

**PROCEEDINGS OF THE
41ST NATIONAL CONFERENCE OF THE
AMERICAN ASSOCIATION OF ZOO KEEPERS, INC.**



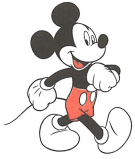
**"KEEPERS MAKING A WORLD OF
DIFFERENCE"**

Paper Sessions

**41st National AAZK Conference
Orlando, FL**

September 8-12, 2014





WALT DISNEY Parks and Resorts U.S.

September 8, 2014

AAZK Conference Delegates

Greetings!

On behalf of my team, I welcome you to the American Association of Zoo Keepers 41st annual conference at Disney's Coronado Springs Resort. We are so pleased to host this important gathering of animal care professionals, and hope you will enjoy the opportunity to network, connect, learn – and have fun!

This year the conference theme is “Keepers Making a World of Difference” and I know that our team members at Disney's Animal Kingdom, The Seas at Epcot, and Disney's Animal Kingdom Lodge are eager to meet you, to collaborate and share best practices. I truly believe that by working together we really can make a world of difference for the animals we all have in our care, as well as those in the wild.

I wish you an outstanding 2014 National AAZK Conference, and a magical time at the Walt Disney World Resort!

A handwritten signature in black ink that reads "Jackie". The signature is stylized with a large, looping flourish at the end.

Jackie Ogden, Ph.D.
Vice President
Animals, Science and Environment



Welcome to the 41st American Association of Zoo Keepers National Conference

“Keepers Making a World of Difference”

Hosted by the Greater Orlando AAZK Chapter & Disney’s Animal Kingdom

Our Chapter is thrilled by this opportunity to welcome you to our world! The members have been working hard to ensure that the 2014 AAZK Conference will be an experience you will always remember. This year’s conference will allow you to enjoy the Walt Disney World Resort, while connecting and developing professionally with your colleagues from animal institutions around the globe.

In partnership with your national AAZK Professional Development Committee, we are excited to bring you a varied program of workshops, papers, and speakers as the foundation of your conference experience. Additionally, the AAZK, Inc. Specialized Training Workshop Series will debut “The Core Elements of Zoo Keeping” and an in-depth Hospital/Quarantine workshop. These featured programs are a track of AAZK’s Certification Series, brought to you in collaboration with AAZK Online Learning.

Highlights of this year’s conference will include an Epcot icebreaker in The Seas with Nemo and Friends pavilion, followed by a dessert party with an exclusive viewing area for the nighttime spectacular, “Illuminations: Reflections of Earth.” We are also pleased to present a distinctive zoo day, which will take you “behind the magic” at Disney’s Animal Kingdom. Our chapter, along with Disney’s Animal Science & Environment team, has planned an array of very special experiences designed just for you.

While zoos seek to “educate and entertain” their guests and inspire them to conservation action, our goal for this conference is similar: to provide you with scheduled content that is educational, entertaining, and inspiring. With valuable learning experiences, networking, and development opportunities for the zoo professional, all in the unique setting of the “Happiest Place on Earth,” this year’s conference is an exciting chance to celebrate all animal keepers, who truly make a “world of difference.”



Conference Donors

Thank you to the 2014 National AAZK Conference Donors:

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Disney's Animals, Science and Education Dept. of Walt Disney World

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The Greater Orlando Chapter and Disney's Animal Kingdom would like to say THANK YOU to our Exhibitors for joining us at the 41st Annual AAZK Conference:



AAZK | aazk.org



Action for Cheetahs in Kenya | <http://www.actionforcheetahs.com/>



Animal Care Equipment and Services | animal-care.com



Conservation Committee AAZK |

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HayDay, LLC | <http://www.stablegrazer.com/>



International Congress of Zoo Keepers | iczoo.org



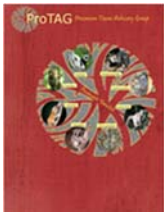
Mazuri | www.mazuri.com



Memphis AAZK Chapter | www.memphiszoo.org/aazk



PBI | polarbearsinternational.org



Prosimian TAG and Ring-tailed lemur SSP | www.prosimiantag.org



Snow
Leopard
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Snow Leopard Trust | snowleopard.org



SR Scales | www.srinstruments.com



St. Louis AAZK Chapter | www.facebook.com/St.LouisAAZK



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Swine Resources Sustainable Swine Resources |

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Tuesday, September 9

BFR Papers

Lewa Paper

Action for Cheetahs (Wykstra) BFR RALLY

BFR 2014 Conservation Resource Grant Update (Lenhart)

Making a difference with AAZK's BFR (Pearthree)

World Rhino Vision (Konstant)

Extended Paper Session

A Milestone in Conservation & Husbandry. The Ron Goellner Center for the Hellbender (EP) (Schuette)

AAZK/ASAG Grant presentation (Debra Dial)

Open Workshops

Giraffe Conservation Foundation- Melaina Wallace

Artificial Aquatic Ecosystem Health through Water Quality

Wednesday, September 10

General Paper Session:

Great Expectations in the Land of the Tiger (Dembiec)

Getting Creative: Recycling & Reusing to Enhance Carnivore Training Programs (Ista)

There's a Pelican in the Classroom! (Pounder)

Working with Con Specifics (Co-Workers) to Train Animals (Davis)

Training Voluntary Reproductive Assessments and Artificial Insemination with African Elephants in a Protected Contact Environment (Middleton/Burns)

Utilizing Voluntary Ultrasound to Monitor Pregnancy in an African Lion (Squirres/Wolf)

Successful Hand Rearing of a Javan Gibbon (Bissert)

A Successful Hand-Rearing & Reintroduction of an Infant Mongoose Lemur (Krause)

Training Apes: A Case Study in Time Management and Patience (Boyer)

Open Workshop:

Pathology at the Zoo: What Can We learn

Iron Overload in Black Rhinos

Extended Paper:

Large Volume Phlebotomy of Black Rhinoceros at Disney's Animal Kingdom® (Losey)

Friday, September 12

General Paper Sessions:

Fancy Footwork. Cheyenne Mtn.Zoo's Giraffe Herd Training for Volunteer Ferrier Work & X-Rays (Bryant)

Halter training Okapi for Enhanced Husbandry Practices (Eye)

There's More Than One Way to Train a Zebra: Hand Injection Training of 3.0 Grants Zebra at Dallas Zoo (Seymour/Pharr)

Utilizing Operant Conditioning with an Aggressive Anegada Island Iguana: A Tale of Targeting and Touch. (Bocek)

Giant Thai Catfish Training at Disney's Animal Kingdom (Locke)

Coming out of their Shells, Keepers Get Creative to Raise Funds for Turtle conservation (Lowe)

I will save a Species From Extinction The Future Role of Zoo Keepers (Parker)

Increasing Amphibian Awareness at your Facility and Within Your Community (Shupp)

Extended Papers:

Connecting Keepers Worldwide (Wunder)

The Rapidly Changing Roles of Zoos: Philosophical Perspectives without Borders (Schmidt)

Open Workshop:

Frog Watch Training (OW)



LEWA
WILDLIFE
CONSERVANCY



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

Submitted By: Mike Watson

Mike.watson@lewa.org

July, 2014.

PROGRAMMATIC AND FINANCIAL REPORT
LEWA WILDLIFE CONSERVANCY RHINO CONSERVATION PROGRAM
July 2013 - June 2014

The Lewa Wildlife Conservancy remains extremely indebted for the financial support from America Association of Zoo Keepers (AAZK) through the very successful Bowling for Rhino (BFR) events. AAZK has contributed **US\$ 209,525** towards Lewa’s rhino protection and security operations over the past one year. These funds cumulatively make up about 15% of Lewa’s rhino conservation program budget. By supporting Lewa, home to 12% and 14% of Kenya’s black and white rhino respectively, AAZK is directly helping to 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 to undertake its rhino conservation and security programs through supporting armed anti-poaching units, tracker dog units, aerial surveillance, ranger salaries, vehicle running costs and radio communication center.

Rhino Conservation Programme



(Waiwai and her 2.2 year old calf)

In 2013 alone, Lewa lost a total of 6 rhinos to poachers while in 2014 to date, no rhino have been lost; with great efforts greatly employed to deter any poaching within the conservancy. The poaching threat continues to escalate to heights never experienced before mainly due to demand for rhino horn and elephant ivory that continues to rise, reaching the highest levels in history. This dramatic increase is the result of a variety of factors, most notably the growing purchasing power of Middle East and Asian populations, and the sophistication of organized poaching gangs who sell wildlife products to black market syndicates in a range countries.

There are great steps being taken by the government and other stake holders to curb poaching ; Within the last five months of 2014-- there has been reduction in rhino poaching across different parts of the country, although still rife in other parts of the country such as in the Lake Nakuru national park and some other conservancies who have experienced significant losses in the numbers of rhino as a result of poaching activities.

Lewa’s impressive anti-poaching track record is well known throughout the conservation world, and can be attributed to the attention to detail and constant adaptation to meet the ever growing and changing threats from poaching. Lewa strives to addresses conceivable angles of threat to its' flagship species through the daily monitoring of each rhino, vigilant observation of all entry points and conservancy boundaries, constant maintenance of the fence line, regular aerial surveillance, and continuous training of all security forces and canine units in preparedness for any potential eventuality that would pose a threat to the conservancy’s resident wildlife.

Kenya Police Reservists (KPR) Armed Anti-Poaching Teams



(KPR team during a training exercise with trainer Pete Newland)

33 members of Lewa’s 150-person security team are categorized as Kenya Police Reservists (KPR), meaning that they are trained and employed by Lewa, but licensed and approved by the Kenyan government to carry firearms and respond to incidences of instability or violence throughout the region. Lewa's teams are deployed on a daily basis to different locations to ensure greater coverage of the conservancy. Many of the poaching incidents experienced on Lewa in 2013 - 2014 have been successful partly due to collaboration between the poachers and other very well organized criminal syndicates and sometimes as a result of insider information. The anti-poaching units are positioned throughout the

conservancy , with one team based at headquarters as an initial rapid response unit, ready to deploy at anytime 24/7, 365 days.

Aside from routine patrols and regular responses to incidences on and off the conservancy, Lewa’s KPR teams are always upgrading and improving their operations and training. An annual training regimen that encompasses new training skills and refresher courses, has been set in place to ensure each member of the KPR teams received specialized armed training skills and technique alongside medical training with one person from each unit also undertaking an advance field-medical course in case of serious/complicated injuries during call-outs.

The teams now carry medical kits with bandages, tunicates and other necessary supplies. Their uniforms were also upgraded to include insulating base-layers and gloves to protect against extreme weather conditions including high-elevation, cold night time temperatures experienced during deployment.

Lewa's anti-poaching unit continues to enhance its collaboration with the Kenya government, most especially the Kenya Police and the Kenya Wildlife Service. After the elections, the Lewa Security team has had more engagement at county government level with the counties of Isiolo, Meru and other neighbouring counties in addressing security matters. This level of concentration at county level is mandatory as security matters primary to their capacity as a KPR unit will be greatly dependant on any matters security at County government level and thereafter at a National level.

The figure below shows comparative poaching incidences for July 2013- June 2014.

Incidence	Total reported during the Period
Armed KPR deployments / follow-ups to serious security incidents	37
Tracker dog deployments	22
Aerial follow-ups and reconnaissance	15
Poaching incidents reported rhinos	6
Road banditry reports	33
Stock theft reports	73
Elephant carcasses / tusk recovery	40
Robbery reports	4
Arrests	16
Firearms / weapons recovered	8

The total cost over the reporting period July 2014- June 2014, to effectively run the mobile KPR armed teams, including salaries, rations, medical, uniforms and allowances was **USD\$207,056**.

Tracker Dog Unit



(Tiva and his handler during a training exercise)

Over the years, Lewa's canine unit has developed a good reputation with regards to high success rates in all deployment follow-ups. 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.

Having lost Tash and Toffee who faithfully served as Lewa's tracker dogs for ten years, in October--the team is now made up of 2 male blood-hounds, Tony and Tiva. There are plans to introduce a further two dogs to what will now be known as Lewa's canine unit, consisting of two extra dogs in addition to the tracker hounds. These dogs are currently at the Ol Pejeta Conservancy training with a larger group of dogs. All of whom are part of a more complex form of training to compliment the KPR teams during engagement, ambush, patrols and recce exercises.

Over this reporting period the tracker dog team has been involved in a total of 22 security follow-ups and has provided invaluable assistance during these situations.

The total cost to operate the canines and their handlers over the reporting period was a total of **USD\$20,238**.

Aerial Back-up



(SUE- Lewa's MD 30 Helicopter)

Lewa's aerial surveillance continues to play a vital role in all operations, supporting not just Lewa's security operations, but also those of partner organizations such as NRT and Ol Pejeta Conservancies. The LWC Super Cub acts as back-up to security related follow-ups to Lewa and other conservation partners nearby such as Ol Pejeta, Ol Jogi and other Northern Rangeland Trust member conservancies. The super-cub has been particularly useful in responding to the upsurge in poaching threats and attempts, that included night flying, follow ups to local stock-theft incidences and road banditry.

The aircraft is also an invaluable resource in locating missing rhino as well as offering aerial support for the annual game count. Lewa's wildlife and security teams aim to locate every individual rhino each day-- should a rhino not be spotted for three days an aerial survey is immediately launched alongside a ground survey of the area until the rhino is found and or spotted. Often rhinos change territory due to emergence of young males who claim territory and displace the older; mostly due to scarcity of pasture that is on the increase on Lewa due to increased number of rhino; as Lewa is over the recommended carrying capacity of rhino; even after the successful translocation of eleven rhino from Lewa onto Borana.

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 support, it would be impossible to provide the current high-level wildlife protection and security responses.

Lewa also acquired a MD 30 Helicopter which has greatly enhanced response to the overwhelming poaching threat within the region, ease capture activities as well as accurate game counts. This Helicopter has and will

greatly continue to support anti-poaching activities, being able to almost halve the time a vehicle response would take on a 62,000acre conservation expanse.

Over the reporting period, the total cost of operating the LWC Super Cub aircraft and MD 30 Helicopter in support of the security deployment and surveillance was **USD\$ 39,880**

Field Monitors Salaries



(Baby Kilifi our newest edition)

Lewa’s rhino monitoring team is made up of **42** field monitors who carry out daily patrols and monitor specific regions or “blocks” of the conservancy. In response to the escalating poaching threats the conservancy has restructured its 18 blocks system into 9 sections, with the aim to create larger presence and consolidated patrolling routine. The field monitors radio back daily 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. The monitoring system and protocol has been adjusted to maximize efficiency and increase the daily protection of each animal.

Lewa’s rangers are well trained and equipped to track rhino. Using binoculars, they identify each of the animals in their patrol block based on age, ear-notching pattern, sex and behavior. In cases where the ranger teams are unable to sight an individual rhino within 3 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 possible corner of the conservancy until it is located.

In addition to this team, we have 4 orphaned animal handlers who take care of the 3 baby rhinos to ensure they well taken care of and protected from any attack from other wildlife like adult male rhino, and predators.

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 was **USD\$ 268,235**

Security Vehicles



The LWC security team has three main vehicles, one for regular rhino monitoring and the other two for the armed KPR teams. As a result of the increased poaching threat and rough terrain within and outside of the conservancy and neighboring community, the security vehicles are driven round the clock, to monitor every member of LWC’s rhino population and other wildlife as well as offer support to the community. 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 continues to do an excellent job of keeping these vehicles running safely and consistently, these eventually need to be replaced. The age and continued wear and tear to these vehicles, has contributed to high cost related to maintaining and running these old vehicles.

AAZK’s funding was used to support the running of these vehicles in 2014, total cost coming to **USD\$ 34,366.**

Radio Operation Room Communication Costs

Lewa’s radio room is the heart of the conservancy’s security operations, providing a central point of communications for the entire region. Lewa’s impressive communications unit manages all aircraft coming in and out of Lewa, as well as maintaining records of each rhino’s specific movements through tracking with the help of the field monitors located in different areas within the conservancy sighting and reporting the rhinos’ 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. This is enhanced through collaboration and linkage with relevant security agencies like the KWS, Kenya Police and other government agencies. It is adequately equipped with modern communication devices and manned by highly trained personnel.

AAZK funding contributes to the costs of radio repairs, purchase of spare batteries, staff salaries and radio licensing. In 2014 the radio communications operation and intelligence network operations on LWC cost **USD \$27,265**.

Total Expenditure towards Rhino Conservation Programmes

AAZK contributed significantly by donating **US\$ 209,525** over this reporting period. 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 great 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 2013 to June 2014.

Lewa Wildlife Conservancy

Submitted to American Association Of Zoo Keepers Bowling for Rhinos Program

Income received by Lewa, Kenya	Amount
Funds received from AAZK BFR on 07 th August 2013	\$22,000
Funds received from AAZK BFR on 16 th September 2013	\$52,800
Funds received from AAZK BFR on 29 th October 2013	\$30,800
Funds received from AAZK BFR on 27 th November 2013	\$29,318
Funds received from AAZK BFR on 31 th December 2013	\$74,607
Totals	<u>\$209,525</u>
Expenditure	Amount

AAZK contribution to salaries for KPR Anti-Poaching Team	\$ 43,917.00
AAZK contribution to Dog Section operational expenses	\$ 5,969.00
AAZK contribution to operating expenses for aerial Back-Up	\$15,526.00
AAZK contribution to LWC Rangers salaries	\$110,113.00
AAZK contribution to Motor Vehicle running expenses	\$ 8,092.00
AAZK contribution to radio communication expenses	\$ 9,317.00
AAZK contribution to boundary fence maintenance	\$16,591.00
Total	<u>\$209,525</u>
Balance	Nil

Note: AAZK contributed 33.5% 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:

Description of cost line	Amount (US\$)
KPR Anti-Poaching Team	207,056
Dog Section	20,238
Aerial Back-Up-Super Cab and Helicopter	39,880
Ranger Salary	268, 235
Motor Vehicle Running Cost	34,366
Radio Communication	27,265
Boundary Fence	28,648
Total Expenditure	<u>625,688</u>

Action for Cheetahs in Kenya: Scouts, lights and cheetah monitoring in the Meibae Conservancy

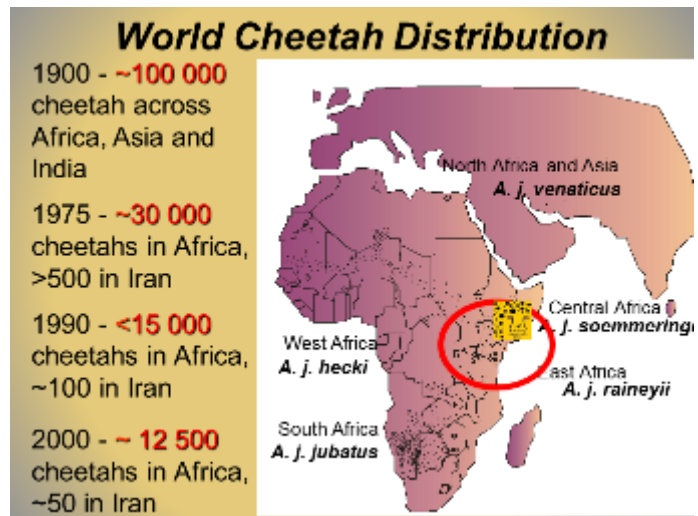
Mary Wykstra
Action for Cheetahs Director / Principle Investigator

Address: PO 1611 Nairobi Kenya 00606
Phone: +254733997910
Email: info@actionforcheetahs.org

Abstract: Action for Cheetahs in Kenya (ACK) works in the Meibae Conservancy to understand cheetah behavior, prey selection and movements in the Samburu Region. Bowling for Rhinos has supported the work of ACK in this region since 2009. Currently we employ six Cheetah Field Officers, support a motorcycle and computer for the senior officer, and are in the process of building a semi-permanent tented camp. Field work includes wildlife monitoring in collaboration with the Conservancy and the Northern Rangelands Trust. In 2014, we conducted trials of predator deterrent lights as a means of conflict mitigation. The area supports an average of 23 adult cheetahs as well as silver-backed jackal, spotted and striped hyena, caracal, leopard and wild dogs. Bowling for Rhinos funds support over 70% of the work in this region.

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

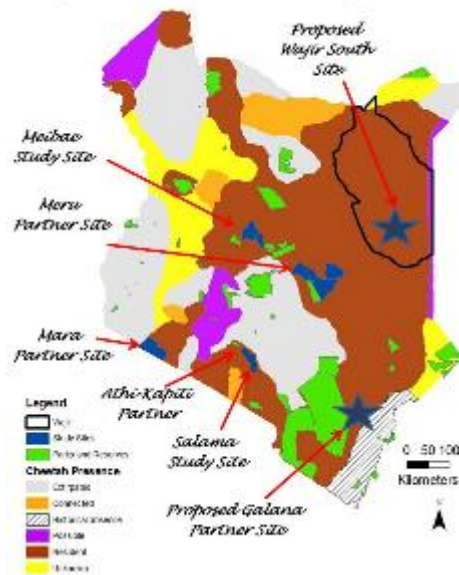
Throughout the cheetah's home range it is vulnerable to the threats that lead to wildlife population decline. While Namibia has the strongest population estimated at around 3000 – Kenya is the central population to the whole of eastern Africa. We estimate the Kenya population to be 1200-1400 based on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



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 2014, IUCN released an evaluation of the threat of illegal cub trade recognizing that the very characteristics that make the cheetah a popular icon are the characteristics that make it vulnerable to extinction. IUCN has 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.

Kenya Cheetah Distribution and Study Sites 2014



Study Sites

- Salama (2005)
- Samburu - Meibae (2010)

Bowling for Rhino funds enabled ACK to develop research in the Meibae Conservancy

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 linked with the neighboring Athi-Kapiti ecosystem in 2012 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 the second location receiving focus by ACK. The conservancy is a part of the Northern Rangelands Trust and is a vital location for cheetahs in the region. 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. In 2014, ACK expanded its research into the Wajir district and launched a planning committee for a second national cheetah survey to begin in 2015.

ACK staff is hired from within the community. They live and work from their homes, allowing them to continue managing their own farms/livestock while integrating data collection and patrols into their lifestyles. Sarah Omusula is the new ACK Senior Scientist replacing Cosmas Wambua in developing ACK training materials and forms, maintaining data bases, and working 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. Staff salaries account for 30% of annual Samburu expenses.



Samburu field officers with ACK Director Mary Wykstra

Research is goal oriented through understanding the problems encountered by people living with wildlife; developing research methods and sharing our findings with local communities, Kenya Wildlife Service, agriculture and livestock partners, and other experts. 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 gave 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.



Since 2003, ACK has documented over 40 adult cheetahs hit by vehicles on Kenyan roads.

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. Highway accidents leave the cheetah population with reduced genetics, orphans and unstable populations. Highway monitoring includes identifying problem areas, and proposing solutions to the National Environmental Management Association (NEMA) in Kenya.

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.

Conflict mitigation was an important aspect of 2014 research in Meibae. Many carnivore projects are evaluating the use of deterrent lights in the effective non-lethal prevention of livestock loss at night. While the cheetah rarely attacks a boma at night, many of the conflicts in both day and night are blamed on the cheetah. Camera traps were set up to determine the frequency of visitation by different predators prior to the installation of the deterrent light systems. Cameras remained at the boma for one month after light installation. Although we found more than 90% reduction in visitation at the 30 meter proximity to the lighted boma, we do fear that predators will get used to the lights. ACK has partnered with a local telemetry manufacturer and other carnivore researchers to develop a transmitter collar that would be fitted to problem animals. The collar will transmit a signal that will alert the boma or herder of the presence of the problem animal, and will provide us with further information on the movements and interactions of different problem animals.

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 - 2014 for the Samburu project. The full operational budget for ACK in 2013 was \$85,000. The Samburu portion of the work in 2013 accounted for 20% of the total ACK budget.

INCOME 2012-2013

Opening Balance 2013:	\$ 836.00
Received BFR 2013:	\$13,707.00
Received BFR 2014:	<u>\$19,138.00</u>
Total Available:	\$33,681.00,

Expenses 2013 (January – December)

Meibae Conservancy Fee	\$400.00
Field Officer Stipend and training	\$6600.00
Transport (Fuel, Insurance, Public service)	\$6900.00
Accommodation (Camping fees, lodging, food)	\$1900.00
Office Equipment and Supplies	\$ 100.00
Motorcycle Purchase, Insurance	\$1200.00
	<u>Expenses 2013 \$17,100.00</u>

Expenses 2014 (January – June)

Meibae Conservancy Fee	\$ 00.00
Field Officer Stipend and training	\$4100.00
Transport (Fuel, Insurance, Public service)	\$3400.00
Accommodation (Camping fees, lodging, food)	\$ 800.00
Office Equipment and Supplies	\$ 100.00
Motorcycle Fuel	\$ 500.00
	<u>Expenses to Date 2013 \$8,900.00</u>

Balance remaining for 2014: \$7,681

PROJECT GOALS AND ACTIVITIES 2014-15

The following goals will be achieved for two study areas by ACK staff.

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

a. Prey Distribution and Abundance: ACK will complete publications for the Salama area based on data collected between 2005 and 2013. Data from the Samburu area will be analysed for annual reporting and used as the baseline for continuing studies

b. Human Settlement Pattern: ACK student, Noreen Mutoro, will complete the analysis of 300 scat samples collected in the Salama and Athi-Kapiti study site. Noreens thesis and publications should be completed by the end of 2015.

c. *Evaluate Livestock Depredation*: 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, predator deterrent lights and livestock health improvements.

Goal 2) To understand cheetah health and habitat selection

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 verify cheetah corridor use and provide positive ID for individual cheetahs in both the Salama and Samburu study areas.

b. *Monitor cheetah movement using GPS collars*: We will work with the local telemetry company, Savannah Design, to develop transmitter collars that provide early alert and deterrent trigger signals for problem animals. The collars will also provide GPS information that will show the frequency of visitation to neighbouring bomas.

c. *Determine habitat use of cheetahs in relation to vegetation and prey*: Boma monitoring, Vegetation surveys and highway monitoring will be included in regular cheetah field officer patrols

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)*: We are working with community members and local administration offices to develop a conservation management plan using Miradi software

b. *Raise environmental awareness through partnerships and internal education programmes for communities and schools*: There is a high demand for wildlife videos to be shown in the schools, thus ACK will hire an education officer to conduct school activities and to show videos about the wildlife.

c. *Encourage sustainable community development through programmes including micro-financing, training and development of cooperative resource marketing*: 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.

Bowling for Rhinos 2014 Conservation Resource Grant Update

Wendy Lenhart, AAZK Board Oversight for Conservation

African Plains Keeper, Philadelphia Zoo

The Bowling for Rhinos Conservation Resource Fund is a competitive grant available each year for applicants involved with rhino conservation and/or research projects. The final 2% of Bowling for Rhinos monies raised over the \$160,000 mark each year are set aside exclusively for this grant. In 2013, \$3426.22 was granted to RhiNO Remedy to fund their “Be Powerful” campaign. This educational outreach program was completed in April 2014 with a custom animation and posters geared to promote behavioral change. AAZK has been recognized as the primary sponsor of this project and is recognized on the RhiNO Remedy website. The materials urge potential rhino horn consumers to “Be Powerful” by making the right choice to have a positive impact on rhino conservation. Partner, Chengdu Panda Base (a non-profit research base for giant pandas and other rare animals in the Peoples Republic of China) has made the materials available in their illegal trade exhibits, but will also be widely distributing the materials, particularly in rhino horn consumer countries. The animation link is available on You Tube and electronic versions of the posters are available or Bowling for Rhinos coordinator use via AAZK Online.

RhiNO Remedy is also the recipient of the Bowling for Rhinos Conservation Resource Fund for the 2014 funding cycle. \$6,784.48 will be granted to the organization to support travel for two youth ambassadors from the United Kingdom to attend the World Youth Rhino Summit in South Africa in September of 2014. This First Annual summit is a world-wide call to action to save the rhino from extinction, led by Africa’s young conservation leaders. This gathering of 100 specially selected young conservationists aged 15-17 from around the world will be held in KwaZulu-Natal’s iMfolozi Game Reserve, known internationally for its role in saving the southern white rhino from extinction 100 years ago. The event is managed by a collaboration of lead organizations including: Ezemvelo KZN Wildlife (www.ekznw.co.za), Kingsley Holgate Foundation (www.kingsleyholgate.net) and Project Rhino KZN (www.projectrhinokzn.org). The summit is also supported by more than 18 other conservation organizations and sponsored currently by more than 20 African and Global sponsors and will generate media interest. The American Association of Zoo Keepers has funded this project to ensure that the next generation of conservation leaders’ voices are heard at a global level.

Link for RhiNO Remedy Video: <http://www.youtube.com/watch?v=mJ0XSQTYtp8>

2014 AAZK's BOWLING FOR RHINOS

“Making a Difference with AAZK's Bowling For Rhinos”

*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 over **\$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. 2013 was another record breaking year raising over \$481,000 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. AAZK has made a difference and will continue to do so.

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 \$5 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 12% of Kenyas Black rhino population and 14% of the white rhino population 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! 12 black rhino were moved to the neighboring Borona Conservancy. This was a longtime dream of Lewa staff that finally became reality in 2012. Lewa is now a globally recognized conservation initiative.

Lewa's **core** rhino conservation program has always been the main focus of BFR funding. AAZK contributes about 15 % of the core operating costs 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 Way Kambas since 2006, Bukit Barisan since 2001 and Ujung Kulon in at least 15 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!**

AAZK Working To Halt Demand for Rhino Horn

The 2013 Conservation resource grant supported a new organization, RhiNOremedy that works to put an end to the demand for rhino horn, elephant tusks and other illegal wildlife trade products. See <http://www.rhinoremedy.org/> for more information.

Zaraffas Coffee of Australia Pledges Sponsorship

Zaraffas Coffee of Australia (the "Starbucks of Australia") has pledged to donate \$25,000 annually (beginning 2013) to BFR for Lewa specifically. In addition, proceeds from a conservation coffee of the month will also be contributed. Zaraffas will also be hosting their own BFR events. They are a very conservation and community oriented company that we are pleased to partner with to save wildlife

worldwide. See <http://zarraffas.com/>

Growing BFR Events Over 25 Years

In 1990, we raised \$138,000 from 35 chapters. Today, we have over 70 chapters participating raising over \$481,000 annually. We passed the \$ 5 million mark and entered 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!

2013 BFR Results

In 2013, BFR raised \$481,449 with 76 chapters or institutions participating. This compares to 2012 with \$337,191 raised by 71 chapters or institutions and 2011 with 280,015 raised by 65 chapters.

2014 BFR Results to date

As of the writing of this paper July 4th, chapters were just beginning to turn in funds. The **2014 winners have not been determined** since the deadline for trip winners to turn in funds is September 1st.

The 2013 Top ten Individual money raisers were:

- #1- Mike Bona - Los Angeles with \$35,800-wins **2 week trip to Lewa**-All time record!
- #2- Ann Knutson- San Diego w/ \$24,340 -wins **2 week trip to Lewa**
- #3-Kenton Kerns-National Capital w/ \$15,716 -wins **2 week trip to Indonesia**
- #4-Crystal Butler-Oklahoma City w/ 15,701 **wins 2 week trip to Indonesia**
- #5- Angie Snowie-Southern Ontario w/ \$13,915
- #6- Christina Eastwood-Dallas w/ \$13,766
- #7- Jessica Scallon-Tulsa w/ \$12,200
- #8- Lindsay Ireland-Detroit w/ \$11,700
- #9- Dave Johnson-Rocky Mtn w/ \$9,196
- #10-Patty Pearthree-North Carolina w/ \$4,290

Honorary Trip winner: Jim Haigwood of LA Zoo(won **one week trip to Lewa**)

Chapter award: Portland AAZK has bowled every year since 1990 and has now raised over \$245,000.

The 2013 top 3 money raising AAZK chapters were:

- #1- Los Angeles-\$35,800 (all time record!)
- #2- Utah-\$30,053
- #3-San Diego-\$24,545

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

- 1) Oklahoma City- \$263,248
- 2) Portland-\$ 245,558
- 3) Dallas-\$207,320
- 4) San Diego-\$198,056
- 5) Detroit-\$193,322
- 6) Utah- \$169,924
- 7) Los Angeles- \$166,697
- 8) Philadelphia- \$143,360
- 9) Lincoln Park-\$137,576
- 10) North Carolina- \$132,546

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 2013 Honorary trip winner was Jim Haigwood of the Los Angeles chapter. He started the LA chapter's BFR event in 2009 and has broken all records since then by being the top money raising chapter every year. He and a companion will be hosted by Lewa on their adventure to be first hand observers of the wildlife that benefits from Jim's hard work and dedication.

The 2014 Honorary trip winner is Laura McGlothlin of the Columbus Zoo. Laura revived the Columbus Chapter's BFR event soon after she began working in Columbus. She has been the main event organizer for the past 14 years and their BFR event is growing every year again. Laura and a companion will be hosted by Lewa in October 2015. Thank you Laura for your years of dedication to making BFR successful!

Trip winners have won trips with as little as \$850 (1995) to as much as \$35,800 in 2013. Trip winners have been from 16 DIFFERENT zoos. If we include the honorary trip, that number would be 19 DIFFERENT zoos!

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

See Table 1 for a comparison of events over the years.

See Table 2 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)
- Invite Blue Rhino Gas folks in your area to join your event (they might even sponsor)
- Invite 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.

Table 1 AAZK BFR Comparison of Funds Raised Year to Year

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	\$12,201	Oklahoma	Oklahoma	\$12,201

			Christensen Tim Hays	\$6,816	City Rolling Hills	City	
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 McFarland Jason Peterson	\$13,593 \$11,500	Oklahoma City Hogle	Puget Sound	\$16,462
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 Gil Myers Logan Agan	\$35,500 \$13,901 \$10,817 \$9,589	Los Angeles Dallas National Capital Oklahoma City	Los Angeles	\$35,500

2013	\$481,449	76	Mike Bona ** Ann Knutson Kenton Kerns Crystal Butler	\$35,800 \$24,340 \$15,716 \$15,701	Los Angeles San Diego National Capital Oklahoma City	Los Angeles	\$35,800
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****bold indicates record amount raised**

*Third place won trip this year as each winner can only win once.

Table 2 AAZK BFR Distribution of Funds Year to Year

Year	LWC	Indonesian Programs		ACK	AAZK Conserva- tion
		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	\$249,781	\$0	\$207,745	\$19,138	\$4,784
2014		\$0			
Total	\$3,203,768	\$403,305	\$1,043,523	\$56,701	\$14,174

Toward a World Rhino Vision 2020

**Bill Konstant, Program Officer
International Rhino Foundation**

An official “World Rhino Vision 2020” has yet to be compiled by the international wildlife conservation community. However, any strategy of this nature would have to address some very basic issues, including the degree to which the threats and logistics differ for each of the world’s five remaining rhino species. The American Association of Zookeepers (AAZK) is committed to the survival of all rhino species and contributes to this international effort largely through its annual Bowling for Rhinos fundraising activities.

According to AAZK, “The rhino is a large, flagship species. By striving to save the rhino, we save large expanses of habitat. By saving these habitats, we are saving many endangered species, not just the rhino.” This vision transforms what might otherwise be perceived as a single-species approach to a much broader biodiversity conservation strategy. A careful look at the programs and projects supported by AAZK confirms that the Association already is making a significant contribution to biodiversity conservation by using rhinos as flagship species, and that additional opportunities exist to expand that effort in the years ahead.

Conservation Status of the Five Rhino Species

Living members of the Family Rhinocerotidae represent four genera, five species and eight subspecies, two of which exist in such low numbers that they are very likely past the point of no return. Two two-horned genera, *Ceratotherium* and *Diceros*, inhabit Africa and two genera, *Rhinoceros* (one-horned) and *Dicerorhinus* (two-horned) inhabit Asia. The genus *Rhinoceros* contains two species, *unicornis* and *sondaicus*, while the other three genera contain a single species each.

White Rhino

Africa’s southern white rhino (*Ceratotherium simum simum*) has the largest wild population of any living rhino species, numbering an estimated 20,000 or more animals in nine countries (South Africa, Namibia, Kenya, Zimbabwe, Botswana, Swaziland, Zambia, Uganda and Mozambique), including populations that have been introduced to areas outside the species’ historic range. Several hundred southern white rhinos are also maintained in zoological parks and special breeding centers internationally. By comparison, the northern white rhino (*C. s. cottoni*), was extirpated in its original Central African range and is now represented by only four individuals in Kenya’s Ol Pejeta Conservancy and several others in one North American and one European facility. In terms of significant biological diversity, Africa’s white rhinos represent the Maputaland-Pondoland-Albany Hotspot, an endangered terrestrial ecoregion of southern Africa, as well as four major Wilderness Areas - the Kalahari Desert, Okavango, Miombo Mopane Woodlands and Grasslands, and Serengeti.

The species *Ceratotherium simum* is currently considered Near Threatened according to the IUCN Red List of Threatened Species. The white rhino’s story is one of the world’s most incredible comebacks in the history of wildlife conservation. Down to an estimated low of perhaps one hundred animals or less in South Africa in the late 1800s, white rhino numbers have multiplied by two orders of magnitude over the course of a century, largely due to increased protection, the re-establishment of populations in former habitats, and the introduction of populations to suitable habitats outside the species’ original range. The IUCN African Rhino Specialist Group has identified a number of Key 1 white rhino populations (100

animals or more) in Namibia, South Africa and Zimbabwe, an indication of their importance in the long-term conservation effort for this species. Although total population numbers have grown steadily throughout the white rhino's comeback, the current poaching crisis threatens to halt that growth, and overall numbers may soon begin to decline as deaths surpass births.

Black Rhino

In total, black rhinos (*Diceros bicornis*) number just over 5,000 animals in nine countries (South Africa, Namibia, Kenya, Zimbabwe, Tanzania, Zambia, Malawi, Swaziland and Botswana). The southwestern black rhino, *Diceros b. bicornis*, numbers just under two thousand animals in the wild and is known from only two countries, Namibia, which holds more than three-quarters of the population, and South Africa. It was recently extirpated in Angola and is currently not maintained in captivity. The eastern black rhino, *D. b. michaeli*, numbers approximately 800 animals in the wild. Three-fourths of the population is found in Kenya, with smaller populations in Tanzania and South Africa. This subspecies is well represented in *ex situ* managed breeding programs. Most numerous of the black rhino subspecies is the southern-central form, *D. b. minor*, which numbers more than two thousand animals in South Africa, Zimbabwe, Tanzania, Zambia, Malawi, Swaziland, and Botswana. A fourth subspecies, *D. b. longipes*, was recently driven to extinction in West Africa, the last known individual being reported in Cameroon in 2006. In terms of biological diversity, black rhinos represent the same Hotspots and Wilderness Areas as are white rhinos, serving as flagship species for dozens of other threatened vertebrates.

Diceros bicornis is considered Critically Endangered according to the IUCN Red List of Threatened Species. At one time it may have been the most abundant rhino species, with total population estimates in the mid-1900s ranging from 65,000 to 100,000 across much of Sub-Saharan Africa. However, ruthless slaughter over the second half of the 20th century reduced numbers to around 2,500 individuals in the early 1990s. At that point, targeted conservation actions were taken, including those supported by the newly-established International Rhino Foundation, with the result that numbers have essentially doubled over the last two decades. Like their white rhino cousins, Africa's black rhinos are highly threatened by the recent increases in poaching for horn. The IUCN African Rhino Specialist Group has identified at least 10 Key I populations in Namibia, South Africa, Zimbabwe and Kenya, including the Ol Pejeta Conservancy, which receives Bowling for Rhinos support in conjunction with the Lewa Wildlife Conservancy. Other threatened vertebrates found in this region are listed in Appendix 1.

Greater One-horned Rhino

Asia's greater one-horned rhino (*Rhinoceros unicornis*) is found in only two countries, India and Nepal, and is often referred to as the Indian rhinoceros. Current population estimates exceed 3,300 individuals, with approximately 80% of the animals inhabiting seven national parks and wildlife sanctuaries in northeastern India, and the rest found in three protected areas in Nepal. The species' range largely coincides with the Himalayan Hotspot.

Rhinoceros unicornis is considered Vulnerable according to the IUCN Red List of Threatened Species. Its story bears significant resemblance to that of the southern white rhino. The total population was reduced to perhaps 100-200 animals at the turn of the 20th century, partly due to habitat loss, but also to uncontrolled hunting. Protective measures have helped build back numbers in both India and Nepal. An ambitious program, Indian Rhino Vision 2020, has set a goal of increasing the number of rhinos in the state of Assam from approximately 2,500 to 3,000 by the year 2020. This will be accomplished by translocating rhinos from populations that are approaching or exceeding carrying capacity (e.g., Pobitora Wildlife Sanctuary, Kaziranga National Park) to other areas within the species' former range from which rhinos have been extirpated (e.g., Manas National Park, Burachapori Wildlife Sanctuary), but where they now can be better protected. This strategy is proving successful thus far, with rhinos having been re-

established in Manas National Park. At least two dozen rhinos have been translocated since the program was initiated, and 10 calves have been born since September 2012. However, poaching also re-emerged as a threat, with seven animals killed since October 2011. Low levels of poaching have also recorded in other protected areas of Assam during this same time frame, during which neighboring Nepal lost only a handful of rhinos to poachers.

Javan Rhino

The other member of the genus *Rhinoceros*, the Javan rhino, *R. sondaicus*, is the rarest of the world's rhino species. It once ranged from the foothills of the Himalayas, throughout much of mainland Southeast Asia, including Bangladesh, Myanmar, Thailand, Cambodia, Vietnam, Lao PDR and Malaysia, and onto the Indonesian islands of Sumatra and Java. The two former Asian mainland subspecies, *R. s. inermis* and *R. s. annamiticus*, are now extinct, the former probably by the mid-1900s and the last known individual of the latter being killed in Vietnam by poachers in 2010. The last *R. s. sondaicus* on Sumatra were probably killed in the 1930s. Ujung Kulon National Park, located on the extreme western tip of Java, is the species' final stronghold. Approximately 50 animals are believed to remain, this population having survived centuries of hunting and one of the world's greatest natural disasters – the 1883 eruption of Krakatau – which flooded much of western Java. No Javan rhinos are maintained in captivity.

The last remaining Javan rhino population resides squarely within the Sundaland Hotspot, which is extremely rich in vertebrate diversity. Javan rhinos share critical lowland tropical forest habitat with at least 25 other threatened terrestrial vertebrates including three amphibians, two reptiles, six birds and 14 other mammals (Appendix 2). In addition to national park personnel, the forests and wildlife of Ujung Kulon are protected by Rhino Protection Units (RPUs) managed by the Rhino Foundation of Indonesia (Yayasan Badak Indonesia or YABI), which receives the bulk of its support from the International Rhino Foundation, with a significant percentage provided by AAZK's Bowling for Rhinos annual fundraising efforts. Four 4-man RPUs currently patrol Ujung Kulon, where these units have maintained a zero-rhino-poaching record since the late 1990s.

Given its extremely small population, the Javan rhino is listed as Critically Endangered by the IUCN. Although anti-poaching efforts have been highly successful, with no reported rhino deaths due to poaching recorded this century, biologists believe that the extent of suitable habitat within the national park may be a significant factor limiting population growth. As a result, an ambitious program is now underway to restore suitable habitat within the park's newly-created Javan Rhino Science and Conservation Area (JRSCA), a 4,000-hectare forest tract where an invasive palm species is being cleared to allow the regrowth of rhino food plants. This project is expected to expand rhino ranges within the national park and increase the carrying capacity for this species. Based on anticipated population growth, surplus animals from Ujung Kulon eventually could be translocated to secondary sites within the species former range, perhaps elsewhere on Java or even on neighboring Sumatra.

Sumatran Rhino

Like the Javan rhino, the Sumatran rhino, *Dicerorhinus sumatrensis*, once roamed across an extensive historic range. The two species, in fact, may have coexisted in a number of areas on mainland Asia and on the island of Sumatra. *D. s. lasiotis* formerly occurred in India, Bhutan, Bangladesh, and Myanmar. While the subspecies may be extinct, unconfirmed reports of its existence in Myanmar persist. The Bornean subspecies, *D. s. harrisoni*, still exists in Sabah, Malaysia and Kalimantan, Indonesia, but in very low numbers in what are considered non-viable populations. *D. s. sumatrensis* formerly occurred in Thailand and Peninsular Malaysia, but is now restricted to three isolated Sumatran populations – Gunung

Leuser National Park in northern Sumatra's mountainous Leuser Ecosystem, and Bukit Barisan Selatan National Park and Way Kambas National Park in southern Sumatra. In total, the wild Sumatran rhino population is now believed to be no more than 100 individuals, representing a significant decline over the past few decades and warranting its Critically Endangered status on the IUCN Red List of Threatened Species. The three Sumatran national parks in which the species remains also harbor a significant number of other threatened terrestrial vertebrates including at least one amphibian, one reptile, 13 birds and 26 other mammals (Appendix 3).

In addition to national park personnel, seven RPUs currently operate in Bukit Barisan Selatan National Park and five more units are employed in Way Kambas National Park, both with support from AAZK's Bowling for Rhinos program. There is also a need for similar efforts in Gunung Leuser. The last recorded rhino poaching incidents in Bukit Barisan Selatan and Way Kambas occurred in 2002 and 2006, respectively, which demonstrate the effectiveness of these protection efforts.

Way Kambas National Park is also home to the 100-hectare Sumatran Rhino Sanctuary, which currently houses five animals, a proven breeding pair, their male offspring, and two mature wild-caught females. Another adult male is currently held at the Cincinnati Zoo and three non-breeding adult animals are maintained at a special facility in Sabah, Malaysia. The majority of these animals potentially factor into a meta-population survival strategy for Sumatran rhinos.

Expanding AAZK's Rhino Conservation Role

Rhino specialists seem to agree that a net annual population increase of at least 3%-5% will be necessary to ensure the survival of the world's five rhino species. This is presently the case for the black and greater one-horned rhinos, and may also be found to be true for the Javan rhino, once estimates from ongoing camera-trap studies are confirmed. Unfortunately, the Sumatran rhino population appears to have declined significantly over the past decade, such that increases projected only a few years ago will not be realized. Also very likely is that white rhino numbers will finally plateau or begin to decline this year as a result of the unrelenting poaching in southern Africa. As a result, efforts to halt current declines must first meet with success before there is any hope of rebuilding wild populations.

Through Bowling for Rhinos, AAZK has been involved in the survival of all five of the world's five rhino species, both in Africa and Asia. In the case of the Javan and Sumatran rhinos, in fact, AAZK-supported protection efforts continue to target roughly 65% of the Sumatran rhino's and 100% of the Javan rhino's remaining world populations. These efforts also benefit dozens of other threatened vertebrate species, including several other charismatic mega-vertebrates such as the Sumatran elephant, Sumatran tiger and Javan leopard.

To ensure the survival of the Sumatran rhino, RPU programs similar to those now operating in Bukit Barisan Selatan National Park and Way Kambas National Park are also being implemented in northern Sumatra's Gunung Leuser National Park. This will not only benefit the resident Sumatran rhino population, but will also add several other threatened species to the list of those receiving protection, including the Sumatran orangutan. Maintaining the zero-rhino-poaching performance of the Bukit Barisan Selatan and Way Kambas RPUs is the highest priority, which may require more "boots on the ground" should rhino ranges and populations expand as hoped, and having a functional program in place in Gunung Leuser in the next 2 years is a reasonable expectation.

In Ujung Kulon National Park, additional RPUs may very well be required over the short-term as the Javan rhino population expands into reclaimed habitat, especially in areas that border large human populations. Searches for habitat suitable to hold a second Javan rhino population are now being planned,

and it will take a number of years before population growth provides a surplus of animals sufficient to support a translocation initiative.

There are excellent opportunities for AAZK to become more directly involved in expanding greater one-horned rhino populations, particularly under the auspices of Assam's Indian Rhino Vision 2020 program. Beefing up the anti-poaching program in Manas National Park will help ensure the success of reintroduction efforts to date, as will support for building community benefits from the rhino's presence in surrounding communities. In addition, security programs and community-based initiatives will be critical to the success of future reintroductions to protected areas where the species formerly occurred, including the Burachapori Wildlife Sanctuary and Dibru Saikhowa National Park. In addition to greater one-horned rhinos, wildlife protection efforts in this region benefit at least 35 other threatened terrestrial vertebrates including two critically endangered vulture species and the pygmy hog (Appendix 4).

As stated earlier, the Lewa Wildlife Conservancy holds one of the most important black rhino populations in eastern Africa, and AAZK's continued support for its operations is critical, especially as it relates to regional wildlife collaborations in Kenya's Laikipia District. Collaborations with the Ol Pejeta Conservancy, Borana Ranch and community-owned Sera Conservancy will help to expand black rhino numbers, while those with organizations such as the Northern Rangelands Trust target endangered species such as Grevy's zebra. Should there be opportunity for AAZK to expand its support for black rhino conservation efforts beyond this region, consideration might be given to programs that target Key 1 populations of the southern and southwestern black rhino subspecies in Zimbabwe, South Africa or Namibia.

AAZK support for white rhino conservation efforts is directed to the Lewa Wildlife Conservancy and combined with that for black rhinos. Similarly, should there be opportunities for expansion, consideration might be given to direct involvement with high priority populations in southern Africa. For example, Zimbabwe's Bulyebe Valley Conservancy harbors significant populations of both white and black rhinos and would benefit significantly from increased support of monitoring and protection efforts.

In 2014, AAZK will reach an important milestone, having raised a total of \$5 million for rhino conservation since the inception of Bowling for Rhinos. It's also highly likely that Bowling for Rhinos events this year will surpass the \$500,000 annual goal set several years ago, posing the question of how the continued success and growth of these efforts can best benefit biodiversity conservation efforts in coming years, using rhinos as flagship species. In truth, AAZK need not look any further than its iconic rhino program to save species. By conserving and protecting rhinos, AAZK can save a myriad of other species, and benefit people as well. Hopefully, this review will help formulate an appropriate vision toward that aim.

Appendix 1: Threatened Terrestrial Vertebrates of the Lewa Wildlife Conservancy

Birds

Scientific Name	Common English Name	Assessment
<i>Polemaetus bellicosus</i>	Martial eagle	Vulnerable
<i>Sagittarius serpentarius</i>	Secretary bird	Vulnerable
<i>Torgos tracheliotos</i>	Lappet-faced vulture	Vulnerable
<i>Trionoceph occipitalis</i>	White-headed vulture	Vulnerable
<i>Balearica regalarum</i>	Grey crowned crane	Endangered
<i>Gyps africanus</i>	White-backed vulture	Endangered
<i>Gyps ruppelli</i>	Ruppell's vulture	Endangered
<i>Necrosyrtes monachus</i>	Hooded vulture	Endangered

Mammals

Scientific Name	Common English Name	Assessment
<i>Acinonyx jubatus</i>	Cheetah	Vulnerable
<i>Hippopotamus amphibius</i>	Hippopotamus	Vulnerable
<i>Loxodonta africana</i>	African elephant	Vulnerable
<i>Panthera leo</i>	African lion	Vulnerable
<i>Equus grevyi</i>	Grevy's zebra	Endangered
<i>Lycaon pictus</i>	African wild dog	Endangered
<i>Diceros bicornis</i>	Black rhino	Critically Endangered

Appendix 2: Threatened Terrestrial Vertebrates of Ujung Kulon National Park

Amphibians

Scientific Name	Common English Name	Assessment
<i>Huia masonii</i>	Javan torrent frog	Vulnerable
<i>Kalophrynus minusculus</i>		Vulnerable
<i>Limnonectes macrodon</i>	Fanged River frog	Vulnerable

Reptiles

Scientific Name	Common English Name	Assessment
<i>Ophiophagus hannah</i>	King cobra	Vulnerable
<i>Python bivittatus</i>	Burmese python	Vulnerable

Birds

Scientific Name	Common English Name	Assessment
<i>Centropus nigrorufus</i>	Javan coucal	Vulnerable
<i>Leptoptilos javanicus</i>	Lesser adjutant	Vulnerable
<i>Lophura erythrophthalma</i>	Crestless fireback	Vulnerable
<i>Mulleripicus pulverulentus</i>	Great slaty woodpecker	Vulnerable
<i>Pavo muticus</i>	Green peafowl	Endangered
<i>Sturnus melanopterus</i>	Black-winged starling	Critically Endangered

Mammals

Scientific Name	Common English Name	Assessment
<i>Aonyx cinerea</i>	Asian small-clawed otter	Vulnerable
<i>Arctictis binturong</i>	Binturong	Vulnerable
<i>Lutrogale perspicillata</i>	Smooth-coated otter	Vulnerable
<i>Niviventer cremoriventer</i>	Dark-tailed tree rat	Vulnerable
<i>Nycteris javanica</i>	Javan slit-faced bat	Vulnerable
<i>Rusa timorensis</i>	Javan deer	Vulnerable
<i>Trachypithecus auratus</i>	Javan leaf monkey	Vulnerable
<i>Bos javanicus</i>	Javan banteng	Endangered
<i>Cuon alpinus</i>	Dhole	Endangered
<i>Hylobates moloch</i>	Silvery gibbon	Endangered
<i>Manis javanica</i>	Malayan pangolin	Endangered
<i>Nycticebus javanicus</i>	Javan slow loris	Endangered
<i>Presbytis comata</i>	Javan surili	Endangered
<i>Panthera pardus melas</i>	Javan leopard	Critically Endangered
<i>Rhinoceros sondaicus</i>	Javan rhinoceros	Critically Endangered

Appendix 3: Threatened Terrestrial Vertebrates of Bukit Barisan Selatan and Way Kambas National Parks, Sumatra

Scientific Name	Common English Name	Assessment	Bukit Barisan	Gunung Leuser	Way Kambas
Amphibians					
<i>Limnonectes macrodon</i>	Fanged River frog	Vulnerable			1
Reptiles					
<i>Oligodon pulcherrimus</i>		Vulnerable		1	
<i>Ophiophagus hannah</i>	King cobra	Vulnerable	1	1	1
Birds					
<i>Alcedo euryzona</i>	Blue-banded kingfisher	Vulnerable	1	?	1
<i>Caprimulgus concretus</i>	Sunda nightjar	Vulnerable	1	?	1
<i>Centropus rectunguis</i>	Short-toed coucal	Vulnerable	1	?	1
<i>Cochoa beccarii</i>	Sumatran cochoa	Vulnerable		1	
<i>Cyornis caerulatus</i>	Sunda blue flycatcher	Vulnerable	1	?	1
<i>Garrulax bicolor</i>	Sumatran laughingthrush	Vulnerable	?	1	
<i>Leptoptilos javanicus</i>	Lesser adjutant	Vulnerable	?		1
<i>Lophura erythrophthalma</i>	Crestless fireback	Vulnerable	1	?	1
<i>Lophura hoogerwerfi</i>	Aceh pheasant	Vulnerable		1	
<i>Lophura inornata</i>	Salvadori's pheasant	Vulnerable	1		?
<i>Melanoperdix niger</i>	Black partridge	Vulnerable	1	?	1
<i>Nisaetus nanus</i>	Wallace's hawk-eagle	Vulnerable	1	?	1
<i>Pitta schneideri</i>	Schneider's pitta	Vulnerable		1	
<i>Pitta venusta</i>	Black-crowned pitta	Vulnerable	?	?	?
<i>Pycnonotus zeylanicus</i>	Straw-crowned bulbul	Vulnerable	?	?	
<i>Tringa guttifer</i>	Nordmann's greenshank	Endangered		?	1
<i>Cairina scutulata</i>	White-winged wood duck	Endangered	1	1	1
<i>Ciconia stormi</i>	Storm's stork	Endangered	1	?	1
<i>Carpococcyx viridis</i>	Sumatran ground cuckoo	Critically Endangered	1		
<i>Cyornis ruckii</i>	Rueck's blue flycatcher	Critically Endangered		?	

Mammals

Scientific Name	Common English Name	Assessment	Bukit Barisan	Gunung Leuser	Way Kambas
<i>Aonyx cinerea</i>	Asian small-clawed otter	Vulnerable	1	1	1
<i>Arctictis binturong</i>	Binturong	Vulnerable	1	1	1
<i>Capricornis sumatraensis</i>	Sumatran serow	Vulnerable	1	1	
<i>Dyacopterus brooksi</i>	Brook's Dyak fruit bat	Vulnerable	1	1	1
<i>Helarctos malayanus</i>	Malayan sun bear	Vulnerable	1	1	1
<i>Hemigalus derbyanus</i>	Banded civet	Vulnerable	1	1	1
<i>Lutrogale perspicillata</i>	Smooth-coated otter	Vulnerable	1	1	1
<i>Macaca nemestrina</i>	Pig-tailed macaque	Vulnerable	1	1	1
<i>Maxomys rajah</i>	Rajah spiny rat	Vulnerable	1	1	1
<i>Maxomys whiteheadi</i>	Whitehead's spiny rat	Vulnerable	1	1	1
<i>Neofelis diardi</i>	Sunda clouded leopard	Vulnerable	1	1	
<i>Nesolagus netscheri</i>	Sumatran striped rabbit	Vulnerable	1	1	
<i>Niviventer cremoriventer</i>	Dark-tailed tree rat	Vulnerable	?	?	1
<i>Nycticebus coucang</i>	Greater slow loris	Vulnerable	1	1	1
<i>Pardofelis marmorata</i>	Marbled cat	Vulnerable	?	1	
<i>Petinomys genibarbis</i>	Whiskered flying squirrel	Vulnerable	1	1	1
<i>Petinomys setosus</i>	Temminck's flying squirrel	Vulnerable	1	1	1
<i>Presbytis thomasi</i>	Thomas's langur	Vulnerable		1	
<i>Rattus hoogerwerfi</i>	Hoogerwerf's rat	Vulnerable		1	
<i>Rusa unicolor</i>	Sambar	Vulnerable	1	1	1
<i>Tarsius bancanus</i>	Horsfield's tarsier	Vulnerable	1		1
<i>Cuon alpinus</i>	Dhole	Endangered	1	1	
<i>Cynogale bennettii</i>	Sunda otter civet	Endangered	1	?	1
<i>Hylobates agilis</i>	Agile gibbon	Endangered	1		1
<i>Hylobates lar</i>	White-handed gibbon	Endangered		1	
<i>Manis javanica</i>	Malayan pangolin	Endangered	1	1	1
<i>Pteromyscus pulverulentus</i>	Smoky flying squirrel	Endangered	1	1	1
<i>Symphalangus syndactylus</i>	Siamang	Endangered	1	1	1
<i>Tapirus indicus</i>	Malayan tapir	Endangered	1		1
<i>Dicerorhinus s. sumatrensis</i>	Sumatran rhinoceros	Critically Endangered	1	1	1
<i>Elephas maximus sumatrensis</i>	Sumatran elephant	Critically Endangered	1	1	1
<i>Panthera tigris sumatrensis</i>	Sumatran tiger	Critically Endangered	1	1	1
<i>Pongo abelii</i>	Sumatran orangutan	Critically Endangered		1	

Appendix 4: Threatened Terrestrial Vertebrates of Assam, northeastern India

Amphibians

Scientific Name	Common English Name	Assessment
<i>Occidozyga borealis</i>	Northern frog	Vulnerable

Reptiles

Scientific Name	Common English Name	Assessment
<i>Nilssononia hurum</i>	Indian peacock softshell turtle	Vulnerable
<i>Python bivittatus</i>	Burmese python	Vulnerable

Birds

Scientific Name	Common English Name	Assessment
<i>Aquila clanga</i>	Greater spotted eagle	Vulnerable
<i>Aquila hastata</i>	Indian spotted eagle	Vulnerable
<i>Chaetornis striata</i>	Bristled grassbird	Vulnerable
<i>Chrysomma altirostre</i>	Jerdon's babbler	Vulnerable
<i>Emberiza aureola</i>	Yellow-breasted bunting	Vulnerable
<i>Francolinus gularis</i>	Swamp francolin	Vulnerable
<i>Grus antigone</i>	Sarus crane	Vulnerable
<i>Haliaeetus leucoryphus</i>	Pallas' fish eagle	Vulnerable
<i>Mulleripicus pulverulentus</i>	Great slaty woodpecker	Vulnerable
<i>Ploceus megarhynchus</i>	Yellow weaver	Vulnerable
<i>Turdoides longirostris</i>	Slender-billed babbler	Vulnerable
<i>Leptoptilos dubius</i>	Greater adjutant	Endangered
<i>Gyps bengalensis</i>	Asian white-backed vulture	Critically Endangered
<i>Gyps tenuirostris</i>	Slender-billed vulture	Critically Endangered
<i>Houbaropsis bengalensis</i>	Bengal florican	Critically Endangered

Mammals

Scientific Name	Common English Name	Assessment
<i>Aonyx cinerea</i>	Asian small-clawed otter	Vulnerable
<i>Arctictis binturong</i>	Binturong	Vulnerable
<i>Bos gaurus</i>	Gaur	Vulnerable
<i>Lutrogale perspicillata</i>	Smooth-coated otter	Vulnerable
<i>Melursus ursinus</i>	Sloth bear	Vulnerable
<i>Neofelis nebulosa</i>	Clouded leopard	Vulnerable
<i>Nycticebus bengalensis</i>	Bengal slow loris	Vulnerable
<i>Pardofelis marmorata</i>	Marbled cat	Vulnerable
<i>Rhinoceros unicornis</i>	Indian rhino	Vulnerable
<i>Rucervus duvaucelii</i>	Barasingha	Vulnerable
<i>Ursus thibetanus</i>	Himalayan bear	Vulnerable
<i>Axis porcinus</i>	Hog deer	Endangered
<i>Caprolagus hispidus</i>	Hispid hare	Endangered
<i>Elephas maximus</i>	Asian elephant	Endangered
<i>Panthera tigris tigris</i>	Bengal tiger	Endangered
<i>Trachypithecus geei</i>	Golden langur	Endangered
<i>Trachypithecus pileatus tenebricus</i>	Capped langur	Endangered
<i>Porcula salvania</i>	Pygmy hog	Critically Endangered

A Milestone in Conservation and Husbandry: The Ron Goellner Center for Hellbender Conservation

Chawna Schuette

Senior Hellbender Keeper/Herpetarium Keeper

Saint Louis Zoo

Saint Louis, Missouri

In 2004, the Saint Louis Zoo established the WildCare Institute as a means to “connect our work at home to conservation in the wild”. The desire to help hellbenders began simply enough, with the passion of one man and his desire to see this animal preserved and thriving in its natural environment of the Ozark rivers he had always loved. Ron Goellner, the center’s name sake, chose this species as one he felt needed help and with our long established relationship between the Zoo and the Missouri Department of Conservation (MDC) it was a natural fit for a partnership. His goal was to help conserve the species in Missouri and to provide long term support for the declining populations through the establishment a captive breeding facility at the Zoo. This was later identified as one of the most key needs for the species survival (PHVA, 2006). Ron Goellner passed away in 2006 and never got to see the Center achieve the goals he and the Saint Louis Zoo had envisioned. We are very glad to have been able to continue this important effort and know that he would be proud of all that has been accomplished. The Center has three main goals. Our primary goal was to reproduce the Ozark hellbender (*Cryptobranchus alleganiensis bishopi*) in captivity, a feat that had never been in a captive setting. The species has high fecundity, so we knew that if we were successful in getting them to breed that numbers of hellbenders would increase rapidly. The second goal was to head start hellbenders for an augmentation effort in partnership with the MDC designed to bolster the population. Lastly, we wanted to document all data and use it to improve our husbandry techniques which supports the first two goals as well as assists United States Fish and Wildlife Services (USFWS) and MDC with their goals by sharing the knowledge we gain and assisting in their conservation efforts.

The hellbender is a large aquatic salamander, endemic to spring fed North American rivers and streams. Missouri is the only state with both species of hellbender. The Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) lives in many of our North flowing rivers in Missouri and the Ozark hellbenders in our South flowing rivers. The two subspecies do not occur in the same river drainages in Missouri. The geographic range of the Eastern hellbender ranges from New York and extends down through West Virginia and Pennsylvania into Southern Georgia, and west into Missouri. The Ozark hellbender has a small restricted distribution into southern Missouri and adjacent into Northern Arkansas. The hellbender is a wonderful indicator of environmental health and a modern day “canary in the coal mine” that continues to teach us many things about our water quality and ecological health. In 2003, after an analysis of 20+ years of data on Ozark hellbenders, it was discovered that there had been

an approximate 77% drop in population numbers (Wheeler et al. 2003) putting the subspecies in grave danger of extinction by 2027 (PHVA, 2006). While no single factor has been identified as the cause of the decline, it appears there are several factors working in tandem, including habitat alteration and degradation, water quality degradation, disease, illegal harvest, human disturbances, and predation by non-native fish (USFWS 2011). The Ozark hellbender was federally listed on Nov 7, 2011 (USFWS 2011).

As of 2005, the zoo housed approximately 150 Ozark hellbenders and about 20 Eastern hellbenders. The majority of these hellbenders originated from a few clutches collected under permit by Missouri State University (MSU) in 2002 under an MDC Wildlife Collectors Permit. The larvae had been raised at the Zoo since June of 2003 after being transferred from MSU to the Saint Louis Zoo at six months of age. The Ozark hellbender larvae were being raised for an augmentation study spearheaded by the MDC (Bodinof et al. 2012, Copeia 2012 (1): (150-159)) to help determine the viability of head-starting as part of the recovery plan for the Ozark hellbender. Through release of 36 animals implanted with radio transmitters biologists tracked their movements and were able to determine if the captive reared juveniles adapted to their new environment and were able to find adequate food, handle the exposure to potential pathogens in the environment, avoid predators, and adapt to stochastic events in the environment. If the results of the augmentation study were positive, this would suggest that head starting was a viable option to help bolster the declining population. Augmentation would also allow us to better understand what factors are contributing to the population decline.

In 2004, the zoo also began efforts toward breeding Ozark hellbenders by constructing an indoor stream in the basement of the Charles H. Hoessle Herpetarium and collecting specimens under and MDC issued Wildlife Collectors Permit issued by MDC. In order to replicate the environmental conditions as closely as possible for the specific river drainage where the breeding stock originated we assembled data on water flow, rain fall, photoperiod, temperature, water quality, and provided natural food items, social opportunities, and appropriate rock and substrate for hiding. The indoor stream was thirty-two feet long and four feet wide with a whirlpool design that cut the stream length wise which allows for nearly double the space that could be occupied. Early efforts to breed the hellbenders were unsuccessful. After making some changes that allowed a different dynamic with more males and fewer females, making daily average temperature adjustments in coordination with the river of origin, and what was thought to be appropriate rock cover, we had our first successful oviposition event in 2007. This was accomplished without any hormone injections and using only natural environmental changes. Males showed interest in the females and there were significant observations of male-male aggressive behavior as well as probably reproductive behavior was observed. After much review of the events, it became clear there were too many access points to the "nest rocks" and that even if eggs were fertilized, the male would not be able to guard the nest from other hellbenders, or predatory fish and crayfish. Over the next few years we modified the nest rocks, added hide boxes, adjusted water flow, photoperiod, temperature settings, and the dynamics of

the social group based on information from the wild populations as well as anecdotal observations from the captive population.

During the years of trials and tribulations, we had to remind ourselves that we were making good progress each year and that success wouldn't happen overnight. Above all else, we were attempting something that hadn't been achieved before. From 2007 to 2010, eggs were laid by females every year at times consistent with oviposition in the wild. Ovipositions were studied and improvements were made based upon what we learned. Through varying attempts to alter the environment and make it more suitable, we buried the large cover/nest rocks, provided bigger rocks, and adjusted the social structure to provide more males to females to select at an approximate ration of 6:4 (male to female). We also made a few attempts at artificial fertilization when circumstances seemed most viable. We were able to use hormones to induce oviposition in 2010 and the resulting eggs were used for attempted artificial fertilization. However, it appeared that sperm quality was our issue. In addition to trying to find the key to successful reproduction, the hellbenders continued to challenge us with new health issues and new behaviors previously not observed, and by enlightening us with information you can only learn by observing animals 24 hrs a day. We worked diligently to turn each unsuccessful breeding year into a learning experience and build on what we had learned in the hopes of eventually achieving our first captive breeding. We began to look closer at a few key factors that we thought would help us reach our goal.

Although we had a considerable amount of knowledge about salamanders, we weren't having any luck breeding this particular species. As a result, we started thinking about how hellbenders are different from other salamanders and if that might play a role. Unlike many salamanders, hellbenders don't have internal fertilization, but instead breed like fish with the males spraying milt over the eggs after the female has deposited them. They also have sperm that is activated in water and a limited time window to fertilize the eggs. Once the eggs are laid they must be fertilized within approximately 4 hours (Smith 1912) before they begin to fill with water and become too turgid for sperm to penetrate. Hellbenders lay many eggs and will eat their own eggs as well as those of other hellbenders. Breeding takes place during a limited time period between late September and late October. Males defend the nest from other hellbenders and other predators. In addition to providing protection, the rocking action of males helps increase oxygenation around the eggs. These were all factors we had to consider when modifying our plan. In 2007, we installed cameras that allowed us to observe behaviors and study the hellbenders using an ethogram. We were able to quantify behaviors as typical or atypical, aggressive, or reproductive. We hoped that by looking at their behavior, even from an anecdotal standpoint, that we would be able to draw conclusions about when to expect oviposition as well as allow us to capture breeding events that could later be studied at greater length (Schuette, unpublished data). Zoo staff watched cameras overnight, to ensure egg laying events wouldn't be missed and that we would be there to intervene if animals started eating eggs or if there was a need to attempt artificial fertilization.

There were a few key areas we focused on to further encourage the hellbenders to breed. We felt that our environmental cycling was working, but that we needed to take a harder look at the male side of the reproductive equation (i.e. sperm) along with water quality and how the two relate to each other. We also needed to evaluate the male's ability to defend and protect its eggs from other hellbenders. Documentation, via camera recordings as well as in person, had been made of hellbenders not involved in the breeding sneaking under the breeding rock and eating eggs. We felt this was something that needed to change in order to achieve success.

To take a better understand the water quality from the rivers where our hellbender breeding stock originated, we compared the historic values from the literature to samples we had collected from the wild. We discovered that the Total Dissolved Solids (TDS), both historic and current, did not correlate with those of our water supply. After evaluating sperm in 2009 and 2010, we knew that we had sperm quality issues to contend with as well. Only 20% of our hellbenders were producing sperm and of those, motility was between 5 and 10%. The situation looked bleak, but as we investigated how water quality affects teleost fish sperm we discovered that higher osmolality had an adverse impact (Shoenfuss et al., 2008). We expected and found a marked decline in activation and motility in sperm suspended in treated wastewater effluent solution that had increasing osmolality (Morisawa 1994; Billard et al. 1995; Krasznai et al. 1995, 2000). We expected and found a marked decline in activation and motility in sperm suspended in treated wastewater effluent solutions with increasing osmolality has an inverse relationship with sperm motility and velocity (Morisawa 1994; Billard et al. 1995; Krasznai et al. 1995, 2000; Takai and Morisawa 1995). "The internal osmolality of the fish in which sperm remains immotile, the effects of the small difference in osmolality between activation media (9 mOsm kg⁻¹) may determine whether a sperm successfully reaches the micropyle of an egg" (Shoenfuss et al., 2008). These factors led us to realize that the municipal water used at the Saint Louis Zoo had too high of an ionic composition for sperm to be motile under the hypothesis that not only did the water need to be at the desired ionic composition for sperm activation (factors include but are not limited to Calcium, Potassium, and Sodium levels), but perhaps more importantly, the hellbenders needed to have the right osmolality for the sperm to have potential in fertilizing an egg at all. We believe that the hellbenders are directly affected by the internal osmolality and therefore cannot produce viable sperm without those conditions being met. In order to achieve the desired ionic composition we used reverse osmosis (RO) and then reconstituted minerals and salts to the desired osmolarity through the use of products such as Kent Marine's RO Right™. Reverse Osmosis water does not have a stable pH so it must be buffered as well. Kent Marine dKH superbuffer™ is our preferred product (©2008 Kent Marine all Rights Reserved; www.kentmarine.com, 5401 West Oakwood Park Drive, Franklin, WI 53132)

In addition to water quality improvements, we needed an improved nest box for the hellbenders. The ideal nest box would only have one single entrance, provide easy access for keeper staff, allow for required water flow, and provide the adequate internal space for the hellbenders. After

representatives from the Saint Louis Zoo and Missouri Department of Conservation (MDC) traveled to China and Japan to compare breeding efforts for Chinese giant salamanders (*Andrias davidianus*) and Japanese giant salamanders (*Andrias japonicus*) respectively (Kawamichi, T., and H. Ueda. 1998 and Kuwabara, K. et al, 1989), an idea was born to create a nest box out of concrete and chicken wire (Briggler and Ackerson, 2012). Some of the nest boxes were constructed with an open bottom, closed bottom and, left or right sided entrances, but all allowed for one hellbender to defend one opening and protect its eggs. The Missouri Department of Conservation built and provided 30 nest boxes to the Zoo. The bottoms were coated with silicon and sand to provide a sandy bottom that wouldn't be abrasive on their feet. A variety of nest box options were placed in each stream, not knowing if there would be a preference for open bottom, closed bottom or which entrance orientation (Briggler and Ackerson, 2012).

Modifications to the ionic composition of the water, used for adult hellbenders housed at the Zoo, occurred in late 2010. We also incorporated the new nest boxes into the indoor stream as well as the two new 40 foot long outdoor streams built in 2011. The indoor stream housed breeding stock from the North Fork of the White River (NFWR) and the two outdoor streams were constructed for housing populations from the Current River (CR) and the Eleven Point River (EPR), respectively. Several male hellbenders from the EPR which had been housed indoors since 2009, and cycled for breeding were introduced into one of the outdoor streams in August of 2011 together with several other adults which had recently been collected by the MDC and provided to us for establishing a breeding group. The husbandry of the animals housed in the outdoor streams was similar to that provided indoors with the exception of photoperiod and precipitation, which were provided naturally outdoors.

In 2011, after nearly a decade, we were finally successful in reproducing hellbender. "On 18 October 2011 two clutches of fertilized eggs with different stages of development were discovered in one of the nest boxes in the outdoor stream housing the EPR Ozark Hellbender population, eventually yielding 151 larval Hellbenders. In 2012, natural reproduction occurred in both outdoor streams (EPR and CR brood stock) and finally the indoor stream (NFWR brood stock) resulting in eight fertilized egg clutches and the sequential hatching of over 2500 embryos" (Ettling, et al. 2014.) It is noteworthy that the male that fertilized the two clutches of eggs had been housed indoor since 2009 and had previously had poor sperm quality.

The first reproduction was an amazing victory for hellbenders and represented the first natural captive reproduction of hellbenders. It represented hope for the species and validation for all of us who had been working so diligently to achieve the goal. What factors had resulted in successful reproduction? Was it the nest boxes or the changes to the ionic composition of our water. Was it due to the animals being housed outdoors? The only way these questions could be answered would be through repeated success. In 2012, when both our indoor and outdoor animals bred, we knew that it wasn't due to us moving them outdoors. Instead, we feel that a combination of factors including the provision of adequate space, nesting sites that can be guarded, animals in good health, environmental cycling, water quality parameters that mimic natural conditions and good sex ratios resulted in our success.

Following the first successful reproductive event, we were then faced with the challenge of hatching the eggs and raising the larvae. Initially, we were dealing with water molds, yolk

collapse, and what appeared to be general failure of the embryos to thrive. We employed anti fungal treatments, and tried to restrict egg disturbance as much as possible. During year one, only 20% of the total fertile eggs hatched. During year two, approximately 86% of fertile eggs hatched. Survivorship after hatching has increased from 50% to over 70% in the last two years (Saint Louis Zoo, unpublished data). The increased survivorship of both the eggs and larvae has been attributed to a change in egg management philosophy. We started thinking about how a male hellbender guarding eggs. If he isn't chasing off an intruder he is probably walking back and forth due to the low oxygenation under the rock. As such, there is considerable movement of the eggs. With that in mind we started agitating the eggs several times a day which in turn caused the embryos to move inside the egg. We believe that this was the exercise they needed to prevent atrophy and death. Once we began to perform this husbandry technique, egg survival increased and we no longer saw fungus on the eggs. Fungal invasion of the eggs is now believed to be secondary to death.

In addition to egg incubation there were also challenges with raising the larvae (i.e. Figuring how many hellbenders could be housed per tank, the amount of food to feed, making sure that there was frequent sorting of animals to eliminate cannibalism) There were also a myriad of medical ailments that inhibit larval survival, which has resulted in a large learning curve on our part and a knowledge base we build upon each year. Through the hands on experience, and advances in veterinary medicine, we have become increasingly more successful in preventive care of larval disease through excellence in husbandry and data management.

While, we feel there is still much to learn and that the hellbenders in our care will continue to provide us with learning experiences for the foreseeable future, we are proud of the accomplishments that the Ron Goellner Center for Hellbender Conservation has achieved over the past decade. The success of this conservation project has been due to a combination of factors that include a dedicated, passionate zoo staff and management team, strong partnerships and a supportive local community. All of these things working in tandem, set project up for success and have provided a model that can be followed by other zoos/conservation organizations.

In a few short years our hellbender project grew from requiring half of a day of one keepers' time to requiring four keeper staff and countless interns. It has grown from about 150 animals in 2003 to over 4,000 animals in 2014. There are over 23 systems with hellbenders living in them, which accounts for a total of 22,000 gallons of water. This includes three simulated streams with two being over 40 ft long and 4ft deep. The day to day care and maintenance involves snorkeling, scuba diving, taking head counts, weights, measurements, medical care, water quality testing, data management, and lots of water change. Feeding all these animals and making sure food competition is controlled is no small task and requires considerable sorting, weighing food, and pipette feeding. Live foods have to be treated and quarantined. Animals need to be consistently monitored for health and weight concerns and most of it has to be documented in some fashion through the use of excel and Zoological Information Management System (ZIMS), a global data base for animal management information. Systems must be designed, built, and maintained. Aquarium systems must be designed and built. There are Life Support Systems staff that assist with the design and implementation of these systems. It's an enormous team effort, but it's amazing to be a part of something that makes a true difference in the survival of a species, the health of the environment, and above all else it's taking place in "our own back yard". Knowing that a species has been projected to be extinct in less than

twenty years is now safe guarded for the foreseeable future under careful management is very exciting to say the least.

To date over 1,500 hellbenders have been released back into the wild to date as part of the augmentation effort. Hellbenders are either reproduced at the Saint Louis Zoo or eggs are collected by the MDC from the wild and brought to the Zoo. The larvae are head-started until they are large enough to have increased survivorship and avoid some of the predation that is believed to be a large factor in juvenile mortality. Prior to release all animals are screened for disease, implanted with either a wire tag, passive integrated transponder (PIT) tag or a radio telemetry device for future identification. The released animals will not only help bolster the population, but will also provide us with insight into what factors are truly causing decline. Ultimately, the hope is to remediate these problems to ensure a secure future for the Ozark hellbender, other wildlife and the people that rely on these watersheds.

Literature Cited

Billard R, Cosson J, Perchec G, Linhart O (1995) Biology of sperm and artificial reproduction in carp. *Aquaculture* 129:95–112. doi: 10.1016/0044-8486(94)00231-C

Briggler, J., J. Utrup, C. Davidson, J. Humphries, J. Groves, T. Johnson, J. Ettlign, M. Wanner, K. Traylor-Holzer, D. Reed, V. Lindgren, O. Byers (eds.) 2007. Hellbender Population and Habitat Viability Assessment: Final Report. IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, MN

Briggler, J. T., and J. R. Ackerson. 2012. Construction and use of artificial shelters to supplement habitat for hellbenders (*Cryptobranchus alleganiensis*). *Herpetol. Rev.* 43(3):412–416.

Briggler, J.T., T. L. Crabill, K. J. Irwin, C. Davidson, J. A. Civiello, M. D. Wanner, C. D. Schuette, S. L. Armstrong, V. Grant, T. Davidson, and J. A. Ettlign. 2012. Propagation, Augmentation, and Reintroduction Plan for the Ozark Hellbender (*Cryptobranchus alleganiensis bishopi*), Ozark Hellbender Propagation Committee, Jefferson City, Missouri. 30 pp.

Catherine M. Bodinof, Jeffrey T. Briggler, Randall E. Junge, Tony Mong, Jeff Beringer, Mark D. Wanner, Chawna D. Schuette, Jeff Ettlign, and Joshua J. Millspaugh
Survival and Body Condition of Captive-Reared Juvenile Ozark Hellbenders (*Cryptobranchus alleganiensis bishopi*) Following Translocation to the Wild
Source: *Copeia*, 2012(1):150-159. 2012. Published By: The American Society of Ichthyologists and Herpetologists

Ettlign, J. A., Wanner, M. D., Schuette, C. D., Armstrong, S. L., Pedigo, A. S., Briggler, J.T.
2013. Captive reproduction and husbandry of adult Ozark hellbenders, *Cryptobranchus alleganiensis bishopi*. *Herpetological Review* 44(4):605-610

H. L. Schoenfuss Æ J. T. Levitt Æ R. Rai Æ M. L. Julius Æ D. Martinovic
Treated Wastewater Effluent Reduces Sperm Motility Along an Osmolality Gradient
Received: 22 April 2008 / Accepted: 4 August 2008 Springer Science+Business Media, LLC
2008

Kawamichi, T., and H. Ueda. 1998. Spawning at nest extra-large males in the giant salamander *Andrias japonicus*. *J. Herpetol.* 32:133–136.

Krasznai Z, Marian T, Balkay L, Gaspar R Jr, Tron L (1995)
Potassium channels regulate hypo-osmotic shock-induced

motility of common carp (*Cyprinus carpio*) sperm. *Aquaculture* 129:123–128. doi:10.1016/0044-8486(94)00234-F)

Kuwabara, K., N. Suzuki, F. Wakabayashi, H. Ashikaga, T. Inoue, and J. Kobara. 1989. Breeding the Japanese giant salamander (*Andrias japonicus*) at Asa Zoological Park. *Int. Zoo. Ybk.* 28:22–31.

Morisawa 1994; Billard et al. 1995; Krasznai et al. 1995, 2000; Takai and Morisawa 1995

Morisawa M (1994) Cell signaling mechanisms for sperm motility. *Zool Sci* 11:647–662

Population and Habitat Viability Assessment 2006

Takai M, Morisawa M (1995) Change in intracellular K⁺ concentration caused by external osmolality change regulates sperm motility of marine and freshwater teleosts. *J Cell Sci* 108:1175–1181

Schoenfuss HS, Levitt JT, Van Der Kraak GJ, Sorensen PW (2002) Ten week exposure to treated wastewater effluent discharge has relatively minor, variable effects on reproductive behavior and sperm production in goldfish. *Environ Toxicol Chem* 21:2185–2190. doi :10.1897/1551-5028(2002)021\2185:TWETTS[2.0.CO;2

Smith, B. G. 1907. The life history and habits of *Cryptobranchus alleganiensis*. *Biol. Bull.* 13:5–39.

USFWS] U.S. Fish and Wildlife Service. 2011.

Endangered and threatened wildlife and plants: endangered status for the Ozark hellbender salamander. *Fed. Reg.* 76(194):61956–61978.

Wheeler, B. A., E. Prosen, A. Mathis, and R. F. Wilkinson. 2003. Population declines of a long-lived salamander: a 20+ year study of hellbenders, *Cryptobranchus alleganiensis*. *Biol. Conserv.* 109:151–156.

Acknowledgements: The work of the Ron Goellner Center is a product of the collaboration and dedication of many individuals, organizations, and universities. I would like to acknowledge our partners: USFWS, MDC, Saint Louis Zoo Wild Care Institute, Arkansas Game and Fish Commission, The National Parks Service, Missouri State University, University of Science and Technology, Dr. Jeffrey T. Briggler (MDC), Trisha Crabill (USFWS), Kelly Irwin (Arkansas Game and Fish Commission), Mark Wanner (Saint Louis Zoo), Dr. Jeff Ettling (Saint Louis Zoo), Sarah Armstrong (Saint Louis Zoo), Amanda Pedigo (Saint Louis Zoo), Josie Kenkel (Saint Louis Zoo), James Civiello (MDC-Shepherd of the Hills Hatchery), Karen Goellner, the late Ron Goellner, and many others too numerous to name.

The Benefits of Recall Training in a Free-Flight Aviary

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Abstract

Like many modern aviculture exhibits, the National Aquarium's Upland Tropical Rain Forest is a walk-through, free-flight aviary that hosts a variety of species. The Rain Forest exhibit includes approximately twenty South American bird species, as well as free roaming tamarins. To address the diverse avian collection's needs, Rain Forest aviculturists have developed an innovative program to manage husbandry through trained recall behaviors. Specific sounds are used to cue individuals of many species including psittacines and passerines to accomplish a variety of husbandry goals. This ability to recall has been instrumental in facilitating daily inventory, shifting, reproduction, and flock management for many avian species.

Title: Great Expectations in the Land of the Tiger (Paper)

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Needs: PowerPoint

Abstract

As zookeepers, we are often challenged to meet high expectations. In the Fall of 2012, at the Jacksonville Zoo and Gardens (JZG) we began planning the Asian expansion project entitled Land of the Tiger (LOT). During the planning stages it was revealed that the design of the exhibit would be a very innovative one with multiple components that had never been done before in zoos (to our knowledge). The philosophy behind the exhibit was to maximize the welfare of the resident animals by providing them with options and choices that they normally do not have in a traditional zoo exhibit. One of the main features was a fortified trail that would allow the tigers to explore outside of their traditional exhibit around or past other Asian exhibits, over the guests, or into secluded areas should they choose to do so. Throughout construction and the grand opening, a lot was asked of the keeper staff including monitoring construction, conditioning animals, writing best practice and safety protocols, and overcoming any barrier that stood in the way of progress. Since this design had never been done before, there were few resources available to help determine what would or would not work. In this presentation we will communicate tips on how to meet large expectations, communicate how JZG zookeeper staff attacked the challenges that arose, and show off our amazing and successful new exhibit.

Introduction

As zookeepers, we are often challenged to meet high expectations. In the Fall of 2012, at the Jacksonville Zoo and Gardens (JZG) we began planning the Asian expansion project entitled Land of the Tiger (LOT). During the planning stages it was revealed that the design of the exhibit would be a very innovative one with multiple components that had never been done or rarely been done before in zoos (to our knowledge). The philosophy behind the exhibit was to maximize the welfare of the resident animals by providing them with options and choices that they normally do not have in a traditional zoo exhibit. Throughout construction and the grand opening, a lot was asked of the keeper staff including monitoring construction, conditioning animals, writing best practice and safety protocols, and overcoming any barrier that would prevent a superb opening. Since this design had never been done before, there were few resources available to help determine what would or would not work.

The opportunity of managing the new LOT area was assigned to seven zookeepers and one supervisor (known as Area 2 at JZG) with leadership coming from the mammal curator. Opening a new exhibit of this nature can be quite an adventure with a lot of problems to solve. Our purpose with this paper is to communicate tips on how to meet large expectations, communicate how JZG zookeeper staff attacked the challenges that arose, and show off our amazing and successful new exhibit.

The Exhibit

LOT has six primary habitats. Included in those habitats are tigers and some species that would be their neighbors or prey in the wild. The main, **innovative feature** of the exhibit is a fortified trail that would allow the animals to explore outside of their traditional exhibit around or past other Asian exhibits, over the guests, or into secluded areas should they choose solitude. The mammal exhibits range between 4,000 and 6,500 square feet and the bird exhibits are between 1000 and 1500 square feet. As visitors enter they are met with two large hornbill habitats that were designed specifically to allow space for the birds to fly as well as appropriate nesting areas. Wreathed and wrinkled hornbills are featured in these exhibits.

On the other side of the public walkway is a steel bamboo node, a 12' diameter end to the fortified trail. It is not overly obvious as it is surrounded by living bamboo and allows visitors to first encounter a tiger or babirusa (not both at the same time). The **innovative feature** of this is that visitors can encounter an animal when they least expect it. Visitors are occasionally surprised to see a babirusa exploring the area, sometimes a tiger lounging in this shaded spot, or they may not even notice the tiger watching them.

As the public continues down the trail they are surrounded by washed out mud banks, a theme that is also in the very long habitats on either side. On one side they encounter Visayan Warty Pigs with a stream and raised planters. The heavily planted habitat was quickly made barren by the animals rooting behaviors; however the remaining real and fake fallen trees in the habitat still give it some nice visual breaks. The **innovative feature** of this exhibit is an encounter area where windows can be slid open to allow visitors while supervised to touch the pigs. We are still in the animal training phase of this feature. This habitat is designed to also house otters in the future.

On the other side of the public path we house Sulawesi babirusa and Asian small clawed otters. They have a small heated "deep" pool with underwater viewing as well as a large shallow pool. This exhibit has similar planters and fallen trees as the other pig habitat. There is a creep window for kids to get a close look from a vantage point their parents cannot see. There is an otter holt with a window for the public to watch them when they are resting. On the backside of this habitat is the second place a guest may spontaneously spot a tiger. Over the habitat guests may see a tiger perched on the highest point of our fortified trail (**innovative feature**). On cool days the tigers like to sit here as they have a high vantage point to watch the pigs and visitors while resting in the sun. While the prey species do not seem to be affected, the tigers do watch the pigs from this vantage point.

On the far end of the babirusa/otter habitat is an Asian themed building that has a viewing window into the babirusa/otter habitat on one side and a viewing window into one of the tiger habitats

on the other. The **innovative feature** of this building is the fortified trail runs through its rafters. The trail runs high in this area allowing visitors to walk directly under the tigers and see them resting on a clear glass floor. The tigers enjoy the fans and shade in this area of the trail on hot days. They can see the babirusa, otter, and any tigers in the adjacent habitat.

The trail continues out of the building and over the public walkway. This portion of the trail is themed to look like the branches of a strangler fig. The branches of the strangler fig lead into an **innovative feature** that is a large, themed strangler fig trunk that also serves as an enclosure for the tigers to descend into. At the bottom of the trunk the guests can see the tiger up close and at ground level. The trail continues out the other end of the strangler fig trunk again with themed branches towards the second tiger exhibit.

The last two sections of the trail go directly behind each tiger habitat allowing guests to spontaneously see a tiger in the background of each exhibit. Each trail culminates in two of the four off-exhibit holding yards where the animals can always access a secluded, sheltered area with access to drinking water. An **innovative management feature** is that we always give tigers access to their holding area when housed in the fortified trail to allow them to be off-exhibit if they choose. However, data collected shows that when given the choice, tigers are choosing to be on exhibit 93% of the time.

The two tiger habitats are long and narrow. One exhibit features a long stream that runs the length of the exhibit. The other exhibit features a deep pool with underwater viewing, a waterfall, and two **innovative features**: a bubble machine and a water portal. There is a small themed tree stump that has a bubble machine in it. When turned on, the tigers can encounter bubbles coming out of it (some tasting like bacon). In the deep pool, there is a pipe that can be adjusted to redirect water into a portal shooting water out along the surface of the deep pool. Enrichment items such as fish or meat popsicles can be flushed into the tiger habitat using this portal.

The zoo's main path dead ends in an air-conditioned tiger viewing building with seats that seem to be much appreciated by our visitors. In this building are tv monitors. We usually have a video loop showing tiger conservation messages and the stories of some of our resident tigers running on these tv monitors. An **innovative feature** in this building is a donor wall which keepers can slide back to reveal a small secure training stage. We can pull a tiger off exhibit and train them giving the visitors a demonstration of our tiger training program.

The off-exhibit tiger holding area has six stalls (three on each side of the building) and four outdoor holding yards (two associated with each set of three indoor stalls). The stalls are linked with a chute system that runs in front of each stall and connects both sides of the building. This **innovative** chute design gives us the ability to move animals from one side of the building or from one habitat to the other quickly or allows us to bypass a stall or another animal. The connecting chute has a squeeze cage/scale built into it.

Each of the pig barns has a concrete stall, two dirt stalls and a dirt holding yard. They also have concrete otter stalls with built-in pools that each have a nice ramp to allow for teaching pups to swim should we

have little otters. Each pig holding yard has a concrete-floored training chute with a built-in squeeze chute for restraint.

The Obstacles

Building a new exhibit always has its challenges and LOT was no different. The innovative features of the exhibit along with an ambitious timeline added some unusual complications. Below are some highlighted complications:

Ambitious timeline

We only had eleven months from breaking ground to opening. This is a very short timeline of an exhibit of this size and complication. The timeline didn't allow room for unexpected delays which ultimately did happen.

Unexpected delays

Opening day of the exhibit was set for March 8th, 2014. The original goal was for JZG to have access to and control of the tiger holding building by November, 2013 and pig holdings by December, 2013. Due to delays in caging construction, we did not receive access to the tiger building until the last week in February and the pig holding buildings until March 1st.

Differences in philosophy

Different staff with different roles in a zoo has different priorities. What is important to a curator may not be what is important to a supervisor, and what is important to a veterinarian may not be what is important to a zookeeper. We encountered a few situations where one person's expectations did not line up with another person's, and we had to find a way to overcome those differences in philosophy to continue progress.

Staying organized

Without organization we knew the opening of this exhibit would have turned into chaos. The best way to keep order is to try to maintain a systematic process to coordinate everything that needed coordination. We had to reorganize our area, assigning personnel to specific duties and reassigning "routines" in a logical manner to be effective. We had to plan the moving of animals and the introduction of animals sometimes to each other and to their enclosures. We had to come up with rules to ensure everyone's safety in the new facilities. Keeping up with organization was not easy and on occasion it admittedly fell by the wayside. Knowing when to proceed without organization is also important.

Being overwhelmed

From assessing the soundness and appropriateness of the new facilities, to making plans to move animals and introduce them to the new exhibits, to establishing safety protocols and figuring out how to manage the innovative features of LOT, there was a lot going on. Add this to the normal operations of

personnel management and the management of the other animals in the area (we still had a bunch of African animals to manage in our area), things can get fairly overwhelming. To ensure no one gets consumed by being overwhelmed we employed a few techniques to help people decompress and stay focused.

Staying safe

Safety is at the very top of priorities to a zookeeper. There were a lot of moving parts to opening the LOT exhibit and a lot of opportunity for things to go wrong. When things are overwhelming and chaotic, it is hard to stay focused and maintain optimal safety. A breach in safety may result in injury to a keeper or to the animals. When working with tigers, a breach in safety may result in worse things than injury.

Achieving success

During the weeks leading up to the exhibit opening, things felt overbearing. It seemed like we were constantly behind, trying to catch up. We were not confident that we would be able to have animals in all exhibits by the opening and that the week full of member previews, VIP galas, and opening day would be anticlimactic. But looking back we realized that we did exceptionally well coming together as a team to achieve our goals. Below we compiled some tips, secrets, and techniques that helped us to be successful:

Visualize and define success

From the day this exhibit design was unveiled, visualizing and planning the best way to manage it became everyone's job. The supervisor considered all the different ways to restructure personnel and acquire and manage the animals as well as manage the facilities. Along the same lines the zookeepers were asked to put themselves in the manager's shoes and come up with how they would manage the area. Two new keepers were hired to help manage the area. Part of the interview process was for them to communicate their ideas of how they think this area should be managed. Everyone was expected to think about things like how the exhibits should look, how the facilities should be managed, and how the team should work. As the opening day approached, everyone had more and more opportunity to discuss their thoughts on how to manage various aspects of the new exhibit. This process went much more smoothly with everyone already having an idea of how they would manage it in their heads with supporting reasons for why they would manage it that way. After discussions, clear decisions were made and communicated so that everyone was on the same page as far as what the protocols or action items were.

Do your homework and be prepared

Although the fortified trail concept was an innovative one, it was not completely foreign to JZG staff. Years of communication with other professionals, whether at TAG meetings or networking through social media, and staying current with animal management techniques made JZG staff aware of the future of animal management. We frequently consulted with other zoo professionals on how to do things. For example, Audubon Zoo was contacted on how to successfully mix babirusa and Asian small

clawed otters in the same exhibit. The Felid TAG listserv was a helpful conduit for acquiring information on what policies to put in place when performing public training demos with large carnivores. Husbandry manuals were read and other zoos were visited. None of our animal care staff knew 2 years ago that they would be involved in opening an exhibit like this, but the information you acquire by being involved in the latest in zoo animal care through reading professional articles, visiting other zoos, networking with zoo professionals, and connecting with professionals at meetings will help you be ready when it is your turn to open a new exhibit.

Acclimating animals

Due to delays in construction the new animals had to spend longer time in our quarantine enclosures than usual. We were unaware that they would not be relocated until almost the last second, but we were prepared to have a short acclimation period. At JZG when new resident animals are brought in and housed in quarantine space, there traditionally is not a plan in place for non-quarantine staff to work with them behaviorally. However, with the demand for a high level of behavioral husbandry in LOT and signs that there would be a short transition period into the new facilities, it was important to keeper staff that they were allowed face time with the LOT animals to begin their behavioral husbandry program and establish a relationship with their future caretakers while in quarantine facilities. Knowing that change often does not happen quickly and smoothly, we presented the new concept of allowing non-quarantine keeper staff to work with the new animals early. It was finally agreed upon after some convincing that once the new animals cleared quarantine, mammal keepers could work with them on a limited basis. It was also agreed that one primary LOT mammal keeper become a quarantine keeper until the animals moved to the new facility.

Once at the new facility, we had very little time for acclimation. We had the longest acclimation time to work with the tigers (1 ½ weeks). We worked on establishing relationships with the tigers by stretching out their feeding schedule to multiple times per day. During some feeds we trained them using already established behaviors (thanks to Palm Beach Zoo and Akron Zoo for doing such a great job establishing a training program with some of the tigers).

We had a shorter acclimation period with the pigs and otters. During this time we learned how cooperative our babirusa were, and our relationship with them progressed rapidly. The otters had just been introduced to each other in the quarantine area, so a lot of the acclimation period the otters were acclimating to each other. Of course, the otters' curiosity encouraged them to be cooperative with us. We had the hardest time with the Visayan warty pigs. They had the shortest acclimation period and we had the poorest relationship with them. The move to the new facility was very stressful on them. They were very frightened of us and barely moved the first couple days. We certainly wish we had a longer amount of time to acclimate them to their new holding facility because when the exhibit was finally ready and we shifted them onto exhibit, it was hard to get them back into holding.

The exhibits were barely animal-ready when we put animals out for the first time. We also had some encounters with hotwire/grass that slowed progress. However, thanks to our relationship building with the animals (at least that's what we are going to attribute it to) and maybe some luck by obtaining

cooperative animals, we were able to overcome most setbacks and acclimate the animals to shifting on and off their new exhibits, the warty pigs being the exception. Our biggest excitement was seeing the tigers acclimate to navigating the fortified trail. We were especially impressed with our female Sumatran tiger, Lucy. Based on her behavioral history we did not think she would work out in the trail expecting her to remain secluded. Instead she was the bravest of all tigers exploring the trail readily.

Don't be afraid to plan to plan

One way we kept organized is we had a lot of meetings. At first the meetings were biweekly, but then they slowly became more and more frequent. On almost a daily basis keepers met first thing in the morning to set daily goals. The purpose of one of our first meetings was to make a list of meetings that we would need to have as the exhibit progressed. This proved to be an important meeting because it gave us a checklist to work off of as we moved forward. The topic of each meeting varied including such topics as how we were going to manage animals, write protocols, inspect facilities, divide up the workload, etc. With delays in the construction it was often tough to write protocols or come up with management plans in advance because it was tough to visualize the operation of the facilities or the behavior of the animals within the facilities. In these situations, we did our best to practically predict the best management practices, but were prepared to amend any protocols or plans as we better understood the reality of the situation.

Some of our meetings were on site at the new exhibit doing things like going over safety rules, walking through shifting patterns, or inspecting facilities. Being a part of the facility assessment team was invaluable as it allowed us to enter the construction site whenever we needed and familiarize with the facilities. After tigers were moved to the tiger holding, we had two keeper manage them (even though we have a one-person shifting rule) so that they could not only familiarize with the new facility together, but also discuss how things went and how to better do things. Communicating clear expectations and establishing clear goals were of utmost importance as consequences of each meeting especially when establishing safety-related goals. Deadlines were linked with action items assigned to specific people. Ultimately, the meetings served as a channel to ensure communication flowed between staff members.

COMMUNICATE!

One of the key secrets to our success was effective communication. Our team was equipped with a bunch of very good and mature communicators. We were open and honest with each other. If expectations were not made clear, keepers were not afraid to ask for clarification. Everyone was encouraged to express their own opinion as long as they had support for their opinion. No one was over-sensitive if there was disagreement with their opinion. Communication had to come from all angles, communicating what to expect before things happened, what was going on as things happened, and how things went after things happened to assess the need for adjustments in strategy. It was especially important for the supervisor to communicate what to expect to the keepers. That way they could be prepared for anything that was thrown at them. On a number of occasions, quick action was needed. For example, we did not know exactly when animals could be moved to the new facilities, but when the window opened, it was important for us to move on the transfers to maximize face time with

the new animals at the new facility. Effective communication ensured that everyone was prepared to take action when action was needed.

Anticipate negativity

Being prepared is not just about being ready to take action when the time comes. It is also about anticipating what may go wrong and steamrolling that negativity before it becomes a more challenging barrier. When opening a big, complicated, new exhibit it should be expected that things are going to become overwhelming or stressful. Frustrations and other negative thoughts and feelings should be expected and dealt with before they fester resulting in mistakes or other negative consequences. Everyone was encouraged to express concerns or negative thoughts as they arose so that they could be addressed immediately. Often the negative thoughts were the result of mismanagement in some way and the expression of those thoughts resulted in more effective or efficient ways of doing things.

One thing we learned was that we should have done a better job anticipating that different people had different priorities. Initially, it was assumed that everyone would be on the same page that the short timeline would result in the need for Area 2 keepers to have face time with the new animals while they were in the quarantine enclosures. However, this was not as big of a priority to hospital staff whose top priority was to prevent potential cross contamination. Another example is the priorities between keepers in the area differed as well as between keepers and upper management. On many occasions, the keepers started the day with an idea in mind of their goals for the day, only to be told that there were different priority goals coming from upper management. As opening day approached, more and more emphasis was being placed on the LOT exhibit and animals. However, some Area 2 keepers were not primary LOT keepers and had the responsibility of keeping the rest of the section afloat while the LOT chaos continued. So their priority was the other animals.

Have the right attitude

One thing that Area 2 keepers could be most proud of was entering this endeavor with a great attitude. Opening a new exhibit is hard work especially one as innovative as this one, and keepers could have viewed it as hard work that was assigned to them. Instead they chose to view it as an opportunity to be a part of something great, new and exciting. As far as we knew this was the first time an exhibit was built with a fortified trail like this for large carnivores, and we got to be a part of that innovation. There were a lot of twists and turns but keepers stayed flexible. Not only did we adapt with the change but we expected and embraced it. As things changed, we learned and evolved. We approached this challenge as a cohesive team filling in for each other when need be, but most of all supporting each other. We expected individuals to encounter difficulties and helped each individual overcome those difficulties. We entered this endeavor with high standards and an expectation of success, and thus far we feel that success was achieved. We barely got the last species (Asian small-clawed otters) out on exhibit just in time for the big VIP gala the night before opening day; we continue to receive compliments of how good the exhibits look and how well the animals have adapted to this unusual style of exhibitory; and we continue to have a flawless safety record managing this new exhibit.

Getting Creative:

Recycling and Reusing to Enhance Carnivore Training Programs

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Abstract

A solid, well-planned operant conditioning program is a key component for enhanced welfare in zoo carnivores. Having the ability to perform ultrasounds, give voluntary injections, obtain blood samples and take regular weights greatly reduces potentially stressful situations and enhances husbandry. But working with potentially dangerous animals can make establishing these behaviors a challenge. In an ideal world, all exhibits and holding areas in zoos would be designed and built with ultrasound boards, blood draw chutes and weight platforms but many times this is not the case. This paper will explore ways to make your own chutes, training walls and ultrasound structures using materials that can be recycled and repurposed for your specific needs. It will discuss the need to be creative and problem solve with each individual animal to obtain the desired behaviors with big cats, hyenas and small carnivores. Most importantly, it will show how using unusual, unique items in training and enrichment programs can enhance trust building and keeper/animal relationships and make a potentially stressful situation fun and engaging.

Introduction

A solid operant conditioning program is essential for optimal animal husbandry and welfare in a captive setting especially for dangerous carnivores. Being able to accomplish advanced behaviors such as voluntary blood draws, injections and ultrasounds is not only beneficial for decreased stress in the animals but it can reduce staff time and costs in comparison to having to anesthetize the animal. Additional benefits to training carnivores include enhancing keeper/animal relationships, giving the animals choice and control over their environment and providing mental stimulus. But there are also challenges to implementing and maintaining successful training programs. These include consistency, keeper and animal motivation, time restrictions, safety concerns and insufficient facilities. Ideally all carnivore facilities and holding areas would have built in ultrasound boards, moveable walls and areas where tails could be easily accessed. Staff would have time set aside to train all their animals at a time when the animals would not have to be on display, there would be an endless budget to build specially designed training devices for each animal and large carnivores would not be as destructive! But we all understand this is not the reality and strive to find creative solutions to work with what resources we do have.

The idea for this paper was born from multiple threads and conversations on list serves, on social media and at conferences discussing many of these challenges faced when training carnivores. Most of the concepts discussed were developed based on these conversations. We used some variation of these techniques with all the animals in Big Cat Country at Milwaukee County Zoo which include Amur tigers (*Panthera tigris*), African lions (*Panthera leo*), jaguars (*Panthera onca*), snow leopards (*Panthera uncia*), cheetahs (*Acinonyx jubatus*), spotted hyenas (*Crocuta crocuta*) and tayra (*Eira barbara*).

Shaping a lean-in/hip target

After establishing basic behaviors like a target or lay down behavior, one of the first steps to training advanced medical behaviors in carnivores is shaping a side behavior. Depending on the design of the facility, this can prove to be the most challenging behavior to establish. Many carnivores, especially cats, have a tendency to face keepers straight on and avoid turning to the side which is a more vulnerable position. When initiating our carnivore training programs at Milwaukee County Zoo, we were faced with none of our animals having an established side behavior in addition to a short time frame for priority behaviors in many of our cats. We started with basic operant conditioning techniques to use a series of approximations to shape a side behavior by establishing a hip target or capturing a lean in behavior. A pole or a stick was used to touch the hip to shape the behavior. This proved to be an issue for most of our cats as not only were they wary to present their side in any fashion but they were quite excited about having a new “toy” entering their space. We ended up with a number of broken sticks before we reevaluated and started looking for other options. In most of our holding areas, we only have mesh access at the front of holding, with the sides being cement walls. This meant there were no corners to use to turn the cat into the proper position. We began to investigate other options knowing we would need to create a way for the cats to line up at the mesh using a type of walkway before we could train the hip target or a lean in behavior.

Getting creative and repurposing

Logs

Due to our short time frame initially, we wanted to use something that the cats were used to so acclimation would be minimal. We realized that the logs that were already in many holding areas or exhibits could be placed in a proper position parallel to the front of the mesh to create this walkway. Logs would need to be heavy enough and positioned so the animal could not move them when they were walking through. After setting up log runways with a number of our cats, we found that they worked with some but not all of them. We made sure to only use logs from our approved browse list in case the animals ate pieces of them. Logs are a good initial option to try because they are relatively plentiful and easy to find. Most of our cats had them already for scratching and enrichment purposes so they were used to them. Logs are easily replaceable and moveable so they can be set up in the desirable position for many species and they allow cats to lie down comfortably in the space provided. Even our most destructive animals (the hyenas and lions) could have logs in their holding. We found that logs worked well in shaping our side behavior for one of our cheetahs, our lions and our hyenas (Figure 1). We were able to use this set up for vaccinations, injections for medical treatments and knock downs, and blood draws. But we found there are also drawbacks to using logs and they did not work for all of our carnivores. They were too moveable and enriching for the tigers and the jaguars to keep them in place. Also, if the cats would not lie down or would pull back from the mesh, we were not able to get injections or sustain the side behavior. We had to go back to the drawing board for one of our cheetahs, our jaguars, our snow leopards and our tigers.



Figure 1: A spotted hyena presenting his side at the mesh. Note the stump behind the log to keep it in place.

Training walls/chutes

Our next idea was to make our own training walls or modified chutes. We do have built in squeezes in most of our areas but they are set up to squeeze back away from the keeper and have large gaps that paws can get through. They are designed to enter the holding only after the animal is completely squeezed but there is not a good way to reinforce the animal during the squeezing process so it is quite a negative experience. Keeper safety is an issue with these squeezes and they are large, cumbersome and scary to most of the animals. Due to the negative experiences associated with them, we decided starting fresh with positive associations was a better option. We still need a way to keep the cats tight to the mesh so some sort of a squeeze was necessary and we found that when given the option to squeeze themselves on their own terms, most of our cats would gladly enter a tight space.

We set out looking around the zoo, our houses and sometimes the side of the road for items that would work for portable, moveable training walls or chutes. The first option we came upon was an unused PVC style dog bed (Figure 2).



Figure 2: A snow leopard squeezes herself into a modified chute made from a PVC dog bed.

By setting this bed on its side and wiring it to the mesh, we were able to create a tight chute for our snow leopards. When in this position, we can give hand injections, do ultrasounds and position them for future blood draws. It is also helpful for assisting in their spring shed by using a brush attached to a pole to rid them of unwanted hair. This space however was not tight enough for our cheetah, who would not line up with the logs and was too tall to fit under the legs so we went back out looking for more options. Using a discarded piece of fencing, we made a moveable squeeze wall that was cheetah size with two poles that stuck through the mesh (Figure 3).



Figure 3: A cheetah in a homemade “squeeze”. Once in position, the wall can be pulled tighter to allow for a safe injection.

This way we could approximate the cheetah to being squeezed into place while being able to reinforce each tiny step. Our cheetah proved to like being in between the wall and the mesh. He seemed to enjoy a gentle squeeze even. He allowed for vaccinations and we even caught him using the training wall for a back scratcher or just hanging out in there after squeezing himself in. The advantage to this wall was that it was tough enough to leave in the enclosure for the cheetah but also see-through enough for him to not feel like he was being trapped inside something. The ends are also open so he had the opportunity to leave at any point as we were not squeezing tight to the mesh, just tight enough for his hip to be in the correct position. A similar set up could be made by repurposing a wooden pallet.

We also applied a similar chute concept with our tayra. We called it the small carnivore tunnel and it is an idea that we have seen used with otters. We made a curved chute that could be wired half way up the mesh holding from a discarded 55 gallon plastic drum. This allowed us to get a side behavior and keep the tayra in place for ultrasounds, wound treatment and injections when needed. Similar set-ups could be employed for other small carnivores, small cats or canids. We can also mount it perpendicular to the floor to get better access to the stomach and feet (Figure 4).



Figure 4: A tayra being reinforced with honey when in the small carnivore tunnel.

Initially, we tried the training wall with our jaguars but their destructive nature and strength were too much to allow us to keep the wall in the holding with them and our male soon found that it was fun to push back on the wall so we would lose control of the handles. We needed something heavier for them but something that would allow us to keep their hips close to the mesh while letting their large heads through first. We settled on a stock tank filled with water (Figure 5). This was short enough to allow their heads to go above it but would create a tight squeeze on the rest of their bodies. Training for injections on all four jaguars once we started with this concept only took about six sessions. We were able to vaccinate all of them which required them to return after the first injection for their second shot.



Figure 5: A jaguar using a stock tank as a modified chute during a mock injection training session.

Ultrasound board

While we were able to successfully ultrasound our lion and snow leopard when in the side position, we wanted something that would give us better access to their stomachs and the ability to use a larger probe which would not fit through our two inch mesh. We found an unused metal frame that was sturdy but relatively light weight and took it to our maintenance department to make an ultrasound board that would be usable for multiple cats or the hyenas in multiple set ups. They covered three sides and the top with a polyethylene-type material (similar to cutting board material) and put two holes in the top (Figure 6).



Figure 6: The top of our carnivore ultrasound board.

We are able to chain it to the mesh of our enclosures in front of our food slot and have a larger access area for the ultrasound probe. By training the cat or hyena to lay down with their stomach over the hole, we have protected access to ultrasound a larger area. The board is currently only being used for hyenas as we still need to install a cover that will allow us to block off one or the other holes so the cats cannot get a paw down into the protected area but we do regular ultrasounds on our hyena to monitor for possible pregnancy (Figure 7).



Figure 7: A female spotted hyena in position for an ultrasound. The probe will go through the food slot opening and through the hole that her stomach is covering.

Results and Discussion

Using the various techniques discussed above, we were able to hand inject thirteen out of sixteen of our animals this year for their two vaccinations. Two years ago, that number was zero. We still have not found an ideal set up for our tigers but hope to have them trained for vaccinations by the late fall. We have been able to perform successful ultrasounds on four individuals multiple times and one mock ultrasound confirming two pregnancies. We were able to provide supportive care for and close monitoring of blood levels for a cheetah in renal failure and have successfully hand injected multiple cats for anesthesia. We cut vaccination time down from a half an hour per animal in addition to the rest of the day to recover from the stress if they were being darted to two minutes and no recovery time. By obtaining blood voluntarily, we eliminated the need for a time consuming and potentially risky work-up. By repurposing and reusing materials we already had access to, the only cost we incurred was the material to cover the ultrasound board. The more advanced training has decreased stereotypic behavior, increased problem solving skills and enhanced keeper/animals relationships. We found that by addressing of the challenges that we had to starting our training programs initially, we were able to create a unique program that was low cost and less time intensive than previous husbandry practices. Trials, evaluation and readjustments were necessary during the whole process and are ongoing as needs arise. We found that not only are training programs and set ups unique to each species of carnivore, each individual has different preferences and needs to address. By being fluid and creative, we were able to create a winning situation for staff and the animals while keeping animal welfare and safety a priority. By reaching out to colleagues for ideas, we were able to adapt the experience of others to fit our needs and to be environmentally conscious at the same time. Most importantly, we found that while we were trying to teach our animals what we wanted them to do, they were teaching us what was best for them. Listening to what your animals are telling you during your interactions is just as important as working shaping their behaviors. In a strong positive reinforcement training program with all animals, especially carnivores, it is important to remember to not force them into something that is too uncomfortable for them. By adapting the tools and your approximations, you can achieve the goals that are desired while keeping it positive and rewarding for your animals.

Acknowledgements

Thank you to Milwaukee County Zoo staff especially the curator, supervisor and keepers in Big Cat Country and the maintenance department and veterinary staff for all your help and support. Thank you also to all the many keepers and colleagues I have had conversations with over the years about ideas and problem solving for carnivore training, enrichment and husbandry.

There's a Pelican in the Classroom!

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Abstract

WildCare is a wildlife rehabilitation and nature education center in the San Francisco Bay Area. The facility is open, free to the public 365 days a year. Our courtyard houses a small collection of non-releasable wildlife including a male Brown Pelican. Many of our animals travel to schools in the Bay Area, educating children about the wonders of nature. These animals are the usual classroom visitors; raptors, reptiles and small mammals. During presentations at many of the inner city schools, I was surprised to discover that some of these children, growing up beside the ocean, had never spent time at the beach or watched the antics of Brown Pelicans fishing. After observing the fascination children have with our Brown Pelican in the courtyard, I wondered how to bring that experience to these schools. Simple: if you can't bring the children to the pelican, bring the pelican to the children. Well, not so simple. He couldn't be tethered and his wings were too wide for display in a puppy pen. I realized that for the children to get the full experience of this amazing bird, he would have to be loose in the classroom. Therefore, in addition to all the usual training behaviors such as crating, he would have to be under total voice control. I'm a relatively new trainer, and the only staff person working with these animals. Was this really something I wanted to take on? This is the story of how a Brown Pelican went to school, but in the end, I'm the one that got the education.

Background

Baja, a one-year old Brown Pelican, arrived at WildCare in April 2012. Fishing line and hooks wrapped around the elbow of his right wing resulted in tendon damage which limited his flight abilities. He was assessed as non-releasable. He joined Winter, the White Pelican, in our small courtyard pool. They bonded immediately. I had an excellent relationship with Winter which allowed me interaction with Baja, a curious but shy pelican, however this triangle made it very difficult to initiate any training with Baja. He would only interact with me in the presence of Winter, and she monopolized my attention during our time together. For the next year I slowly worked on developing a relationship with Baja that I hoped would allowed some basic husbandry training.

Then disaster struck. In March 2013, Winter passed away suddenly from a blood aneurism. For almost a month, Baja was subdued and reclusive. He had always been a voracious eater, but now ate only the bare minimum. I focused on subtle interactions with him; sitting in the enclosure, offering toys and allowing him to wander out in the courtyard when we were closed to the public, as he had done with Winter and myself in the past. When Baja returned to his curious, hungry self, I was pleasantly surprised to discover a



change in our relationship. Forgive me for anthropomorphizing, but it was as if, with Winter gone, I had replaced her as his companion. Regardless of the reason, Baja and I quickly established a trusting relationship and I discovered that he had become an enthusiastic participant in training.

By the end of the summer Baja was targeting, walking into the hospital to step on the scale, climbing the steps up to our small museum and delivering various behaviors on cue such as diving into the pool, giving me his foot, holding still during touching of chest, back and wings and giving a 360° turn with wings out. He had become the hit of the courtyard and many visitors made a point of coming to watch our scheduled feedings just to see Baja. I started thinking that since he was so popular at WildCare, what if I could take him to schools? The training commenced, and as it turned out, we both learned a thing or two.

Training Plan

Baja already had the basic behaviors for presenting to an audience. In fact, he did two presentations every day in the courtyard. The challenges for traveling were:

- 1) Crate training

Baja would need to voluntarily enter a large puppy crate, have the crate moved into a vehicle, travel for up to an hour to the school, exit the crate on cue and participate in the presentation. He would then need to repeat the procedure to return home.

- 2) Targeting during distractions

I had seen a Brown Pelican displayed in a puppy pen and I felt it did not display a bird with a 7 foot wing span to its best advantage. I wanted Baja to be loose and trained to jump up on a small platform so that the children could get a really good look at him. A loose pelican in a classroom? I would need to have him under excellent voice control. He would also need to be prepared for numerous unexpected distractions since we all know, just like animals, children cannot be predicted. I needed him to target to me quickly and consistently in case of the unexpected.

I anticipated the latter, keeping focus and control, would be the biggest challenge to his training. I was very, very wrong.

Target Training

Targeting him with the large target stick I normally used would be very awkward in a classroom, so I changed the behavior to targeting to my fist. Baja quickly adapted to my fist as the target. Given the cue he would quickly come from a distance and touch his beak to my extended fist. He would even hold the target behavior for duration. But what about that other very important “D” of training - distraction? Without really planning for it, this aspect had been built into his everyday training. Yes, I had done some actual distraction work, targeting him through the hospital and museum with different items and people in place. (Strangely enough, the thing that was the greatest obstacle wasn’t people running around or the nine foot tall taxidermy bear, but a backpack left on the floor.) However, without planning, the real distraction training occurred every day we worked in the courtyard. Since the pool area had very limited space for the training we were working on, I set up a puppy pen in our small courtyard to section off an area for our sessions. This area separated the wildlife hospital building from an outdoor patient caging area and WildCare’s back entrance. Wildlife rehabilitation stops for no-one, not even a trainer and a pelican. Throughout our sessions, people walked through with dishes, boxes and carriers

and even animals in towels. There were also members of the public, including lots of children running around in the courtyard. Baja came through with flying colors. Except for a few bouts of admiring himself in the opossum's new plexiglass window he maintained his focus. In fact, by April 2014, I often trained without the puppy pen at all, even with the public in the courtyard. If Baja wandered off to check something out, a quick "target" would bring him right back to me.



Crate Training

Did I mention that I thought crate training would be the easy half of this training project? It all started as expected. In September I left the top and bottom of the crate, nested, in the pool enclosure, leaning against the wall. Baja explored it and eventually used it as a sun shade. We then began training outside the enclosure, in the courtyard, and I targeted him into the bottom half of the crate. He was hesitant at first and then seemed to feel quite comfortable standing in his crate. I removed the target and put the behavior on cue. When the lid went on, a few trials of luring were used, followed by feeding through the back corner of the crate. Do you know that a pelican can reach to the back of a very large dog crate to get a fish without ever stepping into the crate?

Then one day he decided he was willing to enter the crate. The pelican was willing but the wings were not. His slightly extended wings got stuck going in and he wasn't sure how to deal with this situation. Challenge 1: train Baja to tuck in his wings to enter the crate. I was already able to touch his body, including wings, with the cue "easy". Now I started working on taking both wings and bringing them into his body. This went quickly and I was soon able to bring his wings in as he entered the crate without him panicking. He then figured it out for himself.



The door was added and within a few short weeks he was entering on cue, wings in, door on and turning around to wait for his fish. Remaining calm with the door closed and then with the door latched and me stepping away for a minute also went well.

It was now time to work on moving the crate.

Challenge 2: how to move the crate around smoothly with two people, into vehicles, through doorways and up staircases. The crate has built in handles on the sides, but that wouldn't allow two people to go through a door, they needed to be at the front and back. We also wanted to be able to easily keep the crate level. Wheels are all well and good until you have three flights of stairs to climb (old schools do not have elevators). So Baja became a sultan. By adding two loops per side through which two long poles could be

slid, we created a pelican litter. A few sessions with the poles in place proved no problem for Baja. It was time to move the carrier.

The Moment It Fell Apart

Every trainer knows that when you are shaping behaviors you move in small increments, “baby steps”. This is one of the fundamental rules. I know that rule, I use that rule and, up until this moment, I had been following that rule! It was the end of May and I knew Baja was going and in and out of the crate well. He wasn’t stressed being inside the crate with the door closed for short periods of time. He had no problem with large, noisy audiences in the courtyard. I knew he was comfortable in our museum. It was time to move forward with the behavior but I didn’t take a baby step. I didn’t even take a small step - I took a leap. With Baja in the carrier, we lifted it and took it about 24 feet into the museum. We lowered the crate, opened the door and a pelican exploded out. He wasn’t going to target, he wasn’t going to eat fish and he certainly wasn’t going to get back in that crate. I had moved too fast and had lost him. We were going back to square one, or as I had heard other trainers say, “back to kindergarten”.

Getting the Behaviors Back

Luckily, none of Baja’s other behaviors suffered from this mistake. He still did his 360° turns on cue, worked well with distraction, allowed touching and targeted well (except into the crate). Over the month of June, I worked to get the crate behavior back. As a starting point I took the door off the crate and removed the carrying poles. I began with luring him and then reinforcing his head in the crate. By mid June he was entering the crate, door on and the carrying poles in place. As of this writing, he still occasionally balks at entering, especially at the beginning of a session but we always end on a good note. I have done two small lifts of the crate (only for a couple seconds and in place) and he has gone back in on the next session.

As far as presenting to a class – no problem. We have done multiple classes in the courtyard, children sitting, no puppy pen and Baja has been totally focused and the children have been enthralled. Baja also participates in our special Nature Camp “Helping Hands for Wildlife” where the campers learn about wildlife rehabilitation and how we can help wildlife. The highlight of the week is when the campers are invited to participate in a pool bird feeding. They prepare the food and then become pelican feeders, rewarding Baja after his behaviors. It took only a few behaviors for Baja to understand that the cue came from me but the reinforcement came from the children. Baja is definitely ready for the stage, now we just have to get him ready to travel.



The Adjusted Goal

The original goal when this paper was submitted was to have Baja doing on-site presentations in our museum for the summer campers. These presentations were part of the training plan which incorporated short drives before being moved into the museum. By September we would try short visits to neighboring schools that participate in our programs. Longer trips to San Francisco and other areas were projected for January 2015. Due to the crate moving mistake, I have had to adjust the plan. I will continue to work with Baja daily during the summer, taking very small steps and only moving on when I feel he is totally comfortable. Although I have set proposed dates for on-site museum presentations (mid-September) and short off-site trips (January) I will adjust based on his progress.

Conclusions

Baja is an amazing bird. Over the past year he has been an enthusiastic participant in all of his training, displaying great intelligence. I have been amazed at the trust he shows in me, even when I am asking for behaviors that are clearly out of his comfort range. Our relationship has strengthened and, to my relief, was not severely damaged by my mistake. The public comments on how much Baja has learned but I know the truth. I'm the one that learned the most this past year. I have no doubt that Baja will continue to amaze people and I have no doubt that this training project will be successful. Baja will one day be travelling around the Bay Area teaching people about this unique species that will hopefully never find itself back on the endangered list. For me, however, the real success of this past year has been the knowledge and skills I have gained about positive reinforcement training and the pure joy I have experienced working with this magnificent Brown Pelican, Baja



“Working with Different Skilled Conspecifics (Co-workers) to Train Animals”

Many keepers work together to accomplish training goals. What are some things that may make this easier?

Who am I, and what do I know about training? I am not the best trainer, and I am not the worst trainer. Probably, like most of you, I am pretty good and have been training animals awhile. Training people, on the other hand, is naturally harder for me, but this has been getting easier when I am able to apply some of the same methods on people as I do the animals.

I have been a lead keeper, a 5-day a week keeper in one unit, and a relief keeper in multiple units. I far prefer the relief keeper position. I like the variety of animals I get to work with, not to mention the variety of keepers too. Being a relief keeper and being requested to move to different teams and different units has given me a bit of experience working with many keepers to train animals. I very much hate to be bored, and this is rarely an issue for me.

So, with keepers with varying degrees of skill, trainers need to work together to get the job of training done as a team. How do we accomplish this? Let's look at a few different trainer skill sets.

- Your peers have never been trained, and you have been asked to show them; this may involve willing or non-willing co-workers. Willing trainees are great, but what happens when your job is to train a non-willing co-worker to the art of training? If the person is doing it begrudgingly, then start small... very small... maybe train a target. Find a reason for the training that might benefit this person. Better yet, try to show that the animal will benefit from the training so that your co-worker can see for themselves the benefits of training. Know your co-worker and learn what motivates them so you can incorporate their interests as you train with them. Then, just as with the animals, reinforce everything that you see your co-worker do right. Build their confidence to train. And you will build their confidence in you.
- Some zookeepers have picked up bits of training knowledge along the way, but still have gaps in their abilities. They were never trained to train but get by with the knowledge they have. Knowing the importance of reinforcing your peer, while helping to expand their knowledge, is essential. I try to come across as non-threatening so that I am perceived as being helpful rather than taking over. I offer suggestions, never to come across as my way being the only way or that their way is wrong, but simply providing alternatives to try to achieve the goal. If I am wrong, I admit it. And sometimes ideas don't work, even when the idea worked before with another individual of the same species. Admitting when you are wrong helps to build trust with your co-worker.
- Some keepers are “natural trainers.” They may have never been formally trained, but the concept seems to come magically to them. This makes me a bit jealous, but good for them, they usually make pretty good trainers. It's just the formal words and terms they sometimes lack, and this inhibits their ability to communicate well with other trainers that have received more formal training. They will usually pick up on the correct words and terms pretty quickly, and you will have plenty of opportunity to praise and reinforce their learning curve.
- Some co-workers have received training that is a very different method than yours; how do we combine different styles and methods? For example, operant conditioning based mainly on positive rewards and horse training based on positive punishment. In my experience, this takes a bit of understanding and patience. For a trainer who has never used a food reward, and in

fact, is heavily objecting to it, there needs to be some understanding and respect for other ideas on both sides. For the trainer who is not used to applying punishment, it also takes an open mind to see that there is some merit in tried and true horse training methods and there may be some middle ground between punishing (gently) a bad behavior and then adding positive reinforcement to the good behaviors. This reconciliation was a hard one for me, personally, but in the end, we are meeting our training goals for our animals. In my experience, the more rewards we gave, the less punishment was needed. Once you have met in the middle and have begun to see progress, this progress is self-reinforcing for both parties. This is a great time to congratulate yourselves on a job well done and reinforce how well you have communicated together to get something started or completed.

- **Keepers with similar experience**, this should work to your advantage. Communication is key, as is in most circumstances. Talk about what you're doing and why, the more communicating likely the better you will do with the animals. You both know the animals, you both know training, and you both know there are many ways to reach the same end. These peers can have great ideas to tweak your training making it better with outside perspective. When you both have a solid base you can much easier understand what the other person is trying to communicate and why, in this situation you can usually get more done faster. This is a great person to have come and look at your training when you run into a road-block and need a little outside perspective for a fresh idea to get you un-stuck. Asking them for help and praising their help and ideas will help foster a good training relationship.

Now that we have looked at different training levels, let's see how we can all work together better.

Before beginning the actual training, you can start to build your co-trainers confidence in you. In most situations, you will need some pre-training work; maybe we need supplies or paperwork done. I always try and get what we need in advance so we can be ready and they learn they can rely on me. This tends to increase the confidence of my co-trainer, and it's a great foundation for a new training relationship.

There are also some other things to keep in mind when starting a new training relationship.

Sometimes it is better to compromise or give up on an idea so you can strengthen your trainer-to-trainer relationship. As trainers, we can get stuck on an idea, especially when it has worked for us in the past. Remember; as with most things, there is more than one way to achieve the same goal, and maybe going along with your co-worker's idea will also work and strengthen your relationship, even if their way may take more time or be more difficult.

You are only responsible for your own behavior. There will be times when you disagree, and things need to be worked out. All you can do is control your own behavior and what you choose to do and say. **Keep it positive**, and eventually the situation should work itself out.

Keep in mind you may need to be the one to try something new. As in the situation where you have two different styles of training, and you both have valid reasons why your way is the right way. Maybe you could be the one to learn something new, or at least try the idea out. That's the only way to know if it would truly work or not.

In conclusion

Relationships built on mutual respect will work the best. No matter what type of trainer your co-worker is, they have experience and ideas to bring to the table. It may be great animal skills, patience, good listener, hard worker, reliable – no matter what the skills; they will be helpful towards getting the animal trained. If you are having a hard time training with your co-worker, try focusing on these positive skills, and work those in to your training plan to achieve success for all involved. Reinforce your co-worker for these positive skills when you see them in action, even if it is just one on the list. **You may have realized by now, the main theme to this paper is to remember to keep it positive, find and reinforce behaviors in your co-worker that you want to see.**

While we are not zoo animals, we are human, and conditioning methods do apply. Being open and honest, while positively reinforcing desired behaviors in your peers will get you a long way – regardless of the skill level of your co-trainer. Keeping in mind you only have control over your own behavior, but that this has great impact on your peer's behavior. Positivity usually results in success.

Training voluntary reproductive assessments and artificial insemination with African elephants (*Loxodonta Africana*) in a protected contact environment

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While making great strides with the new elephant program at Tampa's Lowry Park Zoo (TLPZ), staff members have had to face numerous challenges that accompany the management and training styles adopted. Most recently, the need to perform full reproductive assessments and the artificial insemination of the facility's 30 year-old female African elephant have been a focus of the program. This feat seemed difficult as our training philosophy no longer called for the use of tethers or restraints. With safety of staff being our main priority, along with our determination to ensure voluntary participation from all animals, we designed and utilized an Elephant Reproductive Assessment Device (ERAD) that is installed directly into our medical chute. This device allows for the veterinary staff to work under an elephant in a protected area while managing the elephant in a stress free manner during an invasive and sensitive procedure. Since development, we have utilized the ERAD for an artificial insemination of an adult who was raised in human care as well as an exploratory scoping procedure on a full term pregnant female who was imported in 2003 as a young adult. Though the backgrounds of the individuals varied greatly, the combination of training and innovation resulted in the ability to perform the behaviors completely, with no restraints, while maintaining the safety of all staff members.

INTRODUCTION

TLPZ has been a presence in the Tampa community since 1957. Over the years the zoo closed, reopening in its present state in 1981. Safari Africa, the zoo's largest expansion since its reopening, was built in 2002 featuring an African elephant exhibit designed to showcase a herd made up almost entirely of individuals from the Kingdom of Swaziland. Tampa's Lowry Park Zoo collaborated with the San Diego Zoo Safari Park to import a group of 11 African elephants from the Mkhaya Game Park. All individuals were approximately 12 years of age and set to be culled as a means of population control. TLPZ was to acquire 2.2 Swazi elephants as well as an adult female from the Knoxville Zoo to create a herd.

Since 2003, TLPZ has been a protected contact facility. However, from 2003 to 2010, management and training methods varied as staff changed resulting in limited successes over the course of those seven years.

In 2010 a new management and training program was established striving for 100% voluntarily participation from all animals in the African elephant/rhino collection. This training completely eliminated the use of restraints and the guide. Training is instead focused on a positive reinforcement foundation and strong relationships with the animals. All animals are trained for voluntary husbandry procedures including, but not limited to blood draws, foot care, trunk washes, rectal ultrasounds, etc.

The herd is managed in as natural of an environment as possible, taking into account their natural social and reproductive needs. Individuals are only separated from the herd during yard maintenance for two hours before rejoining the group in the yards. A natural breeding program is in place for the two females that came from Swaziland. One female, Ellie, is not socially compatible with bulls so artificial insemination was determined as the most feasible reproductive option.

ELLIE

Ellie came to TLPZ in 2003 having lived in a zoological setting for the majority of her life. Collected in Namibia in 1982, at just one year old, Ellie was brought to the International Animal Exchange in Ferndale, MI. Ellie spent two years in Ferndale before moving to Baton Rouge where she spent the following two. The Gulf Breeze Zoo acquired her in 1986 where she remained for the subsequent 12 years as the zoo's main attraction and ride animal. While living at Gulf Breeze Zoo she had no other elephant companion, living as a solitary animal until she was moved to the Knoxville Zoo on a breeding loan. During her five years at Knoxville, she was housed with three other elephants, two females and one male. She did not socialize well with the other cows and was never able to interact with the bull without tethers or in a protected area. The previous facilities managed Ellie in a free contact setting where trainers shared unrestricted space. It was not until 2003, when she moved to Tampa, that she transitioned to a protected contact environment. When she arrived she was 22 years old and had still not had a calf but was known to be cycling normally. The decision was immediately made to inseminate her so she would have her first calf before she was deemed too old where the risk of complications increase. Dr. Thomas Hildebrandt and Dr. Franz Geortiz were contacted and in December of 2003 Ellie went through a standard artificial insemination procedure where her legs were tethered for the safety of vet staff. The insemination was successful, resulting in the birth of Tamani in October of 2005.

As soon as the new management and training program was established, staff began planning to inseminate Ellie in 2011. Meetings were held with our veterinary staff to determine exactly what the procedure would entail. Safety of all staff were of the utmost importance so it had been suggested that Ellie be trained to accept restraints. While this was the safest option that could be thought of at the time, it did not align with the training goals of the department.

The elephant team accepted the challenge and began developing a training plan that would suit both the needs of the veterinary staff as well as the training philosophy.

THE ELEPHANT REPRODUCTIVE ASSESSMENT DEVICE

There were multiple factors that needed to be taken into account in the design of the ERAD. First and foremost, the ERAD needed to provide a safe working area for all animal care staff yet light enough for the staff to easily install in the barn's Elephant Restraining Device (ERD).

We started with the idea of a cage that could be easily secured and removed from the ERD. The two main gates of the ERD were manufactured with upper and lower access panels. Each lower access panel on the main gate is approximately 24.0" wide and 30.0" tall. The purpose of these panels is to allow animal staff to access the lower portions of an animal's posterior or anterior. Any procedure involving the elephant's posterior could have been

done solely using these access points when paired with restraints. However, the use of restraints conflicted with the barn's training philosophy.

The ERAD was built to create a separation between the rear legs of the elephant. In order to do this, we took the measurements of Ellie's posterior. This measurement gave us a rough idea how wide the device needed be in order to separate her legs, but is also gave us an idea how wide we could make it and still ensure that Ellie was comfortable. The height and depth of the ERAD also came from measurements taken from Ellie's posterior. The overall dimensions of the ERAD are, 32.0" high, 26.0" wide, and 28.0" deep. The depth of the ERAD was determined by the area required for personnel to work safely under the elephant.

Once the measurements were taken, we began to research the materials needed to construct the device. Due to the elephants' size and strength it was a primary concern that the materials be able to withstand great force. It was important the device was as light as possible while still ensuring durability. For that reason, we chose to use 2.50" OD steel tubing with an interior wall of 0.25". The steel tubing we chose to use was circular opposed to square or rectangular in order to eliminate any possibility of sharp corners or edges. Circular steel tubing has the highest strength-to-weight ratio making it the ideal material to use in constructing the ERAD while keeping it relatively light at approximately 40 lbs. The horizontal supports were reinforced with steel gussets at each joint. Steel gussets are used to connect and reinforce a joint where members meet at different angles. Once the frame was constructed, it was clear that it had to be wrapped with steel mesh to protect against an elephant's swinging foot or trunk. In construction, 2"x4", 8 gauge steel wire mesh was welded to the exterior of the ERAD and the sharp edges were ground down.

Next, the ERAD had to be secured inside the ERD. To do this, the lower access panel of the ERD gate was modified. Two 7/16" nuts were welded on either side of the window. Two more 7/16" nuts were welded on the rear vertical supports of the ERAD. Then bolts were used to secure the ERAD to the gate. Throughout the duration of any procedure in the ERD, the gate forward of the animal is open, allowing the elephant to walk away at any point.



Fig.1- ERAD (D.Parkinson)



Fig.2- ERAD in medical chute (D.Parkinson)

TRAINING STEPS

It is important to note that during the training sessions, elephants are reinforced with chopped carrots and apples. Various other produce items are also used such as green pepper, squash and broccoli.

Step 1: Ellie had to be taught how to back up into the chute and become comfortable straddling the device. Ellie already knew a back up behavior so we asked her to lean in and present her body along the hallway in front of the medical chute with her back end closest to the chute. At this point we were then able to open the door to give her access to the medical chute where the ERAD had already been secured into the back window. The trainer maintained contact with Ellie on the left side of her body.

- Ellie was asked to “Back up” and when her back foot touched the ERAD, she was bridged and reinforced.
- Ellie was then asked to “Back up” again and was reinforced when her closest foot (her rear left foot) was placed next to the ERAD.
- A target pole was then used to touch Ellie’s right rear foot towards the other side of the ERAD to begin shaping the straddling behavior. We ran into some discrimination issues as most often when her feet were targeted, it was for her rear foot presents. So Ellie was placing her rear right foot on top of the ERAD instead of to the side. We decided to adjust our strategy and just touch her right hip instead of her foot to try and align her over the center of the ERAD.
- Once her right foot was slightly to the right of the ERAD we reinforced. After continuing with this a few times we were confident that she was centered.
- Trainers then asked her to back up one more time while both feet were lined up on either side of the ERAD. She then backed up until she was pressed up against door of the chute. She received reinforcement for this behavior then walked her forward to set up the approximation again.
- After a few approximations Ellie was regularly straddling the device and getting into comfortable positioning.



Fig.3- Ellie straddling ERAD(D.Parkinson)

Step 2: Once Ellie was regularly straddling the device, it was necessary to be able to have her tail held out of the way so we added a second trainer to not only start desensitizing her to people being behind her but to also start her tail manipulation. When Ellie straddled the

device, the second trainer would reach in and touch her tail. She was reinforced for allowing the trainer to guide her tail through the window.

Step 3: We began desensitizing Ellie to general tactile around her genital area. She showed very little reaction to this step so we moved on to introduce the tubes.

Step 4: The veterinary staff were using a 22 inch endotracheal tube to allow the scope to move easily through the vestibule. We began inserting the tube an inch and reinforcing when it was removed. During each approximation the amount of tube that was inserted increased by an inch or two depending on Ellie's response. If she showed any signs of discomfort we would move back to the previous depth.

Step 5: After the tube was completely inserted, the endoscope was then introduced. This is a 3 meter scope that would move past the end of the tube into the vestibule and make the turn to the vagina and eventually the cervix. As when training her to allow the tube to be inserted, she was reinforced after we approximated the scope just inches at a time.

Once the scope was completely inserted we were ready to attempt the insemination during her next cycle.

TRACKING ELLIE'S CYCLE

An elephant's ovarian cycle is approximately 15 to 16 weeks made up of an 8 to 11 week luteal phase and a shorter interluteal phase of 4 to 6 weeks (Olson, 2004). In that interluteal period, there are two luteinizing hormone peaks (Kapustin et al., 1996). The first surge is observed between 12 and 21 days (Kapustin et al., 1996), with the second surge occurring 19 to 22 days later which induces ovulation (Olson, 2004).

Ellie has had a regular cycle since being at TLPZ and on average will cycle every 96 days. Staff has closely monitored her cycle through weekly blood samples, followed by daily bloods when approaching her second LH surge to determine the exact day. Fortunately, several donor facilities were lined up for semen collections and are notified of Ellie's cycle so they are prepared for their procedures.

ARTIFICIAL INSEMINATION PROCEDURE

On March 8, 2013 the zoo received a 3 mL semen sample from our own bull elephant, Sdudla, to use for the insemination process. It was diluted with HEPES, to make a 12 mL sample. Ellie backed into the chute and straddled the ERAD to begin the procedure. At various times during the procedure, the scope turned on itself when attempting to advance the scope through the vagina to reach the cervix. Due to these complications, the team made three separate attempts at the insemination. After the first two attempts, Ellie was given the opportunity to leave the chute and walk around in the barn before setting up for the next. She was inseminated during the third procedure after a combined total of 90 minutes for her three consecutive sessions.

Unfortunately, this procedure did not result in a pregnancy. Ellie has continued to cycle regularly since the procedure. However, to date, there has not been another insemination opportunity because the zoo has not been able to receive a viable sample. The procedure is practiced regularly to maintain the behavior for her next cycle.



Fig.4 Artificial Insemination Procedure (D.Parkinson)

MBALI

Mbali is our youngest and smallest adult female at 22 years old, 5900lbs. Imported from Swaziland in 2003, she was 12 years old and had not previously reproduced while in her herd. For the majority of the time spent at Lowry Park Zoo, Mbali was the most submissive animal and generally needs more time to adjust in new scenarios and with new people. It was clear when introduced to this new program that she would need to build strong relationships with the training staff.

She had been breeding with both males that spent time in Tampa but it was not until 2010 that she conceived her first calf. Staff had not been collecting blood samples from Mbali before she conceived so there was not a concrete date that we were expecting a calf. The team had calculated a due date around October of 2012 based on breeding behavior that had been observed. However, the bull Sdudla, is considered a “recreational breeder”, so he was seen mounting her even though she was not cycling, making it difficult to narrow down a due date.

The average gestation for an elephant is 659 days with a range of 612 to 699 days (Olson, 2004). When an elephant becomes pregnant, her progesterone levels steadily increase and do not drop to baseline until the cow is within 1 to 13 days from parturition (Olson, 2004).

While closely monitoring Mbali’s hormone levels, in June 2012 we were notified that her progesterone had dropped to baseline and that we should expect a calf any day. So we began 24 hour watches as we prepared for labor. Days came and went with no change in Mbali and after two months of observations with no calf, the decision was made to discontinue 24 hour watches but to continue closely monitoring her hormones which remained at baseline. As our original October due date passed, the zoo’s veterinarian requested we train her for an exploratory scoping procedure to see if it would be able to observe any abnormalities with the cervix and birth canal.

TRAINING STEPS

Due to the fact that this procedure was needed to potentially evaluate the status of her pregnancy, we wanted to train this behavior as quickly as Mbali would allow. During her pregnancy, she had developed a rather large edema in her genital region that occasionally would develop sores if she rubbed on logs in the yard. Due to the edema and recognizing

her history of needing more time to acclimate to new stimulus, the team knew she could be more sensitive to the procedure than Ellie had been. Trainers followed the same training steps that had been used for Ellie (see above training outline) but with just a couple of additions. Staff began her training by bringing her into the chute head first, to see the ERAD and touch it, so that she knew it was there when she was asked to back in. This eventually would be something that would occur before every session so she was never surprised when backing in. Trainers also spent more time desensitizing her to tactile in her genital region because of the edema. She took a few days to get used to the veterinary staff touching her edema but after that she did not show any sensitivity to the tube or scope insertions. Staff would do numerous sessions a day with Mbali and after two short weeks were ready for the procedure.

The scoping procedure lasted approximately 20 minutes with Mbali remaining at station. During the procedure, staff observed the condition of the vestibule and reached the cervix. The procedure showed that Mbali was in good condition and that nothing was out of the ordinary. It was determined that staff would continue to monitor hormone levels and treat her edema sores as needed. She remained in good health and condition throughout the remainder of her pregnancy and on December 23rd 2012 Mbali gave birth to a healthy female calf named Mpumi.

CONCLUSIONS

By focusing on building strong relationships with each animal, the team successfully trained semi-invasive medical procedures with two individuals with significantly different histories. The success of the progressive training approach was in its ability to provide animals with a choice while focusing on staff safety.

REFERENCE LIST

Elephant Reproduction [Image](n.d.). Retrieved May 2, 2014 from

http://www.elephanttag.org/general/general_elephant_reproduction.html

Olson, D (Ed.).(2004). *Elephant Husbandry Resource Guide*. Lawrence:Allen Press

Kapustin, N., Critser,J.K., Olson, D., and Malven, P.V. (1996), "Nonluteal Estrous Cycles of 3-Week Duration Are Initiated by Anovulatory Luteinizing Hormone Peaks in African Elephants," *Biology of Reproduction*, 55, 1147-1154.

Photos courtesy of Dave Parkinson, Tampa's Lowry Park Zoo

Utilizing Voluntary Ultrasound to Monitor Pregnancy in an African Lion

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The use of ultrasound technology has proven to be an effective tool to diagnose and monitor pregnancy in captive animals. The Dallas Zoo's Savanna Carnivore team, along with the zoo's veterinary staff, wanted to use ultrasound to determine pregnancy and litter size of an African Lion (*Panthera leo*) due to the possibility of a complicated pregnancy. This paper will discuss how through careful planning, a detailed training strategy and teamwork, the staff was able to successfully train a lioness for voluntary ultrasound without the benefit of squeeze, which would allow them to determine when or if intervention would be necessary as she neared the birth of her cubs.

Introduction

The female lions living at the Dallas Zoo have a family history of dystocia pregnancies (pregnancies that are accompanied by abnormal labor or delivery). In May 2012, one of the zoo's 4-year-old lionesses, "Jasiri", became pregnant with her first litter. Knowing her family history, zoo staff planned for the potential of complications during her labor/delivery. Lacking a squeeze, keepers monitored her pregnancy through weekly body condition assessments and frequent weighings. On September 18, 2012 at approximately 8:30PM, "Jasiri" went into labor and gave birth to 2 stillborn cubs at 12:02AM and 3:40AM. She exhibited appropriate maternal signs towards the cubs, but neither exhibited any signs of life (upon necropsy, it was determined that neither cub ever took a breath upon their birth). Following their birth, the keepers were able to easily move her from bedroom to bedroom inside the holding building. "Jasiri" showed no signs of distress throughout the remainder of the day.

The following morning, "Jasiri" refused to leave the cubbing box when the keepers attempted to feed her and barely showed any response to their presence, which is highly unusual for her. The decision was made to sedate her to give her a checkup and determine what, if anything, was wrong. Upon sedation, a third cub was discovered lodged in her birth canal. Attempts were made to manually remove the cub, but were unsuccessful, meaning surgery would be required. During her surgery, it was determined that in addition to the stuck cub, "Jasiri" had a ruptured uterus. The cub was removed, "Jasiri" was sutured and placed in a mobile recovery squeeze.

"Jasiri" was able to be let out of the squeeze cage and put on stall rest on Sept 25th. She recovered under close observation quickly and was reunited with her sisters on Oct 2nd and reunited with the males on Oct 25th. Due to the potential dangers of breeding her again (whether immediately or

ever again), rather than contracepting her, “Jasiri” was separated from the males anytime she was displaying signs of estrus. This management technique, though tricky due to the irregular periods of time between her cycles, was successful due to diligent keeper observations for signs of estrus. She was easily reintroduced to the pride of 2.2 lions after each separation.

Following her first pregnancy, the zoo began collaborating with SEZARC (South-East Zoo Alliance for Reproduction and Conservation). Discussions between animal staff, vet staff, and SEZARC concluded that “Jasiri” could safely be bred again. Though it had yet to be determined whether or not she could even physically carry cubs again, staff began preparing for her next potential litter. A plan needed to be created to increase not only the likelihood of viable cubs, but most importantly, the survival of their mother. Several thoughts of how to best manage her pregnancy were discussed, including voluntary c-section, determining litter size through x-rays or ultrasound, and when to intervene if distress is seen. It was decided that the best course of action for “Jasiri” was to attempt a natural birth, but to pre-determine litter size, therefore allowing staff to more quickly pinpoint whether she is in distress.

A bench was built by the zoo’s construction staff, giving the keepers a safe space to train our female lions for voluntary ultrasounds. The bench is 3 feet high and runs 5 feet along the front mesh of one of the bedrooms. The entire bottom area under it is enclosed with mesh, allowing the staff to safely reach underneath the animal laying on the bench. Several doors were cut along its length, giving the vets several options of where to attempt the ultrasound.

Materials and Methods

In order to increase the likelihood of a successful pregnancy, ultrasound training was implemented even before “Jasiri” was allowed to be with the males during estrus. In October 2013, “Jasiri” was observed breeding with 1.0 Lion “Dinari” (the father of her first litter) over the course of 4 days. Early fecal results confirmed that she did ovulate. “Jasiri” did not show signs of an estrus cycle a month later and appeared to have minor teat develop, indicating a possible pregnancy. However, pseudo pregnancy has been documented in lions, requiring further fecal sample testing closer to 65 days after breeding. Keepers hoped to utilize this testing, along with ultrasounding, to confirm or deny pregnancy.

Training sessions were done with “Jasiri” minimally once per day (but oftentimes twice per day). Two trainers were required- one to reinforce her and one to manipulate the drop doors/mock ultrasound wand. Initially, she was taught to lay on the bench, with her right side along the mesh. Once she would reliably lay this way, keepers began using the end of a broom handle to simulate the ultrasound wand. “Jasiri” quickly progressed to allowing keepers to touch her side/underbelly with the wand through the stall mesh for 10-15 seconds with no issues.

Next, the keepers began manipulating the slide bolts and doors to get her comfortable with them opening while she was laying on the bench. This proved to be more of a challenge than initially anticipated when “Jasiri” began displaying minor aggressive behaviors during this process. The sounds of the locks and slide bolts of the doors being manipulated and anytime she was able to see the open door would result in vocalizing and turning her head and body towards the end of the bench where the keeper was working. She also stopped presenting her side along the mesh whenever the door underneath her was opened. Due to the potential risks to staff safety (as “Jasiri’s” paws and face could easily fit through the opening), the keepers moved back to earlier steps in their shaping plan. Heavily reinforcing calm behavior whenever the bolts were manipulated and minimizing the chances of her seeing the open door helped increase “Jasiri’s” confidence. Keepers were also careful to never bridge “Jasiri” unless she was laying calmly, facing forward on the bench. Within a few sessions, “Jasiri” was reliably positioning herself over the opening and allowing the keepers to touch her abdomen with the wand for 5 seconds through the open door. Throughout the initial stages of training, the vet staff would periodically attend sessions to make sure the training was conducive to what they needed to actually perform an ultrasound.

The next step was to determine what medium needed to be used between the wand and her abdomen to allow for a successful ultrasound. In discussion with vet staff, water, alcohol and gel were all options. Keepers initially used a spray bottle of water. Once “Jasiri” was reliably positioning herself, allowing her abdomen to be sprayed with water and allowing staff to touch her belly with the wand, the vet staff began coming more regularly to the training sessions. From beginning to end, training her for voluntary ultrasounds took 8 weeks.

Results

The first attempt at performing a real ultrasound occurred on December 31, 2013. Through this first attempt, it was determined that gel would be necessary to get a clear picture. One training session was needed to acclimate “Jasiri” to the sensation of having the gel spread on her abdomen via the wand. Several more training sessions were needed to determine which ultrasound probe worked best, as well as the best position to have “Jasiri” lay in to have the best chance of a successful ultrasound. During the fifth session using the portable ultrasound machine (approximately 60 days after breeding) and after several ultrasounds without seeing any fetal development, the vet staff felt sure that “Jasiri” was not pregnant. Testing on fecal samples closer to the 65 day mark confirmed the vet staff’s theory of a pseudopregnancy. While we were discouraged by this news (even though we knew there was a possibility that she might not be able to carry a pregnancy) we were excited to know that should “Jasiri” become pregnant in the future, we have the necessary tools to give her and her cubs the greatest chance of survival.

Acknowledgements

We would like to thank the Carnivore team for all their hard work, the Dallas Zoo veterinary staff for their time in assisting us with our training sessions, Dallas Zoo management for their support,

our construction staff for building us such a great bench, giving us the tools necessary to making this training a success, and SEZARC for helping us determine ovulation and non-pregnancy.

Successful hand rearing and reintroduction of 1.0 Javan gibbon (*Hylobates moloch*)

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Introduction

On the 29th of April 2013 1.0 Javan gibbon (*Hylobates moloch*) named Duke was born to first time parents Leon and Isabella. Keepers found the infant cold and almost lifeless on the ground that morning. Supportive care was started immediately when we realized he was still alive. The Gibbon SSP Coordinator was contacted and put us in touch with the Gibbon Husbandry Surrogacy Team. Recommendations were made to try and reintroduce the infant back after the 30 hours since he had gained weight. The next day a reintroduction was attempted between infant and mother. After being placed in holding, Isabella, the mother went over to him and picked him up. They were observed for a few hours, and we noticed she was grooming and holding him. She was gentle and showed no signs of roughness or aggressive behavior. After 24 hours of her having the infant, there were no obvious signs of nursing, and there were clear signs of weakness in the infant. An emergency knock down was performed to get the infant back, and at this point we noticed she had not produced enough milk to feed the infant, so the decision was made to hand rear. To ensure proper socialization and after long discussions and communicating with other facilities, the goal for a possible reintroduction would be around 4 months. We also found that the amount of resources available to assist us with was limited and so it became our goal from the beginning to record as much information as possible for future facilities in this similar situation.

Preparation

Prior to the birth, research was done on supplies that were needed if hand rearing was necessary. An incubator, baby bottles, Gerber® Good Start Newborn Infant Powdered Formula, Pedialyte® and some blankets were stockpiled. Protocols were written such as, dress code, temperatures the room should be kept at, feeding schedule and chart. Once Duke was born, we realized we needed a lot more supplies than what we had available. This included preemie size diapers, more blankets, different bottles, pacifier, stuffed animals, fur vest, heating pads, and an electric tea pot. The bottles that worked the best at the beginning were Dr. Brown's® Natural flow 2oz bottle, towards the end of hand rearing the bottles that were used were Philips Avent 9oz. These 2 bottles had airflow inserts that would help Duke drink better. Slits were cut in the nipples to help Duke drink better. Cone Women's Hospital donated Pampers® Swaddlers preemie diapers throughout his care. The hospital also purchased/donated more blankets, formula, play pens and stuffed animals. The Gerber® formula made Duke gassy, so he was changed to Enfamil® Premium Newborn Formula, which he liked better. Little Remedies® for Tummy's™ Gas Relief drops were used when Duke was gassy.

Hand Rearing

When Duke was back in supportive care he had lost some weight from not eating and was dehydrated. Our goal was simply to strengthen him again, and for the first week Duke was kept in a private room in our hospital area. To keep consistency and ensure Duke became stable, we first limited the amount of staff helping to a care team of three which included two keepers and the curator. This remained the only staff to care for Duke in the evenings but more staff and volunteer help was brought in for daytime help. The hospital room was kept at a minimum temperature of 90 degrees and was set up with all necessary supplies plus a rocking chair, and sleeping space for the overnight care. An incubator was ready (which was held at the same temperature) to be used only when keepers had to be away from Duke for a short time.

Initially, two keepers stayed with Duke at night to feed, change diapers and monitor his progress. Fur aprons were made to “imitate” mom and for him to learn to hold on. Gloves, masks and scrubs were worn by keepers to prevent exposure to disease. Duke was kept on a keeper 24 hours and held in an upright position like mom would hold him. After a week of weight gain and being stable the vet recommended that the care team could take him to their home. This would be more comfortable for the keepers for the next few months. At home, the care team did not wear masks unless changing his diaper. For the first two months it was necessary to sleep in an upright position, with him on the fur vest. This was eventually phased out once night time feedings became more infrequent and Duke was sleeping better. At this point, a play pen was set up with a stuffed animal for Duke to grip on.

During the day there was more help for the care of Duke. We were able to utilize volunteers from the Women’s hospital who typically worked with preemie babies. They would sign up for blocks of time from 0730-1700 hrs and stay with him in the hospital building where visitors could see him through a window. Volunteers were vaccinated for hepatitis B, Tetanus, and Tuberculosis. They wore face mask, gloves and the fur aprons while they were with Duke. Volunteers were trained to properly hold Duke, change diapers and exercise him. They were also trained to feed him his bottle, however feedings were challenging and keeper staff took over. Volunteers, as well as staff, would take Duke to have interactions with parents at least four times a day.

Feeding

Day one of birth Duke was only on Pedialyte® and it was offered whenever he seemed hungry. For the first 30 hours this ended up being 25 feedings for a total of 63mL. This is when we tried to initially reintroduce him back to mom. Once back in our care, Duke was on a mixture of Pedialyte®, water and Gerber® formula. The formula solution started out at a 25% formula to 75% water/Pedialyte®. Every other day we would increase the amount of formula and decrease the water/Pedialyte® amount. He would be on a new mixture for a few days, and if he took that well we would increase the formula amount more. When we started getting towards full formula, Duke started getting really fussy and gassy. He did not want to eat, and would also spit up the milk. We spoke with other facilities about what formula they used and found that we should switch him over to Enfamil® formula. For those days of him being fussy, Duke was put on Little Remedies® gas drops. Slowly Duke was changed over to the Enfamil® formula, where it was noticed he was being less fussy, and had no gas problems.

Since we were learning as we went, we were changing routines more than normal. We tried to adjust his eating habits a few times based on how hungry he seemed the first few weeks. After that, we got into a better routine. In the beginning he was being fed anywhere from 1-2 hours a day, and he would take 10-60 minutes to eat. See figure 2 for example of feeding chart.

DATE	Feeding Start Time	Feeding End Time	Body Weight (g)	Bottle Weight Pre-feeding (g)	Bottle Weight Post-feeding (g)	Total Consumed (g)	Comments	Total Consumed for the Day (g)
5/1/2013	1342 hrs.		401.5	74	58	16		
	1508 hrs	1520 hrs		57.5	47.5	10		
	1536 hrs	1610 hrs		47.5	31	16.5		
	1705 hrs	1730 hrs		104.5	101.5	3		
	2005 hrs	2100 hrs		92	59	33		
	2250 hrs	2317 hrs		77.5	66.5	11		89.5
5/2/2013	0100 hrs	0123 hrs		80	77.5	2.5		
	0215 hrs	0246 hrs		77.5	73	4.5		
	0400 hrs	0451 hrs		80	58	22		

Figure 2 shows an example of our feeding chart.

We tried to keep Duke on a set schedule of feeding every few hours, but Duke seemed interested in eating more frequently, or at different times than we had scheduled. The staff would look at other facilities feeding charts for reference, but ultimately we had to figure out what was best for us and Duke. We tried feeding him every time he was hungry, but we quickly learned that he would get up every hour and he would only eat a small amount. It was then decided we would feed him every 2 hours, and after a few weeks we moved it to every 3 hours. At 2 months, we went to a more specific schedule where Duke only got fed at certain times of the day. This would help us wean him off of night feedings, and get him more accustomed to the hours a staff member would feed during a normal work day. Duke seemed to struggle with the nipples on the bottles so we ended up cutting slits into the nipple for better flow. During some feedings he would go down to gibbon holding where the parents and Duke could watch each other. While Duke was being fed, he was kept on the fur apron in an upright position. We also wanted to get him started on solid food early so around 2 months, we started mashing up banana or skinned apple and offering it to him. Duke easily took to eating solid food, so we then offered soaked leaf eater biscuits as well. He started off getting 2g of solid food once a day. At the end of 3 months he was getting 10g of fruit/ steamed veggie mix plus leaf eater biscuits daily.

Around 3 months, we made a goal to reintroduce him to his parents at 4 months. We needed to make sure that he would hold on to the mesh by himself, and be able to come up to the fencing for a feeding. We would bring him down to the holding, set him on a platform and have him hold on to the fence. We then went to the keeper side of holding to feed him his bottle through the fence. It didn't take him long to learn to sit on the platform and drink. After we knew he would wait on the platform for his bottle, we then taught him to come up to the fencing on his own for a feeding. We would put him in the middle of the run and make him come to the fence to eat. Duke would usually cry, but would crawl to the fence. At the end of 3 months, every feeding was in holding and he was successfully coming up to keepers for all feedings.

Exercise

Duke needed to be strong in order to be reintroduced back to his parents at 4 months. There were a few exercises that were preformed to help with his strength. One of these was during diaper changes. It usually took 2 people, one person holding Duke on to their fingers, while the other person would clean and change him. While the diaper was off, keepers would encourage him to do pull ups to strengthen his arms. If only one person was changing him, then he was encouraged to grip onto the fur vest unassisted.

Volunteers were also trained to exercise Duke by walking around the hospital by bouncing and moving their body to mimic the parents. This helped Duke recognize the movements his mother would make and learn to hold on tighter. The volunteers were asked to keep their hands slightly below Duke while walking around and to provide less support to his body. More extensive exercises were continued at night by the care team and included encouraging crawling/walking and hanging on a variety of other items.

At 3 months, we received pictures from Perth Australia of their jungle gym they made to teach their gibbons how to brachiate. Play pens were donated and set up with ropes, blankets and stuffed animals for him to play with. When Duke was in the play pen, his diaper was removed and a puppy pad was put on the bottom to make it an easy clean up. Since Duke wanted to still be held by keepers, we would put him in the play pen and keepers would walk from side to side with banana (his favorite) and have him come over to them. This meant that he could either crawl on the bottom of the play pen or move around from rope to rope. Duke learned to move from one rope to the next, which was a positive sign of him starting to brachiate. Once Duke mastered the jungle gym, we needed him to spend more time with his parents. We set up a jungle gym in a large parrot cage, with perching, rope, straw, blankets and stuffed animals. In the parrot cage he had exercise sessions where he learned how to climb and use perching to get where he needed to be. At the end of 3 months, he was swinging around and going to the top of the parrot cage to look around.

Interactions

Once it was decided to hand rear, a schedule was set up for daily interactions with the parents. Duke saw his parents at least 4 times a day for the first 2 months. The exhibit has a holding area with 3 separate rooms, and outside there is an airlock that leads to the exhibit. In the airlock and Isabella's training run, we put mesh up that was 2 inches by 1 inch. This kept Isabella from reaching out and grabbing him, but allowed her to reach her fingers out and groom Duke gently while also smelling and licking him. Duke would go down anywhere from 15-45 minutes for the first 2 months. If the interaction took place before opening it would be in the airlock outside, and then he would be walked around the outside of the exhibit. For the interactions Duke would be wrapped up in a blanket with his hands tucked away to prevent biting and grabbing from the parents. We used food to reward Isabella for being gentle. Once we felt comfortable that she wasn't going to try and pull or be aggressive, we slowly took away the blanket that he was wrapped in.

At 3 months, we started leaving him alone with his parents where they could reach him a little better. We set up the parrot cage in gibbon holding, on the keeper side, flush up against the mesh so the parents could reach their arms through to have more contact. With the cage being on the outside of holding, Duke could get away if he wanted to. After a few days of this, we felt comfortable enough to put the parrot cage in holding with the parents for further interactions. When Duke was in the cage, he would spend anywhere from 1-2 hours, 2-3 times a day. The adults would have access to him and their exhibit, and could come and go as they chose. Once the cage was put in the holding area, we observed Isabella watching him and trying to groom him more. Duke would tolerate this attention, but sometimes he would just play and ignore her. There was never any aggression from Duke or the parents, but Duke did not solicit attention from them as much as we would have expected.

Reintroduction

At the end of August, things were going really well so a reintroduction plan was discussed. We saw a lot of progress during the months, and felt comfortable with our original goal of a 4 month reintroduction. Duke was eating more solid foods, becoming more independent, and was strong enough to move around the holding space. On the 3rd of September 2013, we moved forward with the reintroduction. Both parents were locked in holding in two runs. We put Duke in the third run on straw in case he fell. We then opened the shift door between Duke and the parents, Isabella went over to him immediately. However, Duke was scared and kept running away, slapping and biting her. She would also try to gently force him on her

stomach, but Duke would get upset and try to get away. Meanwhile Leon, the father, stayed away from both of them and just watched. After 15 minutes, the care team ended up leaving since Duke was focusing too much on them. A past intern came in to observe from a blind during the day while Duke was with the parents. Shortly after leaving, the intern called and said that Leon was very stressed out. We then let Leon outside and kept just Duke and Isabella together inside. We still saw no aggression from Isabella throughout that day, but Duke wanted nothing to do with her. He would just hang on the fence and try to look for keepers. If Isabella went over to him he would just try to push her away. At the end of the day we decided to keep the two of them together overnight since nothing negative was ever observed. A keeper checked on them around 2300 hrs that night and found that he was hanging in the same spot that he had been all day and Isabella was in a different run. At the morning check, Duke was exhausted and stressed. When feeding him, we noticed that his hands were rubbed raw. It was realized that Duke had been excessively bouncing on the mesh during periods of stress. To prevent further damage, the vet recommended taking him back to let his hands heal. Since we saw this behavior repeat, our vet also recommended a prescription of valium to help reduce anxiety. This, in combination with wrapping his hands, helped us continue to moving forward with introductions.

Once introductions continued, in order to reduce stress the parents had access to the exhibit and the holding area where Duke was. We avoided this at first, because there was concern that Duke would go outside, which was not baby friendly. However we felt that this was highly unlikely and the benefits outweighed the risks. To protect Duke's hands in holding, a soft screen was put up over the existing mesh. At night we decided to keep him in a play pen, separated from the parents, with only visual contact. After hour feedings were permanently eliminated. Unfortunately it was noticed over the following weeks that the parents spent less and less time around Duke. Duke usually stayed in one run with his blanket and some low hanging ropes and logs to play with. We worried about him not socializing, so we ended up moving him into another run where the parents were more comfortable. This helped some and then they hung out more together during the day.

It wasn't until October that Duke ended up going outside on exhibit for the first time. While outside, Isabella kept a close eye on him. Duke seemed scared on exhibit so didn't seem to mind Isabella paying more attention to him. This appeared to help solidify the bonding process more than anything else. Though Isabella and Duke continued to bond, Isabella did not allow Leon to come close to Duke and so he continued to observe the interactions only. While outside, Duke initially remained on the ground and close to the shift door. It took some time for Duke to learn to come back inside that first day, and when he did, he didn't show any stress behaviors. It took a few more weeks before Duke would go back outside regularly. If we could get the parents locked in holding, he would follow keepers outside on nice days. After a few weeks of him following keepers outside, he learned to go outside either on his own or with the parents. The bond between Duke and his parents continued to improve over these few weeks. We saw Duke sitting on Isabella's lap and staying close to her, and we also observed play behaviors with both parents. The exhibit mesh is big enough for him to stick his head through, so at night he is separated by himself (which he doesn't mind), but still has the opportunity to see and hear the parents. This allows the parents to still have outside access at night, which reduced their stress. To this day, he will still get excited to see his keepers, but he does not want to be held or "hang out" with us and is a very independent gibbon. During the day we see him with his parents, playing or sleeping. Of all of the three gibbons, Duke has become the most dominate.

Post reintroductions keepers continued to still offer a milk diet along with solid food. We slowly kept reducing the amount of milk intake till around 6 ½ months, when formula was stopped altogether and he was only on solid food. We still put water in a bottle to make sure he was hydrated since he didn't know how to drink out of a bowl. This finally stopped around 1 year of age, when keepers were able to train him to drink from the bowl by placing food items in the water.

Conclusion

Overall Duke ended up being as normal as he could be for being hand-reared. We do see some stereotypic behaviors occasionally, such as a rocking motion when he is stressed. I believe if the staff had to do this again we would be better prepared and more organized the next time. With this being the first hand reared animal at our facility, there was a lot of trial and error and communication with other facilities which was essential. We hope that the information provided here will help other facilities facing a similar situation in the future. Additionally, we feel that this process really helped Isabella develop strong maternal instincts and we feel confident she will successfully raise her next infant. All specific data can be made available to any interested parties by contacting the author.

Products Mentioned

Pampers® Swaddlers preemie diapers: Pampers, USA, www.pampers.com/new-baby-diapers-swaddlers

Dr. Brown's® Natural Flow 2oz bottles: Handi-Craft Company, 4433 Fyler Avenue, St. Louis, Missouri 63116. www.drbrownsbaby.com

Philips Avent bottles: Philips, USA, www.usa.philips.com/c-m-mo/bottle-feeding.html

Pedialyte®: Department 107089, 3300 Stelzer Road, Columbus, Ohio 43219-3034. www.pedialyte.com

Enfamil® Premium Newborn Infant Formula: Mead Johnson, USA, www.enfamil.com

Little Remedies® for Tummys™ Gas Relief Drops: Prestige Brands, 660 White Plains Road-Ste #250 Tarrytown, NY 10591. www.littleremedies.com

Gerber® Good Start® Gently Powdered Formula: Gerber Resource Center, 445 State St. Fremont, MI 49413-0001. www.gerber.com

Title: A successful hand-rearing and reintroduction of an infant mongoose lemur
(*Eulemur mongoz*)

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Introduction

Endemic only to Madagascar, lemurs are living representatives of our prehistoric primates. Although they are highly charismatic, several lemur species are becoming threatened with extinction in the wild. This concern is escalating as recent IUCN redlist reassessments have shown that 94% of lemur species are now threatened, which has increased from the 74% reported in 2008 (Schwitzer et al. 2013; Schwitzer et al. 2014). These findings not only urge us to increase our efforts in wild population conservation but also in maintaining viable managed populations. This is where the efforts of zoos and reserves play an important role in maintaining these populations.

Although there are over 100 species of lemurs, only a few are represented in zoos. Facilities that house these representative species have come together to participate in plans to maintain managed breeding populations. The Prosimian Taxon Advisory Group (PTAG) and relevant Species Survival Plan Programs help guide decisions regarding best practices in lemur husbandry and publish breeding and transfer plans to promote genetic diversity in managed lemur populations. In increasing lemur populations it is not only important to match up the best potential parents for producing offspring, but also to develop plans for when complications arise after offspring are born. This is extremely important for species that are not highly represented in zoological or primate facilities and in which the development of reproductively viable offspring is imperative.

The Lemur Conservation Foundation (LCF) is one such facility that houses breeding pairs of several species of lemurs and has dealt with birth complications. LCF has recently experienced a birthing complication and has demonstrated the proper steps to successfully rear an infant and reintroduce the offspring into its social group.

Case Study

On the morning of March 24th, a mongoose lemur (*Eulemur mongoz*) infant (Silvio) was found in the shavings on the ground of the enclosure. Silvio was brought to the veterinary clinic, a weight and temperature were obtained, and since he was below the normal temperature range (97-99° F) he was wrapped in a blanket and placed on a heat pad under staff supervision. Once Silvio's temperature was within the normal range, staff attempted to reintroduce the infant to the dam (Kikeli). Kikeli would not accept Silvio and retreated from him when staff approached her with the infant. Kikeli and the infant were placed in a medium-sized crate together overnight in an attempt to stimulate maternal behavior; however Kikeli never approached the infant. On day two staff decided to get the dam in hand and place Silvio on her to nurse. Silvio rooted around, would attach to the nipple and quickly unlatch and continue to root and vocalize. The dam did not seem to be producing milk and was acting lethargic, so the infant and dam

were taken to the University of Florida Veterinary School for a full physical exam. It was determined that the dam was not producing milk and the infant and dam were kept overnight for observation and treatment. Silvio was supplemented with the recommended formula (see Table 1) and Kikeli was treated for a retained placenta. Since Kikeli was not producing milk, LCF staff decided to hand raise Silvio, with the hope of reintroducing him back into the group as soon as possible. On day 3 Silvio was placed in a crate within Kikeli and the sire's (Felix) inside holding area that allowed for visual, auditory, and olfactory, but not physical contact.

Table 1: Supplementary Formula Options

Formula 1 (LCF's Choice)	30ml Similac human infant formula prepared according to directions, 30ml nonfat milk, 3ml 50% dextrose
Formula 2 (Alternative)	Zoologic® Milk Matrix 20/14 by PetAg – 10g powder to 100ml water

In hand rearing Silvio, the keepers' goals were to keep him in as much contact as possible with his parents while not causing stress and to have him not associate with keepers over his parents. Silvio's feeding schedule was based on Williams (2002) and daily weights were obtained to ensure proper weight gain (See figures 1, 2, 3). Silvio was housed in a separate small portion of his parent's holding so that they could maintain visual, auditory, and olfactory contact while not being in physical contact. Because Silvio's inside holding area was a small portion of his parent's holding area, he was still able to see them when they were inside and through a window when they were in their outside enclosure. This allowed for all individuals to be within viewing of each other so that they could grow accustomed to each other. This arrangement also protected Silvio from any potential aggression or other harmful interactions that could happen when keepers were not within vicinity. Silvio's holdings expanded from a very small portion of the holdings to a larger area once he started to move around more and play. Although he was hand fed by keepers, they allowed supervised visitations with Kikeli and Felix as often as staff time allowed. During these visitations, Silvio was brought either into his parent's holding area or into their outside enclosure. Silvio was initially not allowed to have unsupervised visitations because of the inability of Kikeli and Felix to perform proper care for him. This arrangement was further supported due to the negative interactions Kikeli and Felix had with Silvio during his visitations over the first few weeks. Kikeli and Felix were seen biting the back of Silvio's neck and grooming him rigorously. During these negative interactions keepers would intervene and prevent the continuing of those behaviors. This assisted in promoting positive interactions between the parents and Silvio and allowing for their relationships to improve.

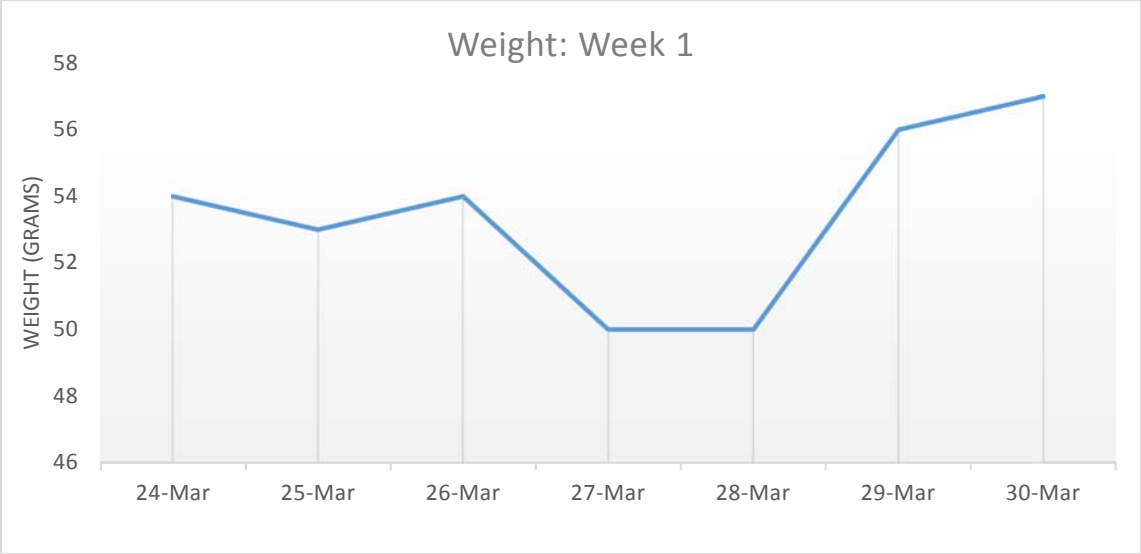


Figure 1. Silvio's daily weight in grams.

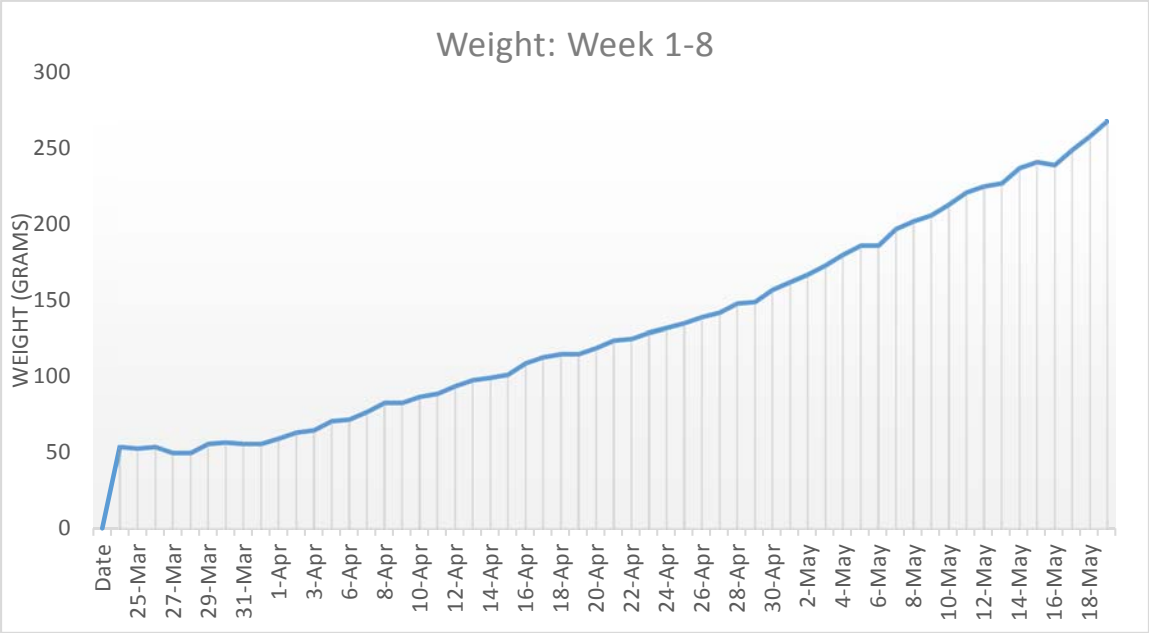


Figure 2. Silvio's daily weight in grams.

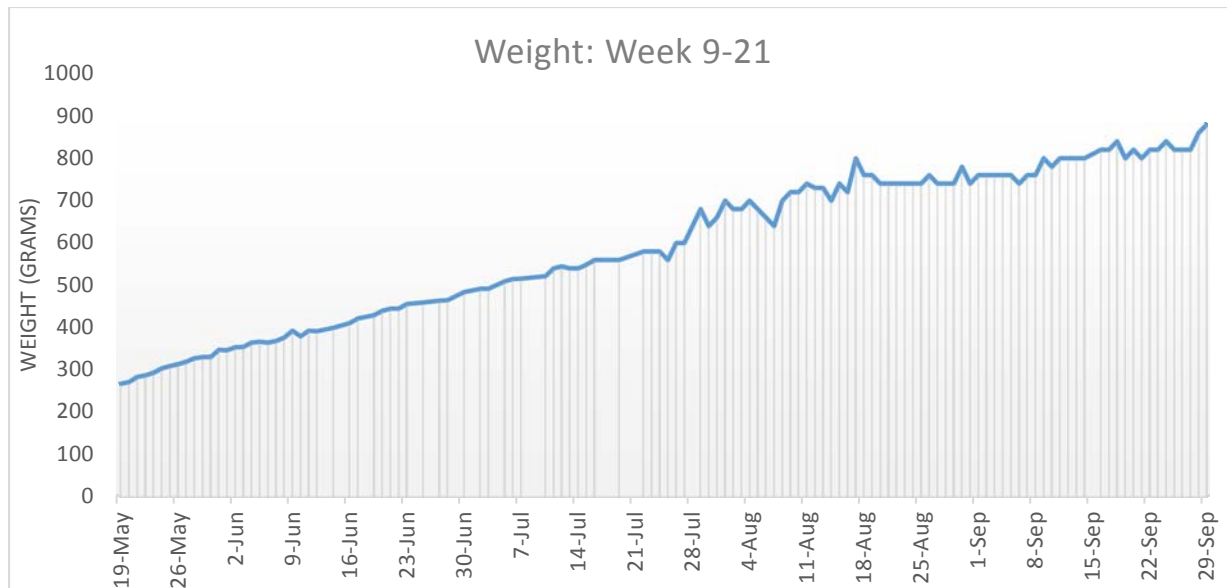


Figure 3. Silvio's daily weight in grams.

From week 1 to 2, Silvio was fed every 2-3 hours by keepers in the presence of Kikeli and Felix. He was carried and fed on a stuffed bear in an attempt to reduce his association with people. Within the first few feedings both parents showed interest in Silvio and started to groom him. Their grooming attempts focused mainly on the face and were slightly vigorous on occasion. Towards the end of the first week Silvio did begin to vocalize while feeding and his gaze towards his parents progressively increased. As the week progressed both parents became more comfortable with Silvio and by the end Kikeli made her first attempt at grabbing Silvio.

From week 2 to 5.5 Silvio was fed every 4 hours. At week 2 an attempt was made to place Silvio onto Kikeli. Kikeli pushed Silvio off of her during every attempt, and it was determined that Silvio would not be reintroduced until a later time. At around the same time, Silvio started to groom himself. Throughout these weeks Silvio became calmer around his parents, and Kikeli became more skilled at grooming Silvio. Supervised visits between the infant, dam, and sire increased to approximately one hour. During this time, part of the holding area was sectioned off so that Silvio could have a larger area to climb and explore when not resting on his bear in his crate. His enclosure was furnished with low branches and toys and also included a window where he could observe Felix and Kikeli when they were in their outside enclosure area.

From weeks 6 to 8.5 Silvio's feedings increased to every 5 hours and chow dust was added to the formula. Grooming sessions between Kikeli and Silvio improved and Felix attempted to groom Silvio more often. During one of the visitations at around 7 weeks Silvio attempted to play with Felix and Kikeli. Felix was not reactive but it startled Kikeli. Towards week 8 both parents were progressing with their grooming and even allowed Silvio to groom them.

From weeks 8.5 to 11 Silvio's feedings further increased to every 6 hours. During a supervised visitation towards the beginning of this period, Silvio attempted to jump onto Kikeli's back. Kikeli initially reacted negatively by jumping away and knocking Silvio off of her, but afterwards she approached and groomed him. Silvio continued to attempt to play with Kikeli. He made several play swats and she was tolerant of him but did not allow him to climb on her or touch her excessively. His interest in Kikeli continued to increase. As his attempts at playing increased, Kikeli's tolerance decreased. With time Silvio became

more defensive and started to swat back when Kikeli would push him away or nip at him. By week 11 Silvio was teething and began to gain confidence in exploring the enclosure during visitations.

At 11 weeks keepers began to feed Silvio every 8 hours. Silvio's visitations improved as he became more interactive with Kikeli and Felix. He cowered less after negative interactions and initiated more play interactions with his parents. Silvio also started to rest and cuddle with his parents and explore the enclosure more. His parents were a little reluctant of his explorations and Kikeli would sometimes swat at Silvio when he would jump on branches near her. Silvio's diet also started to change at this time as he was introduced to softened chow and sweet potato.

As the weeks progressed, the visitations increased and the keepers spent more time outside of the enclosure observing these interactions instead of inside of the enclosure. This prevented Silvio from trying to jump on the keepers and kept his focus towards his parents. Kikeli and Felix still fluctuated between disinterest and intense sessions of grooming, but Felix started to show more paternal behaviors. When Silvio would vocalize, Felix would approach and groom him. Kikeli became less tolerant and would often slap Silvio when he was trying to play or approach her.

At almost 3 months of age, keepers switched from carrying Silvio from his holdings to the outside enclosure on a bear to carrying him in a crate. They started with just carrying the crate while carrying Silvio on the bear. The keepers then put the bear partially in the crate and gradually transitioned to having Silvio fully in the crate for transportation. After approximately a week of being crate trained, Silvio was allowed in the enclosure with his parents for the entire day and brought back to his separate holdings for the night. Silvio also began to show interest in what his parents were eating. Felix tended to just turn away while Kikeli would become very aggressive if Silvio approached her while she had desirable food. During his full day sessions, Silvio progressively became more cautious with Kikeli and tended to avoid her. He spent a lot of time alone in the holdings and often retreated to his bear. Kikeli and Felix showed the most interest in Silvio when he was being fed. After a few days of full day interactions, Silvio was able to stay day and night with his parents. Silvio showed less signs of anxiety towards Kikeli. Kikeli maintained a low tolerance of Silvio and would swat at him often when he approached her. Although Kikeli and Silvio's relationship did not follow a typical mother/infant relationship; the low levels of aggression and occurrence of grooming and cuddling sessions demonstrated that Silvio was fully integrated with his parents.

Behavioral Observations

Around the three month mark, observational data was collected to determine the social dynamics of the family. This continued from when Silvio was given one hour visitations with his parents until he was 5.5 months old and was fully integrated back with his parents. The activity budget and distance from neighbors for all three individuals were measured to determine if Silvio's inclusion in the family altered behaviors and to see if he was integrating properly. To measure this, instantaneous focal sampling along with all occurrence recording were performed during times that Silvio was in full contact with his parents and in the outside portion of the enclosure. The three months of data collection were divided in half and a T-test was used to determine if there were any significant ($p < 0.05$) changes in behavior.

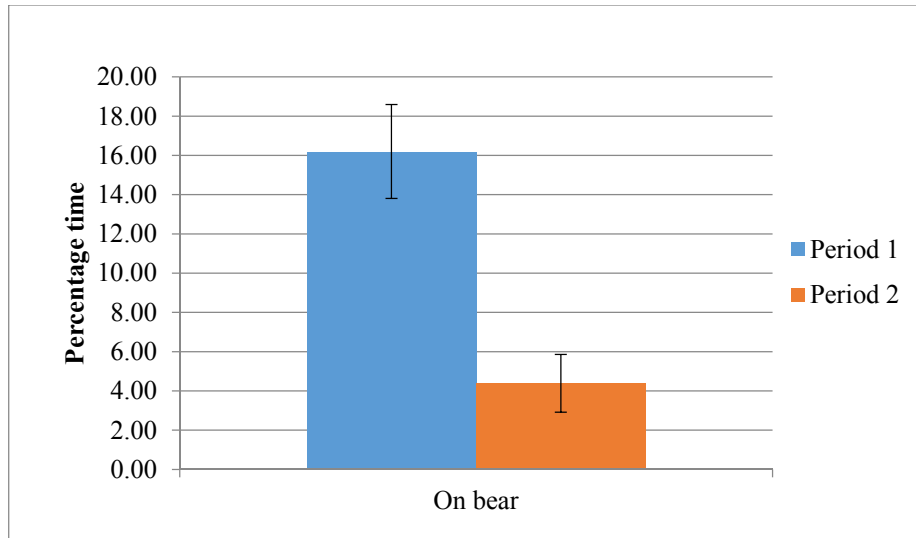


Figure 4. The percentage of time Silvio spent on his bear throughout the first and second period of focal sampling.

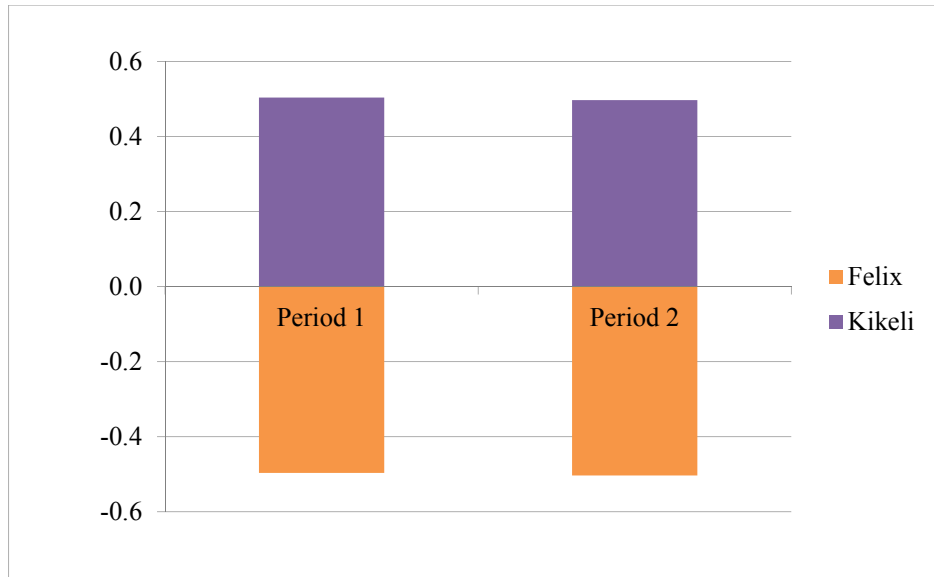


Figure 5. The relative frequency of approaches between Felix and Kikeli during the two periods.

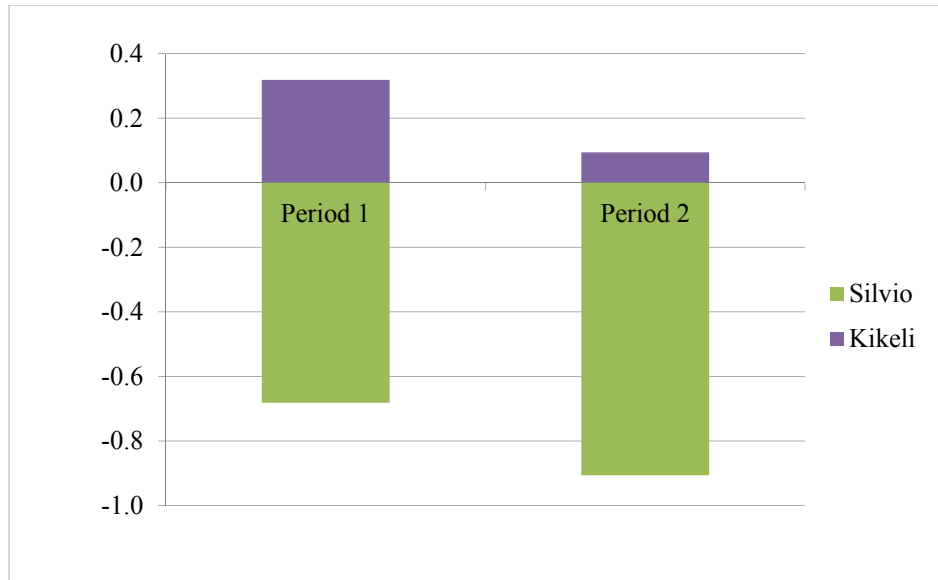


Figure 6. The relative frequency of approaches between Silvio and Kikeli during the two periods.

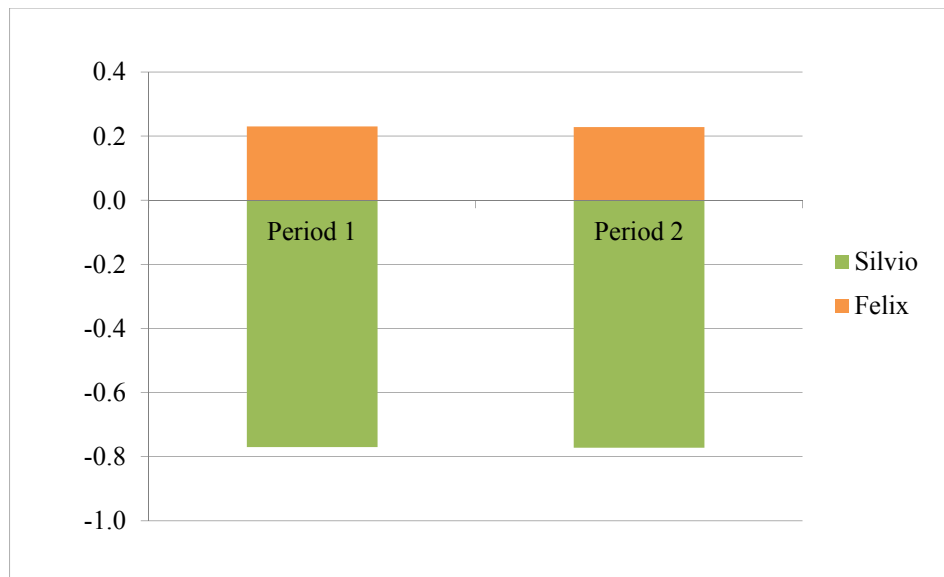


Figure 7. The relative frequency of approaches between Silvio and Felix during the two periods.

The amount of time Silvio spent on the bear was significantly different ($p > 0.045$) between the two periods with him spending less time on the bear (Figure 4). In terms of individuals approaching each other, Kikeli and Felix approached each other approximately the same over both periods (Figure 5). The frequency of approaches between Kikeli and Silvio were significantly different ($p > 0.045$) between the two periods. Silvio increased in approaches and Kikeli reducing her amount of approaches (Figure 6). The amount of approaches between Silvio and Felix did not differ significantly between the two periods although Silvio approached Felix more often (Figure 7).

Conclusion

Silvio's integration was a several month long process that required around the clock care and observations. Several important steps were taken to make this reintroduction successful. Most importantly was maintaining visual, auditory and olfactory contact between Silvio, Felix and Kikeli. By having the

individuals within that frame of contact they were able to interact without the potential of aggression as each of them became more adjusted to the presence of the other. As first time parents, Felix and Kikeli did not show appropriate parental behavior; however, the fact that they did demonstrate grooming and comforted him during his distress calls was a good sign for improvement with potential future offspring. Starting with small visitations and only increasing them based on individuals' stress and comfort levels was very beneficial in not producing a negative association between individuals. Another key aspect of the reintroduction was providing a bear and at times several bears as a safe space for Silvio to retreat to when he was scared. This assisted in comforting him and allowed him to adjust to spending more time with his parents in the enclosure while not attaching himself to the keepers. It was also important that the keepers limited their contact with Silvio and began exiting the enclosure during his longer visitations. This also forced him to associate with his parents over the keepers.

The results of the later observations also demonstrated that his integration was successful. By spending less time on his bear, it demonstrated that he was becoming more independent. This should come naturally with age as an infant grows and becomes less dependent on its mother. The lack of changes in his parent's approaches towards each other demonstrates that Silvio's integration back into the family did not negatively affect their behaviors or relationship. The decrease in Kikeli's approaches followed her general decrease in interest of Silvio, which may depict that she had become accustomed to his presence. The decrease in Silvio's approaches towards Kikeli may be due to the few instances of aggression she demonstrated towards him. Although he approached her to play he often spent a lot of time away from her or avoiding her. Silvio and Felix's consistent approaches demonstrate a stable relationship between the two.

In the birthing season following Silvio's birth, Kikeli produced another male offspring and is competently rearing her infant without staff intervention. In addition to allowing Silvio to integrate into his social group, our rearing protocol may have also had the added benefit of providing Kikeli important maternal experience to rear her future offspring. Currently Silvio, Kikeli, Felix, and the new infant are housed together in a stable social group. The group huddles together, and Silvio engages in play behavior with his younger sibling. We are hopeful that Silvio's rearing has provided him with the social experience necessary to be part of a successful breeding pair if he receives a recommendation.

The success of the reintroduction of Silvio with his parents gives an informative reference for keepers to use in situations where healthy mongoose lemurs are rejected by the dams. By including the housing set-up and premises for visitations, we hope that other facilities can properly execute hand raising a mongoose lemur infant with the hopes of integrating it back into its social group. We also hope that the log summaries for each step in the process will assist other facilities in seeing some potentially parallel behaviors they may encounter. Lastly, by showing our data on individual interactions we encourage other facilities to collect sound data on their lemurs so that the information can be compared and used as foundation for what may be expected.

Literature Cited

Schwitzer, C. et al. 2013. Lemurs of Madagascar: A Strategy for their Conservation 2013-2016. IUCN SSC Primate Specialist Group, Bristol Conservation and Science Foundation, and Conservation International. Bristol Zoo Gardens, UK.

Schwitzer, C. et al. 2014. Averting Lemur Extinctions amid Madagascar's Political Crisis. *Science*, 343: 842-843.

Williams, C.V. (2002). Lemurs. In Gage, L.J. (Ed.), *Hand-rearing wild and domestic animals*. Iowa State Press: Ames IA, pp 104-113.

Training 18 Apes: A case study in time management and patience

By

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Abstract

The Saint Louis Zoo currently houses three groups of great apes: a bachelor group of 5.0 gorillas, 2.2 orangutans, and 2.7 chimpanzees. All three species are housed in one building and reside in close proximity to one another. There are four full-time keepers and one manager that are responsible for the daily management, enrichment, and training of all individuals. The training of 18 great apes presents a variety of challenges ranging from dealing with social complexities, time constraints, and access to cooperation. Over the past few years the ape keepers were able to adjust their daily schedules in a creative and innovative way allowing for time and resources to train each ape on a consistent basis. Through these methods, the keepers have gained access to certain individuals who previously wouldn't train in specific conditions, treated gorilla wounds that would have required anesthesia, and even confirmed a pregnancy within weeks of conception. These minor changes have resulted in better animal management, increased teamwork, and an improved relationship between keepers and apes; as well as increased staff morale and enthusiasm for training.

Introduction

The Saint Louis Zoo currently houses three groups of great apes: a bachelor group of 5.0 western lowland gorillas (*Gorilla gorilla gorilla*), 2.2 Sumatran orangutans (*Pongo pygmaeus abelii*), and 2.7 chimpanzees (*Pan troglodytes*). All three species are housed in one building and reside in close proximity to one another. There are four full-time keepers and one manager that are responsible for the daily management, enrichment, and training of all individuals. The positive reinforcement training for these 18 great apes presents a variety of challenges that are not unique to our zoo or building. These challenges range from dealing with gaining access to individual apes, social complexities within each group, and keeper time constraints.

Access to individuals: Great apes, both in captive and wild environments have complex social structures which result in strict dominance hierarchies. Certain individuals within each social group were historically denied access to keepers during positive reinforcement training sessions by more dominant individuals. Hugo, the dominant male chimpanzee, would use his size to intimidate the females when preferred food items were present. Merah, an adult female orangutan, would not participate in training and would actively push her daughter away from keepers and out into the outdoor habitat, prohibiting her from engaging in training also.

Social Complexities: Often time's aggression can increase during feedings; especially preferred food items are being fed. Typically this problem is addressed by stationing individuals at various locations in the ODH, then feeding each ape separately. During positive reinforcement training sessions, this was not possible due to location of the trainers in relation to the ape, and the limited staff available for stationing. When training would occur while the gorillas were together, aggression within the group would increase when the training rewards were seen. Typically the three older males would begin to posture, and possible even instigate a bout of contact aggression during training sessions. These aggressive interactions would sometimes escalate, resulting in higher level injuries occurring within the group.

Time constraints: As in most professions there is a lengthy list of duties and responsibilities that keepers must address in their daily duties. For Saint Louis Zoo it is required that each group of apes be given access to their outdoor habitat by 9:00am on a daily basis. . This limits the amount of time keepers have each morning to train each individual.

All of these issues combined to make training in the ape building difficult on both the animals and the keepers. The keepers were frustrated over the lack of time and access to animals for meaningful training sessions, the increased aggression and injuries during training sessions, and the lack of any progress being made. Motivation to train the animals was low, and staff was often nervous or fearful that training would cause injuries to the subordinate members of each group.

Methods

Over the past few years the ape keepers were able to adjust their daily schedules in a creative and innovative way allowing for time and resources to train each ape on a consistent basis. As we began to brainstorm ideas of how to gain access to each individual, several things became immediately clear:

- 1) It would be easiest to train the gorilla group in the afternoon, after they had been separated for the evening. This would allow keepers to inspect each gorilla for injuries after the group had been together during the day, treat injuries as needed, and begin veterinarian desensitization training.

- 2) The orangutans were also separated overnight, with the exception of Merah and Rubih, mother and daughter. We wanted to focus on separation training for those two individuals. We would need two keepers to train this behavior.
- 3) The chimpanzees had many complications!
 - a. The subordinate male Jimiyu would not consistently move into the outdoor habitat with the group in the morning.
 - b. The two geriatric females, Beauty and Rose, would not allow themselves to be locked into holding in the morning.
 - c. Given these two problems, we had very limited access to the outdoor habitat. Daily cleaning and enrichment could not occur.

It was decided that the gorillas would be trained at the end of the day, while the orangutans would be trained in the morning, knowing that we could easily change the times they were trained if needed.

Our focus then turned to the chimpanzee group. There were many ideas and training methods discussed and implemented that failed quickly. Station training occurred for approximately six months. While each chimp would station for short periods of time, this did not address the shifting/yard access issues. We then began bringing the group in mid-day, separating and training the group. This worked well at first, allowing us to clean and place new enrichment into the ODH, but again it did not address the shifting issues within the group. Jimiyu would stay in holding all morning, then go into the ODH with the group in the afternoon. Keepers felt this was possibly rewarding his lacking of shifting. There was also a concern for the relationship between Jimiyu and dominant male Hugo. Was this extended separation going to cause tension or aggression between them? Or could it be undermining Hugo as the dominant male?

After it was clear that Jimiyu's behavior was not going to change with this training program, we began to reevaluate. Where should the focus of our training efforts be? What was the desired outcome? Was it more important to focus on Jimiyu's shifting issues, or individual body part training? Could we do all of this together? How?

We also began to tease apart some of the shifting issues. It became apparent that we did not have a clear understanding of why Jimiyu was not going out with the group. We did know that Beauty and Rose were not coming into holding in the mornings due to aggression from the dominant male. This could be addressed by separating the other chimpanzees into holding and not asking Rose or Beauty to come in until they were alone. We also had the idea that if we could get into the ODH every morning, we would be able to place high value enrichment in the ODH, possibly rewarding Jimiyu for going out with the group. It was also theorized through separation, we could move Hugo behind Jimiyu, thus encouraging Jimiyu into the ODH and possibly strengthening Hugo's position as dominant male.

Conclusions

We began implementing this new separation and training protocol at the beginning for 2014. Rose and Beauty quickly realized they could come into holding alone, train with the keepers, receive rewards and breakfast, and relax in holding without any threat of aggression from other chimpanzees. While Hugo separated from the group easily, he readily moved behind the group, encouraging them to move into the ODH, even waiting for any female that happened to be behind him. Jimiyu moved with the group. We have been able to access the yard every morning, increasing the amount of enrichment the group is receiving and ensuring the safety and cleanliness of the ODH.

While this protocol has been very successful for the chimpanzees, it was apparent that we did not have enough time in the mornings to train 2.7 chimpanzees and 2.2 orangutans. We moved the orangutan training to the evening for several months and evaluated. Each keeper felt that they had adequate time to train each individual on their routine every day. All apes have learned many new behaviors, and several chimpanzees that previously would not approach keepers for training now accept a hand injection. Our adult female orangutan Merah now trains with each keeper. Keepers have been able to track her menstrual cycle, and were able to collect urine to perform a pregnancy test ten days after her first missed cycle. Once pregnancy was confirmed we have been able to conduct weekly abdominal ultrasounds. Five months later I am pleased to say we are still making time for every ape, every day.

Summary

Through these methods, the keepers have gained access to certain individuals who previously wouldn't train in specific conditions, treated gorilla wounds that would have required anesthesia, and even confirmed a pregnancy within weeks of conception. These minor changes have resulted in better animal management, increased teamwork, and an improved relationship between keepers and apes; as well as increased staff morale and enthusiasm for training.

Fancy Footwork: Cheyenne Mountain Zoo's Giraffe Herd Trains for Voluntary Farrier Work and Radiographs

By

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Introduction

Hoof overgrowth is a common issue in captive giraffe (*Giraffa camelopardalis*). Hoof overgrowth changes weight distribution in the foot and predisposes the giraffe to develop osteoarthritis and other painful foot pathologies. In captivity, eighty percent of giraffe immobilizations are done to address hoof overgrowth (Jolly, 2003), suggesting that giraffe hoof problems occur at most zoos. Unfortunately, statistics show that ten percent of giraffes put under anesthesia do not survive the procedure (Jolly, 2003). This makes giraffe immobilizations high-risk procedures that are often not carried out until the giraffe displays clinical signs of lameness, hoof overgrowth, abscesses, or swelling. To better manage captive giraffe, new techniques are needed to safely provide hoof care without the use of sedation.

Cheyenne Mountain Zoo (CMZoo) houses approximately 20 reticulated giraffe (*G. c. reticulata*) at any given time, making its giraffe herd one of the largest in North America. The giraffe herd at CMZoo is also one of the most prolific, with 199 giraffe births since the arrival of giraffe at the zoo in 1954. Due to the iconic nature of its herd, CMZoo and its staff feel a strong commitment to providing the best possible husbandry, training, and enrichment for their giraffe.

CMZoo recently developed an intensive operant conditioning program to maintain the foot health of its famously large herd. The training focuses on the giraffes' voluntary participation in their own hoof care. By training the giraffe for front foot handling and front foot radiographs, CMZoo staff is able to diagnose the underlying cause of lameness issues, provide hoof trims, and maintain overall foot health without the use of sedation. The giraffe keepers at CMZoo tailor their training techniques to each of the giraffes' personalities and learning styles, and have made huge leaps forward in the giraffes' overall hoof care. Within one year, most of the herd was successfully trained for voluntary front foot farrier work and radiographs, and further progress continues to be made every day. This paper will outline the setup, materials used, and steps taken to train for front hoof presentations.

Setup & Materials

CMZoo staff modified the setup that was originally designed at Oakland Zoo. It is comprised of two fire hose chest straps that attach to a door frame at the individual giraffe's chest height. The attachment points are eyebolts which are secured onto either mesh, or other eyebolts in the walls, with carabineers (see Fig. 1). The chest straps are secured across a shift door so that the giraffe is contained in the stall when the door is opened and the trainers can stand in an adjacent stall or hallway, establishing a restricted-contact setup (see Fig. 3 & 4). CMZoo's

giraffe barn has four different locations where the chest straps can be set up, allowing giraffe to be trained where each individual is most comfortable. Other materials required for footwork training include: foot blocks, target sticks, clickers, x-ray equipment, and hoof trimming tools. The foot blocks vary in height. One is shorter for older, more arthritic giraffes, and measures approximately 10 cm x 35 cm x 35 cm (4" x 14" x 14"). The other is taller with fire hose padding and measures 23 cm x 46 cm x 35 cm (9" x 18" x 14") (see Fig. 2). The foot blocks are ideally glued together in order to prevent nails or screws from showing up on x-rays.



Figure 1. Fire hose chest strap.



Figure 2. Foot blocks.

Safety

Prior to beginning any hoof work training, each giraffe was trained to “target” to a target stick and to “back up” on cue. Establishing these basic behaviors ensured the trainers had a way to reliably call the giraffe up to the fire hose chest straps to initiate the training session and to have them back up as needed to reposition the animal or be able to safely close the stall door at the conclusion of the session.

At least two primary giraffe keepers/trainers are present at each session. One trains the giraffe while the other acts as the foot mechanic and opens and closes shift doors as needed. A safety talk is conducted before each giraffe’s session. During this talk, objectives are established, roles are assigned, and any signs of frustration, nervousness, or irritation that the individual tends to exhibit are discussed in order to ensure safety and a positive training environment. Giraffe frustration behaviors during a training session at CMZoo typically look like: backing straight up without being cued, licking the walls or posts, staring off into space, head rolling, or leaving the area. Irritation behaviors often look like: tail swishing in the absence of flies and/or ear flapping. Higher levels of irritation or aggression may include: wide eyes, flared nostrils, ears pinned back, head swinging, foot stomping, and/or kicking. In order to set the giraffe up for success, if frustration or nervous behaviors are observed, the animal is given the chance to perform a simple behavior such as “target” or “back,” given a short break in training, or given the option of leaving the training space. If a giraffe shows aggression or irritation prior to the start of a training session, they are not trained that day. If the giraffe shows aggression or irritation during a training session, the session may be ended, or the trainer may take a step back to reshape the desired behavior.

Training for Foot Presentations

CMZoo’s giraffe are trained for hoof presents using a positive reinforcement strategy. When the giraffe offers a desired behavior, they are bridged and reinforced with primary reinforcers (rye crisp crackers, lettuce, bananas, bread, or browse).

The giraffe are trained individually and are asked to target forward in small approximations towards the fire hose chest straps. Most of the giraffe have no issues approaching the fire hose.

Right & Left. Once the giraffe is accustomed to the fire hose, they are taught to place their foot on a foot block. The foot block is initially placed on the giraffe's side of the fire hose. The primary trainer targets the giraffe forward, guiding them towards the foot block. The giraffe is bridged for kicking the block or touching the block with its foot. The target stick is then faded out and the block kicking behavior is paired with a cue "right" or "left," depending on which foot the giraffe is offering. Once the giraffe is kicking the block on cue, the criteria for the behavior is raised: foot kicking the block fades in preference for foot contacting the top of the block, and foot contacting the top of the block fades in preference for foot being held on the block. Once the giraffe is comfortable placing its foot on the block, the block can be moved to the trainer's side of the fire hose. This is where the block will ultimately need to be placed in order to allow the hoof to be worked on safely.

Helpful hint. Know when your animal is ready to be cued. Watch for a shift in weight of their front legs, cue when the weight is taken off of the desired leg. The weight shift can be prompted by the trainer walking with the target stick, and having the giraffe try to touch the target on the opposite side from the desired leg. For example, if the weight needs to be taken off of the right leg, the target stick should be moved in front of the giraffe's left side. The giraffe will lean to "target", and their weight will shift; this is when the giraffe should be cued.

When first learning the behavior, the giraffe receives a high magnitude of reinforcement for keeping its foot on the block. The giraffe earns continual reinforcers as long as its foot stays on the block; when the giraffe takes its foot away, reinforcers are no longer provided. The giraffe is then recued for the desired foot and again receives continual reinforcement while its foot is on the block. The giraffe quickly learns that if it keeps its foot on the block, it gets a lot of reinforcers. This high rate of reinforcement tends to keep the giraffe's attention throughout the training session.

Touch. After the giraffe learns the foot placement behavior, it is trained to allow a mechanic to touch its foot. The giraffe's criterion is to hold its foot on the block while the mechanic touches its leg and hoof. The mechanic's hand(s) on the giraffe's foot or leg are paired with the "touch" cue. This behavior often proves to be the most challenging step, with each giraffe learning the behavior a little differently, depending on its comfort level with being touched. CMZoo's trainers follow "The Study of One" training approach, watching each giraffe's body language to guide them in the training process. Some giraffe are trained by allowing trainers to touch their shoulder and work the hand down their legs. Most are trained by allowing trainers to touch their hoof and work the hand up to the fetlock. The giraffe's coronary band seems to be the most sensitive area around the hoof. Some giraffes are nervous of hands approaching them, so small approximations are taken to work hands in near their legs. If any twitching, backing up, stomping, or taking their foot off the block occurs, the trainers take a step backwards, relax criteria, then work their way forward with smaller approximations.

Move It. Once the "touch" cue is established, trainers start trying to physically manipulate the giraffe's foot. Two hands are used for the "touch" cue, and the trainers start working on moving the giraffe's foot around. "Petting" the fetlock joint tends to relax the giraffe; the giraffe would usually take weight off of the leg on the block while it was being pet. Once the weight is shifted off of the foot, the mechanic relays that information to the primary trainer, and "move it" is cued.

The mechanic can hold the fetlock joint with two hands and move the foot around the block to reposition it for better access. The giraffe is reinforced the entire time, as long as it keeps weight off of its foot and does not pull its foot off of the block.

Curl. Once the giraffe allows the mechanic to touch and move its foot, the trainer works on the “curl” behavior. The giraffe is reinforced for allowing the mechanic to bend the fetlock joint forward so that the bottom of the hoof is visible and accessible (see Fig. 3). The mechanic does not push on the fetlock joint if there is weight being placed on the foot. When the weight is off of the foot, the trainer cues “curl” and the mechanic takes small approximations bending the giraffe’s fetlock joint forward.



Figure 3. Working on “curl.”



Figure 4. Desensitizing to radiograph equipment.

Desensitization. When the giraffe allows for the curl behavior on cue, the mechanic starts working in farrier tools (hoof pick, rasp, nippers, etc.) and additional people may be added to the training scenario (veterinary staff, farrier). The giraffe are also desensitized to radiograph equipment (see Fig. 4), lead gowns, extension cords, and the sound made by the radiograph machine.

Results

The results of CMZoo’s giraffe training program, to date, have been astounding. All of the eighteen giraffe currently at CMZoo have placed at least one foot on the foot block on cue. Thirteen giraffe have had farrier work done, and a few more are ready for the farrier’s next visit. Sixteen giraffe have had voluntary radiographs taken, which helps veterinary staff diagnose, treat, and provide the best care possible to giraffe found to have foot issues. Seven giraffe have currently had enough hoof trims completed to be put on “maintenance” farrier work, meaning their hooves have been trimmed back to the optimal shape and now just need to be maintained.

Discussion

Zoological institutions everywhere need to work together to come up with ways to provide the best possible care for giraffe foot health. Due to the high risk level of giraffe chemical immobilizations, operant conditioning training needs to gain momentum in captive giraffe management, especially when regarding hoof care. Based on the findings with CMZoo’s herd in

regards to radiograph results and hoof overgrowth evaluations, it is likely that many giraffe in captivity may have hoof issues, regardless of whether or not they are showing clinical signs.

By instituting training plans, working through hoof presents, and garnering radiographs, information on foot pathology can be expanded. This information will provide veterinarians with the best possible methods to manage pain, treat existing problems, and provide preventative corrective trims to healthy feet, all without the use of anesthesia.

Acknowledgements

A huge thank you goes to all of the staff at Cheyenne Mountain Zoo. The giraffe training program has been supported by everyone from the ground up. These people include the trainers who would do anything for the herd (Andrea Bryant, Amy Schilz, and Diana Cartier), the managers who make that possible (Jason Bredahl, Tracy Thessing, Jeremy Dillon, and Bob Chastain), and the veterinary staff for consistently reminding us of the valuable work we do and providing the push for this project (Dr. Liza Dadone VMD, Dr. Eric Klahpake DVM, Harley Thompson, and DeeAnn Wilfong). Additionally a huge thank you goes to our farrier, Steve Foxworth, who continues to aid us with this project and compile valuable information on giraffe hoof conformation.

Reference

Jolly, L. (2003). Giraffe Husbandry Manual. Retrieved from www.aszk.org/au/docs/giraffe.pdf

Halter Training Okapi, *Okapia johnstoni*, for Enhanced Husbandry Applications

By Noah C. Eye

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Abstract

In 2008, the keepers at the San Diego Zoo Safari Park (SDZSP) began a program with the goal of halter training all new okapi calves born at the facility. The purpose of this program was to create a more tractable animal that would better comply with husbandry practices that may be too invasive, difficult, or dangerous to enact with an un-anesthetized okapi. Through the use of basic horse training techniques, keepers at SDZSP have trained four okapi to accept a halter and lead with little to no resistance. This training provides a positive control over the animal and has been very useful in reducing the okapi's stress during minor husbandry procedures, providing daily enrichment and creating a more trusting relationship between the halter trained okapi and its keeper.

Introduction

The San Diego Zoological Society has a long history of keeping and breeding okapi. The first okapi arrived from Epulu in 1956 and our first okapi calf was born in 1962. Our breeding program has produced a total of 63 calves between the San Diego Zoo (SDZ) and the San Diego Zoo Safari Park (SDZSP). As of 2014, 4.5 okapi reside at the SDZSP and 0.3 okapi reside at the SDZ.

Standards and practices of okapi husbandry at the SDZSP have changed and evolved over time. In 2008, our then primary okapi keeper, Sue Evans, thought to apply her horse training experience towards raising young okapi. We planned to train our then soon to be expected okapi calf, Zuri, to accept and cooperate with haltering and leading. Using basic horse training techniques, we have achieved excellent results. These techniques include, habituating the newborn okapi to human presence and touch, desensitizing the young okapi to wearing a halter, lateral flexion training and training for forward and backward movement while being led.

We found the results of this training to be very enriching for both the keepers and animals. It is also extremely useful when applied to a host of husbandry procedures. These procedures include, but are not limited to, standing hoof trims, squeeze immobilization training, controlled trailer loading and controlled breeding introductions. Based on the successful results of this first halter trained okapi, we decided to incorporate this type of training into our overall okapi husbandry program. We have thus far trained 3.1 individual okapi to accept a halter and lead with full cooperation from the animal. We have also worked with the Los Angeles Zoo, at their request, to assist in halter training their first okapi calf born at that facility. Following the SDZSP okapi training protocol, they have successfully trained their now one year old male okapi to accept and cooperate with being haltered and led.

Habituating the neonate okapi

We have found that handling the neonate okapi within the first 24 hours after parturition is very beneficial to the overall training success of the animal. Ideally, we prefer to introduce keepers to the young okapi as early as one hour post parturition. This gives the dam an opportunity to clean the calf and the keepers an opportunity to monitor the dam's attentiveness prior to keepers handling the calf. In the many months leading up to parturition, keepers take every opportunity to work with the expecting dam so as to form a strong relationship with her. However, when handling the calf for the first time keepers must take great care in observing the disposition and stress level of the dam in order to avoid possible displaced dam aggression towards the calf. Stress induced dam aggression is our greatest concern in this process. We have had no problems in this regard with the two dams at the SDZSP and no problems with a very timid first time dam at the Los Angeles Zoo. All three females were cooperative and showed no stress with these first habituation sessions.

In the initial session, with a veterinarian present, we take the opportunity to conduct a thorough physical examination of the calf. Following this first session, we will take every opportunity to familiarize the calf to human touch by picking up its hooves, feeling inside of its mouth, palpating genitalia, etc. all the while giving care to provide the dam and calf ample opportunity to bond and form a healthy relationship. Of the four okapi calves trained in this way, one did not receive these types of tactile sessions in the first 48 hours after birth. He was the only one of the four to develop a somewhat aggressive demeanor towards his keepers while being haltered and led.

Introduction of the halter and Flexion training

We use a basic "grow with me" adjustable foal halter for training our okapi. We have introduced the halter as early as 8 days and as late as 24 days post parturition. Earlier seems to be the better option for introduction. Introducing the halter simply involves, first having the halter in hand during a tactile session, then placing the nose strap of the halter over the bridge of the young okapi's nose, lastly reaching over and buckling the crown strap so that the animal is finally wearing the halter. This happens gradually over a number of sessions and each time the animal is reinforced for compliance with positive tactile stimulation. The calf is never left unattended while wearing the halter. Once the calf is acclimated to wearing the halter for longer periods of time we will begin flexion training.

Flexion training is fairly simple, but it is also the key to producing an animal that is responsive and flexible while being led. To begin flexion training we simply stand facing in the same direction at the young okapi's girth area while maintaining a gentle grip on the halter's lead attachment ring. We gently ask the young okapi to bring his head around to his flank by lightly pulling at the lead attachment ring and then acknowledging the calf's slightest compliance by releasing immediately. We will continue to repeat this process on both sides. This exercise will eventually lead to the young okapi willingly folding its nose to its flank and holding that position for a number of seconds. As flexibility in turning is the most important aspect of leading the animal, we will perfect this side to side flexion before we move on to forward and backward movement. The same training techniques apply to leading the animal forward or backward. Apply gentle pressure in the direction you want the animal to move and then release with the slightest compliance. Once the animal is comfortable and compliant with these requests a light lead rope is used to give us greater range. With the lead rope attached, we can begin to practice circling the okapi in both directions. The next step is to practice forward leading and turning in our okapi barn hallway and around a small yard. A good amount of time spent on these exercises and the maintenance of a light touch while training the okapi are the keys to producing a supple and agreeable animal. This will be beneficial in producing an animal that is easy to lead once they become large and more intimidating.



Young male okapi “Kwasi” wearing “grow with me” halter

Applications and benefits

We have found halter training our okapi make husbandry procedures easier and less stressful for both the okapi and the keepers. One benefit of halter training is that it can sometimes provide a husbandry alternative to chemical immobilization. The main benefit comes from having a form of control over the okapi that it trusts and is comfortable and familiar with.

As a result of this close proximity training our halter trained animals are far more confident and trusting of their keepers. For example, captive ungulates generally need some form of regular hoof maintenance. With the halter trained okapi we can perform standing hoof trims in such a way that if the animal is suddenly spooked or becomes irritable, we can safely control its movement and minimize potential danger to the keeper and okapi.

We also use squeeze chute desensitization training on a regular basis. This prepares the okapi for minor medical procedures such as general examinations, ultra sounds, blood draws, etc. Our halter trained animals are always much easier and more confident when entering the O.R.D (okapi restraint device) and also more accepting of semi invasive procedures in the O.R.D. The halter also gives us the opportunity to better control the animal’s position in the O.R.D. and provide the best possible angle for the procedure being performed.

Another application of halter training is easy stress free trailer loading. When trailer loading okapi that have not been halter trained, we generally use a push board for protection and push the animal onto the trailer. By desensitizing the halter trained okapi to being led into tight spaces we can easily trailer the animal with little stress or hesitation in a quick and positive manner. This is invaluable as the SDZSP resides in an area prone to wildfires and quick evacuation can be necessary in a moment’s notice.

Controlled breeding separations and breeding introductions are some of the most extreme applications of this training. Introducing okapi pairs for breeding is often a stressful situation for the keepers and animals alike. Sometimes separating these mating okapi can be dangerous even when the animals involved are quite tractable under normal circumstances. In a breeding situation the animal’s disposition usually changes, especially the males, and this can lead to aggression towards the keepers attempting to separate them.

Zuri, the first halter trained okapi at the SDZSP, is also our primary breeder. In Zuri's case when we need to separate him from an estrus female, we simply divert his attention, indicate that we wish to halter him and he complies, sometimes with reluctance but never with aggression. Of course, this is only one animal and we cannot be sure that every halter trained male okapi would be this agreeable under similar circumstances.



Standing hoof trim with "Kwasi"



Halterred okapi "Kwasi" in O.R.D

On one occasion, after Zuri had been introduced to and successfully bred two other females with no aggression, we attempted to introduce him to a new young female, Mbaya. Prior to the introduction, great care was taken to insure that the female was in peak estrus via hormone analysis and behavioral observations. Unfortunately, the introduction was not successful and Zuri became very aggressive towards Mbaya. The aggression was so severe that we were reluctant to introduce them again out of fear for the female's safety. We made the decision to perform a controlled introduction by leading Zuri into the yard with Mbaya in order to determine whether the aggression would persist on a separate occasion. We introduced them in this way at Mbaya's next peak estrus and unfortunately he attempted to attack her once again. On this occasion, by using the lead and halter, we were able to pull the male from the female and walk him out of his aggressive state. No aggression was displayed towards the keeper that was leading. This type of introduction was tried one more time with the same results so this pairing was abandoned out of fear for Mbaya's safety.

The ability to lead the okapi as enrichment is another benefit of halter training. Of the 2.1 halter trained okapi we currently house at the SDZSP, all seem to prefer being led to being pushed when transferred from their stall to outdoor holding or vice versa. Walking the okapi to areas that they would not normally access is a regular activity that we have added to our weekly and daily routines. This activity is stimulating for the okapi and also strengthens the animal/keeper bond.



Controlled breeding introduction with male Zuri and female Mbaya

Conclusion

In the future we plan to repeat this training with every okapi calf born at the SDZSP and continue to develop its practical applications. In cooperation with our reproductive physiologist at the San Diego Zoo Institute for Conservation and Research we have initiated attempts to manually collect semen from our halter trained male okapi by training them to mount a breeding phantom. If successful, this will be the first time that okapi semen was voluntarily collected and banked for future use. In this process it is necessary to guide the okapi onto the phantom and would therefore be impractical with a male okapi that is not halter trained.

The inclusion of halter training has been a very rewarding and useful extension of the SDZSP's okapi husbandry program. By desensitizing and halter training the young okapi, not only are we able to gain a positive control over the animal and apply that to regular husbandry procedures, but we also form stronger relationships with the animals we care for on a day to day basis. Any husbandry training program that improves the ability to provide the best care while reducing the risk of stress or injury to an animal is invaluable. These are the goals we seek to achieve through our halter training program at the SDZSP.

There's More than One Way to Train a Zebra: Hand-Injection Training of Three Male Zebras at Dallas Zoo

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Abstract

Dallas Zoo currently houses 2.0 gelded Grant's zebras (*Equus burchellii boehmi*) and 1.0 gelded common zebra (*Equus burchellii*) in its Giants of the Savanna exhibit. Per veterinary protocol, each zebra is required to receive two annual vaccinations. Keepers challenged themselves to train each zebra to receive vaccinations via hand injection, in lieu of darting. Each of the three zebras has a very different tolerance level for human interaction, and working with them required training approaches specifically tailored to their individual preferences. Training plans were developed for each animal to meet their specific needs, and adjustments were made to the training environment to ensure maximum participation from each. Although a different approach was required for each animal, the goal of a successful hand vaccination was met for all three zebras. Our work with these zebras has taught us that not all animals respond similarly to the same training model, and that flexibility and innovation are essential in designing a successful training program. Observation and relationship-building are crucial components of determining what will most effectively motivate an individual animal, despite general similarities amongst a species.

Introduction

Dallas Zoo is home to two gelded Grant's zebras and one gelded common zebra: Stewart (age four), Earl (age four), and Vern (age seven). All three are housed together in the zoo's Giants of the Savanna exhibit - Vern since 2010 and Stewart and Earl since 2011. Their holding area in the Savanna Hoofstock barn consists of two stalls, which can be remotely separated, and an outdoor space that can be separated into two smaller yards by means of a swing gate that is normally kept open.

Dallas Zoo veterinary protocol requires each of these zebras to receive yearly immunizations for West Nile virus/Encephalitis/Tetanus (WNV/VEWT), and rabies virus (IMRAB), which means two 1mL injections a year for each animal. Initially, the zebras were administered their two vaccinations via dart, which presented the usual stress and hazards of a darting experience. To eliminate the risks of darting, and to build the keepers' relationships with the zebras, keepers decided to train them to receive hand injections. It was realized very early in the training process, however, that each of the three zebras would require a strategy tailored to his individual personality.

Vern, the oldest of the three zebras and the highest-ranking in the group's social hierarchy, is the most sensitive to even very slight changes in his environment, but the confidence he gained through training often enables him to overcome anxiety when in the presence of his trainers. Dallas Zoo Savanna keepers had trained him in free contact settings in the past, when he was the only zebra housed at Giants of the Savannah. His previous positive experience with free-contact training facilitated a smooth transition to

limited-contact training. Now, a scratch on the shoulder can be used as a secondary reinforcer. Early and continuous relationship-building has helped Vern become enthusiastic about training and eager to approach keepers for sessions, even in the presence of unfamiliar people. In fact, he grew to be possessive of keepers when in a training setting in the presence of other zebras. Keeper interaction can be used as a primary reinforcer for him, and the presence or absence of food during training has little effect on his focus.

Stewart, the second-oldest and middle-ranking zebra, is curious but cautious of new situations, and was tentative about keeper proximity before our training with him was initiated. Both he and Earl came to Dallas Zoo from a less-regimented, more open-range setting with little to no human contact. Stewart developed a level of familiarity and comfort with his trainers while at Dallas, although he is not readily trusting. He is inquisitive once he feels comfortable in a situation, and is especially keen to investigate a situation if he feels food may be involved. He quickly learned to take food from humans' hands. Stewart is often the first to explore new areas and situations, but only if the other two zebras are in visual contact.

Earl, the youngest, smallest, and lowest-ranking member of the herd, is much less trusting of humans than the other two. He is reluctant to approach even the keepers he sees often. Compared to our other zebras, Earl takes more time to think about situations before acting and reacts with hesitation to even the minutest changes to his cues or training environment. His focus on training sessions tends to be better when no other zebra is around, but he sometimes gains confidence about training after watching Vern perform calmly for a training session. Earl's motivation for food is minimal, and superseded by his lack of trust in humans. However, once he trusts a trainer and an environment, he learns quickly and often seems to pick up on things more rapidly than Vern or Stewart.

Training Vern

Due to Vern's tractable nature, we began our training program in January 2013 by focusing on him. Initially, the goal was to get him to align his body with the chain link fence of the exhibit exterior. This was accomplished by having him alternate between touching his nose to a "station" and then to a "target." Stationing was a previously trained behavior, used to hold the zebras in place without competition while other animals were shifted off exhibit. To station, each zebra held his nose to a hanging object, a unique shape and color for each individual, which was attached to a fence. The target, a foot-long section of PVC tubing attached to a flange, was mounted through the chain-link fence using swivel clips (see figure 1 for diagrams of the stations and target used). Vern was offered positive reinforcement for touching this with his nose. As he alternated between touching the station and target that were ultimately set approximately 3 meters (10 feet) apart from each other on a fence line, Vern was reinforced for lining his body up parallel with the fence (see figure 2).

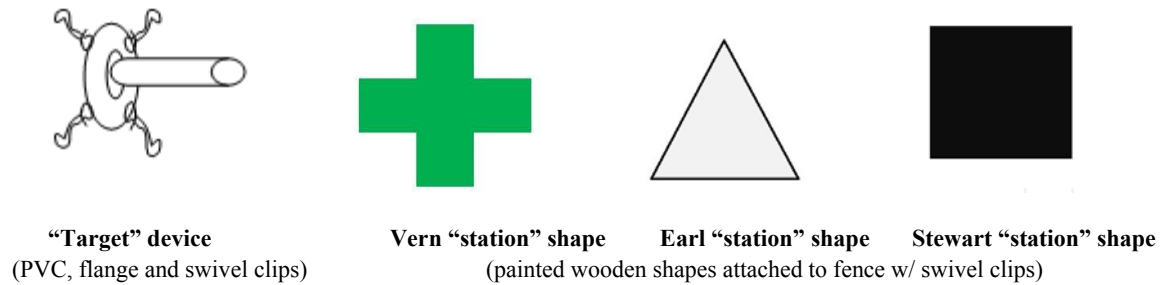
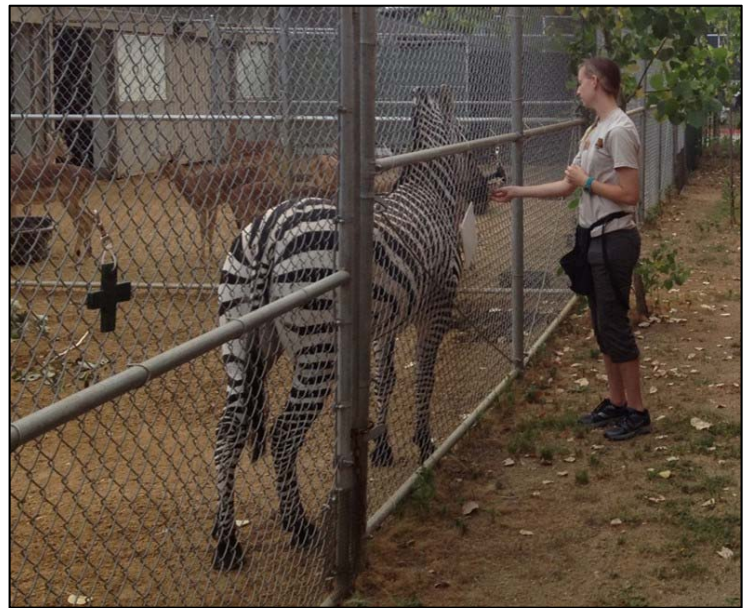


Figure 1. “Target” and “Station” training devices



Vern at his station



Vern sent from his station to his target

Figure 2. Alternating between “station” and “target” as a first step of injection training

To initiate a “lean-in” behavior, Vern's trainer paired the command with a hand-scratch to the shoulder, then bridged and reinforced with food. Then the scratch was offered out of reach, and so Vern started to shift his weight towards the “scratching” hand at the fence. The shoulder scratch was kept in as part of the routine for a few reasons: it served as a secondary reinforcer for the “lean-in” behavior, it became a marker for where Vern was to place his shoulder, and it would help diffuse the feeling of the needle upon insertion once that step was achieved. From there, he learned to work with two trainers, one focused on approximations towards the injection while the other offered primary reinforcers. Desensitization for the “poke” behavior began with dull pressure of one finger, and progressed through twigs, pens, paperclips and blunt cannulas, until on 2 March, 2013 Vern stood for his first vaccination. The second was also administered by hand 7 days later on 9 March 2013 (both using a 22 gauge needle). His reaction to these injections was minimal: he simply stepped or leaned away, looked at the trainers, returned to receive further rewards, and performed some “fun” behaviors (targeting or presenting his teeth) before trainers ended the session.

While hand injection training for Vern progressed fairly quickly, several key observations and adjustments had to be made along the way in order to make it a success. First, the initial shaping plan called for the vaccine to be delivered into the hip. Vern had never been desensitized to touch past his neck and shoulder, and therefore was reluctant to allow a trainer near his rump. So trainers switched gears and instead shaped the lean-in to occur at the shoulder. Second, initial training took place against the back fence line of the exhibit, but the presence of other animals in the mixed-species habitat wandering up to investigate proved to be too much of a distraction, and utilizing other keepers to keep the ostrich, giraffe, and other zebras occupied took too much manpower for training to be done consistently. To minimize distractions, the training location was moved to the holding yards attached to our hoofstock barn. Vern was separated from the other two zebras by moving him to one holding yard while the other two remained in an adjacent yard, which improved his performance in training sessions significantly. Finally, when Vern was first being desensitized to a “poke”, trainers started to notice Vern's desire to participate in sessions waning. Once they started doing occasional sessions that included only pokes with just a finger, or no pokes at all, Vern went back to performing “lean-ins” extremely well, and even leaning into the poke once pressure was initially applied.

The most important observation trainers made regarding Vern’s training involved his primary reinforcer, which we initially thought was the food we were giving him. Although his preferences changed from day to day, Vern was offered zebra pellets, carrot and apple pieces, rye crisp crackers, and sometimes peppermint horse treats during training sessions. However, we noticed that he would often lose focus and stare off into the distance while trainers cued for behaviors. It seemed our presence and conversing were in fact the rewarding factors, and all that we were requiring him to do for that reinforcer was to come up to us. Our best attempts at using prompts or asking for “fun” behaviors were not always successful at recapturing his attention during sessions. However, keepers had noticed in the past that when the three zebras were together in a yard, a keeper directing attention towards one of the younger zebras always elicited a mildly aggressive response from Vern – he would pin his ears and displace the other zebras receiving attention from his favorite keepers. His trainer translated this interest in “being the center of attention” as motivating to Vern, and tried it as a training tool when Vern was least engaged in a session. His response was as trainers expected: he immediately re-focused his attention on his trainer interacting with the other zebras. As soon as Vern chose this response, the trainer returned to the outside of Vern’s yard to resume his training session. Trainers only used this method a few times before Vern learned that by staying engaged in sessions, he would keep his trainer’s attention. As with Stewart and Earl, and as with any animal, Vern chose not to participate in training at all some days, which trainers accepted with understanding. Vern’s sensitive personality makes him extremely reactive to any noises, high winds, or visual distractions – to the point of being too anxious for even his trainer to help calm. On days when distractions make him too nervous to train, he is simply shifted inside and away from the unnerving stimulus.

Training Stewart and Earl

In anticipation of mosquito season, and its related West Nile virus risks, Dallas Zoo's WNV vaccines are administered in April each year. Since the early injection training focused on Vern, we were not able to meet a 1 May deadline for zebra vaccines in 2013 with Stewart and Earl, and so they were darted. However, given the success experienced with Vern, we used the same strategy when we initiated injection training in the fall with Stewart and Earl. With both of them, our first hurdle to overcome was the fact

that they were much less enthusiastic about the prospect of being touched. While they would touch the target stick readily, they stood with their bodies angled away from the trainer and the fence. While we worked on narrowing the criteria on their target behavior to incrementally reward targeting with their bodies angled closer to the fence, we also wanted to introduce a "touch" command to begin tactile desensitization. While both Earl and Stewart were still targeting with their bodies at an angle to the fence, our strategy was to use a short length of gray PVC pipe, almost identical in appearance to their target, to initiate contact. We quickly found that this would be a nonstarter, as both zebras were extremely uncomfortable with the touch stick and would lose any desire to approach the target once it was brought out. Realizing that tactile desensitization would progress more quickly if limited to our hands, we cut a hole in the holding yard fence to help us reach in and touch their bodies. While this successfully trained each zebra that our goal was physical contact between our hand and their shoulder, both Earl and Stewart would walk away and lose interest as soon as they heard the cue "touch."

With this in mind, we adjusted our technique to allow the touch to occur on their terms. We discarded the now toxic "touch" command and instead focused on asking Stewart and Earl to "lean-in," rewarding them for moving their bodies closer into the fence. With our new hand hole, we were able to place our hands just on the other side of the fence to get them used to that presence, and then have them lean in until they eventually made contact with our hand, on their terms.

At this point, we started seeing major differences between Stewart and Earl that required some tailored training. Stewart's food motivation and curiosity helped our training because they kept him willing to perform and overcome distractions more easily than the others, even with trainers' slight nuances in training techniques. However, given his focus on food, we did notice how important accurate and reliable food delivery was to keeping him engaged in the session. We found his eager lips would bump the relatively small grain pellets out of our hands, turning his attention to the ground to survey for dropped rewards. So we moved to mostly reinforcing him with larger/longer rye crisp crackers that we could hold on to better while he took the food into his mouth. We also noticed that Stewart would generally train well with a second person present - one person to offer reinforcers and another to cue and perform desensitization. Earl, the more cautious and nervous of the two, would tolerate a second trainer on occasion, but most often the presence of two people seemed to cause him stress and he would not train well. Earl's wariness of any proximity to his trainer that might allow tactile contact often seemed to trump any interest in food, no matter how we mixed up the reinforcers. He did generally perform better if offered the occasional, higher-value apple oat biscuit or peanut, but for behaviors that involved the trainer's hand moving on or near his body, the success of the session weighed more on Earl's trust in his trainer and mood that day.

Additionally, by fall 2013 the zebras were in a different housing situation than they had been in when Vern was injection trained. They now had two large stalls and two holding yards (see figure 3) which could either be opened up for everyday use or separated into smaller areas. For training Earl and Stewart, we decided to train one individual at a time in the end yard (Holding Yard 16), which left the question of what to do with the other individuals while one was training. We found that Stewart would become anxious and uncooperative if visually separated from Vern and Earl, but if the other zebras were in Holding Yard 15 while he trained in Holding Yard 16 he seemed comfortable and trained well. Earl, on the other hand, would become very distracted by the presence of the two other zebras in the adjacent yard. He initially trained better while he was isolated. However, we then made an important discovery about

Earl that led to subsequent successful sessions. We found that if we attempted a session with Earl and he was uneasy, we could pause his session and move to train Vern in the adjacent yard. Earl would then stand at the fence dividing the two animals and watch the entire session. As long as Vern remained calm, Earl continued to watch. When the trainer returned to train Earl after a calm interaction with Vern, Earl's focus and trust in the trainer was often vastly increased. 2.46 4.13

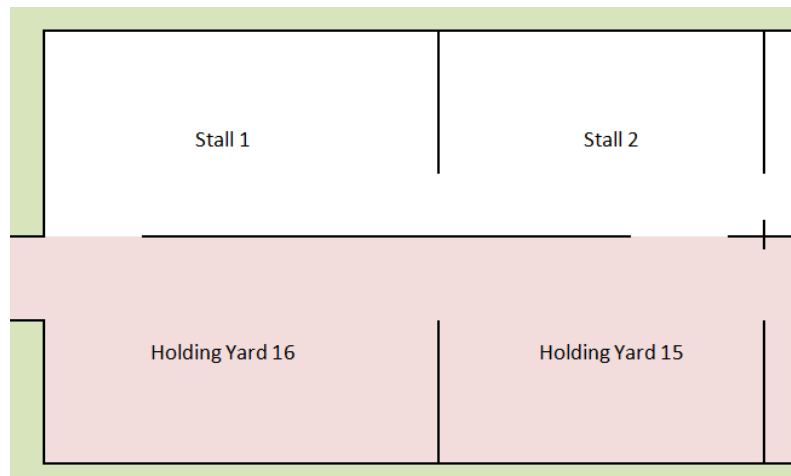


Figure 3. Holding yard setup at Savanna hoofstock barn

Earl was also less forgiving than the others of any differences in training style of his trainers. Movement of the hands anywhere other than right in front of the trainer's waist or torso distracted Earl, and he would often break from targeting and move away. Earl would also walk away from a session if too many food items were dropped on the ground. Dental issues also made the rye crisp crackers difficult to eat for a short period of time, and he became frustrated when offered them and walked away from sessions. Trainers had to communicate these tiny details and observe each other frequently in order to ensure progress.

One important factor that we found had to be integrated into our training model was Vern's easily-excitabile nature and its impact on sessions with the other two. We found that if Vern was anxious about something occurring in his environment, any training sessions happening at the time would have to cease. His comfort level with his surroundings dictated the anxiety level of the others, and hence the success of the sessions. Keeping Vern calm was important to the success of the other zebras' training sessions. Once we realized this, we would try to find another person to station and reward Vern to keep him calm while we trained Stewart and Earl.

Dealing with Regression

Once the right formula was devised for Stewart, getting him to the point where he could receive an injection was mostly a matter of patience and consistency. When he realized a good "lean-in" meant we would begin to poke him with various objects (again varying in size and pressure as we desensitized him to the sensation), he began to pull his shoulder away from the fence earlier and earlier. So we backed up and worked on duration of the lean-in by timing our bridges further and further away from when he actually leaned-in to the fence. Once he grew more comfortable making contact with the different objects, trainers administered his first vaccination on 14 March, 2014. When this vaccination was

administered, he ran away at first but returned to his station and then to his target within a minute to receive additional rewards and trainer interaction.

However, in the weeks that followed his first vaccination, Stewart's confidence for leaning in seemed to wane. He targeted with his body at more of an angle to the fence, and his lean-in duration was much shorter than it had been pre-vaccination. Our attempts to gain duration using the original method were unsuccessful, so we changed strategy and increased his confidence by building momentum. Specifically, we cued and reinforced for the “target” behavior repeatedly, in quick succession. After a short time, Stew began to offer the lean-in on his own. This helped diminish his timidity about the lean-in behavior, and the duration we needed for the second vaccination was achieved. Stew was injected with a rabies vaccination in the same shoulder a month later, on 13 April 2014.



Figure 4. Stewart with two trainers performing lean-in behavior

Around the time that Stewart was first successfully vaccinated, however, Earl started going through a major regression with his injection behaviors. While he had been routinely coming to the target, bringing his shoulder almost even with the fence, and leaning into a trainer's hand, he now showed no desire to even come to the target, and would only come to his station for brief periods before wandering to the back of the holding yard and refusing to approach the trainer. Trainers observed several environmental factors that could easily have contributed to the regression, but were unable to control all of these distractions. Coming back from the regression required a reevaluation of the training strategies being used for Earl.

As noted previously, Earl easily lost focus while training if consistency and reliability were not maintained. To try and rebuild his confidence, we set strict criteria for reducing the time between bridge and reward. Reliability of food delivery again became important. Earl's food rewards (grain pellets for stationing and targeting; pieces of apple oat biscuits, rye-crisp crackers, or peanuts for injection-specific behaviors), were previously held in a training pouch. After delivering a bridge, a trainer would have to reach into the pouch, grab the desired item, bring it out, and try to stick it through the fence in a location

where Earl could easily take it. The process could take several seconds, by which time Earl could grow impatient. To improve Earl's focus, we arranged to have several "ready-to-go" rewards in our hand at all times to speed up the reinforcement process. If a reward was dropped on the ground during the feeding process, we immediately gave Earl another instead of giving him time to drop his head and search around for the dropped food. To give Earl time to regain confidence, we began to focus more on the targeting rather than the lean-in behavior. Like Stewart, Earl too benefitted from some momentum-building, and started to offer the lean-in behavior before requested. Finally, given Earl's observed reluctance to train with two keepers present, the decision was made that even on days when two trainers were available, only one person at a time would work with Earl.

Under the new criteria, Earl slowly started to regain comfort with his lean-in behavior, and in mid-April the decision was made to attempt his first hand vaccination. On 24 April 2014, two trainers were able to inject half of his first vaccination into his shoulder using a 20 gauge needle. He immediately pulled away, but returned quickly as soon as one trainer left. With the goal of getting at least another ¼ of the injection into him, the solitary trainer resumed the session, asking again for the lean-in. Earl remained engaged in the session for an unusual 45 minutes building confidence to lean-in for the second poke (usual sessions lasted no more than 20 minutes) At any time a zebra could end a training session by leaving the training area and remaining in another area of the yard. The trainer would make a few attempts to again engage the zebra, but if he chose to remain distanced from the training area, he was always allowed to end the session. On this day, instead of remaining distanced from the keeper to indicate his unwillingness to train, Earl made calm laps around the inside perimeter of the yard, stopping to station by the trainer and offer a brief lean-in at the target each time. Some uneasy tail-swishing happened as he stopped to target, but he never hesitated to keep the session going. This persisted until Earl allowed another ¼ of the vaccination to be injected into his shoulder. He responded by walking quickly away, but returned for one last station and received a bonus of food items. The second vaccination occurred on 30 May 2014, using one trainer. This too was a partial injection, but veterinary staff supported the decision to accept this as a successful vaccination.

Conclusion

The most apparent lesson from the experience of hand-injection training Vern, Stewart, and Earl is that flexibility is one of, if not the, most valuable tools a trainer has to use. No two animals are alike, and what works for one animal is not guaranteed to work for another. While the same basic strategy ultimately delivered a successful result for three different zebras, the success of our training ultimately was due to the customized shaping plans we made for each individual. While many of these customizations seem minor to us, they may make all the difference to an animal.

In order to make individualized shaping plans possible, observation during, and outside of, training is crucial. In our case, all of the changes we made originally came about because we kept close tabs on how the zebras reacted to what we were doing, and where we were doing it. Constant communication, and the recording of detailed training logs, were essential to helping this process along.

Despite the success experienced with vaccinating Stewart and Earl in 2014, their injection training process remains incomplete. Stewart's training was fast-tracked in the spring in order to meet a vaccination deadline, and because of that we simply had him lean in and get injected, without the "poke" cue that we were able to successfully use with Vern. Our next step with him is to add the "poke" cue to

his repertoire of behaviors. Earl remains hesitant to lean his body into the fence around his trainers, and when he does this behavior lacks duration. Our next goal is to build his confidence so he feels more comfortable with his lean-in behavior, and then phase in the same poke cue. All of this will be a challenge, but using the lessons learned from hand-injection training so far, we feel confident that we will be successful in meeting these and any other future training goals with Vern, Stewart, and Earl.

Utilizing Operant Conditioning with an Aggressive Anegada Island Iguana (*Cyclura pinguis*): A Tale of Targeting and Desensitization to Touch

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Abstract

The Anegada Island iguana (*Cyclura pinguis*) is one of the rarest iguanids in the world. Due to numerous threats in the wild, it has been a key species in ex-situ conservation programs; consequently maintaining healthy animals in captivity is crucial. Over the past decade the increase in reptile training programs has successfully shown training can be used to minimize health risks to animals and keepers alike. At the Houston Zoo we implemented a training program for an aggressive female Anegada Island iguana to increase keeper safety and reduce her stress levels. Our primary goals were to pick up the iguana without struggle and stress for transfer or physical examinations, to safely clean her exhibit, and to increase her mental and physical health. Over the course of 10 months we shaped two behaviors; Target and Touch. A target was used successfully to move the iguana around the exhibit to safely clean and to place her on a scale to acquire weights. We were able to desensitize the iguana to touch to the point of doing physical examinations and picking her up off the ground and standing with her. The peak of our training program was then tested when the iguana was required to move to a new exhibit. This article details the success and failures of shaping and moving the iguana to a new exhibit. In addition we wanted to increase the number of published works concerning infrequently trained animals.

Introduction

The Anegada Island iguana (*Cyclura pinguis*) is one of the rarest iguanids in the world. It can only be found on several small islands in the British Virgin Islands (Anonymous, 2004). Current wild population numbers are estimated at less than 300 animals (Anonymous, 2004, Alberts, 2000). It is listed as Critically Endangered on the IUCN Red List of Threatened Species, Appendix I of the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES), Endangered under the U.S. Endangered Species Act, nationally protected under the British Virgin Islands Endangered Species Act, and the National Parks and Protected Areas Ordinances (Anonymous, 2004; Hilton-Taylor, 2000). Some of the threats posed to this species include; introduced predators, habitat alteration, habitat fragmentation, and exploitation by humans (Hudson & Knapp, 2004; Knapp, 1999; Mitchell, 1999). Being an endemic island species also increases the risk of losing genetic diversity and susceptibility to natural disasters (Burkey, 1995; Lacy, 1987). Due to these threats the Anegada Island iguana has been a key species in ex-situ conservation programs (Alberts, 2000). Keeping these animals in good health is important in order to give us the best chance of successfully breeding them in captivity and maintaining the highest level of genetic diversity. One of the ways to maintain good health is to reduce stress (McEwen, 2008). Reducing the frequency an animal has to be physically restrained and removing its fear can help in interpreting an animal's true health (Wiess & Wilson, 2003). Operant conditioning techniques and training has proven to help in this regard (Dettmer et al., 1996; Elvidge et al., 1976; Grandin, 2005; Hellmuth et al., 2012; Reichard et al., 1993; Reinhardt, 2003). Over the past decade the increase in reptile training programs has

shown how training can be used to successfully minimize health risks to animals and keepers (Augustine, 2009; Augustine, 2010; Augustine & Baumer, 2012; Becker, 2003; Burghardt, 2013; Gaalema, 2011; Gerrits & Augustine, 2013; Hellmuth et al., 2012; Karen & Burghardt, 2007; Manrod, 2008; Vause & Jones, 2009; Wiess & Wilson, 2003). At the Houston Zoo, we implemented a training program for an aggressive female Anegada Island iguana to increase keeper safety and to reduce the iguana's stress levels. With a species in such a perilous state every animal is important and cannot be "left out" if it is difficult to work with. We hope to illustrate another success story using operant conditioning techniques in a taxon that has not been highly documented in the literature.

At the Houston Zoo the Herpetology Department has three Anegada Island iguanas. A male and female (1.1) are housed together on exhibit in the Reptile and Amphibian House while another female (0.1) is housed in a reserve enclosure behind the scenes. The male and female on exhibit are of friendly temperament allowing keepers to do physical examinations or to carry them to new enclosures. However, our female in the reserve enclosure is aggressive towards keepers and will try to bite if approached. This makes doing routine cleaning and husbandry procedures very stressful on her and the keepers. To remedy this situation a training program was put into place. Our primary goals were to pick up the iguana without struggle and stress for transfer or physical examinations, to safely clean her exhibit, and to increase her mental and physical health. Being able to transfer her would also make it easier to place her on exhibit with the male when the time came to attempt breeding. Our tools to accomplish these would be to train two behaviors; Target and Touch. If the training went better than expected, our secondary goals were to create Memorable Moment opportunities for guests to experience training and to perform medical procedures (weights, blood draws, etc.) without constraint.

Methods

Before any training began an assessment of the animal's natural history, individual history, and current exhibit restrictions was conducted to try and eliminate any problems before they occurred. A Primary Trainer (PT) was assigned to the program and conducted all initial training. Relief keepers could train a specific behavior once the PT concluded that the behavior was under stimulus control. Stimulus control occurs when a behavior is immediately performed following the cue. It is performed only when preceded by the correct cue, and it is not performed in the presence of another cue (Pryor, 1999; Ramirez, 1999). We hoped that this would reduce the difficulty in the animal trying to learn a new behavior from different trainers who may not shape the behavior the exact same way. Relief keepers were also encouraged to watch the PT train at least once a month to maintain consistency and communication between team members.

A training session occurred any time multiple primary or secondary reinforcers were given to the animal. Primary reinforcers are reinforcing events that do not depend on learning or previous experience to achieve its reinforcing properties like food. While secondary reinforcers are events or a stimulus that initially may mean nothing to the animal, but becomes reinforcing through pairing with a primary reinforcer (Pryor, 1999; Ramirez, 1999). Formal training sessions occurred on Mondays and Wednesdays. Sessions lasted until the food ran out (typically five to ten minutes long) increasing in time as secondary reinforcers could be used instead of primary. No cues were given to begin or end the session besides gathering the equipment needed to enter the exhibit and begin training. A "three minute rule" was implemented if the iguana did not engage in training. After three minutes of no engagement the session was ended and the remaining food would be offered later in the day. Sessions were done inside the iguana's reserve holding enclosure. The enclosure measured 8'x4'x6' with a secondary containment area

of 4'x4'x6' which could also be used for training. The enclosure featured a shelf and ramp where the iguana spent most of her time basking. After each session a summary of the events were recorded in a training log. From this log major events were compiled into Figure 1.

Iguanas are herbivores that occasionally eat invertebrates and fruit (Lemm, 2010). Before formal training sessions were started keepers experimented on the best way to physically offer food and which food items received the best response. The best way to offer food was by using 12" tweezers™ with rubber sheaths on the ends to protect the iguana's teeth from injury (Animal Equipment by Stoney LLC 4210 Linda St. Bacliff, TX 77518 <http://www.aestoney.com/home.html>, Image 1). These forceps allowed quicker reward time from the food stored in a cup clipped on the keeper's belt to the iguana. Fruit was the most desired but difficult to feed off of tweezers and only one or two pieces were available in the daily diet. Therefore half dollar sized pieces of greens and lettuce were used as our primary reinforcer. Twenty to thirty pieces of greens and lettuce were used per session. The remaining diet was offered on a pan at the end of a successful session. If the session was ended early the remaining diet was offered at least thirty minutes later. A clicker was used as our secondary reinforcer. As iguanas communicate mainly through visual and chemosensory cues, a consistent fixed sound was thought to be better than using a verbal reinforcer (Burghardt, 1977; Martins & Lamont, 1998; Vitousek et al., 2007).

Results

To obtain our goals of being able to pick up the iguana without struggle or stress and to be able to open the exhibit without risk we first had to establish our reinforcers. The primary reinforcer used was food and the iguana took to eating from the tweezers right away. Next up was our secondary reinforcer. For three weeks starting on March 4th, 2013 we paired the sound of the clicker with receiving greens off the tweezers. On March 18th during the session we introduced the target for the first time. The goal of the Target behavior was to allow keepers to move the animal around the exhibit to clean, use the target to place the iguana on a scale to get weights, to decrease the flight response range of the iguana, and as a tool for future behaviors. The target pole used was a half red half white buoy with an extendable metal pole™ (Animal Equipment by Stoney LLC 4210 Linda St. Bacliff, TX 77518

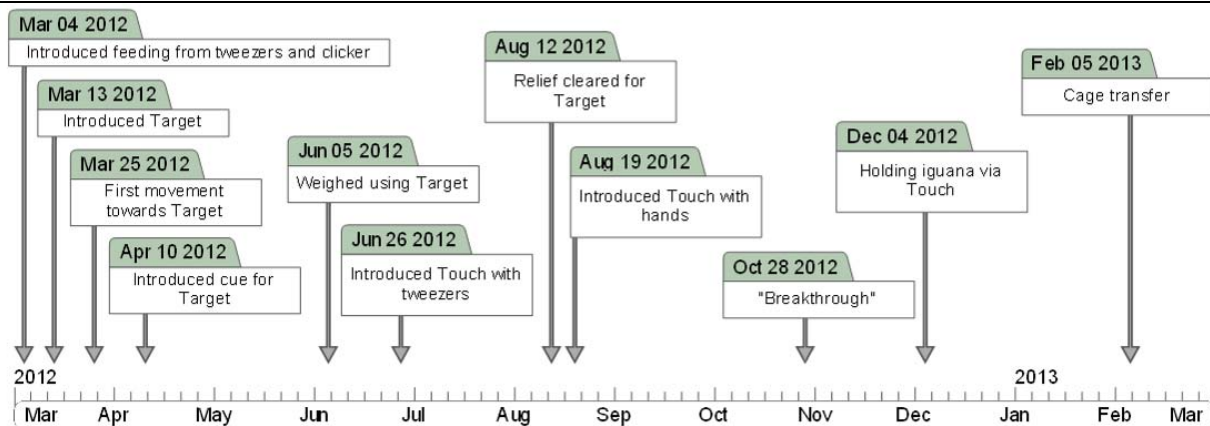
<http://www.aestoney.com/home.html>, Image 1). The PT tried to place the target to her nose based on a similar successful training with a Rhino iguana occurring at the same time but she ran away, head bobbed, mouth gaped, and hissed. These are all negative behavior signs (Carpenter & Ferguson, 1977; Lacy & Martins, 2004; Marler & Moore, 1988). Therefore, the PT placed the target at the edge of the shelf and just fed the iguana off tweezers with the target in her field of vision, clicking when fed. At the next session the PT placed the target on the shelf when feeding, then moved the target under the shelf so she could not see it when the PT was grabbing another piece of food. With each new attempt the target was moved closer to the iguana and then placed back under the shelf. On March 25th, her third

Image 1. Weighed using Target.



session with the target, she made her first movement towards the target and attempted to lick/bite the target. This action was reinforced and accepted in our criteria for a successful Target as iguanas use their tongues to explore their environment (Schwenk, 1985). This seemed to be a more natural behavior and more easily captured compared to placing its nose to the target. By April 10th she began to follow the target around the shelf and a verbal cue of "Target" was introduced. The cue for the behavior evolved into the verbal cue paired with the PT taping the target on the ground at a desired location. On April 24th she came to the entrance of the exhibit upon seeing the keeper prepare to enter the exhibit and by May 1st the PT was able to lead her around the exhibit in one to two foot movements. For the next two months the PT worked on adding distractions and variations to the Target behavior which included standing vs. bending down, moving vs. stationary, moving the target overhead, noises in the area, having a second person inside the exhibit, standing in different locations, and changing the order of all of the above. A plywood board was also added to the environment and placed on the floor in the secondary area. The iguana at first stopped in front of it and head bobbed when asked to Target on it but afterward had no problem moving all over it to follow the target. The next session, on June 5th, the board was added again but this time with a scale underneath it raising the board an inch and half off the ground. She walked right onto the board when asked to Target on it and keepers were able to get a weight without restraint for the first time (Image 1). On June 26th, it was determined to start shaping the next behavior; Touch. The PT waited an additional month during this shaping to ensure there was no regression due to shaping a new behavior before allowing relief keepers to use the Target behavior; this was announced after watching a relief keeper command a training session successfully (August 12th).

Figure 1. Anegada Island iguana (*Cyclura pinguis*) major event training timeline.



The goal for Touch was to be able to give a verbal cue and then pick up the animal, give a physical examination, or carry the iguana to a new enclosure. To begin shaping this behavior the PT began offering a verbal cue of "Touch" and placing the tweezers close to the base of the tail about six inches away. On July 15th this progressed to touching her at the base of the tail or on her hind leg and on August 5th moved to pinching her skin slightly with the tweezers. Her reactions to the tweezers coming at her and touching her were defensive when shaping began. She would rise up on all fours, arch her tail scorpion-like, whip her tail, or run away. It was almost two months before the PT tried touching her with a hand on August 19th. During a training session, the PT would touch with the tweezers first and then gradually switch to touching with the hand, giving the iguana a better idea of what was about to happen. By late September the Touch behavior progressed to touching her on her flanks and moving the hand

up the back. From the time shaping the Touch behavior started in June to late October the iguana's progress was sporadic. On October 28th, a breakthrough occurred. The PT reached for the iguana to touch her on her back legs and she turned around quickly moving her head towards the keeper's hand. Instead of pulling the hand back the PT did not move and the iguana did not bite the hand, but instead tasted the hand with her tongue (exactly the same as she does with the target). Realizing the hand was not food, she turned her head back around. During the next session on October 30th she turned her head towards the hand coming towards her but did not act on it. From this session onwards shaping Touch progressed much faster. The PT added switching up hands, using both hands, and coming from different directions. On December 4th, the PT was able to pick the iguana off the ground a couple inches for a few seconds. For the next three months PT continued to work on increasing the time held and height being held. By the end of January 2014, the PT could bring the iguana off the ground three feet and hold for a minute. On January 29th, the PT tried to walk with the iguana and she tried to scurry out of the hands. Shaping would have to continue to add movement, along with the previous obstacles of height and duration. Relief keepers were also cleared to touch the iguana with their hands but not pick her up as result of the PT watching a relief keeper train a successful session. On February 5th, an unscheduled culmination of the training efforts were tested.

Image 2. Holding iguana via Touch



On February 5th, one of the Reptile and Amphibian Building's exhibit animals was injured and had to be moved off exhibit. The only housing available was where the Anegada Island iguana was housed in reserve. Therefore, she would have to be transferred that same day to another display across the building. This was the first time since training began in March 2012, that she needed to be physically relocated. The PT decided to try and Target her through the building, in areas she has never seen before with lots of distractions, and pick her up using Touch to place her in the exhibit instead of physically restraining her. Targeting her to the exhibit went well. She followed the target hesitating occasionally to check her surroundings, which included plants, but the PT was always able to get her back on track. Upon getting to the exhibit the PT bent down to touch her but the iguana moved away quickly. The PT tried again and she ran away. The iguana then continued to run away and it was necessary to physically restrain her using gauntlets. While being grabbed and held she tried to bite the PT. In the end, the Target behavior worked great but Touch did not.

Discussion

Overall with any training program there are challenges to be overcome giving one successes, failures, and lessons learned. Each animal is unique and they have their own challenges. The most stressful and hardest part about training a reptile is the pace. Due to their ectothermic nature and keeper schedules training only occurred twice a week for a total of ten to fifteen minutes. A trainer must stay patient and not push too far too fast. Granted, as our successful implementation of Target and Touch behaviors show, reptiles can learn behaviors if only trained ten to fifteen minutes a week over extended periods of time. This should give encouragement to staff and facilities with limited time for training but who wish to train more husbandry behaviors with reptiles. Another challenge encountered was due to the PT's inexperience in operant

conditioning; knowing when the secondary reinforcer was established was difficult to determine. In hindsight, more time should have been used to firmly establish the clicker to increase the quality of communication between trainer and animal. What starts as a success can also manifest into a problem. Over the course of training the territorial displays of head-bobbing decreased dramatically, from a couple times a session in March 2013 to never by January 2014, implying her stress levels decreased over time. She actively would come meet the keeper to engage in training at the beginning of the session or during regular cage servicing. This led to the problem of the iguana being too excited and trying to climb the keeper or being unable to remain still. Before Touch could be worked on she had to be Targeted a few times to calm her down. A Least Responsive Stimulus (LRS) which is used as a technique to tell the animal “that’s wrong” was used to stop her from climbing and approaching too close (Pryor, 1999; Ramirez, 1999).

Training is an ever changing give-and-take between trainer and trainee. Conquering these challenges together make training worthwhile and provides valuable lessons to help during the next crisis. One valuable lesson learned was in regard to video taping training sessions. Videos were taken of sessions by interns or fellow keepers and were shown to more experienced keepers in other departments for advice and guidance. This was extremely helpful in correcting small shaping errors and timing of the reinforcers. However, only successful sessions were saved. One can learn just as much, if not more, from a failed session as from a successful one especially when looking back at video over time. The biggest regret and lesson learned occurred on February 5th when the iguana was transferred to the new cage. The responsibility of the trainer is to place the animal in a position to succeed. The PT believed the iguana was not ready to be picked up after Targeting through uncharted territories but wanted to test the efforts of training selfishly. The iguana was not put in a situation to succeed as was seen when she ran off when attempted to be picked up. What was suggested after, and what should have been done, was place a ramp or steps in front of the new exhibit and try to Target the iguana into the new exhibit. Then, if she did not follow the target into the exhibit, try using the Touch behavior. Placing the animal’s interests over the trainer and trusting one’s instincts are essential to be successful.

During the first 10 months of training we achieved our goals to pick up the iguana without struggle or stress for physical examinations, safely clean her exhibit, and increase her mental and physical health. The iguana is currently housed on exhibit and is still scheduled to be used in breeding situations. We are using the lessons learned from the past year to continue Targeting and shaping the Touch behavior to meet our criteria. In time, we hope to make transferring our iguana a positive experience, but in the meantime cleaning and getting weights has been much easier. We hope this is one more resource and a place of reference other keepers can use to help initiate training programs in underutilized taxa, such as reptiles, as finding information in the literature can be difficult.

Acknowledgements

A special thanks to the Houston Zoo team and the entire Animal Programs department particularly Sharon Joseph, Stan Mays, Judith Bryja, Chris Bednarski, Monty Criswell, Chris Valdez, Jack Burchett, Stephanie Turner, Ashley Roth, Alicia Kemery, Paul Reed, and Priscilla Farley. Thanks to Lauren Augustine for guidance.

Literature Cited

Alberts, A. C. 2000. West Indian Iguanas: Status Survey and Conservation Action Plan IUCN – the World Conservation Union, Gland, Switzerland.

- Anonymous, 2004. Anegada Iguana, *Cyclura pinguis* Species Recovery Plan 2006-2010. IUCN SSC Iguana Specialist Group Glans, Switzerland.
- Augustine, L. 2009. Husbandry training with an exceptional South African crocodile. ABMA Wellspring 10(3):2-3.
- Augustine, L. 2010. Putting training to work in a large animal capture. ABMA Wellspring 12:36-37.
- Augustine, L. and M. Baumer. 2012. Training a Nile crocodile to allow for collection of blood at the Wildlife Conservation Society's Bronx Zoo. Herpetological Rev. 43:432-435.
- Becker, W. 2003. Eliminating Fear Aggression in an Eastern Kingsnake. ABMA Wellspring 4(1):9-12.
- Burghardt, G. M. 1977. Of iguanas and dinosaurs: Social behavior and communication in neonate reptiles. American Zoologist 17:177-90.
- Burghardt, G. M. 2013. Environmental enrichment and cognitive complexity in reptiles and amphibians: Concepts, review, and implications for captive populations. Applied Animal Behavior Science 147(3):286-298.
- Burkey, T. V. 1995. Extinction rates in archipelagoes: Implications for populations in fragmented habitats. Conservation Biology 9:527-41.
- Carpenter, C. C., and G. W. Ferguson. 1977. Variation and evolution of stereotyped behavior in reptiles. Pages 335-54 in C. Gans and D. W. Tinkle (eds.), Biology of the Reptilia, Vol. 7. Ecology and Behavior A. Academic Press, New York.
- Davis, K. M., and G. M. Burghardt. 2007. Training and long-term memory of a novel food acquisition task in a turtle (*Pseudemys nelsoni*). Behavioural Processes 75:225-230.
- Dettmer, E. L., K.A. Phillips, D. R. Rager, I. S. Bernstein, and D. M. Fragasey. 1996. Behavioral and cortisol responses to repeated capture and venipuncture in *Cebus paella*. Am. J. Primatol 38:357-362.
- Elvidge, H. J., R. G. Challis, J. S. Robinson, C. Roper, and G. D. Thorburn. 1976. Influence of handling and sedation on plasma cortisol in rhesus monkeys (*Macaca mulatta*). J. Endocrinol. 70:325-326.
- Gaalema, D. E. 2011. Visual Discrimination and Reversal Learning in Rough-Necked Monitor Lizards (*Varanus rudicollis*). Journal of Comparative Vol. 125(2):246-249.
- Gerrits, J. and L. Augustine. 2013. Multiple Snakes, Multiple Problems. ABMA Wellspring 13(1):9-10.
- Grandin, T. 2005. Animals in translation. New York Scribner.
- Hellmuth, H., L. Augustine, B. Watkins, and K. Hope. 2012. Using Operant Conditioning and Desensitization to Facilitate Veterinary Care with Captive Reptiles.

- Hilton-Taylor, C. 2000. 2000 IUCN Red List of Threatened Species IUCN – the World Conservation Union, Gland, Switzerland, and Cambridge, U.K.
- Hudson, R. D., and C. R. Knapp 2004. Translocation Strategies as a Conservation Tool for West Indian Iguanas: Evaluations and Recommendations. Pages 199-209 in Alberts, C. A., R.L. Carter, W. K. Hayes and E. P. Martins (eds.), Iguanas Biology and Conservation. University of California Press Berkley and Los Angeles, California.
- Knapp C. R., S. Buckner, A. Feldman, and L. Roth. 1999. Status update and empirical field observations of the Andros rock iguana, *Cyclura cyclura*. Bahamas Journal of Science 7:2-5.
- Lacy, K. E., and E. P. Martins 2004. Behavior and Ecology of Rock Iguanas, I: Evidence for an appeasement display Pages 101-108 in Alberts, C. A., R.L. Carter, W. K. Hayes and E. P. Martins (eds.), Iguanas Biology and Conservation. University of California Press Berkley and Los Angeles, California.
- Lacy, R. C. 1987. Loss of genetic diversity from managed populations: interacting effects of drift, mutation, immigration, selection, and population subdivision. Conservation Biology 1:143-158.
- Lemm, J. M., N. Lung, and A. M. Ward. 2010. Husbandry Manual for West Indian Iguanas.
- Manrod, J. D., R. Hartdegen, and G. M. Burghardt. 2008. Rapid solving of a problem apparatus by juvenile black-throated monitor lizards (*Varanus albigularis albigularis*). Anim Cogn 11:267–273.
- Marler, C. A. and M. C. Moore. 1988. Evolutionary costs of aggression revealed by testosterone manipulations in free-living male lizards. Behavioral Ecology and Sociology 23:21-26.
- Martins, E. P., and J. Lamont. 1998. Estimating ancestral states of a communicative display. A comparative study of *Cyclura* rock iguanas. Animal Behavior 55:1685-1706.
- McEwen, B.S. 2008. Central effects of stress hormones in health and disease: Understanding the protective and damaging effects of stress and stress mediators. Eur J Pharmacol 583: 174–185.
- Mitchell, N. C. 1999. Effect of introduced ungulates on density, dietary preferences, home range, and physical condition of the iguana *Cyclura pinguis* on Anegada. Herpetologica 55:7-17.
- Pryor, K. 1999. Don't Shoot The Dog [rev. ed.]. Bantam Books, New York.
- Ramirez K. 1999. Animal training: Successful animal management through positive reinforcement. Chicago (IL): John G. Shed Aquarium.
- Reichard, T. Shellabarger, W., and Laule, G. 1993. Behavioral training of primates and other zoo animals for veterinary procedures. Proceedings of the American Association of Zoo Veterinarians, 63-69

- Reinhardt, V. 2003. Working with rather than against macaques during blood collection. *J. Appl. Animal Welfare Sci* 6:189-197.
- Schwenk, K. 1985. Occurrence, distribution and functional significance of taste buds in lizards. *Copeia* 1985:91-101.
- Vause, K and H. Jones 2009. Training Royalty at Riverbanks Zoo and Garden. *ABMA Wellspring* 10(3), 15-17.
- Vitousek M, Adelman J., Gregory N, et al. Heterospecific alarm call recognition in a non-vocal reptile. *Biol Lett* 2007:3:632-4.
- Weiss, E. and S. Wilson. The use of classical and operant conditioning in training Aldabra tortoises (*Geochelone gigantean*) for venipuncture and other husbandry issues. *Journal of Applied Animal Welfare Science* 2003, 6:33-8.

Giant Thai Catfish Training at Disney's Animal Kingdom

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Abstract

The Giant Thai Catfish (*Pangasius sanitwongsei*), or pangasia, is found in the Mekong river and the Chao Phraya river in Thailand. It is an omnivorous species that reaches lengths over 4 feet, 40 kg, in a managed environment and occasionally over 8 feet, 300 kg, in the wild. Our catfish arrived at Disney's Animal Kingdom in 2003. In 2007, a proposed move of the 4.5 foot pangasia from his enclosure challenged us to create a low stress capture method. This challenge initiated the pangasia training program.

Driven by the desire to enhance our husbandry with the pangasia, some trained behaviors included hand-feeding, tactile, and voluntarily swimming into a net-stretcher draped into the water. Training sessions occur every day and the pangasia sets the pace. A next task is desensitizing the pangasia to allowing himself to be lifted out of the water.

A benefit to training has been an increase in the pangasia's overall daily activity. This improved animal visibility and, in turn, guest satisfaction. Our success with pangasia training has been a model to train other collection fish. Pacu, gar, and channel catfish have all shown motivation to be trained. We are excited with our results so far, and hope to make a world of difference for fish husbandry.

Introduction

The giant Thai catfish (*Pangasius sanitwongsei*), also known as a paroon shark or pangasia, is native to Southeast Asia. The species is found in the Chao Phraya and Mekong basins (Hogan 2004). *P. sanitwongsei* is a benthopelagic, potamodromous species which inhabits large rivers surrounded by rainforest (Jenkins 2014). It is characterized for having a broader head and mouth than any other species in the family *Pangasiidae*, and filamentous extensions on its dorsal, pectoral, pelvic and anal fins (Roberts 1991). As the second largest species of catfish, pangasia can reach a standard length of 2.5 to 3 meters and weigh 300 kg (Hogan 2004). Overharvesting for food, the aquarium trade, increased shipping on rivers, and the building of dams have helped to deplete the natural population of pangasia (Hogan 2014, Wang 1998). The IUCN lists the natural population of *Pangasius sanitwongsei* as critically endangered (Jenkins 2014).

In 2003 Disney's Animal Kingdom acquired 0.01 Giant Thai Catfish, Bruce (Image 1). The 1.37 meter (4.5 foot) long pangasia is housed in a fenced off portion of a 318,000 L (84,000 gallon) freshwater aquarium which also exhibits 2 Asian small-clawed otters (*Aonyx cinerea*) and 14 pacu (*Piaractus brachycomus*). Exposed to the elements, the pool is heated to a constant water temperature of 70°F (Image 2).



(Image 1: 0.0.1 giant Thai catfish, Bruce; Image 2: Map of the exhibit pool in the waterway.)

In July of 2007, collection planning threatened the need to drain the entire aquarium. There was no plan for moving the pangasia, so netting him, and pulling him out of the pool, would be the only choice. Safety was a concern given the pangasia's size, and because it had never been done before. Also, we did not want to place unwanted stress on the catfish. Disney's Animal Kingdom's Behavioral Husbandry Team saw this as an opportunity to challenge the training team with developing a means of low-stress capture and restraint that would facilitate for safely moving Bruce. The basic concept was to have Bruce, willingly, let keepers catch him.

A training plan was developed. It consisted of two main goals. Goal #1 was to have the pangasia hand feed from the trainer. Hand-feeding was important because it would allow Bruce to be responding directly to the trainer. Acting like a target, the hand could be used to shape behaviors. Goal #2 was to train the pangasia to swim into a transfer container. Similar to a box, this container would have guillotine doors on either end to keep the catfish contained and allow for easier capture and release. The proper dimensions and specifications for this container would be determined over time, through training. Goal #2 was broken down into 3 steps. Step 1, to get the pangasia to reliably swim through a submerged PVC square. Step 2, to swim through a longer tunnel that would assimilate the final transfer container. Step 3, to have the Bruce swim into the transfer container.

Materials

Historically, the pangasia displayed seasonal changes in activity and motivation. Currently, training consisted of targeting Bruce to a pool buoy in different locations in the exhibit. Preferred food items such as strawberries or cantaloupe were utilized for reinforcement. During cooler months, Bruce would either ignore the buoy or avoid it altogether. This period of lessened activity was dubbed Bruce's "wintering" period. With this seasonal lack of appetite, and low motivation, the training team needed to determine how much of the offered diet the pangasia was actually eating.

The pangasia diet consisted of two types of pelleted fish food, kale, and romaine lettuce (Image 3). For enrichment, Bruce gets mixed vegetables, strawberries, and cantaloupe. The challenge with pelleted food, in an aquatic environment, is that as soon as you put it in the water, it sinks or floats away in all directions. If not eaten right away, all the food would end up in the pool's skimmer drain.

To facilitate easier food delivery during training, the diet is made into mush-balls. The greens and mixed vegetables are chopped up in a food processor, the pellets are softened in water, and then everything is combined. The result is a mash of food that can be rolled into a ball of any desired size (Image 4). By making the balls a uniform size, the consumed portion of the diet is easy to quantify. The mush-balls fit easily into a balled hand for hand feeding, plus the balls sink, so they are easy to feed to a swimming fish.

The pangasia responded favorably to the new form of diet delivery.



(Image 3,4: Diet components before and after preparation.)

The next step was to desensitize the pangasia to a submerged PVC square and have the pangasia swim through that submerged PVC square. Initially, the PVC square was made 55.88 cm (22 inches) long on each side, and it had a PVC arm at one corner to hold it in place while submerged. This square was intended to be much larger than the pangasia, so Bruce could swim through without having to touch any of the sides.

After swimming through the PVC square was reliable, we assimilated the transfer container. A square, plastic, Rubbermaid trash can was used. The solid bottom of the trashcan was cut off and the trashcan was oriented on its side, providing a rigid, rectangular tunnel for the pangasia to swim through. PVC squares, with arms to hold the tunnel in place, were placed on the exterior of each end of the tunnel. The PVC square on the large, front, opening was 55.88 cm on each side, and the PVC square at the back, narrow end, of the tunnel was 38.1 cm (15 inches) on each side. A small hole was cut into the top of the tunnel to provide access to the catfish and deliver reinforcement.

Methods

Original Training Plan

Training began in February 2007 with re-establishing the target behavior that seemed to have regressed. Once Bruce was reliably targeting we started the transition from a pool buoy as the target, to a gloved hand being the target. Targeting Bruce closer to the edge of the pool, brought the pangasia within reach and allowed the pool buoy to be replaced by a fist wearing a white latex glove. The criteria for hand feeding requires the pangasia to touch its snout to the gloved-fist. When this occurs, the fist opens and deposits the reinforcement into Bruce's mouth (Image 5). Transitioning to hand feeding went quickly considering the pangasia was allowing itself to come in physical-contact with the trainer. Bruce was reliably hand feeding one week later.



(Image 5: Bruce, hand feeding.)

Training sessions then started incorporating the PVC square. The pangasia had to become desensitized to the new object. Unfamiliar objects seem to cause Bruce to display behaviors like fast swimming with quick, deliberate turns, opposed to typical calm, slow, swimming. The rapid paced behavior diminishes over exposure time and as food is introduced. To desensitize the pangasia, the PVC square was submerged into the water, parallel to the wall, and Bruce was targeted and hand fed in close proximity. With introduction of the PVC square, Bruce exhibited the quick swimming and tight turning, but calmed when asked to target and hand feed. Training sessions continued and slowly the square moved closer to the training area, increasing its role in the session. After two weeks, the pangasia would hand feed right in front of the PVC square. Two days later, food was taken from a hand protruding through the PVC square. As comfort around the PVC square increased, it was turned perpendicular to the edge of the pool. Moving the PVC square brought more quick swimming and turning, but those behaviors decreased, and Bruce was successfully baited through the square (Image 6). Incorporating the pangasia's normal swim pattern through the pool, Bruce was only asked to swim clock-wise through the PVC square. Soon, baiting was not necessary because the pangasia would swim through the PVC square on his own. Reinforcement would be tossed in the water behind the square as Bruce swam through.

Training sessions with the training tunnel started, the same clockwise swim was encouraged through the tunnel. Initially, the pangasia was reinforced for swimming close to the tunnel. After comfort increased, hand feeding brought the pangasia close to the opening of the tunnel. Baiting was utilized to get Bruce to enter the tunnel. After two months, the pangasia would eat from the small hole cut in the top of the tunnel (Image 7). After another week and a half, Bruce took food from a hand at the back end of the tunnel. However, every time the pangasia entered the tunnel, he would back out of it, never swimming completely through. After a few months the training team made changes to the training plan.



(Image 6: Pangasia swimming through a PVC square; Image 7: The pangasia half way through the training tunnel.)

Revised Training Plan

The new training plan was to have the pangasia swim into a, submerged, cradle-like net. Once in the net, Bruce would be lifted out of the water and placed into a rigid container, filled with water, for transport.

Goal #1 for the new training plan was to have the pangasia swim through two, smaller, pvc squares. Step 1, was to start with the two PVC squares together and slowly separate them. Step 2, was reducing the size of the squares to 38.1 cm (15 inches) on each side. A 38.1 cm square would require the pangasia to bring in its pectoral fins, slightly, while still having control over movement. Step 3, was to desensitize the pangasia to tactile contact in the area between the PVC squares. This could desensitize the pangasia to feeling netting on its body as progressing through the other training steps and goals. Goal #2 will be to train the pangasia to swim through a cradle-net assimilation. Using the same PVC squares from Goal #1 with nylon-mesh added to the sides. Step 1, added netting to the bottom. Step 2, had netting on the bottom and wall side of the pool. Step 3 had netting on the three sides. Goal #3 was to train using a cradle-net. This net was custom-made with two, 1.83 meter (6 foot) long, aluminum, handles with a 1.53 meter (5 foot) square of, rubber coated, 2.54 cm (1 inch), nylon netting, stretched between (Image 8). Training consisted of swimming through the net and desensitization of the net being closed around the pangasia. Goal #4 was to lift the pangasia out of the water.

The team began training with the new plan. Swimming through 2 squares was no problem for the pangasia until the two were set about 0.46 meters (1.5 feet) apart. At this distance apart, Bruce would squeeze around the right side of the second PVC square. The criteria for this behavior was to swim through both squares, so reinforcement was only presented when the second square was swam through, not gone around. Bruce became reliable with swimming through both.

Training the pangasia to swim through smaller, 38.1cm, squares happened in two days. Tactile contact between the two PVC squares was accomplished using the hand feeding behavior. As the pangasia swam through the first PVC square, a hand, containing food, would be lowered into the water. This hand could then be gently run along Bruce's dorsal side. The behavior was reinforced as Bruce swam through the 2nd PVC square.

Adding mesh to the sides between the PVC squares was the next step. Desensitization to swimming through the full 1.53 m (5 foot) length was slow. Success was achieved by shortening the initial distance between the 2 PVC squares and slowly lengthening the mesh as the distance between the squares

increased (Image 9).



(Image 8: The cradle-net; Image 9: The pangasia swimming through two PVC squares with black, nylon, mesh on three sides.)

Equipment modifications were necessary for the next step of training, swimming through the cradle-net assimilation. The rubber-coated net did not sink into the water very much, so 4 lengths of galvanized, steel chain were added to the netting. The chain gives structure to the net and holds it in place, even in the pool's current. The pangasia does not get tangled in the chains because they were added to the underside of the net. Also, white rope was weaved into the edges of the net's openings. This was intended to look like the white outline of the familiar PVC squares. To prevent the net from moving around, 4 brackets were installed on the walls, just above the surface of the water. These brackets work in pairs to support poles on which the net's handles are rested. A hands-free setup is ideal in this situation so the trainer can focus on training rather than supporting a net.

Upon the initial introduction of the cradle-net, Bruce exhibited fast swimming and sharp turning. Reinforcement was offered just for swimming close to the net. Baiting and hand feeding were used to get Bruce accustomed to being near the net. Each day the pangasia would have to get a little closer to the net before being reinforced. It did not take long for Bruce to swim through the cradle-net for the first time (Image 10). By narrowing the exit of the net, Bruce was required to brush against the netting while passing through, desensitizing him to the feeling of the netting. Next, the net was slowly closed on the pangasia as he swam through.



(Image 10: Pangasia swimming through cradle-net.)

Lifting the pangasia out of the water, seemed within grasp, but the behavior began regressing. Rather than swimming through the net on his own, Bruce would repeatedly ignore the net or wait outside of the opening until he was baited. Here, he would take the reinforcement and back out of the net and leave. The trainers did not want to reinforce this behavior, so, training with the net-stretcher was halted. Other behaviors were worked to diversify the pangasia's daily training routine. Remaining disinterested in training the pangasia's diet and number of training sessions was reduced to a point where he was consuming his whole diet. This helped with motivation, but delayed the net behavior training until Bruce started showing more consistent behavior.

Other Training

Training sessions remained consistent, but little progress was made past swimming through the net-stretcher. The training team wanted to try something new. The idea was to signal the start of training sessions with a sound cue. This might get the pangasia's attention and allow us to keep it for a training session. For the cue, a unique sound that could be heard in the water was desired. With two 3" PVC caps, a short length of 3" PVC, and 7 wing-nuts, a simple rattle was constructed. The cue became 8 shakes of this rattle, under the water. A response was seen immediately. Bruce swam over, at normal speed, to investigate the noise. Training sessions were now started with the cue. After a week, the pangasia started swimming over very quickly and swimming in circles after hearing the cue. Yielding such a strong response, it was captured as a behavior when food reinforcement was tossed into the water for a quick response. A second rattle was built and keepers took turns cuing from opposite ends of the exhibit, reinforcing after each successful response.

With this new training success, the training team decided to try getting in the water with the pangasia for training sessions. If Bruce was receptive, being in the water could bring a lot more training freedoms: greater access to the pangasia, more space to work, and a better opportunity to communicate with guests and have them see what we were doing. Historically, we had decided against feeding while physically in the pool because divers swim the pool overnight to clean it. We did not want Bruce bothering them, thinking they were there to train and feed him. However, using the cue to start training sessions would eliminate this from happening. If the divers had problems after we started the training sessions, we would stop.

A training plan was developed for getting into the water and training. Goal #1 was to desensitize the pangasia to having a keeper in the water during a training session. Goal #2 was to find a comfortable spot for training in the pool. Being in the pangasia's environment, Bruce had to be comfortable with the training location, likewise, so did we. After a spot was found, Goal #3 would be training established behaviors now with the trainer in the water.

The pangasia was desensitized quickly to having one trainer in the water. A second trainer put on a pair of chest waders and slowly submerged one boot. This was done to the side of the training area, where the waders would be seen, but not focused on during the training session. The pangasia remained calm, swimming slowly and returning to the training session. Next, the second boot was slowly submerged. Bruce remained calm, with his normal slow swimming. After this, more of the waders were submerged until the second trainer was standing in the pool. The goal of the training session was to have the pangasia hand-feed from the keeper standing in the water. Bruce swam over slowly, but after taking reinforcement, he was swimming around at normal speed, displaying no change from a normal training session.

The pangasia showed little hesitation to slow movement through the pool, following the trainer everywhere. His response to hand-feeding, remained favorable and soon, Bruce would swim directly next to the trainer, and stay until reaching the new training spot. From outside of the water, this looked like a dog that was doing a heel behavior. This was not captured as a behavior because soon we would be carrying training tools through the water and we did not want this to interfere. Swimming past, Bruce did

not react when brushing up against the trainer. Tactile training was desired, so this also became a focus while hand-feeding. A rub of the snout or top of his head after giving reinforcement became running a hand or two along the length of his body (Image 11). The pangasia's reaction to tactile training was very favorable. In many instances, Bruce seemed more interested in tactile reinforcement than food-reinforcement, for he would avoid consuming the food-reinforcement but pause for extra tactile.



(Image 11: Tactile Training)

Behaviors that were considered maintenance were trained in the new training location. The use of the net-stretcher was more complicated. The new training location did not have the necessary supports to hold the net-stretcher, so a second trainer was necessary to hold it. Desensitization to the second trainer and the net-stretcher was necessary. Training this started with the second keeper with the net-stretcher, standing in the water, off to the side of the training area. To be least obtrusive, the net was rolled up on the surface of the water. As the pangasia became used to the net-stretcher, it was unrolled in the water to its full size. After the net was fully exposed, the keeper moved closer to the training area. Initially, the pangasia was hesitant when training around the net-stretcher. Bruce would slowly swim up to the net-stretcher and then turn around and avoid it. As the pangasia got more comfortable approaching the net-stretcher, baiting was utilized to get the pangasia to swim into the net-stretcher. At first, Bruce would only stick his head into it, and then back out. Lowering the net-stretcher, deeper, into the water, proved successful. The pangasia had completed the desired behavior. The net-stretcher was raised, in the water, as Bruce became comfortable swimming through it (Image 12). Swimming into the net-stretcher, suspended in the water, by the keepers, is the extent of the pangasia training program so far. We are confident when the time comes to move Bruce, both the fish and the staff will be ready.



(Image 12: Pangasia training with the net-stretcher.)

Conclusion

What comes to mind with the phrase "husbandry training"? Do images of fish flash through your mind? Probably not. For many, the idea of fish husbandry doesn't exist beyond feeding, cleaning, or breeding. The progress Bruce has shown with his training program shows that fish can be trained. Beyond the completed behaviors, training the pangasia has resulted in a noticeably increased activity level. Historically the pangasia spent a lot of time underneath a bridge that runs over its waterway. Most visitors to the park probably never noticed the fish was even there. After training started, however, people started to notice, and a descriptive sign was even added to the exhibit. With the sign, many people stopped at the exhibit and were able to see the pangasia swimming around the waterway. Beyond this, training with keepers in the water allows for direct interaction with the public. Bruce still spends time under that same bridge, but it is a considerably less amount. No formal activity study has been performed, but the increased level of activity is obvious to the area keepers and managers. Guests get very excited, and are amazed, when they see the size of the catfish. This excitement allows keepers to connect with guests and give out conservation messages. The keepers have even celebrated National Catfish Day on 25 June the last two years, setting up a table to inform guests about catfish globally and the importance of aquaculture.

The successes of the pangasia training has inspired keepers to train other fish in the collection. Channel catfish (*Ictalurus punctatus*), Florida gar (*Lepisosteus platyrhincus*) and longnose gar (*Lepisosteus osseus*) have been trained to eat from tongs, eat off feeding sticks, when cued to a location. Pacu (*Piaractus brachycomes*) are being trained and will target to a 5-gallon bucket lid that is lowered to the water's surface from above. Using two bucket lids, an A to B behavior has been achieved. All the fish show a positive response to the training.

Training the pangasia has taught us a lot about Bruce. Through training, more attention is being paid to eating habits and keepers are able pick-up on changes in overall behavior and swimming patterns. Since training started, we have seen a decrease in the length of Bruce's wintering phase. Training also brings to light other challenges. The waterway is open to the elements and it is far from being a controlled environment. Outside factors can alter Bruce's behavior as well, so there are always surprise challenges to overcome. However, even with the challenges and the time commitment, it is thrilling to work with such a magnificent creature. The fact that such training results were achieved with a fish is very exciting. Obviously, fish can be trained; it just patience, time, and creativity to reach training goals.

References

Hogan, Zeb S., Moyle, Peter B., May, Bernie, Vander Zanden, M. Jake, Baird, Ian G., 2004 The Imperiled Giants of the Mekong: Ecologists struggle to understand - and protect - Southeast Asia's large migratory catfish. *American Scientist*, Vol. 92, No. 3:228-237.

Jenkins, A., Kullander, F.F. & Tan, H.H. 2009. *Pangasius sanitwongsei*. In: IUCN 2014. IUCN Red List of Threatened Species. Version 2014.1. <www.iucnredlist.org>. Downloaded on 18 June 2014.

Roberts, T.R. and C. Vidthayanon, 1991. Systematic revision of the Asian catfish family Pangasiidae, with biological observations and descriptions of three new species. *Proc. Acad. Nat. Sci. Philad.* 143:97-144.

Wang, S. 1998. China Red Data Book of Endangered Animals. Pisces. National Environmental Protection Agency.

Coming Out of Their Shells: Keepers Get Creative to Raise Funds for Turtle Conservation

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Abstract

The Turtle Survival Alliance (TSA) is an action-oriented global partnership that is committed to *zero turtle extinctions*. With projects or programs in 15 countries spanning Asia, Africa, Europe, as well as South, Central, and North America, the TSA is a recognized force for turtle conservation globally. In 2013, we opened the Turtle Survival Center in South Carolina, a captive breeding facility targeting critically endangered species, some of which no longer exist in the wild and are dependent on assurance colony management and future re-introduction strategies.

Since 2008, AAZK Chapters have raised more than \$22,000 for the TSA's turtle conservation initiatives. The keepers that have supported the TSA have raised funds in a wide variety of ways, ranging from TSA merchandise sales to special events at their zoos. Our friends at the Bronx Zoo have hosted a social event at a local tavern providing a nice venue for keepers and friends to get together as well as generating funds for turtle conservation. I will review and highlight some of the more unique fundraising efforts, hoping to inspire other new, creative ideas to raise funds for turtle field programs, keeping with the conference theme of "Keepers Making a World of Difference."

Introduction

The mission of The American Association of Zoo Keepers is to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life¹. Since 2008, AAZK Chapters have raised more than \$22,000 for the Turtle Survival Alliance's (TSA) turtle conservation initiatives. Funds have been raised in a variety of ways, including, but not limited to: special events, bake sales, raffles, merchandise sales, or some combination thereof. Funds have typically been awarded to the TSA either through vote by chapter members or a grant application process. Here, I will highlight some examples of particularly successful campaigns and will discuss why additional chapters may want to consider the TSA in their future fundraising initiatives.

New York City AAZK

The New York City chapter of AAZK began hosting an annual fundraising event called Bar-nanza in 2011. In 2011 and 2012, a portion of the proceeds benefitted the TSA. These "fun raising" events were each hosted at a local tavern and featured free or half-price drinks and appetizers for attendees. Aside from revenue generated through ticket sales, the members also organized dart contests, silent auctions and raffles to raise additional money. In 2012, the event hosted 90 guests (30 more than the previous year). However, other bar patrons also got in on the fun and many purchased raffle tickets after visiting with some of the event guests and seeing the prizes that were being given away. Hosting the event in a public venue during regular business hours generated great exposure for both organizations, especially since both venues

were open to allowing AAZK members to distribute information on both groups in the form of flyers or brochures. In total, the two events generated \$2,256, which was directed to the TSA's general fund.

Omaha's Henry Doorly Zoo AAZK

Omaha's AAZK Chapter, based at the Henry Doorly Zoo, held a very large special event in 2011 called the "Race Against Extinction...Footprints for the Future." Held on Earth Day, the race was a huge success and hosted 200 participants, raising more than \$4,000 for the TSA's programs in Bangladesh. Aside from raising funds for conservation, their team recycled everything possible after the event and served all refreshments in fully compostable products. In the race packets, they included information on the conservation programs that they supported, affording the TSA a great amount of exposure to a new audience.

Why Turtles?

Turtles are among the world's most endangered vertebrates, with more than half of all chelonian species threatened with extinction. The TSA focuses on endangered species and currently manages or supports programs in 14 countries to benefit 20 of the Top 25 most endangered tortoises and freshwater turtles, according to the Turtle Conservation Coalition².

We put boots on the ground in areas with high levels of endemism and where turtles are most threatened. This hands-on approach helps us to work toward our mission of *zero turtle extinctions* and allows donors to easily see how their gift has made a difference in a very tangible way.

Additionally, many people in the zoo community have been very excited in recent years about our new Turtle Survival Center in South Carolina. The issue of sustainability of zoo managed captive populations is a hot topic within the Association of Zoos and Aquariums (AZA). Due to the high number of critically endangered turtle and tortoise taxa found in AZA zoos, the AZA Chelonian Advisory Group is always looking to find the space to manage them sustainably. With the addition of new space afforded by the TSC, a number of AZA programs will move closer to sustainability. Examples include *Indotestudo forsteni*, *Leucocephalon yuwonoi*, *Kinixys homeana*, *Manouria impressa*, *Cuora pani* and *C. mouhotii*. A second benefit will be the large F1 populations that can be managed at the TSC, thereby providing space for the next generation. Space constraints in zoos often preclude them from holding and rearing F1 progeny, and much remains to be learned about nutrition and juvenile husbandry for many of these species. Given this, the TSC has benefitted from a great deal of support from AZA institutions thus far, as well as individual AAZK Chapters.

Working Together

For several of the fundraising events hosted by AAZK Chapters in the past, the TSA was able to provide support to help make the event a success. Examples of support have included:

- Providing brochures, magazines and other giveaway for distribution at the event,
- Donating merchandise for raffle prizes or silent auctions, and
- Helping to promote the event via the TSA newsletter and social media.

The TSA welcomes the opportunity to work with AAZK in the future and is obviously willing to do whatever we can do make future fundraising events a great experience for everyone involved.

Acknowledgements

The Turtle Survival Alliance would like to acknowledge all of the AAZK Chapters that have supported our work over the years: Battle Creek, Chesapeake (Salisbury Zoo), Cleveland

Metroparks, Detroit, Galveston, Heart of Illinois, Milwaukee, New York City, Omaha's Henry Doorly Zoo, Puget Sound, Rocky Mountain and San Francisco.

References

1 - "About Us - AAZK." AAZK. American Association of ZooKeepers, 2014. Web. 01 July 2014.

2 - Turtle Conservation Coalition [Rhodin, A.G.J., Walde, A.D., Horne, B.D., van Dijk, P.P., Blanck, T., and Hudson, R. (eds.)]. 2011. Turtles in Trouble: The World's 25+ Most Endangered Tortoises and Freshwater Turtles—2011. Lunenburg, MA: IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Conservation Fund, Turtle Survival Alliance, Turtle Conservancy, Chelonian Research Foundation, Conservation International, Wildlife Conservation Society, and San Diego Zoo Global, 54 pp.

I Will Save Species from Extinction! The Future Role of Zoo Keepers

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Abstract

Zoos and aquariums play a powerful role in saving species in the wild while educating the public about wildlife and wild places through our ambassador animals. Our institutions are evolving, and our role as zoos and aquariums is being redefined to focus on taking action to protect wildlife. Keepers are an integral part in bringing their institutions' conservation efforts to the forefront, educating guests and inspiring them to take action to save animals. Without zoo and aquarium employees who are knowledgeable and passionate about the conservation work their institution is doing, our guests will walk away lacking information they need to take conservation action.

This presentation will touch on recent research conducted by the author which shows the incredible impacts a connection to a field conservation project can have on zoos and aquariums, their employees, and our guests. These connections can take many forms, but create powerful benefits such as improving employee work ethic, increasing staff ability to message conservation issues to guests, increasing employees' passion towards wildlife, conservation and their current position as well as improving the interest of employees to make conservation more apparent at their institution. This presentation will include the findings and implications of the research, examples of how zoos and aquariums are connecting their staff to conservation projects, and conclude with a discussion about how to strengthen efforts at each institution to make conservation more apparent, through inspired and knowledgeable employees. The goal of the presentation is to fuel discussions surrounding how our collective organizations can improve our conservation messaging by empowering our staff.

Introduction

Zoos and aquariums have come a long way since their inception in the 1800's, where institutions collected and held exotic species in captivity for research, profit and visitor recreation (Turley, 1999). Today, zoos and aquariums are evolving into wildlife preservation and education centers that promote conservation messages through fun, recreational experiences (Ballantyne, Packer, Hughes & Dierking, 2007; Falk et al., 2007). This shift in institutional mission and operations began in the late 20th century in response to dramatically decreasing wildlife populations and natural habitats, and continues to evolve today (Ballantyne et al., 2007). Zoos and aquariums realize that to remain relevant in an ever-changing planet, serious investments must be made in conservation both financially and culturally, while moving away from exotic animal recreation centers to institutions that couple fun, educational experiences with conservation actions (Rabb, 2004).

The evolution of zoos and aquariums to conservation, education, and recreation centers provides enormous potential for saving species and habitats globally. Over 700 million people around the world visit zoos and aquariums every year, allowing staff at these institutions to message conservation issues and actions to an enormous population (Gusset & Dick, 2011). In addition to vital messaging, education and outreach, worldwide zoos and aquariums impact conservation by spending US\$350 million to save species in the wild (Gusset & Dick, 2011). Unfortunately, financial support for wildlife conservation efforts in the field alone will not be sufficient to protect wildlife and wild places long-term. Human behavior change must occur to

create an opportunity for conservation success. Zoos and aquariums are uniquely positioned to create this behavior change among the 700 million people who visit these institutions annually. Zoos and aquariums can promote conservation and behavior change through a variety of means; one method includes inspiring and educating guests during their visit (Ballantyne et al., 2007). The use of ambassador exhibit animals, handling animals and engaging and educational talks has proven to be an effective way of influencing public attitudes about conservation (Ballantyne et al., 2007; Davison, McMahon, Skinner, Horton, & Parks, 1993; Fuhrman & Ladewig, 2008; Hutchins, Smith & Allard, 2003; Swanagan, 2000; Yerke & Burns, 1991). Visitor experiences that are more interactive in nature enhance guests' learning and increases attitudinal change (Moscardo, Ballantyne, & Hughes, 2007). Research has proven that these interactive, up-close experiences with animals and the people who care for them have a measurable impact on conservation knowledge and attitudes (Falk et al., 2007). The potential zoos and aquariums have to reach large populations about the problems of our planet and the need for everyone to take action is most powerful when given through animal encounters (Packer & Ballantyne, 2010). These encounters are even more influential when staff is able to integrate meaningful information with facts that allow visitors to create connections between their past experiences and the problems they are comprehending (Ballantyne, Crabtree, Ham, Hughes & Weiler, 2000; Moscardo, 1999). The potential of zoo and aquarium staff to connect with visitors through their head *and* their heart is imperative for successful conservation interpretation (Ham & Weiler, 2002).

To effectively create these connections between staff and visitors, staff must feel knowledgeable and confident about the conservation messages they are delivering. A research study at the Philadelphia Zoo shows that conservation outcomes are directly impacted by two vital elements: exhibit quality and staff quality (Wagner, Chessler, York & Raynor, 2009). To effectively impact each guest that enters a zoo or aquarium, staff must be knowledgeable about conservation issues and solutions and motivated to promote these messages. This research project was conducted to measure the impact (or potential impact) of connections between field conservation projects and zoo and aquarium employees, in hopes of improving the conservation culture among these institutions through the staff. It was hypothesized that a connection to a field conservation project by a zoo or aquarium staff member would improve the employees' work ethic, ability to message conservation issues, passion for wildlife and conservation, passion for current position, and interest in making conservation more apparent in his/her respective institution.

Research Methodology

This research project sought to measure the impact (or potential impact) of connections between field conservation projects and zoo and aquarium employees. Field conservation projects are defined as any projects (local or international) that work to preserve species in the wild. An online survey was sent to zoo and aquarium professionals globally through Survey Monkey. This survey included a mix of open-ended, multiple choice, and Likert-like scale questions. The survey closed after 30 days. Quantitative data included multiple-choice questions represented as percentages of those who responded to that specific question. Likert-like scale responses were analyzed using two-tailed t-tests utilizing unequal variance and equal variance. Qualitative data (open-ended responses, "other" and "why or why not") questions were analyzed using a coding system with the assistance of an outside, objective analyst.

Results

In 30 days of online data collection, 272 responses were collected from zoo and aquarium staff in the United States, Europe and Australia. Figure 1 displays the various departments in which employees who responded to the survey work.

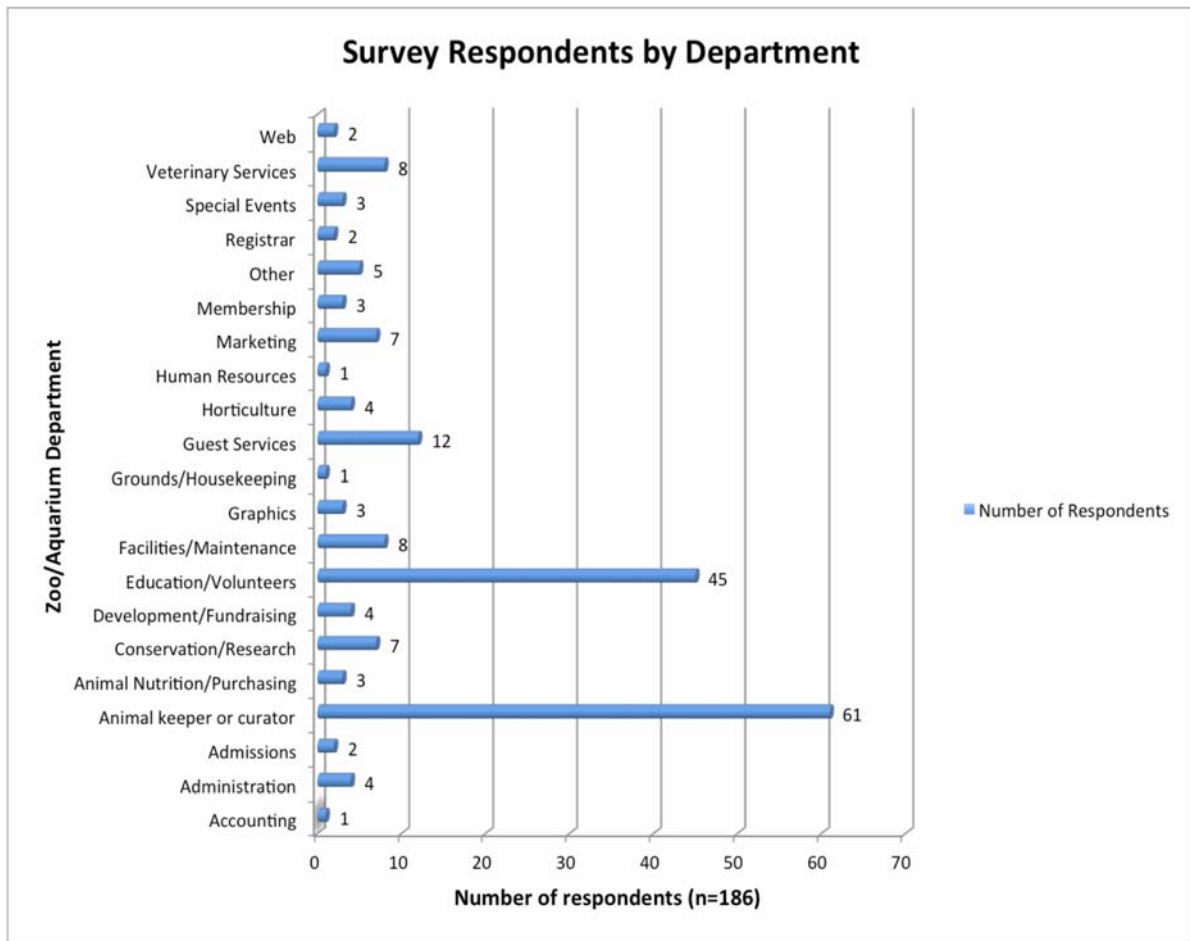


Figure 1-Survey Respondents by Department (n=186).

Of the 272 responses, 35.29% identified themselves as not having a connection to a field conservation project. When asked if those without connections would like to become more involved with a project, 71.05% replied affirmatively. Figure 2 highlights the ways in which non-connected employees would like to become involved with a field conservation project.

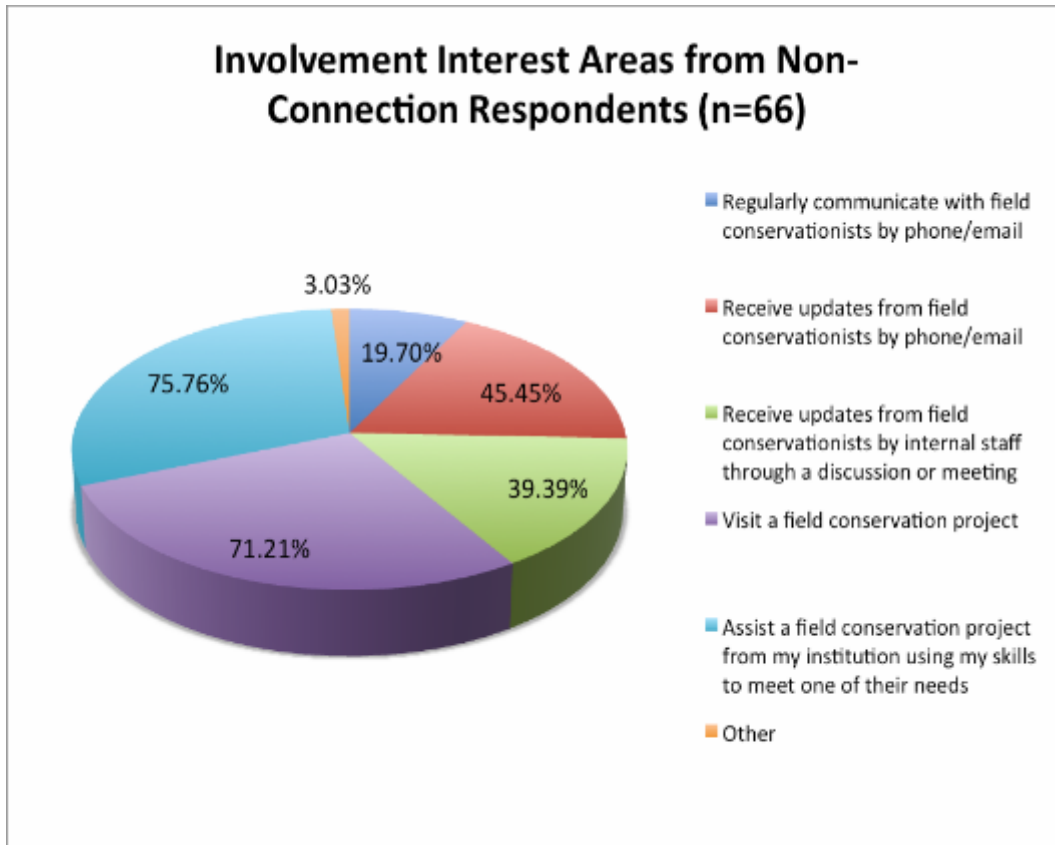


Figure 2- Involvement Interest Areas from Non-Connection Respondents (n=66). Participants selected the way(s) in which they would like to become involved with field conservation projects.

The main obstacles perceived when wanting to begin working with a field conservation project are time and money. For all 272 respondents, 83.33% confirmed that opportunities for conservation project involvement exist at their institutions and 65.59% stated that their institutions fund such activities.

64.71% of the total survey respondents identified themselves as having a connection with a field conservation project. Of these, 46.32% had visited a field site at least once, 34.56% had continuous communication with a project resulting in an action taken by the respondent to benefit the project/species, and 33.46% had organized and/or held a fundraiser to support the efforts of the project. 85.53% of these “connected” employees became connected with their field conservation project through their workplace. Over half (53.66%) of 123 responses indicated they are now more excited, passionate and engaged in their work since developing a connection. The employees who did travel to a field site indicated a long visit was not required to make an impact on the individual. Almost a quarter of respondents mentioned spending only hours at a field site.

Each subset group (those with a connection to a field conservation project and those without) were asked to rank themselves on several parameters: work ethic at institution, ability to message conservation issues to the public (including fellow staff and guests) at institution, passion towards wildlife and conservation, passion for current position, and interest in making conservation more apparent at institution. Those with a connection to a field conservation

project were asked to rank themselves on these parameters twice, once reflecting on their roles prior to developing their connection and again based on how they felt at the time of completing the survey. Ranking choices for each topic included very poor (1), poor (2), fair (3), strong (4), and very strong (5). Averages were calculated for each topic and compared between respondents in two ways. The first comparison was between those without a connection to a project and those with a connection to a field project (as the latter group currently ranks itself), and the second comparison assessed differences between the retrospective and current rankings for those who have a connection to a field project. A paired t-test was used for each comparison (results shown in Table 1).

Not connected to conservation project			Connected to conservation project (now)			
	n	Average response (1-5)	n	Average response (1-5)	P-Value	T Statistic
Work ethic^a	80	4.44	125	4.72	0.00	3.86
Ability to message^b	80	3.79	125	4.51	0.00	7.66
Passion for conservation^c	80	4.34	125	4.74	0.00	4.84
Passion for position^d	80	4.24	124	4.54	0.00	3.14
Interest^e	80	4.19	125	4.67	0.00	4.99
Connected to conservation project (before)			Connected to conservation project (now)			
	n	Average response (1-5)	n	Average response (1-5)	P-Value	T Statistic
Work ethic^a	125	4.66	125	4.72	0.01	2.71
Ability to message^b	125	3.83	125	4.51	0.00	12.88
Passion for conservation^c	125	4.46	125	4.74	0.00	6.94
Passion for position^d	124	4.38	124	4.54	0.00	4.60
Interest^e	125	4.15	125	4.67	0.00	9.23

Table 1- The average responses from questions 2, 20 and 21, on which respondents were asked to rank themselves on 5 job-related parameters. Statistical significance was found across all 5 factors, in both subset group comparisons.

a = Work ethic at institution

b= Ability to message conservation issues to the public (includes fellow staff and guests) at institution

c= Passion towards wildlife and conservation

d= Passion for current position

e= Interest in making conservation more apparent at institution

Discussion

The data collected through this survey supports the hypothesis that zoo and aquarium employees' connections to field conservation projects improves their work ethic, ability to message conservation issues, passion for wildlife and conservation, passion for current position, and interest in making conservation more apparent at their institution. Employees of zoos and aquariums who are connected to field projects work additional hours (weekly) to support these efforts, and are currently more excited, passionate and engaged in their work than they were before developing their conservation link. The majority of employees who did not have a connection to a field conservation project expressed the desire to create such a connection (71.05%). Non-connection respondents felt that a connection to a project would improve their ability to message conservation issues to others (including zoo and aquarium visitors), increase their passion for their job, and feel more involved and knowledgeable about conservation in general. The potential to improve how guests receive conservation information during their visit as well as increase the likelihood that guests take action after a visit to a zoo/aquarium can be seen through developing employees' familiarity with conservation projects.

Houston Zoo Examples

The Houston Zoo realizes the importance of connecting its' staff to field conservation projects and works extensively to connect employees in all departments, from grounds to accounting to the issues animals are facing in the wild and the superheroes across the globe who are fighting to save them. It is evident by the data collected through this research project that staff that is connected to field projects are more passionate, confident and engaged employees who are well-equipped to discuss conservation issues with our guests. With roughly 350 employees at the Houston Zoo, we see the power and positive influence these employees can have on our 2.1 million guests in order to create conservation change.

One example is our Primate Staff. Utilizing a unique Houston Zoo program called the Staff Conservation Fund, primate employees received funding to assist a howler monkey rehabilitation facility in Belize called WildTracks. Using their expertise in animal husbandry and education, zoo staff have been visiting and assisting the project annually for many years now (Figure 3). Building on this relationship with WildTracks, Primate Staff have taken their experiences working with wild howler monkeys in Belize and integrated them into a conservation education event which is called "Howlerween" and is now part of our annual Zoo Boo program during the month of October (Figure 4).



Figure 3-Houston Zoo Primate Staff provide husbandry assistance for howler monkeys in Belize.



Figure 4-Houston Zoo Primate Staff translate experiences in Belize with wild howler monkeys into an educational event for the Houston community at the zoo.

A similar connection can be seen amongst several different employees at the zoo and the Painted Dog Conservation (PDC) project in Zimbabwe. Using funding from the Staff

Conservation Fund program, our Director of the Veterinary Clinic designed a vet training course which she conducted for local staff in Zimbabwe (Figure 5). Our carnivore staff is also directly connected to the project and hosts a conservation education program annually during one weekend in June called “The Dog Days of Summer” to increase awareness of the African Wild Dog and raise funds for the project. Finally, a member of our Facilities department is working with PDC to redesign anti-snare satellite collars for the dogs to wear in the wild (Figure 6). Through one staff member, numerous employees have become connected to this project and have been able to offer their skills to directly impact painted dogs in the wild.



Figure 5-Veterinary Clinic manager leads a training for vet staff of the Painted Dog Conservation project in Zimbabwe.



Figure 6-Facilities staff assists Painted Dog Conservation by developing new “anti-snare” collars for wild dogs to wear.

Finally, a wonderful example of how a strong connection between a zoo employee and a field project can change the way your institution operates can be seen through our carnivore keeper, Angie Pyle. Angie became connected with one of the zoo’s field projects, the Niassa Lion Project in Mozambique and immediately developed a substantial relationship with the founders of the project, traveling to Mozambique to the project numerous times (Figure 8). Angie enhanced the field project by mimicking an annual event held for the people of Niassa here at the Zoo called “Lion Fun Days”. This educational event on zoo grounds creates awareness of the challenges lions face in the wild, how the zoo helps by assisting the Niassa Lion Project and how our guests can help lions (Figure 7). This is now an annual event held in September which heightens local awareness of the plight of lions while raising funds for the field project. Angie has extended this awareness weekend by creating connections with local Houston schools that have lions or other cats as mascots, to create opportunities for these students to fundraise for wild lions and rewarding the class who fundraises the most with a visit to see and experience the lions at the zoo. Based on the success of these projects, Angie has created a brand new position for herself at the zoo where she works dually, part of the week as a carnivore keeper and the other part of the week in our Education Department to further her program connecting schools with cat mascots to field projects. She has also successfully fostered new donors for the zoo through her energetic and passionate conversations about the lions housed at the zoo and their counterparts in the wild.



Figure 7-Houston Zoo carnivore staff host an annual education event on-grounds to highlight how lions are doing in the wild.



Figure 8-Houston Zoo carnivore staff visit the zoo's partner, the Niassa Lion Project in Mozambique to assist with an annual educational event.

Staff Conservation Fund

Many of the staff connections to field projects discussed here were made possible by a unique program at the Houston Zoo called the Staff Conservation Fund. This is a fund where donations are collected yearly from employees of the zoo, and all funds are available for full-time staff to use. Staff must apply for funding to do conservation work using a formal application process. They can choose to build upon an existing conservation project with a skill they have (locally, internationally or both), create a brand new project from scratch or implement new sustainable practices. A committee made up of representatives from around the zoo reviews applications quarterly and decides whether they meet the criteria for funding. Staff must demonstrate how they will incorporate this work back into the zoo and must conduct a presentation for fellow staff and volunteers after they have concluded their project. This unique program is just one way zoos and aquariums can connect their staff to field projects while making positive change for their employee's professional development and their overall mission of conservation.

Discussion: Creating Connections at other Institutions

It is clear that zoo and aquarium employees have a huge impact on the guests that visit our institutions. With this new research, it is evident that employees who have connections to field conservation projects are better equipped to discuss conservation issues with our guests and feel more inspired and engaged. One of the best ways to enhance connections between conservation projects and employees is networking and discussions amongst like-minded individuals. I'd like to take this time now to open up the floor to ideas and suggestions of how to better connect our employees to field projects! How can we strengthen efforts at each institution to make conservation more apparent, through inspired and knowledgeable employees?

Acknowledgements

I would like to thank the Houston Zoo's Wildlife Conservation Program staff for being ever supportive of this research and allowing me the time and support needed to complete it. Special thanks also go to Carol Trosset, Director of Enrollment Research at Bennington College and Kevin Matteson, Assistant Director of Masters Programs, Project Dragonfly at Miami University for their assistance in the coding and statistical analysis of the data discussed here.

References

- Ballantyne, R., Crabtree, A., Ham, S., Hughes, K. & Weiler, B. (2000) Tour guiding: developing effective communication and interpretation techniques (Brisbane, Queensland, Queensland University of Technology).
- Ballantyne, R. R., Packer, J. J., Hughes, K. K., & Dierking, L. L. (2007). Conservation learning in wildlife tourism settings: lessons from research in zoos and aquariums. *Environmental Education Research*, 13(3), 367-383. doi:10.1080/13504620701430604
- Davison, V.M., McMahon, L., Skinner, T.L., Horton, C.M., & Parks, B.J. (1993). Animals as actors: Take 2. Annual Proceedings of the American Association of Zoological Parks and Aquariums, 150-155.
- Falk, J.H.; Reinhard, E.M.; Vernon, C.L.; Bronnenkant, K.; Deans, N.L.; Heimlich, J.E., (2007). Why Zoos & Aquariums Matter: Assessing the Impact of a Visit. Association of Zoos & Aquariums. Silver Spring, MD.
- Fuhrman, Nicholas E.; Ladewig, Howard. (2008) Characteristics of animals used in zoo interpretation: a synthesis of research. *The Free Library* (July, 1), [http://www.thefreelibrary.com/Characteristics of animals used in zoo interpretation: a synthesis of...-a0191351210](http://www.thefreelibrary.com/Characteristics+of+animals+used+in+zoo+interpretation:+a+synthesis+of...-a0191351210)
- Gusset, M., & Dick, G. (2011). The Global Reach of Zoos and Aquariums in Visitor Numbers and Conservation Expenditures. *Zoo Biology*, 30(5), 566-569.
- Ham, S. H. & Weiler, B. (2002) Interpretation as the centrepiece of sustainable wildlife tourism: R. Harris, T. Griffin and P. Williams (Eds) Sustainable tourism: a global perspective (Oxford, Butterworth Heinemann), 35–44.
- Hutchins, M., Smith, B., & Allard, R. (2003). In defense of zoos and aquariums: the ethical basis for keeping wild animals in captivity. *Journal Of The American Veterinary Medical Association*, 223(7), 958-966.
- Moscardo, G. (1999) Making visitors mindful: principles for creating sustainable visitor experiences through effective communication (Champaign, IL, Sagamore Publishing).
- Moscardo, G., Ballantyne, R. & Hughes, K. (2007). Interpretive signs: principles in practice (Golden, CO, Fulcrum Press).
- Packer, J., & Ballantyne, R. (2010). The Role of Zoos and Aquariums in Education for a Sustainable Future. *New Directions For Adult And Continuing Education*, (127), 25-34.
- Rabb, G. B. (2004). The Evolution of Zoos from Menageries to Centers of Conservation and Caring. *Curator*, 47(3), 237-246.
- Swanagan, J.S. (2000). Factors influencing zoo visitors' conservation attitudes and behavior. *The Journal of Environmental Education*, 31(4), 26-31.
- Turley, S. K. (1999) Conservation and tourism in the traditional UK zoo, *The Journal of Tourism Studies*, 10(2), 2–13.

Wagner, K., Chessler, M., York, P., & Raynor, J. (2009). Development and Implementation of an Evaluation Strategy for Measuring Conservation Outcomes. *Zoo Biology*, 28(5), 473-487.

Yerke, R. & Burns, A. (1991) Measuring the impact of animal shows on visitor attitudes, in Annual Conference Proceedings of American Association of Zoological Parks and Aquariums (San Diego, California).

Increasing amphibian awareness at your facility & within the community

Chris Shupp, Keeper II – Cypress Swamp

North Carolina Zoo

Asheboro, NC

Abstract

The theme “Keepers making a world of difference” is indicative of how our profession has evolved to become more proactive in conservation efforts. Amphibians make a great group of animals through which to connect our communities with our conservation message since they are in nearly all of our backyards, and act as environmental bioindicators. Amphibians have been on this planet for 350 million years and until recently have thrived. Today however, of the over 7000 species of amphibian, approximately a third are in decline. This is a global issue which is not the result of a single problem, but more the cumulative effect of factors such as disease, pollution, habitat loss and climate change. This is where zoos can make a difference though, as amphibians have proven to be resilient given the time and resources to recover.

There are many ways to go about making a difference, the following are some approaches undertaken at the North Carolina Zoo. These include: A) Elicit interest through targeted events such as “Amphibian Awareness Day” B) Support existing conservation efforts, such as Chopsticks for Salamanders. C) Encourage and support individual efforts to ensure amphibians remain in our backyards, through programs like FrogWatch USA. D) Develop new amphibian conservation projects on your own, or through partnerships with other zoos, wildlife agencies, universities, or a host of other institutions and organizations. Opportunities abound, and I hope that this talk will inspire others to get involved in amphibian conservation.



Fig. 1 – Cope's gray treefrog (C. Shupp)

A) Elicit interest through targeted events such as “Amphibian Awareness Day”.

A challenge for any zoo awareness event is capturing visitors’ attention and interest while ensuring that important conservation messages are communicated. This can be accomplished through events that combine entertainment with education. Using targeted events such as the NC Zoo’s “Amphibian Awareness Day”, or even by participating in another facilities event such as the North Carolina Museum of Natural Science’s “Reptile and Amphibian Day” our staff use educational and entertaining activities to inform guests about the threats facing amphibians and the ways that can help.

Starting in 2009 the North Carolina Zoo has held an annual event in conjunction with international Save the Frog Day. Over the last three years we engaged local high school students in the event. We have had increasing success using one or two of these students to act as liaisons between the zoo and the school while also acting in the roles of recruiting other students and assisting with development of the events activities. Working with youth allows us to have many more “entertaining” activities (face painting, crafts, games, etc.) through which we can impart the message. This affords the more trained zoo staff to focus on the deeper conservation messaging opportunities and provides more balance to the event.

This year we also participated in the North Carolina Museum of Natural Science’s “Reptile and Amphibian Day” (fig. 3), and had the opportunity to talk about amphibians with a whole other visitor pool. The beauty of this event is that it gave us an opportunity (albeit most of the time a brief one) to really be a spokesman, and at times salesman, for an existing amphibian conservation project that gives visitors a simple action to both reduce threats to amphibians and support their conservation, in this case Chopsticks for Salamanders. Our hellbender ambassador “Snotty” (fig. 2) even was able to make appearances at both of these events, as well as many others around North Carolina and even in other states.



Fig. 2 - Amphibian Awareness Day (J. Owen)



Fig. 3 – Community art project at Reptile & Amphibian Day (C. Shupp)

B) Support existing conservation efforts, such as Chopsticks for Salamanders.

Sharing our passion for amphibians and their conservation can become contagious and may inspire others as well. This was the case for the Chopsticks for Salamanders project, which I became aware of at the AAZK conference last year. Seeing the passion for salamander conservation through the Chopsticks for Salamanders effort inspired me to get involved. Salamander conservation is especially relevant here in NC as we have some of the highest diversity of salamander species on the planet. Seeing the spark of recognition in someone that has made the connection between chopsticks and salamanders is huge. Once they can see how the over harvesting of mature hardwoods (commonly used to make chopsticks) leads to deforestation and environmental degradation it’s easy to see how the loss of habitat can lead to loss of species. These opportunities can provide a little boost of energy, and help us find hope that people really will care once informed (fig 4). Then when you can sell that person a set of chopsticks not only are you raising funds that will support salamander conservation, but perhaps this person will change their habits and pass it along to others as well. I have had the opportunity to engage not only zoo and museum guests,

but also many herpetologists at the North Carolina Partners in Amphibian and Reptile Conservation (NC PARC) meeting in the spring. It has been enlightening to see how many people are completely in the dark about the environmental impact of disposable chopsticks; in fact until recently I was one of them.



Fig. 4 – Talking Chopsticks for Salamanders at Reptile & Amphibian Day (C. Shupp)

C) Encourage and support individual efforts to ensure amphibians remain in our backyards, through programs like FrogWatch USA

I would hope that every one of us has heard a wild frog or toad call at one time or another and that most take pleasure in hearing the sound even if they don't recognize the species. Many of us are even fortunate enough to hear frogs calling where we live (fig 6). It is the sound that lets us know that spring is coming or that the hazy days of summer are here. These calls are also providing key data regarding the status and distribution of anuran populations globally. AZA's FrogWatch USA is providing the resources for analyzing this data, but needs trained volunteers to collect and input this data into the system. This program is designed for those individuals willing to commit not only to supporting, but directly contributing to conservation research. Through the collection and contribution of scientifically valid data (aka citizen science), a great opportunity is present for us to ensure that we are aware of how anuran populations within our communities are fairing (fig. 5). Our job is to facilitate those individuals within our community to become informed about frogs living in their area and of this program and then provide the training, support and resources necessary for their long term commitment to this effort. FrogWatch NC Zoo kicked off its inaugural year in February of 2014 and this first year has served as a useful learning experience for us to get our feet wet. We have had modest success in recruiting volunteers without really pushing very hard outside of our general zoo community in 2014, but our goal starting in 2015 is to serve the entire central NC community. While we had many individuals interested and able to complete the training, many volunteers (for a variety of reasons) were unable to record their own data this year. This is where our focus as training coordinators will be over the next calling season as we try to encourage a deeper commitment to this very important program.



Fig. 5 – Slide from FrogWatch NC Zoo volunteer training presentation



Fig. 6 – Calling Fowler's toad (Jeff Beane)

D) Develop new amphibian conservation projects on your own, or through partnerships with other zoos, wildlife agencies, universities, or a host of other institutions and organizations.

In 2013 (thanks to the efforts of a highly driven NC student – Rachel Hopkins) North Carolina formally designated the pine barrens treefrog (*Hyla andersonii*) (PBT) as the state frog. Along with this status comes an opportunity to represent all other anurans statewide to ensure greater awareness of their plight and importance. Due to a wide range of factors (most notably habitat loss) affecting most, or all amphibians, the PBT have disappeared from many of their historic locations. The PBT has evolved with a breeding strategy that allows its tadpoles to thrive in wetlands that have an acidity level (pH 3 to 4) which is uninhabitable by tadpoles of most species (fig. 7 & 8). The loss of these specific wetlands can lead to being out competed by other species and consequently their inevitable decline. Through a collaborative effort between the NC Zoo, NCAAZK and the NC Wildlife Resource Commission the hope is that this spectacular frog can become re-established within its former range. This effort is currently underway through a carefully planned telemetry study designed to assess the habitat use of PBT and thus to identify the appropriate locations to undergo habitat restoration. Down the road there is the potential to target a reintroduction program in parts of the historic range that have low probability of natural re-colonization. Efforts like this give members of the community (and/or visitors to your facility) a clearer picture of how your institution is actually contributing to conserving species through active field work.



Fig. 7 - Pine barrens treefrog (C. Shupp)



Fig. 8 - Pine barrens treefrog metamorph (C. Shupp)

Summary

The take home message is that to increase awareness and conservation for a species of interest, there is no single approach. Instead we must be flexible, know our audience and then find the most effective method to reach our visitors. We also need to be willing to make a deeper commitment to amphibian conservation ourselves. Whether we help organize an event, initiate a community conservation program, or contribute through field work (fig. 9), we must be ready to demonstrate how we can all make a difference. It is important that we demonstrate this through not only our words, but more importantly our actions. Utilizing this combined approach we have the potential to impact more people, generate funds for broader conservation efforts, and get involved in the conservation of local (and global) species of concern..



Fig. 9 – Sandhills Game Lands 17 Frog Pond (C. Kendall)

International Congress of Zookeepers, “Connecting Keepers Worldwide!”

By

International Congress of Zookeepers Steering Committee Members:

Rolf Veehuizen, Carsten Knott, Liz Romer, Carla Srb, Norah Farnham, Sara Wunder Steward, Richard Barnett, Ross Snipp, Virginie Roy, Damien Lerasle, Raul Cabrera, Tiago Nabico, Dennis Blomjous, Sebastian Schorr, Leo Suarez, DVM, and Emilia Lastica, DVM.

Introduction

The International Congress of Zookeepers (ICZ) provides a variety of assistance to our international colleagues, promotes the goals and objectives of American Association of Zoo Keepers (AAZK), Inc. on an international level, increases awareness of AAZK, and enhances communication among the world’s zoo professionals. The ICZ evolved from AAZK’s now-extinct International Outreach Committee (IOC). A major accomplishment of the IOC was procuring a travel grant which afforded the opportunity for representatives from seven of the world’s professional zookeeper associations to meet at the AAZK conference in Columbus Ohio, in 2000. These seven representatives met to discuss the need for better communication among zookeepers worldwide. The idea to create the International Congress of Zookeepers (ICZ) was formulated.

Representatives at the 2000 meeting of the World’s Professional Zookeeper Associations were:

- American Association of Zoo Keepers (AAZK)
- Association of British Wild Animal Keepers (ABWAK)
- Australasian Society of Zoo Keeping (ASZK)
- Asociación Ibérica de Cuidadores de Animales Salvajes (AICAS)
- Association Francophone des Soigneurs Animaliers (ASFA)
- Berufsverband der Zootierpfleger (BdZ)
- Stichting De Harpij (De Harpij)

ICZ’s Mission Statement: ‘The ICZ will build a worldwide network among zookeepers and other professionals in the field of wildlife care and conservation. This exchange of experience and knowledge will improve the professionalism of zookeepers for the benefit of the animals under their care and promote awareness and actions that will contribute to the preservation of wildlife everywhere.’

ICZ’s Vision Statement: ‘A global network of zookeepers with the highest standards of professional animal care contributing to a diverse and sustainable natural world where neither wild animals nor their habitats are in danger.’

A Steering Committee (SC) was formed to direct the progress of the ICZ and create a vision for the budding association. The SC consists of two volunteer members from each of the professional keeper associations. As of 2014, the SC of the ICZ consists of 18 members representing the world’s nine professional keeper associations. They have met once a year since 2000 to coordinate the development of an international association that will promote professional animal care throughout the world. Currently, the ICZ is operated completely by volunteer committee members. The ICZ has five priorities; keeper development (workshops and aiding keepers in developing countries receive access to resources and information), the hosting of international conferences or congress every three years, assisting with the development of new national keeper associations, development of the global network of zookeepers, and

conservation. Already the ICZ has witnessed great success. Yet the challenge for the ICZ remains the continuing development and evolution of the association.

2014 World's Professional Keeper Associations that make up the ICZ:

- American Association of Zoo Keepers (AAZK)
- Association of British & Irish Wild Animal Keepers (ABWAK)
- Australasian Society of Zoo Keeping (ASZK)
- Asociación Ibérica de Cuidadores de Animales Salvajes (AICAS) (Spain & Portugal)
- Association Francophone des Soigneurs Animaliers (AFSA) (France)
- Berufsverband der Zootierpfleger (BdZ) (Germany)
- Stichting De Harpij (Netherlands and Belgium)
- Animal Keepers of Africa (AKA) (Established 2006)
- Zookeepers' Association of the Philippines (ZAP) (Established 2006)

2014 ICZ Steering Committee:

- President: Rolf Veehuizen, Stichting De Harpij
- Vice President: Carsten Knott, BdZ
- Treasurer: Liz Romer, ASZK
- Secretary: Carla Srb, ASZK
- AAZK Representatives: Norah Farnham & Sara Wunder Steward
- ABWAK Representatives: Richard Barnett & Ross Snipp
- ASZK Representatives: Liz Romer & Carla Srb
- AFSA Representatives: Virginie Roy & Damien Lerasle
- AICAS Representative: Tiago Nabico & Raul Cabrera
- AKA Representatives: John Werth
- BdZ Representative: Carsten Knott & Sebastian Schorr
- Stichting De Harpij Representatives: Dennis Blomjous & Rolf Veehuizen
- ZAP Representatives: Leo Jonathon Suarez, DVM & Emilia Lastica, DVM

Strategic Directions of the ICZ

- Achieve the highest standards of zoo keeping globally.
- To assist zoos in need of improvement.
- Securing the financial growth and stability needed to implement the ICZ's strategy.
- Increasing ICZ's visibility and impact.
- Improving and developing the ICZ, reflecting the needs of zookeepers, zookeeper associations and zoos needing improvement.
- Developing and delivering ICZ's core conservation activities.
- Developing and strengthening ICZ's external partnerships.
- Procure and develop a professional administrative management.

Developing the ICZ as a Non-Profit

In 2008, the ICZ became incorporated as a 501(c) 3 non-profit organization in the state of Ohio, USA, due to potential legal issues. There are much different legality, in each of the nine countries represented by ICZ that apply to various issues such as liability, fundraising, accounting, etc. A Constitution, By-

Laws, Statement of Purpose, Mission Statement, Website, and Membership Categories were also established, along with 6,000 members from 30 countries.

International Congress on Zoo Keeping (Conference)

The first major goal for the ICZ was to organize an international keeper conference or congress. In 2003, the first congress of the ICZ was held at Avifauna in the Netherlands. In 2006, the Congress was held at the Gold Coast, Australia. In 2009, the Congress was held in conjunction with the 36th AAZK National Conference at Woodland Park Zoo, Seattle, Washington, USA. In 2012, the Congress was held at the Wildlife Reserves Singapore. A total of over 1,100 zookeepers from all over the world have attended the four previous ICZ conferences. The upcoming 5th International Congress on Zoo Keeping will be held at Leipzig, Germany, September 9-13th, 2015. We are anticipating at least 300 zookeepers and other delegates from all around the world attending this Congress. Associations interested in hosting a Congress after 2015 should contact the ICZ SC.

The ICZ does have scholarship available to aid keepers in developing countries to attend the Congress. Just an example; for the 2012 Congress in Singapore, the ICZ gave five full scholarships and three partial scholarships, which allowed participants from the Philippines, India, Uganda, France, Mexico, Taiwan, and Singapore to attend the 4th ICZ Congress. Since the ICZ's first Congress is 2003, approximately 15 scholarship have been awarded to delegates from all over the world. It was with heavy heart in September 2012, when the ICZ lost one of its own SC members, Mr. Paul Howse. Paul had worked tirelessly for the ICZ since its inception and to honor his life, love, and enthusiasm, the ICZ SC created the Paul Howse Scholarship, which will be awarded to a commendable delegate for the first time at the 2015 ICZ Congress at Leipzig.

Membership

The ICZ has five categories of membership, all of which are free, except for Institutional Support membership.

1. Professional Association membership shall be offered to any regional Keeper Organization as defined or recognized by the ICZ SC.
2. Professional Membership shall be offered to any person that is a professional member of a regional Keeper Organization recognized by the SC.
3. Professional Affiliate membership shall be offered to any person employed in a zoological institution, which wishes to support the aims and objectives of the ICZ, but is not covered by membership of a regional Keeper Organization.
4. Individual Supporting membership shall be offered to any individual wishing to support the aims and objectives of the ICZ subject to SC approval.
5. Institutional Supporting membership shall be offered to any institution or organization that wishes to support the aims and objectives of the ICZ subject to SC approval. Your support will give you the opportunity to nominate a partner zoo needing improvement as a sponsored institutional supporter of the ICZ. Benefits include discount for institutional ICZ supporters at ICZ member conferences and association publications. Use of the ICZ website to promote your relevant conferences and other keeper related activities. Your institution will be shown on the link page of

the ICZ website with a hyperlink to your website. Use the ICZ website to post Job and Internship opportunities. You can also be eligible to host ICZ Conferences and ICZ related events, keeper workshops, etc. You will receive the quarterly electronic ICZ newsletter, “Keeper Notes”, to keep up to date with the ICZ activities.

Current Members

American Association of Zookeepers (AAZK)

The American Association of Zoo Keepers, Inc. began in 1967 in San Diego, CA with the purpose of promoting professionalism in zoo keeping through education of zoological staff members in the most modern and current techniques of captive exotic animal care. AAZK's mission is to provide a resource and a forum of continuing education for the animal care professional and to support zoo and aquarium personnel in their roles as animal care givers, scientific researchers, public educators and conservationists; to promote zoos and aquariums as cultural establishments dedicated to the enrichment of human and natural resources; to foster the exchange of research materials, enrichment options and husbandry information through publications and conferences which will lead to a greater understanding of the needs and requirements of all animals.

Animal Keepers of Africa (AKA)

Animal Keepers of Africa is an African Network for Ethical & Competent Animal Keepers. This initiative is fully fledged by Portfolio of African Association of Zoos and Aquaria (PAAZAB). The vision of AKA is ‘to develop a sustainable network for professional animal keepers of Africa to enhance animal welfare through knowledge & communication’. The mission statement is to develop ‘an African network for ethical & competent animal keepers’.

The objectives include the uniting of people who subscribe to the core values of AKA; to represent members motivated by respect and concern for our surroundings; who are constantly improving their ability to sustain our animal collections; serving our community through active involvement in biodiversity; to utilize all communication methods to provide and encourage the use of the latest animal care and behavioral management information, technology and techniques. Lastly, to develop effective networking opportunities, skills development and experiential training for African animal keepers. AKA is one of two Professional Associations the ICZ helped to organize.

Asociación Ibérica de Cuidadores de Animales Salvajes (AICAS)

Founded in 2000, the Iberian Association of Zookeepers (AICAS) is constituted by Spanish and Portuguese Associates with the main goals of promoting the education, the professionalization and the exchange and dissemination of information in relation to the care and management of wild animals in captivity.

It is also meant to encourage the preservation of biodiversity through the involvement of the workforce of zoos, aquariums, centers for rehabilitation and reintroduction of wildlife, nature reserves, parks and every other person working in the care and management of exotic wildlife or with a direct or indirect link with wildlife.

Association Francophone de Soigneurs Animaliers (AFSA)

The Francophone Association of Zoo Keepers was created in order to develop methods of care and handling of wild animals in captivity. This association is a link between professionals working in the fields of training, public presentations, research, care, conservation and education.

In 1999, three keepers from Doue la Fontaine Zoo, Pont Scorff Zoo, and Branfere's Park begin to talk about the possibility of creating a Professional Association of keepers like in other countries. The need to create AFSA was due to the fact that in France there is no exchange between keepers regarding zoo keeping and the occupation of zookeeper wasn't professionally recognized. AFSA is an association of keepers only directed by keepers; it is addressed to all French keepers as well as staffs of zoos, aquariums, aviaries, etc.

The first meeting took place in November 1999 with the assistance of representatives from other Professional Associations.

Association of British Wild Animal Keepers (ABWAK)

The Association of British Wild Animal Keepers is a non-profit organization which has set its following goals and objectives: To improve cooperation among animal keepers, both nationally and internationally. To provide, encourage and organize facilities for the meeting of keepers of wild animals. To improve, through education, the professional competence of all involved with wild animal husbandry and to support the conservation of wildlife throughout the world.

Australasian Society of Zookeeping (ASZK)

Formed in 1976, the Australasian Society of Zookeeping is primarily a professional organization in the Australasian region, which seeks to promote the exchange of information on all aspects of wild animal husbandry, and in so doing add to the conservation of rare and endangered species. The Society achieves these objectives through the production its journal, "Thylacinus", e-newsletters, workshops, and annual conferences which are held throughout the Australasian region. ASZK currently has over 400 members covering Australia, New Zealand, and overseas members from Japan and the United States.

Berufsverband der Zootierpfleger (BdZ)

The Berufsverband der Zootierpfleger was founded in 1993 at the Zoo Frankfurt. Our Association now has more than 1,000 members mainly in Germany, but also in Swiss, Austria, and Denmark. We want to promote nature conservation and species protection, but most importantly we care about the education and training of zookeepers. BdZ has a journal three times a year and several special editions with different topics. BdZ has annual meeting and several workshops through the year, sometimes in other countries. We are associated member of the EAZA and working closely together with the other German zoo organizations.

Stichting De Harpij

The Harpy Foundation is an organization for Dutch and Belgian zoo employees. It does not have a membership, but does publish a quarterly journal, "The Harpy", that is available by subscription. The foundation's chief goal is "the improvement of care and well-being of non-domestic animals in the broadest sense of the word".

The Harpy's began in 1980 when a group of zookeepers from the former Wassenaar Zoo took the initiative to distribute a newsletter written by zookeepers for zookeepers. They hoped via this publication to broaden their knowledge by exchanging experiences with keepers in other zoos. The first years were quite difficult, and it was sometimes questionable whether there was a reason to continue. But by 1985 the interest in the publication had grown, eventually resulting in the official establishment of the Harpy Foundation on May 18th, 1988.

Much has changed in the years since then. Thanks to the support from the directorship of the participating zoos, and the efforts of approximately 30 zoo personnel, the Harpy Foundation has grown into an organization that is here to stay in the zoo world. The primary target group is the personnel of zoos in the Netherlands and Belgium that are members of EAZA.

Zookeepers Association of the Philippines (ZAP)

ZAP is the first professional association of zookeepers in the Philippines. ZAP's aims and objectives are to professionalize and promote brotherhood among zookeepers, to serve as a venue for networking and exchange of ideas and information, to promote concerted effort of zookeepers for education and conservation of wildlife, and to uphold standards on rescue, display and captive breeding of wild animals. ZAP has more than 90 members nationwide. ZAP is one of two Professional Associations the ICZ helped to organize.

Partners and Supporting Members

The Partners for the ICZ are; the International Rhino Keeper Association, the International Association of Avian Trainers and Educators (IATTE), and the Shape of Enrichment.

The Supporting Members for the ICZ are; Zoo Frankfurt, Wildlife Reserves Singapore, Travel Traffic Web Design, Woodland Park Zoo, Chester Zoo, Zoo Barcelona, Zoo Leipzig, and Mickael Michault.

What We Do

ICZ and the Shape of Enrichment Workshop

In November 2012, the ICZ and The Shape of Enrichment worked hand in hand in presenting two environmental enrichment workshops under the EAZA Academy. These workshops were held from November 12-15 in Sofia Zoo in Bulgaria, and November 19-22 in Tbilisi Zoo in Georgia. The workshop in Bulgaria was co-organized by the Zoopark Sofia, the Bulgarian Ministry of Environment and Water, and was attended by zookeepers, zoo directors and ministry officials whose job is to monitor zoos all over Bulgaria. The participants of the Tbilisi Zoo workshop were all zoo-based, and represented zookeepers, curators and directors from Tbilisi Zoo, Minsk Zoo (Belarus) and Yerevan Zoo (Armenia). Lectures on animal welfare, a zookeeper's job, and essential husbandry skills were interspersed with environmental enrichment lectures, which made up the majority of the workshop. All the lectures and activities were well-received and participants of the two workshops remarked on how professional the workshop was conducted.

Book Review on Zookeeping Written by the ICZ

The ICZ regularly receives requests from zoological facilities around the world seeking teaching and training materials for their new and/or under-experienced keepers. Finally, in one volume, the solution has arrived- Zookeeping: An introduction to the Science and Technology, by Mark D. Irwin. The book is a collaborative effort, with 73 contributing authors, and seven contributing artists, a diverse group of experts from varying backgrounds, and regions of the world. Contact information for these experts is included in the appendix. The 66 major chapters discuss an impressive range of topics such as; animal welfare, ethics to wildlife rehabilitation, taxon-specific husbandry guidelines, nutrition, preventive medicine, behavioral husbandry, enrichment, emergency preparedness, and crisis management. The comprehensive array of content covers every aspect of successfully running a modern zoo. Seemingly a handbook for new zookeepers, this book is in fact a resource which will prove useful to even the most seasoned zoo professional.

The ICZ SC members were given the honor to read the zookeeping book before it went to print and we were even given the opportunity to write an endorsement for this valuable book. The book was published December 2013.

“Zoo Technology is destined to become the "must have" comprehensive resource for the zoo industry. It offers an abundance of information and knowledge for the novice zookeeper and the seasoned veteran alike. From the history of zoos to animal welfare, training, husbandry, and beyond--- to the future of the zoological institution as we know it. Zoo Technology covers it all, replacing dozens of single-subject books. The contributors are among the most respected and recognized zoo experts, and they include nearly every conceivable subject of interest to those in the field." ---International Congress of Zookeepers (ICZ)

Associacao Brasileira de Tratadores de Animais Silvestres (ABTAS)

In May, 2013 Tiago Nabico (ICZ SC Representative for AICAS) and Carsten Knott (ICZ SC Representative for BdZ, ICZ Vice President, and Outreach Chair) went to Brazil to assist the Brazilian zookeepers set up their own regional keeper organization with the support of the Society of Brazilian Zoo (SBZ). This would be the third regional keeper association the ICZ has assisted with. In 2006, the ICZ assisted in creating two regional keeper organizations; the Animal Keepers of Africa (AKA) and the Zookeepers' Association of the Philippines (ZAP).

The ICZ and keepers began their meeting with a workshop with 30 zookeepers from all over Brazil. All of the keepers' expenses to attend the meeting were covered by their own institutions. After three days of presentations, examples from how the nine existing regional keeper associations run, discussions, debates, and translating from German to Spanish to English to Portuguese, the mission was accomplished! The Brazilian Association of Wild Animal Keepers (ABTAS) was born! A board of directors was formed, a mission statement created, along with bylaws, and a constitution. A timeline was also outlined for the steps to take over the next 12 months and a strategy plan for the next three years. Finally Tiago and Carsten made a six day, 4,500 km road trip across southern Brazil visiting five different zoos, while giving two presentations and a training workshop at each institution. The Brazilian keepers exceeded ICZ's expectations and we are expecting wonderful things to come from the ABTAS.

Keeper Notes

Keeper Notes is the official newsletter of the ICZ and it is published quarterly. It is comprised of articles from all nine professional zookeeping organizations that make up the ICZ, along with news from the ICZ itself, and other conservation programs. It is delivered electronically to all 6,000 of our members and it can be found on the ICZ website.

Conservation

ICZ represents a resource of over 6,000 keepers worldwide. Zookeepers have a large range of specialized skills and knowledge that can be harnessed for conservation work not only involving conservation breeding of threatened species in zoos and wildlife parks but which can extend into work in the field. These talents include good observation and identification skills, intimate knowledge of animal behavior, animal handling skills, recording of scientific information and good physical fitness for undertaking strenuous work in the field. Keepers also have a passion, which has driven many conservation programs.

The ICZ Conservation Committee is currently working on a database for zookeepers involved in any Conservation Project anywhere in the world. Conservation is very important to the ICZ and we would like to share information from these conservation projects worldwide. Our plan is to compile information on all of these conservation projects and encourage the involvement of other zookeeper, or better still maybe some will start new ones of their own. Many conservation projects are run, managed, or helped by keepers.

Examples of such conservation projects are; the Painted Dog Program, in which a keeper has set up a fundraising program to hire rangers and create local awareness, protect habitats, and undertake scientific research. The Silvery Gibbon Project was started by keepers at Perth Zoo is run entirely by volunteers, with 100% of funds raised going towards the conservation of this endangered species. The Tenkile Program in Papua New Guinea, the Snow Leopard Trust, the Asian Rhino Project, Polar Bear International, the list goes on.

Illustrated Zookeeper Manual

The ICZ is currently working on a project to create a completely illustrated; i.e. drawings, photographs, illustrations, zoo keeper manual. This manual would be provided to zoos in countries that may have staff that are not able to read or write. This idea was initially proposed to the ICZ Steering Committee Members by a veterinarian who works at a zoo in a developing nation. This strictly illustrated zoo keeper manual would also be useful to spread to other countries because there will be no need for translating between languages. The illustrated zoo keeper manual will be based off a written manual already created by one of ICZ's members, the Zookeepers Association of the Philippines (ZAP). This written manual teaches zoo keepers how to be safe and productive and give the animals they care for the best lives possible.

Currently the ICZ is looking into funding for the production of the illustrated manual. If you or your institution would be interested in assisting ICZ in the illustrations or production, please let the ICZ know.

The Future of ICZ

Keeper development and the advancement of the animal care profession have become a top priority for the ICZ. The role of the ICZ in helping keepers, especially those in developing countries and those without their own associations has been huge. Nothing else that has occurred in the last 14 years that has had such a positive effect on the global development and networking of the world's zookeepers. Increased

communication, advanced husbandry, and the sharing of expertise are the products of the ICZ. Another great example of the ICZ's positive influence has been the transformation of *Dreamnight at the Zoo* from a European-based event into an international success story.

The ICZ will continue to develop a global network for zookeepers. Already, many keepers have developed lifelong friendships, with colleagues throughout the world, as a result of the ICZ. Additionally, there is greater opportunity to share expertise with colleagues on a global scale.

The ICZ will work towards developing and supporting conservation. The ICZ has many things to accomplish before becoming a major player in conservation; however, the future looks bright for the development of a global conservation effort for zookeepers. We envision a flagship conservation effort that all of the world's keepers can promote and take pride in.

There are many things yet to accomplish, but already the ICZ has developed faster and accomplished more than anyone could have imagined when this effort was started in 2000. Many of you and your associations have supported the ICZ. We hope that you find the accomplishments and potential of the ICZ as exciting as we do, but we need your help in planning for our future. This cannot be done by the Steering Committee alone. We need your feedback and involvement. Most importantly, the ICZ belongs to all of you. Speak up, get involved, and help guide the evolution of your international keeper association. We hope to see you at the next ICZ conference in Leipzig, Germany on September 9-13th, 2015.

Resources

American Association of Zookeepers (AAZK)
www.aazk.org

Animal Keepers of Africa (AKA)
<https://www.facebook.com/pages/Animal-Keepers-Association-of-Africa/102096149863287>

Association of British & Irish Wild Animal Keepers (ABWAK)
www.abwak.org

Association Francophone des Soigneurs Animaliers (AFSA)
www.afsanimalier.com

Asociación Ibérica de Cuidadores de Animales Salvajes (AICAS)
www.aicas.org

Australasian Society of Zoo Keeping (ASZK)
www.aszk.org.au

Berufsverband der Zootierpfleger (BdZ)
www.zootierpflege.de

International Congress of Zookeepers (ICZ)
<http://iczoo.org/>

Irwin, Mark D. *Zookeeping: An introduction to the Science and Technology*. Chicago: University of Chicago Press, 2013.

Stichting De Harpij
www.deharpij.com

Zookeepers' Association of the Philippines (ZAP)
https://www.facebook.com/ZookeepersAssociationOfThePhilippinesZAP?hc_location=timeline

The Rapidly Changing Roles of Zoos: Philosophical Perspectives Without Borders

expanded presentation and dialogue lead by

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Abstract

In a world of diverse change and cultural differences, the zoo industry has become an ever-morphing collection of institutions dedicated to effecting positive change in both our collection management focus and our conservation initiatives. To ensure the success of both captive populations and their counterparts in the wild, zoological institutions have adopted collective ownership strategies, promoting best practices and sustainability in both fields. This collective ownership requires partnerships at every level, from keeper up to director and beyond.

Working cooperatively at both national and international levels has many challenges. Cultural perspectives, both foreign and domestic contribute towards these challenges. This paper will address some of these challenges in an open-forum format, designed to promote thought and establish dialogue; refine the questions that need to be asked and work together towards clarity. As an exercise in partnership and problem-solving, dialogue will be focused on introducing keepers to some of the current roles that AZA TAGs play in the rapidly changing roles of today's modern zoo as well as what keepers can do to play an active role in this partnership.

Perspective

The role of the Association of Zoos and Aquariums (AZA) Taxon Advisory Groups (TAGs) is to monitor the success of the Species Survival Plans (SSPs) in their purview, make decisions on species to be maintained in human care, and attempt to predict the holding capacity for all species covered under the TAG's umbrella.

This role has changed dramatically in the past five years or so. Besides genetics and a personal or institutional commitment to a species; increasing pressure on native habitat and species, challenging local and international laws, and the loss of captive space are a few of the criteria used in deciding the future of a species to be maintained in AZA accredited institutions.

AZA zoos have several AZA approved private partners such as White Oak Conservation Center and many AZA institutions work closely with private partners that meet institutional standards and have the same commitment to conservation.

It is impossible to save every species and difficult decisions must be made. We, as care takers of animals, have a responsibility to individual animals in our care. As species managers, we have a responsibility to maintain appropriate numbers of genetically diverse specimens for the sake of the species. TAG's have the responsibility to look at all the species under their charge.

From 01 June through 06 June, 2014 approximately 140 people representing 25 countries met in the Netherlands to work on global species population management and strategies.

There are no easy answers; the discussion needs to occur on broader levels, with as many of the situations and circumstances taken into account. This includes, individual animal management, species management, wildlife management in range countries, non- genetically valuable animal management, exotic vs. domestic management, and how the future leaders of this industry are going to deal with these challenges.

A major key to the success of these programs is its own sustainability. Encouraging participation in TAGs at the keeper level helps maintain a diversity of experience and perspective and provides new growth within TAGs. Discussions and cooperative participation between TAGs and the American Association of Zoo Keepers promotes professional development and leadership opportunities.