bowling for Rhinos. Without the BFR funding predator conservation efforts in this region would suffer. Funding through zoo grants and AAZK chapters support the long-term conservation efforts and other regions of ACK focus.

Students and volunteers are self-funded or utilize funds through joint grants. Below is the income and expense for 2013 - 2013 for the Samburu project. The full operational budget for ACK in 2012 was \$127,000. The Samburu portion of the work in 2012 accounted for 8% of the total ACK budget.

INCOME 2012-2013

<u>Opening Balance 2012:</u>	\$ 1300.00
<u>Received BFR 2012:</u>	\$ 8593.00
<u>Received BFR 2013:</u>	\$13707.00
Total Available:	\$23,600.00

Expenses 2012 (January – December)

<u>Meibae Conservancy Fee</u>	\$1000.00
<u>Scout and Ranger Salaries and Stipend and training</u>	\$2963.00
<u>Transport</u>	\$4572.00
<u>Accommodation, Food</u>	\$1122.00
<u>Office Equipment and Supplies</u>	\$ 127.00
TOTAL Expenses 2012	\$9657.00

Expenses 2013 (January – June)

<u>Meibae Conservancy Fee</u>	\$1000.00
<u>Field Officer Stipend and training</u>	\$2100.00
<u>Transport (Fuel, Insurance, Public service)</u>	\$2476.00
<u>Accommodation (Camping fees, lodging, food)</u>	\$ 545.00
<u>Office Equipment and Supplies</u>	\$ 250.00
<u>Motorcycle Purchase, Insurance</u>	\$1200.00
TO DATE Expenses 2013	\$7571.00

Balance remaining for 2013 - \$6372.00

PROJECT GOALS AND ACTIVITIES 2013-14

The following goals will be achieved for two study areas by ACK staff. Links with Masai Mara, Meru and Athi-Kapiti area researchers will allow comparisons to cheetahs in other regions of Kenya, and will enable pilot projects to be used to launch into a national survey.

Goal 1: Identify factors affecting cheetah livestock predation and mitigate conflict.

a. Prey Distribution and Abundance: The availability of prey can be directly linked to the level of livestock predation by cheetahs (Ogada, Woodroffe et al. 2003), thus it is important to understand prey availability when conducting a programme aimed at conflict mitigation. Prey distribution is sampled using game counts in each study area and mapped using ARCGIS. Prey density and abundance is calculated using DISTANCE software. These counts are compared to past publications and on-going studies to evaluate trends of prey populations over time. Cheetah prey selection is determined through faecal hair analysis and will provide insights into the adaptations of the cheetah to human settlement as well as the level of domestic stock consumed by the cheetahs.

b. Human Settlement Pattern: The largest threat to predators in Kenya is land use changes and conflict for resources (IUCN/SSC 2007), thus understanding the relationship between these two factors will assist in conflict mitigation planning. Using maps of human settlement, vegetation, permanent and seasonal water sources combined with camera trap surveys identify key cheetah passageways and

determine the sustainable management requirements to maintain the corridors. Human settlement and areas of human use (severe-high, medium, and moderate) will be analysed using ARCGIS buffer tools and compared to past studies and publications.

c. *Evaluate Livestock Depredation:* Conflict with local people, particularly over livestock depredation, is a major cause of the global decline of large carnivores (Ogada, Woodroffe et al. 2003), thus understanding the issues affecting livestock depredation assists in conflict mitigation. Conflict incidents are confirmed via immediate verification and interviews by Cheetah Field Officers to evaluate conflict circumstances by investigating herd size, livestock husbandry, and level of protection against loss to carnivores. Interviews are used to evaluate the effectiveness of our communication and materials in preventing livestock loss. Mitigation efforts include herder training, boma reinforcement and livestock health improvements.

Goal 2) To understand cheetah health and habitat selection

Understanding cheetah movement and habitat selection will assist in conservation management in habitats where cheetahs and people coexist.

a. *Monitor cheetah presence and movements through observation:* Monitoring methods include direct observations, camera trapping, spoor counting and verification of public sighting reports. Cheetah Scouts collect cheetah-sighting reports and verify predator spoor. Data is entered into an Excel database and mapped using ArcGIS for analysis and comparison annual and seasonal cheetah movements. Camera trap transects in 2014 will verify cheetah corridor use and will provide positive ID for individual cheetahs in both the Salama and Samburu study areas.

b. *Monitor cheetah movement using GPS collars:* While there are several monitoring methods that provide information on the movements of cheetahs, the method that provides greatest coverage of an entire range is through radio collaring (Wykstra 2004). Further testing of the robotic goat and camera transects will be done in 2013-2014.

c. *Determine habitat use of cheetahs in relation to vegetation and prey:* Cheetahs are known to occupy a wide range of habitats including woodland or bush land savannah (Myers 1975; Frame and Frame 1977 ; Hamilton 1981). Carnivores are susceptible to changes in landscape such as roads, fences, cultivation, and housing (Sunquist and Sunquist 2001). The scat-detection dog locates faecal samples in each study site. Fecal samples are used to identify prey species preference and evaluate stress hormone (glucocorticoid) levels. Cheetah movement data is overlaid into data from human settlement, prey monitoring, and conflict maps. Prey hair is isolated and identified using method documented by Marker (Marker, Muntifering et al. 2003) and Keogh (Keogh 1983) respectively. Glucocorticoid analysis will be calibrated through this project in collaboration with the Smithsonian Conservation Biology Institute to develop laboratory capacity for glucocorticoid analysis in Kenya. DNA analysis will be piloted during the 2013 study in preparation for a national survey anticipated in 2014-2016. DNA analysis will be conducted at the new KWS forensic laboratory in Nairobi. A better understanding of prey selection and cheetah health will assist with cheetah conservation management decisions.

Goal 3: Influence public and administrative changes to positively affect cheetah conservation and management protocols.

a. *Conduct community programs to disseminate findings, promote conservation awareness, and improve livestock management techniques (public meetings called baraza):* Results from recent interviews in Salama showed that higher general education did not lead to higher tolerance for wildlife, but the level exposure to conservation education materials and community information meetings resulted in positive

attitudes towards living with predators (D'Udine 2009). Monthly community meetings (baraza) are held to discuss information about carnivore conservation. KWS and local administration attend the meetings and ACK awards community members with "Conservation Hero" certificates.

b. *Raise environmental awareness through partnerships and internal education programmes for communities and schools:* Education programmes instil a conservation ethic and reduce misconceptions about cheetahs. School programmes include video, puppet and poster presentations showing that targeted presentations even with low technology are highly effective in children's retention of the conservation message.

c. *Encourage sustainable community development through programmes including micro-financing, training and development of cooperative resource marketing:* Biodiversity conservation must be fully integrated into strategies for economic development and is essential for sustainable livelihoods at a local scale (Lyra-Jorge, Ribeiro et al. 2010). Conservation Measures Partnership (CMP) provides focus on issues of environment and social responsibility, and allows us to measure our effectiveness in achieving our goals. Community projects in bee keeping, livestock management, community crafts and natural resource management are a strong aspect of ACK work within the ecosystem.

d. *Establish cheetah conservation protocol and the policy in collaboration with KWS and local stakeholders:* KWS and local administrative offices hold the power of prescription that guide procedures within the human-wildlife interface, thus the knowledge they receive assist in their decisions and actions. ACK provides quarterly updates to KWS and we present our research findings at an annual Carnivore Action Forum meeting. We submit updates to the National and Regional Wild Dog and Cheetah Strategic Plans to assist in the framework of cheetah conservation. Printed materials and digital submissions through our web site create awareness of activities and findings.

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Bowling for Rhinos Conservation Resource Fund

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Since 2010 the Bowling for Rhinos Conservation Resource Fund has been made available on an annual basis to projects dedicated to rhino conservation. In the past four years, this fund has contributed \$9,304.92 to conservation of both Asian and African rhino species. In 2013, \$3426.22 was granted to RhiNOremedy to fund an educational outreach program to curb the demand for rhino horn in China. This segment of the panel discussion will provide a brief overview of the fund, including operational procedures and summaries of the projects supported.



A New Approach to Teamwork at Denver Zoo's Toyota Elephant Passage

**Molly Kainuma and Mike Murray
Toyota Elephant Passage Zookeepers**

Abstract

In June 2012, Denver Zoo opened the 10 acre Toyota Elephant Passage (TEP) exhibit, a state of the art facility dedicated to environmental sustainability and innovative animal care for 13 Asian species ranging from elephants to eyelash frogs. With this new addition came the opportunity to form a completely new team within the animal department and the chance to implement a new strategy for teamwork. This approach began with the management's vision to create an all-inclusive, collaborative framework, where all team members are on equal ground. Beginning with the hiring process and continuing on to empower every keeper to become valued contributors, the TEP team ultimately became a diverse group of individuals with complimentary degrees of experience, strengths, and backgrounds. Our team leaders made a commitment to transparency and communication. We developed a code of conduct together, participated in numerous professional development opportunities, and were empowered to take on leadership roles. We are expected to commit ourselves to individual and team goals, and even peer review each other throughout the year. This is an overview of the process of forming a team from the keeper perspective, that was very unique not only to Denver Zoo, but in the zoo community as a whole. This unified approach has facilitated a strong commitment from teammates to overcome challenges and accomplish difficult tasks.

Introduction

Toyota Elephant Passage opened to the public on June 1st, 2012. Denver Zoo guests were eager to see the Asian elephants in their new home (the former elephant habitat was over sixty years old) along with greater one-horned rhinos, Malayan tapirs, clouded leopards, Asian small-clawed otters, fishing cats, white-cheeked gibbons, and a variety of reptiles and amphibians. The innovative design allows the elephants, tapirs, and rhinos to rotate through five large outdoor yards and demonstrate a variety of natural behaviors. The exhibit also tells the unique conservation story of all of the exhibits' inhabitants and how the public is helping global conservation programs just by visiting. The spirit of the exhibit is not the innovative design, the endangered animals, or the vital conservation programs the exhibit supports; it is the 19 animal care professionals that work together daily to provide the highest possible care for the animals, create eye-opening guest experiences, and support critical *in-situ* and *ex-situ* conservation programs.

Exhibit Overview

The 10 acre area is arranged in three immersive sections that are themed to merge Southeast Asia's culture with Denver Zoo's animal messaging. More than two miles of trail connect five large, rotational habitats which encourages exercise and flexibility. Mud wallows, scratching trees, shade structures, three animal crossings, and more than one million gallons of water for swimming and bathing have been developed to ensure active and healthy animals. The holding facilities are also designed to provide comfort and exceptional care. The layout of the elephant house was built to accommodate up to 8 bull elephants, and includes large stalls with sand substrate, an elephant-operated shower, and working walls for medical care. Both the rhino/tapir indoor night quarters and the elephant house have veterinary care systems that are used to stabilize animals for medical procedures.

The exhibit recently received LEED Platinum certification from the U.S. Green Building Council and contributed to the AZA ranking Denver Zoo as the greenest zoo in the country. Helping Denver earn this award is not only the exhibit design and construction, but also the launch of a new waste-to-energy system which we anticipate will convert 90 percent of the zoo's total waste stream into clean energy. The zoo reached its goal with the use of renewable energy, recycled water, reused materials, natural daylight and ventilation, efficient heating and cooling systems, and other green design and construction practices.

Successfully operating and maintaining this vast exhibit on a daily basis requires a small army of dedicated staff members. This would not be possible without strong relationships and a high level of trust and accountability amongst these individuals. The animal care team at Toyota Elephant Passage shoulders much of this responsibility and is unique from many other animal teams in the zoo industry in how the team formed, how it operates, and the unique challenges the team faces.

Forming the Team

The Toyota Elephant Passage (TEP) department became its own team at Denver Zoo on August 1, 2011. Formerly, the keepers that cared for the elephants, rhinos, tapirs, and hippos worked in the Large Mammal department, which also included Denver Zoo's hoofstock collection and the Predator Ridge (lions, hyenas, and African wild dogs) collection. The size and complexity of the new exhibit required TEP to be its own department and separate from the Large Mammal team. Additionally, the exhibit was built to house up to 12 elephants, which requires an extraordinary amount of energy without even considering the remainder of the TEP collection. From the beginning, the TEP team required teammates to trust and rely on one another to build a positive work environment that achieved the large "to-do" list that needed to be completed before the exhibit opened.

Dale Leeds, Curator of Toyota Elephant Passage, and Becca McCloskey, Assistant Curator of Toyota Elephant Passage, immediately set a precedent on how the team would function. They set guidelines for the keepers on what the department would look like. There would be no elephant manager working on a daily basis with the elephant team (Dale Leeds holds this title), there would be no section/lead keepers, and everyone would work as equals to accomplish the goals of the exhibit. All animal management decisions would take a collaborative approach between the keeper, management, and veterinary teams. Our curators set out to hire individuals that had varied experiences and, above all, would be positive contributors to the team.

This foundation created a group with varied strengths, making every zookeeper a teacher and student to one another. All sixteen keepers that were hired exhibit various attributes that compliment the goals of the department. In addition to hiring people with strong backgrounds in elephant and rhino husbandry, zookeepers were hired based on their operant conditioning and behavior management skills, primate experience (managing apes is not unlike managing elephants), and working in collaborative team environments. The team learned to rely on each other and the various strengths they brought.

Team goals would be the driving force behind all of our operations. The first major goal was shipping all of the new animals in to TEP which included thirteen animal transfers from other institutions and five animal transfers within Denver Zoo grounds. We also had to manage the quarantine periods for these animals, design the behavior programs, introduce them to the exhibits, design public demonstrations, and the list goes on. Additionally, Denver Zoo's AZA accreditation visit (including all new elephant accreditation standards)



happened three weeks after the exhibit opened. These two activities set our goals for the team but there were other goals we set for ourselves.

Early on we developed a code of conduct for the team that would help us work as a cohesive unit. This is a collaborative process in which the team decides on specific behaviors they wish to see from their teammates (example: positive attitudes and addressing conflict openly and professionally). The code of conduct was signed by the keepers and managers within the division and it became part of our job description (See Appendix A).

Moving forward, goal-setting became part of our culture. Currently, we are trying to strengthen our behavior programs with keeper-led training meetings, improve our guest experience by increasing our quality and quantity of demonstrations, and maintain relationships with other departments. We as a team have built the foundation to become a high performing entity.

Team Operations

The team is composed of 16 zookeepers that operate within three subgroups; Elephants, Rhinos, and Village Hall. Every team member has been given the opportunity to cross-train in all other sections. Each subgroup has regular meeting and all team-members are invited and encouraged to attend and problem-solve. These meetings allow us to set goals and come together to discuss important topics.

We created Standard Operating Guidelines (SOG's) for each species in our care. These documents determined how we wanted to see our department operate. Because of the overlap and rotational aspect to our exhibit, this required collaboration from the entire team. Many of these guidelines were set by the keepers themselves, with management support and keeper input. We wrote these guidelines together, editing and amending along the way. These guidelines are living documents that we periodically revisit and amend as our exhibits evolve.

In order to streamline the communication process and provide individuals with leadership roles, a 'point person' position was created for each section. These positions are on a volunteer basis, but the expectation is that everyone on the team will take their turn. The term of this position is rotated quarterly and is tasked with scheduling team meetings, note-taking, tracking updates, and relaying information between the team and management staff. Our team relies heavily on email and written documentation to stay on track, so having a point of contact helps to simplify daily operations and share responsibilities.

To evaluate our progress and effectiveness as a team, we implemented our own peer review program. This was a unique initiative taken on by our team and hadn't been done in other departments to our knowledge. These evaluations are compiled on a yearly basis and structured to provide specific feedback on team goals and elements of our Code of Conduct. They are designed as a way for our team to anonymously give feedback on individual performance, recognize achievements, and suggest areas for improvement. The questions are also structured to mirror the goals of our yearly Employee Performance Cycle (EPC) that is our zoo-wide evaluation program. Our peer reviews are strategically done mid-year so that we can compile the information and have the remainder of the year to make improvements if necessary. Individuals are rated on a scale from 1-5



for specific questions and are encouraged to give specific, concrete examples of good or bad behaviors.

In addition to these evaluations, each department within the entire zoo was tasked with completing a DiSC survey. The DiSC program is a personal assessment tool designed to improve work productivity, teamwork, and communication. It is designed to be a non-judgmental way to discuss individual behavior patterns, differences, and personality traits. The goal is to increase your self-knowledge: how you respond to conflict, what motivates you, what causes you stress and how you solve problems. It teaches the skills to adapt your own style to get along better with others, fosters constructive and creative group interactions, facilitates better teamwork, and minimizes conflict. It is also designed to give managers the skills to be more effective in how they deal with their employees. This assessment, paired with our previously completed Myers-Briggs Type Indicator (MBTI) surveys, proved to be a valuable asset.

Challenges with Outcomes

There is no recipe for a perfect team. Naturally, conflicts arise and opinions clash. We knew this would happen, but our team has made a commitment to face these differences head on and resolve them professionally. It isn't always easy or comfortable, but the end result is respect, maturity, and pride in the way we deal with difficult situations. This will continue to be an ever-changing process as we move forward through inevitable staff changes and fluctuations. There is always room for improvement.

From the animal management perspective, brainstorming and trouble-shooting sessions continue to be a significant part of our weekly routines as the animals and people alike adjust to their new surroundings. Some of these challenges include the transfer of 1.1 Black Rhinos to the old elephant habitat, the complicated birth of our first baby Malayan tapir, and acclimating our female GOH Rhino, clouded Leopards, and gibbons to their new environments. While many animals adjusted immediately, others required much more focus on behavior management techniques. We continue to adapt our husbandry techniques to suit the individual animals' needs and provide an exceptional guest experience. We work closely with our Behavior Husbandry Curator to discuss and evaluate our training techniques and many times we need to make adjustments in order to make the exhibit work for the animals. Even though each of these challenges had a primary group of keepers working directly on each issue, it ultimately took buy in and the willingness of the entire team to make adjustments in order to reach our goals together.

Denver Zoo's elephant program has undergone an extraordinary amount of changes in the past year. We went to restricted contact elephant management in April of 2011, moved into a new elephant facility, acquired 4 new elephants, lost 1 elephant, hired five new elephant keepers, developed all new training strategies (transition from unrestricted management to restricted management based on positive reinforcement training) and trainer integration policies, went through AZA accreditation, developed a new public demonstration in a new amphitheatre, imported a young bull elephant from Europe, and introduced all of the elephants to a rotational exhibit. This paper is not to outline each of



these challenges but to highlight that we accomplished all of these tasks as a team. This collaborative approach meant weekly elephant management meetings with our managers and sometimes the veterinary staff. It is important that the opinions of each team member was heard and taken into consideration. This process was sometimes difficult and created conflict within the team but the end result was an environment where everyone works together on common vision for elephant care.

Conclusion

The TEP management staff encourages keeper staff growth by recognizing the importance of professional development opportunities. They have committed to creating space in our budget to provide these to all TEP team members. Every keeper has participated in conferences, workshops, keeper exchanges, AZA courses, or served on committees which have all contributed to the knowledge base and advancement of our animal husbandry techniques. Aligned with Denver Zoo's mission, many team members have also been fortunate to travel and participate in global conservation efforts that include work in Nepal, Vietnam, and Thailand. Their work is directly involved with wild species that our also in our care at the zoo. These real-life experiences and efforts link Denver Zoo's mission and core values with Toyota Elephant Passage's conservation messaging. We strive to make these elements key learning outcomes of our daily public demonstrations.

The scope of the Toyota Elephant Passage exhibit and the goals of the animal care team have come together to provide an innovative and inspiring exhibit for our guests, an enriched environment for our animals, and a rewarding working environment for staff.

Acknowledgments

We'd like to thank Dale Leeds, Becca McCloskey, Emily Insalaco, Brian Aucone, and the entire Toyota Elephant Passage zookeeper staff for all their hard work and dedication.

Appendix A – Toyota Elephant Passage Team Code of Conduct

- Create a culture of safety
- Assume good intent
- Have good intent
- Be professional
- Be positive, look for the good
- Participate in meetings. your opinion is valid and necessary
- Trust and respect your teammates
- Offer help, request help
- Communicate in an open and timely manner



- Respect your conflicts; approach them directly
- Don't make assumptions about people
- Don't make assumptions about animals
- Keep an open mind/brace diversity
- Celebrate others' successes, support failures
- Hold yourself and others accountable, own your weaknesses
- HAVE FUN



Using Ethograms to Develop Research Skills in Students

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Teaching primary and secondary school students how to conduct their own research is a mainstay of curriculum standards for K-12 education. More and more, teachers are looking for ways to incorporate lessons that develop research skills while taking their classrooms outdoors into more ‘natural’ settings. Outdoor science lessons increase student confidence and learning while also helping students to positively experience and study nature (Carrier, 2009; Cronin-Jones, 2000). Ethology, the study of animal behavior, offers an excellent method to frame such outdoor science lessons: the ethogram. Ethograms are valuable tools for both behaviorists and educators, and are used to record types of behavior in individual, or groups of, animals, quantifying these behaviors for later analysis. Ethograms can be a valuable tool for educators or keeper/educators to take their programs outside and use guided inquiry to develop observation and research skills in young scientists, right on zoo or aquarium grounds.

Why Use an Ethogram to Teach Research Methods?

Students of any age can use an ethogram to observe and record behaviors, making this an ideal tool for all types of young researchers. Because ethograms involve a predetermined list of possible behaviors an animal may exhibit, student researchers can easily record, and later analyze, displayed behaviors on their own datasheets. Ethograms can also be tailored to age and skill levels; young students can work from a limited list of behaviors to develop their general observation skills, while older students can work from a more specific/detailed list, or develop their own behavior lists if time allows. Thorough ethogram use requires accuracy and attention to detail at any age, building student skill and knowledge for all participants. Regardless of student age, a well-designed ethogram data sheet will guide students in appropriately categorizing behaviors during their research. Additionally, introducing students to the concept of ethograms with a live program animal can be helpful by analyzing real behaviors and recording them together. Finally, using existing ethograms that are actually used by zoo staff will make this experience more authentic for students and potentially save background planning as well as possibly contribute to active research at the zoo. This is also an activity many of us would have been eager to try as students ourselves!

How to Guide Open Inquiry

Determining what students want to study may be difficult, but with guidance effective projects can be carried out in small amounts of time. A brief description of a typical ethogram-based program may help outline tasks and goals as needed when designing your program (**Table 1**). Start by going on a ‘Reconnaissance Mission’ (*see Casual Sampling, in Table 2*) in the zoo to develop possible research questions with students. Have your group note the difference between *watching* and *observing*. *Watching* just requires looking at the animals, while *observing* involves analyzing what they’re doing (Lehner, 1998). Having students keep even a one-page ‘field journal’ for their research to jot notes in while developing their questions is helpful. Encourage them to take notes on things that may influence behaviors, like environmental features. There are many options for open-inquiry research questions in a zoo, so guide students to think about what animals they like and what they might be interested in finding out after completing their initial observations. Animals, like people, may exhibit preferences as individuals (Bowen & Arsenault, 2008), so honing in on the underlying reasoning for those preferences, such as predator avoidance, environmental preferences, or access to resources, may narrow their interest into good research questions.

Table 1: The Ethogram Field Trip Format
A skeletal outline of a typical school ethogram program

<i>Description</i>	<i>Details</i>
Pre-Trip or Program Introduction	
1. Introduce students to comparative questions	1.1 Start with a pre-trip discussion in an outreach program, send materials to the teacher ahead of time, or cover in a lecture-style introduction.
2. Introduce program concepts	2.1 Define concepts such as <i>inquiry</i> , <i>ethology</i> , and <i>ethograms</i> , with examples.
During the Program	
1. Provide example behavior list	1.1 Provide, or have students develop, a behavior list including categories such as <i>Maintenance</i> , <i>Locomotive</i> , or <i>Social</i> . Help students properly and consistently identify behaviors to avoid confusion or duplication.
2. Reconnaissance expedition around zoo	2.1 Give students some reconnaissance time with the task of formulating their comparative questions.
3. Describe ethogram types	3.1 Explain different methods of ethogram sampling (Table 2)
4. Develop research questions	4.1 Develop comparative questions. Encourage <i>focal sampling</i> over <i>group sampling</i> , especially for younger students.
5. Allow time for sampling	5.1 Students should understand their time constraints and be allowed sampling time. 5.2 Encourage students to work in pairs for ease of data collection. One student can time while the other records.
Program Conclusion or Post-Trip	
1. Analyze results	1.1 Rough analysis of data can be made at the zoo, if time allows. Otherwise, finish analysis post-trip as a homework assignment, with their teacher, or in an outreach visit by zoo personnel. 1.2 Scale analysis to grade levels. Encourage visual depictions (graphs) of their data.
2. Present results	2.1 Have students present their results to their peers. 2.2 Encourage students to reflect on what they would change in future experiments as well as what they would keep.

In any open-inquiry project, comparative questions are key. Strong comparisons are more ‘solvable’ and can be completed in shorter periods of time, whereas other types of questions, such as descriptive or essential, may be too complex or take too long to answer. For example, a descriptive question might ask, “*Why do the marmosets eat on the higher branches?*” whereas a comparative question might ask, “*Do the marmosets spend more time feeding on high branches or on the ground?*” As you can see, the comparative question will be much more straightforward to answer and analyze. The two most challenging features to the formation of any comparative question are: 1) making sure students’ questions are ‘solvable,’ and 2) that students can isolate a single variable, or as few variables as possible. Having students work in pairs or groups may help them come up with appropriate research questions as well as work out the best methods of data collection and sampling. Finally, have students develop a hypothesis for their comparative question. Getting them to think about what they expect to find will help them to develop better research questions as well as more sound methods.

Collecting Data and Analyzing Results

Collection of behavioral data can be done in a number of ways, but the first thing to determine before your program begins is what type of sampling is appropriate for their age group. Three basic sampling models are proposed in **Table 2**, with different advantages and disadvantages discussed for each. Casual sampling is just that; students are given time to simply record what they see happening and practice their observation skills. Scan sampling will be most appropriate for younger or larger groups of students; everyone can participate, it can be done quickly, and data

are easy to analyze. For even more quantitative scan sampling with advanced students, Zero-One sampling, where students record a ‘zero’ or a ‘one’ for every behavior, every sample interval, can be used. Time sampling may be more appropriate for smaller groups with more time to spend; this method may additionally be appropriate for multiple zoo visits. Very young students can simply draw and label, or, if an option, photograph different behaviors they may see occurring during or after a casual sampling instead of recording data in an ethogram chart.

Table 2: Ethogram Sampling Models

An overview of methods of data sampling for student ethograms

Method	Description
Casual Sampling	<p>General notes are taken on what is happening, recording all behaviors over predetermined period of time.</p> <p>Pros: Allows students to just sit, observe, and record. Useful as a qualitative base to help determine a research question. Can be done individually.</p> <p>Cons: Not very systematic, not quantitative.</p>
Scan Sampling	<p>Specific behaviors are identified and at predetermined periods of time, say 15 or 30 seconds. At timed intervals, students will note whether or not the animal is performing specific behaviors in a simple checklist. This is best done in pairs, with one student acting as a recorder and the other as the timer.</p> <p>Pros: An efficient way to grab a selected set of behaviors, especially for larger numbers of animals. Data are simple to record and analyze. For an even more quantitative version, Zero-One sampling can be used with this method.</p> <p>Cons: Only records specific subset of behaviors. Only records frequency, not duration.</p>
Time Sampling	<p>All behaviors performed are recorded during a predetermined period of time, say 1 minute. Again, this is best done in pairs.</p> <p>Pros: Works well when the study focus is small (one individual or a small group of animals). May record a wider variety of behaviors.</p> <p>Cons: Requires intense focus. Requires the ability to identify specific behaviors, and when they change.</p>

Regardless of the sampling method selected, be sure to prepare your students for the inevitability of observing inactive animals, or the possibility of animals performing only one behavior for the entire duration of their observation. This is where good causal sampling ‘reconnaissance’ at the beginning of the program may prevent students from selecting an animal that they cannot continually view, or that may not be active at all observation times. Inevitably, students may need to reevaluate their comparative question after their causal sample or their first round of data collection. Just be sure to allow the opportunity for them to fine-tune their question in order to make it more suitable for their research project.

Depending on the age group, you will most likely conduct quite simple data analyses with your students. Counting displayed behaviors and plotting on a chart or graph can be done even with the youngest students. With very young students, if they all observe a group of the same species, their results can be combined together into a single graph written on the board-giving each student a chance to contribute to the overall project. Older students familiar with X-Y graphs and pie charts should be capable of documenting their findings, if given a sufficient example. For the most advanced students, statistical significance of specific hypotheses can be analyzed.

Program Wrap-Up

You may decide it makes more sense for the students to take time outside of the zoo to analyze their results, especially for older age groups. Prepare appropriate follow-up materials for the teacher, or for yourself if you plan on following up with students at their school later. Either way, program conclusion materials will help to guide students to a complete, well-rounded project. Be sure to ask reflective questions relating to their experiment as well

as their process, such as ‘*Did your results support your hypothesis?*’ or ‘*What would you do differently next time?*’. Though supported by national reform efforts and shown to positively affect student achievement (Lowery, 2003), reflective teaching is all too often glossed over or skipped due to time constraints, so make this final component a celebrated book-end rather than an obligatory summary to your program. Furthermore, encourage constructive feedback from student peers to develop dynamic dialogue and introspective self-examination. If you have time during their visit to allow for data analysis, providing time for students or groups to present their findings is a fun, instructive, and memorable way to celebrate student findings and develop public speaking skills. Some teachers may prefer their students write a report as part of this project, so confer about whether you, or the teacher, will cover the basic tenets of scientific writing. Finish by asking students what they would next like to study, knowing now what they do from their first behavioral experiment. This is not only an important component of a scientific report, but also a great way to keep them coming back to the zoo!

Conclusion

Using inquiry-based ethograms in your facility to enhance current programs or create entirely new ones is a great way to incorporate free-choice learning into your zoo environment. Inquiry-based education addresses multiple learning styles and intrigues students of different intelligence levels. By giving students and guests control over what they are studying, while at the same time connecting them to individual animals’ behaviors, you take them beyond just watching and passively learning to actively observing, engaging, and participating. These all lead to long-term retention and possibly to improved environmental consciousness. The growing desire of zoos and aquariums to be recognized as centers for scientific learning can be met through strong inquiry-based educational programs such as this one. The great thing about ethograms is they can be done formally or informally, through a walk-by cart or a formal school tour, and they can be taught by zoo keepers, paid educators, or trained docents. Just think about the possible applications! If you’re interested in learning more about inquiry-based education, check out Dragonfly’s Q.U.E.S.T. inquiry-based education model (Myers et al., 1998).

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Keeper-Driven Intern Program: Mentoring the “Next Generation”

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Utah's Hogle Zoo

Abstract

The intern program at Utah's Hogle Zoo is a joint effort between the Education department and the Animal Care Department. In the last few years we have re-vamped the program to include much more keeper involvement, from reviewing applications and doing intern interviews to holding weekly meetings, mentoring intern projects and scheduling field trips and tours. Because the keepers are the people who spend the most time with interns, we wanted to have them involved in every step of the process. This paper will outline the intern program at Utah's Hogle Zoo, including the division of duties, review and interview process, intern daily tasks and intern projects. In order to give interns a worthwhile experience, some training of staff on intern mentoring is also a part of the process. An internship is often the first place a future zoo keeper encounters the reality of zoo keeping as a career, and the experience should be enlightening, informative and enjoyable.

Introduction

History of Interns at Utah's Hogle Zoo

Utah's Hogle Zoo has had interns for many years. The Education Department was responsible for bringing interns in and doing the training required for insurance purposes. After the initial training, the experience the intern had was almost completely up to the investment of the area keeper. Some keepers spent a lot of time giving out information, doing tours of other areas, and showing the intern the inner workings of the zoo such as breeding program information and conservation projects. Some keepers did not, and tended to look at the intern as “free labor” and little else. Intern Projects were usually based around building enrichment items with few other options.

Several staff members were interested in making the program more consistent and educational for the interns, with more policies in place for projects, shadow days, and training. Because the Education Department and Animal Care Supervisors already had a very heavy workload, several keepers became Intern Liaisons to facilitate the addition of programs. Intern Liaisons began their duties in the summer of 2011, and the program has evolved each year.

What does “keeper-driven” mean?

The Education Department is still very much involved with the intern program; it was not a complete transfer over to Animal Care. Rather, Education continued to take responsibility for their traditional role and expand the initial classroom training for interns. Education is still responsible for most of the preliminary work of bringing the interns to the zoo; these duties include advertising, collecting applications, organizing the initial training, and scheduling large gatherings that include food from food service.

The “keeper-driven” aspect of Hogle Zoo’s intern program focuses on the intern experience once they are set loose in the zoo after their initial introductory period. The Intern Liaisons hold weekly intern meetings, schedule behind-the-scenes tours, set up shadow days in other areas, and are generally there for the interns if they have questions or concerns about their internship. Animal Care management is kept informed of all happenings, but generally trusts the Liaisons to handle much of the intern scheduling.

Current Intern Program Structure

- 10-week session, 40 hours per week. Our intern sessions are generally in the summer, but we have had interns during the school year as well.
- Preference is given to those in a college program or who have graduated.
- Interns are in one primary area unless otherwise specified.
 - Primate areas – Split the week between two buildings, and are trained on Apes diets if appropriate
 - Giraffes/Hoof stock intern splits the whole term – five weeks in one area, five weeks in the other
- Internship starts the first week of June. There are two days of classroom training. Day 1 is the first day of the internship, and includes a lunch for all keepers to meet interns. Day 2 is a week later to give the interns time to get to know the zoo.
- Mid-term lunch (generally around the 4th of July) -Interns give an informal report on internship so far, and share their project proposal. This is also open to all keepers.
- Weekly journals – turned in to Animal Care Supervisors to track progress.
- End of term presentations – Interns give presentations on their projects. Lunch is provided and all staff are invited to attend.
- Weekly meetings are scheduled and run by the Intern Liaisons. These include a variety of topics and include weekly assignments. Some of the “meetings” are behind-the-scenes of areas where there are no interns.
- In the second half of the internship, there are two weeks of “Shadow” days. Interns spend the day in another area of the zoo, one per week. The Animal Hospital is included in the list of potential shadow areas.

Areas with Interns

Primate Building/Primate Forest (medium primates, lemurs)

Giraffes/Hoofstock (plus birds)

Small Animal Building Tropics Zone

Small Animal Building Temperate Zone

Small Animal Building Desert Zone

Reptiles (SAB) (not allowed to work with or be present for venomous routine or work with crocodiles)

Animal Resource Center (Education animals)

Water Quality (Rocky Shores)

Conservation (2)

Behavioral Enrichment Coordinator

Curator

*Education (2)**

*Graphics**

**These areas have interns that do not participate in the animal care programs and activities*

No Interns

Rocky Shores (except water quality intern)

Great Apes

Asian Highlands (big cats)

Elephants

Division of Duties and Communication

Because there are so many people involved in the intern experience, a clear division of duties was essential to ensure that things were getting done, and only getting done once!

Education Department Duties

Putting out advertising for internship positions

Collecting resumes/letters/college transcripts

Informing interns of acceptance once Animal Care has concluded interviews

Initial Training -two full days , one before work starts, one a week later

Scheduling the Meet the Interns lunch on the first training day

Scheduling mid-session lunch

Scheduling end of session Presentation Lunch

Collecting evaluations from Animal Care

Animal Care Duties – Area Supervisors

Interviews (supervisors and area keepers)

Contacting Education for acceptances

Scheduling area shadow days (Intern Liaison and Supervisor)

Intern Project Supervision (Intern Liaison, primary keeper, supervisor)

Mid-term and end of term evaluations (Primary keeper and Supervisor)

Collect weekly journals

Animal Care Duties – Intern Liaisons

Interviews (supervisors and keepers)

Setting agenda and scheduling weekly meetings

Emailing information to interns (get to know you, first assignment, etc)

FAQ for interns including social media policies

First-day tour of area

Collecting any weekly “assignments”

Scheduling Behind-the-Scenes Tours

Scheduling area shadow days (Intern Liaison and Supervisor)

Intern Project Supervision (Intern Liaison, primary keeper, supervisor)
Maintaining and Updating Intern Project Notebook
Guidance and mentoring of interns in areas (primary keepers, intern liaisons)
Sending out weekly emails to AC staff (As the Zoo 'Terns)
Sending out weekly emails to interns if needed (meetings, assignments, upcoming events)

Animal Care Duties – Primary Area Keepers

Training of interns in areas (Primary keepers)
Supervision of interns in areas (Primary keepers)
Guidance and mentoring of interns in areas (primary keepers, intern liaisons)
Mid-term evaluations (Primary keeper and Supervisor)

Intern Program Details

Collection of Applications

The Education Department puts out advertising and collects all application materials. Advertising is sent out to area colleges and universities. The Education Director sends the intern listing directly to professors of biology, psychology, ecology, and education, and to the school's career center. Sending it only to the career center yielded poor results in the past, which is why the listings are sent directly to professors working with students who may be interested in the program. Internships are also advertised on AZA.org, and on Hogle Zoo's website. The majority of interns find out about the internship through the zoo's website.

Application materials include a resume, a letter of intent, and college transcripts if applicable. Interns have a first and second choice for areas.

Intern Interviews

After Education has collected all the application materials from interested interns, they produce a list that gets passed on to animal care. The list includes contact information and which areas the intern would prefer to work.

The areas supervisors and the keepers who work in the area then schedule interviews with interested interns. The interviews can be either by phone or in person. A list of questions is asked to every intern to keep the interviews as consistent as possible, even with different people doing the interviewing. Generally, interns are interviewed and "hired" into the areas they request. If one area is short on acceptable candidates, they may decide to ask other areas if they have candidates that they liked but have not picked yet.

Intern Classroom Training

A full schedule of the intern classroom training is attached at the end of the paper. Sexual Harassment and Child Protection are required training for the zoo's insurance policy. Everything else is chosen to help the interns get acquainted with zoo policies and programs.

Initial classroom training is broken into two full days, but they are not back-to-back. Topics include zoo codes and emergency response, zoo policies including social media, animal welfare, intro to zoo acronyms, and behavioral enrichment and training. This is a crash course in zoo policy; specific issues are addressed in individual areas. An example of this is the snake bite alarm and protocol, which is generally only discussed in detail with interns in the Small Animal Building.

The first training day also includes a zoo tour and to view the Worlds of Flight bird show. The bird show is contracted out, and so is not a zoo area that can be included in the shadow days or behind-the-scenes tours.

Intern Orientation to Areas

Some areas choose to start the interns in their specific string the first day, and some areas choose to do an orientation. Primates and Small Animal Building starts the interns out with a tour of all the areas and specific area information relevant to all interns. This also helps save some time for the primary keepers if the interns are familiar with central locations or general safety.

Weekly Journals

Interns must write journal entries weekly. Information includes duties the intern preformed that day, new things learned, thoughts or questions on zoo topics, or just any fun thing that the intern was able to be involved with. Journals are turned in to Supervisors.

Weekly Meetings

Weekly interns meetings were started by the Intern Liaisons, and are planned and executed by them. About half the meetings are talks on various zoo subjects that were not necessarily covered in the intern training, and the other half are behind-the-scenes tours or training sessions of dangerous animal areas.

Each week the interns have an assignment related either to the topic just discussed, or prep work for the next meeting. Each meeting also has a green message, delivered by our zoo's Green Team member! Intern meetings are a way to gather all the interns together to relay any messages and receive feedback. The schedule of meeting topics is put out at the beginning of the term, so that non-animal care interns can participate as their supervising staff chooses. The conservation interns, education interns, and BE intern would sometimes join the behind-the-scenes tours but didn't attend every meeting.

Intern Training in Animal Areas

Intern training in their area is done by the primary keepers, with support from the Intern Liaisons and AC Supervisors if needed. The intern is given a copy of the area protocol and given a tour of the area on the first day. Over the course of the ten weeks, interns work with all keepers assigned to that area, not just the primary keeper. Areas train their interns differently based on needs, with no standard procedure, but most areas have a checklist so all keepers are aware of progress.

All interns are supervised at all times, and work they do is ultimately the responsibility of the keeper in the area that day. Even if the intern does the majority of husbandry, there is still a keeper assigned to

the area. Interns may work independently if they have proven the ability to follow directions and make good judgment calls, but everything ultimately rests on the keeper to make sure protocols are being followed. Depending on the area, interns may be trained in all duties except for operant conditioning, or may be restricted based on safety issues (such as rabies risk with bats). Interns may or may not get keys, and this depends completely on the area and the intern's previous work.

If an intern is not meeting standards, we are able to dismiss them. This happens very rarely but is an option if we are seeing no improvement in performance after several discussions.

Intern Projects

Past intern projects tended to be centered around building enrichment devices. These were often completed in a short amount of time, and limited the scope of what the intern could learn about and contribute to the zoo. Intern Liaisons came up with a list of categories and some suggestions and outlines for projects in each category. We still wanted the interns to pick a project that they were invested in, but that would require some in depth research and would also benefit the zoo.

Project Categories:

1. Vet Care and Nutrition
2. Enrichment
3. Training
4. Exhibit Design
5. Guest Interaction/Education
6. Research/Data Collection
7. Conservation

Expanded explanation of each category is attached to the paper

Projects are decided on between with intern and the primary keeper, with input from supervisors and Liaisons if needed. The projects need to be practical to the ten week time frame, and useful to the zoo in some way. Interns are required to put in a proposal in writing by the third week of the internship. The proposal outlines the general idea for the project, and also considers time commitment, resource needs, and potential costs.

Project completion is done during the internship hours. It is left up to the area keepers when is most convenient for the intern to work on their project, but most of the work should be done at the zoo, during normal working hours. We want to avoid interns being forced to spend their own time and resources on their project, although many choose to do so.

Past Intern Projects range from diet and nutrition research, to native plant recovery in animal exhibits, to helping with animal data transfer forms and other shipping requirements. At the end of each intern session, Intern Liaisons pick the best projects from that year to add to the Inter Project Notebook. This way, we have several excellent examples to show next year's interns what kind of projects we are looking for, and what level of execution we expect.

Intern Evaluations

Interns are officially evaluated twice; one mid-term and once at the end of the internship. The evaluation is filled out by the primary keeper of the area, with input from all staff that works with the intern. The evaluation is then discussed with the intern, the animal care supervisor, and the primary keeper. It is then filed with Education. The evaluation form covers topics such as attitude, work ethic, thoroughness of work, and adherence to zoo policies such as uniform guidelines.

Intern Mentoring

Mentoring is a difficult job. It requires constant vigilance and professionalism, and the ability to communicate effectively. Your ability to be a mentor will have a great effect on the experience the intern has in your area. Remember, you may be training your future co-worker. The training they receive now will have an impact on their future work ethic, knowledge, and skills. Set a good example and be professional at all times. Keepers should model good work ethic, appropriate coworker communication, and genuine care for the animals.

Keepers are encouraged to share all aspects of the job with interns. This includes husbandry manuals, breeding recommendations, USDA and AZA regulations, and nutrition information. Don't just tell the intern what to do and how to do it, but also share *why* we do things the way we do. What do the various medications treat? Why is the exhibit set up the way it is? How do we decide what kind of enrichment is appropriate? Point out animal behaviors to interns. What's normal, what's off, why you think there's a problem, what you suspect is the issue. (Desert Zone intern noticed a neurological problem in our female meerkat and alerted keeper)

The internship should be as close to "real" keeper work as possible. There should be a balance of work and fun. Interns are in this to learn about the field – they should be exposed to the not-so-fun parts of our job such as cleaning public areas, deep cleans, raking leaves, turning dirt, and putting away deliveries. Check to make sure they are allowed to do certain tasks (OSHA, local laws, facility insurance, workman's comp, etc). However, interns are not "free labor". They are here to learn, so share and let them experience things as allowed such as training sessions, vet procedures, and cool enrichment. Make the interns feel welcome and part of the team. Refer to interns by name, not "my intern" or "the Reptiles intern."

Keepers must give immediate feedback to interns. Just like animal training, positive reinforcement usually works best, and timely corrections are the most effective. Inappropriate behavior, time management, and attitude issues need to be addressed as they occur. Keepers are encouraged to ask for support from Intern Liaisons or Animal Care Supervisors if they feel they need backup. Discuss boundaries with the intern. Just because the intern saw a keeper do it or did it with a keeper does not mean they are able to do it independently. Interns should always check with keeper before starting a task. Balance this with being proactive; interns should be able to anticipate routine tasks and not just stand around waiting for direction.

Share your own keeper story. Where did you go to school? What degree did you get? Where did you do your internship/seasonal/volunteering? Did you get the first job you applied for? The 50th? Did you have to move for your job? Give any advice you have on getting a job as a zookeeper. Suggest areas to improve experience and resume building, and where to search for jobs. Introduce interns to professional organizations and invite them to local AAZK Chapter meetings. Encourage interns to join national AAZK at least, if not local chapter. Let them know the benefits of conferences, networking, professional development, and conservation.

Conclusion

The intern program at Utah's Hogle Zoo has benefited from keeper-driven initiatives in the last several years. The benefits include greater consistency, a wider range of zoo knowledge for interns, and varied and useful projects that directly benefit the zoo and the animals. Having keepers take a greater leadership role in the intern program meant that it could be expanded without a significant amount of work being added to Education or AC Supervisors. It also meant a greater buy-in from other keepers, and that lead to a better experience from all the interns. Each year, we get more and more organized and add more things to the program.

Weekly Meeting Schedule 2013

Meetings were schedules for Thursday afternoons

Meeting 1 – June 5th

Assignment was given via email: Learn about one of the animals you will be working with and give informal report to the rest of the group

Topic : Introductions, professionalism

Assignment for next time: Find out a fun fact about your primary keeper!

Green Message: Ultimate Alternate Transportation Challenge

Meeting 2 – June 13th

Topic: Intern Projects

Share your fun fact about your primary keeper!

Assignment: Research AZA and AAZK

Green Message: Bowling for Rhinos

Meeting 3 – June 20th

Topic: AZA, ZAA, AAZK, ICZ

Assignment: Project proposals due June 24

Think about possible safety issues while working with great apes

Green Message: Bring reusable cups and water bottles for beverages

Meeting 4 - June 27th

Topic: Apes Training Session (at Apes)

Assignment:

Green Message: Palm oil

Meeting 5 – July 4th

Topic: Guest Connections, Public Education and Demonstrations

Assignment: Write a 5 minute Guest Connection

Green Message: Work the 10 Conservation messages in to conversation with guests this week!

Meeting 6 – July 11th

Topic: Rocky Shores Behind the Scenes Tour

Assignment: Conservation issues relating to big cats

Green Message: Sustainable fish consumption

Meeting 7 – July 18th

Topic: Asian Highlands Behind-the –Scenes and Training Session

Assignment: Update your resume for next meeting

Green Message: Big cat conservation

Meeting 8 – July 25th

Topic: Resumes (with two Animal Care Supervisors)

Assignment: Research answers to elephant and rhino facts

Green Message: How effective is “Reduce, Reuse, Recycle?”

Meeting 9 – August 1st

Topic: Behind-the-Scenes Elephants/Rhinos

Assignment: Project Due August 4th

Green message: Results of the Ultimate Alternate Transportation Challenge

Meeting 10 – August 8th

Topic: Feedback, surveys

Assignment: Project presentations August 13th

Green message: Public transportation

Intern Training Schedule

Day 1: June 4, 2013

Time	Topic	Presenter
8:30-9:00	Check-in and t-shirts/paperwork for recording hours, nametags; Parking	Chris
9:00-9:30	Introductions of Interns and supervising staff	Chris: Jane, Boanna, Jeff, Gina, Suzanne, DeeDee, Liz, Christina
9:30-10:45	Zoo Policies <ul style="list-style-type: none"> • Media • TB Test/Tetanus shot • Dress Code • FAQ's Internship Requirements <ul style="list-style-type: none"> • Project, Journal, Hours • How to record time Child Protection Sexual Harassment	Chris
11:00-11:30	Bird Show	Chris
11:30-1:00	Lunch with the Supervisors, Mentors and Area staff	Pizza in Rendezoo
1:00-4:30	Zoo Tour including hospital (be at hospital at 1pm)	Suzanne/Dr. Nancy

Day 2 : June 12, 2013

Time	Topic	Presenter
8:30-10:00	Customer Service Training	Rebekah and Mark
10:00-10:30	Green Team/Conservation	Green Team member
10:30-11:00	Guest Connections/Animal Welfare	Chris
11:00-11:30	Guest Emergencies	Security
11:30-12:00	Animal Emergencies	Jeff
12:00-1:00	Lunch on their own	Tickets for the Beastro
1:00-2:30	Behavioral Enrichment and Training	Dawn
2:30-3:30	AZA, TAGS and SSP's	Conrad
3:30-4:00	Wrap-up and plans for rest of summer	Chris

Other Important Dates:

- **WEEK 1:**
 - **June 4 General Zoo Training and Lunch with area staff**
 - **June 5 Report for work in area. Begin daily/weekly journal.**
Confirm with supervisor who will be reading your journal.
- **WEEK 2:**
 - June 12Second Day of Training
- **WEEK 3:**
 - **Discuss Project Topics** with assigned staffing area.
- **WEEK 4:**
 - **June 24Turn in project proposal to supervisor.**
- **WEEK 5:**
 - **July 3 11:30-1:30 lunch in Rendezoo Room** and 5-10 minute presentations about internship experiences with staff
 - **July 12Complete midterm progress report.** Supervisor and mentor will also complete a progress report. These will be discussed with the student.
- **WEEK 6:**
 - **Rocky Shores Training Demo and Q and A (Date and Time TBD)**
- **WEEK 7:**
 - **Shadow Week** (Interns can shadow a day in an area of their choice. Arranged by supervisors).
- **WEEK 8:**
 - **Shadow Week** (Interns can shadow a day in an area of their choice. Arranged by supervisors).
 - **Cat Training Demo and Q and A (Date and Time TBD)**
- **WEEK 9:**
 - **Presentation by Elephant Keepers and Q and A (Date and Time TBD)**
 - **August 4Project is due by 5:00 pm**
 - Student should hand deliver the final project/paper to supervisor. This will be reviewed and discussed with student in Week 10.
- **WEEK 10:**
 - **August 13Luncheon and Thank you gifts and Project presentation** to the group.
11:30-2:00
- **Last Day depends on intern schedule** (timewise it is the 13th but could work through the 17th)
Hand delivers Student Internship Evaluation Form. At this time the supervisor will go over his/her final evaluation with the intern.

Intern Project Categories and Explanations

Vet Care/Nutrition

- A) Research natural diet of animal and come up with a diet that addresses nutritional needs in captivity. Include research into various chow brands for nutrition content, vitamins/minerals in produce, fiber content, digestive health, etc. Will work with Dr. Nancy Carpenter as a resource.
- B) Exotic animal vet care: pick three species of various taxa and elaborate on a health care plan. Include common diseases and their prevention, diet and excursive needs, etc.

Enrichment

- A) Fill out an “Enrichment Strategy” for a new/incoming species. Help create an approved enrichment list for that species.
- B) Organize enrichment inventory, outline items to be constructed, repaired, or purchased
- C) Create a new enrichment device for a species and conduct behavioral research on its effectiveness

Training

- A) Write a shaping plan for a new training behavior. As a qualified trainer goes through the plan, troubleshoot and revise plan as needed etc. Schedule sessions with trainer.

Exhibit Design

- A) Using existing animals and exhibits, prepare a proposal for an exhibit renovation including behavioral goals and costs/timeline.

Education/Guest Interaction

- A) Create a class for pre-schoolers on an animal or conservation subject
- B) Create a class for school-aged kids or scouts
- C) Create a class/talk for adults about conservation, natural history, BE, etc. Present the information to an audience.
- D) Create/Update Guest Connection talking points sheet for your area. Create and deliver a Guest Connection

Research/Data Collection

- A) Create an echogram for observational studies of an animal and carry out observations. Includes writing a scientific paper.
- B) Design a research study. Must include ethogram, control vs test conditions or groups, observation schedules, projected outcomes and hypothesis. Do not actually have to perform the study.

Utah's Hogle Zoo Internship

Mid-Term Student Performance Assessment

Instructions: Please assess the student in comparison to others you have worked with of similar academic level. Your responses will be kept confidential and used for the purpose of student grading and programmatic evaluation.

Student's Name _____ Date: _____

Department: _____

Supervisors Name: _____

Section I: Student Background Information

1. ACADEMIC EMPHASIS	2. SEMESTER OF PLACEMENT	3. LENGTH OF PLACEMENT
<input type="checkbox"/> Biology <input type="checkbox"/> Environmental Science <input type="checkbox"/> Psychology <input type="checkbox"/> Education <input type="checkbox"/> Other _____	<input type="checkbox"/> Summer Semester <input type="checkbox"/> Fall Semester <input type="checkbox"/> Spring Semester	<input type="checkbox"/> Mid-Semester Assessment <input type="checkbox"/> Final Assessment

Section II: Performance Assessment

4. APPEARANCE	5. TEAMWORK	6. INITIATIVE
<input type="checkbox"/> Well-groomed appearance <input type="checkbox"/> Acceptable appearance <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Works very well with others <input type="checkbox"/> Gets along satisfactorily w/ others <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Seeks out additional responsibility <input type="checkbox"/> Completes assigned responsibilities <input type="checkbox"/> Needs improvement
7. SELF-CONFIDENCE	8. JUDGEMENT	9. DEPENDABILITY
<input type="checkbox"/> Self-confident <input type="checkbox"/> Usually self-confident <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Makes appropriate decisions <input type="checkbox"/> Usually makes the right decision <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Very dependable <input type="checkbox"/> Usually dependable <input type="checkbox"/> Needs improvement
10. MATURITY	11. ABILITY TO LEARN	12. PROBLEM SOLVING
<input type="checkbox"/> Very mature <input type="checkbox"/> Mature <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Learns new skills quickly <input type="checkbox"/> Average ability to learn new skills <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Solves problems independently <input type="checkbox"/> Needs help solving most problems <input type="checkbox"/> Needs improvement

13. QUALITY OF WORK	14. WRITTEN COMMUNICATION	15. VERBAL COMMUNICATION
<input type="checkbox"/> Regularly exceeds expectations <input type="checkbox"/> Regularly meets expectations	<input type="checkbox"/> Strong communication skills <input type="checkbox"/> Satisfactory communication skills	<input type="checkbox"/> Strong communication skills <input type="checkbox"/> Satisfactory communication



skills

___ Needs improvement	___ Needs improvement	___ Needs improvement
16. ATTENDANCE	17. PUNCTUALITY	18. PROFESSIONALISM
___ Regular ___ Irregular	___ Regular ___ Irregular	___ Professional ___ Unprofessional

19. Have you noticed that the student is particularly strong or lacking in any of the areas listed in the previous section (Section II)?

Section III: Performance Summary

20. How would you rate this student's overall performance compared to others you have worked with of similar academic level?

- ___ **5 Much more than acceptable** (Significantly above criteria required for successful job performance).
- ___ **4 More than acceptable** (Generally exceeds criteria relative to quality and quantity of behavior required).
- ___ **3 Acceptable** (Meets criteria relative to quality and quantity of behavior required).
- ___ **2 Less than acceptable** (Generally does not meet criteria relative to quality and quantity of behavior required).
- ___ **1 Much less than acceptable** (Significantly below criteria required for successful job performance).

21. Please describe how this student could improve their performance.

This report has been discussed with the student intern:

Yes No

Internship Supervisor (please print): _____ Title: _____

Internship Supervisor (signature): _____ Date: _____

**Please give a copy of this form to the student and the original to: Chris Schmitz, Education Curator,
Utah's Hogle Zoo**



Utah's Hogle Zoo Internship

Final Student Performance Assessment

Instructions: Please assess the student in comparison to others you have worked with of similar academic level. Your responses will be kept confidential and used for the purpose of student performance and programmatic evaluation.

Student's Name _____ Date: _____

Department: _____

Supervisors Name: _____

Section I: Student Background Information

1. ACADEMIC EMPHASIS	2. SEMESTER OF PLACEMENT	3. LENGTH OF PLACEMENT
<input type="checkbox"/> Biology <input type="checkbox"/> Environmental Science <input type="checkbox"/> Psychology <input type="checkbox"/> Education <input type="checkbox"/> Other _____	<input type="checkbox"/> Summer Semester <input type="checkbox"/> Fall Semester <input type="checkbox"/> Spring Semester	<input type="checkbox"/> Mid-Semester Assessment <input type="checkbox"/> Final Assessment

Section II: Performance Assessment

4. APPEARANCE	5. TEAMWORK	6. INITIATIVE
<input type="checkbox"/> Well-groomed appearance <input type="checkbox"/> Acceptable appearance <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Works very well with others <input type="checkbox"/> Gets along satisfactorily w/ others <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Seeks out additional responsibility <input type="checkbox"/> Completes assigned responsibilities <input type="checkbox"/> Needs improvement
7. SELF-CONFIDENCE	8. JUDGEMENT	9. DEPENDABILITY
<input type="checkbox"/> Self-confident <input type="checkbox"/> Usually self-confident <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Makes appropriate decisions <input type="checkbox"/> Usually makes the right decision <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Very dependable <input type="checkbox"/> Usually dependable <input type="checkbox"/> Needs improvement
10. MATURITY	11. ABILITY TO LEARN	12. PROBLEM SOLVING
<input type="checkbox"/> Very mature <input type="checkbox"/> Mature <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Learns new skills quickly <input type="checkbox"/> Average ability to learn new skills <input type="checkbox"/> Needs improvement	<input type="checkbox"/> Solves problems independently <input type="checkbox"/> Needs help solving most problems <input type="checkbox"/> Needs improvement

13. QUALITY OF WORK	14. WRITTEN COMMUNICATION	15. VERBAL COMMUNICATION
<input type="checkbox"/> Regularly exceeds expectations <input type="checkbox"/> Regularly meets expectations	<input type="checkbox"/> Strong communication skills <input type="checkbox"/> Satisfactory communication skills	<input type="checkbox"/> Strong communication skills <input type="checkbox"/> Satisfactory communication



skills

<input type="checkbox"/> Needs improvement	<input type="checkbox"/> Needs improvement	<input type="checkbox"/> Needs improvement
16. ATTENDANCE	17. PUNCTUALITY	18. PROFESSIONALISM
<input type="checkbox"/> Regular	<input type="checkbox"/> Regular	<input type="checkbox"/> Professional
<input type="checkbox"/> Irregular	<input type="checkbox"/> Irregular	<input type="checkbox"/> Unprofessional

19. Have you noticed improvement in the student's performance since their mid-term evaluation? Are they particularly strong or lacking in any of the areas listed in the previous section (Section II)?

Section III: Performance Summary

20. Describe the student's final project.

21. How would you rate this student's project compared to others you have worked with of similar academic level?

- 5 Much more than acceptable** (Significantly above criteria required for successful job performance).
- 4 More than acceptable** (Generally exceeds criteria relative to quality and quantity of behavior required).
- 3 Acceptable** (Meets criteria relative to quality and quantity of behavior required).
- 2 Less than acceptable** (Generally does not meet criteria relative to quality and quantity of behavior required).
- 1 Much less than acceptable** (Significantly below criteria required for successful job performance).

22. How would you rate this student's overall performance compared to others you have worked with of similar academic level?

- 5 Much more than acceptable** (Significantly above criteria required for successful job performance).
- 4 More than acceptable** (Generally exceeds criteria relative to quality and quantity of behavior required).
- 3 Acceptable** (Meets criteria relative to quality and quantity of behavior required).
- 2 Less than acceptable** (Generally does not meet criteria relative to quality and quantity of behavior required).
- 1 Much less than acceptable** (Significantly below criteria required for successful job performance).

21. Would you recommend this student for permanent, full-time employment? _____ Yes _____ No

This report has been discussed with the student intern: Yes No

Internship Supervisor (please print): _____ Title: _____

Internship Supervisor (signature): _____ Date: _____

**Please give a copy of this form to the student and the original to: Chris Schmitz, Education Curator,
Utah's Hogle Zoo**



“Designing your Volunteer Program”

Lauren Humphries, Senior Animal Keeper
Geoff Horsfield, Volunteer Coordinator
Carolina Tiger Rescue

Volunteers are an essential part of a successful work environment at any small nonprofit organization, where resources and capabilities can be limited. With three full time animal keepers and over 60 animals, we rely on well trained and skilled volunteers to assist with daily animal care. Over the past several years, Carolina Tiger has advanced its volunteer program to further educate its volunteers and allow them to take greater ownership and responsibility for their work. Not only does the structured program allow us to properly train volunteers, but it allows for volunteers to feel confident and empowered with their work. This in turn increases their engagement and encourages long-term volunteering.

This program will demonstrate how animal keepers can be more efficient by focusing their resources and time on projects that could have a larger impact on the welfare of animals in their care, by increasing the capabilities of their organization and by improving the skill set and knowledge of their volunteers. If implemented properly, then a strong volunteer program can create a consistent system where volunteers are properly trained, allowing them to work effectively and independently. As a result, this allows for volunteers to increase the capacity of not only the animal care aspect of Carolina Tiger Rescue, but the entire organization.

Carolina Tiger Rescue currently has approximately 60 animal care volunteers that are spread out through the week into two four-hour shifts per day. We receive applications for a range of volunteer opportunities consistently and hold approximately 18 volunteer orientations throughout the year. The Volunteer Coordinator sorts through the applications and selects individuals best suited for animal care.

All volunteers are required to take an orientation class. This class provides a basic introduction to Carolina Tiger Rescue (including its history, mission, values) and expectations of volunteers. In addition, basic safety rules, time and physical requirements, and animal information are reviewed. The new volunteers are then able to begin working based on their schedule.

In prior years, the Volunteer Coordinator would communicate with volunteers and hand-create a weekly schedule of who is volunteering and at what times. This became overwhelming and time-consuming, so an online calendar was created for volunteers to sign up for their shifts through Lotsa Helping Hands, which is primarily designed for hospice care patients. Other websites and database management tools offer similar services. On weekdays, the schedule can accommodate up to 8 volunteers (split between the morning and afternoon shift) and 12 volunteers on weekends (split between the morning and afternoon shift).

The structure of our volunteer program is based on a four-tier system; color coded so that volunteers can be quickly assessed and identified. Animal keepers determined baseline responsibilities for new volunteers and the increasing responsibility throughout the tiers. This allows for a progression of instruction, ensuring that each volunteer is trained consistently and on a variety of tasks. This also allows for greater retention of knowledge among the volunteers.

In addition to the basic orientation that volunteers must attend, keepers meet with new volunteers on their first official day to review expectations. Well-defined and clarified roles allow for volunteers and staff members to maintain honest and open communication. Volunteers have their progress tracked on a record sheet (see Figure 1) where keepers can make notes on training and development. Subsequently, a keeper that may have never met a volunteer can identify them and know the tasks they are capable of completing.

The tier system is divided into the Tan, Purple, Orange, and Black Tiers (Figure 2 for the complete list). The Tan Tier consists of the baseline responsibilities for volunteers. As one advances through the system, volunteers are trained on more complicated and involved responsibilities. However, if a volunteer is currently at the Tan Tier, this does not preclude them from being trained on more advanced tasks.

During a volunteer's first three months while on a probationary status, animal care volunteers will be trained on all of the Tan Tier tasks and a variety of other duties. The goal of the initial probationary period is to expose the volunteer to the types of tasks they will be performing and to allow staff members and the volunteer to evaluate the duties and prerequisites of volunteering at Carolina Tiger Rescue to determine what role will best suit them. Animal Care volunteers are reviewed (tested) on specific tasks by an animal keeper in order for them to advance in the volunteer program. They are given a study guide to prepare for each review. The reviews can be individualized as much as possible to accommodate various learning styles among volunteers.

It is required for all animal care volunteers to pass the reviews for the Tan Tier. Volunteers may then progress through the system by request. After a review is complete, the keeper makes a note in the Volunteers Promotion Record (see Figure 3) indicating that the volunteer passed the review, did not pass the review, or that further discussion is needed to determine a verdict. The animal care information is reviewed with volunteers at every tier in order to emphasize the importance of keeping up to date with this information.

All efforts are made to assist the volunteer in passing reviews. If a volunteer does not pass a review on the first attempt, they have two more opportunities to pass. A limit is placed on the number of attempts because keepers want volunteers to come prepared and if a person is having trouble with the physical aspect of the job, a more suitable volunteering option can be found for them such as tour guiding, construction, or office support. If a volunteer is reviewing past the Tan Tier and does not pass a review, they must wait until they have completed 32 volunteer hours between the time of the first review and when they can review on that task again.

Rewards and incentives have also been placed throughout the Tiers to encourage volunteers to progress through the system, such as free merchandise in the gift shop, leading personal tours, increased responsibilities and leadership roles, and assisting keepers with special projects.

Between training new volunteers and conducting reviews with others, keepers do spend a significant amount of time working with and training volunteers. An organization benefits the most from volunteers when they can operate effectively and efficiently without keeper supervision. Keepers can assign daily tasks to volunteers and be assured that duties will be completed correctly. This allows keepers more time to spend on operant conditioning, building projects, and other more time consuming tasks.

This program is highly structured and works best in a type of environment conducive to high staff involvement, with large numbers of volunteers. Volunteers and staff members must work closely together to ensure that communication is clear and consistent. Smaller organizations may prefer a less formalized structure, while larger ones may gravitate towards more structure or increasing volunteer roles. The key factor is finding a system that works best for the organization and their volunteers. Clear and consistent position requirements must be partnered with adequate training to ensure well-trained and self-reliant volunteers.

Figure 1. Volunteer Record

Extern	Intern	Existing	Probationary	Tan	Purple	Orange	Black																																	
<p>First Name: _____</p> <p>Last Name: _____</p> <p>Email: _____</p> <p>Phone (Cell): _____</p> <p>(Home): _____</p>				<p>Volunteer Picture Here</p>																																				
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Level 2's	_____																																							
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Figure 2. List of Tiers in order of responsibility.

Tier 1 – Animal Care Tan

Duties and Responsibilities:

- minimum 18 years old
- Basic Volunteer Orientation
- Be able to perform duties and responsibilities listed immediately below

Duties and Responsibilities:

- name and locate all animals
- be familiar with posted animal care information, including Sign-In board, Animal Updates board and Animal Food Prep board
- properly locate and clean all water dishes without assistance
- complete morning food prep without assistance
- administer enrichment safely and properly
- properly record enrichment information (entering in computer, moving names on board)
- pick up food from locations providing donations
- complete assigned tasks in a timely manner

Minimum Commitment:

- no more than 2 consecutive months with less than 16 hours of Animal Care volunteer time per month (Example: You can miss one shift in March, one shift in April, but you then must make all shifts in May.)
- *Probationary requirements* - within three months of completing their Basic Volunteer Orientation, new volunteers must demonstrate proficiency with all duties and responsibilities of AC Tan. May be dismissed if not meeting minimum time requirements.
- attend at least one Compound Emergency and Safety Review, Basic Volunteer Orientation, or Tour Guide Training class every twelve months

Tier 2 – Animal Care Purple

Duties and Responsibilities:

- able to perform all duties and responsibilities immediately listed below
- apply for promotion in writing (paper or email)

Duties and Responsibilities:

- all duties of previous tier
- differentiate animals in same enclosure

- be familiar with the *Animals with Chronic Health and Behavioral Issues* document
- prepare for feeding
 - load the truck for feeding
 - quarter food correctly
- clean Level 4 enclosures following appropriate safety procedures
- clean shiftable Level 2 enclosures following appropriate safety procedures
- clean indoor OR outdoor kinkajou enclosures (seasonal)
- be familiar with posted animal care information, including Sign-In board, Animal Updates board and Animal Food Prep board

Minimum Commitment:

- no more than 2 consecutive months with less than 16 hours of Animal Care volunteer time per month (Example: You can miss one shift in March, one shift in April, but you then must make all shifts in May.)
- attend at least one Compound Emergency and Safety Review, Basic Volunteer Orientation, or Tour Guide Training class every twelve months

Tier 3 – Animal Care Orange:

Prerequisites:

- minimum 104 hours of Animal Care volunteer time
- able to perform all duties and responsibilities immediately listed below
- apply for promotion in writing (paper or email)

Duties and Responsibilities:

- all duties of previous levels
- know compound section names
- clean Level 1 enclosures with a partner
- clean tiger pools
- clean indoor or outdoor kinkajou enclosures (seasonal) OR have 104 total animal care volunteer hours
- clean quarantine after being trained in cleaning Level 4 enclosures and accompanied by Keeper.
- be familiar with posted animal care information, including Sign-In board, Animal Updates board and Animal Food Prep board

Minimum Commitment:

- no more than one consecutive month with less than 16 hours of Animal Care volunteer time per month (Example: you can miss one shift in March, but you then must make all shifts in April.)

- attend at least one Compound Emergency and Safety Review, Basic Volunteer Orientation, or Tour Guide Training class every twelve months

Tier 4 – Animal Care Black:

Prerequisites:

- minimum 208 hours of Animal Care volunteer time
- able to perform all duties and responsibilities immediately listed below
- attend a Tour Guide Training class
- apply for promotion in writing (paper or email)
- unanimously approved by staff

Duties and Responsibilities:

- all duties of previous tiers
- Pass 100% on the *Animals with Chronic Health and Behavioral Issues* document
- Waters review – safety check (if not already done)
- be comfortable butchering deer and assisting with butchering of larger animals
- trained on cleaning both indoor and outdoor kinkajou enclosures
- demonstrate ability to use hand tools
- ability to drive and operate all vehicles including stick shifts
- clean Level 2 enclosures with a partner
- lead big cat feeding crew
- lead binturong feeding crew
- be familiar with posted animal care information, including Sign-In board, Animal Updates board and Animal Food Prep board

Minimum Commitment:

- no more than one consecutive month with less than 16 hours of Animal Care volunteer time per month (Example: you can miss one shift in March, but you then must make all shifts in April.)

Figure 3. Each Promotion Record varies depending on the duties and responsibilities of the next tier.



Tan Tier Promotion Record

Volunteer Name: _____

Date of Request: _____

Approved

By: _____

Approved (Y/N & Date): _____

Date	Requirements	Staff Initial	Comments
	A 3 month probationary period must be completed before reaching “AC Trainee”		
	16 hours of volunteer time per month until Tan Tier is achieved		
	Name and locate all animals		
	Familiar with posted animal care information (Animal Updates boards, etc.)		
	Properly locate and clean all water dishes: RIGHT SIDE (safety check, all dishes located)		
	Properly locate and clean all water dishes: LEFT SIDE (safety check, all dishes located)		
	Complete AM food prep without assistance		
	Administer enrichment safely and properly		
	Properly record enrichment information (entering in computer, moving names on board)		
	Complete assigned tasks in a timely manner		

Beginning the discussion of the role of population management euthanasia for long-term sustainability of animal populations: preparing staff and measuring attitudes

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David Powell, Ph.D.²

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ABSTRACT:

Zoos and aquariums continue to strive for responsible maintenance of their animal populations so that large, diverse collections can continue to inspire visitors about the importance of conservation. However, evidence suggests these animal populations are becoming unsustainable over the long term due to low genetic diversity and a lack of births to offset deaths. Already, zoos and aquariums incorporate an array of techniques to promote selective breeding of genetically valuable individuals, but there are indications that preventing individuals from breeding may do more harm than good. Population management euthanasia is seen as a method of addressing this problem. With management euthanasia, zoos and aquariums may employ an additional tool allowing them to mimic the natural life cycle of animal populations, thus permitting parents' welfare to increase by allowing animals to reproduce naturally. Restricting breeding may contribute to a loss of parental and social skills, transition to maintenance of unnatural groupings (e.g. single sex groups, demographically old groups), infertility due to chemical and hormonal contraception, and an increase in prevalence of reproductive abnormalities. Management euthanasia can be used to avoid these outcomes and could optimize use of limited space in zoos. However, incorporating this tool can be difficult for animal care staff to accept. Keeper education about this practice will improve awareness about its potential benefits. In an effort to do so, a survey has been developed to ascertain keeper attitudes concerning management euthanasia. In this presentation, the role of population management euthanasia and situations in which it may be used will be discussed along with an introduction of the survey. Stimulating discussion among keepers may help incorporate management euthanasia into the set of tools already practiced widely in management for long-term population sustainability.

Introduction

Sustainability of animal populations in zoos and aquariums is a major topic of discussion today. Sustainable management of populations ensures that zoos will continue to exhibit a diverse collection of animals to inspire visitors into the future. When a zoo visitor encounters an animal at a zoo or aquarium, research demonstrates that visitors experience positive emotions and these correlate with conservation mindedness [Powell & Bullock, submitted]. The Association of Zoos and Aquariums (AZA) code of professional ethics states that members have a moral responsibility to the animals under their care and they must, “promote the interests of wildlife conservation, biodiversity, and animal welfare to the public and to colleagues [“Code of Professional Ethics,” 1976].” Terry Maple notes, “We’re going to save animals by being great educators and awareness-builders and great fund-raisers and building essentially an ethic or an attitude about animals in the people who visit us and participate in zoos that will eventually allow us to save the wild [Croke, 1997, p. 171].” However, it is becoming increasingly obvious that zoos may not be able to sustain the collections of animals that they have [Lees & Wilcken, 2009]. To address this issue, one must understand why it is occurring, how the current use of population management tools affects it, the potential benefits of population management euthanasia, and how this concerns animal care professionals.

Understanding the sustainability crisis

A sustainable population, within a zoological setting, is typically defined as a managed population that is capable of remaining viable by retaining at least 90% of its original genetic diversity for a minimum of 100 years, and/or more than 10 generations [Boyle et al., 2010]. Many factors contribute to a population’s overall sustainability, including: the limited amount of space zoos have to provide, success in encouraging animals to reproduce, availability of appropriate diets and provision of veterinary care to promote health while maintaining a certain amount of genetic diversity. The role of veterinary medicine in zoos has advanced enormously since the 1950s when many of the modern zoos did not have staff veterinarians. Moreover, advances in breeding have come a long way since the 1960s when breeding became preferable to importing [Croke, 1997, p. 161]. However, as zoos construct larger, more naturalistic exhibits and incorporate newer and better visitor amenities, a lot of space is being taken away from the animals [Fischer, 2012].

Exacerbating space issues is the low genetic diversity of many captive animal populations, many of which are descended from low numbers of founders, contributing to low long-term genetic viability. Demographically, several populations are experiencing detrimental effects due to low

birth rates not offsetting death rates. There are many techniques used to manage populations genetically and demographically. These techniques include contraception, isolation of individuals into various kinds of groups, adding breeders, increasing the amount of holders, and incorporating facilities that can dedicate themselves to breeding. However, not one method is perfect and it is the combined use of all of these methods that help in managing populations. That being said, it is becoming increasingly evident that these management techniques, even when used together, may not be enough to sustainably manage animal populations within zoos.

The AZA began a discussion about sustainability issues and appointed a task force in early 2009 to evaluate them. This task force recommended that each species population be assessed individually, which led to the modification of Species Survival Plans (SSPs), which are scientifically managed breeding programs for captive animal populations within the AZA. One recommendation by the task force was to change the SSP programs into a color coordinated system that would define their sustainability. Programs are now labeled as Green or Yellow SSP programs or Red programs. Green SSP programs are sustainable for the long-term, meaning that they are capable of maintaining at least 90% genetic diversity for the next 100 years. Yellow SSP programs have more than 50 individuals, but cannot maintain 90% genetic diversity for the next 100 years. This can be a result of several factors: there are too few individuals in the population, there is not enough space, there is a lack of husbandry and/or breeding expertise, the gene diversity is low, or the demographics may be poor. A population is designated a Red Program when it has been recommended by an AZA Taxon Advisory Group (TAG) for management, but a studbook has not yet been published recording the population's pedigree, or the captive population includes fewer than 50 individual animals. Until a studbook is published, and the population has grown greater than 50 individuals, these populations cannot be considered sustainable. The new designations allow Yellow SSP programs to cooperate with non-AZA facilities, encouraging the growth of these populations to reach green status. Additionally, designation as a Red Program is seen as a call-to-action, meaning that these populations are in the most need of support. The new system not only provided a means to assess the sustainability of individual populations, but also provided a platform to reiterate how necessary cooperation is amongst zoos to manage their populations [Boyle et al., 2010]. The task force discovered that allowing zoos to work with non-AZA institutions was considered the greatest benefit ["Population Management," 2012]. This is due to the fact that SSPs now, potentially, have more space to utilize as populations grow.

These new designations provide a way to quantify the sustainability issues. As of July 2013 the Green SSP programs include: two (28.5%) of the seven managed amphibian populations, two (2.4%) of the 85 managed reptile populations, 15 (7.9%) of the 191 managed bird populations, and 18 (6.7%) of the 267 managed mammal populations. None of AZA's managed invertebrate

or fishes programs (four and 40, respectively) are designated as Green SSP. 54.1% of reptile programs are designated Red Programs, while 41.4% of the bird programs and 42.3% of the mammal programs are Red Programs.

The Ungulate TAGs have identified a similar trend. When broken down, the Ungulate TAGs oversee two Green SSPs out of a total of 82 programs; 42% of these are Red Programs [Wildt et al., 2012]. However, the problems here become much worse when looking at the very nature of ungulates within zoos, which generally require significant space. Over the last 10 years, approximately 900 ungulate spaces have been lost in the AZA. Ungulate TAGs foresee an unknown future because importing hoofstock to bolster low founder numbers and increase genetic diversity is extremely challenging. The challenges faced include strict quarantine standards, cost, and a lack of sources [Fischer, 2012].

All of the Ungulate TAGs (Antelope/Giraffe, Cervid, Equid, Caprinae, Bison/Buffalo/Cattle, and Wild Pig/Peccary/Hippo) have issues that can be linked to sustainability, whether it is lack of program leaders, lack of genetic diversity, or spaces are occupied by species whose populations exceed target numbers (e.g. plains zebra (*Equus quagga*)) or that are recommended to be phased out by the appropriate TAG [Fischer et al., 2012].

Unreliable breeding also serves as a barrier to sustainability; when animals cannot be bred reliably, this creates challenges for maintaining genetic and demographic population health. While contraceptives can be beneficial in controlling breeding, they may also have unintended effects on future fertility. Animals that have been on contraceptives for long periods of time may not be able to produce offspring or may have a much harder time producing offspring when the contraceptive cycle has ended. Even managing animals in same-sex groups could have negative effects on fertility. In some mammals, it appears that separating the sexes, without also placing females on contraceptives to control cycling, is associated with reproductive abnormalities that can decrease fertility or even cause death [Asa et al., 2013; Penfold et al., submitted]. It is also possible that when animals are isolated or kept in same sex groups, their behavioral skills may be negatively affected.

Understanding the basics of population management

To fully understand sustainability issues in captive populations, it is necessary to know some basics of population management in zoos. Population management means controlling the demographic and genetic status of a population. There is a wide array of tools used to accomplish this, but some tools are more easily used than others. The whole purpose of these management tools is to preserve genetic diversity and maintain a healthy age structure within a given population. The overall genetic goal of population management is to preserve as much of

the founder animals' genetic diversity as possible. Individual animals get breeding recommendations based on their mean kinship [Ballou & Lacy, 1995], which helps to avoid the deleterious effects of inbreeding. Inbreeding can have dramatic effects on population health, such as high infant mortality [Croke, 1997, p. 162]. Animals with low mean kinship are prioritized for breeding because they are the least related to the population as a whole. Mean kinship is a constantly fluctuating number based on both the reproductive success of the individual and the number of relatives the individual has in the population and how well they are reproducing. Generally, more relatives indicate higher mean kinship. Depending on the genetic structure of the population, space, and breeding success, it may be many years between breeding recommendations. Often, animals are contracepted or otherwise prevented from breeding in the interim.

The other main focus of population management is maintenance of demographically healthy populations. Population age structure can be tracked in age pyramids that show the number of individuals of each sex in the population from youngest to oldest. The age pyramid should be triangular or heavy on younger individuals and get narrower in the older age classes. Unfortunately, many populations within AZA have different age structures. One alternate model is columnar, which indicates there are roughly equal numbers of individuals in all age classes. This is typical of populations that have reliable breeding history, but are constrained by space such that the population is maintained at a certain carrying capacity. An inverted triangle structure is characteristic of demographically unhealthy populations; these populations are demographically "old" with few young individuals. These populations have decreased reproductive capacity and are more vulnerable to extinction. To achieve stable population structure, breeding must increase over time until a triangular shape is evident in the age pyramid. However, as mentioned, this is not always possible in zoos due to the reasons of limited space and unreliable breeding.

Animals in captivity do not always breed as expected, which can affect the population's age structure. Fertility in many, but not all species, varies with age. Low fertility occurs early on when animals are not sexually or socially mature. Fertility tends to decline in older individuals due to either programmed senescence or as they experience a general decline in condition. Moreover, zoos sometimes see irregular breeding cycles within their collection animals. One example of this is evident in the red river hog (*Potamochoerus porcus*). The 2013 breeding and transfer plan as well as the TAG's 2008 Regional Collection Plan mention that the reproductive biology of this species is not completely understood and the captive population has experienced low reproductive success. It was suggested during the 2011 Ungulate TAG proceedings that this species might need to be bred continually. Otherwise, there has been evidence that the hogs will cease breeding reliably.

Understanding the role of population management euthanasia

It may seem counterintuitive to consider euthanizing animals as a strategy to help increase the health of animal populations or promote sustainability, but there are several arguments that suggest euthanasia for population management should be part of our sustainability toolbox. First, many animals evolved to be reproductive throughout their lifetimes, even if fertility declines with age. This means that they have been shaped by evolution to continually undergo reproductive processes such as sperm production, egg maturation, breeding, pregnancy (or being gravid for egg-laying species), birth or egg laying, and rearing offspring. Thus, long periods of reproductive inactivity, and in particular periods of repeated non-conceptive ovulatory cycles, are unnatural and expose the reproductive system of females to endocrine dynamics to which it is not accustomed. It could therefore be argued animals should be allowed to breed regularly so that their reproductive systems better mimic natural breeding patterns. As mentioned earlier, data are emerging for mammals that indicate that periods of reproductive inactivity have a negative effect on fertility [Asa et al., 2013; Penfold et al., submitted]. Second, aside from reproductive health, it could be argued that animals live more natural lives in captivity when they breed regularly. Breeding animals demonstrate a wider array of behaviors than non-breeding animals do and may express better social skills, including parental care. Also, animals that are kept in breeding groups generally live in more natural social groupings than non-breeding animals do. Contraception may allow for natural social groupings to persist in captivity, but it also has drawbacks (discussed previously and below). One could argue that breeding animals regularly has welfare benefits. Third, contraception presents a non-zero risk to future fertility. For some taxa like non-human primates, the contraceptive options are more developed and more readily reversible because they have a long history of testing in humans. But for other taxa like carnivores, there are far fewer options and some options have serious side effects if used for very long [Asa et al., 2013; Moresco et al., 2009; Munson, 2006] or are very unpredictable in terms of when the contraceptive effects diminish. Some contraceptive options also have dramatic effects on behavior, such as the elimination of sexual behavior. Hence, while contraception is often very effective at preventing reproduction, it can have dramatic and sometimes irreversible effects or reversal times. The time it takes for a contraceptive to wear off can sometimes waste additional years of fertility. Similar to contraception, the practice of simply separating the sexes can have dramatic effects on physiology and behavior and possibly welfare. Females that repeatedly cycle without getting pregnant may risk compromised fertility or reproductive pathology, demonstrate fewer natural behaviors, and may live in non-natural social groups, depending on the species. Males that are kept separated from females sometimes must live alone, as is the case with many ungulates, dramatically reducing their behavioral repertoire and possibly decreasing welfare. Bachelor

groups may be formed to provide company for non-breeding males, but these are unnatural groupings in many cases and present their own set of challenges in terms of managing aggression. Finally, space is limited in zoos unless we dramatically reduce the number of species zoos are working with. All zoos and aquariums should look for ways to increase space and use it more effectively, but there is still an upper limit on space and this often keeps large percentages of populations from breeding regularly. These realities suggest to us (and to zoos in other parts of the world, see below) that a population management tool that allows animals to regularly experience normal reproductive events, to display the widest range of natural behaviors, and to live in natural social groupings while not leading to over-crowding in zoos, would be very useful for some populations at certain times. Such a tool would promote individual animal welfare as well as strong population viability. Population management euthanasia is such a tool; it has all these capabilities without creating a population of surplus animals.

Population management euthanasia has other benefits as well. First, targeted, well-informed use of euthanasia can be used to adjust the genetic status of a population by equalizing founder representation in the population and reducing levels of inbreeding. Second, it can be used to address gender imbalances in the population such that more animals get opportunities to breed. Third, it can be used to ensure that limited captive space is used most effectively for breeding age animals when it is applied to post-reproductive animals. There are some data that indicate that populations, which are managed by culling, appear to be demographically healthier than populations managed using other tools. The age pyramids below represent recent data for the scimitar-horned oryx (*Oryx dammah*) populations in AZA (Figure 1) and EAZA (Figure 2). There are approximately 176 scimitar-horned oryx in AZA and 350 in EAZA. The EAZA (the European Association of Zoos and Aquariums) population is managed by selective culling of surplus males. The Europeans also cull geriatric or post-reproductive animals in many cases because they feel they are no longer supporting the maintenance of the population. The EAZA age pyramid is triangular in shape and shows good potential for future reproduction. The AZA age pyramid clearly reflects a less demographically healthy population characterized by a severe decrease in breeding approximately 12 years ago and a period of approximately 7 years for the population to begin producing larger numbers of offspring again.

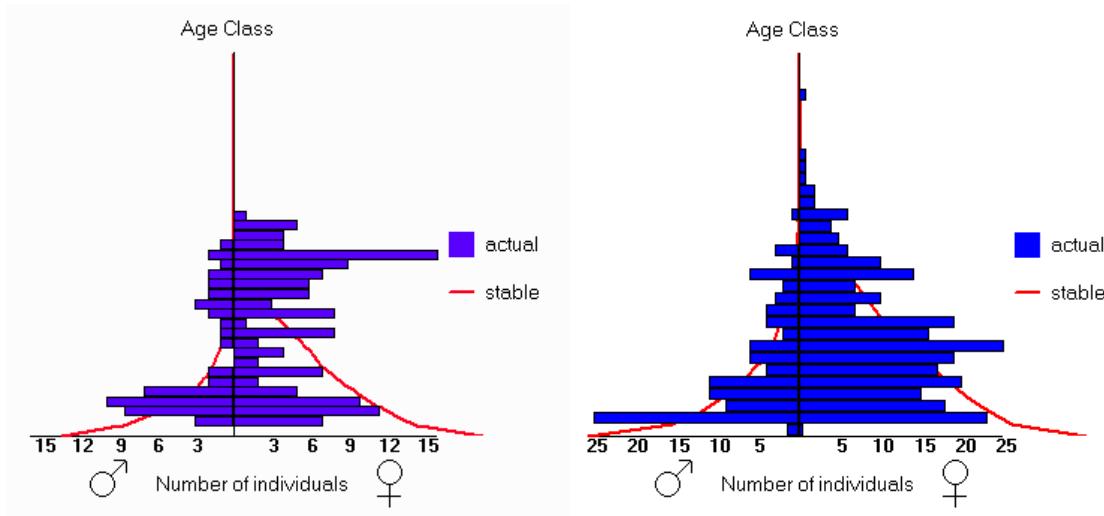


Figure 1: Age pyramid for the scimitar-horned oryx (*Oryx dammah*) population within AZA institutions

Figure 2: Age pyramid for the scimitar-horned oryx (*Oryx dammah*) population within EAZA institutions

Without a doubt, population management euthanasia is one of the more difficult tools, in the sustainability toolbox, to use from a social perspective, but this should not prevent us from exploring ways to make the tool available when needed. Some of the complications include reconciling the needs of individual animals versus the needs of the population and making ethical decisions about how or whether to prioritize individuals or the population. Deciding how to communicate with the staff and public about euthanasia is also a challenge. There are also questions about when a surplus animal should be culled and whether we can truly identify “surplus” animals in the population.

A starting point for dealing with some of the social implications of this management practice is to recognize that zoos and aquariums have a responsibility to maintain *populations* of animals over the *long-term*, beyond the lifetime of individual animals. This does not absolve institutions from providing the best possible welfare for their collections. Second, we need to understand that the decision to cull an animal for population management reasons is not a welfare decision (unless you are talking about the welfare of the population), but an ethical decision. Animals that are culled do not *experience* reduced welfare, unless they are euthanized using inhumane methods. “Experience” is emphasized because, firstly, animals that are dead are not aware of a negative emotional, mental, or physical state, and, secondly, welfare is not a cumulative point system, but rather a combination of positive and negative mental, physical, and emotional states that are co-dependent and vary over time [“Animal Welfare Committee,” 2012]. Third, recognizing euthanasia, as part of the sustainability toolbox, does not mean all of the other tools will be thrown out of the toolbox; it should be used in a well thought-out and judicious way alongside other tools.

AZA institutions are governed by a code of professional ethics and policies, such as the AZA Acquisition and Disposition policy, that affects how animals are cared for, acquired, and de-accessed from collections [“AZA Acquisition-Disposition,” 2006]. The AZA is currently drafting a position statement in support of management euthanasia as part of a suite of tools to manage populations in zoos and aquariums. In fact, management euthanasia is already noted in many institutions’ acquisition and disposition policies and is already in practice within some AZA institutions [Penfold et al., submitted]. Both EAZA and WAZA (the World Association of Zoos and Aquariums) also have position statements in support of population management euthanasia [“Euthanasia Statement,” 2011; Penning et al., 2010]. In addition to operating under the professional ethics code of AZA and its policies, institutions have to make their own ethical decisions about how to manage their animals, but should do so in a way that maximizes the potential for long-term persistence of animal populations. Zoos and aquariums should be able to communicate with their staff, trustees, and the public about these issues and clearly articulate how their institutional position supports the overarching goal of preserving animal populations for generations to come.

There are still some questions that we need to answer when deciding to implement management euthanasia. First, how do we know if an animal that is born or hatched is surplus to the population? There is not one formula that will work for all animals and situations in answering this question. Generally, when offspring are produced as a result of a breeding recommendation from an SSP Coordinator, those offspring are important for the population, so culling is not necessary unless the litter or clutch size is very large and more offspring are produced than are needed. This is sometimes the case with taxa like reptiles, amphibians, and fish. But there are also cases where more offspring are produced than needed because a large number of breeding recommendations are made when it is uncertain how successful each breeding will be. Reproductive success and offspring survival sometimes vary significantly from year to year and more offspring may be produced than are needed. Offspring may also be produced from breeding situations that are not recommended, either because participation in the program is voluntary (e.g. for Yellow SSPs), because the species is not part of a formal management program [Boyle et al., 2010], or because the animals were bred to meet the exhibit needs of that institution only. In all of these cases, institutions should consult with program managers and studbook keepers to help ascertain whether the offspring are surplus. Institutions also have expertise with the species they work with and should have a sense of what their future needs will be for offspring and factor that into decisions about surplus status. Of course, the institution can also work with other institutions to see if surplus offspring can be placed elsewhere.

Another question focuses on when to euthanize surplus animals. This is particularly important for mammals, as well as other species in which parental care experience is important for adults.

It has been argued that there are advantages and disadvantages to euthanizing offspring either at birth or at a later period, such as at weaning or the age of independence [Penfold et al., submitted]. The costs and benefits to zoo staff, to the animals, and to the public must be considered.

Population management euthanasia survey to assess keeper attitudes

The 2012 ungulate TAG meeting in Palm Springs, California brought about the decision that a keeper curriculum should be established to train keepers on the background of population management euthanasia and its purposes. This curriculum could be utilized within the different keeper instructional schools as well as adopted by institutions across the country to train their staff. The taboo nature of the subject is believed to be one reason why population management euthanasia is not considered more often in American zoos. Many animal care professionals may not understand why this tool would be used, or why current methods of population management are sometimes not enough to manage sustainable populations. Additionally, zoo public relations departments may have difficulty in handling the topic. However, it is hoped that zoo employees may come to understand the benefits of this management tool and help disseminate this information to overcome their apprehension.

Since we did not have a good sense of how keepers collectively felt about management euthanasia or their knowledge of it, a decision was made to construct a survey that could be distributed to keepers across the country. Several individuals from many institutions contributed their expertise and advice when editing the survey. It was also reviewed during a critical thinking session at the 2013 Ungulate TAG meeting. This survey has been designed to draw correlations between the way keepers feel about euthanasia and the various situations in which population management euthanasia could be used. Additionally, it provides a learning tool for keepers to understand the background of management euthanasia.

The survey and resulting curriculum are intended to address how the sensitivity of this topic will affect animal care professionals. Their focus on individuals' welfare establishes an attachment that exists on a very emotional level and can have a considerable impact on how keepers perceive the use of population management euthanasia. The resulting population benefits from using this tool can be imperceptible when a keeper has to witness the application of it on animals they care for. It will take extensive training to allow keepers to value an individual animal as they do now, while maintaining an appreciation for the way an individual animal can affect the population. Focus on both individuals and populations not only creates an atmosphere conducive to population sustainability, but also helps animal care professionals maintain high standards of care for their animals. It is every keeper's responsibility to educate

him/herself on the sustainability crisis so that these two drastically different goals can be addressed simultaneously.

The survey will soon be distributed to American Association of Zoo Keepers (AAZK) members in order to survey a broad, diverse group of animal care professionals. The results will be used to gauge existing keeper knowledge and opinion about population management euthanasia as a tool to promote sustainability and identify gaps in how keepers are trained for work in the zoo and aquarium industry. We hope the survey results will be incorporated into training programs at zoos, aquariums, AZA courses, and curricula at zoo-focused university programs.

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The Development of the Light-footed Clapper Rail (*Rallus longirostris levipes*) Project

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Team Clapper Rail

The Development of the Light-footed Clapper Rail (*Rallus longirostris levipes*) Project

The Light-footed clapper rail, *Rallus longirostris levipes*, is one of the most endangered coastal birds in southern California. Habitat destruction and degradation of coastal wetlands resulted in the near demise of this sensitive marsh bird. In the 1980s populations reached a critical low of fewer than 200 pairs in 23 distinct locations, with 80% of the population distributed between only three locations within southern California. In addition to habitat destruction and fragmentation, populations suffered a genetic bottleneck from lack of movement between sub-populations. In 1998 a partnership between SeaWorld San Diego (SeaWorld), United States Fish and Wildlife Service (The Service), San Diego Zoo Safari Park (Safari Park), Living Coast Discovery Center; formerly Chula Vista Nature Center; (Living Coast), California Department of Fish and Wildlife, Richard Zembal, and a handful of NGOs was established to enhance the wild Clapper Rail population and improve the genetic composition through zoological-based breeding and release activities. SeaWorld, Safari Park, and the Living Coast each served as breeding centers for propagation efforts. SeaWorld developed artificial incubation and hand rearing protocols and techniques. The development and implementation of pre-release transition process to evaluate and improve the readiness of the birds, combined with the developed husbandry techniques, has maximized productivity and propagation success of both parent reared and hand reared offspring.

Artificial Incubation

Eggs collected from the wild for artificial incubation are candled in the field to determine fertility. The air cells of the eggs are marked in the field with a nontoxic Sharpie®. Eggs are collected from wild nests in Newport Bay transported to SeaWorld in a portable incubator set at 99.0 °F (37.2°C). Millet or foam is used as the substrate in the portable incubator to cushion the

delicate eggs. Transport time is approximately two and a half hours. Upon arrival at SeaWorld, eggs are weighed, candled, and transferred to a Humidaire™ model 21 incubator. All eggs are candled using a Marsh Farm's Hi-Intensity Candler to determine fertility and check eggs for damage. Incubation parameters are 99.0° F (37.2°C) dry bulb, 82-84° F (27.8 – 28.9 °C) wet bulb (Guam rail source). Eggs are manually turned, by hand, 180° five times a day. Each egg is marked with two arrows, each pointing opposite directions 180° apart from each other, to indicate the turning direction and prevent constant rotation in the same direction. Egg turning stops when the chick pips through the exterior egg shell. At this time, the chick is moved into a Grumbach Hatcher™. The hatching egg is placed on a bar mat lined tray with the air cell tilted slightly up. Pip to hatch interval is 24 - 48 hours. A clutch of healthy rail embryos should hatch synchronously. It is preferable to set all eggs from a clutch at the same time. Rail chicks are precocial and begin walking within an hour of hatching. They hatch with their downy feathers matted to their skin. The newly hatched chick takes on a black and fluffy appearance. Chicks are moved from the hatcher to a brooder box at approximately 24 hours after hatching.

Housing

The brooder box is 20" x 20"x 20" wood container. The box has screen vents that allow for light and air circulation. The heater is a porcelain based receptacle with a 6 watt red bulb and a thermostat. A second porcelain based bulb controlled by a toggle switch allows for artificial photoperiods. The light is switched on for roughly twelve hours each day. The brooder box is painted for ease of cleaning and disinfection and is lined with bar mat or shelf liner and a clean towel free of holes or frays. The rail chicks are easily tangled in loose threads thus it is important to check towels daily. Feather dusters are not recommended as brooders due to entanglement. The brooder box is cleaned and disinfected daily.

Tapes of ambient marsh sounds are continually played to minimize the potential for imprinting. Chicks are puppet reared in the brooder box until they are eating from a dish without stimulation. At seven days of age, the chicks are moved to a heavily planted 4' x 8' enclosure with supplemental heat provided by a ceramic core heater. The enclosure is screened with opaque plastic or screen to minimize human contact. The marsh tapes are continuously played in this new enclosure and there is no talking in the area. Daily maintenance is minimized and there is very little exposure to animal care takers. By day 10 the chicks are eating live food items with ease and the base diet is discontinued. At day 14 the clutch is moved to an outside planted 4' x 8' enclosure with supplemental heat and a gently sloped pool. Supplemental heat is provided until the chicks are three weeks old and thermo-regulating in ambient temperatures.

Diet

Rail chicks begin to eat almost immediately upon being moved to the brooder. The chicks are encouraged to eat independently by using a puppet head and forceps to tap at food. All feeding dishes are natural appearing artificial rocks. The dietary components are varied on a daily basis. The live foods are coated with commercially prepared complete diets until the chicks are moved to a planted enclosure. Dietary components are selected to resemble items that rails would forage on in their natural habitat. Readily available live food items like: crickets, meal worms, wax worms, bloodworms, pinkie mice, snails, and mosquito fish are incorporated in to diets. Both natural and commercial live foods are important components of the diet because the provide stimulation and develop foraging behaviors that the birds need for survival.

Krill, fresh-frozen fishes, hard-boiled egg yolk, chopped romaine lettuce, duckweed, Mazuri Waterfowl Chick Starter™, soaked dog food (Wayne's Sensible Choice™) are items fed to meet the nutritional needs of the rail chicks. The egg yolk, dog food, and Waterfowl starter are

considered the base diet. The other items are alternated in to the diet for variety. Live food items are placed on top of the base diet and other non-live items to stimulate interest in food and prevent developing a preference for commercial diets. All food items are sprinkled with Vionate™, a multivitamin and calcium carbonate while chicks are fed previously frozen and thawed fish and krill and commercial pellet. Once sufficient foraging is identified in all members of a group (based on weight gains), the diet is transitioned to a live food only diet.

Post-release Monitoring and Radio Telemetry

The Light-footed clapper rail is very elusive in its natural wetland habitat. Each captive-bred rail is banded with a Federal aluminum band and a colored plastic band. The color of the plastic bands varies from year to year and serves to denote the year of banding/release. Catching a glimpse of the colored band is difficult and identifying a rail by reading a band number is even more challenging due to the bird's inconspicuous behavior. Annual censuses are conducted by counting vocalizations as opposed to sightings. This makes tracking released rails difficult.

Radio telemetry was employed to monitor post release survivability and movements of captive reared rails in 2005 and 2006. In 2005 rails were tracked in Sweetwater Marsh, San Diego and Mugu Lagoon.

All chicks are banded with a colored cable tie system during the hand rearing process. Chicks are numbered with individual institution accession numbers and also given a regional studbook number. The birds are entered into a PopLink data base. Prior to release, the colored cable ties are removed and replaced with a Federal aluminum band and a color plastic wrap-around band (see Zembal and Massey 1983 for a full discussion of trapping and banding techniques). Although there have been multiple sightings of some of these banded rails, an attempt to develop more data on post-release dispersal was made in 2005 and continued in 2006

with radio telemetry. Ten RI-2c transmitters were purchased from Holohil Systems Ltd. The transmitters weighed slightly less than one gram each, measuring 15 x 7 x 35 mm, about the size of a pencil eraser. The expected battery life was 42 days with a range of about one mile. All of the transmitters were designed for tail-mounting. They were attached to the two central tail feathers with 12 lb monofilament and super glue. It was surmised that the tail-mounts would fall off with tail-molt or sooner with repeated jostling and preening.

Transition for release:

Every Clapper rail produced by the program, both parent reared and hand reared birds, go through a transition/proving process prior to release to the wild. The proving process serves three primary purposes. The first function of this step is to provide the young rails with the opportunity to safely forage and function in a natural salt marsh environment. Although most of their foraging habits seem to be instinctual, the proving process is beneficial and necessary in transitioning the chicks from the captive diet to a more natural, live prey diet they will need to consume in the wild. Observing and documenting that each cohort of rails is foraging live prey is a requirement before birds are released. The second purpose of the proving process is to evaluate, and if necessary shape, the young bird's behaviors and attitudes to the presence of people and predators. Over the history of the program, several cohorts of rails have become accustomed to the presence of people and associated their keepers with feedings. Some groups of birds have shown a lack of fear of predators – particularly raptors. In addition to the behavior based considerations for the Clapper rail offspring, the proving process is also useful to increase and manage for multiple clutches of offspring for the breeding adults.

Ideally young clapper rails are transferred, with their siblings as a cohort, when their primary wing feathers are 70 to 90 percent grown-in. This window is between 50 to 60 days of age and the ideal duration for birds in the proving system is four to six weeks.

Feeding regimen while in the proving enclosures consists of commercial previously frozen fishes, krill, and a variety of live native invertebrates (Fiddler crabs (*Urca crenulta*) and Shore crabs (*Pachygrapsus sp.*) collected in wetland habitats. The live food items are offered to encourage and ensure appropriate foraging behaviors. Typically the proving enclosures contain generous amounts of live Killifish (*Fundulus parvipinnis*) and Sail fin Mollies (*Poecilia latipinna*). Between the food items supplied by the proving keepers and the naturally occurring live foods items, the rails have access to food at all times.

Release:

Release sites are selected by Richard Zembal after the annual census is conducted. Resource management, food availability, and vegetation are considered during the selection process. Richard Zembal is the expert on the sustainability potential of habitat and light-footed clapper rail behavior after over twenty years of study and data collection (B. Massey 1984). Descriptions of all the marshes recently occupied by Light-footed Clapper Rails are available (U.S. Fish and Wildlife Service 1985 and Zembal and Massey 1981). The wetland vegetation is dominated by pickleweed (*Salicornia virginica*) but scattered stands of spiny rush (*Juncus acutus* ssp. *leopoldii*) are critical for rail nest placement. Artificial nest baskets designed by Zembal have been used successfully in rail habitat to provide suitable cover for rails in areas of sparse vegetation. The baskets are a 2 ft X 2 ft piece of outdoor plywood covered with a dome of welded wire that is entwined and covered with raffia except for the 4 side doors. The baskets were fixed 18 – 24 in above the ground, beginning level with the vegetation canopy and

proceeding above it on two pieces of aluminum conduit driven securely into the substrate. Skinny bamboo rods were attached at various angles to and through the basket, protruding 36 in. in all directions above to deter raptor perching. The artificial cover provided by the rafts and elevated baskets should be considered a short-term management tool for use while restoration of natural cover is planned, implemented, and matures.

Since 2001 nearly 400 Clapper rails have been raised and released into the southern California wetlands. Breeding and release activities have contributed to a more robust wild population, with a steady increase since the inception of the program. Current population is estimated to over 500 breeding pairs in their native United States range. This represents a historic record high since monitoring began. Additionally, release activities have resulted in a more even population distribution through their native range. Husbandry techniques learned through the zoological breeding efforts continue to benefit the wild populations and provide opportunities for future genetic diversity.

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Rail chick and artificial rock feed bowl



Rail nest in pickleweed (*Salicornia virginica*)



Transition Pens



Parent with chicks

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Cooperatively Coping and Flight Training a Peregrine Falcon with WNV, Monocular Blindness and a ‘Can-Do’ Attitude

Author: Rachael Rufino, Animal Keeper, CuriOdyssey at Coyote Point

In 2012, CuriOdyssey received a non-releasable, rehabilitated peregrine falcon (*Falco peregrinus*) for their educational animal collection. Upon arrival, it was obvious that his nares were severely congested; possibly caused by his West Nile Virus. This meant that coping Horus' talons and beak included restraining him further to clear his nares of debris each time. In addition, Horus has limited vision, which raised challenges for training him to fly on stage during Wildlife presentations. To address these issues, a training plan was created to desensitize Horus to some aspects of coping and work around his physical challenges to fly in a theater. Within a year of implementation, Horus now has his talons trimmed without restraint and is flying onstage and off during shows. Training has been so successful that stationing in the mew and full foot lifts for programs have also been achieved. This paper will discuss the challenges and successes of Horus' training, and how understanding the species and the individual can make all the difference.

Introduction

Despite a slew of misfortune, a peregrine falcon named “Horus” at CuriOdyssey has demonstrated what can be accomplished by simply living in the moment. In 2005, Horus was found as an orphaned chick. He was rehabilitated at the Ojai Raptor Center (ORC) where he tested positive for West Nile Virus (WNV). As is the case with most infected birds, Horus did not show signs of illness and was still deemed a good candidate to be released. He was placed in a falconry program where he trained to hunt for two seasons with a local falconer. Shortly before Horus was going to be released, he was spooked into the bars of his cage during the night and found the following morning with a corneal ulcer. After losing sight in his right eye, Horus was considered non-releasable by a veterinarian and was used for educational purposes at ORC.

In 2012, CuriOdyssey acquired Horus as an education animal. It was clear that Horus was very congested at the time and with each breath the skin around his nares would fluctuate. Under anesthesia a substantial amount of debris was removed from his nasal cavity. Veterinarians suspect this may be a side effect of WNV or damage sustained from his accident at ORC. Because of this, Horus' nares would have to be picked on a bi-monthly basis while restrained for regular coping. He was assigned a primary trainer with the following training goals in mind: 1. Horus would be used for all onsite and offsite programs, 2. He would have his talons cooperatively coped to reduce the amount of time he would be restrained, and 3. He would fly onstage in wildlife presentations.

Approach

Horus is trained roughly four days per week with a whistle for bridging desirable behaviors and his regular diet as reinforcement. The goal to use him as an education animal was achieved shortly after he arrived because he had already been manned down and used for this purpose at ORC.

The second goal- to cooperatively cope Horus- began with desensitizing him to being touched. Because of Horus' reactive personality, a feather was used first to desensitize him to touch instead of bare hands. The verbal cue, "touching" is said right before each touch. Initially, he was very vocal and would constantly try to bite and talon anything that came near his body. Horus was bridged and reinforced for not having physical reactions toward the feather that would touch him. When he was consistently calm during these training sessions, the feather was phased out and bare hands were used. Light toe, ankle and keel touches evolved into Horus having his toes lifted off of the glove and anklets tinkered with regularly. Eventually, talon clippers were held to his each of his toes and within a few sessions, they were being trimmed as he sat calmly on the glove. This has reduced the amount of time that he is under stress during restraint since he requires additional maintenance.

Training Horus to fly on stage was the last goal and the most challenging. This behavior was also the most enriching because provided exercise and could take place indoors and outdoors in the backfield. Although the field is somewhat spacious and flat, it is also very distracting. Wild turkey vultures, ravens, hikers, bikers and airplanes tend to distract Horus from flight training. The outdoor space is also used for other animal trainings and CuriOdyssey's summer camp, so communicating when the space is used is important. With one trainer, Horus began flight training in the field from perch to glove. Only a physical cue was used to signal him to fly, which was a raised glove. The perch was constructed from a sawhorse, AstroTurf and zip ties. For outdoor flights, Horus is attached to a creance and a drag. After being placed on the perch, Horus was asked to perform 1 ft. "flights" to the glove. He was initially baited to the glove to perform this behavior. The flight distances increased to 30 ft. in the field. When this behavior was reintroduced inside CuriOdyssey's theater, Horus was asked to perform 1 ft. flights again, which increased to 12 ft. onstage. The theater was also the first time Horus was introduced to having two trainers at once for glove-to-glove flights. Using a creance, Horus flies from an animal keeper's glove backstage and lands onto the glove of the keeper onstage. He exits the stage by flying back to the keeper that is behind-the-scenes. Horus was much more consistent flying onstage than exiting; the keepers speculated this was caused by his monocular blindness, since it is harder for him to gauge how much space he has on his right side when flying in-between two walls that are 1 ft. wider than his wingspan. To compensate for this, the space between the walls was widened by 1 ft. Horus responded very well to this adjustment and began flying much more readily offstage. When he became consistent flying offstage, the space was reverted back to its original width and Horus appeared unaffected.

Once Horus became consistent during trainings, he was not always immediately bridged for performing a behavior. At times, he would be asked to perform a behavior or a variety of behaviors, twice or three times before receiving a bridge. He would also receive several pieces of reinforcement rather than just one piece for a well-executed behavior or multiple behaviors. This helped maintain his interest because training sessions would be variable. An effort was also made to have an audience as often as possible during training sessions. This allowed Horus to be desensitized to performing behaviors in front of people from the get-go, lessening the time it takes from "mastering" a behavior to performing it in a program. In addition, Horus would be less stressed when surrounded by people because it did not necessarily mean that he was going to be caught up and restrained.

Moving Forward

Training Horus has been so successful that behaviors in addition to the three main goals have been implemented. Desensitization to touching has led to Horus sitting calmly while his entire foot is lifted off of the glove and held for 5 seconds. This has been useful for programs when keepers describe how large falcon feet are for their body size, and make his talons more visible when lifted off the dark colored leather glove.

Another behavior was established more from necessity than for aesthetic reasons. Animal keepers had noticed that due to Horus' high-strung personality, he became very vocal and flighty whenever they approached him in his mew. The decision was made to station train Horus so that he would fly to a designated platform and wait to be picked up. His verbal cue was "station," with a simultaneous physical cue: a fist at the trainer's chest. While the permanent platform was being constructed, a temporary station was used- a perch wrapped in Astroturf. Horus took to stationing almost immediately. The challenge came with his temporary station was removed and his permanent station was introduced. The wooden platform is 7 in. in diameter, covered with a daisy mat and is attached to the frame of his mew by wall-hanging cleats. Additional cleats are drilled in the mew so when his perching is rearranged, the platform can be reattached elsewhere for him to access. Horus had difficulty separating the old station from the new station, despite the old one being removed. After taking a couple weeks off from station training, it was reintroduced with the new verbal cue, "perch," and a new simultaneous physical cue: 3 two-finger taps on the platform. Horus re-learned how to station within two training sessions and continues to be very consistent with this behavior.

Future behaviors for Horus to learn include opening his wings on cue for programs and cooperative nare picking. Both behaviors have been established in other CuriOdyssey education raptors, which may help serve as a model for creating these training plans.

Conclusion

There is no doubt that Horus has accomplished a lot at CuriOdyssey in less than two years. Patience and consideration for his physical restraints and personality has helped him succeed in performing a number of behaviors, allowing him to be a more effective and impressive animal ambassador. More importantly, Horus' stress levels during coping and human interactions have been greatly reduced as he participates in his own healthcare. Horus continues to move forward with his training program and rather than focusing on the past, focuses on his future- the next delicious piece of reinforcement.

Acknowledgements

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Training a Pair of Abyssinian Ground Hornbills for Voluntary Radiographs

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ABSTRACT

Cheyenne Mountain Zoo (CMZ) is home to 1.1 Abyssinian Ground Hornbills that star in the zoo's "Wings of Africa" bird show. By nature, ground hornbills are very curious, intelligent and charismatic, which in turn makes them great education and exhibit birds. Unfortunately, hornbills are also known to find and ingest foreign objects that may put them at great risk. In 2008, CMZ's hornbills began ingesting rocks too large to pass through their digestive tract. They were regularly caught up and sedated for radiographs to monitor what foreign bodies were in their systems, sometimes even tubing them with mineral oil to encourage rocks and gravel to pass through on their own. In addition to these procedures, the female had to have surgery to remove small pieces of glass and metal and large rocks from her stomach. The routine captures and involuntary restraints began to break down trust between the birds and their keepers. Since we needed to maintain a high level of trust and a good relationship for the show, we began to brainstorm ways to get voluntary radiographs on both hornbills in a stress-free setting. This paper outlines the steps taken and the challenges that were overcome to train two Abyssinian ground hornbills with very different personalities.

BACKGROUND

In 2008, both hornbills began to ingest foreign objects, including rocks that were too large to pass through the bird's digestive tract on their own. We began to look at the possible causes for the pica to see if we could stop the behavior. We looked at their diet and overall health to determine if they were experiencing a mineral deficiency, which was leading them to geophagy. We also re-evaluated how often they were receiving enrichment and started providing enrichment more often throughout the day. We offered multiple feedings in the day to allow them more opportunities to forage. We also contacted other zoos to see if anyone had any other ideas for us. We began feeding them Metamucil and then later peanut butter mixed in their meat diet to see if those items might help the smaller rocks and grit pass through on their own or bind to them and help them pass. However, by this time the damage had been done and we had to perform surgery on our female hornbill, Jekyll (the more severe case of the two hornbills), to remove the larger rocks and the pieces of glass and other foreign objects in her ventriculus. After the surgery, we had to routinely catch up both hornbills to tube them with mineral oil and Metamucil to help the remaining stones pass through their GI tracts. This had to happen repeatedly (sometimes even twice a day) and really broke down the trust between Jekyll and her keepers. Understandably, she began to flee from us when we would approach and wouldn't train with us. We had to work for a while after the treatments to rebuild our trust account with her.

Over the years, we have been able to slow down the pica by increasing enrichment opportunities and providing more complicated enrichment to increase foraging time. Also doing more frequent training sessions and feedings also helped reduce the pica. Ultimately a change to the Abyssinians' enclosure was what helped most. We had to put rubber mats down to keep them from eating the rocks in the soil. We still allow them supervised time on natural substrate and provide regular dust baths of sand or sifted soil to allow them to maintain good feather health.

THERE'S GOTTA BE A BETTER WAY...

Both hornbills continue to have a small amount of small rocks and grit in their GI tract, but I wanted to have an easier, more stress-free way of monitoring how many rocks were present or if they managed to eat something else they weren't supposed to. Therefore, I decided to start training for voluntary radiographs.

I brainstormed with our vet staff, my supervisor and our Animal Behavioral Programs Manager about how we wanted to train the behavior. Did we want them to line up along the mesh of the indoor enclosure for vet staff to radiograph them? But that could be a problem as the x-rays would bounce off and interfere with the metal mesh. Did we want them to station on the ground and hold the plate next to them? My main concern with this idea was protecting the exposed and vulnerable x-ray equipment from the powerful bills of the hornbills. Therefore, we decided to try modifying a plastic dog kennel and use that like a training chute. We also used an x-ray plate holder that we use to protect the x-ray plate when taking radiographs of giraffe feet. Since the holder was strong enough for giraffe, it had to be strong enough for hornbills, right? Vet staff then creatively taped a dead chicken to the x-ray plate holder and placed it in the kennel to see if x-rays can pass through the plastic of the dog crate. Luckily they can! I then modified the crate further to allow the passage of the plate holder into the crate next to the hornbills from the top of the crate, removed the metal mesh on one side of the crate and cut down the seam between the top and bottom sections of the crate to reduce interference on the radiograph.

THE TRAINING PROCESS

Since both hornbills were crate trained, it didn't take long for them to enter into the modified crate. At first, my training plans were to have them turn around in the crate and face the door so they would feel more comfortable. But it became quickly evident that the crate was a little tight with the plate holder in there, so I began reinforcing them from two holes drilled in the back of the crate. They could enter and then back out to exit the crate. I had also planned on closing the crate door once they were inside to ensure the safety of the x-ray equipment outside. However, I noticed that Jekyll wouldn't eat inside the crate and seemed to need to step out to toss her head back to catch the food in the back of her throat. Therefore, I removed the door from the crate entirely and gave them both the freedom to leave the crate at any time. This remained for the entire training process. The hornbills could come and go as they pleased.

I worked with them on positioning first, getting them lined up properly with the x-ray plate. Then I worked on holding duration with them. I would give them a verbal cue "crate" to enter the crate then a verbal "hold" cue along with a finger cue to keep their focus forward. After they were holding for 7-10 seconds, I introduced a second trainer to stand next to the crate with a small Coleman lunch box cooler to act like a light machine. We also began wearing lead vests at this time to get them accustomed to us wearing large bulky vests. I then asked one of our veterinary technicians to assist in the training sessions to allow the hornbills time to get used to the person who would be assisting with the actual procedures. We gradually worked in additional vet staff to observe the training until the big day when we were able to successfully get several clear radiographs from each bird.

RESULTS

The personality of each bird needed to be taken into account while training. We went at the birds' pace and relaxed criteria when introducing new people. Jekyll is much more timid around new people and with new situations, whereas Petrie is very confident during training sessions and curious when new people are around. Therefore, Petrie's training progressed more quickly than Jekyll's.

The number of sessions required to train the behavior was as follows:

Petrie= 26 sessions (a little over 1 month)

Jekyll= 40 sessions (a little over 2 months)

OBSERVATIONS

Challenges faced with Petrie were mostly surrounding focus when we introduced vet staff. He is such a curious, personable bird and he just wanted to see them and thus got distracted easily. Challenges with Jekyll also involved vet staff, but in a different way. Instead of being excited to see them like Petrie was, she appeared nervous around vet staff due to her negative history with them. We were able to overcome those challenges with patience, positive reinforcement and trust building. I had vet staff feed her during some of the sessions or just at random times to build trust between them. Also, empowering her proved to work in my favor. She was always allowed to leave the training area completely and go back into her enclosure whenever she wanted. She would almost always come right back out to continue training once she felt more confident.

There were some pleasant surprises that resulted from the training. I was concerned that they might bite and pull at the power cord leading to the x-ray plate and was prepared to protect it with PVC pipe, which I was also concerned that they might mess with. I was also concerned that they (especially Petrie) would pound on the x-ray plate holder and that we might have to work on just standing quietly in the crate for a while. Neither of these concerns proved valid as they behaved themselves and were perfect little hornbills!

CONCLUSION

In the end, my goal was achieved- to have the hornbills allow us to take awake/voluntary radiographs of their GI tract so that we can continue to monitor their health and catch any foreign object ingestion early on. Going at the birds' pace, reading their behavior and allowing them power during the sessions helped gain trust, sped up the training process and resulted in a successful training project.

Pizza Boxes, PVC and Packing Paper: Enrichment for an Empty Wallet paper

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Institutions both large and small feel the impacts of a poor economy and often look introspectively for ways to reduce costs. For many organizations, especially smaller ones, a tight budget may lead to animal enrichment programs being severely reduced or even eliminated completely in an attempt to curb expenditures. Toys that can withstand the abuse captive animals deliver are often prohibitively expensive or have surprisingly short lifespans. While some novel objects cannot be easily recreated (like the much loved, and very expensive "30-inch Boomer Ball"), the behaviors they elicit often can be. By focusing on the purpose of specific types of enrichment rather than the commercially available choices, we have found ways to create engaging and varied enrichment programs for our animals; which range in size from songbirds to cattle.

First things first, get acquainted with your neighbors! We, at the Museum of Life and Science in Durham, NC, are incredibly fortunate to be situated right in the middle of a very supportive neighborhood. Thanks to our neighbors, we have routine deliveries of newspaper, cereal boxes, toilet paper and paper towel tubes, and yogurt cups. We've also had special deliveries that vary with the seasons: truckloads of watermelons or pumpkins, evergreen trees, stumps, wooden spools, egg crates, deer legs, towels and blankets, and even a 2-stall horse trailer. It's amazing what items people are willing to donate to a local organization. All you need to do is ask.

Once you have a small stockpile of items, put your imagination to use. Not every item needs to be complicated to be engaging for your animals. We've found that for many of our animals, the simple items become the most entertaining (for both critters and keepers). Below are five different categories of enrichment --Sensory, Food, Toys, Behavioral, Training-- that we use at our museum and some examples of items that could be used to satisfy those categories along with a few animals who seem to like them. All of the items are things that we've acquired for free or were assembled from leftover parts from other projects.

Sensory: Sight, Sound, Smell, Tactile, Taste

- Windsocks hung out of reach of animals, but within their sight: Raptors, Alpaca, Wolves.
- Radios playing music quietly: Steer, Lemurs, Blue Jay.
- Old perfume, animal scents and attractants sprayed lightly on an area of the exhibit or onto another piece of enrichment: Bears, Opossums, Wolves.

- Small pinches of fur from another animal, sprinkled cooking spices, Astroturf carpets with the animal's diet scattered on it, foam noodle covered perches, piles of substrates (mulch, sand, pine shavings, hay): Donkey, Snakes, Chicken.
- A clean litter box filled with mulch, sand, water, rocks, or pine shavings: Ferrets, Box turtles, Owls.
- Molasses/syrup dribbled on a toy, dilute juice/Gatorade/blood popsicles (can be frozen in yogurt cups/ice cube trays for small animals or in water balloons/rubber buckets for large animals. If you use bundt pans, the center hole allows them to be hung up in exhibits): Bears, Wolves, Goats.

Food

Nearly any existing toy or enrichment item can be modified to dispense food. Take a look at what you've got laying around. Most hard plastic balls can have various-sized holes drilled into them as can any paper boxes, PVC pipes, kitty litter containers and large water cooler jugs. They can be laid on the ground or suspended from chain or rope for a different experience. Boxes can be filled with newspaper or with other boxes to increase the challenge. Here are some examples we've done of food-based enrichment that are a bit different.

- Kerplunk game for our Bluejay:
 - What you need: Paper towel tube, thin wooden sticks (we used the "handles" off long cotton applicators), a whole peanut in its shell.
 - How to make it: Using a knife, we punched small holes in the sides of the paper towel tube, then we folded one end of the tube in on itself to close it off, dropped in the peanut, inserted the wood sticks across the tube making sure they crossed at various points, and flipped the tube over so the peanut was at the top. In order to "win" the Blue Jay needs to pull out enough wooden sticks to allow the peanut to fall to the bottom of the tube, where he can reach it. We've had this tube both suspended from a branch in his cage as well as sitting on the floor.
- Paper mache balls:
 - What you need: balloons, newspaper, flour, water, drying space.
 - How to make it: Blow up a balloon and tie it closed, mix your water and flour until you've got a thin paste, rip your newspaper into strips and start layering them over the balloon, leaving the area around the tied bottom of the balloon uncovered, set the balloon aside to dry. Once it's dry, hold the bottom of the balloon in one hand and pop it with something sharp. You should be able to pull out the balloon, leaving you with a hollow paper ball to fill with anything you'd like. CAUTION: Many of our animals like to eat the paper mache (rabbits, pigs and steer), yours might do the same.
- Insect dispenser:
 - What you need: Old clear plastic container (we used an empty cable tie container), a spare PVC tee joint, some rocks and sand, maybe some glue, bugs.
 - How to make it: Cut a round hole on the side of the plastic container that's just big enough to slide the PVC tee into. This hole can be as high or as low on the container as you'd like (ours is about 6" up from the bottom). Insert the center

stem of the PVC tee into the hole. Fill the container with sand and rocks until you reach the bottom edge of the PVC tee. Toss some bugs in the top and wait until they randomly wander out the PVC tee. This can be suspended, placed in a large bowl or set directly on the ground. Our duck uses this with crickets on a regular basis.

- Honey dripper for bears:
 - What you need: 4" PVC pipe, 2 end caps (1 screw on kind, 1 permanently affixed), 6 inches of ½ inch threaded rod, length of chain, 2 acorn nut caps for the threaded rod, drill, PVC glue.
 - How to make it: Glue the solid end cap to one end of the PVC pipe and let dry. Drill a ¼" hole in the center of the solid end cap. On the other end of the pipe, drill a hole on each side that the threaded rod can fit through, this is what the honey dripper will hang from. Put an acorn nut on one side of the threaded rod then thread on a link of the chain, then put it through the holes you drilled on the sides of the PVC pipe. Once through, thread on the other end of the chain and affix the other acorn nut. Glue on the fitting for the screw cap over the open end of the PVC. Once dry, add some honey (syrup and molasses also work), screw in the cap and hang up in the exhibit. We've had great success with this item as long as it's kept above the bears heads. They can knock it around but it'll only drip out honey one drop at a time.

Toys

These are the items that are often more difficult to replicate when you're strapped for cash. Handled Jolly Balls, Boomer Balls, Kongs, traffic cones and climbing structures are all staple items at the museum. It can seem impossible at first to create a reusable item like these out of nothing, but it can be done!

- Plastic umbrella stands can have holes drilled in the bases and be used as food dispensers, simulating the "Amazing Graze." Our donkey also likes to grab the top of the stem and throw the umbrella stand across the yard, even when it's empty.
- Trash can lids can be cable tied together (concave sides facing) making a toy that wobbles like a weebles. It can be made more interesting by putting a ball or two inside so it makes additional noise as it moves around.
- We once found a Little Tykes plastic outdoor play set being thrown away and we scooped it up for our bear cubs and baby goats to play on. It's gotten a little sun bleached, but 5 years later it's still around and waiting for our next batch of excited babies to play on.
- Old metal troughs that no longer hold water are staple climbing structures in our bears' holding yards.
- Jolly Balls that have lost their handles have been chained together and hung up for our steer to knock his horns into.
- A 15 foot long piece of leaky garden hose had holes punched in it and plastic chains attached to make a kind of curtain that we could string across a yard.
- Any lidded plastic container can be filled with dry beans or balls and sealed shut making rattles. We have tiny ones made out of pill containers for ferrets and chinchillas as well as a larger one made from a cement mixing container for our steer.

- PVC pipe that is attached to a fence and can be spun around, allowing a small child's toy that's safely enclosed inside the pipe to "Moo."
- Firehose can be woven into frisbees and hammocks for all sorts of animals. We have hammocks for ferrets, lemurs and bears and a frisbee for our Donkey.

Behavioral

This kind of enrichment is about letting an animal do what it's naturally inclined to do. Here are a few ways we accomplish that:

- Stumps: Our neighbors drop them off or we get them from fallen trees on grounds. They are climbing platforms for goats, part of our training sessions for bears and lemurs, natural scratching surfaces for our alpacas, a place to scent mark for our woodchuck, a convenient Keeper step stool for that "just out of reach" place, and so much more. We make 6 foot tall piles of stumps in our steer yard nearly every morning so we can watch him knock them all down when we let him out. The pigs roll them around their yard, the lemurs sit on them and sunbathe, the opossum will lick them and rub his face on them until he's soaking wet; there is no replacement for a good stump. The best part? When you're done with them, you can simply toss them out into the woods!
- Pumpkins can be stacked up into the Autumn equivalent of snowmen to be tackled by bears or headbutt by hoofstock.
- Large round hay bales have been brought into the bear yard for some really hilarious bear antics and then later redistributed in the yard for the bears' winter bedding. Ours are leftover from an Autumn seasonal event.
- Scrub brush heads: you can hide food in them or just leave them as is. The muskrats will extract food and the ferrets will dig through the bristles.
- Fake sheep:
 - What you need: a box for the body, wool or some kind of prey animal fur, a paper mache ball or a box for the head, cardboard tubes for the legs and neck, markers or paint for decoration.
 - How to make it: Anyway you'd like! We've made tiny ones for the muskrats and woodchuck and huge ones for the wolves. They've been completely covered in wool sometimes and others have been little more than a cardboard box with a sheep drawn on it. The level of detail is up to the creator.
- Going on walks: Almost all of our animals are given some level of supervised free-roam exercise time daily. Exercise is important for captive animals' physical and mental well-being. It's not just the outdoor animals that get to run around in the mornings, the animals that live indoors have exploration schedules, too. Some get supervised outdoor walks, others stay inside but are allowed to explore areas they normally don't have access to, via exercise balls, playpens or direct keeper supervision.

Training

The Operant conditioning program at the Museum of Life and Science is still relatively new. All of our large animals are well-versed in behaviors that help us care for them on a daily basis and we're now beginning to incorporate medical procedures into our daily training. While we do not choose to teach our animals to perform for our guests' entertainment, we do have a few animals

that learn new behaviors faster than the keepers might like them to requiring us to sometimes train a behavior that is really “just for fun.” Even those behaviors that are not strictly husbandry related are of great value to both the keepers and the animals. Operant conditioning allows for a closer inspection of an animal’s behavior or general health and the bonding time it creates can be invaluable in an emergency or stressful situation. Even if your animals only know “target” you can be confident knowing that you, at the bare minimum, have a tool that can move an animal from its current location to a more desirable one. Even reptiles and fish can learn to target with consistent training.

Enrichment doesn’t need to be a burden on your department’s budget. Often times, it’s as much fun to prepare as it is to watch the animals interact with. Enrichment can be as simple as a ball of newspaper or as complicated as a PVC puzzle feeder, it can be as tough as teaching a Blue Jay to come when called or as easy as snuggling a rabbit while he sleeps. As long as you can keep your enrichment varied and unpredictable, you’ll be bettering the lives of your animals.

Extras

Below is a list of items not explicitly mentioned in this paper. All are things we’ve been donated from our community and have been used at the Museum.

- o **Starch packing peanuts/packing paper-** loose or in a big pile, great for diggers.
- o **Holey logs-** drill holes in small logs to hide food in, great for dexterous animals.
- o **Bamboo chimes-** lengths of old bamboo poles chained across a piece of scrap wood and hung up, our steer loves knocking his head into them.
- o **Phone books-** some animals like to shred them, some will pick food out from in between the pages, others use them for bedding. Bears, Pigs, Woodchuck.
- o **Milk crate goat climbing structure-** make a pyramid out of crates and secure them with cable ties, great for smaller goats and climbing animals.
- o **Browse-** vet approved wild foliage, a favorite of hoofstock and rodents.
- o **Recycling bin beds-** Durable, washable containers that our education animals like to make beds in. We like the stackable kind with a low front edge so our little animals can access them easily.
- o **New mop heads for cereal stringing-** string O-shaped cereal onto the strings of a new cotton mop, favorite of our lemurs.
- o **Play keys-** old keys that no longer open locks are put on a padlock and hung up, lots of animals investigate these, but they’re a favorite of the goats and alpacas.
- o **Desk organizers with strings threaded through-** a puzzle feeder. It’s mainly for our lemurs but the Blue Jay is pretty good with it too.

- o **Applesauce cup feeder**- small applesauce cups with holes punched in the center of the bottom then strung up on a single small rope with knots to keep the cups separated. The songbirds and lemurs use this the most.
- o **Bubbles**- regular old kids bubbles. The alpacas will chase them around the exhibit. They also chase butterflies...
- o **Dry erase markers on tank glass, chalk drawings inside exhibits**- We mainly draw for our turtles to make their lives a little more colorful.
- o **Calendar pictures laminated**- We hang these up like backdrops behind reptile tanks and change them weekly.
- o **Supervised animal interaction or visual contact from safe distance or through barriers**- Some of our animals are allowed visual interaction as long as none show any signs of stress. Other animals are allowed direct contact with one another under supervision. Ex: the duck, pigs, and goats all run around the farmyard together in the mornings.
- o **Fabric gift bags**- Small fabric bags make great puzzle feeders for our lemurs.
- o **Old t-shirts,sweatshirts, towels**- They make cozy beds for smaller animals.

A PROGRESSIVELY CHALLENGING ENRICHMENT PROJECT FOR A SLOTH BEAR (*Melursus ursinus*) AT THE SAINT LOUIS ZOO

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Abstract

Progressive, solvable challenges in enrichment provide advanced opportunities for animals to express natural behaviors, and to develop natural abilities beyond their current capabilities. Based on this enrichment strategy, the Saint Louis Zoo Carnivore Unit developed a progressively challenging, but solvable enrichment project for Daisy, a female Sloth bear. This Sloth bear has long established pacing behavior, so primary goals were to decrease pacing, and increase opportunities for development of natural vacuuming ability. Sloth bear natural behavior includes vacuuming, which is used to suck insects from underground, out of logs, etc. We built four PVC tube devices with varying diameters and lengths, followed a protocol with valued food items in the tubes, and offered them each in successive weeks for progressive, enriching challenges. Our project encompassed six weeks; the first and last weeks were control, and the middle four weeks were the experimental weeks for devices 1 through 4. We observed and collected data twice daily using a scan sampling method. Our data indicates that the project goals for Daisy were effective during the observational study periods in both decreasing pacing and providing opportunities for development of natural vacuuming ability. Furthermore, collateral behaviors including manipulating and sniffing also increased, which collectively led to a decrease in pacing as well. The implications of this enrichment project highlight how essential enrichment programs are for both proactive husbandry and problem solving to enhance animal welfare.

Introduction

The enhanced enrichment program implemented for the Sloth bear (*Melursus ursinus*) at the Saint Louis Zoo upon her arrival was a problem-solving approach to an established pacing stereotypy. As part of the enhanced enrichment program, we decided to offer four different category items of enrichment for her every day in efforts to decrease pacing and increase natural behaviors. Understanding the natural behavior repertoire of wild animals is essential, so we can simulate these same opportunities for zoo animals in enriched, complex, appropriate environments (Shepherdson, 1998). This type of understanding is part of proactive enrichment programs, which help prevent the development of stereotypic behaviors through knowledge gained of the species natural and individual history, and by creation of zoo environments which encourage natural behaviors (Mellen, 2001). Initially, the carnivore unit action planned for enrichment initiatives by researching Sloth bear natural behavior, her individual history, and then we brainstormed ideas. After approvals and implementation, this enhanced enrichment program was in place. This enrichment strategy is the SPIDER model framework for sustainable, goal-oriented enrichment programs; essential in the care of captive animals (Disney Animal Kingdom, 2009).

Listed by the IUCN as Vulnerable, the Sloth bear is a myrmecophagous ursid ranging in South Asian countries of India, Nepal, Bhutan, and Sri Lanka (IUCN 2012). Sloth bear natural behavior includes sucking/vacuuming, which they use to obtain insects from large underground colonies of social insects. They turn over rocks, logs, and dig into the ground to feed (Yoganand, Rice, and Johnsingh, 2012). Sloth bear adaptations for myrmecophagy include flexible, protrusible lips and nostrils which they seal shut when sucking ants and termites (Hunter, 2011). Additionally, the long snout and the lack of two inner upper incisor teeth are specialized adaptations for feeding on ants and termites (Macdonald, 1984). As they break open a termite mound with their long claws, sloth bears then use their lips and long snout as a

tube to blow away debris and then suck up their prey. Their omnivorous lifestyle consists of insects, grubs, sugarcane, carrion, honey, fruits, and flowers (Macdonald, 1984).

An enrichment study conducted at the Smithsonian National Zoological Park in Washington D.C., investigated aspects of bear husbandry to promote natural behaviors by changing the way they are fed. These aspects included; providing objects to manipulate for obtaining food items, returning novelty to these objects when the bears habituated to them, and varying feeding methods such as in one meal, in a device, and hiding the food. Among this study's results, it was suggested that enrichment in the forms of multiple manipulatable objects to forage and acquire food, led to decreased stereotypic pacing (Carlstead, Seidensticker, and Baldwin, 1991).

This present enrichment study included the construction of four PVC tube devices with varying diameters and lengths, followed a protocol with valued food items in the tubes, and offered them each in successive weeks for progressive challenges in vacuuming behavior to acquire food. Our study arose from the concept of progressively challenging enrichment for enhancing animal welfare (Meehan and Mench, 2007). Meehan and Mench examined integrating challenge into enrichment activities as a necessary component in an enrichment program for zoo animals. Wild animals are presented with daily challenges which they must solve to acquire food, shelter, etc., and they meet these challenges by using and developing their natural physical and cognitive capabilities. When challenging zoo animals, we can offer progressive difficulty in the enrichment, but it must be solvable for them with their natural physical and cognitive abilities. We can continue to evolve the challenges as they progress by giving them more difficult enrichment. Meehan and Mench define appropriate challenge as "problems that may elicit frustration, but are potentially solvable or escapable through the application of cognitive and behavioral skills". While stress and frustration can result from these challenges, the animals engaging in appropriate challenges are gaining opportunities for development of natural abilities beyond their current capabilities as they learn and problem-solve, similarly as their wild counterparts cope with daily challenges (Meehan and Mench, 2007).

We reviewed our enrichment programs and set new goals for our sloth bear. We developed a progressively challenging (but solvable) enrichment project aimed to provide opportunities for our sloth bear to go beyond current natural capabilities and actually *develop* natural abilities, and to decrease pacing. Our project encompassed six weeks; the first and last weeks were control, and the middle four weeks were the experimental weeks for devices 1 through 4. We observed and collected data twice daily using a scan sampling method. We expect these four progressively challenging enrichment devices to increase time spent vacuuming, sniffing, manipulating, and to *develop* natural vacuuming ability, while decreasing time spent pacing.



Methods

The subject of this progressively challenging enrichment project was the female Sloth bear, Daisy, at the Saint Louis Zoo. She is 16 years old, and has lived at the Saint Louis Zoo since 2010. Her zoo habitat is an outdoor, concrete grotto with approximate dimensions of 90' wide x 49' deep. She spends the day outside, and then has in/out access to an inside holding area overnight. The outside habitat has naturalistic rockwork wall barriers which surround both sides and the back, and the front perimeter is a dry moat which is 9' wide and 10' tall. The enclosure is furnished with many deadfall trees, a foot thick mulch layer over half of the habitat, a sloped pool, two waterfalls, and two rock caves on each side of the exhibit. Additionally, temporary enrichment items can be secured in various locations in the enclosure via quick links, chains, and ground bolts. The inside holding area has a large hammock, an elevated ledge, and radiant heaters for winter. Daisy's diet consists of a mixture of fruits, vegetables, insects, and dry chow.

Materials

We built four PVC tube devices with varying diameters and lengths, to provide progressively more challenging situations from which she could vacuum out the enrichment placed inside. Device 1 was 1' length x 2" diameter, device 2 was 2' x 2", device 3 was 1' x 3", and device 4 was 2' x 3". Each PVC tube device was capped off at one end, and secured to the exhibit area with a quick-link through an eyebolt which we secured on the capped end.

Procedures

Our project encompassed six weeks; the first and last weeks were control, and the middle four weeks were the experimental weeks for devices 1 through 4. We started the first experimental week with the shortest, most narrow tube, and then with each week the tubes offered were wider and longer for progressive, solvable challenges in natural vacuuming ability development. The scheduled devices were offered on Mondays, Wednesdays, and Fridays of their scheduled week. The MWF experimental days, and the Tue-Thur-Sat non-experimental days, aimed to minimize any possible carry over effects by having a day off in between the devices.

We followed a protocol with valued food items (honey, raisins, blueberries, waxworms) in the enrichment devices using a weekly schedule for which enrichment foods to place inside. The amount of honey, raisins, waxworms, and blueberries were measured as 1 cup each. Mondays: honey and blueberries, Wednesdays: honey and waxworms, Fridays: honey and raisins. We used the honey to hold the enrichment foods in the bottom of the devices.

From project start to completion, Daisy's constant, enhanced enrichment program was modified as follows: the mandatory four types of daily enrichment which were constantly offered in her outside habitat were instead offered only inside the holding area, and in the afternoon when she received in/out access for overnight. However, we held constant the daily chow and produce throughout her outside exhibit.

Data collection

Mondays through Saturdays, we observed and collected data twice daily, at 10:00 a.m. and 2:00 p.m., every week for six weeks. No data was collected on Sundays, in order to have the same number of control days as we did test days. The data collection was a scan sampling method every 15 seconds for 15 minutes, and we recorded the observed behaviors from the definitions in the ethogram. From this ethogram the observer was able to document Daisy's behaviors from the list at 15 second intervals, and put an X under the behavior and time of what and when it was observed. To increase inter-observer reliability, we established clear guidelines on rating behaviors, and conducted 'practice' sessions before the data collection actually began.

The first observation period started with the observer standing at the front of the exhibit on the visitor side, and began with the first 15 second interval when Daisy is shifted onto exhibit. Teamwork was critical as one carnivore keeper administered the enrichment, food/produce, and shifted Daisy out onto exhibit, and the other carnivore keeper was in position to start the data collection the second Daisy is shifted out onto exhibit. The second data collection time (2pm on the same day) was conducted by the same observer for that day and started as soon as the observer positioned themselves in front of the exhibit on the visitor side. The observer was equipped with the data collection sheet, ethogram, stopwatch, and wore a vest with "Animal Observation, Please Do Not Disturb" on the back. On Sundays, other than the food and produce on exhibit daily, no other enrichment was offered on exhibit, but the daily four types of enrichment was offered inside for p.m. in/out access.

Sloth Bear- Progressively Challenging Enrichment Project Ethogram

Type of Behavior	Behavior	Description of Behavior
<i>Locomotion</i>	Pacing	Animal uses the same path continuously for 3 transverse repetitions along the same path. This will be recorded as a stereotypic behavior.
	Running	Animal is running.
	Walking	Animal moves around the exhibit but does not meet the requirements for straight line pacing or circle pacing. See above behaviors. This will not be recorded as a stereotypic behavior.
	Resting	Animal is motionless and not engaged in any locomotion.
<i>Investigative</i>	Eating	Animal consumes food it finds in its environment other than with the enrichment device.
	Manipulating Object	Animal is touching the specific enrichment device given.
	Sniffing	Animal sniffs any item or spot in exhibit.
	Vacuuming	Animal vacuums/sucks any item or spot in exhibit.
Use of Pool	Use of Pool	Animal does any behavior in the pool.
	Digging	Animal is digging in the mulch
Marking	Marking	Animal rubs, or scratches any trees, rocks, logs, spots etc. in the exhibit other than the enrichment item. This can also include urinating or defecating.
	Out of View	Animal is completely out of view for the observer by traveling down into the moat or in a hiding area but still on exhibit.



Results

The progressive enrichment devices effectively increased goal behaviors during the observation and data collection periods. The percentage of time Daisy spent engaged in activity with the devices indicated an increase in vacuuming, manipulating, and sniffing. The data also indicated a marked decrease in pacing behavior during these observation and data collection periods. There was behavior variation between devices as well. We compared percentages of time spent per behavior amongst the devices, and between control and experimental weeks. This method accurately described how she spent her time when in each situation and provided a valid overall comparison. Statistical tests may be used in future projects, but we chose this less complicated method of data analysis in hopes of encouraging more in depth projects in the future, and also because this project had a small sample size of one.

The introduction of the four progressive enrichment devices increased the vacuuming behavior, which was one of our goals, from the control weeks of an average of 1.39 % time spent vacuuming, to a collective experimental result with an average of 8.85 %. Daisy spent more time vacuuming with devices 1 and 2 (10.28%, 10.69%) which were the smaller 2 inch diameter devices with 1 and 2 feet lengths. Devices 3 and 4 were both the 3 inch diameter with 1 and 2 foot lengths, and even though she still had increased vacuuming from the control weeks at 1.11%, 1.67%, she spent less time vacuuming devices 3 and 4 (7.22%, 7.22%), however more time manipulating these devices (14.58%, 11.67%). Pacing for the controls weeks averaged to 12.92%, but decreased during experimental weeks to an average of 8.44%. The biggest decrease in time spent pacing was during the experimental week with device 3, which was 4.86%, as this was the device which she manipulated the most at 14.58%.

The following graphs and charts in Figures 1 through 23, show comparison of the collective results from the first and last weeks of control, to the collective results for all 4 experimental weeks for the vacuuming, sniffing, manipulating, and pacing behaviors.

Figure 1. Control Week 1

Date	Time	Test	Control	Device #	Vacuuming	Sniffing	Manipulating	Pacing	Vacuuming %	Sniffing %	Manipulating %	Pacing %
9/17/2012	AM		X	None	0	9	1	18	0.00%	15.00%	1.67%	30.00%
	PM		X	None	0	0	0	0	0.00%	0.00%	0.00%	0.00%
9/18/2012	AM		X	None	0	6	4	24	0.00%	10.00%	6.67%	40.00%
	PM		X	None	0	7	0	1	0.00%	11.67%	0.00%	1.67%
9/19/2012	AM		X	None	0	6	3	6	0.00%	10.00%	5.00%	10.00%
	PM		X	None	1	5	1	5	1.67%	8.33%	1.67%	8.33%
9/20/2012	AM		X	None	1	6	7	13	1.67%	10.00%	11.67%	21.67%
	PM		X	None	0	1	0	0	0.00%	1.67%	0.00%	0.00%
9/21/2012	AM		X	None	2	12	2	25	3.33%	20.00%	3.33%	41.67%
	PM		X	None	0	2	1	33	0.00%	3.33%	1.67%	55.00%
9/22/2012	AM		X	None	4	20	1	0	6.67%	33.33%	1.67%	0.00%
	PM		X	None	0	24	0	0	0.00%	40.00%	0.00%	0.00%

Figure 2. Control Week 1

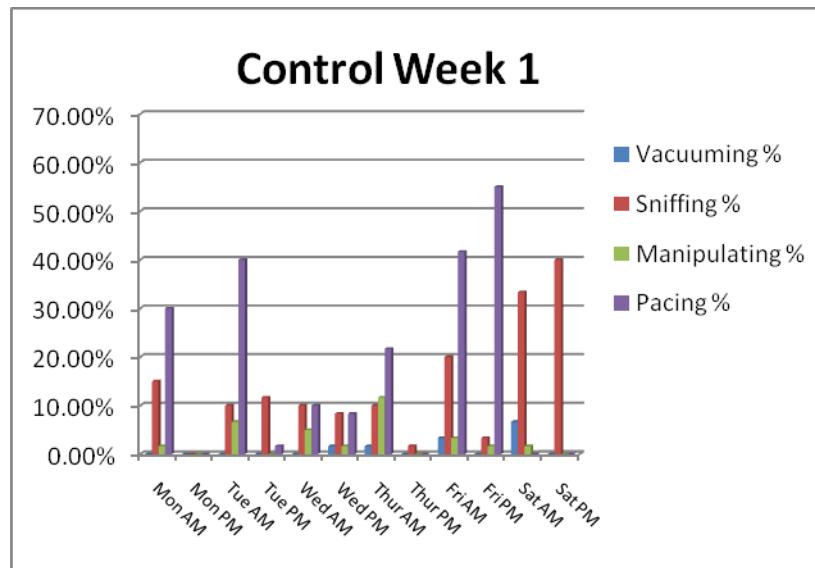


Figure 3. Control Week 1

	Vacuuming %	Sniffing%	Manipulating%	Pacing%
Total Ave %	1.11%	13.61%	2.78%	17.36%
Ave % AM	1.94%	16.39%	5.00%	23.89%
Ave % PM	0.28%	10.83%	0.56%	10.83%

Figure 4. Device 1.

Date	Time	Test	Control	Device #	Vacuuming	Sniffing	Manipulating	Pacing	Vacuuming %	Sniffing %	Manipulating %	Pacing %
9/24/2012	AM	X		1	26	4	15	0	43.33%	6.67%	25.00%	0.00%
	PM	X		1	0	17	4	0	0.00%	28.33%	6.67%	0.00%
9/25/2012	AM			1	0	6	1	15	0.00%	10.00%	1.67%	25.00%
	PM			1	0	3	0	0	0.00%	5.00%	0.00%	0.00%
9/26/2012	AM	X		1	20	8	16	0	33.33%	13.33%	26.67%	0.00%
	PM	X		1	0	2	0	0	0.00%	3.33%	0.00%	0.00%
9/27/2012	AM			1	0	19	0	6	0.00%	31.67%	0.00%	10.00%
	PM			1	0	6	0	0	0.00%	10.00%	0.00%	0.00%
9/28/2012	AM	X		1	28	5	8	0	46.67%	8.33%	13.33%	0.00%
	PM	X		1	0	0	0	33	0.00%	0.00%	0.00%	55.00%
9/29/2012	AM			1	0	10	3	13	0.00%	16.67%	5.00%	21.67%
	PM			1	0	6	2	13	0.00%	10.00%	3.33%	21.67%

Figure 5. Device 1

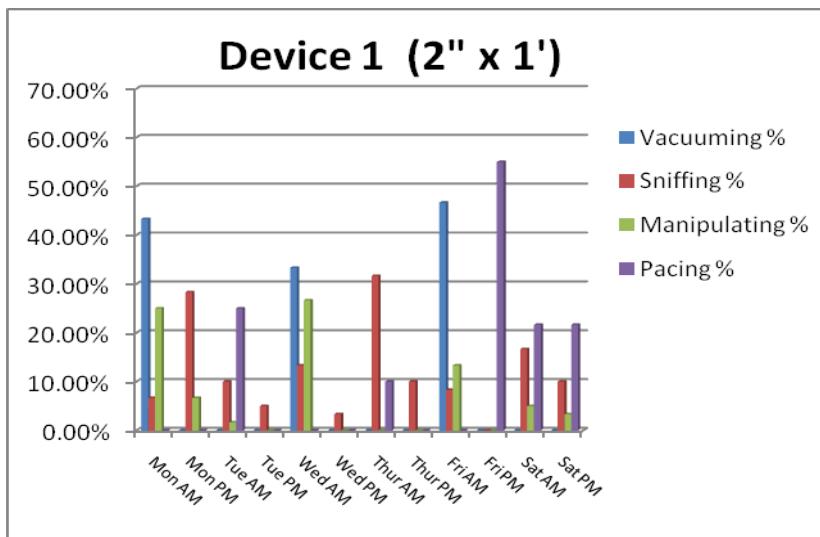


Figure 6. Device 1

	Vacuuming %	Sniffing%	Manipulating%	Pacing%
Total Ave %	10.28%	11.94%	6.81%	11.11%
Ave % AM	20.56%	14.44%	11.94%	9.44%
	0.00%	9.44%	1.67%	12.78%

Figure 7. Device 2

Date	Time	Test	Control	Device #	Vacuuming	Sniffing	Manipulating	Pacing	Vacuuming %	Sniffing %	Manipulating %	Pacing %
10/1/2012	AM	X		2	25	1	24	0	41.67%	1.67%	40.00%	0.00%
	PM	X		2	0	14	1	0	0.00%	23.33%	1.67%	0.00%
10/2/2012	AM			2	0	4	0	5	0.00%	6.67%	0.00%	8.33%
	PM			2	0	2	0	0	0.00%	3.33%	0.00%	0.00%
10/3/2012	AM	X		2	12	3	7	0	20.00%	5.00%	11.67%	0.00%
	PM	X		2	0	18	10	0	0.00%	30.00%	16.67%	0.00%
10/4/2012	AM			2	0	11	0	7	0.00%	18.33%	0.00%	11.67%
	PM			2	0	5	1	30	0.00%	8.33%	1.67%	50.00%
10/5/2012	AM	X		2	36	4	11	0	60.00%	6.67%	18.33%	0.00%
	PM	X		2	0	0	0	0	0.00%	0.00%	0.00%	0.00%
10/6/2012	AM			2	4	8	2	11	6.67%	13.33%	3.33%	18.33%
	PM			2	0	0	0	0	0.00%	0.00%	0.00%	0.00%

Figure 8. Device 2

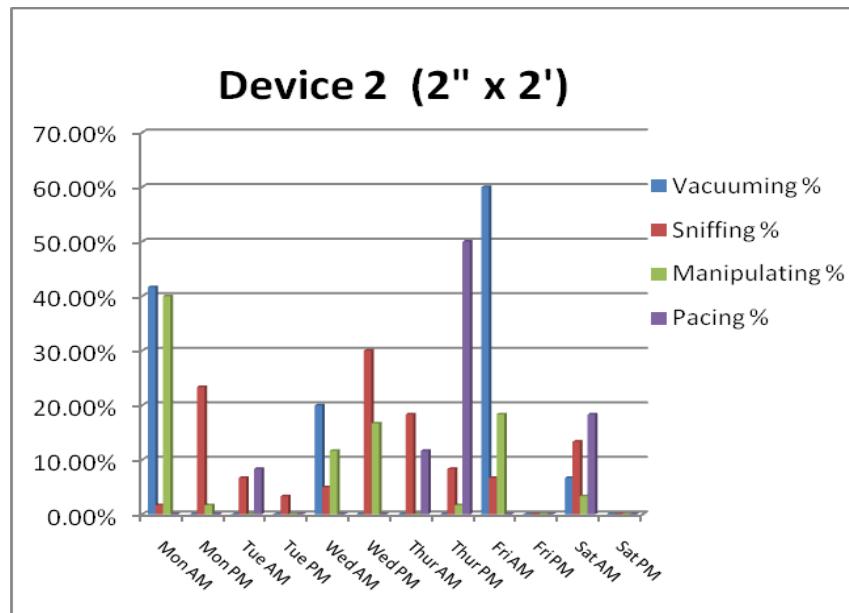


Figure 9. Device 2

	Vacuuming %	Sniffing %	Manipulating %	Pacing %
Total Ave %	10.69%	9.72%	7.78%	7.36%
Ave % AM	21.39%	8.61%	12.22%	6.39%
Ave % PM	0.00%	10.83%	3.33%	8.33%

Figure 10. Device 3

Date	Time	Test	Control	Device #	Vacuuming	Sniffing	Manipulating	Pacing	Vacuuming %	Sniffing %	Manipulating %	Pacing %
10/8/2012	AM	X		3	14	11	21	0	23.33%	18.33%	35.00%	0.00%
	PM	X		3	0	0	0	0	0.00%	0.00%	0.00%	0.00%
10/9/2012	AM			3	0	17	4	2	0.00%	28.33%	6.67%	3.33%
	PM			3	0	12	0	1	0.00%	20.00%	0.00%	1.67%
10/10/2012	AM	X		3	19	4	24	0	31.67%	6.67%	40.00%	0.00%
	PM	X		3	10	6	30	0	16.67%	10.00%	50.00%	0.00%
10/11/2012	AM			3	0	13	0	5	0.00%	21.67%	0.00%	8.33%
	PM			3	0	0	0	0	0.00%	0.00%	0.00%	0.00%
10/12/2012	AM	X		3	8	7	24	6	13.33%	11.67%	40.00%	10.00%
	PM	X		3	0	0	0	0	0.00%	0.00%	0.00%	0.00%
10/13/2012	AM			3	1	5	2	3	1.67%	8.33%	3.33%	5.00%
	PM			3	0	7	0	18	0.00%	11.67%	0.00%	30.00%

Figure 11. Device 3

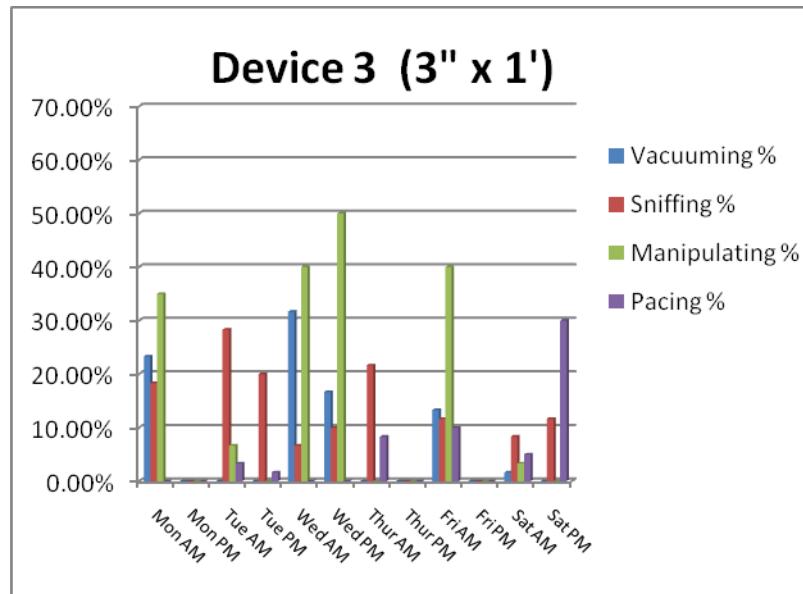


Figure 12. Device 3

	Vacuuming %	Sniffing %	Manipulating %	Pacing %
Total Ave %	7.22%	11.39%	14.58%	4.86%
Ave % AM	11.67%	15.83%	20.83%	4.44%
Ave % PM	2.78%	6.94%	8.33%	5.28%

Figure 13. Device 4

Date	Time	Test	Control	Device #	Vacuuming	Sniffing	Manipulating	Pacing	Vacuuming %	Sniffing %	Manipulating %	Pacing %
10/15/2012	AM	X		4	17	3	17	4	28.33%	5.00%	28.33%	6.67%
	PM	X		4	0	0	0	0	0.00%	0.00%	0.00%	0.00%
10/16/2012	AM			4	0	13	0	15	0.00%	21.67%	0.00%	25.00%
	PM			4	0	1	3	0	0.00%	1.67%	5.00%	0.00%
10/17/2012	AM	X		4	19	3	12	0	31.67%	5.00%	20.00%	0.00%
	PM	X		4	3	5	4	15	5.00%	8.33%	6.67%	25.00%
10/18/2012	AM			4	2	10	0	8	3.33%	16.67%	0.00%	13.33%
	PM			4	0	6	0	16	0.00%	10.00%	0.00%	26.67%
10/19/2012	AM	X		4	8	4	38	0	13.33%	6.67%	63.33%	0.00%
	PM	X		4	0	1	0	17	0.00%	1.67%	0.00%	28.33%
10/20/2012	AM			4	3	9	9	0	5.00%	15.00%	15.00%	0.00%
	PM			4	0	2	1	0	0.00%	3.33%	1.67%	0.00%

Figure 14. Device 4

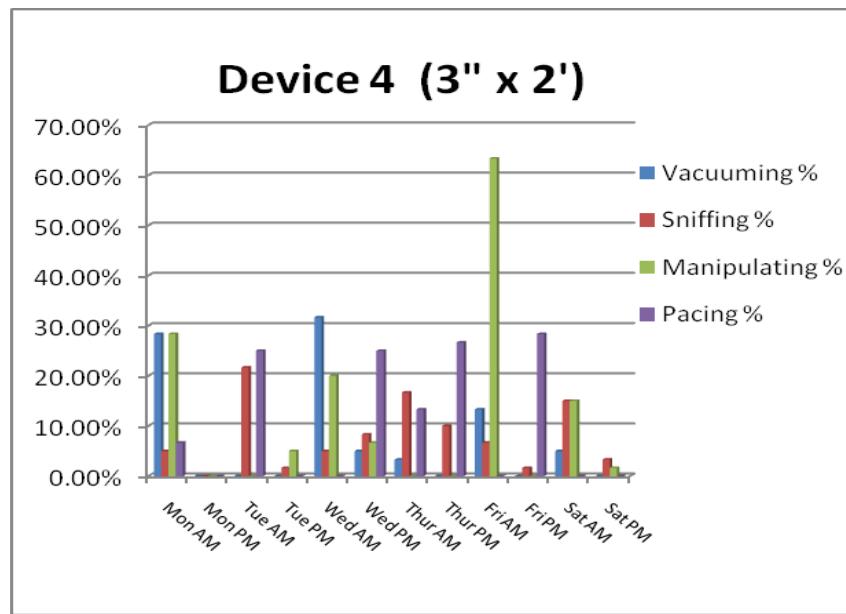


Figure 15. Device 4

	Vacuuming %	Sniffing %	Manipulating %	Pacing %
Total Ave %	7.22%	7.92%	11.67%	10.42%
Ave % AM	13.61%	11.67%	21.11%	7.50%
Ave % PM	0.83%	4.17%	2.22%	13.33%

Figure 16. Control Week 6

Date	Time	Test	Control	Device #	Vacuuming	Sniffing	Manipulating	Pacing	Vacuuming %	Sniffing %	Manipulating %	Pacing %
10/22/2012	AM		X	None	3	10	4	0	5.00%	16.67%	6.67%	0.00%
	PM		X	None	0	0	0	0	0.00%	0.00%	0.00%	0.00%
10/23/2012	AM		X	None	0	3	0	0	0.00%	5.00%	0.00%	0.00%
	PM		X	None	0	13	0	0	0.00%	21.67%	0.00%	0.00%
10/24/2012	AM		X	None	2	12	0	13	3.33%	20.00%	0.00%	21.67%
	PM		X	None	0	6	0	14	0.00%	10.00%	0.00%	23.33%
10/25/2012	AM		X	None	3	14	8	2	5.00%	23.33%	13.33%	3.33%
	PM		X	None	3	15	7	0	5.00%	25.00%	11.67%	0.00%
10/26/2012	AM		X	None	0	19	7	10	0.00%	31.67%	11.67%	16.67%
	PM		X	None	0	6	0	18	0.00%	10.00%	0.00%	30.00%
10/27/2012	AM		X	None	1	9	7	4	1.67%	15.00%	11.67%	6.67%
	PM		X	None	0	6	2	0	0.00%	10.00%	3.33%	0.00%

Figure 17. Control Week 6

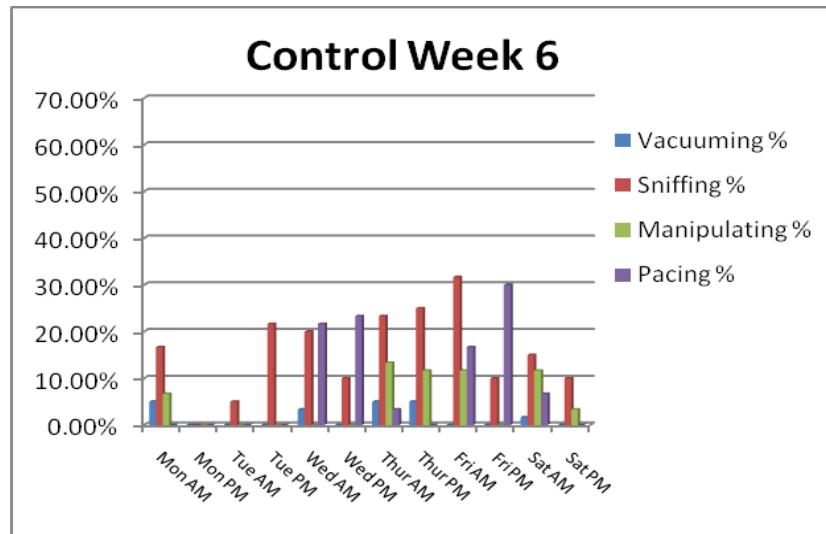


Figure 18. Control Week 6

	Vacuuming %	Sniffing %	Manipulating %	Pacing %
Total Ave %	1.67%	15.69%	4.86%	8.47%
Ave % AM	2.50%	18.61%	7.22%	8.06%
Ave % PM	0.83%	12.78%	2.50%	8.89%

In Figures 19 through 23, we looked at results for vacuuming, sniffing, manipulating, and pacing behaviors *between* each of the devices.

Figure 19.

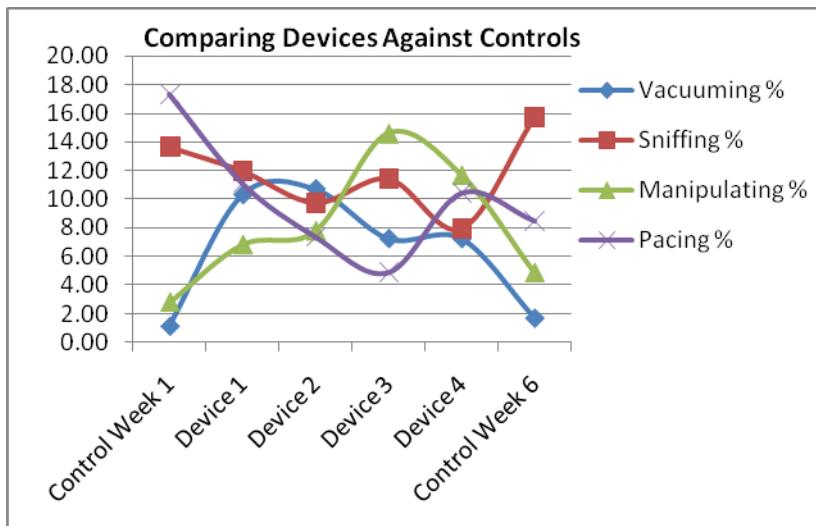


Figure 20.

	Vacuuming %	Sniffing %	Manipulating %	Pacing %
Control Week 1	1.11	13.61	2.78	17.36
Device 1	10.28	11.94	6.81	11.11
Device 2	10.69	9.72	7.78	7.36
Device 3	7.22	11.39	14.58	4.86
Device 4	7.22	7.92	11.67	10.42
Control Week 6	1.67	15.69	4.86	8.47

Figure 21.

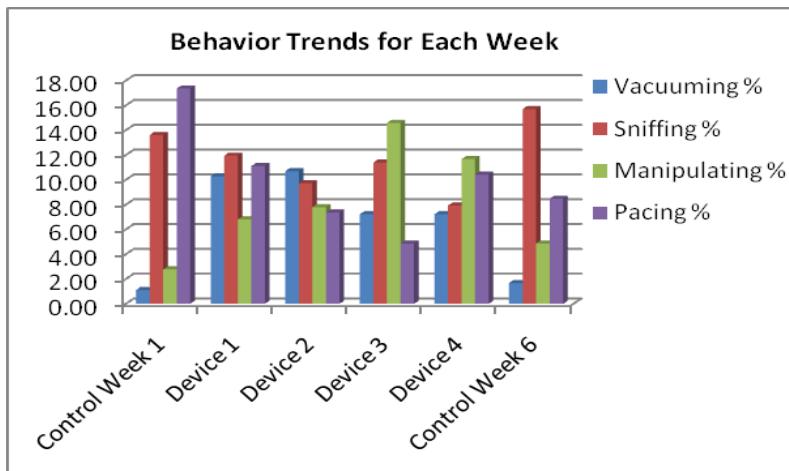


Figure 22.

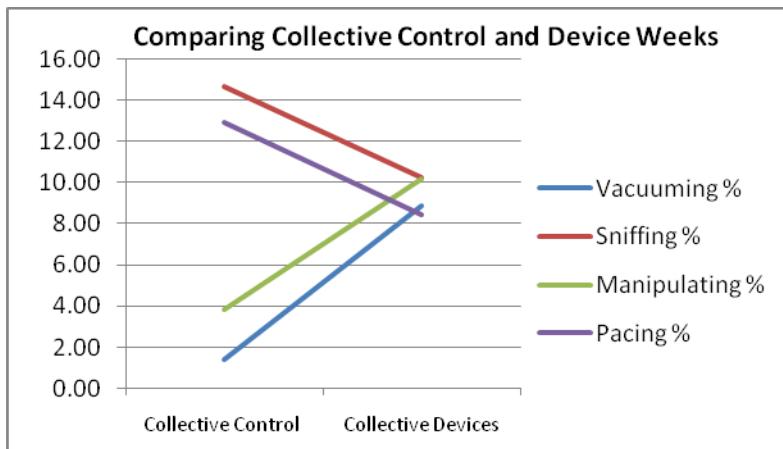


Figure 23.

	Vacuuming %	Sniffing %	Manipulating %	Pacing %
Collective Control	1.39	14.65	3.82	12.92
Collective Devices	8.85	10.24	10.21	8.44

Discussion

The project results indicate these four progressively challenging enrichment devices increased time spent vacuuming, sniffing, and manipulating, while decreasing time spent pacing. The longer device with smaller diameter is the most challenging and effective for natural ability development, because Daisy spent the most time vacuuming with device 2 (2' length x 2" diameter). The 3 inch diameter devices are less challenging and though she spent the most time manipulating these devices, which resulted in less pacing, the natural vacuuming ability isn't gained. These two devices with the wider diameter were too easy to obtain the food items inside. The results lead us to plan for a longer, 3' length x 2" diameter device to offer in the future, as the additional length with the smaller, more challenging diameter may provide even more challenging opportunity for natural vacuuming ability development. Additionally, the four enrichment devices can be offered in multiples, as suggested from the previously referenced bear study at the National Zoological Park, in which multiple, manipulatable enrichment foraging objects (honey filled logs) led to decreased stereotypic pacing (Carlstead et al, 1991).

Even though Daisy vacuumed out all the food items in the a.m. observation period, she at times returned to interact with devices in the afternoon; however this was an area of the study which could have included refilling the devices for the afternoon observation period, in alignment with results from the NZP bear study (Carlstead et al, 1991). Refilling these enrichment devices is definitely a plan in our continuing goals of decreasing pacing, and increasing opportunities for development of natural vacuuming behavior. Furthermore, increasing device complexity to include elbows or random holes may be even more enriching and challenging.

This project and its concept can be utilized with all species. As always, the first step is researching the natural and individual history of the animal, and then identifying a species-typical behavior to focus for natural ability development beyond current capabilities. Zoo animal care teams gain knowledge and team building experiences through planning and creating progressive, solvable enrichment projects for the

animals in our care. Additional implications from this project include contributing to this innovative concept of adding appropriate challenges to enrichment activities for zoo animals as discussed by Meehan and Mench (2007), and lending to the progression of integrating problem solving opportunities across zoo enrichment programs. This progressively challenging enrichment project demonstrates how essential enrichment is for problem-solving opportunities, and for proactive husbandry to enhance animal welfare.

Acknowledgments: We thank everyone in the Saint Louis Zoo Carnivore Unit for assistance and support with this exciting project. We also thank Carnivore Curator and Zoological Manager, Steve Bircher and Rachael Macy for approving this project and providing all materials necessary. Finally, we express heartfelt gratitude to our late coworker Becky Wanner, who contributed passionately on this project.

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Management of a 4.0 Bachelor Group of Western Lowland Gorillas

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The Louisville Zoo Gorilla Forest currently houses 5.5 Western Lowland Gorillas and 1.4 Patas Monkeys. The gorillas are divided into 3 separate groups. One group is a 0.2 geriatric group. One group is a 1.3 family group. The third group is a 4.0 bachelor group. All three gorilla groups and the patas group rotate throughout the building on a daily basis. We do not separate our groups at night, including our bachelor group. The age range of the 4.0 bachelor group is 14-16 years old.

HISTORY

The 4.0 bachelor group is made up of two pre-existing familial pairs. Two are half brothers that came to us together, and the other two are a nephew/uncle pair that arrived together as well. The 4.0 were introduced together and housed with an older silverback that was known to be tolerant of juveniles. At the time of group formation, the age range was 5-7 years of age. Initially, the group consisted of a silverback, 2 young males and 2 young females. The 2nd pair of young males was added to form a group of 5.2 gorillas. Several months later the 0.2 were removed from the group and transferred to another zoo.

HOUSING

The Louisville Zoo Gorilla Forest is comprised of 2 outside exhibit yards, 3 indoor exhibit dayrooms, 7 off exhibit holding stalls, and 1 off exhibit holding yard. The building is set up in a circular fashion, so groups can be shifted in more than one direction. When housing the bachelor group, we take the size of the space they are occupying into consideration. If they are housed off exhibit in holding stalls, they are given 3-4 stalls. The stalls are different sizes, so it depends on which ones they have access to as to how many they occupy. When the temperatures are high enough, we also allow them access to an outdoor space. If they are occupying a dayroom, they will also have access to additional space, whether it is a yard, holding stall, or a second dayroom. By giving them this extra space, it allows the gorillas to spread out as much or as little as they want.

The Louisville Zoo also houses a 1.3 family group in the same building. Proximity of the bachelor group to the family group is also taken into account. Due to the building being set up in a circular fashion, the groups are almost always in sight of each other. As of now, there have been very few issues with the proximity of the groups to each other. The age of the bachelors has much to do with that. They are just recently becoming interested in females. Currently, we have not had to adjust our group housing to keep spaces between the groups. This is something that may change in the future, and something we are monitoring closely.

TRAINING

As stated before, we do not separate our bachelor group. This can make individual training complicated. We do 2-3 training sessions each day. During each session, all 4 bachelors are engaged. Each gorilla in our care is trained to "hold." If we do not have enough keepers present to work each gorilla at the same time, one keeper can ask a gorilla to "hold" and the gorilla knows to stay where they are. The keeper can then train another member of the group. Upon returning to the gorilla that was placed in a "hold," the keeper releases the behavior and rewards the gorilla for remaining in place. That gorilla can then be trained as well. The dominate gorilla in the group is the last to be released from the training session so there is no displacement of lower ranking gorillas. During these sessions, keepers communicate with each other so as to ensure a successful session. All of our bachelors know basic behaviors that allow us to be able to monitor their health. Behaviors such as opening their mouth, and showing us their hands, feet, and back allow us to look them over for injuries and monitor any known injuries. We also train veterinary behaviors such as hand injection and ultrasound. These behaviors allow us to administer vaccinations and monitor heart issues. There are also behaviors that are just fun for the gorillas. Behaviors such as clap, knock, pat your belly, "fix your hair," and blowing "razzberries" are behaviors that the gorillas do naturally and we have captured on cue. Performing a variety of these behaviors keeps the training sessions fun for the gorillas as well as functional for us.

Even though we do not separate our bachelor group, we do separation training. On a regular basis, we will separate the bachelors into sub-pairs, or into individual spaces. By doing this, the bachelors are used to be separated so if the need arises, we can separate. One reason we separate for brief periods is to obtain weights. This allows the gorilla to sit on the scale without concern of displacement by a more dominant group member. We also separate for veterinary procedures. When the group is separated, they are still within sight of each other, which reduces the stress of being separated.

DIET

Feeding at Gorilla Forest occurs several times daily. There are 2-3 hand feedings each day, which assist in training sessions. There is also a bulk diet that is spread for the group to forage for. The bulk diet is often separated and fed at different times depending on shifting. Some days the bachelor group may be shifted through several different spaces, so they get part of the bulk diet in each area.

Bulk diets consist of 2 types of greens, 2 types of vegetables, a forage item, and browse biscuits. Greens consist of items such as iceberg, romaine, endive, celery, kale, and leaf lettuce. Vegetables offered are carrots, green peppers, cucumbers, tomatoes, onions, and broccoli. Occasionally other greens or vegetables are substituted based on cost of produce. Mazuri browse biscuits are offered due to the lack of browse year round. Forage items are offered in small amounts and include nuts, dried fruit, cereal, rice cakes, cooked brown rice, and popcorn.

Hand feedings occur 2-3 times daily and allow us to hold training sessions with the gorillas and get up close looks at each individual. Morning feeds include either, oranges or grapefruit, a small amount of oatmeal, and a juice, water, chamomile tea mix. We offer the drink and the oatmeal to aide in administering medications to individuals. Often there are 2 separate afternoon hand feedings. One consists of fruit, and the other consists of starch. Fruits that are offered may include apple, pear, kiwi, strawberries, bananas, pineapple, and melons. Starches offered are sweet or white potatoes, corn, and hard boiled eggs. The last hand feeding of the day also includes the drink mix and oatmeal for medication purposes.

ENRICHMENT

Many types of enrichment are offered to keep our gorillas occupied. One type of enrichment we utilize is habitat enrichment. Our gorillas occupy a different space each day. The circular set up of the building allows us to offer many different options of spacing. They may occupy 4 holding stalls one day and 4 different holding stalls the next day. They may occupy 2 dayrooms, or a dayroom and a holding stall. Higher temperatures also add in the usage of yards for additional space. We also change the “furniture” in the stalls and dayrooms regularly. Ropes, Fire hoses, and logs get moved around to change the “landscape” of the stall or exhibit.

Another type of enrichment we use is sensory enrichment. Scents and objects are rotated for the gorillas to manipulate. Objects such as plastic barrels, milk crates, puzzle feeders, blankets, and boomer balls allow the gorillas to manipulate the items as they desire. Occasionally we will hang an object so it is more stationary and the gorillas are forced to manipulate it differently. We also offer different substrates for enrichment. Dayroom floors are covered in mulch. We offer wood wool for bedding in all occupied spaces. Occasionally we will offer wood shavings or straw for enrichment.

A third type of enrichment we use is food enrichment. As stated above, we will offer different food items as part of their bulk diet or hand feedings. Use of puzzle feeders is common practice as well. Rather than just spreading items throughout the enclosure, we will place food items into barrels, balls, paper sacks, or cardboard boxes so the gorillas have to manipulate the objects to obtain the food items.

The final type of enrichment we use is behavioral enrichment. Multiple training sessions each day keep our gorillas engaged. The layout of the building also lends to behavioral enrichment. The gorillas are constantly close to staff as the daily work is completed. Staff talks to the gorillas and engages them at random times throughout the day.

Social enrichment is also a big part of our gorilla's lives. At times when staff is not engaging the group, individuals may play together in pairs or as a larger group. With all the enrichment options available, there is always something the gorillas can do to stay occupied.

CONCLUSION

We believe that our success is multileveled. Forming the group at a young age with a silverback to "guide" the group, taking advantage of familial bonds within the group, utilizing the spaces we have available, implementing many enrichment options, and a consistent training program, have all led us to successfully keeping this bachelor group intact.

While housing our 4.0 bachelor group together works now, we are prepared to separate them if necessary. Contingency plans are in place if the need arises. Behavioral studies are in progress to determine if there is any correlation between estrous cycles in the family group and fights in the bachelor group.

A Barrel of Monkeys... and Squirrels

The introduction of two mammal species into a free roaming environment.

Abstract:

In May of 2011, Moody Gardens re-opened the Rainforest Pyramid after a twenty-five million dollar renovation following Hurricane Ike's devastation in 2008. New free roaming additions slated to be housed in this one acre, ten-story exhibit included 3.0 white faced saki monkeys (*Pithecia pithecia*) and 0.2 Prevost squirrels (*Callosciurus prevosti*). This paper will discuss the introduction and training prior to and following their transfer into the Rainforest Pyramid with the primary focus on the similarities and differences of the training process between these two mammal species. It will highlight the important role behavioral management has played in their adjustment to life in this unique mixed species exhibit and the challenges that went along with it.

Introduction:

In 2010, biologists of the Rainforest Pyramid at Moody Gardens were very busy getting ready to display two new free roaming species in their one acre, ten-story exhibit: white faced saki monkeys (*Pithecia pithecia*) and Prevost squirrels (*Callosciurus prevosti*).

There were many similarities in the approach it took to get these two species ready for life in a free range environment. They are both arboreal species which caused the staff to presume how they would use the exhibit and to consider where training sessions might take place. They are both omnivores; eating fruits, nuts, seeds, insects and even bird eggs. Knowing this gave insight into how both sets of animals might take advantage of all the 'free food' available to them in the form of diets of the other free roaming species within the rainforest. Examples of this 'free food' included free flight bird pans, feeder logs of pierced fruit that was made available for the frugivorous birds such as turacos and barbets, naturally occurring insect populations, many different fruit bearing trees including citrus and papaya, etc. This in turn may affect their level of hunger and therefore their level of interest towards recalls and training sessions.

While there were many similarities, there were also many differences the keepers had to consider when planning these animals' introductions to this new free roaming environment. The largest and most profound difference was the social structure of the two species and how that would affect continual training once in the rainforest. Sakis are social while the squirrels are primarily solitary. Continual training with the squirrels would most likely be on a one-on-one basis while the sakis would most likely be in a group dynamic.

In the fall of 2010, the first animals to arrive were the three sakis. They were from different institutions coming in as a pair of brothers and a singleton; they therefore needed the large step of introduction to each other. The squirrels did not require this significant step since they were already a family unit when they arrived in the summer of 2011.

Preparation For The Rainforest:

The Sakis:

Lionel (12) arrived at Moody Gardens on November 23rd, 2010 after being previously housed at the Cleveland zoo, where he was born and part of a mixed species exhibit with a female. After his exhibit mate passed away, plans began for him to find a new home. Once transported to Moody Gardens, Lionel was housed singly in an outside public exhibit for quarantine. He came in with little to no behaviors.

Not far away, the two brothers Frankie (4) and Clyde (8) lived with their family unit at the Philadelphia Zoo. Due to their age and family dynamics, they were slated for a new home at Moody Gardens as well. They arrived on December 17th, 2010 and were housed together in an outside holding space for quarantine. The brothers came with a few basic behaviors.

The introduction process began after quarantine was complete and the staff could begin exchanging enrichment and perching between the two groups. The next step was to prepare a suitable and neutral place for the introduction. A large outdoor cage with the ability to be divided into two spaces and then return to its original large complete state, with the removal of a middle panel, was chosen. This setup would allow for the sakis to share a cage wall that would allow them to not only see each other, but also smell and even possibly come into contact with each other. The original plan was to begin this part of the introduction as early as late January but was delayed because the winter of 2010-2011 brought a very unusually cold winter for Galveston. Moody Gardens is used to relatively mild winters and is not prepared to house animals in colder temperatures for extended periods of time. The sakis therefore had to be setup in indoor holding until temperatures leveled out.

On March 10th, 2011 the 3.0 sakis were transferred to this new outdoor enclosure; Lionel was housed on one side and Clyde and Frankie on the other. Initially there was not a lot of interaction between the three; with the exception of some scent marking and looking between each other, it was relatively non eventful. After three days of observing behavior that indicated no major signs of aggression between them, the divider was removed. Immediately once there were no barriers a disturbance occurred between Clyde, the dominant male of the brothers, and Lionel. Lionel went to the ground and began running the cage perimeter. Any time he tried to climb up on a limb close by, Clyde would become dominating and aggressive. This aggressing behavior from Clyde was not unexpected to the staff. As the older sibling of Frankie, he had already reached sexual maturity and became the dominate male between the two. Upon this introduction the staff assumed that Lionel, the oldest and singleton, would get displaced. A keeper was in place to monitor the introduction as well as observe and record behavior. They went back and forth for about two weeks but as the days passed, the aggression and chasing lessened.

Once things settled down, the trio formed an understanding. Clyde was definitely the dominant, although it was expressed in relatively passive ways, mostly occurring during feeding opportunities. Frankie was the troublesome youngster second in line. Lionel was the old man that was always sub-dominant and had no problem being off to the side. Between the months of March through May, staff worked on cooperative feeding and the training basics: bridge, name, recall, target, scale and crate. Recall was a major priority due to the complexity of their new habitat. It was decided to use a whistle blast while rolling the tongue. The sound was loud and distinct and the behavior did not take long to solidify.

The newly enhanced rainforest was scheduled to open Memorial Day weekend. With construction not quite complete, staff was given only two weeks to introduce them to the rainforest before opening. Fortunately, the trio was doing well together with their basic training. Once crated up, they were released together in the same area of the rainforest. The location of release was a centralized, open area with many arboreal pathways for them to utilize. Within a few days they appeared adjusted and seemed more comfortable with exploring. They stayed together during the day and slept apart at night. They came to their recall and did well maintaining their basic behaviors. The only problem to be faced was that the sakis enjoyed walking/running on the rail of the canopy walkway, where guests would be. Not a major issue for the sakis themselves, but a public temptation. All in all, the release of the sakis into a free roaming environment was considered a success.

The Squirrels:

Moody Gardens received 0.2 Prevost squirrels, a mother/daughter pair, from the Bronx Zoo. The individual histories on the squirrels, Momma (11) and Brownie (4), were promising; they were not 'green' and had been in a free roaming environment at their previous institution. The encouraging aspects were that they knew their names, target, and were familiar entering a crate. The challenge presented to Moody Gardens' staff was that true training sessions only took place occasionally while crated in their holding areas, not while they were in their free roaming exhibit. The squirrels had only proved capable of training in enclosed, guest free spaces, the exact opposite of what staff was aiming for – continued progressive training within the rainforest, a vast exhibit that is regularly crowded with guests. This information led Moody Gardens staff into determining what would be the first and most important behavior to teach the two squirrels, a behavior that would continue to be imperative once in the rainforest – recall.

Their recall, the sound of a kazoo being blown, was first taught by presenting the cue every time their diet was offered. This was then extrapolated to hand feedings as well so the kazoo could be blown multiple times repetitively in the same session with continued reinforcement. This initial understanding of the recall went quickly.

To prove that this behavior was concrete enough for a one acre rainforest environment, it was tested in four ways before they were released: within their holding enclosure, their holding secondary, a separate multi species holding enclosure, and a multi species enclosure directly within the rainforest itself.

Their holding enclosure had dimensions of roughly 6x3x8 feet and the initial test was to recall them at opposite sides and ends of the enclosure. Once this was solid, the animals were crated (separate working behavior) out of the enclosure and let into the secondary. Once released into secondary there were lots of distractions including enclosures of other animals such as a kinkajou (*Potos flavus*), tamandua (*Tamandua mexicana*), parrots, and other types of birds. With these distractions, the continued response to the behavior proved it was solid enough for further testing.

The third test of the recall behavior was crating the squirrels into a separate larger multi species holding cage for training sessions only. In the beginning, these sessions were short and to the point as staff tried to determine if the behavior was strong enough in enriching scenarios that would entice more exploration from the squirrels. Eventually the squirrels moved into this enclosure until their permanent move to the rainforest. Housing them here also gave the squirrels exposure to various other animals, including Guira cuckoos (*Guira guira*) and a Lady Ross turaco (*Musophaga rossae*), which was important because the squirrels would be free range in a multi-species, multi-taxa exhibit. With their recall behavior remaining strong, time was spent on other training such as target, station, crate, scale, tactile, q-tip, and chute. Some of these behaviors were very important in the continued success of this transition while others were dismissed rather quickly. Tactile and q-tip were used to dye one of the squirrel's tails in order for the entire rainforest staff to better distinguish them apart once in the rainforest. The behavior of chute however, teaching the squirrel to go into a tube shaped piece of mesh, was discontinued due to its functionality heavily depended on the mesh of the enclosure; something that would not be present in the rainforest.

Once further squirrel proofing modifications happened in the rainforest, keepers began the fourth and final step to the squirrels becoming free roaming. They were moved into an enclosed exhibit that housed the Rodrigues bat (*Pteropus rodricensis*) collection which was netted within the rainforest itself. The squirrels could see other animals such as the sakis and various birds through the mesh but still be in an enclosed space so if their recall behavior broke down and regressed dramatically they would still be contained. This fourth step was the most challenging due to the food availability in the exhibit for the bats. The main reinforcer used for the squirrels were grapes and they, among a lot of other reinforcing items, were very abundant in the bat diet and also accessible to the squirrels due to their arboreal nature. Therefore, the best training took place in the early morning hours before the bats were fed. Recalls were still attempted after the bats were fed, but the success was at a much lower percentage. Learning this trend led the biologists to know when the best time to train and observe the squirrels would be once free roaming – in the mornings.

Once it was determined that the recall behavior remained solid, about a month, the squirrels were released on the canopy level on June 14th, 2012. The canopy was chosen because the squirrels would naturally be found in the tree tops and would likely remain in the area allowing the staff to monitor them. A release on the ground level would have ended with them inevitably shooting up a tree, which was unwanted during these critical first minutes and hours. All of the training leading up to this moment was the same for both squirrels but upon release the journeys that these two were about to continue in the rainforest split ways and changed drastically. Momma got out slowly and explored the railing as well as the air conditioning vents for quite some time before finding a more natural, suitable location on a

palm tree. Brownie, on the other hand, leaped out of the crate as soon as the door opened causing her to go airborne off the railing towards a large open water fish exhibit, 25 feet below. She luckily grasped on to some rockwork making up a wall along the edge of the exhibit, keeping her from landing in the water. Throughout the day they were both seen and trained with excessive reinforcers. Brownie refused to let anyone get too close to her while Momma got right next to guests on day one and even did a good training session in their presence. These two differences marked how they would continue to behave and train in the rainforest for months to come.

Life in the Rainforest:

The Sakis:

Once the rainforest opened and the sakis established themselves, trainers began to implement their behavior management plan within the rainforest. In holding, it was found that even if the sakis had received their whole diet; they would still come over to train for mealworms, seeds and nuts. This made the transition to training in the rainforest efficient even though they had many foraging options. The sakis came to their recall and performed their known behaviors consistently and over time staff was able to continue adding to their behavior repertoire. Behaviors such as drink (from a syringe), scale, stand and crate all proved beneficial for successful management. Along with training, daily enrichment was incorporated which proved beneficial in enhancing their wellbeing even in an already enriching environment.

Being members of a multi species free roaming exhibit, the sakis demonstrated very neutral relations with all other species including the 2.0 cotton top tamarins introduced shortly after their release. It didn't take long to discover the most challenging part of the free roaming exhibit would be the public. Though the sakis would get close to people, they would never cross the line of interaction, however the guests would. Staff stationed docents at frequented locations, put up many signs, and did their best to keep the sakis engaged through training and enrichment as a solution to this challenge. Through communication and problem solving, a coexistence was achieved.

The challenges that were anticipated never became an issue. Concerns such as regression with behaviors, weight loss or gain and the possibility of not getting daily visuals, proved to be unnecessary worries. The sakis merged naturally with the rainforest and attested to being a beneficial exhibit species.

The Squirrels:

The squirrels both developed favored locations where they were seen regularly and interacted well with offered enrichment. They responded frequently to their recalls although it still remained the strongest in the early hours of the day before any food was available on exhibit and was weaker in the afternoon hours. The early morning recall, however, allowed for nearly daily visuals and potential training opportunities. A challenge that arose once in the rainforest was that the chosen mode of recall - the kazoo - was not loud enough to be heard throughout the entire rainforest when blown. Keepers had to test the distance the sound could travel and then modify where recalls were made. Based on the favored areas of the two individual squirrels, recall locations in the rainforest were chosen where the squirrels would be most likely to hear it. A refusal to recall could, therefore, mean the squirrel just never

heard it. During recall responses, Momma continued to participate in more detailed training sessions with relatively large public crowds while Brownie remained the introvert of the pair.

After one and a half months in the rainforest, Momma had responded to a recall but was not taking her reinforcers ‘normally.’ She seemed unable to chew and was slightly shaky in her movements. Due to her training history, she was easily crated and taken to the vet where the only evident condition was severe dental wear. Sadly, she passed away the following day and although the cause of death was inconclusive, the majority opinion was that she had declined due to old age. After Momma’s death, Brownie’s behavior changed and she started participating more in training sessions. She began training from multiple different keepers, strengthening old behaviors such as station, and learning new behaviors such as stand. After seven successful months in the rainforest, on January 19th, 2013, she had not responded to her recall after three days. A detailed search ensued which concluded in finding her deceased. Yet again the cause of death was inconclusive. While both individuals had a short time in the rainforest, the management and introduction of them into the environment was successful. If anything, it proved how important a recall is in a free roaming environment for the continued monitoring of any species.

Conclusion:

The past two years have brought much learning and development. Both species were successfully introduced to the rainforest. They set up territories, learned to co-exist with many taxa peacefully, trained well and were visible to guests without any negative interactions. Through an extensive training and enrichment program and overcoming challenges, the staff has been able to maintain the first bachelor group of white faced saki monkeys and had been able to observe and train Prevost squirrels in a large free roaming exhibit.

“One, Two, Three”

The evolution of the capuchin program at Denver Zoo with an innovative team approach

By: Jessica Grote and Samantha Smith, 2013

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Denver Zoo is home to a group of 2.14 Hooded Capuchins. The management techniques used with the capuchins constantly change to reflect the current needs of the animals. Over the years, the capuchin program has seen many changes in husbandry style and management. Working with highly intelligent and social primates requires staff to display strong communication skills, as well as dedication and flexibility in adjusting routines to fit the animal dynamics. In 2011, the primary capuchin keeper transferred sections within the zoo. At this time, several primate keepers initiated a significant change in the management style of the section. The “Old Monks” section that included the capuchins was combined with another primate section, the “Neo-tropical” section. Two keepers joined together to form the “Neo-Monks team.” Over the next year, the team updated the routine to better fit the new management style. Some of the changes included modifications to existing animal shifting guidelines, as well as modifications to the training and enrichment program. In 2012, it again became necessary to adjust the management of the section when one of the team members accepted a different position within the zoo. The team approach was taken one step further, and a team of three keepers was formed. The success of the Neo-Monks team relies on excellent communication skills, dedication, and flexibility. The team has made significant advancements in the care of all animals in the section. This paper will focus on the advancements in animal husbandry within the capuchin group and the improved communication and teamwork protocols that allowed these advancements to occur.

Hooded Capuchins (*Cebus apella*) are medium-sized New World monkeys (Figure 1). They inhabit mountain and tropical rainforests throughout South America. Capuchins spend their days searching the forest for food, grooming conspecifics, vocalizing, and napping. A social species, capuchins live in groups ranging from 6 to 40 individuals. Groups usually consist of closely related females, their offspring, and several males. A single male is usually the dominant figure in the group. Capuchins have been considered the most intelligent monkey. They have a large communication repertoire which includes body movements, touching, facial expressions, and vocalizations. When females are in estrus, they use their extensive communication to solicit the dominant male. Capuchins are very territorial and often scent-mark themselves and surroundings with urine (Rowe, N. 1996, pg. 94-95). The intelligence and social dynamics of this species make them a challenge to work with in captivity.

The Denver Zoo capuchin program is a fascinating experience for zoo visitors, staff, volunteers, and the 2.14 capuchins. There are two seasons to the program; a summer island season from approximately April to October, and a winter viewing season from October to

April. Over the years, the program has varied in many aspects, including: the number of capuchins, changes to the social dynamics within the group and their respective family groups, and changes to staffing. In 2009, Denver Zoo primate keepers authored a paper entitled "Who's Training Who? Implementation of a positive reinforcement program for shifting of a large group of hooded capuchin monkeys". This was presented at both National AAZK and ABMA conferences. It explains the multitude of challenges associated with historical, as well as recent, management of the capuchins. The paper details how the program began to evolve in 2005, starting with a group of staff analyzing the program. This analysis included seasonal routine adjustment, shifting guidelines, diet changes, the implementation of a training program, and building stronger keeper and animal relationships to better manage this large group. With hard work and dedication, results were achieved with the capuchin group in both the summer island season and in the winter viewing season.

In many zoological institutions, routines are completed primarily by a five-day section keeper that oversees the daily management and husbandry of the animals. In addition to the section keeper, there are relief keepers that work the routine at times the section keeper is absent. Denver Zoo's capuchin program was managed with one section keeper and multiple relief keepers until 2011. It was imperative for the section keeper and relief keepers to openly discuss routines and husbandry on a daily basis. This was important to ensure consistency when working with a large group of intelligent monkeys. Communication was indeed successful because the program continued to flourish.

In 2011, significant staffing changes occurred to the capuchin program when the five-day section keeper transferred to another animal department. The staff transition went smoothly, thanks to the consistency and communication between the prior five-day section keeper and relief keepers over the years. Around the same time at Denver Zoo, an innovative team approach among the entire animal department was encouraged by management. This meant that instead of having one section keeper manage a section, the section would be managed by several keepers. In other words, the management style changed from an individual keeper to a team. Following this model, two primate keepers formed a new team in October of 2011. The team managed both the Old Monks section (capuchins, Wolf's guenons, silver leaf langur, spider monkeys, and giant anteater), along with the neo-tropical section (neo-tropical primates including marmosets, tamarins, sakis, and several other new world species and small mammals). Since this innovative team approach had not been implemented before in the primate department, the new team had to design routines for how the section would be managed. The team worked closely with supervisors and the Curator of Behavioral Husbandry to develop routines that would best accommodate this new management style. Both of the team members already had excellent relationships with the animals in the section, which helped immensely with the transition. The team members divided their time equally among all animals in order to stay current on social dynamics, routine details, medical updates, and training behaviors.

The team was initially formed during the winter viewing season. During the winter season, the capuchins are housed in ten indoor cages. Seven cages measure 2.4 meters by 2.4 meters and three cages measure 3.0 meters by 2.4 meters. Seven smaller cages are along one side of the hall and are directly across from the three larger cages. Two overhead ramps connect several cages on either side of the hall to allow the capuchins access to all ten of these cages (Figure 2). Additionally, there is one outdoor viewing cage that measures 6.1 meters by 3.7

meters (Figure 3). During the winter season, the capuchins have access to all ten indoor cages as well as the outdoor viewing cage.

Within the large group of capuchins, there are four separate family groups. Each group is comprised mostly of a dominant ex-breeding female and her offspring. One of the males, Sol, sired most offspring within the separate family groups. Although most of the capuchins are related as half-siblings, the groups have variant social ranking which plays a key factor in the day to day management of the group. Over the years, one management piece that has remained the same is that although the capuchins are all together during the day, they are separated into smaller family groups for the evening. This management practice allows the capuchins 100% choice in which cages and cage mates they will spend the evening with. It also allows for less food competition and gives individuals a chance to relax with whom they are most comfortable. This flexibility has allowed the winter routine to become predictable and very efficient.

Although both the previous five-day section keeper and relief keepers were consistent in capuchin shifting, there were differences in the time it took to complete the shifting aspect of the routine. At the start of the team approach, the winter shifting routine was taking the team 30-40 minutes on average to complete from start to finish. This included bringing the capuchins inside from the outdoor viewing cage and then separating them into the cages that they were choosing to be in for the night. Food and enrichment was passed out to the capuchins at this time. With two keepers alternating the shifting during the week and relief keepers filling in, over time, the winter shifting was being completed in just 20 minutes or less. The relationships between the capuchins and all keepers were noticeably stronger whether a keeper was in there one day a week or four days a week. All keepers were able to read behaviors (cycling, individual mannerisms, etc.) and could predict which cages the capuchins would choose to spend the night in. Although this is common knowledge for a typical five-day section keeper, sharing this knowledge amongst a team and getting the same results is an accomplishment among all involved.

Another valuable aspect of the team approach was the regular availability of two keepers to participate in the training program with the capuchins and other primates in the section. Keepers were able to train all 16 capuchins at least every two days, as well as other primates in the same day. This was accomplished through thorough keeper communication in planning out the routine for the day and prioritizing projects. The new team approach was recognized as an effective way to manage the collection.

The summer island routine presented new challenges in management style. The summer island routine involves capuchins spending the day on an island measuring 334 square meters with multiple mature cottonwood trees, several smaller trees and shrubbery that is surrounded by a water filled moat (Figure 4). The island is also set up with many layers of ropes, a three-tiered climbing structure, several swings, and a hammock. There are also 2.0 white pelicans that reside on the island during the summer months. In addition to the pelicans, we have exhibited various bird species in different combinations on the island during the summer months throughout the years. This has included Sarus cranes, Demoiselle cranes, Crested screamers, Red-crowned cranes, and East African crowned cranes. The team wanted to involve other areas of expertise to enhance the island experience for the capuchins. The Horticulture team performed tree trimming, pruning, and hung many new layers of rope, providing a more enriching exhibit for animals and visitors alike. The Sustainability team assisted with new water efficient hoses, water analysis tests, safe algae eating cleaning products, and devices to assist with cleaning and

disinfection of the moat. This allowed the moat to be cleaned every ten days instead of every seven days. This resulted in savings on water use, chemical use, as well as more days the capuchins were able to spend on the island instead of being kept inside for moat cleaning. The Visitor Experience team was also incorporated, which formalized the capuchin release to the island. The release and keeper demonstration was added as an event to the Zoo Map and attracted 30-50 visitors daily. Another visitor experience added was a live-fish feeding to the pelicans once per week.

The team worked with supervisors and the Curator of Behavioral Husbandry to modify the summer island shifting routine to offer more choices for the capuchins. The morning island shift involves reuniting all sixteen capuchins inside and releasing them to the island through a long underground tunnel after which point they spend the day on the island. However, not all capuchins want to go to the island or come into the outdoor viewing cage. The new routine allowed those capuchins to choose where they spent the day without any consequences (fasting). Another addition to the routine incorporated a mid-day enrichment toss which included tossing mixed nuts to the capuchins. This increased capuchin activity levels during the day and offered another visitor experience. The evening routine also was modified. Rather than opening the tunnel door from the island to the outside cage at the end of the day, the tunnel door was opened early afternoon and access to the inside cages became available. All 16 capuchins could choose how to spend the remaining hours of the day (either on the island, in the outdoor viewing cage or their night-time indoor cages). Occasionally, some capuchins chose to spend the night on the island. These capuchins could come off of the island into the outside cage to eat the main part of their diet, and still have access to the island. The team believed it was important for the capuchins to have the choice to stay on the island overnight, but it still was necessary to withhold the valuable items such as fruit and enrichment from these animals. This is how the team kept the balance between consistent shifting and the opportunity for choices. Communication was critical between the team and relief keepers to keep consistency with the new modifications and ever-changing social dynamics. These new modifications to the routine were successful for the entire summer of 2012. The capuchins enjoyed a successful summer with choices and reduced aggression.

In August of 2012, it became necessary to adjust the staffing of the section again as one of the two team members accepted a position in a different department of the zoo. It was decided to take the team approach one step further, and create a core team made up of three keepers. To date, this is the current management of the section. There are also four relief keepers that continue to work with the core team.

In October of 2012, one of the capuchins, Lydia, was diagnosed with insulin dependent diabetes. Lydia is the highest ranking member of a middle-ranking group. The team took immediate steps to help treat her disease, as well as preventative steps to decrease the chance of other capuchins becoming diabetic. Lydia immediately began oral medications for diabetes, but she needs to accept insulin injections in order to be fully controlled. Together, the core team and the Curator of Behavioral Husbandry developed a training plan to increase Lydia's chances for success. One keeper is focusing on hip injection (Figure 5). Another team member is focusing on arm injection (Figure 6). The third team member is training Lydia to voluntarily enter a squeeze cage (Figure 7). The team has found that these behaviors are going to take a lot of dedication and time to train successfully, so Lydia receives training sessions for these behaviors

multiple times each day. She is an incredibly smart animal, and has been hand injected for exams and rabies vaccinations multiple times. Perhaps because of several recent injections, she has become very suspicious of her training and is fearful of needles, syringes, and squeeze cages. As a result, the training strategy is very important. The team is also working on a urine collection behavior with Lydia. Urine is collected from her about every two weeks so that veterinary staff can check her urinary glucose levels. To obtain urine, Lydia is separated from her family group for breakfast and given access to an overhead ramp. Trays are placed on the ground under the ramp to collect her urine (Figure 8). The team observes her and rewards her when the behavior is captured.

In order to help Lydia, as well as the rest of the capuchin group, it was decided to reassess the capuchin diet. The team consulted with an animal nutritionist. The capuchins are currently in the process of transitioning to a healthier and more appropriate diet. The team also started to offer konjac (glucomannan) as a supplement to the capuchins. The konjac powder is a fiber made from the root of the konjac plant (*Amorphophallus konjac*). Konjac has been known to help control high blood sugar caused by Type 2 diabetes in humans, as well as captive primates. Konjac is prepared from a mixed ratio of water and konjac powder to create a gel. The combinations of oral medications, konjac gel, and diet modifications have caused an obvious improvement in Lydia's physical condition, including a healthier coat and weight gain.

The team also experienced a new challenge during the winter of 2012-2013. The team observed dominant capuchins becoming challenged and aggressed upon more than ever observed previously. Surprisingly, it was two of the most dominant females of the entire collection that were affected the most. The team is always flexible and made decisions to try to ease the tension. The team incorporated weekly "breaks" for the large group, where the capuchins stayed in their family groups for the entire day, instead of putting the animals all together. The team was always ready to modify or change decisions quickly depending on the situation and the dynamics of that day. Occasional aggression during the day was seen when the capuchins are all together, but the majority of aggression to these dominant animals was occurring overnight. Therefore, the team started to break the larger family groups into even smaller groups to help minimize tension overnight. Ideally, this meant splitting a family group of six into three groups of two where the capuchins choose their cage mate.

Due to constantly changing dynamics, it is very important for management techniques to reflect the current situation. It is truly amazing and inspiring to look back at the historical management of this capuchin group, and how it has evolved to where it is now. The hard work and dedication of past capuchin keepers have allowed the new team to be able to fine tune and make decisions that truly fit what is best for the entire capuchin group, each family group, and each individual capuchin.

In March 2013, the capuchins were able to have access to their island exhibit earlier in the year than ever before! Historically the capuchins have been given access to the island in April or May. However, due to warmer temperatures occurring earlier in the year and team communication with the horticulture department, the team was able to offer the island a month earlier for the capuchins. This was even before the cottonwood trees on the exhibit leafed out (Figure 4). This has been a pleasant surprise to zoo visitors and staff alike that the island is open in March instead of April.

The team approach that has evolved over the last two years has proven to be a successful management tool for keepers and animals involved. Strong communication, consistency and open-minded conversations keeps the capuchin program flourishing at the Denver Zoo whether it is one section keeper, a team of two, or a team of three managing the animals. This innovative approach will continue to open more doors for improvement and modifications to the capuchin program and all animals in the care of the team.

Acknowledgements

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Figures

Figure 1: Hooded Capuchin “Sol” at Denver Zoo



Figure 2-Capuchin hallway



Figure 3-Outdoor Viewing Cage



Figure 4-Island (before trees have leafed out) with keeper setting up for demonstration



Figure 5-Lydia being trained for hip injection



Figure 6-Lydia being trained for arm injection



Figure 7-Lydia being trained to voluntarily enter squeeze cage



Figure 8-Lydia in overhead ramp with urine collection trays placed beneath her



Tools of the Trade: Using Your AAZK Chapter to Connect Guests to Wildlife

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Abstract

How can you fulfill your AAZK chapter's mission, harness the passions and talents of your members, create positive relationships with staff at all levels, and connect guests to wildlife? By volunteering to take on projects and programs that Smithsonian's National Zoo are unable to support or continue, the National Capital Chapter (NCAAZK) has grown into an active, vibrant, and appreciated community within the Zoo. NCAAZK develops and delivers professional development classes and seminars for AAZK and non-AAZK members; offers educational outreach to local school groups and organizations; hosts educational tables at special events; and provides animal artwork to silent auctions and high donor gifts, raising thousands of dollars each year for the Zoo. NCAAZK President Kenton Kerns and Secretary Elise Bernardoni share tips and ideas on how to use what's in your toolkit to turn your AAZK chapter into a highly-visible, well-respected organization that connects keepers to guests, and in turn connect guests to wildlife.

Introduction

Chartered in 2006, the National Capital AAZK Chapter (NCAAZK) began as any other AAZK chapter does: as a way for keepers to collaborate, learn, and have fun. Being a federal institution (Smithsonian's National Zoological Park, SNZP) with a non-profit support society (Friends of the National Zoo, FONZ), NCAAZK had to find its footing as it toed the line of where it fit within these institutions. It quickly became apparent that NCAAZK was most appreciated when it filled holes that SNZP and FONZ could not meet. Leveraging the skills and talents of our chapter members, NCAAZK is now responsible for or supports several high profile programs that are recognized in our zoo community as effective in connecting keepers to guests and guests to wildlife.

As NCAAZK grew, the executive officers needed support to continue with new programming. The officers developed coordinator positions to head up different or growing number of programs and events. These coordinator positions include Education Outreach, Fundraising, Bowling For Rhinos, Social Media, Zoo Tours, Open Houses, Social Activities, and Local Conservation, as well as Travel Grant and Professional Development Committees. While each of these coordinators and committees help NCAAZK to meet its mission and connect guests to wildlife in some capacity, we will focus on a few select programs here.

Educational Outreach

For a variety of reasons, SNZP and FONZ do not offer off-site educational outreach opportunities. Requests made to the zoo were almost always turned down. As NCAAZK established itself as a presence at SNZP, requests began making their way to the officers, who in turn would send them to the member base. Nearly every offer was accepted. Members often volunteered off-the-clock time to visit with school groups, adult groups, and professional gatherings.

The NCAAZK officers developed an Education Outreach Coordinator, whose role is to maximize the number of outreach opportunities that NCAAZK can attend. This position is responsible for disseminating opportunities to appropriate members. They are charged with recording specific information about each educational opportunity, and in turn this information will be provided to SNZP and the Smithsonian Institution to demonstrate SNZP and NCAAZK's educational reach. Additionally, the Coordinators are tasked with sending follow up surveys via email, which will help us to assess our effectiveness in the future. Finally, the Coordinators decided to develop three generic power point presentations focusing on different aspects of the zoo keeping profession, and are currently developing backpacks filled with props and biofacts. These devices were designed so that a busy NCAAZK member could easily take on an education outreach opportunity little preparation.

Taking on educational outreach has had several benefits. NCAAZK filled an important need on behalf of SNZP and FONZ, which helped to secure us as an important resource to our zoo. By focusing the outreach topics on the zoo keeping profession, we are able to promote AAZK and NCAAZK's missions and messages, while reaching a larger audience than we typically would. Educating the public is an area that many of our members are passionate about. Giving them opportunities to volunteer for outreach allows them to share their excitement, enthusiasm, and knowledge with a wide variety of people.

Professional Development

NCAAZK recognized a lack of professional development opportunities for zookeepers that didn't involve costly travel and conference registrations; these opportunities were limited to a small percentage of staff each year. The chapter developed its own Professional Development Committee and created tiered programming that allowed every level of zookeeper, as well as non-keeper chapter members, to experience some sort of on-site training with subject matter experts already employed by SNZP and FONZ.

Professional development courses allow NCAAZK members to have a richer understanding of topics ranging from body scoring to kiwi history and husbandry. One of the most basic ways that NCAAZK can help connect guests to wildlife is to arm our members with a strong professional base. Staff who are confident in discussing the nuances of the animals in our care provide guests with a richer understanding of natural history, threats to species, and how zoos play a pivotal role in their survival. Staff who publicly demonstrate best practices in husbandry (or any aspect of their daily duties) provide guests with a positive glimpse into the important role of a zoo keeper.

Just as with educational outreach opportunities, NCAAZK identified a professional development gap and filled it with quality programming. This has made the NCAAZK chapter a vital part of keeper training, and soon staff were approaching the NCAAZK officers to coordinate classes on specific topics, and instructors who wanted to get information to keepers were contacting NCAAZK to help facilitate workshops and training. Professional development and staff training helps morale and staff retention, and by spearheading these efforts NCAAZK is taking a center role in supporting the zoo environment as a whole.

Animal Art

Animal art is a fun and engaging way to introduce the public to animal enrichment while creating an entertaining project for both animals and their keepers. Animal art programs can get unruly quite quickly when everyone at a big zoo wants to paint. Who purchases and distributes the paint and canvases, making sure both are safe for animal use? Who stores the art? Who prices and gives away the art? Who ensures that art is ready for fundraising events?

NCAAZK started animal art programs at SNZP, and very quickly became the go-to program for the zoo's art requests. In 2012, using donated paint, supplies, and gallery space, NCAAZK held its first-ever Animal Art Show silent auction. The proceeds of this art show went towards buying more paint and art and distributing it equally throughout the whole zoo. SNZP's Development Office, recognizing the increasing popularity of original animal art pieces, approached NCAAZK about supplying pieces as thank you gifts to high donors. NCAAZK is pleased to provide these unique items to donors, and SNZP appreciates that there is a ready supply available at any time.

In order to meet the new demand and streamline the request process, NCAAZK developed a Fundraising Coordinator position whose purview includes animal art and art sales. This coordinator oversees the distribution of canvases and paint, and ensures that each event has the required amount of art. The Fundraising Coordinator is responsible for devising new ways to use animal art so that NCAAZK may achieve and maintain financial stability while supporting SNZP development goals. NCAAZK views animal art as a great conversation piece, a fun educational object, and a way to connect individuals to specific animals and their stories – all while raising funds for both organizations!

Local Conservation

In 2012 both National AAZK and SNZP leadership discussed the important of local conservation partnerships and programming with NCAAZK officers. Our NCAAZK executive officer team decided to turn this important initiative into a coordinator position. We approached a keeper who is passionate about local conservation, and she started creating local conservation projects near to the zoo. We open conservation projects up to all zoo staff and volunteer participation

The National Zoo is located in Rock Creek Park, a treasured natural area in a big city. The zoo is skirted by Rock Creek, which numerous species rely on for survival, and is tragically polluted. SNZP does not have the resources to assist in routine Creek clean-

ups. With a new focus on local conservation, NCAAZK partners with local and national programs, including Friends of Rock Creek (FORCE) and the local chapter of Jane Goodall's Roots and Shoots teen volunteer program, to provide clean up services. This particular local conservation effort is important to the health of the zoo and our neighborhood, engages our internal zoo and local communities, and provides teens with special opportunities to work alongside our staff.

Special Events

NCAAZK makes an effort to show up at every zoo event with a table with audience-appropriate activities. For children's events and science-oriented days, NCAAZK displays include make-an-exhibit exercises and conservation action posters that include activities and actions that everyone can take part in, and we fundraiser for our chapters with low-priced items such as Chopsticks for Salamanders and animal prints note cards. During more adult-themed events such as Brew at the Zoo, NCAAZK keepers sell animal artwork. By attending a variety of events, NCAAZK is spreading an age-appropriate zookeeper message of conservation to every age group.

One of the biggest comments that FONZ receives in event feedback surveys is that guests wish for more animal information and interactions. NCAAZK supports FONZ by hosting tables and providing valuable – and much appreciated – one-on-one opportunities with animal staff. This seemingly small action not only helps NCAAZK reach thousands of people each year; it has created a wonderful working relationship with FONZ. They support our programs, provide in-kind services, and support our endeavors.

Tips for Turning your AAZK Chapter into a Resource for your Zoo

Keep your expectations and your activities at a manageable level, and ensure that you have the ability to be flexible. We attempt to evaluate every program and adjust as needed. When a program has served its purpose and attendance wanes, we siphon those resources to a different program.

Discuss with your senior management how your chapter can support your zoo, even if you don't feel that your zoo always supports you. A critical step to positive relations between NCAAZK and SNZP was simply offering to help. By offering our services out chapters quickly became a valuable resource and a respected partner of SNZP and FONZ. NCAAZK provides educational outreach, local conservation projects, and professional development programming – incredibly important programs that SNZP and FONZ required but needed support, while NCAAZK was able to meet our mission and connect our guests to wildlife.

NCAAZK recognizes that with a large chapter base, we can accomplish a lot. Not every chapter has many members, but every chapter has passionate, willing, and enthusiastic members. Find the place(s) where the support your institution needs matches the skills, interests, and expertise of your members.

Get your members involved by creating coordinator, chair, or support positions for new projects and programs. NCAAZK executive officers needed to delegate some of the responsibility, but we also wanted members to have greater ownership of aspects of the chapter. We also believed that a coordinator position could be a useful addition on a resume.

Be very clear with your expectations. Although our coordinator positions are voluntary, they come with a clearly written position description and the duties and responsibilities associated with them. Coordinators are asked to serve for one year, making it a reasonable commitment, and volunteers can serve indefinitely.

Support your members' initiatives. When a keeper comes along with a passionate proposal and is willing to take on the responsibility, NCAAZK typically supports them if it matches our mission. Member initiatives almost invariably connect chapter members and zoo guests to wildlife, either through service, education, or volunteerism.

If you have the flexibility of a larger budget, let your coordinators decide how best to spend it. Certain initiatives (BFR, Local Conservation) are given a budget that they are free to spend as they wish through the year. This adds a level of responsibility for the coordinator, but it also increases their ownership of the program.

Be a positive and visible presence in your zoo's internal community and to your visiting public. Attend public events while representing your chapter and your zoo, volunteer for outreach events, and organize activities that best move your chapter and zoo forward.

Be inclusive. NCAAZK prides itself on its large membership base of over 100. We have created bylaws and membership structure that allows anyone from volunteers to the director to join our chapter. NCAAZK has no expectations for any member, but instead invites them to support us however they can, be it through donation, time, or other resources.

Conclusion

Through a combination of critical analysis, hard work, and an open approach to new projects and programs, your chapter can determine how best it can support its zoo while meeting its own mission. Creating programming that complements your zoo will make your chapter an essential resource, and your zoo's staff will appreciate and integrate your chapter. Ideally, your chapter's activities will support your mission, your members, and your zoo, thus creating a perfect match that will benefit everyone involved. Well-rounded AAZK members rise to the top of any organization or group, and they will certainly be the key to connecting your zoo's guests to wildlife.

I'm an AAZK officer, what do I do now??

Ideas for running a successful chapter

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Sometimes one of the hardest parts of being an AAZK officer is just getting people to come to meetings! In 2012, The Greater Houston Chapter of the American Association of Zoo Keepers (GHCAAZK) revamped the format of operations and activities, resulting in an increased participation level through a combination of intriguing meetings, clinics, simple fundraisers, and social events. This paper will highlight the ideas and successes of a year in the life of GHCAAZK.

Getting started:

The first few weeks as a new officer can be exciting and stressful. Getting organized will help the chapter function efficiently throughout the year. Starting out, the officers focused on having a good organizational structure. Officers reviewed the national AAZK bylaws, re-evaluated the chapter's bylaws, and reviewed the roles of each officer. A line of communication was opened with the zoo's management in order to create a relationship for future approval of fundraising events, permission to sell animal paintings, etc. Scheduling a meeting at the beginning of the year to share some chapter goals can lead to successful cooperation between the chapter and the zoo.

Officers:

Create a strong leadership team. GHCAAZK officers meet once a month, a week prior to the general meeting, to plan and discuss the current events of the chapter. These meetings often occur over lunchtime or take the shape of an occasional potluck at an officer's home.

Create clear job descriptions for officers. Each officer plays a vital role in the success of the chapter. Assigning the officers specific tasks helps in achieving a sense of accomplishment and belonging. These tasks may include: reserving a meeting location, sending out member emails, or scheduling guest speakers. Some roles are straight forward (secretary and treasurer), while others may require additional responsibilities (vice president and liaison). Communication is vital to ensure each officer is incorporated and appreciated.

Create officer binders. For each officer position, our chapter created binders. The binders provide new officers a description of their position and assigned tasks to ease them into their roles. Binders include everything from the chapter's bylaws; to a list of zolympics events; and banking and tax information.

Chapter:

Create a feeling of ownership. Include the chapter members in all major decisions. At each meeting, members are able to provide input and ideas to the chapter. On the yearly officer voting ballot, members fill out a survey based on what they would like to see more or less of from the chapter and ideas for future clinics.

Create a structure that applies to everyone. Currently, there are two different modes for members to request chapter funds. Members can request funds for conferences and professional development opportunities as well as apply to receive a months worth of coins from the chapter's coin funnel to be designated to a conservation project of their choosing. Both requests require applications and have guidelines that were voted on by the chapter. When funds are requested, they are approved or declined via a chapter vote. This system has worked well by removing any thoughts of unfairness. Every member goes through the same process and all requests are voted on by the chapter.

Meetings:

Previously, GHCAAZK had slipped into a slight rut of very business like meetings. Many keepers began asking themselves "why should I attend an AAZK meeting?" The Houston Zoo has a fairly large animal care team including 10 animal sections with anywhere from 5-17 keepers per section. Therefore, creating connections between departments can be difficult. To help remedy this issue, every other month during the second half of a chapter meeting, a different animal section is chosen for a visit. These section visits allow departments to show off anything from training, enrichment, and even incubation with the chapter.

Supervisors of a department are contacted in advance to organize a visit within their section. Some of our section visits have included a visit from our leash trained cheetahs and Anatolian Shepherd, observing blood draws on the zoo's 3 rhinos (followed by rhino baths that members assisted with), observing the incubation and chick rearing of the endangered Prairie Chicken, and watching our chimps play with their iPad in envy, as many keepers do not even have an iPad! In order for all areas to be included, visits have been rotated around to different sections over the course of two years.

In addition to section visits, other strategies were used to encourage meeting attendance. Monthly meetings started incorporating raffles with items such as canvasses, non-toxic paint, tickets to the Zoo's Conservation Speaker Series, or gift cards. Other activities included guest speakers for a "get to know your management" series, training games, and free food (always a keeper favorite!). Advertising something interesting for every meeting kept the members coming.

Fun Raising:

Monthly meetings are not always enough to attract individuals to take part in a chapter. GHCAAZK used social events to draw people in as well.

Zoolympics is a very popular event with many chapters. To breathe new life into our event, an email was sent out on the AZA list serves to acquire ideas for new events (the complete list of event ideas is attached to the end of this paper). Advertising a "new and improved" Zoolympics produced the largest amount of

registered teams than ever before! To include everyone who attended, 8 main team events took place. The team events included obstacle courses, fecal identification, water balloon netting, and zoo taboo to name a few. Several individual games were also available for those not on a team, but who wanted to partake in events at their own pace. To boost excitement for the event, a mythical creature was assigned to each team in advance of the event. This activity required teams to prepare a keeper chat on their creature and present it at Zoolympics. Teams were scored on their facts and presentation style and props were encouraged!

Zoobrews: Taking advantage of happy hours and local pubs has been a successful way for GHCAAZK to socialize. Advertising a place and a time will usually bring out participants from all over the zoo. Houston is lucky to have a “dog park bar” that GHCAAZK frequents. This encourages the dog owners who try to use the “I have to go home to take care of the dog” excuse to come out and have some fun! Since this venue in particular has done many fundraisers for local pet charities in the past, we are hoping to team up with them for a Painted Dog fundraiser in the future.

Trivia Night: Trivia night has proven to be popular among our members. There are a handful of bars around Houston that hold a weekly trivia night. Members meet at the bar and split up into teams to compete against each other. Finally a place for random knowledge to be put to good use!

Community Projects: The chapter is involved with local conservation through an Adopt A Beach trash collection program. Through this program, a segment of beach is assigned to the chapter. It is the chapter’s job to clean this area several times a year. GHCAAZK is currently working on finding a more local project to support, which would allow more members to have involvement with the project.

To gain appreciation for one of our native species, a bat emergence viewing night at the local Mexican free tailed bat colony was organized. For this event, the chapter collaborated with a local Bat Conservation International member who gave a presentation about bats and their importance to the local environment. Not only did a crowd of zookeepers attend, but many people from the general public were involved too. This turned out to be a great way to educate the public and spark an interest in local wildlife.

Clinics:

One need that officers saw for keepers was more continuing education and professional development opportunities. For GHCAAZK, this took the shape of a clinic program. The chapter brainstormed ideas for clinic topics (nothing was too small or too big) then chose a few of the easiest to tackle first. The goal was to have four or five hour-long clinics a year touching on a variety of topics. The first year of the clinic program included power tools, toxic plants, knot tying, and keeper/vet relations. More recently, there was a safe exhibit propping clinic and a capture and restraint clinic is in the works.

To start the planning of a clinic, subject matter expert on the zoo’s staff were sought out who had the skills we wanted to highlight. The maintenance and horticulture departments were obvious choices for the power tools and toxic plant

clinics, but finding a knot expert took some effort! After finding someone to facilitate a clinic, materials lists were made and a venue and date were picked.

Clinics are as hands on as possible and often begin with a “classroom” session by means of a power point presentation or introduction on the topic. After the introduction, individuals divide into groups for hands on tool or knot tying practice. For the toxic plant clinic, our horticulture staff even cultivated some of the local toxic plants and brought them so keepers could learn to identify the whole plant!

Fundraising:

To be a financial resource for your chapter, fundraisers are a necessity. GHCAAZK found that the key to fundraising success is finding activities that work well for your chapter. Every fundraiser doesn't necessarily work for each chapter. Several different fundraisers take place each year in GHCAAZK for conservation and the chapter's general fund. Some fundraisers are large and take months of planning, like Bowling for Rhinos. Others are easy and take almost no effort on the chapter's part.

Conservation fundraising: Each year GHCAAZK has two large conservation based fundraisers. One fundraiser is the nationwide Bowling for Rhinos (BFR); the other Climbing for Clouded Leopards (CFC). As many of you know from planning your own Bowling for Rhinos event, a great amount of work goes into putting on a successful event. Every chapter is different depending on resources available and support from the local community. 2013 was the most successful BFR for GHCAAZK due to their ability to attract many companies and individuals to sponsor lanes, as well as donate big ticket items to the silent auction and raffle. To draw in new attendees, a gourmet food truck was stationed in front of the bowling alley.

The chapter is currently planning their third annual Climbing for Clouded Leopards event. This event raises money for clouded leopard conservation through a night of rock climbing, in which the rock gym donates 50% of their proceeds on the night of the event. In addition to rock climbing there is an animal painting silent auction; items to sponsor such as camera traps, batteries, and SD cards; and a directed raffle where participants choose items by putting their raffle ticket in a jar for each specific item. This year, the planning committee would like to have a photo booth available at the event. Due to the great partnership the chapter has with Houston Zoo, Inc., CFC tied the event with a conservation project that a carnivore staff member has directly worked with. As an added bonus from this connection, chapter members have been directly involved with the project by helping sort through, and make identifications on, hundreds of camera trap photos collected in Borneo.

Along with Bowling for Rhinos and Climbing for Cloudeds, GHCAAZK has a few smaller, less involved conservation fundraisers. One example is “Leaping for Lemurs.” This event partnered with a local indoor trampoline park to raise money for lemur conservation. For two days, Sky Zone donated 20% of their proceeds to lemur conservation and this year, a “Dodging Extinction” dodge ball tournament is being added to the event. Since the business agreed to simply donate a percentage of their proceeds, there was little planning or organization needed on the chapter's part. All that was required was a phone call or two and promotion for the event. The

chapter continues to look for ways it can assist with conservation through fun events like Leaping for Lemurs. In the future, there is hope of holding “Putting for Prairie Chickens” and “Paint Ball for Painted Dogs”.

Some fundraisers take months of planning, and some take place on the spot. One example is GHCAAZK’s involvement to help the Okapi Conservation Project that was attacked by rebels on 24 June 2012. The Houston Zoo promptly held an Okapi Crisis Relief fundraiser and GHCAAZK donated time and supplies to the event. The day prior to the fundraiser, chapter members gathered to make buttons to be sold and okapi masks were prepared for children to color and wear. The chapter also held a staff bake sale with a percentage of the profits being donated to the relief efforts. Everyone’s willingness to bake wonderful goodies, including whole cakes and pies, made for the chapter’s most successful bake sale. A month’s worth of coins collected from the coin funnel were also donated.

Chapter fundraising: In order to raise money for the chapter, several small-scale fundraisers have been found to be very successful including: coin funnels, face painting, staff bake sales, and a chapter t-shirt sale. The chapter is lucky to have the support of the Houston Zoo, who allows two GHCAAZK coin funnels to be placed on zoo grounds. Any AAZK member can apply to have a coin funnel placed next to an exhibit around the zoo to raise money for a conservation project of their choosing. All they need to do is fill out an application and submit it to the chapter for a vote. If their application is chosen, money raised from the funnel goes to that project. There is also a second coin funnel that is always allocated for GHCAAZK to insure that funds are available for conference requests and other chapter needs. To promote the coin funnel and the allocation of the funds raised, a sign is placed on the funnel that displays a picture of the species from the project or a keeper doing some aspect of animal husbandry (training, enrichment, hoof trim, etc). Additionally, a title “Spare any change?” with a one to two sentence description for the use of the funds is displayed. This has been a very easy venue for the chapter to raise money with almost no effort on the chapter’s part. The officers only need to empty the coin funnel periodically and make sure it is in a well-travelled area of the zoo.

Two of the easiest fundraisers for GHCAAZK are face painting and bake sales. For face painting, the chapter was approved to paint several times a year on zoo grounds during specific events (Zoo Boo, Zoolights, and Spring Break). The chapter supplies face paint from a local craft store and member manpower. The event charges \$2 per painting and a pre made poster of painting options is displayed (although a flamingo with a Santa hat was requested during Zoolights!). Many zoo staff members are keen bakers, so bake sales are a simple and easy option. Bake sales take place three or four times a year, usually centered close to holidays. A central location for staff is chosen for the bake sale venue to encourage staff to attend. By renting out one of the zoo’s credit card machines during the event, profits have greatly increased!

Another simple fundraiser that our chapter tried for the first time in 2012 was a t-shirt sale. The first success was a “You know you’re a zookeeper when...” t-shirt. This fundraiser had several benefits. The money went towards the chapter’s general fund; a pretty awesome zookeeper shirt was created; and it gave the chapter a unifying t-shirt for members to be recognized at events. The first step for this

fundraiser was member submission of phrases such as; "... you spend all of your vacations visiting other zoos." Once a list was compiled, members voted on their favorite phrases. These sayings were implemented into a design on the back of the shirt, while the front of the shirt had the chapter's logo. The company used was customink.com, which made the designing and purchasing process very easy. For this fundraiser, the chapter purchased a set amount of shirts and sold them to staff members at the Houston Zoo. After posting them on the GHCAAZK Facebook page, several online orders were placed from zookeepers around the globe! This company was also used for the chapter's BFR shirts. Instead of ordering a set amount of shirts for BFR (there are always too many leftovers), people were able to purchase the shirts separately through the Customink website and the shirts were shipped straight from the company to the buyers. The middle man process was removed and there was no left over stock.

One good investment for the chapter was the purchase of a button maker that is available for members to use for conservation and fundraising events. Members have used the button maker for Bowling for Rhinos, Climbing for Clouded Leopards, and zoo conservation events. The "I Heart Okapi" buttons were especially popular with the keepers!

For the future:

To increase attendance, several ideas have been tossed around. One idea is to visit sections during morning meetings to promote chapter events. Another is to team up with HR to catch new staff as they arrive by placing an AAZK pamphlet in the new staff welcome packet.

The Houston Zoo has a keeper driven Spotlight on Species (SOS) program in which keepers put together an educational weekend event that raises money for a species in the wild. To raise awareness about zoo keeping, a Zookeeper "SOS" would be planned, including mini zoolympics events for kids to get a hands on feel for what it is like to be a keeper. This would be ideal for National Zookeeper Week, but seeing as July in Houston can be pretty unbearable, the event will most likely take place in the fall or winter.

Conclusion:

By being creative and finding events and fundraisers that work for your chapter, being an AAZK officer can be a great experience. Don't be afraid to set goals and try new things and share what works for your chapter with others!

Acknowledgements:

The success of our chapter couldn't have been achieved without the ideas and hard work from its officers: Danny Keel, Ben King, Letty Ochoa, Corri Osborne, and Mollie Coym. Thanks as well to the chapter members for participating and Renee Bumpus for cheerleading.

Zoolympics Events

Who SCAT That?

A picture identification game of animal poop. Each team had a set of animal pictures and a set of poop pictures that were spread around on a table. They then had to work together in 3 minutes to match the pictures of the animals to the pictures of that animal's poop. We set a points value for correct matches and incorrect matches. We had ~26 pairs of animals and their poop this year.

Keeper Chat Challenge

Each team chooses one member to speak for 5 minutes and give us a "keeper" chat. (We give them at our zoo for approx 15 minutes in different areas everyday). To make it fair, we placed fictional and/or extinct characters/animals on cards and had each team pick out of a box. We have had Clifford the Big Red Dog, the Kraken, Thing1 and Thing2, Unicorn, the Lorax and the Dodo bird, a hoop snake, a chupacabra, a hippogriff, etc.

Each team was judged on creativity, knowledge of natural history, time, and answering a couple questions from our judges. Props are greatly encouraged.

In One End...Out the Otter

Two years ago, we had keeper make otter "poop" using oatmeal, water, yams and tuna (very realistic). We had a competition for each team to "clean" up as much otter "poop" as they could in 30 seconds. They had to clean it from a pan using a small dust pan and squeegee and place it in a bucket to get weighed out. It was fun, but maybe not challenging enough, so at the end of the event, it was hard to determine which team ended up cleaning up more, since both teams were able to get most of the poop into their buckets.

This or That

We had two display boards with close-up pictures of animal skin/feathers, small baggies of various types of hay, pictures of browse and weeds, and an assortment of tools that keepers had to identify.

What's Your Feather?

We had a collection of 13 feathers from our collection birds (collected during molt). The teams had to match the name of the bird to the feather. We only used adult plumage.

What's that...SMELL?

We placed white bandanas in the smelliest barns/areas for a week and then placed in bags. Had to identify which barn or building the bandana came from. We also had "enrichment" spices in jars, such as pepper, thyme, etc.

Bat Round-Up

A test of net skills, one of the most popular events.

Water balloons were filled and then tossed from different distances representing different difficulties of bats (juvenile and adults). One person tossed ~5 balloons (bats), one person caught in a net, and one person removed from net and placed in bucket. Balloons broke of course which meant that the bat didn't make it so negative points were added. For each bat caught, positive point values were assigned.

Are you Penguin Enough?

Team relay acting like a penguin.

Each team had to catch a fish (Swedish fish) in their mouth and then collecting nesting material and waddle back to their nest to sit on a dummy egg. We did this event twice, but not this year.

Trivial PurZOOT

Trivia game identifying employees, picking the job that matches the description, misc facts about animals, etc.

Zoo Taboo

Like the board game, we made cards with animals' names, tools, zoo terms, etc. and then a list of five taboo words under them. One person on each team had to get their team to guess the most keys words without saying any of the taboo words. The team that collected the most cards won.

Keeper Enrichment Challenge

This was made up of three mini-events. The first round was several cardboard boxes in a field, with only a few having feathers in them. The first teams to find feathers moved on to the next round, and the other teams were out. The next round was several paper mache eggs, with only three having candy in them, the first teams to find the candy advanced to the last round. The last round was a puzzle feeder made of PVC with holes drilled in it, and filled with a bag of skittles. It was a timed event, and the keeper who got the skittles out fastest won.

-Obstacle course where a keeper is dressed in a CDC primate protocol suit and has to run to a hose that is laid out, roll it and carry it to the next obstacles on the course. Obstacles included 2 buckets with water, moving a feed bag from one location to another, raking a small area to find something that is buried (without breaking it) and place it in a basket, "assist a guest" who has a map question (they have to tell them how to get from A to B by pointing it out on the map from current location). The keeper who made it to the end first with their hose and the most water in their

bucket won.

-Count the rubber ducks (again in a large tub with water and a hose making a current and therefore they are moving around. Time limit).

-Minute to win it games

-hose an item through an obstacle course (fastest time wins)

-Estimating the weight of a pre-weighed food sample with various food items not using a scale

-Zookeeper themed Pictionary (a good one to encourage teamwork!).

*Animal Food Identification/Matching

*Browse Identification

*Guess # of Kibble in Container (good tie breaker)

*Guess the Weight of Items (food items animal and human, office supplies, tools, etc)

*Pile of Keys – Match up With Locks (timed)

*Timed Hose Coil (get 100 ft long, gnarly hose, put in cooler first)

*Stack Bags of Feed/Bales of Hay (timed)

*Roping (use steer head, decoy, plush animal)

*Aquarium Fishing (scoop different items out with different nets/utensils)

*Animal Escape Drill (gather supplies/get dressed, load “dart”, use super soaker gun to dart animal, net and secure in crate)

*PPE Relay (whole team dresses up in PPE gear that is spread out in stations, then all have to be at end station to undress gear... maybe do something at end station first)

*Relay Race (net monkey out of tree, sort mail, load and shoot super soaker gun, feces toss into wheelbarrow or buckets)

*Musical Hay Bales or Buckets

*Wheelbarrow Race (load items into wheelbarrow and run to other end of pavilion, tag out another team member and run back)

*Eat like a... herbivore, carnivore, etc.

*Hanging stuffed animal like a piñata that needs to be netted

- Supermarket Sweep: Contestants are given a list of items that are fed out to various animals. They are also given a bucket that would hold all of the items. Whoever collected the items in the shortest amount of time wins the game.
- Unicorn Poop Scoop: Chalk is used to outline a 16x16 foot square area. The "referee" scatters a large bag of skittles throughout the "pen". Contestants are given a variety of tools: shovel, broom, dustpan, and scraper. They are allowed to use whatever tools they want. They are given ten seconds to pick up as much unicorn poop (skittles) as possible. The collected poop must be placed into a small bucket before the thirty seconds are up. Poop is weighed out on a small scale, who ever collected the most wins.
- Hose Over Bros: A hosing "obstacle course" is constructed. It should include a

- start line, ramps, barriers, barricades, and a finish line. Contestants have to hose the ball through the obstacle course. Whoever finishes fastest wins.
- The Keys to Success: Drill various holes in a piece of wood. Fit D-rings/eyelets into the holes. Lock a variety of locks with different cores (all ones the keepers have access to on their key rings) onto the eyelets and D rings. Lock keys onto D-rings/eyelets as well as onto chains in order to make it harder. The keeper who completes the contest in the shortest amount of time wins.
 - Barker's Beauties: Ask your supervisor for a list of 10 items and their cost (for example, chlorhexadine, a case of bleach, ten bananas). Have the items displayed out for the keepers to look at. Have the keepers guess how much each item or group of items costs. Calculate the difference in the actual cost and the guessed cost for each item. Add up the differences. Whoever has the smallest number wins.
 - Food for Thought: Fill two small lunch bags with various amounts of five different food items. Weigh the lunch bags, and don't tell anyone the weight. Divide your staff into two teams. Place a large amount of each of the five items in front of the two teams. Give each team a lunch bag. Have each team work together to figure out how much of each item needs to go into the bag in order to match the other bag's weight. Teams can handle the bags to compare the weights. After 3 minutes, call 'time'. Weigh the sample bag, and then weigh the coordinating team's bag. Whichever team's bag is closest in weight, wins.
 - Who Knows the hose: Locate a long hose that is wrapped up somewhere in your zoo (it helps if the hose is hung up on a wall). Make a mark on the ground about 20-30 feet away. Have each keeper label a piece of tape with their initials. Have the keepers place their piece of tape, on the hose where they think it would unwrap to meet the mark on the floor. After everyone has placed their guess, unwrap the hose and see who wins.
 - The Call of the Wild: Download animal calls from the internet. There are a bunch of free sites out there, and you can convert them to MP3s easily. Download about twenty different calls. Play each call, and have people write down which animals they think make that noise. It's harder than you think! Whoever gets the most right wins.

Daily Activities

Crossword Puzzles: Find a website that lets you create a crossword puzzle. Think of phrases, animal names, co-workers names, zoo themes, a-la-carte food, etc. Plug them into the puzzle creator and wha-la! Deliver the crosswords at a central location each morning. Correct them at the end of the day. Who ever has the most correct wins. If there is more than one entry with the highest score, have a drawing.

Find the Difference: Take some pictures from around the zoo. Photo shop some slight differences in the pictures. Place the pictures in a central location, and have people guess the differences. You can find these kinds of games in people magazine.

Operant Condition Training Challenges, Successes, and Accomplishments of 4.12 Chimpanzees (*Pan troglodytes*) and 3.3 Western Lowland Gorillas (*Gorilla gorilla gorilla*) at the North Carolina Zoo.

Elizabeth McChesney, Lion, Chimpanzee, and Lemur Keeper II North Carolina Zoo Asheboro, North Carolina.

Gisela Wiggins, Vet Tech II North Carolina Zoo Asheboro, North Carolina.

Aaron Jesue, Gorilla Keeper II North Carolina Zoo Asheboro, North Carolina.

As staff members of the animal and veterinary divisions of the NC Zoo, we have had the opportunity to spend many hours in meetings about why the training program has been unsuccessful in accomplishing a variety of important medical behaviors. These topics ranged from the complaints of the veterinary staff about the ineffective abilities of our keepers in training, to the animal staff concerns that they are not given enough support (primarily due to time constraints) and guidance. Many times, the vet techs tried to defend the keepers, because many of us felt like we knew where the problems lie. Having attended many AAZK conferences where behavioral training was the subject of conversation in paper sessions and workshops, we were aware that in order for training to be successful in medical procedures, the veterinary staff needed to be an integral part of the training sessions, from the start. Also, the zoo must be willing to support the process, particularly with staff time. Many times, we attempted to impart this information to our superiors and co-workers, only to feel like our suggestions fell upon deaf ears.

After a significant amount of time, a veterinary resident, tech and a small group of keepers who were invested in changing the method of thinking at our facility, things began to change. One of the fundamentals was that all staff should be involved from the beginning. The vets can tell them to train the animal to present an arm or tail for drawing blood, but they don't know where the vessels needed are, or all that's involved in getting the sample. When training for auscultation with a stethoscope, they need to know that the animal needs to let the vets listen for a certain amount of time. By having discussions between vets and keepers from the start, we can prevent a great deal of frustration on both ends simply by clarifying the expectations. The animal also needs to feel comfortable around the person performing the procedure. This requires a significant amount of time being spent with that animal, particularly on the part of the hospital staff who do not already have established relationships with the animals (or if they do, they are often negative). Thankfully the vets and animal management eventually listened and agreed that we needed to change our approach to how we interacted between the two divisions and our expectations for training.

Because we have two busy full time vets, three rotating veterinary residents and a supervising veterinary technician, the job of initiating these training sessions from the veterinary side fell on the 4 veterinary technicians. As opportunities came up for training, vet techs volunteered to be the point person for that animal. The natural choice for the primary tech for the apes was Gisela, whose first job at the NC Zoo was as a zookeeper working with most of the chimps still at our institution. Another tech, Dave, has assisted with ape training, particularly when we have had important behaviors that need to be completed in a shorter amount of time. His presence has also been beneficial because he is a man and some of the apes have had few positive interactions with male staff (the majority of keeper staff have been females in recent years).

On the animal side, we had a few keepers in each great ape section who were interested in increasing the amount of training. The primary short term reward for animals and keepers being reduction of stress for medical procedures and long term a reduction in the number of immobilizations overall. In the chimp section routine, immobilizations are performed on animals under the age of 30 every other year and the animals 30 and over every year. The gorillas follow the same guidelines but with the cutoff age being 20. The vets agreed that if TB tests, visual exams and ideally blood samples could be obtained, then the number of procedures could be reduced, unless other medical concerns are present. Unfortunately, as in many zoos, staffing is always a challenge. While there was a great deal of excitement between the techs and keepers about what could be accomplished, we had to be realistic and decided to utilize time once or twice a week in the afternoons to work alongside the vet staff in joint training sessions. While vet staff were now involved during initial planning, keeper staff worked on behaviors during normal training sessions and then all staff worked with the animals during cooperative training sessions. The animals that were targeted first were the ones who excel in training and those with medical concerns that require more frequent immobilizations since these animals would have the most impact initially.

While all of our animals participate daily in the training program, the following are some of those that we initially focused on in cooperative training sessions.

Chimpanzee, Hondo #48, Male

Hondo was our alpha male for the majority of his life at the NC Zoo. He had strong relationships with many of his keepers, a few vet staff members and was more trusting than many of our chimps. He also had been diagnosed with hepatic amyloidosis, which increased risks during immobilizations. In February of 2009 he was noted to have non-weight bearing lameness on his right leg that presented after a fight the previous night, but no obvious wounds or swelling were noted. Due to his relationship with staff, it was determined to begin training for radiographs. Because of his comfort level with staff it was only two days later when he presented his right foot in

a modified blood sleeve and two radiographic views were taken. The vet suspected that there was a sprain, but wanted to examine the opposite foot as a comparison. The next day, he once again presented his right foot into the blood sleeve during training and the tarsal joint was showing visible swelling. He was asked to present his left foot for visual and tactile examination and it appeared normal. Vets determined that it was most likely a severe sprain with medication and rest resolving the issue.

On March 13, 2009, additional radiographs were again taken of the right foot, which showed worsening changes that were an indication of chronic arthritis.

That initial training for radiographs was just the first in a series of training protocols that proved to be successful in monitoring Hondo's health. Subsequently, he was trained for radiographs on his right hand due to knuckle walking, which once again was due to osteoarthritis (March 15, 2010) and abdominal ultrasound training was begun to monitor his progression of amyloidosis in his liver. His primary keepers trained him to sit on a low platform and present his abdomen to an access port in the cage. Through this access port, we were able to train him for abdominal ultrasounds. Due to this training, we were able to get an ultrasound technician in to observe and direct the ultrasounds, without anesthesia, and report on her findings.

On October 1, 2010, due to training working with the blood sleeve, the veterinary resident at the time, Dr. Betsy Stringer, who was incorporated into the training sessions, was able to get the first successful blood sample through training using a 3 cc syringe and a 25 gauge butterfly catheter. On Nov. 5, 2010, we were able to perform his TB test with a tuberculin syringe, in his forearm, through the blood sleeve. We were also able to read it at 24, 48 and 72 hours. Vets were also successful in doing an annual exam, which included auscultation of heart and lungs using a stethoscope, ophthalmic and otic exams, visual dental exam and nasal exam. An overall visual body exam was also done.

Training was then begun to add a cardiac ultrasound to his list of health monitoring and on May 9, 2011, again with keepers as well as in the presence and with the direction of an ultrasound tech, a complete echocardiogram was performed on Hondo through voluntary training.

Sadly, Hondo died on August 19, 2011, due to complications from his liver amyloidosis. He died quietly, and we expect quickly, on exhibit.

Chimpanzee, Jon #1404, Male

Jon, Chimp #49, is a training marvel. He is always very eager to train. He also has a slight cardiac abnormality that was discovered during a routine cardiac exam (performed under immobilization). Because of this, he was another of our initial

animals. His first visual exam and cardiac auscultation using training were done in July of 2008. We began training him for a non-anesthetic echocardiogram after his annual exam in August of 2009. The issue with the hospital staff was not that he could not perform the needed behavior; it was making sure that he was comfortable with the machine, probe, gel and pressure that would have to be exerted in order to get the proper images. Another major component was making sure that he could hold the behavior without breaking for an extended amount of time. Unfortunately, the chimps were opposed to the gel. Finding a way to get the needed contact without having gel to skin contact had to be found. What we eventually came up with, after talking to keepers at the annual AAZK conference, was putting the gel in an ultrasound sleeve with the probe and using warm water as the contact agent between the skin and probe. Early in the process, our resident, Dr. Betsy Stringer, was brought in to assist in the training so that when the ultrasound tech came in to do the echo, a veterinarian was present to actually hold and manipulate the probe. We felt that if the sonographer got too technical, the vet would be better able to understand what was desired. The techs and keepers know what our limitations are and we want to set our animals up for success. We also felt that, even though Jon was normally a good chimp, someone more used to their erratic ways and knew more about chimp behavior, should be the one in close contact with him.

On March 29, 2010, Jon had his first awake echocardiogram and he did great! Unfortunately, the staff vets failed to communicate that in order to obtain the most important view needed, he had to be lying down on his left side. This allowed the heart to shift slightly so that an image could be taken of the pulmonary vein. The keepers had been assured that if Jon could be trained to perform adequately for his echo, he would not have to be anesthetized and at this point, Jonathan had sat for an exam for almost a complete hour. So, when this snag came up, Dr. Stringer and the techs were horrified. If Jon had to be immobilized anyway, it would be a huge breakdown in the trust that had been established between the keepers and vet staff. So, his primary trainer, Beth, frantically attempted to quickly get him to lie on his side in order to get this one view. Luckily he is trained to station, which helped tremendously, but we were at this point working with an animal that was full and had been training for over an hour. We all could see and feel the confusion and frustration Jon was experiencing. But, because he is so eager to train, he tried very hard to understand what we were asking of him.

Because we had to anesthetize several gorillas for their annual exams and echocardiograms, we decided to break from what we were doing, go do the gorilla procedures and return later, giving Jon a break and the chimp keepers time to work at teaching Jon to lie on his side. That afternoon, when vet staff returned to the chimp barn, the keepers had indeed successfully trained him in that very short amount of time to get him in the perfect position to get the images needed. The problem was getting him to hold that position for an extended amount of time. He kept breaking before the sonographer could get enough of the recorded Doppler exam to evaluate his condition. Our Senior Vet, Dr. Ryan DeVoe, had told us earlier that Jon could have any food item

that he wanted in order to make it worth his while to do exactly what we requested. So the keepers, as a last ditch effort (generally dilute juice and small pieces of the fruit portion of their diet are the only rewards used), brought out the Coca Cola®. Jon saw the keeper walking around the corner, pouring the Coke into a squeeze bottle and there was an immediate reaction. He hooted and went straight onto his side, holding there until all the images needed were recorded (approximately 20 minutes). It felt like we had won the lottery and helped to keep staff excited about training.

Over the next two years, keepers and hospital staff were able, through training, to collect blood with the use of a blood sleeve, perform annual TB testing and do full visual annual exams, which included heart and lung auscultation, heart rate, oral exam and otic and ophthalmic exams. We also, the very next year, performed another echocardiogram without incident. In April of 2012, he was anesthetized for a full annual and echo.

Several other male chimps were successfully trained for blood draws, TB testing and visual annual exams.

Chimpanzee, Maki #1289, Female

Maki was our smallest stature chimp and a low ranking female. She was fairly good with keeper staff but nervous around vet staff. She was not generally aggressive during training but would just walk away when she had enough. Maki, in July of 2008, was also given her annual exam via training, which included a visual and cardiac auscultation. In 2009, she was given an SSP recommendation to breed, and it was suspected that she conceived in early December of 2009 with an estimated due date of June 28th. We began training with Maki and the keepers for abdominal/OB ultrasounds in early January 2010, after her second positive pregnancy test. Like with Hondo and Jon, she was trained to sit on a low platform and present her abdomen to the access port. Also with the male chimps, we were always cognizant of her ability to grab (or kick at) the ultrasound probe. On our first attempt at her ultrasound, we were unsuccessful in getting an image, but we were told that it was so early that getting an image would be almost impossible.

On February 6, 2010, Dr. Stringer, Gisela and keepers were performing an ultrasound through training, not really expecting to be able to visualize the fetus at that early a stage, when we both saw an ~ 2cm fetus moving in amniotic fluid. Both Dr. Stringer and Gisela let out a short scream, Maki jumped and in all of that, we were unable to save the image. The keepers attempted to get her to come back, but she was having none of it. Many times when we did get an image of the fetus, she would jump or kick at the probe. We continued with her training, monitoring her progress every few weeks. When her suspected due date came and passed, we began monitoring through

ultrasound every few days, checking to make sure there was amniotic fluid present, the fetus had a heartbeat, there was movement and neither she nor the fetus were in distress. During this time, keepers were also manipulating her mammary glands and expressing first clear and later milky fluid from both.

On August 2, 2010, around 7:15 am, Maki gave birth to a female chimp, Nori. Because throughout her pregnancy, Dr. Stringer was often involved with her ultrasound training, she was able, within a couple of hours after delivery, to go into the chimp barn and performed a visual exam on Maki and newborn Nori, without stress to Maki and the rest of the troop. Unfortunately, Maki, despite trained "mothering behaviors", did not have the experience to care for Nori long term so she was removed August 10. Fortunately, she was reintroduced successfully to the group at the end of the year and today, exhibits only species appropriate behavior.

Chimpanzee, Tammy #1201, Female

Tammy is a spitter, and while she is good with most of her keepers is particularly ruthless when it comes to hospital staff. She was recommended for breeding by SSP and on her last cycle before she was put back on birth control (at the tender age of 40), Tammy became pregnant. We all knew she was going to be a challenge, particularly for the vet staff. Just getting her to the point where she didn't spit on vet staff every time she saw them was the first goal. This was accomplished when the vet staff began showing her attention and giving her juice and fruit at every opportunity so she began actually looking forward to their visits. The general consensus was that she might not train as well as Maki did, and that she was much grabbier and sneakier.

Our protocol with Tammy pretty much followed the same as with Maki, except we decided to use the cardiac probe instead of the larger curved probe. In doing that, we were able to just have her sit on a bench and place her abdomen to the cage. The smaller probe was able to fit between the 2X2 opening of the cage wire. We didn't have as much access to her abdomen as we did with Maki, but the chances of her grabbing either the probe or the tech was much reduced. Surprisingly, Tammy was very good and would only spit if she were upset by one of the other chimps in the enclosure with her. Rarely did she try to grab and she was very tolerant of the water and having to shave her belly in spots. She, like Maki, went well beyond her expected due date and like with Maki, we began doing more frequent ultrasound checks to monitor the health and progress of the fetus. On January 16, 2012, at 6:15am, Tammy gave birth to Ebi, a female.

On July 12, 2012, due to training, our Senior Vet, whom Tammy was not usually comfortable around, was able to do a visual exam, including ophthalmic and otic exams and heart and lung auscultations. She was great. Tammy continues to be much calmer

and more tolerant of the vet staff when we are in the building.

Gorilla, Nkosi #1783, Silverback Male

From the moment Nkosi came into quarantine, he was eager to train for anyone that would spend the time doing so. He was so accommodating that we were able to TB test while he was in quarantine. We were also able to train him to go into a crate, and in doing so, he was transferred to his holding/exhibit area without anesthesia.

Much like our other great apes, Nkosi being able to train for behaviors that would allow vet staff to perform exams without anesthesia was the optimum goal. Nkosi came to the NC Zoo with many behaviors already established, so enforcing those behaviors, even in quarantine, was not difficult. But, the vet staff wanted more. Due to being diagnosed with infected gum pockets and some gum disease, vets wanted the keepers to train him to accept some form of dental hygiene care. If we were unsuccessful in the training ideas, we would potentially be knocking Nkosi down every six months to treat the infections. We all settled on focusing on daily mouth washes. Opposed to training the gorillas to spit back at the keepers to remove the mouthwash from their mouths, we chose to use Kids ACT Mouthwash Ocean Berry Blue with a big SpongeBob Squarepants on the bottle. After nearly a month of converting from water mixed with smaller amounts of the mouthwash to a full blown dose, Nkosi began accepting twice daily sprays over all of his teeth. This was great in resolving his gingivitis and his first check-up after performing the mouthwash training for two months led to a clean bill of dental health.

Next on the agenda was training Nkosi for blood draws. Like with the chimps, we used a 3 cc syringe, a 25 gauge butterfly catheter and alcohol (or dilute 2% chlorhexidine gluconate). Initially, he did great using the blood sleeve, but something happened, and to this day we still don't know what it was that made him hypersensitive to vet staff coming at him with a needle. This roadblock forced us to look at the training as a whole.

After many weeks and attempts to get a successful blood sample, techs and keepers had to find other options. We decided that we needed to think outside the box - no idea was too outrageous. After ideas on creating a blood sleeve for the back side of his leg (where blood draws occur during anesthesia procedures) to fingertip draws, we realized he had veins on his bare chest that, especially on warm days, were very visible. Also, having done several years of TB testing on his chest without incident with Nkosi, we decided to change our focus. Let's try for one of those vessels. When Gisela brought it up at daily vet rounds, the vets laughed at her. They said it would never work. She and the keepers didn't care, they wanted to try anyway. Admittedly, we have yet to get blood from him using this method, be we have, on multiple occasions,

using a 27 gauge butterfly needle, had the needle in his chest to the hub without him even being aware. It was reported that another institution, after hearing of our attempted method, tried it and was successful in getting a small blood sample from a gorilla. Previously, only successful blood draws on awake gorillas occurred with two female gorillas, one at the Hogle Zoo in Utah and the other at Zoo Atlanta in Georgia. We have also recently been informed that the Denver Zoo used a modified version of the blood sleeve, moving further up the forearm to the antecubital fossa (the bend of the elbow, the area most people are bled from), and was successful in getting blood samples on two separate male gorillas. We are hoping that we will be able to get a copy or photo of their design.

After attending an inspiring Gorilla Workshop with presentations devoted to cardiac ultrasound training and combining it with the success in training a chimp for cardiac echograms, it was decided to add this to Nkosi's repertoire of behaviors. Before the hospital staff became involved in the training, the keepers began working with him using a jump rope handle to simulate the type of probe we would be using. They also worked at getting him used to the ultrasound gel. Fortunately, he did not have the aversion to the ultrasound gel that the chimps had, so it was not necessary to use the probe covers or water. He did, however, feel the need on many occasions to wipe it off and making us to constantly reapply it. After many attempts at training in our holding building with no appropriate locations, we decided to do the training outside at a mesh area on exhibit that he was comfortable working in.

Our goal was to get him to tolerate not only the probe and gel, but moving the probe to all areas of his chest and putting pressure on his chest with the probe at various sites. We needed him to be able to sit in the desired position for potentially long periods of time. The best position was with him sitting with his arms up, fingers grasping the cage wire and chest flush against the cage. Because the ultrasound probe was smaller than the 2X2 cage wire, we were able to do it all without modifying the cage in any way. Based on the information we learned from doing the chimp echograms, we were proactive in also training him to lie down on his left side with his right hand high on the mesh, much like what needed to be done with Chimpanzee Jon. This required getting him to sit with his chest against the wire and keeping his right hand attached to the cage wire, have him lean to the left until he was practically lying down, and still keep his chest flush against the cage. Surprisingly, this did not take as long to train him as we expected, but definitely took longer than one day like it did for Jonathan! Because Nkosi was trained to put his ears to a target (a dowel rod) for ear exams, his primary trainer was able to get him to put his ear to the target, while keeping his right hand attached in the original "high" position, and continue to lower the target until his head was practically touching the ground. He was able to have him doing the behavior in no time.

Our biggest challenge was that periodically, Nkosi would chop at the probe. The tech or vet holding the probe had to be cognizant of any movement from him and quickly remove the probe from inside the cage wire. Sometimes, especially in the very

beginning, he would pay attention to the fact that you were not watching him as closely as you should, particularly if you were trying to “drive” the probe and watch the ultrasound screen. That was when he was most likely to strike.

When it was time to do his echogram, Nkosi did great. The complete session lasted over 20 minutes with a tray full of carrots. After doing all the training, we found that getting him to lie on his side was not necessary for his exam. But, the behavior is there if it is ever needed.

Gorilla, Jamani #1853, Female

While in quarantine in early 2010, techs were able to perform a TB test on Jamani with training. Because of this, we thought that after she was recommended for breeding and tested positive for pregnancy, she would be a good candidate for training to receive ultrasounds to monitor her pregnancy. Again, the keepers prepped her by using a jump rope handle and getting her used to the ultrasound gel.

Initially, we began attempting to do the ultrasound training inside gorilla holding. Keepers mounted a bench and a hole was cut in the caging which allowed access with our larger, curved probe. The bench was designed so that as her pregnancy progressed and the fetus grew larger and moved further up the abdomen, it could be lowered to provide access to more cranial parts of her abdomen. Based on our knowledge of chimp obstetrical ultrasounds and how far along in her pregnancy she was, which at the time was approximately 3 months, we started by placing the probe as low as possible on her abdomen. We were very careful to watch for her trying to chop or grab the probe, but our challenge with Jamani was that she kept kicking the probe with her right foot.

No matter how hard we looked, initially we could not find a baby. Back at the vet hospital there was much discussion about what Gisela and the veterinary resident were doing and where we were attempting to get images. Vets gave suggestions on placing the probe, but somehow none of them sounded right to Gisela, but when she tried to suggest where she thought they should look, the suggestions were pretty much ignored. Plus, by this time our resident, with Gisela in tow, was doing the majority of the ultrasounds. Finally, on a day that it was just Gisela and another tech doing the ultrasound, she decided to ignore all other suggestions and go with her gut. With the second tech holding the machine, ready to hit the record button at the word, the probe was placed very close to the pubic bone and aimed to the back and down towards the pelvic cavity. Amazingly, we found the fetus, and it was moving!

Even though the fetus was found, Dr. Loomis, our Chief Veterinarian, would not give permission to release the information of Jamani’s pregnancy to the general public until a heartbeat was found (and recorded). He wanted to see it for himself. The time following his edict was probably one of the most stressful times for those involved at

the NC Zoo. Whereas we could routinely get images of the fetus moving, we were unable to obtain an image of the heartbeat. The zoo wanted to announce the expected arrival since it had been over twenty years since a baby gorilla had been born, and they couldn't until we produced that unattainable footage of the fetus' beating heart. Every time we went out to do training, someone would say to get the heartbeat. We would be walking into the gorilla barn and either someone from the curator's or marketing's office would be on the phone asking if we got it. When Gisela arrived back at the vet hospital she would have people asking her about it. On one occasion, she actually snapped at a veterinary resident that had the misfortune to ask that question as she was returning once again, without that image.

The day we got the footage was a surprise for everyone, including Jamani. When I had the probe on her and glanced at the monitor and saw what Gisela was sure was a heartbeat, she "apparently" asked the tech helping her to push the record button in an excited voice. We also firmly believe that the "waves" from the ultrasound machine causes the amniotic fluid to vibrate, thus causing the fetus to react and move. This combined with the change in staff's demeanor and voice, prompted Jamani to grab the probe, which was still attached to my hand. I remember snatching my hand from her grasp, and when I saw she was still holding the (\$7000) probe, Gisela began yelling at her, along with everyone else in the building. She quickly let it go and needless to say, the training session was over, but it didn't matter, we had our images. When talking to the keepers afterwards, Gisela commented that she remembered hearing a lot of screaming, and was informed, that when she had my arm, the screams were coming from me.

After that incident, we tried other options to do her ultrasounds, creating a way to come up from below the bench to get our images, but when our resident was hurt when Jamani again attempted to grab her, we decided to find another way. When Gisela finally convinced the vets that our cardiac probe was capable of getting the same images as our larger, curved probe, we made the decision to move the training outside at the same outside exhibit mesh that Nkosi trains at. Keepers were able to get her on a large ball, which was secured to the cage wire and approximately 2-3 feet off the ground. By having her sit on this, her belly would be right up against the wire. After several tries with this method and my hand and the probe routinely getting kicked, we came up with the idea to fashion a PVC pipe that allowed us to place the probe inside it, exposing only the head. This was a two-fold improvement; it allowed us to reach further into the cage without fear of being grabbed and protected the probe when she decided to kick at it. From that point on, we were able to get ultrasound images up until about 3 weeks before she delivered. No attempts were made to do ultrasounds during that time, and she delivered sooner than we expected. Even though the baby was stillborn, we were confident the fetus was alive the last time an ultrasound was done.

A year later, with her second pregnancy, Jamani was much more cooperative. We began training her outside on the ball and I was able to get images of the heartbeat

on the first attempt. Once again, images of the fetus were obtained until about 3 weeks before she gave birth. At that point, we were unable to clearly visualize the fetus, but we were determined to attempt to get images for as long as possible. It was determined that the fetus was beginning to drop, thus allowing the gut to move more prominently to the front, obscuring the baby. Thankfully, this time Jamani delivered a healthy male named Bomassa.

Gorilla, Olympia #1915, Female

When pregnancy tests began showing positive on Olympia, training was already in progress. By this time, we knew where to start looking for the fetus and her training was non-eventful. We already had so many safety protocols in place, that we had little trouble getting regular images. For the most part, the only issues were the fact that Olympia and Jamani were pregnant at the same time, and both seemed to vie for position on the training ball. Also, by this time, no one seemed to care if there was a confirmed heartbeat before announcing it to the general public. In early August, after Jamani had delivered Bomassa, we had difficulty getting good images of Olympia's fetus, we did not automatically assume she was late enough in her pregnancy to begin dropping. Because her expected due date was still at least 2 months away, everyone was surprised when she delivered Apollo a little more than three weeks after Bomassa was born. Because Apollo was clearly full term and very healthy, we realized she had gotten pregnant much faster than previously thought and provided us with two false negative tests.

Gorilla, Acacia #1855, Female

In early 2012, vets and keepers decided to train Acacia for echocardiograms. Because Gisela was doing the majority of the pregnancy ultrasounds on Jamani and Olympia, one of the other techs did the majority of Acacia's training, with me helping out occasionally. Acacia did very well and when the sonographer came out to do chimp and gorilla echocardiogram, Acacia was put on the list to do it without anesthesia. Unfortunately, due to miscommunication and some misunderstandings, Acacia grabbed the probe, along with the probe cover designed to protect it (thankfully the tech involved was able to disconnect it from the machine) and pulled it through the caging, destroying it in the process. Our Senior Vet commented that he hoped that she was enjoying her \$7000 enrichment item. Keepers were eventually able to retrieve it, but it had irreparable damage. We now use that probe for initial training.

When Acacia became pregnant, based on her previous incident with the ultrasound probe, we did not immediately attempt to get an image of her fetus. There was quite a bit of training with the broken ultrasound probe before we attempted using

the real one. Also, due to her actions, we decided we needed to come up with a more protective cover for our newly replaced probe. Even after devising a new cover, we still practiced many times with the cover and broken probe before moving on with the new one. Once Gisela felt absolutely as comfortable as she could, the decision was made to bite the bullet and attempt to get an image. We were able to get several images on the first attempt, and even though they were not the greatest, our Senior Vet verified that there was indeed a fetus on all of the images. On several occasions, we had proof that our protective cover worked, because she was able to grab the cover and pull it off without grabbing or damaging the probe. On each occasion, she just looked at it, sniffed and licked it, and returned it within a few minutes.

The objective with Acacia was to attempt to track the progress of her pregnancy longer than we were able to with the others. Gisela wanted to determine when the fetus began to drop and attempt to see if the probe was returned back to the general area we started in at the beginning of the pregnancy. A week after Gisela was able to visualize the fetus at her umbilicus area, she was unable to find the fetus in that same area and decided put her theory into place. She began by moving the probe lower down her abdomen. She found she didn't have to go down as far as she thought (back to the pubic area), only moving it to the lower right section of her abdomen. She was able to continue getting images until just a week or more before her delivery. We weren't able to do as many ultrasounds toward the end as we would have preferred, but it was only due to a much too busy schedule.

WHAT WE HAVE LEARNED

Chimps and gorillas move much faster than you ever can.

Use the highest gauge (the smallest needle) possible when attempting to draw blood.

If the animal is not paying attention to what you are doing, they never feel the needle stick.

Both chimps and gorillas, if they are watching you, anticipate the needle stick. They will act as if you are hurting them.

If you are calm and non-reactive, they will be calmer and train better.

You have to have extreme patience.

After every successful training session, reward the animal and make sure you also give them some of the jackpot.

Protect yourself.

When doing ultrasound training, a second person, other than the trainer, works best.

When doing cardiac ultrasounds, make sure the machine is set to “CRD”.

When doing obstetrical ultrasounds, make sure you have the machine set to “OB”.
Setting it to “ABD” will not work.

Play with the depth settings of the ultrasound machine and pay attention to the setting that works best. Remember that setting.

Be consistent with the items you bring to the training sessions.

Be flexible.

Never assume that the new person knows what to do or how to do it.

Practice, practice, practice.

Document your work.

Equipment Used

Alcohol

Gauze

Cotton balls

25, 26, 27 gauge needles

23, 25 gauge butterfly catheters

EDTA blood tubes

Serum blood tubes

Dilute 2% Chlorhexidine Gloconate (Nolvasan®)

Tuberculin and 3 cc syringes

Sonosite Ultrasound Machine – M-Turbo®

Cardiac ultrasound probe – P21x/5-1MHz Transducer

Curved ultrasound probe – C60x/5-2MHz Transducer

Ultrasound gel

Warm water in a squirt bottle

MUM – Monkey Ultrasound Mechanism® (Chimp)

Super MUM – Super Monkey Ultrasound Mechanism® (Gorilla)

Balloons

Tape

CIV-Flex™ Transducer Covers

Masks

Gloves

Clippers

Bridging the Gap to Further Reptile and Amphibian Conservation

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Abstract for a Presentation

The Reptile Discovery Center (RDC) is more than just an exhibit at the Smithsonian National Zoological Park (NZP); this building reflects a multifaceted approach to reptile and amphibian conservation that affords animal keepers the opportunity to connect more directly with wildlife. RDC hosts several amphibian scientists, the herpetology staff aids researchers with husbandry, research and veterinary care and, in turn, are included in the final papers as coauthors. The benefits of these collaborations are mutual: With the support of animal husbandry professionals, researchers have confidence that their study animals are maintained properly and more time is available for interpreting and evaluating data. This also gives staff the opportunity to assist in field-related research. During the past year alone, RDC keepers surveyed and collected salamanders in the Shenandoah National Park for a behavioral study in response to climate change and traveled to Arizona to collect lowland leopard frog eggs (*Lithobates yavapaiensis*) for a study on *Bd*. Additionally, staff surveyed for eastern hellbender (*Cryptobranchus alleganiensis*) populations in Virginia and Pennsylvania for an ongoing project on stress responses to varying temperature gradients. RDC also partners with several other conservation organizations whose missions include long-term population management and captive breeding programs, such as the Panama Amphibian Rescue and Conservation Project (PARC). These important relationships provide keeper staff members with the unique opportunity to participate in field work, gain scientific writing experience, and make valuable connections within the herpetological community. This greater connection to wildlife helps keepers enthusiastically convey the message of reptile and amphibian conservation to visitors. With two of our conservation efforts on display - eastern hellbender research in the Appalachian salamander lab and an exhibit of our work in Panama with PARC - we are demonstrating to visitors in a visible way that zoos and aquariums can and do much more than simply show animals.

Introduction:

The science of animal husbandry is constantly evolving as new methods, research and observation are made. These revelations often lead to improved husbandry practices and further research and interest. Although animal keepers are the front line of animal care and in unique positions to observe animal behavior, they are sometimes under-utilized when animal conservation and research programs are designed and implemented. The Department of Herpetology at the Smithsonian's National Zoological Park is excited about bridging the gap between animal husbandry, conservation, and research. By forging relationships, both within the Smithsonian and with organizations outside the Smithsonian, the Department of Herpetology has collaborated with several conservation organizations and scientist to further

reptile and amphibian science and conservation. These mutually beneficial relationships facilitate animal husbandry, field work, research, and networking opportunities that can prove invaluable to those involved.

Collaborations with Conservation Organizations:

Over the past two years the Department of Herpetology has collaborated with several field related projects. The Orianne Society is a wildlife conservation organization working to save the threatened eastern indigo snakes, *Drymarchon couperi*. RDC initiated a mutually beneficial relationship with this conservation organization in 2010. NZP supports keeper staff from all departments within the Zoo to assist field biologists with their surveys of eastern indigo snake habitat in Georgia. This is an excellent opportunity for keepers to help capture, pit-tag, weigh, measure, and collect DNA samples from wild snakes. The information learned in Georgia aided RDC staff with designing the exhibit and implementing husbandry protocols for this species at the zoo.

The Smithsonian National Zoological Park also partners with several other institutions forming the Panama Amphibian rescue and Conservation Project (PARC). This initiative's mission is to rescue and establish assurance colonies of amphibian species that are in extreme danger of extinction throughout Panama. Additionally this project focuses efforts and expertise on developing methodologies to reduce the impact of the amphibian *chytridiomycosis* (Bd) so that one day captive amphibians may be reintroduced to the wild. RDC staff travel to Panama and assist with facility set up, frog collection, and local staff training.

Additionally, the Smithsonian has a unique relationship with George Mason University, having formed the Smithsonian-Mason School of Conservation in 2011. This facility, housed at the Smithsonian Conservation Biology Institute arm of the Zoo in Front Royal, VA connects professors and students with zoo staff creating an excellent opportunity for networking and collaborating. Currently, Dr. Thomas Akre, an adjunct professor from Longwood University, has been studying wood turtles, *Glyptemys insculpta*, in Virginia. His research site is approximately 45 minutes from the zoo, making this collaboration inexpensive and easy to facilitate. Keeper staff travel out to Dr. Akre's field sites and assist with radio tracking and processing nesting wood turtles in the spring. RDC staff also occasionally assist with class instruction at the Front Royal campus and host students for behind the scene tours of the Reptile Discovery Center.

Collaborations with Scientists:

The Reptile Discovery Center collaborates with several amphibian scientists including Smithsonian Postdoctoral fellow Anna Savage, who is conducting research on lowland leopard frogs, *Lithobates yavapaiensis*, and the immunological and genetic correlates of *chytridiomycosis* susceptibility. Her experimental design uses a combination of field and laboratory approaches and her ultimate goal is to understand genomic adaptation to disease and identify resistance genes to mitigate the impacts of this deadly pandemic. RDC staff accompanied Dr. Savage into the field to collect lowland leopard frog eggs in Arizona. The eggs were shipped back to Washington, D.C., where staff hatched and reared the tadpoles. Once metamorphosed, the frogs were moved to a quarantine facility where Dr. Savage could conduct her research. In this partnership RDC staff assisted with animal husbandry and in return learned about Dr. Savage's experimental design and field techniques.

RDC's exciting new Appalachian Salamander lab hosts David H. Smith Conservation Research Fellow Dr. Kimberly Terrell who studies the effects of climate change on the Eastern hellbender, *Cryptobranchus alleganiensis*. Her research assesses the physiological impacts of projected climate change on hellbenders and her research utilizes an *ex situ* research population of hellbenders housed in RDC's salamander lab. Hellbenders are maintained in extremely specific environmental parameters, and Dr. Terrell's research animals are meticulously cared for by RDC staff. In return, RDC staff accompanies Dr. Terrell in the field and learns her research techniques.

PhD student Gina DellaTogna is currently working on cryopreservation in Panamanian Golden frogs, *Atelopus zeteki*. Her research involves isolating and freezing Panamanian Golden Frog sperm. Her research animals are maintained in a temperature and humidity controlled room within RDC. Panamanian Golden Frogs are a species RDC works intensively with, also housing an assurance population in an adjacent room. RDC staff members are responsible for the husbandry of these frogs and also assist Dr. DellaTogna with frog handling when needed. In return RDC staff gain experience handling frogs for injections and can observe Dr. DellaTogna's research.

Local Relationships

In addition to the collaborations outlined above, Herpetology staff also works closely with several local organizations. Staff have surveyed and collected salamanders in the Shenandoah National Park with United States Geological Survey, hosted Virginia Herpetological Society meetings at RDC and presented at the venomous snake workshops hosted by Catoctin Zoological Park and Preserve. In making these connections staff can expand on their experiences, meeting new colleagues and creating opportunities for future scientific collaborations. The last and most easily attainable partnership for RDC staff is participation in Herp Happy Hour. Once a month all the herpetologists in the DC area get together for drinks to discuss projects and potential collaborations. This is a great resource for keeper staff to network in the area and get to speak with seasoned veterans.

How to form these partnerships

All of these collaborations are relationships that had to be initiated through staff connections and nurtured along the way to ensure mutual cooperation and benefit. These relationships are formed through veteran staff connections, following up with peers from conferences and other networking opportunities and reaching out to local organizations and universities. The benefits of veteran staff members are numerous and in this capacity irreplaceable. The herpetological community, especially in North American zoos, is a small familiar group. Any keeper who has worked in zoo herpetology for a decade or more knows many animal professionals from other facilities. These connections are vital to making collaborations work. NZP's RDC Curator, Jim Murphy, has been working in zoo herpetology for over 50 years. His connections and friends are greatly responsible for many of RDC's collaborations.

Conferences are an amazing resource for all keepers. Not only are they great learning experiences, but they are also a great place to meet other animal professionals. Keepers must take these introductions seriously, being sure to get people's contact info and form

relationships with peers - collaboration could always be possible in the future. As an example, recently RDC staff attended the venomous snake workshop in Catoctin where an employee of Herpetological Associates, a reptile and amphibian survey group, was also presenting. RDC staff became interested in Herpetological Associate's work and their staffer and our curator began discussing a working relationship. Herpetological Associates has agreed to take keepers into the field this summer to survey the New Jersey Pine Barrens.

An important way that zoo units can create mutually beneficial partnerships is to make the department useful. Offer assistance and provide a benefit to the collaborator. For example, when working with scientists, RDC staff offer their animal expertise to assist with captive research animals. This helps ensure greater control when conducting experiments - a very desirable trait when participating in research.

Challenges

There were several challenges to overcome when RDC began forming all of these relationships. The major challenges to consider are staffing when keepers are in the field, increased work load when taking in additional animals for research and communication amongst staff and researchers. When forming a field-based partnership it is imperative to maintain the appropriate staffing within the zoo while still offering opportunities field research. It is often difficult to coordinate staff vacations with conference dates and field surveys that are time sensitive. At RDC a year-at-a-glance calendar is used to help staff foresee potential short staffed days and avoid overlapping vacations with field work opportunities.

Partnering with researchers generally means increasing the size of the collection. When considering taking on a research project it is important to analyze the potential workload. Often at RDC we can compensate for extra work with internship positions. These can either be interns assigned to a project that work under the researcher and a designated keeper, or be a general Keeper's Aid or volunteer. Additionally, animals brought into the collection for research purposes generally must follow the same collection management guidelines as other animals in the collection and researchers must be made aware of these practices.

Communication is a vital part of any relationship and can make or break a partnership. When working with scientists, RDC staff has to communicate daily about the care and status of the research animals. Additionally, if the researcher wants to make changes to the animals' husbandry, this must be communicated and approved by animal staff. It is extremely important that everyone is clear on their role in this research and that mutual respect is given. At RDC a keeper is always designated for each research project to be the point person. This helps clarify who will be absorbing most of the husbandry work as well as communicating with the researcher.

Conclusion

The benefits to RDC staff from these partnerships are innumerable. First, stepping out of the zoo setting and experiencing animals in the wild is an educational experience that reminds us all what we are working so hard for. Secondly, getting to partake in scientific research is a valuable experience that sharpens one's observational and record keeping skills. Additionally, RDC staff members are co-authors on any publication resulting from collaborations with scientists which is a good learning experience, as well as an opportunity to build their resumes.

Lastly, through incentivizing staff to initiate their own research projects within the zoo, these experiences can help further the department's connection and commitment to conservation. Animal professionals are in a unique position, working very closely with a large number of specimens, and this position should not be taken lightly. We owe it to these animals to utilize their lives in captivity to the fullest extent and learning how to properly conduct research is an important step.

These opportunities and experiences help RDC staff better connect zoo visitors to wildlife conservation. Four of our collaborations are easily viewed in RDC (lowland leopard frogs, Panamanian frogs, hellbender lab, and eastern indigo snakes), and through these exhibits we are conveying this overall picture of conservation to them daily. The Appalachian salamander lab displays hellbender science, field work and husbandry. The Panamanian frog rescue exhibit displays species from Panama, as well as graphics on the Smithsonian's work *in situ*. Staff also utilize the Zoo's website, volunteer meetings, and the internal volunteer publications to write blogs, give talks, and publish articles about the field work and science going on in RDC. We have a strong group of volunteers that interpret our exhibitions to our public. Keeping them up to date on our collaborations helps them convey our message to the visitors and paint a picture of the multifaceted approach we are taking to conserve reptile and amphibians.

Keeping Kea: Combining Keeper and Program Leader Roles to Improve Welfare and Sustainability

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The most important question in zoos today is “How do we keep our animals?” This can be interpreted several ways: zookeepers are concerned with best practices for daily animal care, while population managers work to ensure the survival of the captive population. As any keeper who has packed up a beloved animal for shipment knows, it may seem at times that the roles of a zookeeper and of a program leader are somewhat in conflict. Keepers focus on providing the best care for their individual animals. They are concerned with the health of their animals, their behavioral needs, and understand the uniqueness of each individual. It is easy for keepers to feel as if they know what is best for the animals in their care and it can be very difficult to part with an animal that is sent to another institution. A good keeper will also understand the importance of providing attractive exhibits, both from the animals’ perspective and the visitors’ perspective, and will also understand the value of educating visitors about their animals. All of these activities can increase visitor interest and concern about the animal in question, thus promoting a conservation message to ensure a future for the animal in the wild. Program leaders, on the other hand, see the captive animals in a zoo community as a whole population, and hope to ensure their future in captivity as well as in the wild. They are concerned about population size, genetic diversity, and overall sustainability of the population. A good program leader is interested in satisfying the wants and needs of institutions (which don’t always correspond to the wants of the keepers), and also in providing a guideline for animal care standards in the community. It is easy for the program leader to place an emphasis on genetics and demography, a big picture view, rather than looking at each studbook number as representing an individual animal.

At Denver Zoo, there are a number of keepers who have taken on the role of studbook keeper, program leader, and/or SSP coordinator. Having the opportunity to combine the zookeeper and program leader roles has made a big difference in the way I view and experience my profession. I have been a zookeeper in the bird department at Denver Zoo since 2004, and in late 2008 was offered the opportunity to apply for the new Kea PMP that was created by the Parrot TAG. This is the story of how becoming a program leader for a managed population changed how I perceive and do my job as a zookeeper, and how being a zookeeper has influenced me as a program leader. I hope that by sharing my experience I can encourage other zookeepers to become more involved in the AZA programs that are designed to support our zoo populations and the animals we care for every day.

There are currently 38 kea in 12 North American institutions. The kea is a psittacine species native to the south island of New Zealand, and the only alpine parrot species in the world, making it a great psittacine for colder-weather zoos. They are opportunistic omnivores and famous for their curiosity and intelligence, with their mischievous antics delighting and

annoying tourists. Their engaging and interactive personalities make them great exhibit birds, and they have an interesting conservation story, as they were hunted under a bounty from the 1880's until 1970 due to their habit of attacking live sheep as a food source.

The Zookeeper Role

Denver Zoo acquired our first ever kea, a pair of sisters from Woodland Park Zoo, in 2008. The only staff member who had previous experience with the species was our curator, so the keepers had a lot of learning to do. Kea can be a challenging species due to their curious and destructive nature, so we had to adapt our management techniques to meet each challenge the birds presented. At first I took a simplistic, problem-solving approach to meet these challenges, but becoming the program leader for kea has changed my view of my role as a keeper, how I approach challenges, and how I think about my place in the zoo world.

The first order of business was to Kea-proof our holding areas and exhibits for the incoming birds. As a keeper, I was inclined to listen to my curator's and supervisor's suggestions for which changes were needed. I offered suggestions where I could, and helped to design the transfer cage they suggested that would allow us to separate our birds during feedings if needed. But for the most part, I allowed them to make the decisions, since they had the most experience and had been in contact with the previous institution. We are lucky to have a talented maintenance staff that can work wonders, and we soon had our Kea-proofed exhibit and a new guillotine door in the wall leading to a transfer cage in the service area. Over the years, we have relied on our guys to patch and fix areas that succumbed to the constant curiosity of our Kea.

Our next challenge was to manage the interactions of our pair of sisters, who had some issues with displacement and minor aggression over food and enrichment. One of the females dominated food sources and enrichment. This can be a common problem in captive animals, and we used a variety of tried and true keeper strategies to deal with it: scatter-feeding, hiding and skewering food, offering forage or puzzle feeders and training the birds to separate for feedings. To make sure that both birds were getting sufficient, but not excessive food, the birds were scale trained and their weights were monitored regularly. Although our current breeding pair has fewer problems with displacement, we continue to utilize some of these same management techniques. As the years have passed and my experience as a program leader has deepened, I have added another level to this and I have started collecting diet information from AZA and EAZA (European) zoos and consulting with a nutritionist to evaluate diets in preparation for work on the Animal Care Manual.

The next challenge to meet was the kea's need for an extreme amount of enrichment to remain active and busy in captivity. Their enrichment must vary widely to keep them interested. We have used another keeper problem-solving strategy available at Denver to meet this need. We have a wonderful teen volunteer program, and we have a specially trained group of teens that come to make enrichment for our kea and other psittacines. The teens are also tasked with making behavioral observations to monitor the use of enrichment, consumption of food, and interactions between the birds. Their creativity has proven to be invaluable in keeping the kea busy, as have their hours of observation which allow us to monitor the effectiveness of our

program. As a keeper, I am proud of this accomplishment, and as a program leader, I have been able to share this idea with other kea holders in the hopes that they can utilize a similar resource, if they have not already.

When we received our new male in 2010 in a trade, I began researching nest designs. I had some contacts as a program leader by this time, and I reached out to several AZA institutions which had successfully bred kea in the past. I designed a nest box which replaced the transfer cage in the service area (since our breeding pair was compatible). I hadn't thought to look much beyond AZA in the beginning, and the problem with this became apparent when not only did our male spend all his time dominating the nest, but he began chewing holes in it as well! Maintenance crew came to the rescue again and fixed up the box, then later installed a second cave nest site on exhibit, mimicking San Diego's strategy of giving the male a separate place to roost. Still no nest or eggs. So I finally used my contacts as program leader to reach out to successful zoos in Europe, and almost every one of them is using a nest site with a tunnel entrance, allowing the female to exclude the male from the nest. Our maintenance staff added a tunnel, and we were rewarded with our first clutch of eggs! Since then, we have had another clutch of eggs and our first hatch, although unfortunately the chick did not survive. This series of events shows how important it is to research beyond the normal scope of your thinking, especially if you are a keeper who has worked at one institution your whole career, as I have. I don't believe that I would have had the courage or know-how to reach out to Europe in this way if it hadn't been for the skills I learned as a program leader over the years.

The Program Leader Role

I became the studbook keeper and program leader for the Kea PMP in late 2008. This position has opened a whole new world for me in terms of understanding the bigger picture of captive management of a species. Before taking on this role, I had very little understanding of the importance of these management programs to our captive populations. Taking the Population Management I and II classes and managing my own population have taught me so much about what it means to have a healthy population. Although the number of animals in the population matters, population analysis provides so much more information about the genetics, demography, and general health of the population. For instance, a population may look large at first glance, but if a large number of those animals are old or post-reproductive, the population may be due for a crash. Making our populations healthy is more important as time goes on and it becomes more difficult to import animals from the wild due to a number of factors including cost, feasibility, permit changes, and ethics. Furthermore, having a managed population increases the cooperation and communication among holding institutions and provides a species champion (or group of champions) that advocate for the species in many ways: creating space, improving husbandry, and increasing communication to name a few.

The Kea PMP was a new program, recommended by the Parrot TAG Regional Collection Plan (RCP). I will freely admit that this responsibility felt huge and I didn't quite know what I was getting myself into. I love solving puzzles and organizing data, so this seemed like a good fit for me. I thought I would just enter a bunch of data into a computer and *voilà* – studbook! Population Management I class was a great start and I dove right into the studbook

compilation. Establishing relationships with Institutional Representatives (IRs) and registrars was more of challenge for a self-proclaimed animal-person like me, but this was all about stepping out of my comfort zone. As I published my studbook after a long year of work, I began to realize that this was only the beginning and the point of a studbook is to *do* something with all that data. But what? And how? And this was MY job?

Although things were changing quite a bit with the way programs were designated and the order in which the PMC helped with population planning, I was lucky to get on their list as a Red Program (a population with fewer than 50 animals) that had never been planned before. The PMC was amazingly helpful in creating the Population Analysis and Breeding and Transfer Plan (formerly known as the Master Plan). I just had to get my studbook up-to-date and "clean" (fixing errors) and collect wants and needs from my IRs. We conducted our planning meeting online and several holders called in to "attend" the meeting as well. The analysis of the population showed a lot about the health (or lack thereof) of the population and gave us the beginning of an idea of how to improve the situation. Then we were able to recommend transfers and breeding pairs for the coming years. After a review by IRs and a couple of changes, we had the first Kea Breeding and Transfer Plan published! It felt like a huge accomplishment.

Then in 2012, the PMC coordinated with the Parrot TAG (and several other TAGs) to begin creating a new type of report: the Population Viability Analysis (PVA). This analysis goes beyond the genetic and demographic analysis of a population, and takes into account the possibility of random events that occur in the population. This report holds a lot of value for a population, as it can be a useful tool to show the program leader, TAG, holders, and others the state of the population. It can also take into account potential changes to the population that could be used to improve the status, such as increasing space, importing founders, or increasing breeding success. This allows program leaders to focus their efforts on the issues that will be most beneficial to the population.

As a program leader, I have been able to work with a variety of people to accomplish some of my goals for the population. A major current undertaking is work on the Animal Care Manual. This is quite an undertaking and will take years to accomplish, but I was given some good advice by several holders and my TAG chair: start small and work toward the goal in increments, sharing information along the way. Thus far I have been able to gather a small group of keepers, trainers and even a nutritionist who are helping me create surveys and compile information. I have created a Wikispace to gather all of our information in one place, and this will eventually be available to all holders. And in the meantime I created an email list that provides a forum for kea holders, keepers, and anyone else who has a stake in kea to share information and ask questions. This work on husbandry issues will hopefully go a long way toward improving the health of the population.

Combining the Roles

Clearly, becoming a program leader has changed things quite a lot for me as a zookeeper. I believe each of these roles that I play have provided valuable assets to the other.

And this experience has provided an avenue for professional development that has been enlightening, interesting and challenging.

My experience as a keeper has provided many advantages for my role as a program leader. Working with a species every day provides valuable first-hand experience for a program leader to use when making recommendations or suggestions for better management and care. A keeper can try a new idea such as enrichment, training, or nesting material and see the results immediately. Being a keeper also helps me step back and remove my program leader blinders for a moment to think about how keepers, IRs and institutions feel about potential recommendations. This is hard to do when you spend a lot of time staring at PopLink and PM2000 dreaming of the genetic possibilities for breeding pairs. Those numbers are actual animals that keepers and often the wider community care about, and that provide some value to their institution. There have been times I refrained from making a recommendation with this in mind, and other times I was able to explain to an IR the reason and importance for a particular recommendation. It also helps during a planning session to take a moment to remember, again, that these are actual living birds – each transfer I recommend requires a bird to undergo extensive medical procedures, handling and stressful transport, not to mention a period of adjustment to a new facility and a new social group or mate. As a keeper, I also have access to a valuable fundraising opportunity for my species conservation in the wild. Our local AAZK chapter donated \$2000 to Kea Conservation Trust in 2011 after I suggested one of their projects as a recipient from our annual fundraiser. And, of course, being a keeper motivates me to be the best program leader possible – I really care about kea. I want them to survive and thrive in zoos, and working with them each day reminds me of how important my job as a program leader is.

Just as importantly, my program leader experience has shaped and changed my understanding of the zoo world and my role as a zookeeper within it. Experience with the challenges and frustrations of managing a population provides a bigger picture view for not only the program species, but all animals in the collection – our beloved animals would not and may not exist in zoos without the efforts of SSPs and Red Programs. I have recently heard of the demise of captive populations of several barbet species I really enjoyed working with in the past – keepers are often not aware of events like these in the way that curators are. As a keeper, it can be difficult to part with a beloved animal or species, but being a program leader has changed this for me. I see how important it is to be flexible and willing to treat our animals as one population rather than as simply individuals, so I find it easier to part with animals and to share this sentiment with my fellow keepers. I have also found that I am able to better answer the sometimes difficult questions from visitors about our management of captive animals and where they come from. Most visitors have no idea the level of management that is dedicated to some of these species, and many are impressed to hear about this aspect of zoos. For that matter, many keepers are not even aware of these programs. I was unaware of all that AZA does and has to offer before I became a program leader, and this experience has opened doors for me I did not know existed. I also gained access to the myriad resources AZA has to offer. I see this as a starting point for a rich future in my zoo career, which does not necessarily include management! My work on the studbook and animal care manual has also opened communication with colleagues across the US, Canada, Europe and New Zealand. This is not

something I can do for every species I care for, but if every keeper chose a species and compiled information and shared it, there could be a revolution in animal care and breeding. And finally, being a program leader continues to motivate me to be a better zookeeper. There's nothing like taking an in depth look at a struggling population to get you motivated to get your birds breeding and help others to do the same.

So let's look back at that original comparison of roles. Rather than being in conflict, each role can be seen to benefit and support the other. The keeper's concern for animal welfare provides a healthy base for any population by maintaining conditions that keep animals healthy and therefore create a healthy stock for breeding. Both providing attractive exhibits and education of visitors and colleagues can increase interest in the species, and therefore increase space in zoos, which is critical to maintaining a healthy population. As I mentioned before, keepers may have access to fundraising opportunities, as well as the time and passion to assist with conservation efforts. Working with AZA and the TAGs to support *in-situ* conservation supports the overall goal of keeping a place on Earth for these animals we care for. The Program Leader's goal for a sustainable captive population clearly benefits the keepers who care for these animals – most captive populations are currently unsustainable, and if we want to continue to provide these attractions for visitors and these ambassadors for conservation, we must improve our management of the populations we have. On a smaller scale, the program leader works with zoos, IRs, and yes, even keepers, to provide for the wants and needs of the institutions whenever possible, ensuring a future for the animals in each participating institution. And finally, work on the animal care manuals, in cooperation with keepers, IRs, and other experts, can provide recommendations for the care of the animals to maximize their health and happiness in captivity. The roles of zookeepers, providing excellence in daily care, and program leaders, working for population sustainability, have so much to offer each other. My hope is that more and more zookeepers will become involved in AZA and population management so that our unique set of skills and qualifications help to increase the overall health of zoo populations.

How To Get Involved

- Talk with your managers
- Talk with a program leader (also known as SSP coordinator)
- Check out AZA.org for information and available programs
 - Studbook and SSP manuals
 - Search Animal Programs – Vacant
- Contact the Taxon Advisory Group (TAG) that represents your favorite animal
- Apply to be an officer for an SSP (vice-coordinator, secretary, etc)
- Offer to assist with an SSP or Red Program
 - Keeper Representative
 - Newsletter
 - Fundraising
 - Animal Care Manual
 - Other ideas – What are your strengths and interests?

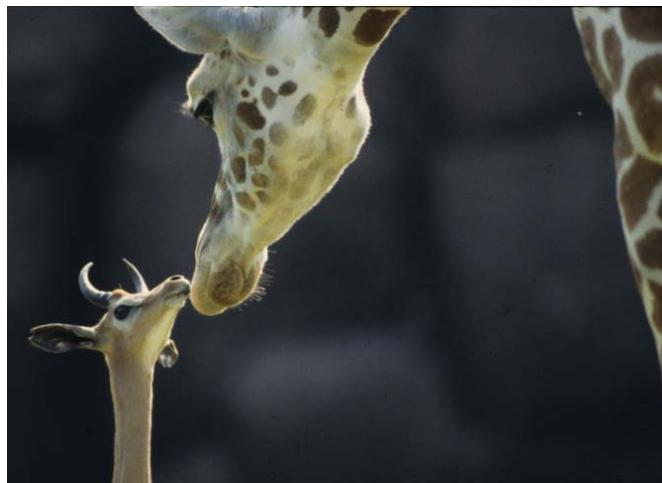
Urban Ungulates

Christy Poelker

Saint Louis Zoo

Antelope Area Senior Keeper

Successfully sustaining endangered species in zoos relies on institutions being able to transfer animals between one another. This not only allows cooperative multi-institutional programs to maintain as much genetic diversity as possible within a species but also provides the desired number of animals needed for display and social compatibility to meet individual institutional needs. This holds true for all taxa, including ungulates that thrive on routine and tend to be flighty and sensitive to change. Some institutions manage ungulates in large, open pastures in mixed-species settings. There are also institutions that manage ungulates in a traditional urban zoo setting. These herds are often smaller, in closer contact with people, and shifted indoors at times. The transfer of an animal between these two diverse management systems can provide some challenges at first. Fully understanding both management systems can help staff prepare the animal and themselves before transitions occur and help problem-solve after the animal is moved.



Different perspectives
Photo by Saint Louis Zoo

When an ungulate is transferred to a new zoo, and especially if it is transferred to an unfamiliar management system, it is critical to have a positive attitude and accept that the transition may be challenging and may require some flexibility and changes. Doing some research about the environment and management in which the incoming animal is familiar is essential. It is important to understand the details of an animal's current life, such as its training, contact with

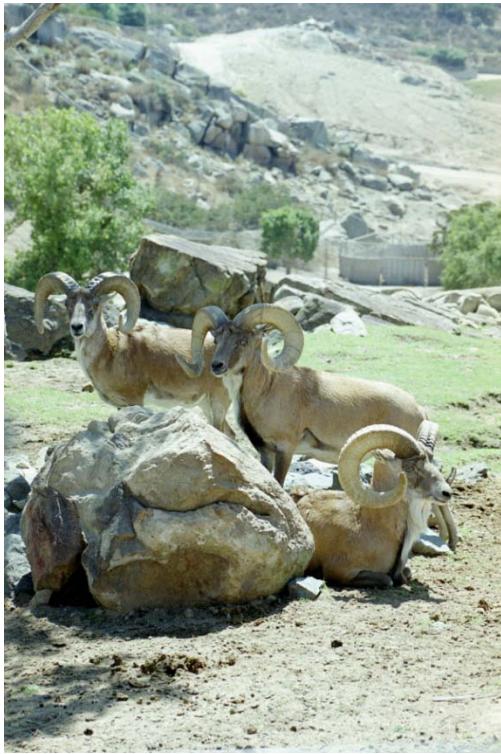
keepers, indoor and outdoor habitats and daily schedule. Animal Data Transfer (ADT) forms can be helpful. It is extremely beneficial to have this paperwork filled out and sent to the receiving institution in advance so they can make plans ahead of time. This may include having the animal's favorite foods ready, making accommodations for any health or behavioral concerns and being prepared for the animal's demeanor and individual preferences. ADTs also provide contact information for any additional comments or questions that may arise.

It is important to have good communication between institutions, as well as with program managers, to figure out what is best for the animal, the species, and the staff. For instance, it may be helpful to identify two animals that can be transferred at the same time. This can reduce stress for flighty animals during transportation, quarantine and integration into a new herd and facility. It is also important to discuss if an individual is better suited to a specific management system or if there is an animal that adapts to change well and would be a better candidate for transfer. Accommodations cannot always be made, but it is important to at least discuss the options.

If you know that an individual animal is likely to be more challenging to transfer there are steps you can take before the transfer takes place. This may include gradually weaning the challenging individual from herd mates or conditioning it to crates, trailers or barns. It may mean introducing the animal to other individuals of the same species that may be travelling to the same zoo. Although this may take more time and effort it will help the animal, the staff at the new zoo, and will have a positive influence on the willingness of other zoos to accept animals from your institution in the future.

The first challenge may occur when a new animal first arrives. Although the receiving institution may have a standard operating procedure if they already care for that species, there should be an allowance for the previous experiences of the animal and for its demeanor. Unloading the animal from a crate or trailer is the first opportunity to make the transition as easy as possible. It is important to know if the animal has been hand-reared, if it has been crate- or trailer-trained, and if it is skittish or aggressive. It may not react the same way as the animals that have lived in your collection for years. It is also important to realize that the animal may be accustomed to staff of a certain gender, personality or appearance.

Acclimation of an animal to its new home should begin when the animal is in quarantine. When transitioning from a big herd management facility to a traditional urban zoo, this time in quarantine is often used to introduce the animal to shifting procedures, proximity to people, flight distances and typical barn set-ups. Consideration about how much space to offer the new animal is important and flexibility is critical. Increased space may lead to harmful behaviors or may ease the nerves of an animal. An animal may not be accustomed to indoor holding areas or the close proximity of people. It will likely take time and patience to figure out what the



animal prefers, while at the same time making plans to ease it into whatever type of accommodations it will be moving to after quarantine.

Transcaspian urial born at San Diego Safari Park with her lambs
born at Saint Louis Zoo
Photo by Saint Louis Zoo

After the quarantine period is completed, keepers need to help the animal adjust to its new home. This often means another move from quarantine, as well as introducing new barns,

habitats, staff, conspecifics and sometimes other species. Ungulates often acclimate faster and easier when paired with at least one animal that does well with the routines at the facility. This animal can act as a mentor for remaining calm, following shifting procedures, and being comfortable within a habitat. It can be helpful for staff to proactively identify an animal that would be good in this mentoring role, for example, the individual that comes inside from exhibit the most readily and calmly. We can sometimes take for granted animals that were born in our zoo or have lived there long enough to be comfortable with the routine, but we should keep in mind that although the way we do things may seem normal to our veteran animals and staff, it is very different for the new animal. An animal transferring from a large herd to an urban zoo may not be accustomed to walls, smaller habitats, indoor areas or close keeper and visitor presence. On the other hand, an animal transferring from an urban zoo to a large pasture may not be used to living with other species, maintaining distance from vehicles and people, fences, or finding food, shade and water.

I have found through my experiences at the Saint Louis Zoo that patience can be one of the most important tools. And sometimes this means short-term sacrifices for long-term gains. It is crucial to earn the trust of a new animal. This may mean letting an animal get comfortable shifting in and out many times, even overnight, without shutting the door behind it. And then only securing it indoors for short periods of time so the animal knows it can go back to its comfort zone. It may mean allowing the animal access inside if that's where the animal prefers to be. So this may mean you give up the opportunity to clean an area as well as you would like or have an animal on display at all times at first. But it can pay off in the long run because you may earn trust more quickly and earn more reliable and quicker compliance with a new routine.

As caretakers there are a few things to remember when working with all ungulates, but are important to remember to apply to new animals in particular. Ungulates thrive on routine, so sticking to one way of doing things is a good idea. This means that everyone working with the animals needs to communicate so all team members know the routine. Keep in mind the flight distance for each species as well as for each individual animal and respect that distance. Remember that most ungulates adopt a herd mentality so use that to your advantage. Keep things calm and quiet when possible but also remember to let the animals know where you are at all times to keep from startling them.

It can be helpful to remember that an animal born at a facility or an animal that has lived there for a long time may not always reside there. For example, when an animal must be hand-reared consideration should be given to ensure it has opportunities to display species-appropriate behaviors. This may mean providing nutrients to the calf from a bottle but allowing the animal to remain with its dam. This will reduce imprinting which will allow the calf to learn proper social behaviors and have a better chance of integrating into a herd. This also

provides an opportunity for the dam to learn how to deal with calves. This may help the female have better success at raising her young in the future. It can be difficult to resist the urge to interact with the calf but keep in mind how this animal may behave with unfamiliar keepers at your zoo or at a future zoo when it is full grown.

In a traditional urban zoo setting it can be important to desensitize an animal to close proximity to people, but keep in mind that this can also cause an animal to lose its natural instinct to move away from people and maintain an appropriate flight distance. And of course the opposite can be true. It can be helpful for some species and individuals to learn to have reduced fear in the presence of people. An animal that lives its early years in an expansive pasture may need to adjust to a more traditional zoo setting.

As keepers we all have tight schedules and are comfortable doing things a certain way. We must realize that the extra time, flexibility and changes we make to accommodate a new animal are worth it. It helps maintain the genetic diversity of a species by allowing the successful transfer of animals between zoos. It also helps each zoo maintain the appropriate number of individuals in their population. It is helpful to keep in mind that the animals you transfer from your zoo require the keepers at another zoo to make adjustments as well.

In conclusion, it will take good communication, planning, patience, and commitment to continue to work together both within our zoos and between our zoos to sustain ungulate populations. If there is a willingness to work together, from population managers, traditional urban zoos, private ranches, and large breeding centers, we can transfer animals to meet the needs of zoos, zoo staff, visitors, individual animals and the sustainability of the species in our care.





Soemmerring's gazelle calves Pockets
and Hatari at Saint Louis Zoo
Photo by Tim Thier

Soemmerring's gazelles Pockets and Hatari at Caldwell Zoo
Photo by Brent Huffman



Exploring the interactions which occur between captive and free-ranging animals in a zoo setting

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Abstract

Zoological parks are havens for biodiversity, where people are encouraged to have meaningful, close-contact encounters with animals that they may never experience elsewhere in their lifetime. What makes zoos most unlike any other setting in the world, however, is the zoo's ability to assemble exotic captive animals and native free-ranging animals in one environment, when they would not naturally interact (Adler, Tuten & Nelder, 2011). Little knowledge exists regarding the interactions which occur between captive animals and free-ranging wildlife in a zoo setting. The lack of research in this field of study is discouraging, as interactions between captive and free-ranging animals could lead to disease transmission, physical harm, or death (Harmon et al., 2005). On the contrary, some of these interactions could have positive impacts. For example, sights, smells, and noises of free-ranging animals may provide captive animals with sensory enrichment (Wells, 2009). In order to better understand captive-wild animal relationships, this study aims to identify, categorize, and describe the types of interactions which occur between zoo-housed captive animals and free-ranging, local wildlife in the setting of the Oregon Zoo in Portland, Oregon. To collect this data, a survey was distributed to Oregon Zoo animal care staff. It was predicted that survey results would demonstrate that most interactions occurring between captive and free-ranging animals at the Oregon Zoo would involve killing and/or consumption behaviors. The results of this survey-based study supported the original hypothesis. Fifty percent of interactions recorded involved killing, while 36 percent of interactions were described as predation or consumption. Continued research in this field of study could help us to redefine the way we care for the captive animals in our zoo collections and *also* the local wildlife that inhabit our zoos.

Keywords: captive animal, free-ranging animal, wildlife interactions, zoo

Introduction

Zoos are settings in which people can learn about and appreciate wildlife and also where wildlife conservation and research can occur. Zoos are, however, not isolated settings. In addition to the animals included in a zoological collection, many zoos and wildlife preserves also play host to local wildlife and thus, interactions between captive, zoo-housed animals and free-ranging animals (hereafter referred to as “wild” animals) may occur. These interactions have not been well researched. One of the few studies that address this issue, by Ross, Holmes, and Lonsdorf (2009), reports that interactions between captive primates and local wildlife typically involved indifference, hunting, killing, and/or predation behaviors. It is thought that most naturally occurring, local wildlife is likely attracted to a zoo setting due to food, habitat, and/or corridor opportunities, but wildlife may also be intrigued by scents and sightings of captive animals (Ross et al., 2009).

This area of study is of particular interest to zoo staff who are responsible for the care of captive animals such as animal keepers, curators, and veterinarians. While some interactions between captive and wild animals may be inconsequential, others could lead to physical harm, predation, or disease transmission (Harmon et al., 2005). More often than not, captive predators are the individuals responsible for predation in captive-wild animal interactions, yet some instances have demonstrated that wild omnivores such as raccoon (*Procyon lotor*) and Virginia opossum (*Didelphis virginiana*) may consume captive bird eggs and/or hatchlings (Hill, Dubey, Vogelnest, Power & Deane, 2008). Furthermore, in more remote zoos like Northwest Trek Wildlife Park in Eatonville, Washington, predation of captive animals by larger wild predators, such as cougar, are not uncommon (Northwest Trek Wildlife Park [NTWP], 2010). Disease transmission is also a major concern when considering captive-wild animal interactions in zoos. For instance, most arthropod-transmitted diseases or ectoparasites are thought to be transferred to captive animals from wild animals which inhabit zoo environments (Adler et al., 2011). Giant ant-eaters residing at a South Carolina zoo that were infested with fleas, and also thirty-four percent of birds housed at the Bronx Zoo which were infected with West Nile Virus, were thought to have acquired parasites and/or disease from local wildlife (Adler et al., 2011). Because of the potential risks that wild and captive animals may pose to each other in zoo settings, it is imperative that we gain a better understanding of the interactions which may occur between these two groups.

Little, however, has been documented about the types of behaviors that occur between wild and captive animals in a zoo setting. Thus, this study aims to examine the relationships between captive and wild animals by cataloguing and categorizing these interactions in the setting of the Oregon Zoo. Zoos are unique settings where exotic animals, local wildlife, and humans all intermingle in a confined space and

Captive-Wild Animal Interactions in a Zoo Setting

thus there are many opportunities for various species, which may never interact in a wild setting, to come face to face (Adler et al., 2011). While the animal species housed in zoos are numerous and diverse, those wild species which commonly inhabit zoo environments in North America often include species well-adapted to human environments such as raccoon, Virginia opossum, Canadian geese, American crow, coyote, as well as many rodent and invertebrate species (Harmon et al., 2005). Interactions between captive and wild animals could range from a captive primate predating on a locally occurring bird to a captive owl vocalizing in response to a wild owl. In order to better understand captive-wild animal interactions, animal care staff were asked to complete a survey which aimed to record and categorize the types of captive-wild animal interactions they have observed during their career at the Oregon Zoo. It was predicted that the majority of captive-wild interactions, documented by survey responses, would involve killing and/or consumption. Additionally, the author hypothesized that most of the captive species involved in wild-captive animal interactions would be predatory species, rather than prey species. Ultimately, if we know more about the interactions which occur between captive and wild animals in zoo settings we can take precautionary actions to reduce those that may be harmful to zoo-housed animals and/or local wildlife and encourage those interactions that benefit both captive and wild animal groups.

Methods

In order to study the relationships between captive and wild animals in a zoo setting a survey was distributed to animal keepers, curators, veterinary staff, and volunteers working in animal care at the Oregon Zoo. The survey was created using a website called Survey Monkey. Using this website, the survey asked participants to recount and record instances in which they have observed captive animals interacting with wild animals on Oregon Zoo grounds. Survey respondents were encouraged to recount any and all memories of captive-wild animal interactions during their career at the Oregon Zoo, and thus some interactions could have occurred up to 30 years prior to the beginning of this study, and some interactions may have involved animals that are not presently housed at the Oregon Zoo. This unlimited timeframe was allowed with the hope of yielding a diverse and significant collection of information pertaining to captive-wild animal interactions.

The survey created for this study consisted of four questions which were designed to provide information about the captive and wild species involved and the type of interaction occurring (Appendix A). First, participants were asked to identify both the captive and wild animal species involved in the interaction.

Captive-Wild Animal Interactions in a Zoo Setting

Second the participants of this survey-based study were asked to place the type of interaction occurring into a category. The categories that participants were asked to choose from included predation/consumption, stalking, physical contact, visual observation, vocalization, injuring, killing, and other. Respondents were enabled to select more than one category to describe the interaction which they observed. Finally, participants were asked to provide a brief description of the interaction. Survey participants were encouraged to give two examples of captive-wild animal interactions which had occurred at the Oregon Zoo, but were only required to provide one example.

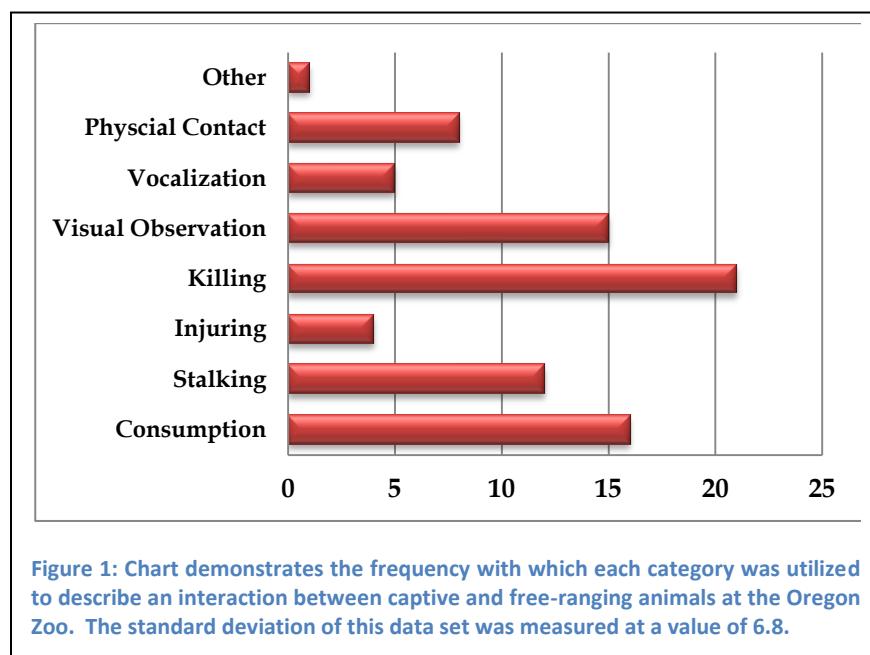
This survey was distributed using an Oregon Zoo email list, designed to reach all persons working in the Living Collections Department and also members of the Portland American Association of Zoo Keepers (AAZK) Chapter. This email list reached a total of sixty-eight Oregon Zoo staff members and animal care volunteers. The survey has initially sent to respondents via email on March 3, 2013 and responses were collected through March 31, 2013. Recipients of this email were provided with a link to the survey (<http://www.surveymonkey.com/s/JV8BSQH>) and asked to complete and submit the survey once all eight questions were answered. Responses to the survey were collected, recorded, and analyzed using the Survey Monkey website.

Results

After closing the survey on March 31, 2013, twenty-one of the sixty-eight Oregon Zoo staff and volunteers contacted, completed the survey. This resulted in a total of thirty-nine examples of interactions occurring between captive and wild animals at the Oregon Zoo. Of these responses the majority (82%) of the captive animals involved were carnivores or omnivores. The free-ranging animals involved also tended to be omnivores or carnivores, but were typically smaller in size and at a lower position on the food chain. Captive animals which were most frequently observed in captive-wild interactions included felids, primates, and raptors. Specifically, the captive animals that were most frequently described in captive-wild animal interactions were Great Horned Owl (*Bubo virginianus*) and Bobcat (*Lynx rufus*) with each of these two species being observed in four separate interactions (Appendix B). Birds (raptors, songbirds, etc.) and rodents (squirrel, mouse, rat, etc.) were most frequently listed as the wild animals involved in interactions with captive species (Appendix C). Many of the wild species involved in captive-wild animal interactions were unidentified. Appendices B and C detail the complete range of captive and wild animals observed and also the frequency at which each animal species appeared in captive-wild interactions at the Oregon Zoo. While some interactions

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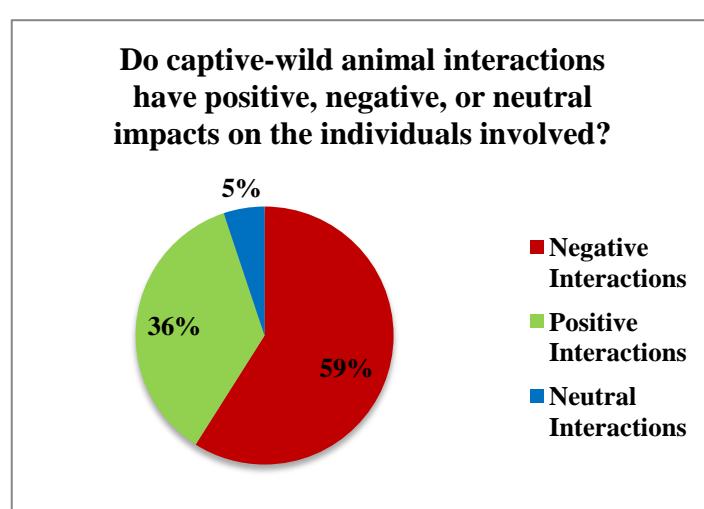
described were actually witnessed by animal care staff, others were insinuated based on finding remains of dead animals in the zoo exhibits.



and “Visual observation” categories were also selected frequently to describe relationships between captive and wild animals (Figure 1). Of all the categories listed for respondents to choose from, “Injuring” was selected least frequently (Figure 1). Only one respondent chose to use the “Other” category to describe the type of interaction occurring between captive and wild animals at the Oregon Zoo. When utilizing the “Other” category, the write-in answer described the interaction between the captive and wild animal as “chasing.”

Furthermore, interactions were classified as having positive, negative, or neutral impacts on the animals involved. Negative interactions were those in which harm was inflicted upon the captive species, the wild species, or both species, and included interactions which involved injury or death. Positive interactions were categorized as those that may be considering enriching to the captive species, the wild species, or both species involved. Neutral interactions were considered to be those interactions which had neither a positive nor negative impact on the captive

The category selected most frequently by respondents to describe the type of interaction occurring between captive and free-ranging animals at the Oregon Zoo was “Killing” (Figure 1). Of those interactions that were described in this way, 90 percent of interactions involved captive animals killing wild animals. The “Predation/Consumption”



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or wild species, or those interactions for which the impact was unknown. Fifty-nine percent of interactions recorded were classified as negative interactions, 36 percent of interactions were classified as positive interactions, and 5 percent of interactions were classified as neutral interactions (Figure 2).

Discussion

General Conclusions

The results of this survey-based study support the hypotheses in two distinct ways. First, the primary hypothesis predicted that most interactions which occurred between captive and wild animals would be categorized by Oregon Zoo staff members as “Predation/Consumption” or “Killing” interactions. The results of the survey support this claim as the “Killing” category was selected most frequently to describe captive-wild animal interactions. This may have been true because the Oregon Zoo houses many large predatory animals in primarily open-air habitats and, thus, there are abundant opportunities for these animals to interact with (to kill or predate upon) outside wildlife. Second, the author also predicted that most interactions between captive and wild animals would involve captive predator species rather than captive prey species. This, too, was supported by the data as 82 percent of the recorded captive species were predatory (either carnivorous or omnivorous), while only 17 percent of captive species were prey animals (herbivorous). This claim was hypothesized primarily because prey species at the Oregon Zoo are carefully displayed in protective exhibits or are too large for local wild animals to approach (elephants, giraffes, etc.), and thus interactions between captive prey species and local wildlife were thought to be less likely to occur.

While 56 percent of interactions recorded were classified as having negative impacts on either the captive or wild animals involved, 36 percent of interactions were classified as positive interactions. For instance, several descriptions offered by respondents reported that captive animals visually observed or engaged in vocalizations with local wildlife, which could be considered enriching to the captive and/or wild species. It would be beneficial to further explore both positive and negative interactions occurring in a zoo setting. By investigating negative captive-wild interactions we can learn how to prevent those interactions which may cause harm to captive and/or wild animals. Additionally, if we were to continue research on those interactions which were determined to be positive for both captive and wild species, we could develop new enrichment techniques for captive species and ensure the safety of both captive and wild species.

Confounding Variables

Several factors may have influenced the results of this study. First and foremost the number of respondents and also the amount of data collected was far less than expected. Despite several attempts to gain more participation, including sending reminder emails for the survey and asking for participants to fill out surveys in person, responses remained few. With a larger data set, achieved by providing a larger survey network or allowing more time to collect responses, the information collected by this survey-based study may have been more significant. Second, the survey used to collect data was designed so that respondents could select multiple categories to describe the captive-wild animal interaction which they had observed and recorded. This factor may have introduced too many variables into the study and also proved to make analyzing data very difficult and time-consuming. As a result, the only sound method which could be used to analyze the data was to compare and contrast how many times each category was selected by a respondent. Thus, it is unclear whether the categorization survey question (Appendix A) provided a sound depiction of which type of interaction was occurring most frequently between captive and wild species. If respondents were only given the option to select one category to describe the interaction, the results may have been far more definitive. However, based on descriptions provided by respondents some interactions may have been very difficult to place into just one category as they involved multiple behaviors. Additionally, only one respondent utilized the “Other” category to describe an interaction between captive and wild animals at the Oregon Zoo. It is unclear whether this suggests that the list of categories provided (killing, injuring, visual observation, etc.) was so extensive that respondents did not need to utilize the “Other” option or if respondents were not inspired to search their minds for another alternative. If the latter possibility is true, it may be possible that some interactions were incorrectly categorized. Lastly, it was evident that knowledge of local wildlife varied significantly between respondents. Some participants in the survey were able to identify an exact species, while others provided vague descriptions of animal species in place of a common species name. Animal identification may have been particularly difficult with certain interactions which were recorded on the basis of finding animal remains in a captive animal enclosure. Therefore, it was impossible to catalogue all wild animal species involved in interactions (Appendix C).

Implications for Animal Care

Based on the available literature, it is clear that information on the interactions which occur between captive and wild animals in a zoo setting is severely lacking. Thus, it is imperative that more research be conducted on this subject matter. Information found in studies such as this one can enable us to manage anti-predatory mechanisms, control pest populations, and even identify and control vectors for disease

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and/or parasite transmission (Adler et al., 2011). Although the results of this study show that most physical harm occurring in interactions between captive and wild species at the Oregon Zoo is perpetuated by the captive species, harm could also come to the captive species through ingestion of or merely contact with a wild species. For instance, physical harm may befall a captive species in an altercation with a wild species if there is a struggle, or disease may be transmitted to the captive species via consumption (Harmon et al., 2005). The findings of this study demonstrate obvious implications for the care of captive animals, but should zoos not also be responsible for the well-being of native wildlife populations that inhabit a zoo setting if they wish to promote wildlife conservation? With the introduction of large exotic predators, wild animal species residing in a zoo may experience population declines and also disease transmission due to interactions with captive species, especially when considering those diseases which are exotic to a particular environment (Harmon et al., 2005).

Zoos can choose to address local wildlife in many different fashions. Some zoos and wildlife parks build up perimeters and remove food and trash to discourage local wildlife from entering zoo grounds and subsequently interacting with captive animals (Jones, 2012). This is primarily an attempt to protect a zoo's collection from zoonoses and/or harmful interactions between captive and wild animals (Jones, 2012). For instance, disease can be spread from local wildlife to captive animals due to close proximity or due to sharing food (Adler et al., 2011). Many zoological institutions which neighbor natural areas have additional concerns about captive-wild animal interactions due to the possibility of outside animals preying upon captive animals (Jones, 2012). At Northwest Trek Wildlife Park in 1998, a male cougar with an established territory adjacent to and possibly including the park's property repeatedly crossed the park fence boundary to hunt and kill several captive bighorn sheep, mountain goats, one elk, and one white-tailed deer (NTWP, 2010). In response to these events, Northwest Trek Wildlife Park was forced to relocate the cougar and enhance park boundaries to deter similar attacks in the future (NTWP, 2010). In contrast, some zoos take a much more welcoming approach towards local wildlife. The Oakland Zoo in Oakland, California feels it is their responsibility to not only care for the captive animals included in their animal collection, but also to act as stewards of the surrounding land and wildlife (Jones, 2012). As zoos are becoming more recognized for their work in wildlife conservation, we must ask ourselves, should our conservation efforts also address the needs of the local wildlife which inhabit our zoos?

Since the modernization of zoological parks and aquariums, which has placed an emphasis on natural habitats, open-air enclosures, and multi-species exhibits, there is more opportunity for captive wildlife to interact with and even live alongside local wildlife (Adler et al., 2011). While these modifications have drastically improved the psychological and physical well-being of captive animals, they also create more

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risk for disease transmission, accommodating pest populations, and harmful physical interaction between captive and wild animal species (Adler et al., 2011). Yet, not all captive-wild interactions have negative impacts on the animals involved. Sightings, smells, and noises of local wildlife can provide sensory enrichment for captive animals (Wells, 2009). For example, several survey responses described interactions between a captive western screech owl housed at the Oregon Zoo and a local, free-ranging western screech owl, in which the two individuals vocalized to each other periodically. This interaction provides an excellent example of how engaging with local wildlife can provide captive animals with auditory, and even visual, stimulation. By interacting with local wildlife a captive owl utilized senses and adaptations she might use in her natural environment and this is the main goal of animal enrichment in zoos (Wells, 2009). It is clear that we can benefit from collecting more information about the relationships between captive and wild species which occur in the zoo setting. With continued research on this topic, we can continue to improve how we manage wild-captive animal relationships by discouraging those interactions that may be harmful and encouraging those interactions which are beneficial or enriching.

Conclusion

Studying local wildlife in zoos presents a great opportunity for public education as the more we know, the more we can share with the public about what it means to live *with* wildlife. Modern zoos in North America play a major role in educating the public and participating in international wildlife conservation. However, it is difficult to participate in or even encourage international conservation if we fail to address wildlife conservation and animal welfare at home. Interactions between captive and wild animals in a zoo setting are potentially harmful to those individuals involved, through the transmission of disease, injury, and sometimes predation (Adler et al., 2011). However, this study also demonstrates that these interactions can benefit the psychological and physical well-being of captive-housed animals through sensory enrichment. Therefore, it is clear that we must continue research on the interactions which occur between captive and wild animals in a zoo setting. Continued research in this field of study would greatly benefit captive animals, wild animals inhabiting zoos, and also the zoological community, by providing us with a better understanding of how to manage captive-wild animal interactions.

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Appendix A: Survey

1. What captive animal species was involved in this interaction?

2. What free-ranging animal species was involved in this interaction?

3. Please categorize this interaction:

- Consumption/Predation
- Stalking
- Injuring
- Killing
- Visual Observation
- Vocalization
- Physical Contact
- Other (please specify)

4. Please describe the interaction which occurred between the captive and free-ranging animal species:



Appendix B: Captive Species Involved in Captive-Wild Animal Interactions

Captive Species Involved in Captive-Wild Animal Interaction	Frequency of Interaction
Western Screech Owl (<i>Megascops kennicottii</i>)	3
Chimpanzee (<i>Pan troglodytes</i>)	3
Asian Elephant (<i>Elephas maximus</i>)	1
Great Horned Owl (<i>Bubo virginianus</i>)	4
Bobcat (<i>Lynx rufus</i>)	4
African Southern Ground Hornbill (<i>Bucorvus leadbeteri</i>)	1
Cougar (<i>Puma concolor</i>)	1
Amur Leopard (<i>Panthera pardus orientalis</i>)	2
Red Tailed Hawk (<i>Buteo jamaicensis</i>)	3
American Kestrel (<i>Falco sparverius</i>)	1
Lanner Falcon (<i>Falco biarmicus</i>)	1
Brown Bear (<i>Ursus arctos</i>)	1
Siamang (<i>Sympthalangus syndactyl</i>)	1
Snow Leopard (<i>Panthera uncia</i>)	2
Black Bear (<i>Ursus americanus</i>)	1
Caracal (<i>Caracal caracal</i>)	2
Gray Wolf (<i>Canis lupus</i>)	1
Mandrill (<i>Mandrillus sphinx</i>)	1
Allen's Swamp Monkey (<i>Allenopithecus nigroviridis</i>)	1
Galapagos Tortoise (<i>Chelonoidis nigra</i>)	1
Golden Eagle (<i>Aquila chrysaetos</i>)	1
Cheetah (<i>Acinonyx jubatus</i>)	1
Kinkajou (<i>Potos flavus</i>)	1
Francois Langur (<i>Trachypithecus francoisi</i>)	1
Purple Sea Urchin (<i>Strongylocentrotus purpuratus</i>)	1

Appendix C: Wild Animal Species Involved in Captive-Wild Animal Interactions

Wild Species Involved in Captive-Wild Interactions	Frequency of Interaction
Western Screech Owl (<i>Megascops kennicottii</i>)	3
Mallard Duck (<i>Anas platyrhynchos</i>)	1
America Crow (<i>Corvus brachyrhynchos</i>)	3
Common Peafowl (<i>Pavo cristatus</i>)	2
Sharp Shinned Hawk (<i>Accipiter striatus</i>)	1
Red Tailed Hawk (<i>Buteo jamaicensis</i>)	1
Unknown Avian Species	13
Coyote (<i>Canis latrans</i>)	1
Virginia Opossum (<i>Didelphis virginiana</i>)	3
Roosevelt Elk (<i>Cervus canadensis</i>)	2
Gray Squirrel (<i>Sciurus carolinensis</i>)	6
Unknown Rodent Species	8

Title: It's hard for a program leader to "serval" institutions

Presenter: Dan Dembiec

Institution: Jacksonville Zoo and Gardens

Position: Supervisor of Mammals

Bio: A product of Michigan State University's Professional Masters program in Zoo and Aquarium Science, I've risen through the ranks from Intern at the Detroit Zoo, Zookeeper at the Dallas Zoo, Senior Keeper at Sedgwick County Zoo and now Supervisor of Mammals at the Jacksonville Zoo and Gardens, where I supervise the care of mammals in the African and Wild Florida loops. These areas consist of mostly large carnivores and hoofstock. I'm also the Serval program leader and a member of the Felid TAG steering committee.

A/V needs: PowerPoint presentation

Contact information: Phone – 904-757-4463 ext. 197

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Abstract:

The purpose of this presentation is to communicate the reality of being a program leader, using the Serval Species Survival Plan (SSP) as an example. In November of 2011, I took over the duties of coordinating the Serval SSP and managing the Serval studbook. The Serval SSP population data was already well-organized by past coordinators, but the population is far from sustainable. The AZA standard for a sustainable population is one with 90% genetic diversity over 100 years. If the serval population continues on its historic trend, servals have a 58 % chance of going completely extinct in zoos in the next 100 years. The best-case scenario will leave it with less than 40 individuals and less than 57% genetic diversity, as well as an inbreeding coefficient of 0.37 (anything higher than 0.25 is more than the equivalent of breeding with your parent or sibling). Managing an SSP is not just about keeping track of individual animals, plugging the data into a computer, printing out population statistics, and publishing a book full of numbers and pretty pictures. An effective program leader should have the ambition and skills to communicate proactively and effectively, the creativity and flexibility to roll with the dynamic trends in zoos and aquaria, and the ability to get all species holders to see beyond their institutional needs and focus on the health of the overall population. Pushing this population in the direction of sustainability proves to be a challenge. This presentation will highlight barriers that need to be overcome and work that needs to be accomplished in order to help the serval population thrive. This includes changing past attitudes, correcting old conventions and management strategies, improving communication, promoting this species, and building partnerships and collaboration, all while trying to maintain your sanity.

Introduction

Zoo professionals have been keeping track of animals within a species for years using studbooks, and every studbook had a person dedicated to maintaining the data within the studbook. However it wasn't until 1981 that Species Survival Plans (SSPs) were formed by what is today the Association of Zoos and Aquariums (AZA). At that time, the first SSP coordinators focused mostly on maintaining a studbook and eventually making

breeding recommendations that if followed would help maintain genetically healthy populations within AZA and affiliated institutions. Over time, the management of animal taxa has evolved. For a while, other programs existed along side SSPs such as Population Management Plans (PMPs) or Display/Education/Research Populations (DERPs). PMPs and DERPs have since been discontinued and all managed programs today are called SSPs. There are now over 300 SSP programs.

As the way we manage animal programs has evolved, so has the role of SSP program leaders. When PMPs and DERPs were in place all SSP program breeding and transfer recommendations had to be followed, while PMP and DERP recommendations were not as strong of a priority. SSP coordinators had to make breeding and transfer recommendations regularly and follow up to ensure that institutions were following the recommendations. PMP and DERP coordinators did not. Today a new system is in place where every population is given a red, yellow, or green designation based on how sustainable the population is (red programs are technically not considered an SSP). Each designation has rules associated with them as far as level of compliance by AZA institutions and ability to work with non-AZA affiliates.

The following text is taken from the AZA's SSP program handbook (2012):

Green SSP Programs

- Green SSP Programs are cooperative population management Animal Programs for selected populations that receive the highest level of formal management to assure their future sustainability.
- Each Green SSP Program Breeding and Transfer Plan manages breeding in order to maintain a healthy and self-sustaining population that is both genetically diverse and demographically stable.
- Green SSP Programs are overseen by an SSP Coordinator, a Vice-Coordinator, and a Management Group (if desired).
- The PMC, PMC Adjuncts, and approved SPMAG Advisors are available to assist Green SSP Programs.
- Green SSP Program participants must abide by the AZA Policy for Full Participation in SSPs and, if needed, the AZA Animal Management Reconciliation Policy.
- Green SSP Programs may partner only with Non-Member Participants that are approved by the WCMC (See Appendix E).

Yellow SSP Programs

- Yellow SSP Programs are cooperative population management Animal Programs for selected populations that receive formal management.
- Each Yellow SSP Program Breeding and Transfer Plan manages breeding in order to maintain as healthy and self-sustaining of a population as possible that is both genetically diverse and demographically stable.
- Yellow SSP Programs are overseen by an SSP Coordinator, a Vice-Coordinator and a Management Group (if desired).
- The PMC, PMC Adjuncts, and approved SPMAG Advisors are available to assist Yellow SSP Programs.
- Although cooperation among AZA member institutions is strongly encouraged for the long-term benefit of the zoo population, participation in Yellow SSP Programs is voluntary.
- Yellow SSP Programs may partner with private participants (organizations that are not AZA member institutions) without completing the WCMC Non-Member Participant

- approval process. Adherence to the AZA Code of Professional Ethics and Acquisition and Disposition Policies is still required.
- Yellow SSP Programs will not be able to be designated as a Green SSP Program unless private participants become approved Non- Member Participants by the WCMC.

Red Programs

- Red Programs are not SSP Programs but instead are those populations that the TAG recommends for cooperative management among AZA member institutions, but are comprised of fewer than 50 individual animals.
- These populations are managed by an AZA Regional Studbook Keeper who maintains an official AZA Regional Studbook for the population.
- If the TAG wants additional population management help for a Red Program, the PMC, PMC Adjuncts, and approved SPMAG Advisors may be available to help if resources are available.
- Although cooperation among AZA member institutions is strongly encouraged, participation in Red Programs is voluntary.
- Red Programs may work with private participants (organizations that are not AZA member institutions) without going through the WCMC Non-Member Participant approval process. Adherence to the

Depending on the designation of the animal program, the program leader's role may change. For example, a yellow or red program leader may need to put more effort into promoting their species and encouraging zoos to create space for that species, while a green program leader tends to already have plenty of space and will focus more on maintaining their space.

Ultimately, the goal of a program leader should be to create a population that is “sustainable” in captivity. Since the definition of “sustainable” is subjective, the standard that was created in the AZA is for the population to be capable of maintaining at least 90% genetic diversity over the course of 100 years. If a population has achieved this standard it is designated a Green SSP program. If a population contains more than 50 individuals but has not achieved this standard, it is designated as a Yellow SSP program. Any population that has fewer than 50 individuals in it is designated as a Red program.

A population's ability to be sustainable can be calculated using mathematical models that incorporate probability based on the species' historic population trends. There has been great advancement in our ability to calculate and monitor the sustainability of a population over the years and this advancement in technology has been used most recently to create Population Viability Analyses (PVAs). PVAs are reports that take into account many factors that can affect a population. They consider different scenarios based on the most logical management strategies that may be utilized and project an outcome of what the population will look like after implementing those management strategies.

The formula to be an effective program leader may appear simple. Make sure your population has a lot of unrelated “founder” animals within your species; breed them with unrelated individuals; keep records of all individuals within your population including genetic heritage (there are user-friendly computer programs that allow you to do this); and continue to make breeding recommendations that all institutions will follow without

question. Unfortunately, this formula is not as easy to follow as it looks, and even if you do follow the formula there are still many other roadblocks you may encounter.

I became the Serval SSP program leader in November of 2011. The Serval SSP population already had a well-organized studbook in place as the previous program leaders did a good job tracking all individuals within AZA zoos and affiliated institutions. The population was considered a yellow program with greater than 50 individuals in the population, but it was not projected to be sustainable (90% genetic diversity over the next 100 years). According to the last population analysis conducted for a Breeding and Transfer Plan (2010), the population had 91% genetic diversity but would plummet to 34% after 100 years. A recent PVA showed that if no changes in management strategy take place, the population has a 58% chance of going extinct within 100 years and the inbreeding coefficient would be 0.37 at best if it did persist (anything higher than 0.25 means that all servals in the population are the equivalent of full siblings).

Purpose

The main purpose of this paper is to communicate what it is like to be a program leader using the Serval SSP as an example.

Developing a Strategy

The population when I received it was far from sustainable and my goal is to get this population on track to become sustainable one day. My first step was to understand the history of the population and find out how it came to be. Here's what I discovered:

Reasons the population was not sustainable

- There was a poor understanding of genetic heritage of the servals in the population. There were 98 servals in the population, but less than 30% of the population had 100% known genetic heritage.
- Most servals came to institutions from private breeders who did not track or communicate their servals' heritages.
- Some institutions sought out servals for use as program animals. Since program servals were not being produced in the Serval SSP, they had no choice but to acquire servals from private breeders.
- Some institutions rescued servals from pet trade confiscations.
- Historically this population was a PMP. Since compliance was optional, many institutions did not communicate with the program leader sufficiently and breeding and transfer recommendations as well as sustainability were often not a high priority to them.

Other important information to consider:

- Servals are considered least concern by IUCN; they are not endangered.
- Non-pedigreed Servals are readily available through breeders, dealers, or the pet trade.
- Due to increased popularity in the pet trade, serval/domestic cat hybrids called savannah cats were produced. After generations of breeding it is highly possible

that servals obtained from breeders or the pet trade contain domestic cat genes in their genetic make-up.

- The cost to acquire a pure serval from a breeder or dealer is high (at least \$4000).
- Due to space constraints of small cats in zoos, the Serval SSP was only allotted a population size of 65 servals by the Felid Taxon Advisory Group (FTAG).
- A space survey in 2009 projected the serval space to decrease from 92 spaces to 78 spaces. In reality, there was an increase to 96 spaces.

The second step was to take this information and use it to decide how to move forward when managing the population. The two things I definitely knew were that the Serval SSP needed more space, and needed new blood as its founder base was minimal.

Although I had a good idea of what I wanted to do to attack these two issues, this was my first time managing a program. It did not make sense to me to move forward on my own without advisement from experienced people from within the SSP. I also felt that it was important to generate buy-in from the Institutional Representatives (IRs) of the Serval SSP by making them a part of the decision-making process. That way, it did not matter what strategy I chose, I would have vested parties to support my decision (or share the blame ☺). So I decided to hold a meeting at the 2012 Felid TAG's mid-year meeting. Before the meeting I sent out a needs/wants/space survey so that I had a current understanding of available serval space as well as the preferences of participating institutions. During the meeting I posed the following questions in an attempt to gather information and generate buy-in:

If servals are available and are not endangered, does this population need to be sustainable?

The purpose of this question was to explore the easiest possible solution. If institutions were okay with acquiring servals on their own and sustainability wasn't a priority, then I could let them acquire servals on their own and I would just keep track of them.

What caused an increase in serval spaces when it was projected to decrease?

I already knew the answer to this question. Serval space increased because of their increasing popularity as program animals.

Should servals be used as program animals?

This was a rhetorical question I asked to generate a little bit of controversy and emotion into the conversation and to segue to some information about program servals in the population. No time was spent answering this question as a group. After this question I revealed the following information about the serval population:

- At least 25% of the servals in the population were used as program animals (I later discovered that this percentage was low. It was more like 33%).
- At least 27% of serval-holding institutions had a program serval (I later discovered this percentage was actually about 40%)
- I had at least three institutions interested in acquiring program servals.

- No program servals are contributing to the gene pool by breeding.

Can program servals contribute to the sustainability of the serval population?

Traditionally most zoos would not allow their program serval to be a part of a breeding program because breeding would negatively impact the serval's program disposition. Some zoo professionals believed that to have a successful program serval, the serval had to be permanently contracepted (neutered or spayed). I even received information that some professionals only would work with fixed males.

Can producing program servals contribute to population sustainability?

The purpose of this question was to accumulate pros and cons producing program servals from within the SSP. This gave the delegates the opportunity to express interest or concern with this management strategy.

If there's demand for program servals from within the SSP, does it make sense that the Serval SSP serves as a source for them?

The purpose of this question was to get a direct answer from the delegates as to whether or not we should start producing program servals. About half the delegates in the room spoke in favor of this strategy and no one refuted the idea. This decision to move forward with producing program servals is contrary to the decision Serval SSP made in 2009 when it was decided not to produce program servals.

What is needed to be a self-sustaining source for program servals?

Understanding that if the Serval SSP began producing program servals there was a chance that everything could go wrong, I wanted to take this concept a step further so that I had adequate information before implementing it. I also wanted to highlight the fact that if this was the direction the Serval SSP was going, then there would need to be strong institutional commitment. This was also an opportunity to communicate the Felid TAG position statement on the use of felids in programs (2009). This document not only includes guidelines to help institutions manage program servals ethically, but the guidelines also include information that when followed, increase an institution's likelihood of success raising a program serval.

Do servals have a unique niche as a program cat species?

I wanted the delegates to leave the room on a positive note so that they could look forward to the management strategy that they helped create. This question led to the discussion of the positive outcomes that may result from this strategy:

- Zoos would no longer acquire generic servals from private breeders. Instead they would receive fully pedigreed servals that could potentially contribute to the sustainability of the population.

- By replacing generic servals with pedigreed servals over time due to attrition and replacement, more servals space would go to individuals contributing to sustainability
- This strategy may generate greater interest in institutions acquiring servals resulting in the creation of more serval space.
- This strategy may cause servals to move from exhibit space to education space opening up exhibit space for one of the other small cat species whose population needs help (ex. caracals or sand cats).

Implementing the Program Serval Strategy

Unfortunately, I could not just wave a magic wand and make this all happen. A program leader has to be pro-active especially if you are trying to change the way your SSP is managed. Change, especially when multiple parties are involved such as multiple institutions in your SSP, is not something that can happen overnight. I wanted my change in strategy to be as smooth as possible. The most emphasized piece of advice I received from other program leaders was to be a thorough communicator. If you don't know the status of an animal or breeding pair, contact the IR to see how things are going. Instead of writing an email, call them. Never leave a phone call or email from an animal manager unanswered. Even if you do not know the answer to their question, email them back and let them know you are looking into the answer. Then, make sure you get back to that as timely as possible. As a new program leader, it was important that I establish a relationship with the IRs and serval managers. Excellent customer service is very important. Be as specific and detailed as possible when explaining why you made a particular recommendation. If there was a disagreement or issue with a recommendation, resolve it immediately through pro-active communication. When communicating, be polite and understanding towards each institution's unique situation and accommodate their situation the best you can. If a serval manager likes you, they are more likely to cooperate with you.

My first move was to communicate the change in strategy. After communicating it in the 2012 Felid TAG annual report (2012), emailing all Serval SSP IRs, and writing 2 articles about it in two different issues of the Felid TAG Times, there were still a lot of people/institutions that were not aware of the change. If they are not aware of the change, they can't take advantage of it, so I took my communication to a higher level and sent emails to all Felid TAG IRs so that even non-serval holding institutions were aware of the change. When communicating one on one with IRs via email, I often included a brief description of the upcoming changes if it was even slightly relevant. To this day, I am certain there are still institutions that are not aware of the change. So I included an update on our progress producing program servals at this year's SSP meeting and in the 2013 Felid TAG annual report as well as at this AAZK conference!

My next move was to get some institutions on board and committed to breeding servals for the purpose of producing program servals. Institutions do not like to be told what to do. So I couldn't just tell an institution that they were to pull their serval kittens for program training. Also, rarely do institutions jump at the chance to put resources into

something if they weren't going to get something out of it. So when I communicated that the Serval SSP was looking for institutions to be involved in producing program servals, I did not get much of a response. One institution that had already committed to improve the sustainability of the serval population immediately communicated that they would be willing to produce program servals, but I needed more than one institution. After multiple emails, phone calls and constant bellowing of what's good for the population, I was able to get four institutions on board with producing program servals.

Once I had program serval producing institutions the next step was to make obtaining an effective program serval as easy as possible. Institutions are more likely to try something new if the risk to do so is minimized. Having information readily available helps reduce risk. When communicating the new strategy, I made sure to include the Felid TAG position statement on using felids in programs document in an email to all program serval-holding institutions and prospective holding institutions. I emphasized the importance of following the guidelines and asked that all institutions reviewed the document and asked them to make sure they were compliant with the guidelines. I began accumulating a library of documents that could serve as resources for new program serval holders. I asked institutions that had successfully raised program servals to create a timeline of their serval's development and the steps they took to train it for program use. I asked people experienced in raising program servals if they would serve as program serval consultants. My ultimate goal is to create a survival guide for raising a program serval to make it easy and therefore desirable to have a program serval.

Barriers to Success

The serval's status as a lower profile, non-endangered species tends to put servals lower on most institution's priority list. It has almost become habit for institutions to not consult with the Serval SSP (formerly PMP) program leader before making decisions that may impact the population. Proactive communication and an understanding of AZA's policies related to the SSP system was my remedy for this barrier. When becoming program leader, I sent an email introducing myself to IRs to immediately make myself visible. Each time there was a change in the SSP, I sent update emails to all IRs. Included in these emails were requests to follow AZA policies and to communicate with me before making any decision that may impact the population. I published two articles in the Felid TAG Times that communicated updates with the SSP. I also had Bahati, the first program serval produced under the new strategy featured in the "Meet the Cat" section of the Felid TAG Times. I sent emails or called all institutions with a breeding recommendation to see how things were going. Finally, if there were any requests to acquire or disposition a serval, I responded to them immediately. If I could not satisfy their needs immediately, I gave them regular updates on the status of their request. With space limitations, the last thing I wanted to do was leave an institution that had space for a serval hanging as that would make them rededicate that space to another species, causing the Serval SSP to lose space.

As previously mentioned compliance was an issue with the Serval SSP. Institutions would do what they want without consideration for the SSPs needs. For example, one

institution was breeding a non-recommended pair of servals as one parent was pedigreed and valuable but the other was not pedigreed and sending them outside of the SSP. Although the offspring were not 100% pedigreed offspring there is value to having 50% pedigreed animals in a population. After a month of trying to contact this institution, I sent a stern email that highlighted the AZAs policies on compliance. Although this is a yellow SSP and 100% compliance is not required, it is still strongly encouraged and reflects negatively on an institution if they don't comply. After that email was sent, I received a phone call from that institution that very day. Now they are on board with producing program servals.

One small issue was that there weren't very many people committed to the serval population. For example, when I held my first Serval SSP meeting, only 14 people were at the meeting representing only 10 institutions that held servals. This was partially because the meeting was competing with higher profile animal meetings such as Lion and Tiger SSPs. So I communicated this issue with the other African small cat SSP program leaders (caracal and sand cat) and joined forces with them. Putting our heads together we'd be more likely to come up with solutions to our common problems. We also could get greater attendance if we annually held joint meetings.

When implementing the program serval strategy other potential barriers arose. There was a common belief that program servals should always be excluded from the genetic population because when intact servals matured, they would become too difficult to behaviorally manage in a program. This belief has merit because these are non-domesticated carnivores that may become aggressive at any time. Some people communicated that only male servals could work out as program servals. However, some program serval managers have communicated that they were able to maintain intact female servals in program throughout their life proving that it can be done. The program serval strategy allows the Serval SSP to track the successes and failures of servals on program and document what works and what does not so that there is a scientific basis for these potential misconceptions. Currently, there appears to be an indication that all or most servals could be trained for program use if trained consistently and using proper behavioral husbandry techniques, but fixed or male servals may be slightly easier to train.

Progress

It is too early to definitively say the Serval SSP is on the road to sustainability. However, things seem to be moving in the right direction. Results from the PVA indicated that the Serval SSP needed to improve breeding, so I made more breeding recommendations. Eight servals have been born in the last year and a half. These births have not only improved the percentage of 100% known pedigreed servals, but it also allowed me to satisfy all institutions' requests.

Since our founder base was fairly narrow, bringing in more founders would help this population. I was able to establish contact with the manager of the Australasian Species Management Program (SMP). As a result, we agreed to exchange servals to bring in new blood for the well-being of both our populations. The SSP will be importing two males

from Australasia soon and the SMP will be importing a female. I've also established contact with an animal broker that is able to locate founder servals if needed. Proactive communication and the implementation of the program serval breeding program have resulted in serval space increasing from 92 spaces to 105. Serval SSP also helped one institution decide to create space for caracals, which need space even more than the serval population.

There are four institutions on board with producing program servals and we've already produced four servals that are successfully utilized in programs. Seven total institutions have communicated interest in obtaining program servals and two now have program servals in place. A third is in the process of raising a program serval and they have communicated that progress was being made despite the belief that he was pulled a little too late from the dam. I've accumulated a couple timelines of servals raised to become program servals to be distributed as resources for new program serval institutions, and I have three program serval consultants on board to help give advice. Finally, I'm in the process of publishing my first studbook, and I cannot wait to have my population analyzed for an official breeding and transfer plan. It will be interesting to see how my sustainability-related statistics have changed in the last two years, but with the increase in space, increase in births, and importation of two new founders, I'm certain they will be heading in the right direction.

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The Effect of a Simulated Nocturnal Exhibit on the Activity of 1.2 Ocelots (*Leopardus pardalis*) at the North Carolina Zoological Park

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Abstract

From January 2012 through April 2012 observations were conducted and activity budgets were recorded of three captive ocelots exhibited at the North Carolina Zoological Park before and after the manipulation of the lighting in their exhibit. Their normal indoor diurnal exhibit was transformed into a simulated nocturnal exhibit. The percentages of active behaviors were compared from the natural darkness from the diurnal exhibit and the artificial darkness from the nocturnal exhibit. All three ocelots increased the percentage of active behaviors during the darkness periods when they were exhibited in the nocturnal exhibit. The increase differences were 15.3%, 7.2% and 2.4% for a mother ocelot, female kitten, and male kitten respectively.

Introduction

Ocelots (*Leopardus pardalis*) are small felids that are commonly exhibited in zoos throughout North America. These cats are a nocturnal species whose range may extend from southern Texas down through Mexico and Central America. Throughout their range, ocelots can live in a variety of habitats and can vary from tropical forests, dry scrub forest, deciduous and thorn forests, swamps, marshes, and pastures (Murray and Gardner, 1997). Many ocelots will also travel through multiple habitats in their lifetime (Murray and Gardner, 1997).

Ocelot exhibits in zoos are as varied as their habitats in the wild. From the author's experience, not all ocelot exhibits are alike, however most ocelot exhibits are diurnal exhibits. By visiting many modern zoos in North America, the author has observed that ocelots are rarely exhibited in nocturnal habitats. The animals are generally exhibited in diurnal exhibits that use natural light in order to illuminate the exhibit and very few have been seen in a nocturnal exhibit. A search of the literature has found very little information that compares the activity budgets of animals in a diurnal exhibit to a nocturnal exhibit.

A nocturnal animal is active at night so logic would infer that housing a nocturnal animal in a diurnal exhibit may lead to decreased activity. From casual observations by the author, nocturnal animals in a diurnal exhibit will not be visible to the zoo visitors. Studies have shown that zoo visitors are significantly more interested in exhibits where the cats are more active and visible to the visitors (Margulis et al, 2003). In the wild, ocelots are mostly active during the nighttime (Murray and Gardner, 1997) which classifies them as a nocturnal animal. Therefore, they may be mutual benefits for both visitor satisfaction (active animals) and the animal if ocelots were exhibited in a nocturnal setting.

At the North Carolina Zoological Park (North Carolina Zoo) the ocelot exhibit is an indoor, naturalistic exhibit, simulated to look like a canyon region of the Sonora Desert. The ocelots that

are currently housed in this exhibit are a mother and her two kittens. The mother was transferred to the North Carolina Zoological Park in the spring of 2010 with a male ocelot. The kittens (one male and one female) were born in April of 2011 at the North Carolina Zoo. Through casual observations, prior to the kittens' birth, the mother was observed to have been mostly inactive during the day when zoo visitors were present. The mother ocelot activity increased when the kittens were born up until they reached approximately six months of age. At this time, the mother seemed to return to her normal activity levels during the day.

While very little information has been found on the activity budgets of captive ocelots, activity budgets of wild ocelots have been studied numerous times similar to those studies conducted by Ludlow and Di Bitetti (Ludlow, 1987 and Di Bitetti, 2006). The goal of this project was to observe any changes in the activity levels of the ocelots when the exhibit was temporarily modified from diurnal to nocturnal. This study may be useful when designing future ocelot exhibits therefore by using the ocelots' natural history and observing captive ocelots in circumstances in which they would be found in the wild, the management of these animals could be adapted if the ocelots' increase their activity in a nocturnal exhibit.

Methodology

Subjects and exhibit

This study focused on three (1.2) generic (unknown origin) ocelots currently housed at the North Carolina Zoological Park's Sonora Desert Exhibit. The three ocelots are a mother (age: 7 years) and her two kittens (age: 1 year). The mother ocelot was born in captivity and has been at the North Carolina Zoo since the spring of 2010. She was exhibited with a male at a previous institution in a diurnal outdoor exhibit. The mother ocelot was exhibited with this male at the North Carolina Zoo up until the kittens were born in April of 2011. The exhibit currently shares a howdy door with him through which all three can interact with him through visual, olfactory and auditory means.

The site where the study was conducted is an indoor exhibit with no access to the outdoors. The exhibit was designed to simulate a canyon region of the Sonora Desert and has rock-work formed by painted concrete with mulch as a substrate. There are several ledges, branches and vertical areas for the cats to access. The exhibit measures approximately 35 feet by 12 feet. Two skylights make up the ceiling of the exhibit to allow natural light to illuminate much of the exhibit. These skylights measure approximately 10 feet by 12.5 feet. In the exhibit there is a 6 feet x 6 feet x 6 inch pool area and a 6 feet x 4 feet section of the exhibit that has sand as a substrate. There is one access door through which the cats can enter their holding area. The public can view these animals through three panes of glass which allows the cats to view the Sonora Desert exhibit animals including free flight birds.

Management of ocelots

The current husbandry and management of the ocelots remained the same throughout the entire study period. The three ocelots received half of their diet between 9:00 and 10:00 in the morning and half of their diet between 15:30 and 16:00. Their diet is varied and consists of chicken, fish, horsemeat, rabbit, mice and rats. They were fed in their holding area which is made of 4 sections, 3 sections are 4 feet x 4 feet x 6 feet and 1 section is 4 feet x 8 feet x 6 feet. They had access to water through the location of a pool on exhibit plus the use of a water dish in the

holding area. Enrichment was provided daily both in their holding area and on exhibit. Various naturalistic enrichment items were placed on exhibit each day and the enrichment used in holding consisted of items, such as boxes, hard plastic balls, and toy logs. The exhibit and holding areas were maintained at 70 degrees F and 80 degrees F, respectively. The humidity for these areas was maintained between 40% and 50%.

Manipulation of the Exhibit

The amount and color of light was manipulated to achieve a nocturnal effect in a diurnal setting. Since the ocelot exhibit has several skylights, black, 4 millimeter thick, plastic sheeting was temporarily attached to the skylights in order to block out the natural light that illuminated the exhibit from above. The exhibit also has several flood lights and other lighting that illuminate the exhibit. For the temporary nocturnal effect, the flood lights, which normally have clear bulbs, were replaced with 150 watt blue blubs to simulate the moonlight. For the reverse light cycle, the other lighting in the exhibit, in which the bulbs cannot be changed to the blue color, were turned on during the night for the diurnal effect.

The lighting schedule for the diurnal exhibit was 7 hours of artificial light with an additional 1-2 hours of natural light that would illuminate the exhibit. The remaining hours of the day (15 hours) the exhibit was in darkness. During the nocturnal manipulation of the exhibit, 7 hours of the exhibit had artificial darkness and the remaining hours of the day (17 hours) were spent in artificial light. The lighting schedule was based on the established management of the ocelots.

The visitor glass was also temporarily altered to reduce natural light for a simulated nocturnal effect. Since visitors still have to be able to view the ocelots, black plastic sheeting was temporarily attached to the top 24 inches of the glass in order to block out a portion of the natural light. This manipulation allowed the visitors to view the animals yet much of the natural light from the desert dome exhibit was blocked. The coverage area of the visitor glass was determined by the comfort level of the visitors' ability to view the animals.

Data Collection

An ethogram derived from Weller (2000) was used with two additional categories, consumption and social, added based on the current management of the ocelots. The observations were conducted at the Sonora Desert exhibit with 30 days of diurnal observations (January 30, 2012 – February 28, 2012) and 30 days of simulated nocturnal observations (March 12, 2012 – April 10, 2012). There was a 12-day acclimation period between the existing exhibit and the modified exhibit (February 29, 2012 – March 11, 2012). All observations were conducted by one observer throughout the study. Three categories of behaviors (active, inactive, and not visible) were observed with 2 of the categories (active and inactive) being broken down into specific behaviors (Appendix 1).

Data were obtained through direct and recorded observations. Observational scan sessions, 30 minutes in duration, were taken at six points during the day from the visitor's vantage point of the exhibit. Three of these observations were direct or live scans and three were recorded or video-taped scans. The times of these scans were categorized as early morning, morning, late morning, afternoon, evening and late evening. For the direct observations, the observer was

anywhere from 6 to 10 feet away from the glass. The video equipment was set up approximately 1 foot away from the glass and was not an issue when it came to the behavior of the ocelots.

Results

A total of 311 30-minute observation sessions were conducted. Of these sessions 154 were of the diurnal exhibit and 157 were of the simulated nocturnal exhibit. There were 172 live 30 minute observation sessions and 139 camera recorded sessions. The data collected during all of the 311 30-minute sessions were used in the analysis.

The activity budgets of each individual in natural darkness and artificial darkness were compared. This was done by calculating the percentage of time that each animal spent exhibiting active and inactive behaviors along with the percentage of time each animal was not visible. The percentage of time equaled the total number of behaviors observed for each category (active, inactive and not visible) divided by the total number of behaviors and the result multiplied by 100.

The natural darkness periods were defined as the diurnal observation period including evening, late evening and early morning. The artificial darkness periods were during the nocturnal observations and included the times of morning, late morning and afternoon. The observations from the natural darkness periods and the artificial darkness periods were compared to see if the activity levels differ.

Mother Ocelot

During the diurnal exhibit period, the mother ocelot spent 23.1% of the observed time in active behaviors (Figure 1). She spent 34.7% of the time in inactive behaviors. The remaining 42.1% of the time she was not visible, during which behavior could not be seen. When the ocelots were not visible they were in their night holding area and their behavior was not visible to the observer. When the exhibit was changed to a simulated nocturnal exhibit her active behavior rose to 27.1% (Figure 2). Her inactive behaviors during this same time decreased to 25.2%. She was not visible 47.7% of the time.

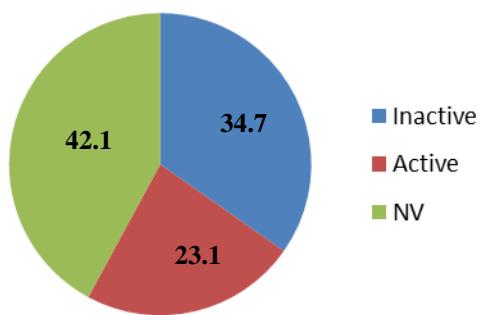


Figure 1: Division of Mother's behaviors in diurnal exhibit by category (Inactive, Active and Not Visible (NV))

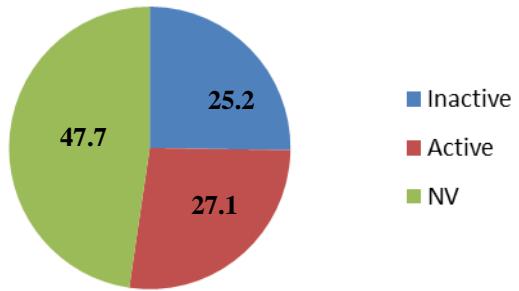


Figure 2: Division of Mother's behaviors in simulated nocturnal exhibit by category (Inactive, Active and Not Visible (NV))

When the simulated and actual nocturnal settings were compared, the mother ocelot was active 19.1% in the actual nocturnal setting and active 34.4% in the simulated nocturnal settings. She was inactive 9.7% of the time in the actual nocturnal setting and 35.5% in the simulated nocturnal setting. During the actual nocturnal setting the mother was not visible 71.2% of the selected observation times. As for the simulated nocturnal setting, she was not visible for 21.1% of the time.

The temporal pattern for the active behaviors was charted for both the diurnal exhibit (Figure 3) and the simulated nocturnal exhibit (Figure 4). The mother's activity pattern over the diurnal exhibit observations had the highest peak of activity, 17.3%, in the afternoon and the lowest activity, 1.4%, in the morning. For her activity during the simulated nocturnal exhibit, her peak activity was in the morning and late evening observations (41% at each observation) and had another high peak in the afternoon (39.2%). The lowest activity periods were in the early morning (17.3%), late morning (24.3%), and evening (23.7%).

The temporal pattern for the inactive behaviors was also charted for both the diurnal exhibit (Figure 5) and the simulated nocturnal exhibit (Figure 6). The mother ocelot's inactive behavior in the diurnal exhibit peaked at 24% during the late evening. Her inactivity was steady throughout the late morning through the evening. Her inactive levels during the simulated nocturnal setting peaked at 31.3% in the late morning and the evening also had another peak at 27.4%. Her lowest inactivity levels in the simulated nocturnal exhibit were in the early morning (10.1%), afternoon (12.4%) and late evening (12.4%).

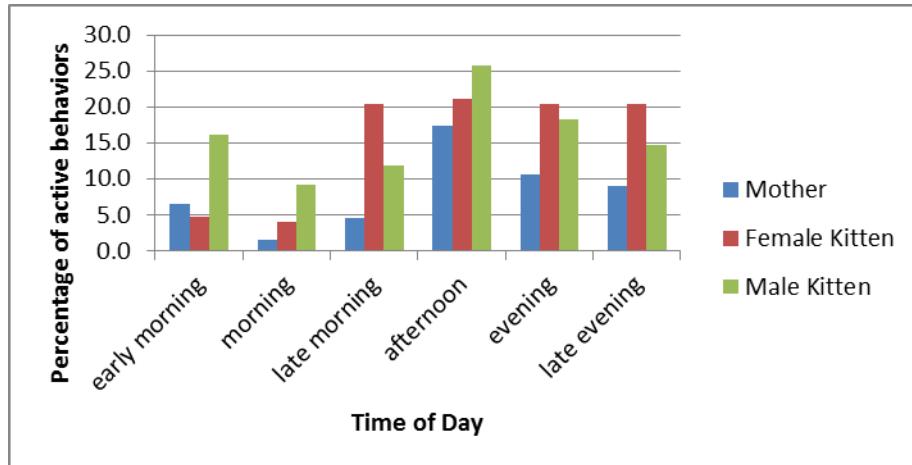


Figure 3: Individual temporal pattern of active behaviors in the diurnal exhibit setting

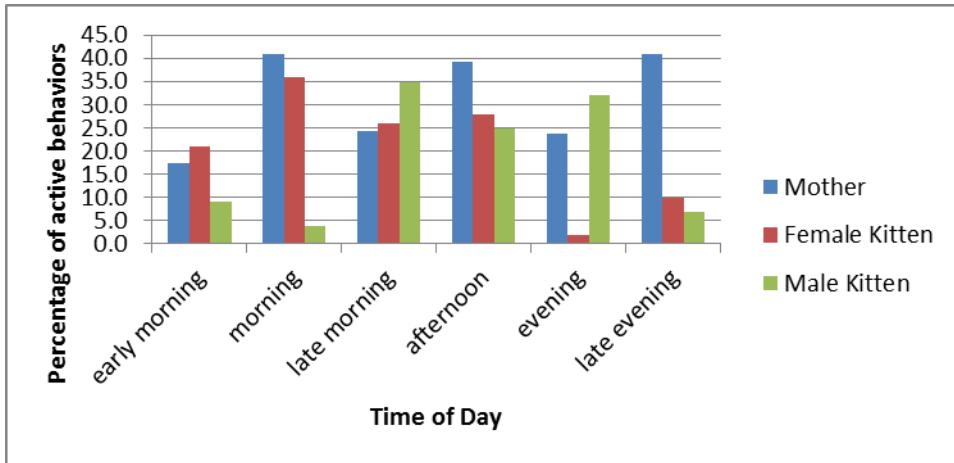


Figure 4: Individual temporal pattern of active behaviors in the simulated nocturnal setting

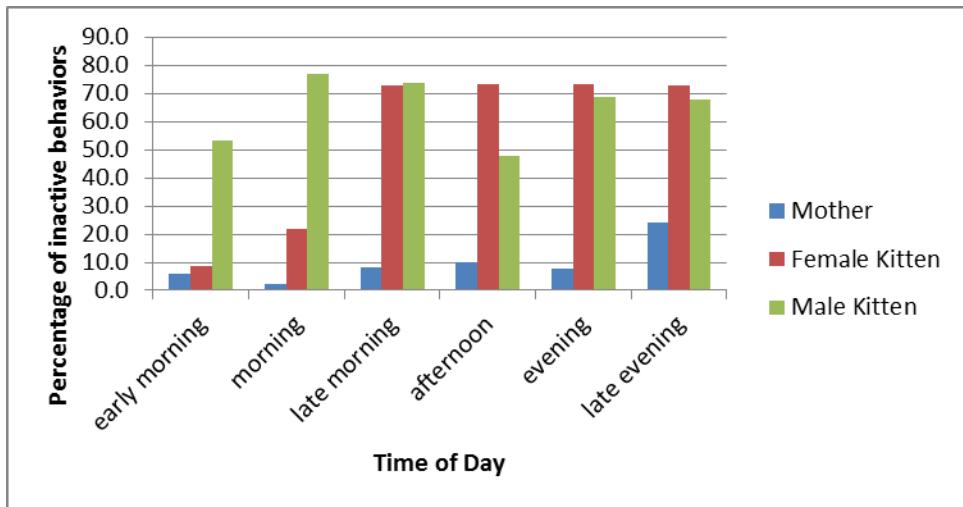


Figure 5: Individual temporal pattern of inactive behaviors in the diurnal setting

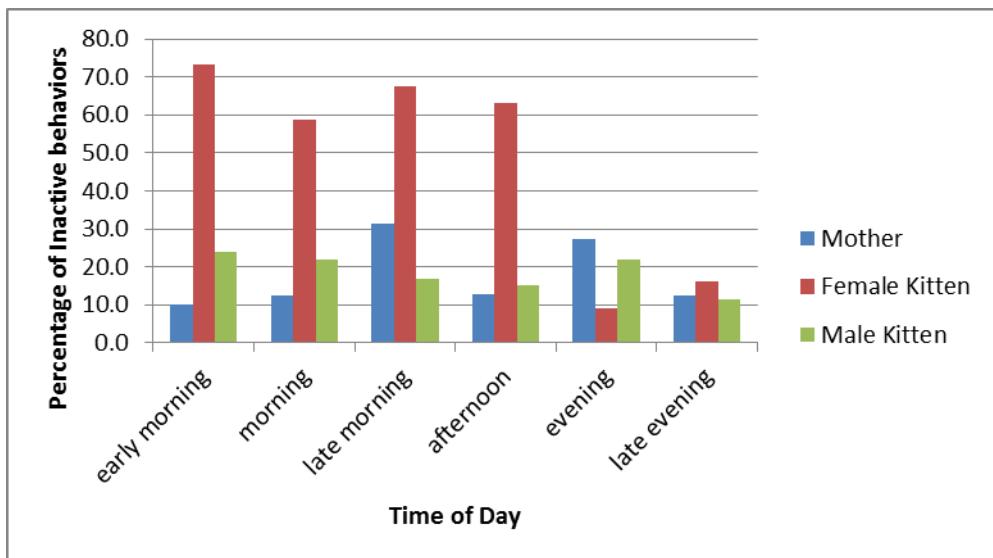


Figure 6: Individual temporal pattern of inactive behaviors in the simulated nocturnal setting

Female Kitten

The female kitten's behaviors, broken into categories, can be seen in Figure 7. She spent 22.5% of her time in the diurnal setting displaying active behaviors. She was inactive for 35.0% of the time. She was also not visible for 42.5% of the time observed in the diurnal setting. In the simulated nocturnal exhibit she decreased her active behaviors to 15.0% (Figure 8). She also decreased her inactive behaviors to 30.3% and increased not being visible to 54.7% of the time observed in the simulated nocturnal exhibit.

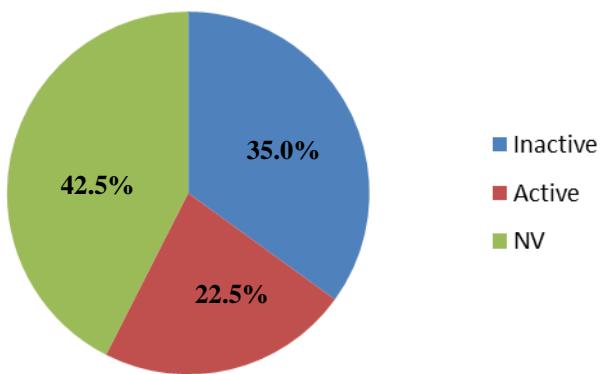


Figure 7: Division of Female Kitten's behaviors in diurnal exhibit by category (Inactive, Active and Not Visible (NV))

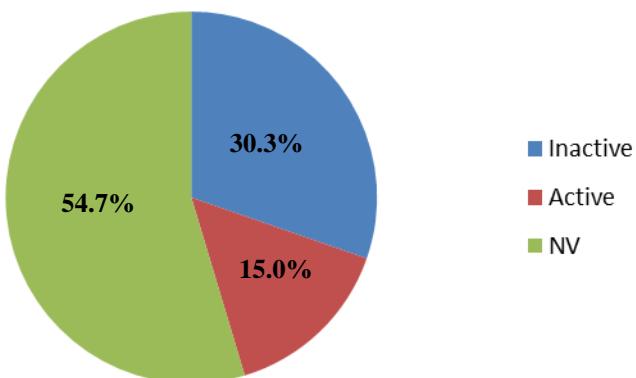


Figure 8: Division of Female Kitten's behaviors in simulated nocturnal exhibit by category (Inactive, Active and Not Visible (NV))

From looking at the artificial darkness and natural darkness, the female kitten was active 12.5% of the time in the natural darkness (diurnal exhibit) and she increased her active behavior to 19.7% of the time in the simulated nocturnal setting. Her inactive behaviors were observed 8.0% of the time in the natural darkness and 48.0% of the time in the simulated nocturnal setting. In the natural darkness the female kitten was not visible for 81.1% of the observed time. For the simulated nocturnal exhibit, she was not visible for 32.4% of the time.

When looking at her temporal pattern for her active behaviors in the diurnal exhibit (Figure 3), she peaked in the afternoon (21.1%) but was level starting in the late morning (20.4%) through the late evening (20.4%). The time of day where her active behaviors were the lowest was in the morning (3.9%). Her inactive behaviors were highest in the afternoon (73.4%) and lowest in the early morning at 8.8% (Figure 5). Like the active behaviors, her inactive behaviors leveled in the late morning through the late evening.

In the simulated nocturnal exhibit, the temporal pattern for her active behavior can be seen in Figure 4. Her highest peak of active behaviors is in the morning (35.8%) and the time of day where her active behaviors were observed the least was in the evening (1.9%). In Figure 6 the temporal pattern of her inactive behaviors is illustrated. Her peak time when her inactive behaviors were the most observed was in the early morning (73.4%). There is a slight drop in the morning to 58.9% with it increasing again in the late morning to 67.6%. There is a severe drop in the frequency of these inactive behaviors from afternoon (63.2%) to evening (9.1%).

Male Kitten

Figure 9 shows the division of the behaviors, by category, for the diurnal exhibit of the male kitten. Active behaviors were observed 21.8% of the time. He was inactive for 39.1% and not visible for 39.1% of the time. During the simulated nocturnal setting observations, the male kitten spent 16.4% being active, 41.2% being inactive, and 42.4% of the time not visible (Figure 10).

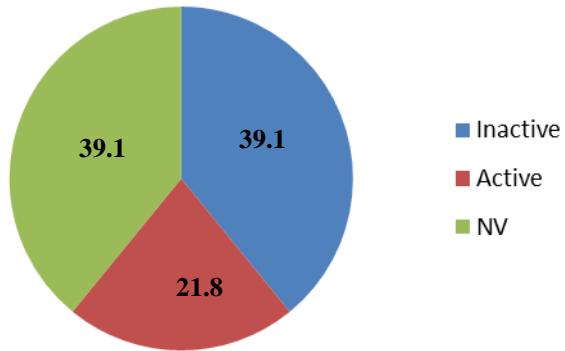


Figure 9: Division of Male Kitten's behaviors in diurnal exhibit by category (Inactive, Active and Not Visible (NV))

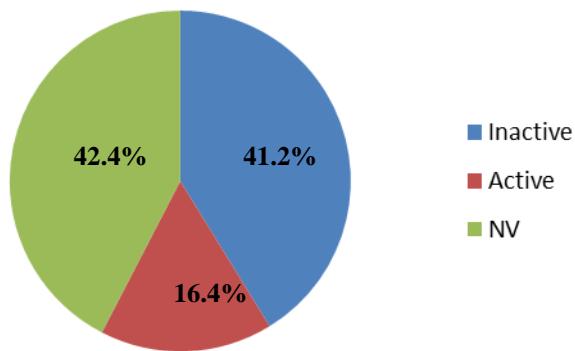


Figure 10: Division of Male Kitten's behaviors in simulated nocturnal exhibit by category (Inactive, Active and Not Visible (NV))

When comparing the behaviors, by category, during the dark hours from both conditions, the male kitten was active for 17.6% of the time during the natural darkness (diurnal exhibit). During this exhibit condition, he also spent 12.5% of the time inactive and 71.5% not visible. During the simulated nocturnal darkness, he was active 20.0%, inactive for 50.8%, and was not visible for 29.2% of the time observed.

When looking at the temporal pattern in the diurnal exhibit, he had the highest peak in the afternoon (Figure 3). The morning was the time when his active behaviors were the lowest (9.2%). When looking at the temporal pattern of his inactive behaviors for the diurnal setting, the highest peak was in the morning (76.9%) and decreased to 47.8% in the afternoon (Figure 5). There was another peak in the evening at 68.8% and then started to decrease again.

In the simulated nocturnal setting, his active behaviors were highest in the late morning at 34.7% (Figure 4). There is a second peak in the evening at 32.1% and then decreases to 6.8% in the late evening and 9.1% in the early morning. His inactive behaviors in the simulated nocturnal exhibit have a peak at 24.0% in the morning. The inactive behaviors then drop in the afternoon to 15.1% and peak again to 21.9% in the evening.

Discussion

All three ocelots had an increase of activity during the artificial darkness period. They spent less time being not visible as well. This allowed the visitors to be able to see the ocelots. If visitors see the animals, it increases their visitor satisfaction. Visitor satisfaction also increases if the animals are moving around their exhibit. This project showed that all three animals had an increase in their activity in artificial darkness. From the results of this study, a nocturnal exhibit is not an effective tool to showcase the activity of the ocelots. The change in activity of the ocelots was so minor that exhibiting them in a nocturnal exhibit is not necessary.

The mother ocelot did have an increase of stereotypic behavior (pacing) during the simulated nocturnal exhibit observations. This increase added to the active behaviors that were seen during this observational period. The increase of pacing could have been related to several additional factors and not to the change in the exhibit. From her history at the North Carolina Zoological Park the project observations coincided with an estrus cycle behaviors that were observed the previous year. One behavior she exhibited during this estrus cycle was pacing.

Another reason that her pacing could have increased was due to the increase of volume of visitors that attended the zoo. This increase was due to the fair weather and school groups that usually plan their yearly field trips to the zoo. From casual observations, visitation at the ocelot exhibit varies throughout the day. In the morning hours, when the building first opens, visitor numbers are small. These numbers increase throughout the day and the late morning has the most visitors at the exhibit. The afternoon time period shows a decrease of visitors but the numbers are higher than those in the morning.

When comparing the activity of all three cats in the diurnal setting it is interesting to note that the male kitten's active behaviors mimic the mother's behavior while the female kitten's behavior levels out. This is interesting since during the observations, the two kittens spent most of their

time together or in the vicinity of one another. When looking at the activity in the nocturnal exhibit, the mother and the male kitten's patterns are almost opposite of one another.

When comparing the artificial darkness to the natural darkness the times of day differed. The natural darkness occurred during the evening, late evening and early morning time periods. The artificial darkness occurred during the morning, late morning and afternoon. The management of the animals did not. During the artificial darkness the ocelots still had access to their holding area where they could choose to be not visible. From the numbers all three dramatically decreased the percentage that they were not visible. In other words they chose to stay on exhibit during the artificial darkness.

These ocelots presumably move less in a captive environment given that they do not have to search for food, mates, defend territory, avoid predators or anything else needed to survive in the wild. These animals adapt to the schedule of their keepers. They wake up when the keepers turn on holding lights. They eat when keepers feed them. They essentially adapt to the keepers' schedule, whatever that may be. So is changing an exhibit from diurnal to nocturnal helpful to the animals? In this case the increase of behavior was so slight that the general public visitor would, most likely, not notice the increase of activity.

Conclusion

Logic would conclude that if an animal is nocturnal in the wild then if that animal was placed in a nocturnal exhibit it would be more active during the hours that exhibit is dark. In the case of the 1.2 ocelots at the North Carolina Zoological Park converting their exhibit to be nocturnal did seemingly increase their overall activity. This increase was most likely not significant enough that the general public zoo visitor would notice. The increase of the mother's behaviors may have been due to several other factors affecting her activity in the exhibit from the increase of visitors to her estrus cycle. Future replica studies could be performed with ocelots at other institutions where the light cycle could easily be reversed. A longer study could also be done on the ocelots from the study. This longer study could show a greater increase of activity. Along with the longer study, a visitor survey could be performed to look into whether or not visitors could actually see a difference in the activity of the ocelots. It would also be interesting to see if the reverse of this study could be done on an ocelot that is already in a nocturnal enclosure and see if the activity decreases when the ocelot is in a diurnal exhibit. In the end, more studies are needed to prove whether a nocturnal exhibit truly increases the activity of a captive ocelot.

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Appendix 1: Ethogram of ocelot behaviors being used in the study (adapted from Weller and Bennett, 2000).

ACTIVE	
<i>Locomotor</i>	
Walk	Quadrupedal locomotion, movement of opposite limbs, two limbs on ground.
Run	Rapid, forward moving locomotion, pushing off with hind limbs. All limbs may leave ground simultaneously, but no pause between next ground push off.
Climb	Vertical movement up or down substrate. Claws can be used to grasp substrate.
Jump	Subject leaps from one point to another, either vertically or horizontally.
Pace	Slightly rapid, repetitive, unvarying ambulatory movement, unique to each cat.
<i>Exploratory</i>	
Investigate	Searching, pawing at, or trying to reach item
Sniff	Smell object
<i>Mark</i>	
Spray	Subject directs urine horizontally on an object
Scrape	Scraping or rubbing hind feet alternately on ground
Sharpen Claws	Front claws are used to scratch on object
Cheek rub	Cheek is rubbed against another object
<i>Consumption</i>	
Eat	Subject is consuming an item either part of its diet or enrichment
Drink	Subject is consuming water.
<i>Social</i>	
Kittens	Subject has physical interaction with kittens
Male	Subject has interaction with male through howdy door
<i>Stand</i>	Subject is stationary. Subject may be in a quadrupedal position or may be in bipedal position, with front legs resting against vertical surface.
INACTIVE	
Sit	Subject is resting on haunches, forelegs are braced
Lie/asleep	Settled on substrate, either sternally, laterally or on back. Eyes are closed
Lie/awake	Like the above, except eyes are open, subject is alert.
NOT VISIBLE	Subject cannot be seen by the observer. Location of the subject may or may not be known.