CONFERENCE PROCEEDINGS
2002

"Enhancing Animal Welfare Through Positive Reinforcement"

27 February – 2 March
San Diego, California

The Animal Behavior Management Alliance

Proceedings of the 2002 Conference of the Animal Behavior Management Alliance

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San Diego, California
27 February – 2 March 2002

THANK YOU!

The ABMA Host Committee would like to thank everyone who made this conference possible.
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The World-Famous San Diego Zoo,
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ABMA Conference Chair: Gary Priest,
Curator of Applied Behavior, Zoological Society of San Diego

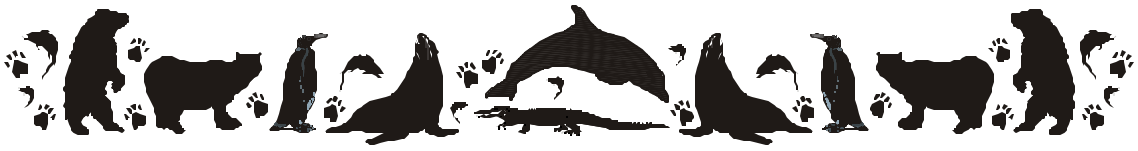
Conference Opening: Doug Myers, ZSSD, CEO
President's Welcome: John Kirtland
Key Note Address: Bob Bailey

PRESENTATIONS

* INVITED SPEAKER

Wednesday, 27 February

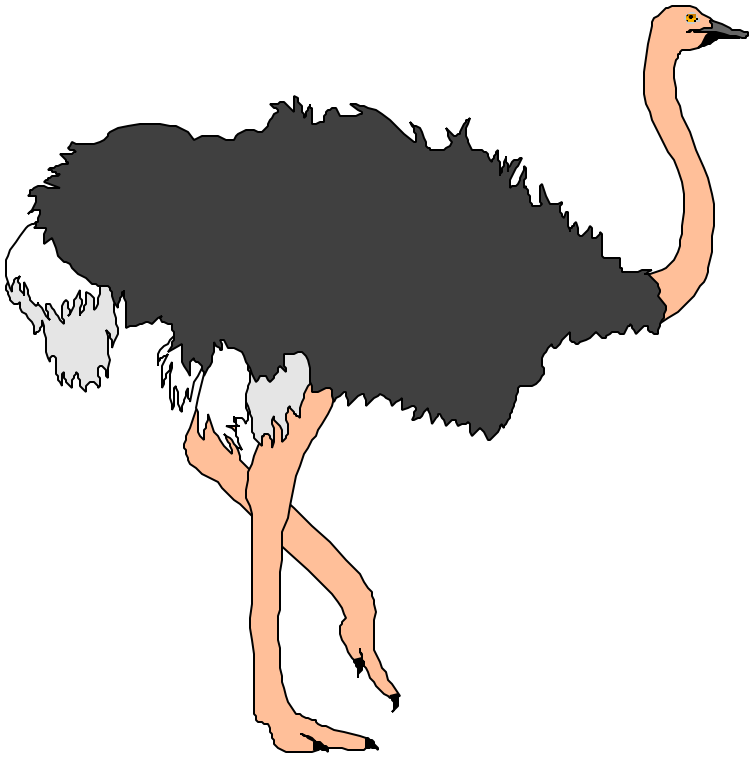
Thursday, 28 February



Friday, 1 March

Saturday, 2 March

Poster Presentation Abstracts



Conference Welcome –Doug Meyers
President's Welcome – John Kirtland
Key Note Address – Bob Bailey

Presentations: Wednesday, 27 February

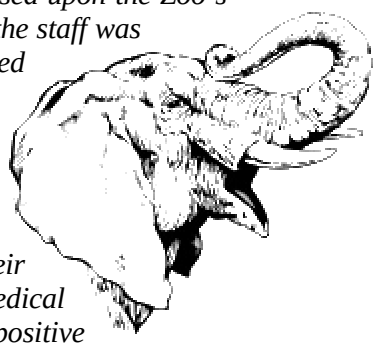
BRIDGING THE GAP–IMPROVING HOW KEEPERS FROM DIFFERENT DECADES WORK SIDE BY SIDE

Lee Nesler
Pittsburgh Zoo and Aquarium http://zoo.pgh.pa.us/

All zookeepers and curators have the same frustration when it comes to personnel issues. Some issues are cut and dry like lateness and a safety violation. Others, such as the working relationships between all keepers, are not. I feel that it is time to address our changing profession and what that means for our keepers, both the old school and the new school. How do we support both styles of animal keeping? How do we encourage keepers to join the new age and include enrichment and training into the daily work schedules? How do we improve the quality of care for the animals when only a portion of the keepers see the benefit and believe in the outcome? In the business world, if you do not grow in your position, they will find someone to replace you. I am not looking to replace keepers whose years of experience are necessary to good animal husbandry. I am hoping through support, education, and time, we, as managers, can educate the entire staff of the benefits that our profession's evolution can bring to the animals under our care.

RESPONSIBLE MANAGEMENT FOR ALL SPECIES: THE KEEPER AND THE KEPT

Jack Grisham
Oklahoma City Zoological Park and Botanical Garden
http://www.okczoo.com/visitors/index.htm



In July 1996, the Oklahoma Zoo started an operant conditioning program based upon the Zoo's needs in elephant management. A safe environment for both the animals and the staff was paramount. The concept of using positive reinforcement has been demonstrated for a number of years with marine mammals and was being used in protective contact for elephants. The Zoo moved from a free-contact elephant management program to a protected contact program overnight with the assistance of Gary Priest. The Zoo saw the potential for taking this program to the next level with great apes, cats, and hoofstock. Staff was trained to incorporate operant conditioning training and enrichment programs into their daily work schedules. This process has greatly reduced stress on medical procedures and transferring animals between exhibits. It created a more positive working environment for the keeper staff. An Animal Behavior Committee made up of keepers, curators, and veterinarians further defined the role of the program. The use of positive reinforcement has led to a reduction in stress to both the animals and the staff and has created a safe, positive working environment. This is the goal of a modern zoo--to have a safe environment for both the keeper and the kept.

LEARNING AT THE ZOO: A WIN-WIN-WIN SITUATION FOR STUDENTS, KEEPERS, AND ANIMALS

Ginger M. LeBlanc
California State University at Bakersfield http://www.csubak.edu/

Cindi Carter
California Living Museum http://www.creec.org/region7/stories/storyReader$302

In the spring of 2001, a partnership developed between our Zoo, the California Living Museum, and the Psychology Department at our local University, California State University, Bakersfield. The goal of this partnership was to augment the staff with additional volunteers and to provide a hands-on learning experience for students enrolled in a Principles of Learning laboratory course. Under the supervision of the curator and the psychology instructor, each student was assigned to work with an animal over a 4-week period. Specifically, each student was required to use the principles of positive reinforcement learning in class to train a husbandry-related behavior chosen by the curator. Other volunteer duties or "learning opportunities" involved food preparation, assisting with rehabilitation, enclosure cleaning, and creating enrichment. The results of this project were very positive. The service-learning program resulted in the target training of 24 animals, more enrichment for the animals, and an increase in time for staff members to engage in other duties. Thus, a symbiotic relationship developed between the students and the zookeepers. That is, students learned about animal care and welfare from zookeepers, and zookeepers learned about the operant conditioning principles from the students. Finally, this relationship resulted in continued volunteerism from many of the students and the employment of three individuals who required virtually no training.

Introduction

The California Living Museum (CALM), situated in Bakersfield, California, is dedicated to the conservation of native California wildlife. Like many facilities, CALM strives to achieve its mission through education and research with a heavy reliance on volunteers. California State University, Bakersfield, (CSUB) is an institution committed to excellence in teaching, scholarship, and community service in order to provide active learning environments.

In the winter of 2000, a partnership developed between CALM and CSUB Psychology Department. This partnership was designed to provide CALM with student volunteers that could assist the staff with animal management duties. This arrangement would also provide psychology students enrolled in a *Principles of Learning* laboratory course with hands-on learning experiences which research has shown to facilitate learning.

The *Principles of Learning* laboratory course revolves around the classical and operant conditioning paradigms. Specifically, students in this course first learn about behavior modification techniques in a laboratory using positive reinforcement to shape behaviors in a rat. As part of the course, students are then required to substitute four weeks of in-class/laboratory time for 3 weeks of service learning at CALM. The purpose of this requirement was to make classroom concepts come alive and demonstrate the reliability and generalizability of learning principles.

Methods

Twenty-three CSUB undergraduates were required to spend a minimum of 20 hours at CALM over a 3-week period. The service-learning schedule was completed by the student and approved through the curator. Scheduling restrictions mandated that students work no less than 2 hours per visit and miss no more than two consecutive days of training. It is important to note that the curator provided an orientation that focused on rules of conduct at the Zoo. For example, this covered guidelines regarding daily check-in procedures, appropriate dress, animal protocols, and safety procedures.

All 23 students were assigned to work an animal. The student-animal assignments were based on each student's history of animal related experiences. The animals used in the project ranged from the relatively tame to the more dangerous. Students assigned to animals considered tame (e.g., goats and sheep) were allowed to work inside the enclosure. Assignments that involved animals considered more dangerous (e.g., bobcats and raccoons) required students to work through the fence outside of the enclosure. All student-training sessions were supervised and video taped by the course professor, the teaching assistant, and/or a CALM staff member.

The behavior modification assignment required students to employ learning principles to clicker and target train their animals. Each student was given a clicker and was responsible for providing an item that would serve as an appropriate target. Students were also required to document the details of each training session (e.g., length, number of reinforcers, reinforcement criterion) in a training log that was ultimately kept as part of CALM's permanent records.

Another purpose of the project was to educate students about animal care. Thus, in addition to conducting training sessions, students were required to engage in other animal related responsibilities. Specifically, at the beginning of each day, either the curator or a staff member would create a list of animal care duties to be performed by student volunteers. These duties included, for example, food preparation, enclosure cleaning and maintenance, and creating / providing enrichment for various animals.

Results

Student Benefits: All 23 students successfully clicker and target trained their animals. More importantly, from an educational standpoint, the students reported that the service learning experience facilitated their understanding of classroom concepts. Specifically, 84% of students believed the experience enhanced their understanding of lectures and readings in the course. Additionally, 95% of the students indicated that the community service aspect of the course facilitated their understanding of how the principles of learning could be used in their everyday lives.

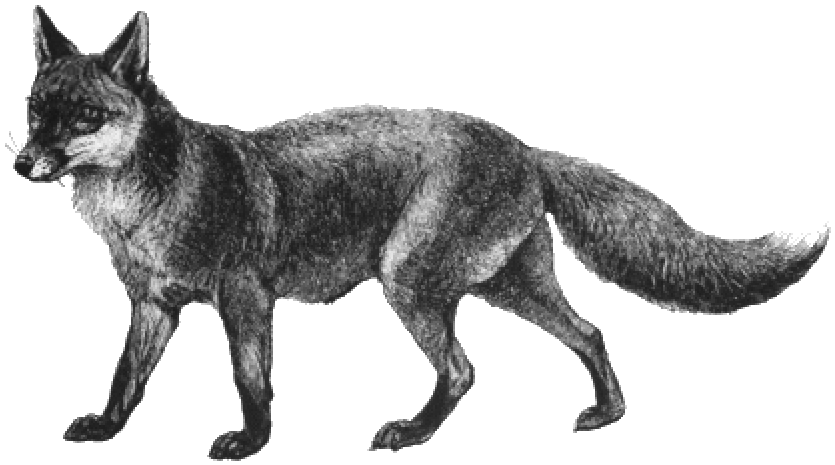
Zoo Benefits: Having an additional 23 volunteers significantly helped with the daily workload. Specifically, after minimal training, students were able to assist in areas such as food preparation, animal care, rehabilitation, and enrichment. This assistance afforded many keepers the opportunity to work on uncompleted projects. This arrangement was further beneficial in that additional 23 animals were clicker and target trained. This is important because the majority of these animals typically are not involved in training programs because of the staffs' demanding workload. However, because of the students, the foundational training (i.e., clicker and target training) was completed, and it has been relatively easy to shape new husbandry behaviors (e.g., body exams).

The students' educational backgrounds (e.g., knowledge about animal learning, and training in research methodology) enhanced their value as volunteers. Specifically, they were able to:

(1) teach the staff about the principles of operant conditioning,
(2) perform literature reviews on various animal-related topics for staff, and
(3) collect behavioral data on various animals using semi-naturalistic observation techniques (e.g., note taking on whether an animal engaged in stereotypic pacing behavior or recording the number of conspecific interactions).

Animal Benefits: Having students learn by working with animals led to a significant increase in human-animal interactions. Overall, the students devoted more than 460 hours to their animals. This was particularly important for those animals (e.g., sheep and goats) that don't receive much one-on-one activity. The effect of these interactions was clearly evident in the animals' change of behavior. For example, all of the animals spent more time at the fronts of their enclosures and were more interactive during public feeding times. Finally, many of the students become involved in developing and providing various types of enrichment for their animals (e.g., using scrub brushes on the heads of goats). In fact, one particular student continues to provide daily enrichment for her assigned animal, "Valley", an island fox. This is accomplished through her innovative "Valley Program" that involves providing wildlife education and experiences to less fortunate children of the Bakersfield community.

An outcome of this unique project was the recognition that local universities can be potential valuable resources for accomplishing animal management goals. Partnering with CSUB, specifically the Psychology Department, resulted in a symbiotic relationship that positively affected students' education, the Zoo, and the animals. The students involved in the service experience were afforded an environment where they could broaden their understanding and application of classroom concepts. The staff at CALM benefited from the extra help of these volunteers, and from the additional knowledge imparted from the students about the principles taught in their class. The application of this information resulted in a greater number of animals receiving training and enrichment.



OPERANT CONDITIONING AS A TOOL FOR THE MEDICAL MANAGEMENT OF NON-DOMESTIC ANIMALS

Brian E. Joseph
Turtle Bay Exploration Park http://www.turtlebay.org/

Traci F. Belting
Point Defiance Zoo & Aquarium http://www.pdza.org/

There are three cornerstones to the successful maintenance of animals within zoological environments: appropriate nutrition, a healthful environment, and a comprehensive medical program.

Operant conditioning's contribution to a healthful environment is accomplished through the improvement of the animal's psychological well being through mental stimulation and behavioral choice. This mental stimulation may replicate some of the challenges and choices necessary for the animal's survival in natural environments. Additionally, the positive emphasis of operant conditioning programs and the benefits resulting from the human/animal relationships seem to motivate animals to participate in training and may even facilitate the success of other types of learning such as habituation and classical conditioning.

Operant conditioning's contribution, expressed through husbandry training, to a comprehensive preventative medicine program is multifaceted.

First of all, performance of trained husbandry behaviors improves our ability to gather physiological samples immediately. The behavioral and physical observations of trained animal caretakers and trainers provide the most valuable data concerning the health of animals. Evaluating behavior against established behavioral criteria and observing an animal's overall responses in a training session are significant tools in the assessment of animal health. Non-domestic species, especially social or prey species, are adept at masking symptoms. Although many influences can change an animal's responses during a training session (e.g., change in social grouping, change in surroundings, environmental temperature perturbations, reproductive cyclicity, etc.), variations in an animal's general performance may suggest a change in health status. Through the human/animal relationship, and based upon years of experience, trainers learn what environmental events increase or decrease the probability of certain behaviors occurring over time that may or may not suggest the presence of illness. Thus, their insight is often very informative in assessing health status.

However, it is generally necessary to add physiological data to this information to confirm or eliminate illness as a cause of behavioral or physical changes and allow immediate and appropriate treatment. Our concern for the welfare of the animals in our care motivates us to make this determination as quickly as possible. The use of trained husbandry behaviors often allows us to gather samples immediately to acquire these data. Relatively simple trained behaviors can facilitate the collection of blood, respiratory, fecal, gastric, and urine samples, and permits temperature and weight measurements. More advanced procedures such as bronchoscopy, endoscopy, radiography, and ultrasonography using trained husbandry behaviors, provides the opportunity to gather in-depth physiological data without the necessity of chemical or physical restraint.

Secondly, performance of trained husbandry behaviors improves our ability to gather meaningful physiological data. Data collected cooperatively is not affected by the excitement accompanying physical restraint or the effects of immobilizing or sedative drugs. The excitement and exertion of physical restraint are accompanied by the release of catecholamines. These hormones produce multiple physiological effects resulting in increased erythrocyte and leukocyte counts and changes in the number and proportion of white blood cells. The number and proportion of neutrophils increase, while the number and proportion of lymphocytes and eosinophils decrease in response to the release of catecholamines. In addition, exertion during physical restraint can also result in the release of intracellular enzymes, such as creatinine phosphokinase and lactate dehydrogenase, and alter electrolyte values. Finally, the excitement of physical restraint causes increased respiratory and cardiovascular effects and increases body temperature. These physiological and physical changes confound our ability to discriminate between the effects of illness and the effects of the excitement of physical restraint.

Our ability to document the physiology of species in our care is greatly improved through the use of husbandry behaviors. Samples can be gathered easily and regularly, allowing the collection of a greater number of samples from animals in good health. These samples will not be affected by variation induced by the excitement of chemical and physical restraint and, thus, will provide more accurate determination of species or individual specific normal values. Samples gathered through the use of husbandry behaviors greatly add to our understanding of the reproductive cycles of animals under our care. Voluntary samples such as blood, saliva, semen, urine, and the performance of ultrasonography can be collected on a daily basis to fill in data points in our studies more completely. The resultant accurate data can provide information necessary to encourage the success of experimental procedures such as artificial insemination and embryo transfers.

Third, performance of trained husbandry behaviors improves our ability to administer treatments without the increased excitement or risk that might accompany chemical or physical restraint. One of the greatest challenges in the medical management of non-domestic animals is the challenge of administering therapeutic measures such as fluid administration and injections on an appropriate schedule. Orogastric, intramuscular, and intravenous therapeutic measures can all be administered through trained, voluntary husbandry behaviors. This provides the opportunity to administer treatments on a more frequent, more effective schedule and broadens the spectrum of available therapeutic options. In addition, basic procedures such as dental care and elephant foot care can be performed through the use of trained husbandry behaviors.

Fourth, performance of trained husbandry behaviors eliminates the dangers that accompany chemical restraint due to the physiological effects of the drugs. Chemical restraint can be dangerous under the best of circumstances, and this threat can be exaggerated in people and animals that are ill. Anesthetic complications are one of the most common causes of mortality in people and animals under medical care. Decreasing or eliminating the need for chemical restraint is extremely beneficial.

The choice of immobilization/restraint versus training during any given situation is based upon the amount of time needed to train; the severity of an injury, or the urgency of the illness; and the benefit to the animal. Sometimes it will not be possible to use training techniques for a particular medical procedure and various levels of physical or chemical restraint will be necessary.

Lastly, the performance of trained husbandry behaviors may decrease the animal's anxiety that might result from sample gathering and treatments that are administered during physical restraint. This decrease in anxiety likely improves the psychological well being of animals undergoing

treatment for illness and, as previously stated, provides them with an amount of control over their environment.

The use of trained husbandry behaviors also benefits the facility and staff. Improved staff management is facilitated through the necessity of decreased staff to gather samples and administer treatments. Several animal caretakers, trainers, veterinary technicians, and veterinarians may be required to gather samples or administer medical treatments to animals under physical restraint. On the other hand, these measures can be implemented by as few as one trainer or caretaker to work with the animal and a single person to gather the sample or administer the treatment if husbandry training is used. Also, in the case of aquatic animals, samples may be gathered and treatments administered without the necessity of draining pools. Savings result from eliminating the necessity of replacing water from drained pools and eliminating the need for facility operators to drain and fill pools. Less obvious but equally important benefits include decreasing staff anxiety and the risk of staff injury that accompanies physical restraint.

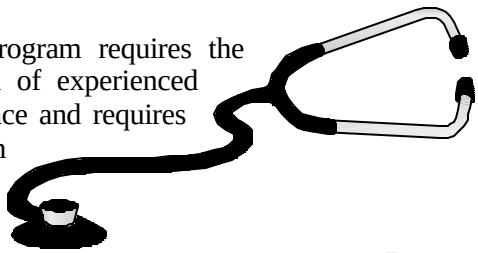
Medical behaviors provide a strong interpretive opportunity for our visitors. Emphasizing the importance of preventative care can be reassuring to visitors who are unfamiliar with the care of animals within zoological environments. Many visitors have pets at home and they know their animals rarely cooperate when it's time to visit the veterinarian. Demonstrating an animal's voluntary participation in medical procedures can be a testament to the benefits of animal training.

Institutional and personnel challenges are associated with the design and implementation of an effective husbandry-training program. These challenges are consistent between facilities and across species boundaries. They are, generally, solvable, but require thought, discussion, and effective decision making.

The primary challenge is the need for the recognition of the value of, and long-term commitment to, operant conditioning by the institutional leadership and line staff. Unless this recognition and commitment exist, a program will fail. Successful husbandry training programs require long-term and consistent time investment in operant conditioning by line staff and must be proactive, not reactive. Planning is an important part of any successful program. Behavioral goals for husbandry should be developed with the participation of curators, managers, keepers/trainers, and veterinarians. An institutional recognition must be made that there are costs associated with a husbandry-training program, but also resultant savings and benefits, as discussed previously.

Animal caretakers and trainers generally have a full schedule of required activities. This can lead to the common perception that the conditioning process requires more time than is available. The reality is that in many cases, there isn't time not to train. With a very small time investment, significant behaviors can be conditioned that reduce the time and staff needed to perform routine procedures. With as little as 10 minutes of training a day, a few times per week, basic target training can be accomplished that is the foundation for many medical behaviors. Weighing an animal can be accomplished quickly and regularly under stimulus control with one trainer, as opposed to the time and effort necessary with either physical or chemical restraint. This is not to understate the time, patience, and training consistency necessary to accomplish more demanding medical procedures such as voluntary bronchoscopy, endoscopy, and injection of medication.

Another challenge is that an effective husbandry-training program requires the employment of or training of personnel and/or participation of experienced consultants. Operant conditioning is as much an art as a science and requires training and experience that can only be accomplished with an



investment of time and effort. If an institution is unable to employ experienced animal trainers, it may be necessary to retain an experienced consultant to provide necessary and effective personnel training. The use of outside consultants accelerates the development of an effective program, ultimately saving time and benefiting animals under our care.

Another challenge is that the development of an effective husbandry-training program requires an ongoing time investment by the veterinary staff. There are many competing needs for veterinary time within zoological institutions. In addition to the obvious time commitments of preventive and clinical medicine, zoological veterinarians are often subject to administrative, collection management, design, and husbandry management needs that impact their availability. Veterinary staff must understand the previously listed benefits resulting from a trained husbandry program and must be willing to participate on a regular basis. If they do not participate on a regular basis, they--the animal caretakers or trainers--and the animals may lack the necessary confidence to reap the benefits of this programming. This may result in a much greater investment of time and resources to accomplish necessary sampling and treatment using chemical and physical restraint.

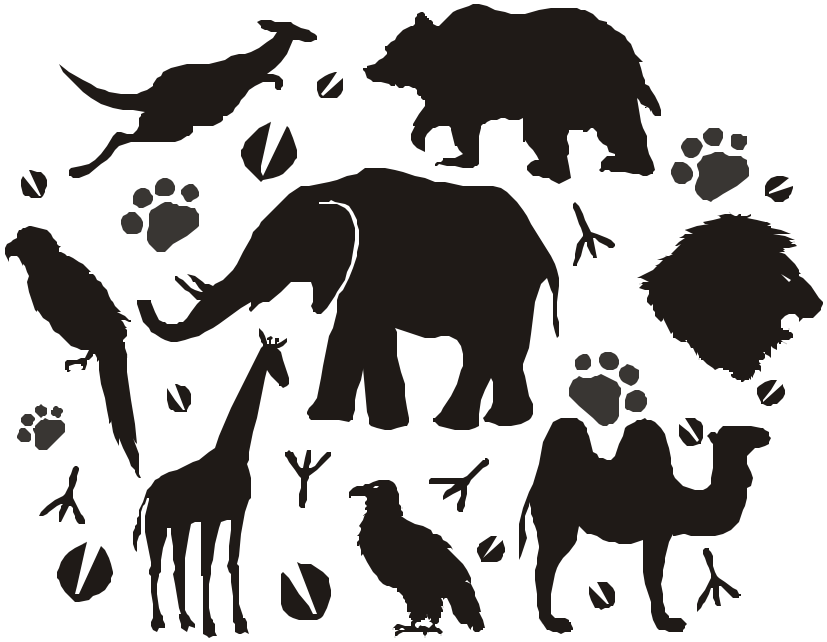
In many institutions, veterinarians occupy a position of authority, and this can be intimidating to animal care staff when working cooperatively on the training of medical behaviors. Veterinarians are generally result-oriented and want to collect samples or other measurable information immediately. The trainer is the behavioral manager and must maintain behavioral criteria. The goals of the veterinarian must be balanced with an animal's long-term behavioral responses. It can be difficult for a trainer to speak up and request that the veterinarian stop in the middle of a procedure because an animal is getting excited, but this may be necessary to ensure the animal's continued participation. Although time consuming, veterinarians must make a concerted effort to participate in husbandry training sessions other than when samples are taken. Concurrently, trainers should strive to reduce an animal's ability to discriminate between practice and real sessions. This can be accomplished by varying as many factors as possible including the number of people present during sessions, the location in the exhibit where behaviors are performed, the presence of medical equipment, and the time of day.

Less obvious challenges are that conditioning may break down with animal illness or lack of staff attention, conditioning may not be possible and/or cost-effective due to species-specific behavior patterns or anatomy, and we may be hampered by our perceptions or beliefs. Food may lose its effectiveness as a motivator when an animal is ill as is often the case in humans. Other forms of reinforcement may also lose their effectiveness as motivators at such times. Trained behaviors may break down with a lack of staff attention. Staff shortages, conflicting institutional needs for caretaker and trainer time, and changes in personnel can all result in decreased time investment in husbandry behavior and result in the breakdown of trained behaviors. Species-specific behavior patterns that preclude or prevent the cost effective or safe development of a husbandry program often occur in dangerous species such as carnivores or species that are perceived as less responsive to training. Anatomic constraints might also preclude the use of certain trained husbandry behaviors for a given species. Although voluntary blood sampling has become a community standard, venipuncture is difficult in some animals due to their anatomy, even when immobilized. Dedicating large amounts of time in the training of this behavior may not be the best use of resources and may cause undue distress to the animal because of the difficulty of venipuncture. Decisions to design, implement, or abandon husbandry training must consider animal and human safety, the time necessary for training, and costs associated with necessary facility modifications. Sometimes our beliefs, perceptions, and lack of innovation may prevent us from developing and implementing an effective husbandry-training program. However, there are many examples of successful programs involving animals that many might have thought were not suitable for husbandry training. The scope of husbandry training is continually advancing, and

behaviors we think are impossible today may be standard practice in the future because of the creativity and collaboration between animal health and animal care personnel.

The final and most important challenge is to develop an understanding that the positive relationship between an animal and trainer is crucial when training potentially uncomfortable procedures. A strong reinforcement history must exist before attempting to train difficult medical behaviors. Trainers must be able to communicate expectations clearly to the animal. Consistency is paramount. Confusion can quickly lead to frustration and aggression (in the animal and/or the veterinarian!) and must be avoided in the training of medical behaviors. Participation in training must be so enjoyable and positive for the animal that it outweighs discomfort associated with the performance of medical procedures. Trainers are often heard saying, "You can't make an animal do anything it doesn't want to do," and in a good training program this should definitely be the case. An animal's choice to participate is always balanced by its choice not to, so it is our job as animal managers to swing the balance in favor of participation. To achieve this, medical behaviors cannot be the only training goal. To balance the program, the animal needs the opportunity to succeed in simple training goals such as performing natural behaviors placed under stimulus control. For example, training high-energy exercise behaviors can offer a needed release after extended durations of quietly holding for medical procedures. Sometimes animals are reluctant to participate in the training or maintaining of uncomfortable medical behaviors, so the opportunity to be reinforced instantly for an easy natural behavior can be very beneficial in maintaining motivation and increasing the animal's attention span.

The use of trained husbandry behaviors is a vital component in the provision of adequate preventive and clinical medicine within zoological institutions. It is also a powerful research tool. The use of husbandry behaviors was pioneered by marine mammal and circus caretakers. Its many values are well understood and accepted by all zoological institutions, and the implementation of such training programs is becoming an expectation of our community. There is tremendous room for growth, improvement, and innovation in the development of new husbandry behaviors and in application of husbandry training to new species. We look forward to all of our future successes in improving the quality of life and contributing to the psychological well being of animals under our care.



RE-INFUSING THE MOVEMENT TO INTEGRATE BEHAVIORAL MANAGEMENT, OPERANT CONDITIONG, AND KEEPER RESEARACH WITHIN ANIMAL PARKS

Christopher S. Trammell
Los Angeles Zoo Magnet School http://www.lausd.k12.ca.us/NH_Zoo_Magnet/history.html

Nearly 30 years after the Nobel Prize was awarded to Konrad Lorenz, Niko Tinbergen, and Karl Von Frisch, zoo behaviorists and keepers have successfully navigated frontiers that these pioneers would have been proud to witness. These days, we often find that the use of operant conditioning and the use of ethology in zoos has been elevated to a place held and largely utilized by individuals skilled in behavioral management and modification, and by academically trained behaviorists. When we revisit the publications of the early 1990s and look to some of the leading animal parks in the country today, we see that there is still a movement to integrate these two fields into one program. An emphasis has been placed on alleviating the challenges of behavioral management that keepers face by utilizing volunteers, behavior students, and other interested zoo members. Following is a discussion about simple ethograms, pre-, current, and post-management behavioral analysis. I also provide ethogram template designs that may streamline initial analysis, and demonstrate how academic behaviorists, keepers, and applied behaviorists can work together to integrate the most successful behavior management program while avoiding philosophical conflict.

In the past 15 years, the practice of using operant conditioning in behavioral management has allowed the zoo, scientific, and behavioral communities to achieve breakthroughs greater than once imagined. Behaviors benefiting veterinary procedures, transport and movement, and education and entertainment have contributed to advances in conservation and unparalleled breeding success. But we must realize that no behavioral management or modification program has been implemented without some degree of preliminary assessment of the behavior of an individual animal or a group of animals. Whether that assessment was formal or informal, there are few behaviorists that have attempted to modify behavior without some type of preliminary assessment.

The common sentiment held by academic behaviorists is that our flaw, the applied behaviorist's flaw, is in the inconsistent use of ethology and empirical evidence to support a management plan. Rather, it seems that we are scolded for relying on intuition, commonality, and experience. My goal here is not to restate the obvious benefits and success stories of operant conditioning in behavioral management, but to re-infuse the emphasis of integrating ethology, pre- and post-behavioral observations, keepers, and other departments to create the most successful management plans when behavior modification or management is being considered.

By and large, zoo behaviorists, keepers, and applied behaviorists are now slowly coming to agreement on issues that pertain to implementing a successful behavioral management program. What comes as intuition to some for modifying an animal's behavior, is less obvious and needs to be more scientific and methodical for another, appealing more to the scientific "If-Then" approach that can be concluded with mathematical analysis. Today, I hope to share with you the ideas that will help us establish or strengthen the marriage of these ethological approaches and how we all can benefit from them.

In 1955, Heine Hediger, the leading successor of Carl Hagenbeck, wrote the celebrated and progressive book, *The Psychology and Behavior of Captive Animals in Zoos and Circuses***.** Not only did his topics range from exhibitory and husbandry, he also discussed flight distance, predator-prey arrangements, play, and training as a means to "brighten up the daily existence of animals in the zoo" (Hediger, 1955). Soon after, Skinner and Thorndike's experiments proved that much of animal learning takes place through trial and error, and that the rewards are a critical component of the learning process (Drickamer, Vessey, and Jacob, 1996). At the same time, Konrad Lorenz, Nikolas Tinbergen, and Karl Von Frisch were compiling the bulk of their work that was later honored with the Nobel Prize in Medicine and Physiology in 1973. Even though many consider Charles Whitman and Oskar Heinroth as the founders of modern ethology (Lorenz, 1981) it was the three Nobel Laureates that elevated it to the respected science that it is today. We now jump forward to the present.

In 1989 and 1990, there were a number of publications at zoological conferences that came out of both behavioral departments and applied behaviorist departments. In 1988 and 1989, the Dallas Zoo published two articles, one was, *Use of Simple Checksheets for Animal Keeper Research at the Dallas Zoo* (Bennet and Meller, 1989), and the other, *Integrating Research and Management at the Dallas Zoo* (Iliff, 1988). In 1989 and 1991, the San Diego Zoo had publications on the success of its behavior management program with a mandrill, *Mandrillus leucophaeus*, (Priest, 1991). In 1999, it published *Animal Management and Enrichment* (Priest 1999). Other notable publications best discussing the integration of keepers and students for ethological studies are from Zoo Atlanta, *Teaching Operant Conditioning at the Zoo* (Lukas, Marr, and Maple, 1997), which recently developed, *Animal Behavior Research at Zoo Atlanta, Program Goals and Objectives, Zoo Atlanta Neighborhood Charter School, 2000*. [One of the results discussed in *Teaching Operant Conditioning at the Zoo* was that the students who participated in this class felt that on a scale of 1 (strongly disagree) to 7 (strongly agree), "conducting behavioral observations of our animal was helpful in learning about the animal we had to train" scored the least with a 3. This seems to make sense, as what we observe about the animal is not always an indicator of the nuances and operants that we will elicit and aim to modify in that animal.]

As we take the time to read the growing amount of information that is out in print and on the internet, we see that there is still a slow trend to integrate various zoo departments, staff and volunteers in the most constructive manner. But, the challenge is to continue to strengthen these partnerships, and to continue to streamline certain aspects of zoological ethology to be used successfully by both keepers and trained volunteers. The literature and common sentiment seems to support that this is continuing in animal parks that are more progressive and unified in their efforts to create the most successful programs. While trainers are no longer the sole possessors of the skills they utilize, we see keepers are also advancing their skill and use of operant conditioning on a regular basis to better manage their animals in the collection. When we discuss the keeper's role, we should look at three main concepts for making a preliminary behavior assessment:

1. Keepers are a valuable primary source of obtaining preliminary data as they have the closest relationship with the animal to be studied.
2. Although our intuition may naturally lead us to a plausible solution, we should still develop a refined and answerable question (hypothesis) that we can submit to keepers and/or volunteers to study, quantify, and analyze.
3. Thorough investigation into the specific animal's history and species background, combined with keeper knowledge will provide us with the best information to create a preliminary investigation for behavioral modification or management.

We understand that keepers, as well as other departments, are under the influence of time and resource limitations. It is important then that the three departments--behavior and research, applied behaviorist, and keepers—work together to create the best plan and, if possible, utilize students who are mature enough to effectively assist with specific behavioral observations. Using this approach, and borrowing from other facilities that have had success in this integrated structuring such as Zoo Atlanta (Lukas, et al., 1997) and the Brookfield Zoo (Margulis, Reiser, Dombeck, Go, Kyza, and Golan, 2001), other facilities will also benefit from these well-structured partnerships. If we aim to maximize our collection of necessary information about an animal while decreasing research time, we are better serving those involved and the resources allocated to the project. Also, if we create and maintain streamlined and simplified ethograms (see Crockett, 1996, Bennet and Meller, 1989) that can be used by both keepers and other trained personnel, we will find that our initial apprehension to this process will be followed by a period of creative and successful behavioral management that will benefit all departments.

Behavioral observations in the zoo do not have to be exhaustive when we are determining the preliminary steps that we are going to take in our management program. Better yet, we should observe the location preference and exhibit use of that animal. This type of observation will help us identify where an animal is spending the greatest amount of time, then we can investigate more thoroughly in order to understand why the animal is spending that amount of time there. Second, we should focus on the social or activity behavior of the animal. Many times we find that the stimuli for an animal come from both inside and outside of the environment. When stimuli come from inside the environment, we would normally find that stimuli can be conspecifics, scents, or novel items. When the stimuli come from outside the environment, we have to examine interspecific stimuli, scent, sound, or other possible stimuli that are affecting our animal's behavior. Both of these two described stimuli sources have an enormous effect on an animal's behavior, and both can be observed and quantified by using a systematic ethological approach.

Conclusion

The ethological approach in zoos is not exclusive to the behavior and research department, just as operant conditioning is no longer exclusive to the applied behavior department. Rather, behavioral management and modification is an integrated cooperation of many departments whose collective role is to serve the resident animals best. If one department's strongest skill can be enhanced and utilized by the skills of another department, then it only makes sense that we endeavor to continue to integrate the departments discussed in the most effective manner. The movement to progressively and successfully manage an exotic animal collection started with a few individuals that had little support form their predecessors, whereas, we are at a place where the flow of information and integration of many individuals' skills occur at a rapid pace daily. As applied behaviorists, we should endeavor to continue to narrow the gap and change the sentiment that ethologists and academic behaviorists have held about our positions. Because ultimately, we are most often given credit for changing behavior, and sometimes the behavior needing changing is our own.

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IMPROVING HUMAN/ANIMAL INTERACTIONS THROUGH TRAINING

Emily Weiss
Sedgewick County Zoo, Kansas http://www.scz.org/home.html

No written paper submitted.

SHAPE OF ENRICHMENT – WHAT IS ENRICHMENT?

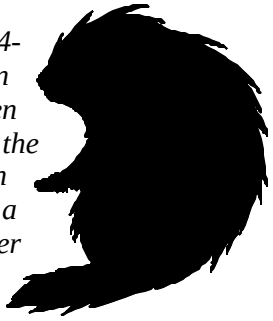
Val Hare
CRES, San Diego Zoo http://al.sandiegozoo.com/conservation/scientists.html
Karen Worley
Zoonooz, San Diego Zoo http://www.sandiegozoo.org/

No written paper submitted.

Presentations: Thursday, 28 February

IT'S NOT JUST THE QUILLS THAT ARE SHARP: THE TALENTS, SKILLS, AND ABILITIES OF THE SOUTH AFRICAN CRESTED PORCUPINE

Kimelaine Zirpolo and Donna L. Kent
San Diego Wild Animal Park http://www.sandiegozoo.org/



The San Diego Wild Animal Park's Wildlife Education Compound is home for a female 4-year-old South African crested porcupine (Hysterix africaeaustralis). She is used as an ambassador in the Park's educational programs and her previous conditioning has been limited to harness and leash training. In an effort to provide behavioral enrichment, the trainers have learned that the porcupine is full of surprises. She has the capacity to learn new behaviors quickly. We have begun a preliminary study of shape discrimination with a variety of objects. We conduct one to two sessions a day with ten discrimination trials per session. So far, we have seen encouraging results and plan to further investigate the porcupine's cognitive abilities. Cognition in other species has been studied, but these abilities are not often associated with porcupines. In conclusion, South African crested porcupines have the potential to learn novel behaviors. Their abilities, talents, and skills should not be underestimated.

Introduction

The South African Crested Porcupine (*Hystrix africaeaustralis)* can be found in many zoological institutions. Despite their popularity, conditioning and cognitive research of this species is virtually unexplored. With limited literature available, we began an exploration into these areas of interest.

The cognitive aptitude of rodents has long been studied, but porcupines have been largely overlooked in this research. We decided to conduct a preliminary study designed to test the capacity of shape discrimination in the South African crested porcupine. Pocahontas, commonly known as Pokie, is a 4-year-old South African crested porcupine who served as an ambassador for the Wild Animal Park's Education Department. She has been trained to harness, walk on a leash, target, crate and position on a scale and numerous other behaviors for use in husbandry, enrichment, and interpretive programming. As a result of the subject's propensity to quickly learn novel behaviors, we felt she had much more potential. All behaviors were shaped using operant conditioning. A clicker was used as a bridging stimulus, and diet items served as the primary reinforcer.

By conducting this preliminary study, we have gained more insight into how the subject learns, thus enabling us to develop training plans that will set us and the animal up for the highest probability of success for future training programs.

Trained Behaviors

Behavior:	**Description:**
Target	Animal touches nose to trainer's fist

Harness/Leash	Trainer can put a harness on the animal and walk her on a leash
Position on Scale	Animal walks onto a scale and remains stationary while being weighed
Left Turn	Turns left with verbal/visual cue
Right Turn	Turns right with verbal/visual cue
Station	Assigned position for the animal to stand on
Wave	No explanation necessary
Relax	Lay down
Run	Demonstrates her interesting gait
Freeze	Demonstrates how porcupines, when suddenly disturbed, will freeze when standing
Pick up/drop	Demonstrates how porcupines pick up and collect bones in the wild and carry them back to their den
Fan	Demonstrates how the quills flare in a defensive posture
Back up	Demonstrates how a porcupine backs into potential enemies
Feet up	Places front feet up on elevated object to allow us to touch her underside
Paw	Presentation of front paws for physical manipulation
Open mouth	For inspection of teeth and mouth
Crate	Animal walks into crate on cue

SHAPE DISCRIMINATION

Materials and Methods

Tools: A plastic tray was used for the porcupine to station on. Common three-dimensional objects were used as stimuli for discrimination trials in this preliminary study. The objects were a ball (called "ball"), a square cement block (called "square"), and a traffic cone (called "cone"). Prior to the shape discrimination trials, Pokie was trained to touch her nose or foot to the select three-dimensional object (ball, cone, or square) when cued. Additional novel objects were used for stimuli in the experiment (e.g., football, cup, crate, hat, etc).

Procedure

The Training Phase: The training phase took place in a training area or in the porcupine's enclosure. Site choice was based on convenience and was not meant to impart any influence on the animal's behavior.

The three-dimensional object sets were placed randomly within either site. The objects were placed at an estimated 2-3 feet from where the porcupine was stationed. One trainer would give verbal commands to the porcupine. When she touched the correct object with her nose or foot, she was bridged and given a food reward. The rewards were given on a continuous reinforcement schedule. If an incorrect object was chosen, the word 'no' was said. Whether or not the correct object was chosen, the porcupine was called or targeted back to the tray. After she stationed, another attempt was made.

The Experiment

Three objects were used per trial in the experiment. One of the objects was familiar to Pokie, the other two were novel. When the porcupine chose the correct object, she was bridged and rewarded. The rewards were given on a variable schedule of reinforcement. If the incorrect object was chosen the word "no" was said and the porcupine was returned to station. After each trial, the

objects were switched to different locations to obviate position preference. This is common practice in two choice discrimination sets because rodents are notorious for position responding. Using three or more objects lowers the chance probability that the animal is rewarded for responding randomly or to the same location (King, 1968). Another trainer kept documentation of the trials and videotaped a sampling of the sessions. The trials for the training phase and experiment were conducted over a 3-month span, with one to two sessions a day, not necessarily on consecutive days. Due to unforeseen circumstances, there were time lapses that occurred periodically during the study.

Results

In 20 sessions with ten trials each, the porcupine chose correctly 63% (+/-1.45) of the time. The binomial probability that this would happen was 0.0689, or about 7%. The probability is low because there were three objects to choose from. This gives each object a lower probability of being chosen randomly (33% for each object). This indicates that the porcupine was not choosing randomly. She had only a 33% chance of choosing correctly, yet chose correctly over half the time.

Discussion

Due to time constraints, the amount of consecutive and numerous trials/sessions necessary for an in depth scientific study were not achieved, but the preliminary results are interesting. Given the preliminary nature of our study, we only hope to emphasize our belief that the South African crested porcupine possesses innate cognitive abilities to demonstrate shape discrimination.

In the wild, the porcupine is neither predator nor prey. Their biggest threat is from an infrequent encounter with a lion or hyena. Porcupines are also nocturnal. Visual acuity is not a major component for survival in their evolutionary strategy, but the ability to shape discriminate is. South African crested porcupines need to find food, shelter, identify mates and offspring, and be ready for a possible encounter with a predator.

Because the porcupine learned behaviors quickly and easily, she earned the name “one-session Pokie.” She was also a quick study for the discrimination trials. By the sixth session of the training phase she was capable of recognizing the three-dimensional objects involved in the trials. We hope that other trainers will capitalize on the natural and trained abilities of the South African crested porcupine and utilize it as an integral part of educational programs, shows, and presentations. Demonstrating behaviors of the porcupine to zoo visitors will help our audiences to better appreciate and understand this species.

With this study, we hope to inform other zoological institutions of this species’ potential. We feel additional studies will allow for opportunities to enhance the South African crested porcupines’ life in captivity. This may assist with improved exhibit design, unique enrichment opportunities for physical and mental stimulation, and open the door for interesting presentation and show concepts.

Conclusions

1. South African crested porcupines have the potential to learn novel behaviors. Their abilities, talents, and skills should not be underestimated.
2. South African crested porcupines have potential to shape discriminate three-dimensional objects.

3. By conducting this study we have gained more insight into how the subject learns, thus enabling us to develop training plans that will set us and the animal up for the highest probability of success for future training projects.

Acknowledgments

The authors are grateful to the staff of the education department at the San Diego Wild Animal Park, especially John Piazza and Cindy Wallace for their help, support, and approval to embark on this project. We would like to thank our co-workers, educators, and exhibit attendants for their understanding and support throughout the duration of the project. A thank you also goes to Amy Walker and Sharon Belcher for their time invested and assistance with the statistical analysis. We would like to give a special thank you to Scott Stefanatz for his expertise and assistance with film editing and production.

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TRAINING, NOT RESTRAINING

Heather Seymour
Dallas Zoo http://www.dallas-zoo.org/home/home.asp

This paper explores the Dallas Zoo's efforts to assist veterinary applications and enhance animal management through positive reinforcement techniques. Implementing food reward, tactile praise, and the ability to interact with conspecifics, Dallas Zoo keepers and veterinarians record weights and vitals; perform hoofwork; conduct visual and tactile examinations; administer IM injections and TB tests; and collect blood, urine, and semen. The following categories highlight achievements in the above: crate training with meerkat, klipspringer, and small primates; scale training with hoofstock, elephant, primates, and felids; IM injection with okapi, warthog, camel, and great apes; TB testing with hoofstock; blood collection with rhino and tiger; urine collection with okapi and chimp; and semen collection with chimp. Our discussion of these particular case studies concludes that, through creativity of set up and reward presentation, animal staff may overcome challenges such as extreme animal skittishness, lack of response to food reward, and staff safety.

OKAPI INJECTION TRAINING

Megan Lumpkin
Dallas Zoo http://www.dallas-zoo.org/home/home.asp

This paper focuses upon work toward replacing the practice of darting the Dallas Zoo's okapi collection for administration of annual vaccinations and other medications through manual IM injection training. A discussion of set up identifies:

(a) the use of two trainers: one to conduct a variety of methods of positive reinforcement and the other to desensitize the okapi to injection and
(b) the application of an indoor, protected-contact, three-window, chute variation.

The paper outlines the general steps as well as the individual challenges involved in the training of 2.2 okapi and highlights the variety of responses to favored conspecifics to the training session. The discussion also addresses the importance of training schedules designed to meet vaccination deadlines, as well as maintenance of the training for long-term management. In addition to injection training, work with the above set up proves effective for a variety of other veterinary practices including rectal thermometer probing, stethoscope placement, ear cleaning, TB testing, and possible ultrasound administration.

USE OF OPERANT CONDITIONING FOR UNRESTRAINED HUSBANDRY PROCEDURES OF GIRAFFES

Brad N. Stevens
Memphis Zoo and Aquarium http://www.memphiszoo.org/

Many institutions are unable to develop adequate physical restraint devices for giraffes, due to financial expenses or lack of physical space. The Memphis Zoo staff is using operant conditioning as a means to provide the husbandry care necessary in order to sustain the livelihood of the institution's 1.2 giraffe population. The keeper staff's ultimate goals are to assist the veterinarian staff and research department in procedures and projects complimenting the mission statement of the institution. With these specimens, through the use of positive reinforcement, the Memphis Zookeeper staff is able to examine the eyes, ears, horns, nostrils, mouth, and upper parts of the neck. These husbandry behaviors provide the opportunity for important medical procedures such as injections and blood withdrawals. The purpose of the video presentation is to further illustrate the operant conditioning methods of the Memphis Zoo keeper staff in hopes of giving other institutions insight on how to condition their animals for similar husbandry procedures without the use of physical or chemical restraint.

Introduction

Operant conditioning continues to be utilized in zoological institutions in order to maintain and improve the simplicity and quality of animal care, to provide a means of environmental enrichment, to contribute to the efficiency of animal research, and to entertain people from an informative, educational perspective. Initially, operant conditioning was used to train marine mammals and non-human primates, but today it continues to expand to other species within institutional animal collections.

Large hoofstock, such as giraffe, require substantial management in terms of space, housing, and general husbandry, due to their size and timid disposition. To provide the best possible care, a giraffe's hooves require trimming and cleaning to avoid overgrowth and possible infection. Also, it is important to have the ability to fully examine the animal for any abnormalities. Because giraffes are large animals, these concerns make husbandry rather challenging. Some institutions may feel that without a physical restraint device, addressing these husbandry concerns would be impossible unless the animal was tranquilized. The objective of this investigation was to explain that husbandry procedures (including some medical treatment) can be accomplished without the use of a physical restraint device, by using an effective operant conditioning program.

Materials and Methods

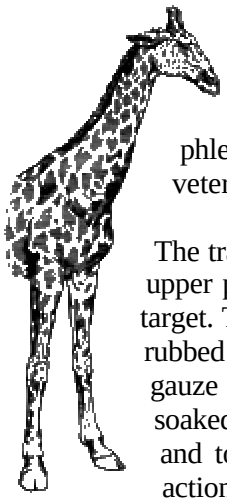
The Memphis Zoo currently exhibits 1.2 reticulated giraffes (*Giraffa camelopardalis reticulata)* in its animal collection. The two females were born and raised at the Memphis Zoo ("Alta", 17 years of age and "Luna", 19 years of age). Our male, "Bobai" (6 years of age) was born at the Birmingham Zoo in Birmingham, Alabama. Each of these animals is involved in a proactive animal health program initiated by the Memphis Zoo veterinary staff. Overall health conditions of the animals have been good, and the Zoo has successfully reared more than five offspring. The giraffe barn and yard meets Species Survival Plan recommendations for the housing and care of this species. However, because of the architectural design of the barn and the lack of adequate

physical space, the Memphis Zoo does not have the ability to construct a physical restraint device.

The operant conditioning program was initiated in August 1998 and currently meets the guidelines and requirements for training and programs outlined in the *Operant Conditioning Protocol for the Memphis Zoo.* The giraffe operant conditioning team contains three primary trainers and three secondary trainers. Primary trainers are responsible for capturing and shaping new husbandry behaviors, while secondary trainers are responsible for maintaining established husbandry behaviors. Although the responsibilities of the trainers vary with level, the goals and objectives for the program are determined in team meetings. Meetings typically occur on a monthly basis with a member of the curatorial staff.

Each animal was given its own uniquely shaped and colored target to associated with. These targeting objects were made from pool buoys attached on one end to a length of PVC piping. The other end was submerged in an empty gallon bleach container filled with sand. The purpose of the weighted container was so that the trainer's hands were free to train the animal. Apples and bananas taken from the animals' daily diets were used as their reward. The giraffe team used dog whistles and verbal praise as a bridge.

Training Behaviors: Once the bridge was established, trainers began training each animal to target its own targeting object, which was established in a relatively short period of time. After the targeting behavior was captured and shaped, the trainers began to desensitize the animal to head tactile, while it was stationed on the target. The animal was asked to target, and the moment the trainer's hand touched its head while targeting, it was bridged and rewarded. Gradually, the amount of time that the trainer was able to touch the head of the animal lengthened and each trainer was able to branch and desensitize other parts of the head. Each animal allowed the trainers to feel and examine its ears, eyes, horns and nose, and open its mouth to examine its teeth and tongue. One of the trainers captured and conditioned the lifting of the front left and right legs on command from one of the females, in hopes to condition it further into part of a hoof trimming routine. As found with training most animals, the range of time to capture and shape a behavior varied with each giraffe specimen.



Blood Withdrawal: Before the trainers began any behaviors such as blood withdrawal or injections, they went through phlebotomy training taught by the zoo veterinarian. This involved discussing animal and keeper safety issues, knowledge of the equipment used, and applying the techniques. On completion of the phlebotomy training, the trainer began working an animal under close supervision of the veterinary staff.

The trainers began tactile desensitization by touching on and around the jugular area of the upper part of both sides of the neck, with the animal stationed (nose touching target) at the target. Then the trainer introduced cotton gauze (letting the animal see and smell it) and then rubbed the general area where the blood would be withdrawn. Once the animal accepted the gauze routinely, the trainers added isopropyl alcohol. The purpose of the isopropyl alcohol soaked gauze was to generally clean the hair of any dirt decreasing the chances of infection, and to raise the vein for increased visibility. Once the animal was desensitized to these actions on either side, the trainers added a blunt needle (22-gauge) and syringe simulating a needle entering the skin. At first they used very light pressure if any at all, before they bridged and rewarded. As the animal became more comfortable, the trainer applied more pressure for a longer length of time. Once the animal accepted the procedure consistently, and the trainer felt that the animal was completely comfortable with the blunt needle, a sharp 27-gauge needle was

introduced to the procedure. The 27-gauge needle was used once or twice a week alternating sides of the neck. Anymore than twice a week the animal began to regress and lose trust in the trainer. Once the trainer was able to place the needle into the skin for several seconds, a 22-gauge sharp needle was used in place of the 27-gauge needle. If the animal regressed, the trainer had to step back to the 27-gauge or blunt needle. The trainers soon discovered that it was quite difficult to apply and hold the gauze and needle, while bridging and rewarding the animal. Additional or secondary trainers were recruited to strictly reward the animal when the bridge was given. Initially this caused problems because the animal was not used to the additional trainer and had to be desensitized to it, but everything has worked out quite well.

Results

Alta, the younger female, has a disfigured ear that was caused by her mother sucking it shortly after birth. This head tactile behavior has given the opportunity to the trainer to routinely clean the disfigured ear with gauze and isopropyl alcohol. The older female, Luna, began having abscesses or lumps that appeared occasionally around her upper lip and jaw area. Her trainer began to desensitize her lips so that the trainer could examine them closer. The trainers could also routinely check the animals' teeth for any abnormalities. Once the animals felt comfortable with the trainer touching every area of their head, the trainers began to desensitize the neck for blood withdrawal in the same manner. The youngest female seemed the most inquisitive and picked up behaviors rather quickly, whereas the other animals were a little more apprehensive.

During the development of the blood withdrawal procedure, shaping the application of the blunt needle seemed to be the most time consuming for each specimen. The progress using the blunt needle fluctuated. Some days an animal would not want to cooperate for unknown reasons, and other days it would do really well.

Currently, one of our primary trainers has drawn blood with a 22-gauge needle and is beginning to withdraw 1-2 cc weekly from the younger female. Another primary trainer is pivoting between the blunt 22-gauge and 27-gauge needle with the older female and our other primary trainer is at the stage of introducing and conditioning the blunt needle to the male. Our primary goal is to be able to draw blood from each giraffe on a weekly basis. Once that goal is accomplished, our next phase is to develop steps toward conditioning our giraffes to present their hooves for trimming and routine cleaning.

Conclusions

The development of training guidelines continues to be essential for the progress of the entire giraffe training team. The giraffe training team's protocol not only provides a foundation for trainers new to the program, but it puts into perspective the team's and individual trainer's goals for the program and establishes steps toward achieving them in a timely manner. Effective communication is also important not only between the members of the giraffe training team, but between the giraffe training team and the curatorial, veterinarian, and research staffs. The giraffe training team's goals need to be the same or complement the curatorial, veterinarian, and research staff's goals. They may each have ambitions toward the same specimens and those goals need to focus in the same direction.

This investigation was not to prove that physical restraint devices should be obsolete, but to show that, through operant conditioning, most husbandry procedures that are typically done in a physical restraint device can be done safely without such a device.

Acknowledgements

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OPERANT CONDITIONING IN A FIELD EXHIBIT WITH BARINGO GIRAFFE

Rebecca D. Schaefer
Zoological Society of San Diego, Wild Animal Park http://www.wildanimalpark.org/

Operant conditioning has been used in a typical zoo setting, for husbandry and medical behaviors and as a form of enrichment. Operant conditioning with baringo giraffe (Giraffa cameloparadalis rothschildi) has never been used in the field exhibits at the San Diego Wild Animal Park. In November of 1999, a conditioning program was started in the East Africa field exhibit with baringo giraffe. The objective was to condition a giraffe for a voluntary blood draw and tuberculin testing without the use of anesthesia and restraint. Operant conditioning or training sessions were held one to four times a week, each session lasting about 20 minutes. Through desensitization, successive approximation and reinforcement, this objective will be reached, as training is ongoing. The training will increase the staff's accessibility to the giraffe, overall safety of the staff and giraffe, as well as the guest experience.

Introduction

In November of 1999, an operant conditioning program with the baringo giraffe (*Giraffa cameloparadalis rothschildi*) began in the East Africa field exhibit at the San Diego Wild Animal Park. The East Africa field exhibit is approximately 100 acres of grass, rolling hills, water elements, and eleven other species of hoofed mammals that total over 200 animals. At the beginning of the program, the giraffe herd had 3.9, animals ranging in ages of 6 months to 22 years of age. By February 2002, the herd was 4.9, with animals ranging from 1 to 22 years of age. The training program presented some unique challenges and opportunities for a trainer to learn and grow. These included but not were not limited to:

- Holding training sessions in the exhibit--The trainer and sessions were in full view of the public and photo caravans which tour the field exhibits daily. Giraffe training was conducted in a semi-free contact form because of the need for the station to be mobile, and due to the size of the exhibit.
- Having a mobile training station--The giraffes had to come to the field truck, wherever the station was in the exhibit.
- Incidental stimuli--in such a large exhibit, literally anything can happen. It was decided early on, since there could be no control over incidental stimuli, the giraffe would not be given a time out for leaving the station when alarmed by such stimuli. They would be reinforced every time a strange stimulus arose to strengthen the behavior of remaining at station or promptly returning to station after incidental stimuli.

Throughout the program, the decision regarding the giraffes' reactions to incidental stimuli worked to our advantage. The giraffe had become habituated to various elements, like tractors, the sounds of different motors, vehicles driving by in close proximity, and systematically desensitized to various incidental stimuli, for example, people yelling at them, different species in close proximity and sudden movements. The first goal of the training program was to signal the giraffe to move to a desired location, for example a boma yard or specific location within the exhibit, by presenting a visual sign. Some methods previously used to move giraffe to a desired location were herding with field vehicles or diet reduction and baiting the giraffe to the desired location. These two methods were effective but time consuming and required additional personnel. To reduce the number of personnel and time used to move giraffe and make the experience for the giraffe positive, a conditioning program was an answer and an alternative. The

goal was accomplished and based on the initial success, a second goal of conditioning a giraffe for voluntary blood draw and tuberculin (TB) testing was established.

Methods

The following terms are used throughout the paper and defined below:

Baringo giraffe: Giraffa camelopardalis rothschildi, also known as Uganda or Rothschild giraffe (MacClintock, 1973).

Bridge: a stimulus that pinpoints in time the precise moment of a desired response and bridges the gap in time between that point and when the animal may receive further reward (Ramirez, 1999).

Boma: Swahili for barn.

Habituation: a reduction in the strength of a reflex response brought about by the repeated exposure to a stimulus that elicits that response (Chance, 1994).

Jackpot: a reward that is much bigger than the normal reinforcement, and one that comes as a surprise to the subject (Pryor, 1984).

Operant conditioning: a type of learning in which behaviors are altered primarily by regulating the consequences that follow them. The frequency of operant behaviors so altered by the consequences they produce (Scarpuzzi, Lacinak, Turner, Tomkins and Force, 1991).

Positive reinforcement: a reinforcement procedure in which a response is followed by the presentation of, or an increase in the intensity of, a stimulus (Chance,1994).

Primary reinforcer: a reinforcing event that does not depend on learning to achieve its reinforcing properties (food, water, and sex) (Kagan & Havemann, 1976; Whittaker, 1977; Kazdin, 1989).

Discriminative stimulus (SD): any stimulus that indicates that a particular response will be reinforced (Chance, 1994).

Secondary reinforcer: (conditioned reinforcer or bridge): becomes reinforcing after it has been paired or associated with a primary reinforcer (Kagan & Havemann, 1976; Whittaker, 1977; Kazdin, 1989).

Shaping: (successive approximation): taking a very small tendency in the right direction and shifting it one small step at a time towards the ultimate goal (Pryor, 1984).

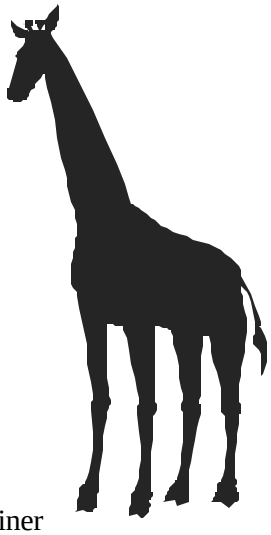
Superstitious behavior: behavior which results from misunderstanding. It is produced where there is no intended relation between response and reinforcement (Ramirez, 1999).

Systematic desensitization: carried on in a step-by-step procedure, rendering a subject less sensitive to a stimulus.

TB test: A skin test used to screen for previous infection by the *Tubercle bacillus* using an intradermal injection (Springhouse, 2000).

Goal: Withdraw blood/ administer a TB test to baringo giraffe

Subject: Baringo giraffe herd of 3.9



Tools:

Call to station sign:	A black and white striped sign
Bridge:	One short blast of a dog whistle
Target:	A fist or tennis ball on a pole
Reinforcement:	Sliced carrots and apples
Station:	Field vehicle(s)
Leave the truck:	Show the animal open outstretched hands

Initial Training: To encourage the giraffe to come to the field vehicle, the trainer initially went to them. This appeared as a novel event for the giraffe. The first three sessions

consisted of a trainer standing and waiting on the bed of a truck holding the black and white striped sign and a bucket of primary reinforcers (sliced carrots). The black and white sign was chosen to be a visual cue that the giraffe could see from great distances. It was silent and significant only to training sessions. During the fourth session, about 2 weeks into the training, one giraffe finally approached the truck, an 18-year-old female called "Ngora". The next several sessions consisted of the trainer free feeding carrots to any and all giraffe that came over to the vehicle upon presentation of the sign. When animals were coming over regularly, the bridge--a single blast of a whistle--was introduced. The whistle was aversive initially to some animals. Those animals were systematically desensitized to a whistle by just seeing the trainer wearing it, then seeing it in the mouth of the trainer and finally hearing the sound of the whistle. It is important to note that each individual animal had its own learning curve and rate of progress, which was addressed separately. When the bridge had been learned by a majority of giraffe that were reliably coming to station, the station was moved closer to the boma. The giraffe now had to walk farther to the vehicle for reinforcement.

Accurate records of each animal's progress were important and useful. This allowed the trainer to develop a training program that allowed each giraffe to learn at a desirable pace, not too fast and not too slow. Accurate records enabled the trainer to see each individual's progress, make adjustments, and have the next approximation planned for the animal.

SD-Target: A closed fist had been used primarily as the target. A target pole had been used in certain situations, but it became cumbersome and used only when necessary. To encourage the giraffe to touch a fist, a fist was presented along side the reinforcement. So with one hand, the trainer held a slice of carrot and the other hand was right next to it. When the giraffe touched the fist, it was bridged and rewarded. The hand presenting the carrot was faded out and then only the fist was presented. The bridge and reward was now only given after targeting to the fist. After the behavior of target had been learned, a verbal cue "target" was paired to the presentation of the fist. This was how the target pole was introduced and had been taught the same as target on a closed fist. Once the behavior had been considered reliable for an individual animal; it was recorded in the session records as learned. The giraffe had also been taught to target for an extended period of time by approximating the time asked to remain on target. This behavior was important when working with multiple animals and being able to single out one for the desired target behavior and also for reinforcing other animals for remaining at station and remaining calm and waiting for their next cue.

SD-Back up: The behavior of an animal backing up from the vehicle was an extremely important behavior. This behavior had to be learned by the giraffe for the safety of the trainer. The trainer would say "back up" and simultaneously swing both outstretched arms and take a step towards the animal. The giraffe somewhat alarmed to this action moved backwards. The bridge was given when a step backwards was taken. Over time, this cue faded to a verbal cue for some giraffe and for others it remained a verbal and physical cue from the trainer.

SD-Tongue Out: This behavior was taught because it is a natural behavior that was easy to capture and put on a hand signal. This added some variety to the training sessions and became useful in educating the guests of the Wild Animal Park about the uniqueness of the giraffe. The trainer held a piece of carrot into the palm of their hand with one finger and the other fingers were in a waving motion while slowly backing away from a giraffe's mouth. The giraffe was initially bridged for sticking its tongue out a little. Then by successive approximation the trainer's hand was move backwards, the giraffe would stick its tongue out farther. The carrot in the palm was faded out and the hand signal was established.

SD-Neck: This behavior was taught by successive approximation. First, the trainer presented the fist for the animal to target on, "Neck" was then said, and the other arm was held extended to the side of the giraffe's head. The giraffe was bridged for not flinching and remaining calm with an outstretched arm parallel to its head. This arm was approximated closer to the neck by small increments. When actual physical contact between the trainer's hand on the neck of the giraffe had been made for the first time, a jackpot of carrots was given. This behavior became particularly useful when reading a TB test for an animal that was being transferred to another institution. The training program had made it possible to palpate the test site without a restrained animal and a second immobilization. The giraffe was called to station, asked to perform a few behaviors and then the veterinarian was able to physically palpate the test site without the use of anesthesia or restraint. This greatly reduced the stress on the giraffe and saved time for the staff involved. A previously negative experience for both staff and animal had been turned into a positive one.

SD-Ear: This cue was added to increase the variety of the training session and because the site for the TB test had been moved from the neck area to the caudal fold behind the ear. The trainer asked the animal to target, the animal targeted, the trainer said "ear" and then the trainer touched the ear. The giraffe was bridged and reinforced for not pulling away or flinching when the ear had been touched. The amount of time from touching the ear, to holding the ear in the trainer's hand, was approximated by small increments over a series of sessions.

SD-Blood draw/TB test: To complete a blood draw and TB test, the behavior of "neck" included a series of stimuli that had to be desensitized. The start of desensitization was rubbing the neck, applying pressure to certain areas with the hand, and using foreign objects like keys or rubber bands for localized pressure on the neck. When it was felt that the giraffe had been thoroughly desensitized to random application of pressure, the next step was to desensitize to the application of Nolvasan and alcohol. In accordance to the blood drawing protocol approved by the animal health technicians, the area that blood was to be taken from must be cleaned before and after drawing blood. Once the giraffe was habituated to being scrubbed with Nolvasan and alcohol, a cordless hair shaver was introduced. The main obstacle with the shaver was the sound. Desensitizing the giraffe to the sound was the next logical step. A small but very noisy shaver had been donated to the program. The shaver was turned on during a session for about 30 seconds and then turned off for the remainder of the session. The initial reaction was greatly increased flight distance. The giraffe became desensitized to the sound of the shaver over time. Like learning the bridge or target, some animals became desensitized to the shaver quicker than others. Once the sound became unimportant to the giraffe, they were allowed to investigate it. When the novelty of it wore off, they were reinforced for a shaver being switched on near the head and then by small approximations closer to the neck to actually touching the neck. It was at this step that the animal health technicians were asked to participate in the sessions to desensitize the giraffe to "new" people. The giraffe had a "new person" once every three sessions or at least once a week.

At this point in the training program, the giraffe had been trained to come to station; recognize the bridge; target; hold still and remain on target; allow the neck to be shaved, scrubbed, and have pressure applied to it. The next step was to desensitize the giraffe to a needle prick. Since this would require breaking the skin barrier, permission was sought from the Director of Veterinary Services. A protocol for using needles and preparing the area to be poked before and after was developed with the Lead Animal Health Technician. Training began by stroking the desired area with a blunted butterfly needle and reinforcing the animal for remaining calm and still, without flinching or head swinging. The next approximation was inserting the needle under the skin and pulling it out. The criteria for using a blunted needle and a sharp needle were alike. The final approximation was to insert the needle into the desired area and leave it in till the desired amount

of blood was collected. It is important to note that all during the previous months training "new" people were present during sessions. The "new" people played the role of vet technician and/or veterinarian. The TB test was trained simultaneously with blood drawing because it required the same behaviors. These were having the giraffe remain on target for an extended time while the neck was scrubbed, the desired area was shaved and sanitized, and a needle was inserted under the skin and then removed, and the area was given a final cleaning.

Challenges and Solutions

Time: In almost every program, time is a key factor. Time is a concern and there is never enough. Limits were set early on how long training sessions would last (20 minutes) and they would be done at the end of the day when all other required duties were finished. With this in mind, training sessions were held a maximum of three times a week. From February through July, it is birthing season at the Wild Animal Park. Training during that time of year was rarely done, if not only once a month. This did slow down the progression of the program but also made it easier to analyze progress and predict the next step or approximation for each individual animal. This also allowed for a trainer to bring other people into the program and develop their training skills. The program started in November of 1999 and continues on, with a break in training between the months of February through July. The program overall has amounted to about 12 months of cumulative training. Adding up the time recorded for each session amounted to about 80 hours of actual training time.

Training Multiple Animals: The baringo giraffe herd at the start of the program was 3.9 animals. Currently the herd is 4.9 animals. Since the start, the herd has had 5 births, two animals transferred out, a new bull transferred in, and three deaths. Challenges arose in how early one can start training an animal who isn't even on solid food yet. Another was how much training one can do, in a limited time, to make a shipment or immobilization easier. Dealing with multiple animals made identification of each very important and critical to individual progress. Animals had to be identified quickly and sometimes just by looking at their heads and not other identifying marks. Training multiple animals also meant having no control of who came to station and if they all came at once. When this situation did arise, it turned into a free feeding session.

Additional trainers: Initially and ideally, there would have been multiple trainers for this program, but there wasn't. With staff turnover and varied interest from other staff, in the beginning of the program there were only two trainers, a primary and a secondary. As the program began to grow, benefits of the program could be seen and with a staff rotation, another trainer was added. This greatly increased the progression of the program. This additional trainer added the ability for the herd to be somewhat divided among trainers and specific individual animals had a primary trainer. The herd now had three trainers that were interchangeable.

Incidental stimuli: In a 100-acre exhibit with over 200 roaming animals, photo caravans, inclement weather and machinery, there were bound to be distractions. Trying not to control these distractions was the easiest answer and less stressful for trainer and giraffe. This meant increased desensitization for the giraffe. When distractions arose, animals were rewarded for remaining calm and at station. If they left station, for example, in response to a group of rhinos that ran by, they were reinforced for returning to station. The idea was to reinforce remaining at the station, but if hardwiring of the animal dictated flight, then the animal returning would be desirable as well.

Getting the giraffe to leave the truck: Training in the field from the back of a truck means that sooner or later one had to get back into the truck to leave the exhibit. A decision was made early

on that a SD for the giraffe to leave the truck and seek reinforcement elsewhere would be taught. The giraffe would also be taught to back up on cue. When a trainer was finished with an animal and wanted to concentrate on another, the first animal would be shown open outstretched hands and then ignored. Sometimes the giraffe got it and sometimes they did not. The time of day when sessions were conducted and the location in the exhibit were key. In the beginning of the program, sessions were held in the sandy area of the exhibit where photo caravans stopped and guests were able to hand feed giraffe. Photo caravans were encouraged to drive by and continue as normal. This allowed for an animal that was given the SD to leave the truck and the trainer to go to the photo caravans and receive reinforcement from guests. This was also the case when moving closer to the bomas. The giraffe could go to the giraffe feeding area and receive reinforcement for leaving station when the *leave the truck* cue was given. Overall, this has been successful through the cooperation between the trainers and photo caravan guides and visitor assistance officers at the giraffe feeding area. It has also added to the experience of the guests to view training sessions.

Meeting the goal: Unfortunately the goal of drawing blood and performing a TB test has not been met. The target animal "Kazi", a subadult male that is the next scheduled for transfer, has developed a superstitious behavior of licking after targeting. When this behavior has been corrected, the progress of the program will be moving forward again.

Future Goals: It is ideal for the training program to continue, maintaining current behaviors while working toward the goal of withdrawing blood and performing a TB test without anesthesia or restraint. With the approaching animal birthing season and another staff rotation, there has been a small setback. The program will be on a temporary hold until the birthing season is over and then the giraffe will "go back to kindergarten" and the program will again move forward. It should also be noted that future goals include, but are but not limited to, individual "call to station" signs for individual giraffe. This, when taught, will allow the trainers greater control over who comes to station and where.

Conclusion

Being able to train in a field exhibit in a semi-free contact style has broadened the definition of where someone can use operant conditioning and what can be accomplished. It has increased the staff's accessibility to the whole animal and has increased safety for the giraffe and the staff. Husbandry and medical management of the giraffe has also been upgraded. It has also broadened the expectations of what an animal can be taught in a field exhibit. It has also made the job of being a keeper a little more rewarding. From a management standpoint, it has decreased the number of hours it takes to move a giraffe into the boma, and in the future, decrease the number of personnel and time it takes to withdraw blood and perform a TB test.

Acknowledgements

This training program would not have even started without the support and participation of Larry Schiffer, lead keeper, and Gloria Kendall, senior keeper. Despite their 40 years of experience telling them caution, they listened to an idea of training giraffe in the field anyway. It has been able to continue because of the support of various keepers donating their time, veterinary services and the Animal Care Management staff of the San Diego Wild Animal Park. Last but not least, I thank Tammy Batson, senior keeper, who now has taken over the program assuring it will go forward in good hands.

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BREEDING PAIR REINTRODUCTION OF TWO ADULT BENGAL TIGERS USING SUCCESSIVE APPROXIMATIONS

Grey Stafford
Wildlife World Zoo http://www.wildlifeworld.com/

A behavioral management plan to reintroduce an adult pair of Bengal tigers just prior to the onset of estrous was initiated to bring about safe and successful breeding. Complicating the reintroduction was a history of severe aggressive encounters between the pair dating back several years. The subjects were housed separately in the same facility for over 1 year but had continuous visual, auditory, olfactory, and partial tactile contact, via a wire fence. The goal was to systematically increase the amount of time the pair could be housed together on exhibit with minimal aggression, while simultaneously decreasing the number and influence of keeper staff present. Initially, a portion of their daily food base was used to positively reinforce calm attention to a keeper stationed outside the opposite end of the exhibit while the other animal was allowed to enter. The duration of the first session was less than 3 minutes. Subsequent sessions were lengthened in increments of 10-15 minutes with the timing of separating the animals based upon calm behavior responses, not aggression or avoidance. Minimal or no reinforcement was used once the animals were separated. In less than one week, the pair were successfully left on exhibit together between 3-5 hours during the day, resulting in frequent copulation with minimal aggression and no effect on shifting the animals as needed.

WILL SHE FIT? BIG TIGER, SMALL SPACE

Heather C. O'Neill
Moorpark College http://sunny.moorparkcollege.edu/~eatm/

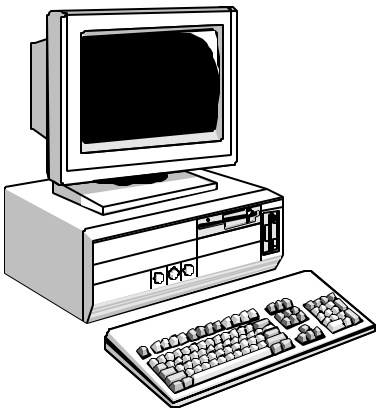
The objective was to utilize a permanent connecting shoot 4' high, 1'8" wide and 2'10" long with sliders in front and behind as a restraint device so injections could be performed. Now this may seem like an ordinary task, but not when dealing with an adult female tiger. Surprisingly, dealing with the size issue was the easiest task. An aggressive behavior associated with food was the biggest obstacle to overcome. Three separate and distinct methods were used to minimize the negative behavior. Desensitization, utilizing incompatible behaviors, and training without food were all utilized to decrease the aggression.

ORCA: A NEW KIND OF LAB

Eddie Fernandez
University of North Texas http://www.scs.unt.edu/orca/

The Organization for Reinforcement Contingencies with Animals (ORCA) is a new student laboratory, based out of the University of North Texas (UNT). Founded in the Behavior Analysis Department in 1999, its focus has been to experimentally examine behavioral phenomena related to animal training and management procedures used within zoos, shelters, and so on. ORCA has also focused on gaining valuable zoo behavior management experiences at the Frank Buck Zoo in Gainesville, Texas for UNT undergraduate and graduate students.

The following talk discusses several of ORCA's past projects, as well as present and future plans for the group. Procedures and data for several projects will be shown, as well as the rationale for implementing such programs. Finally, the need for such measures will be discussed, as well as how zoos and other facilities can implement simple data-taking techniques to empirically verify their training successes.



Presentations: Friday, 1 March

DOLPHIN RESEARCH CENTER'S SUCCESSFUL HUSBANDRY TRAINING PROGRAM: PROTOCOLS, STANDARD BEHAVIORS, AND SPECIALIZED BEHAVIORS FOR BOTTLENOSE DOLPHINS AND CALIFORNIA SEA LIONS

Shelly Samm, Pat Clough, Linda Erb
Dolphin Research Center, Florida http://www.dolphins.org/

Over the past 20 years, Dolphin Research Center (DRC) has used operant conditioning techniques to train voluntary husbandry behaviors to our group of dolphins and sea lions. DRC has created a Husbandry Behaviors (HUBS) committee. This team evaluates what, when, how, and who trains various behaviors and ensures that constancy and consistency are maintained throughout our colony. The information obtained through cooperative behaviors is invaluable in tracking individual health assessment as well as reducing the amount of handling needed to gather medical data. How a HUBS committee can be created at any facility and how it has helped DRC organize, train, and transfer husbandry behaviors maintained at DRC, also will be presented.

Dolphin Research Center (DRC) was established in 1984. Before that time, DRC was a research center as well as an entertainment facility dating back to 1958, when Milton Santini brought his first dolphin into his backyard. This backyard is located in the Florida Bay, part of the Gulf of Mexico. The facility design he created remains the same today. Currently, our facility, which covers 2.5 acres of water, is home to 16 Atlantic bottlenose dolphins and two California sea lions. Our successful breeding program is expanding with the anticipated births of three dolphins this spring in one of our maternity lagoons such as our front lagoon

DRC's founders developed a philosophy back in 1984 that is still strong today. We strive to promote peaceful coexistence, cooperation, and communication between marine mammals and humans through research and education. The health and well being of DRC's dolphins and sea lions holds absolute precedence over all other interests. DRC will undertake no program or activity that compromises this basic commitment.

To provide the best health for our colony, we must be able to obtain diagnostic information about our animals. In the past, husbandry behaviors were trained on an "as needed basis". The trainer that taught the behavior was usually the only one that worked the behavior. If that trainer left, then the behaviors frequently left with him or her. If a sample could not be obtained voluntarily through training, than the animal would be caught, put in a stretcher, and the sample would be collected under restraint.

In the mid 1990s, our medical director went to the vice president of Animal Care and Training and DRC's president with a serious concern. DRC has been a critical care facility, taking in dolphins that need extra medical attention, and our resident population had an increasing number of older animals that needed consistent husbandry care. How could we maintain already trained husbandry behaviors and continue training new behaviors, knowing that staff will not always be the same or at the same training levels?

To reach and maintain the highest level of husbandry care for our old and young alike, a committee was created to evaluate our current level of husbandry care and plan a direction for

future husbandry needs. The committee members were determined according to training experience and medical knowledge. The medical director was designated as the chairperson, and other committee members were made up from our training staff. DRC's president (co-founder and trainer), the vice president of Animal Care and Training, the vice president of Animal Care and Operations, as well as select senior trainers completed the Husbandry Behavior Committee (HUBS).

The first meetings were spent creating goals for HUBS. During these meetings, several key objectives were identified:

- assign primary medical trainers and evaluate the training progress of the behaviors,
- maintain forward movement of training and prioritize behaviors to train,
- create standards for each husbandry behavior for sample collection, &
- set up protocols for passing on behaviors to other trainers.

Overall, the committee was to create improved communication among the training staff, developing more consistency in training husbandry behaviors.

Now HUBS had a direction. It was determined that the committee would meet on a regular basis. In these meetings, the group would determine goals for husbandry training, as well as discuss any training topics that were brought to the committee from the trainers. It is the job of the primary trainers to train medical behaviors to their assigned animals, as well as maintain the behaviors that are already trained. If the trainers have difficulty training a particular behavior, they could come to the committee for advice. The trainers are required to report to the committee if a finished behavior starts to break down. This keeps the committee up-to-date with the status of all the medical behaviors.

In one case, a new primary trainer got some feedback on working with a breast pump for milk collection. In assigning primary medical trainers, several factors are considered. The committee looks at the trainer's overall experience with general and medical training, and the animal's level of medical training. We have several dolphins that are solid on most of their medical behaviors. These are the animals that some of our less-experienced trainers will begin with to gain confidence and experience. We also have some "older and wiser" animals that prove to be more challenging in training. These animals are assigned to trainers with more medical training experience. As new animals join our facility or a trainer leaves, the committee will assign new primary trainers to those particular animals. This gives the novice trainers the opportunity to work with "green" or more challenging animals.

Once the primary trainers were assigned, the committee started to tackle the largest part of their job. They came up with written standards and protocols for the trainers to follow. To create new standards and protocols, their first task was to evaluate the existing behaviors. With a list of the husbandry behaviors in hand, the committee members evaluated each of the dolphins and sea lions. They looked at all the behaviors that the animal knows, both completely trained and in training. If the behavior was solid, there was a schedule set up for maintaining it through practice sessions. If the behavior was not fully trained, then the committee established dates when it must be completed.

Once an animal was evaluated, the committee gave the primary trainer goals for each behavior that needed to be trained, in order of priority. The medical director gave suggestions to the committee on an order of priorities based on the health information that each type of sample collection could give. The order of priority was generalized for all animals, but each animal had its own particular order. Animals that are older may have different priority behaviors than a

younger one, or ones that are sick from ones that are healthy. For example, we have found that training our older dolphins voluntary watering to maintain electrolyte balance is more of a priority than training urine collection or even a fecal collection. Overall, the individual will learn all the medical behaviors, but the ones that can give the most information or assistance for that individual will be prioritized.

The evaluations also revealed a direction for standardizing each of the behaviors for sample collection. These standards were set with the goal of making it easier for trainers to learn the medical behavior. It would be difficult to train ten trainers 15 different ways to set up a dolphin for a blood take if each dolphin had its own standards. With standards, ten trainers learn one process that applies to all the dolphins. The committee took into consideration that the animals were individuals and may have minor quirks. These quirks were noted on the protocol sheet.

Standardized protocols were created for each sample collection. The protocol described the behavior and set up and also the medical team's involvement in the collection process. Protocols were written concisely so that they could be clearly understood. After the protocol, there was a list of dolphins' names and whether or not they were standard or still in training. Here, individuals "quirks" were noted along with the minor adjustments for that particular dolphin.

With three out of the four goals completed, the husbandry program was gaining strength. The last endeavor was training others to work the solid behaviors. It was about this time that the training department went through some changes. Several trainers left, which gave us the opportunity to train some of the younger trainers to be primaries for the medical behaviors. Once these trainers gained confidence with the behaviors, the committee began the "passing on" of these behaviors.

Protocols were created for the process of passing on a medical behavior to another trainer. After working with another trainer, the primary would come to a HUBS member to "check off" the other trainer for that behavior. It was still the primary's responsibility for the maintenance of the medical behaviors. Other trainers learned the behaviors so if the primary trainer was off or on vacation, samples still could be obtained. In addition, when trainers leave, the medical training does not leave with them. This was the committee's main purpose.

To round off the program, the committee wanted to list behavior chains on all the medical behaviors. The chains offered some guidance for the trainers to follow when training the animals. It also offered some history for the dolphins that were already trained. If the behavior started to break down, one could review the steps and know what techniques will bring the behavior back.

I will now show you some of our medical behaviors, many of which are standard for all; others are specialized for that individual animal. (VIDEO SHOWN)

There have been many benefits to creating this Husbandry Behaviors Committee. Increased communication among trainers, improved health monitoring and treatment administration, better consistency of animal participation in programs, and wonderful guest interactions are just a few. We have no behind-the-scenes, so all the medical training is done for our guests' viewing. Medical training sessions are some of the most highly attended. The interest generated by these sessions only re-affirmed our philosophy---this is all done for the health and well being of our animals. What the training staff found-medical training can be fun.

CONDITIONING SEDENTARY CAPTIVE PENGUINS FOR INCREASED SWIMMING TIME

Rickey Kinley
Department of Aviculture, Cincinnati Zoo and Botanical Garden http://www.cincyzoo.org/

Penguins are seabirds that naturally spend a vast amount of their lives in the ocean swimming and foraging for food. In contrast to their wild counterparts, the Cincinnati Zoo's mixed species penguin collection was comparatively sedentary and shore-bound, spending relatively little time in their pool. This study presents operant conditioning techniques that utilized feed fish and toys to promote more swimming time in a captive penguin population. This, in turn, awakened porpoising and other naturally occurring behaviors that the penguin group never previously displayed. Additional benefits were a presumed reduction in susceptibility to bumblefoot disease and a noticeable increase in zoo visitor interest.

Penguins (family *Spheniscidae)* are a well-studied group of flightless seabirds (Stonehouse 1975, Davis and Darby 1990, and Williams 1995) with a solely southern hemisphere range. There are 17 species varying in size from the 38 kg (85 lb.) emperor penguin to the 1.3 kg (3 LB) little penguin. Four species breed on the continent of Antarctica, but most live in somewhat warmer climates. Characteristically, penguins have a thick layer of fat that allows them to exist without food for extended periods of time during the molting and breeding seasons. This layer also reduces heat loss while the penguins are in frigid waters. Since penguins are distinctly torpedo-shaped, with powerful wings and short stubby legs and tails, they are highly adapted for a life in the ocean. Typically they spend a considerable amount of time swimming and feeding on fish, krill (crustaceans), and squid (cephalopods).

Conversely, a multi-species group of penguins kept at the Cincinnati Zoo spent relatively little time swimming. The overall nature of our penguins was best described as sedentary. Even their swimming appeared sluggishly and solely for the purpose of cleaning their feathers. Our smaller penguin species (see 'Penguin Study Group') swam for a daily estimated average of 20 minutes. Our larger species, the king penguins, routinely swam for approximately 10 minutes in the morning and would seldom venture into the pool throughout the remainder of the day. It was decided to encourage swimming for enrichment purposes and because long periods of inactivity are conducive to associated foot problems known as bumblefoot disease, pododermatitis (Sawyer 1983, Ellis et al. 1994).

The Cincinnati Zoo, like many institutions that house penguins, normally hand feeds all the food that the penguins receive. During an early attempt to increase swimming time, live minnows and freshly thawed silversides (see 'Initial Feeding Regimen') were placed in the pool. When live fish were introduced into the pool, most of the penguins were not interested. On several occasions, silversides were thrown near the swimming birds. This also proved ineffective. Because virtually all fish in the water were ignored, it appeared that our penguins did not recognize fish in their pool as food. Our two magellanic penguins (see 'Penguin Study Group') were exceptions, because they ate from the pool and typically swam nearly two hours daily.

In September of 1997, I attended SeaWorld of Cleveland's 2-day seminar called "Dog Days" and learned how their animal trainers use positive reinforcement to motivate captive animals for enrichment, public demonstrations, and to improve animal husbandry practices. These methods seemed applicable to motivating our penguins to swim more.

The purpose of this study was to encourage swimming behavior in a mixed species group of penguins at the Cincinnati Zoo. This paper describes the operant conditioning techniques that were used with feed fish and toys to increase swimming time and activate more natural behaviors. This experiment was initiated in autumn of 1997, lasted for about a year, and has been previously summarized (Kinley 2000).

Penguin Study Group: Our penguins were publicly displayed and maintained in the Zoo's *Wings of the World* (birdhouse) sub-Antarctic coast polar exhibit. The smaller species in the study group included two African blackfoot penguins (*Spheniscus demerus)*, two magellanic penguins (*Spheniscus magellanicus)*, and ten rockhopper penguins (*Eudyptes chrysocome*). The king penguins are the large species in this study. Initially, there were four king penguins (*Aptenodytes patagonicus)*, with three more king penguins acquired later that same year.

Key Birds noted in this study:

Buddy	= magellanic penguin, 10 years old
Maggie	= magellanic penguin, 2 years old
Bonnie	= African blackfooted penguin, 2 years old
Squirt	= rockhopper, 1 year old
Rockette	= rockhopper, 30+ years old, wild caught
Blue	= rockhopper, 25+ years old, blind in one eye, vision-impaired in other

Sub-Antarctic Coast Polar Exhibit: The penguins live in a large naturalistic diorama featuring a typical penguin habitat. The exhibit is 8.2 m wide x 10.6 m tall x 4.8 m deep (27 ft. x 35 ft. x 16 ft.). The exhibit pool holds 45,423 liters (12,000 gallons) of fresh water. The air and water temperatures are maintained at ~10-18º C (50-60º F). The exhibit is illuminated by sodium vapor and metal halide lights. The daylight schedule is 8 hours winter and is gradually changed to 19 hours summer following the natural sub-Antarctic cycle. In addition to penguins, the exhibit also houses two Chiloe wigeons (*Anas sibilatrix)*, two imperial cormorants (*Phalacrocorax atriceps)* and a blackfaced ibis (*Theristicus melanopis*).

Intial Feeding Regimen:
Feed-Fish: The following fish species were received boxed and frozen: silversides (*Menidia menidia*), herring (*Clupea harengus harengus*) and mackerel (*Scomber scombrus*). Live golden shiners (*Notemigonus crysoleucas*) and fathead minnows (*Pimephales promelas*) were placed in the pool for enrichment, but only the magellanic penguins would eat them.

Smaller penguin species: Our smaller birds were mainly fed 5-10 cm (2-4 in.) long freshly thawed silversides in three bowls distributed throughout the polar display twice a day. Their daily feeding schedule consisted of one feeding in the morning and another in the afternoon. Five 1-year-old hand-reared rockhoppers ate from the bowls, but they preferred to be hand-fed. Usually, they initiated hand feeding by approaching the keeper who brought in the food. Rockette would not eat unless she was hand fed and, because Blue was nearly blind, he was also hand-fed.

King penguins: Being significantly larger birds, the king penguins were hand fed mackerel and herring 15-30 cm (6-12 in.) long. Feeding occurred once in the morning and again in the afternoon.

Vitamins: Additionally, the penguins were given Mazuri brand sea bird vitamins. This was administered one of two ways; by hand feeding them fish with a vitamin tablet inserted or by sprinkling a powdered form over fish in a bowl.

Conditioning Methods

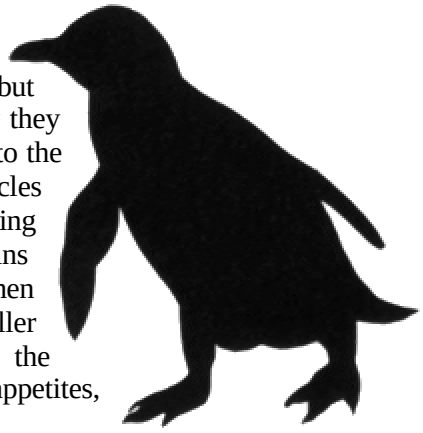
A variable feeding schedule: Utilizing the information gained from the SeaWorld seminar, I began conditioning the penguins to eat in the water so they could be reinforced for being in the pool. This was an important hurdle to overcome, since they rarely swam. It is well known that variable reinforcement can be used to motivate animals in training (Pryor 1984). I decided to vary their feedings by amount, time, and frequency. For example, on one day they might get fed at noon, while on the next day they would be fed in the mid-afternoon. Some days the penguins were fed once, and on other days they were fed twice. I hoped that this sporadic feeding pattern would spark some mental refocusing. On my two days off each week, no conditioning occurred. On those days, the penguins were fed according to the initial feeding regimen.

Whenever I noticed five or more penguins swimming, I would place about 20 live minnows in the water, then quickly leave the exhibit before they could scamper over expecting to be hand-fed. This process was continued the length of this study. More significantly, when the penguins rushed over to be hand-fed during feeding times, I would place the birds in the water. As they swam back to shore to leave the water, they were handed silversides. At first, the penguins ignored the fish while they were in the water; instead they got out and came over to be hand fed.

However, when this technique was tried again, Bonnie and Squirt each ate two fish while they swam to the pool's edge, then they quickly exited the pool following the other birds. This process was continued twice a week, and by the second week, three more rockhoppers ate this way. Bonnie was now eating fish that were tossed near her as she swam to exit the pool. After 5 weeks of this protocol, all of the rockhoppers and African blackfoot penguins were eating while in the pool.

After 8 weeks of conditioning, they began jumping into the water once the first fish was thrown in. It took 9 additional weeks until the king penguins began to eat in the pool. Extra patience was needed with them because they were relatively more sensitive to changes, but they, too, ultimately responded to these conditioning practices.

Motivating Swimming Behavior: Once the penguins accepted fish in the water as food, I wanted to further reinforce their active swimming behavior. To facilitate this, two to four fish were thrown in at different places in the pool. Once they were all eaten, a pause of about 5 seconds followed, and then the process was repeated until the penguins seemed full. This method was advantageous because the limited number of fish in the water each time caused the penguins to grab and eat competitively. This rewarded them for swimming faster.



There was a dramatic difference in penguin behavior after they started eating in the water. Not only were they spending more time swimming, but previously unseen natural behaviors were occurring as well. Almost daily they were observed enthusiastically porpoising and bursting out of the water onto the exhibit walkway. Also, they would swim very fast in figure eights and circles around the pool circumference. Even Buddy and Maggie were swimming longer and more actively. After 9 months of conditioning, all of the penguins (except Rockette and Blue) would quickly jump into the pool to be fed when I entered the exhibit with food. After each feeding session, the smaller penguin species were still given access to three bowls of fish. Since the silversides and minnows were not enough to quench the king penguin's appetites, they were hand fed when they left the water.

I was initially concerned that more aggression would result from competition during the feeding sessions, but was glad to observe that aggression in the exhibit actually decreased. I believe that this was due to the increase in activity. It was extremely rewarding to have the penguins now spending approximately 6 hours daily swimming, versus the 20 minutes or so prior to conditioning.

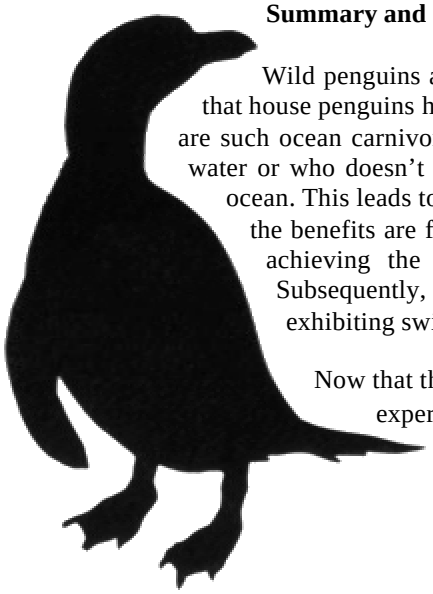
Conditioning with Toys: The penguins were clearly receptive to the conditioning techniques used to increase swim time. Now other forms of enrichment that would encourage active swimming behaviors, yet eliminate the need to put food in the water, were considered. Ellis et al. (1994) noted that various colored rubber balls could be used as toys for penguin enrichment. To incorporate this technique, I enlisted the aid of two summer interns, Paul Evans and Michael Kiselow.

We acquired hollow plastic balls that were red, blue, and black, and varied in size from 10-17.5 cm (4 to 7 in.) in diameter. Initially, during feeding sessions and while the exhibit was cleaned, the balls were placed on the exhibit floor to desensitize the penguins to them. Strangely, the rockhoppers seemed comfortable with the toys since three of them curiously pushed the balls around on the first day. Three days later, during a feeding session, the balls were placed in the pool and silversides were thrown near them to target the balls. After cautiously investigating the black ball, Bonnie was soon batting it around, but seemed to avoid the red and blue ones. The rockhoppers were at first very cautious of the balls in the pool, but over the next few sessions began to show more interest.

This was encouraging, but we had hoped for a more active response. Paul proposed using a hamster ball filled with silversides to promote more interest. We tried a yellow, 20-cm (8-in.) diameter hamster ball, with a smaller ball inserted to provide buoyancy. The hamster ball was used during feeding sessions along with the other balls and was targeted by throwing fish near it. Soon the penguins were eagerly pushing the hamster ball around trying to get at the fish inside. This process seemed to encourage them to play with the other balls as well. On one occasion, Bonnie persisted until she was able to tip the hamster ball. As a result, this released all the fish, which were quickly eaten.

After a week of using the hamster ball in conjunction with the other plastic balls, Bonnie was observed exhibiting more interest in the red ball, opposed to the others. She was seen pushing the balls around with great precision, similar to the way I have seen some sea lions do in shows. The plastic balls were only used during feeding sessions so that the swimming behaviors would continue to be reinforced. After a few weeks, the penguins were avidly playing with the balls as they floated within the exhibit pool.

Summary and Conclusion



Wild penguins acquire food only while they are in the ocean. In contrast, many institutions that house penguins hand feed them, thus rewarding them while they are out of the pool. Penguins are such ocean carnivores that one may question whether or not a penguin that doesn't eat in the water or who doesn't swim much, feels much like a penguin? They are adapted for a life in the ocean. This leads to the assumption that the more closely we can mimic that situation the greater the benefits are for our penguins. In this study, conditioning techniques were instrumental in achieving the goals of increasing swimming time and promoting natural behaviors. Subsequently, our penguins are swimming more actively, more frequently, and are exhibiting swimming behavior similar to penguins in the wild.

Now that the penguins ***are*** swimming more, the exhibit offers our visitors an enhanced experience. Now our patrons can get a closer glimpse into a more natural world of penguins.

Acknowledgments

I thank the Cincinnati Zoo and Botanical Garden, the Aviculture Department and staff, and the SeaWorld of Cleveland animal training staff, led by Ted Turner. Michael Kiselow and Paul Evans are thanked for their interest and innovative ideas. Bernadette Plair, Barbara Rish, and Monica Stoops offered useful manuscript comments. A special thanks goes to Randy Morgan for his skilled guidance and suggestions for composing this paper.

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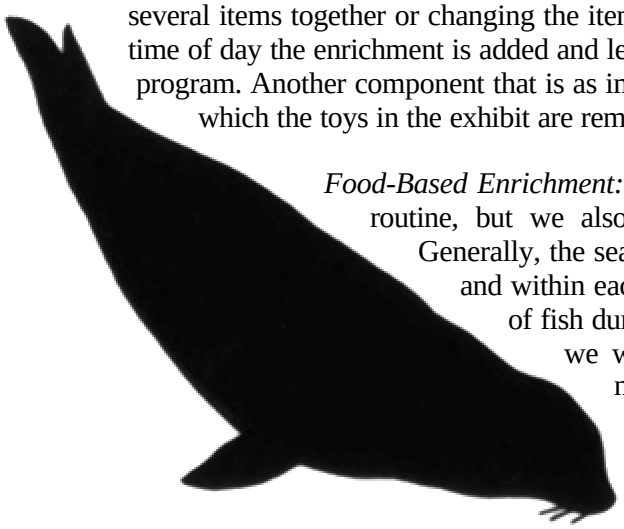
BEYOND THE TOY BOX: CREATING AN ENRICHMENT PROGRAM THAT ADDRESSES THE NEEDS OF THE ANIMAL AND THE STAFF

Holly Cowell and Kathy Taht
New Jersey State Aquarium, Camden, NJ http://www.njaquarium.org/

The New Jersey State Aquarium's marine mammal enrichment program was designed to address the needs of the 3.2 harbor seals (*Phoca vitulina*) and 1.2 gray seals (*Halichoerus grypus*) and the needs of the training staff. Our goal was not only to incorporate objects for the animals to interact with, but also to include other aspects of enrichment that are typically overlooked. Variety in diet presentation, training sessions, exhibit design, and social grouping are important parts of our program. From a management standpoint, it was important for both the animals and the training staff that the program was variable and that it was possible to incorporate into our busy routine. We overcame these obstacles by creating a monthly enrichment schedule and by writing a daily schedule which includes time for enrichment, training, and exhibit maintenance. Our enrichment program has evolved far beyond simply adding a toy to the exhibit, yet the time commitment is essentially the same.

Countless publications support the need for and benefits of environmental enrichment programs for captive animals. However, finding a program that works day in and day out can be difficult. Tossing a toy into an exhibit is easy, but a good environmental enrichment program is much more complex and should include physical, sensory, and social changes in the animals' environment (Carlstead 1996). The marine mammal staff at the New Jersey State Aquarium has developed an enrichment program with their harbor (*Phoca vitulina*) and gray (*Halichoerus grypus*) seals that has worked effectively for over 2 years. The program not only includes many components of enrichment that are typically overlooked, but it is feasible from a management standpoint.

Novel Object Enrichment: Adding Variety: A toy is probably the first thing that enters most people's minds when enrichment is mentioned. What may be challenging, however, is keeping enrichment devices variable. An obvious source of variety is object size, which in our case ranges from Frisbees to a 6 ft. x 5-ft. PVC raft. One of the goals of our program is to stimulate all of the senses. Brush boards, light sticks, scents, and animal noises over the sound system are examples of sensory stimulation that we have explored with the animals. How the enrichment device is presented is a critical component of our enrichment. Enrichment objects are placed in different areas in the exhibit including on deck, floating in the water, sunk to the bottom of the exhibit, hung above the exhibit, and on the public side of the underwater viewing windows. Attaching several items together or changing the item location throughout the day increases variability. The time of day the enrichment is added and length of exposure to the animals also adds variety to our program. Another component that is as important as enrichment devices is the "free day" during which the toys in the exhibit are removed and nothing is added.



Food-Based Enrichment: Food is obviously a critical part of the seals' daily routine, but we also found it to be one of the easiest things to vary. Generally, the seals eat several different types of fish throughout the day and within each feeding. However, sometimes we feed only one type of fish during a feed, or even during one whole day. On occasion, we will also add a type of fish to the diets that is not a normal component. The amount of fish fed per session, along with the size of the fish (whole or chopped) changes. During a session, there are several different

ways the food can be presented. It can be handed directly to the seal, tossed, put on a Frisbee and floated in the water, dropped through a short tube, or in the form of a "capelin ice cube".

Training as Enrichment: Training is an important component of our enrichment program, which is used to stimulate the animals both mentally and physically. Variability is incorporated into the training sessions as much as possible. The number of sessions, length, time of day, and content of the sessions changes daily. The seals are trained several different types of behaviors using primary and secondary reinforcement. Voluntary blood, out-of-water layouts for tactile examination, toothbrush, nail clip, and in-water layouts are examples of husbandry behaviors that we use to care for the animals physically. Natural behaviors allow the public to learn more about seals and their wild counterparts. Show behaviors such as high jump and recycle help us reiterate specific points that were made during a presentation. Training also takes place at a set of underwater viewing windows. The seals perform a variety of behaviors at these windows, giving the public a close-up view of the animals and giving the animals increased variety.

Most of our variability within sessions stems from the use of mobile "seats" or stations. These stations are plastic shapes that are hung from a clip on each seal's food bucket. The shapes that we have chosen are in the form of a letter from each seal's name. Each seal has been trained to recognize its particular shape (or letter) as the only place where it will receive attention from a trainer and be fed. In order for the seals to fulfill the criteria for the "seat", they must sit calmly in front of their letter and focus on their trainer. The seals should go to their seat regardless of the letter's location around the exhibit, thus increasing variability. Mobile seats also enable us to easily switch seals within a session, which makes training sessions more productive. One trainer can feed multiple animals, while other seals get individual attention and training. Then, the animals and trainers can switch to ensure that all training and animal goals are met. Each seal also gets the added benefit of working with and interacting with several other seals in one session.

Training is also an important tool that we use to increase animal interaction with enrichment devices. During formal toy training sessions, primary reinforcement is paired with the intended secondary reinforcer with the goal of training the animals how to interact with the object. It also familiarizes the animals with novel objects that may not have been investigated otherwise. These desensitization sessions help reduce fear of a novel object that may have otherwise been stressful (Laule and Desmond 1998). Primary reinforcement is also incorporated into enrichment devices that are added off-session. We have observed continued interaction with these devices well after the food is gone.

Training principles have been used to interact with the animals during non-food sessions. Prior to incorporating this aspect of enrichment into our program, the vast majority of the time we interacted with the seals, food was involved. Through this continued association, we became secondary reinforcers. We have used this association to our advantage by interacting with the animals on deck and at the underwater window without food. The seals can choose to interact with us as we answer guest questions, fill out our training records, or simply sit on deck. We have not had any occurrences of aggression toward us or between the animals, and because of the absence of food buckets, we feel it is clear to the animals that primary reinforcement will not be available during these sessions.

Habitat and Social Aspects of Enrichment: There are certain things about most exhibits that cannot be easily changed, but there are still opportunities for enrichment through exhibit design. The seal exhibit at the New Jersey State Aquarium is located outdoors, and consists of a 170,000 gallon salt-water pool with two major haul out areas. A gate in the middle of the pool gives us the ability to divide the pool in half, thus changing social grouping and the animals' environment.

The “upper viewing area” has a large deck, with rocks located on the deck, submerged in the water, and partially exposed to provide an additional haul out area. The main features of the “underwater viewing area” are the three large underwater viewing windows. Visitors can see the seals through the glass, and vice versa. Daily presentations take place at the windows, with the seals coming over to the glass and taking cues from a trainer. We have seen many different levels of interaction at the window between the animals, the visitors, and the trainers during off-session times. The windows also allow the seals to interact safely with other animal species, including African penguins. A holding building is located behind the exhibit, and the seals follow the trainers inside to one of two holding pools for an additional change of environment and enrichment opportunities. There are several different aspects of enrichment through exhibit design that we would like to explore further including changing the water level and adding floating docks that can be moved around the exhibit and arranged in different configurations.

Fortunately, our exhibit is designed such that at any given time the pool can be completely open, or separated by the gate. This gives us many opportunities for enrichment through social grouping. Our mixed species exhibit houses a non-breeding colony of 1.2 gray seals and 3.2 harbor seals. The seals can be separated into two groups when the gate is down, or all of the seals can have access to the entire pool. Our females are on birth control, allowing the males and females to be housed together even during breeding season. The number of seals per side of the pool varies, along with combination of males vs. females and harbors vs. grays. Additionally, the holding building is available for individual attention and training.

The training staff at the New Jersey State Aquarium understood the value of each of the above components to a good enrichment program. The two major challenges that we faced upon designing our program was variability and finding time. In the busy day of a trainer, how can we ensure that the enrichment gets done and gets done well? It took a bit of trial and error, but we have been successful in designing an enrichment program that is multifaceted and can be easily completed each day, thus meeting the needs of the animals, the training staff, and the managers.

Variety, Scheduling, and Documentation: Our most difficult obstacle to overcome was keeping our enrichment variable. We found ourselves being pressed for time during the day to do enrichment, and either it didn’t get done, or the same toys were added over and over again at the same time each day. We have since created an enrichment schedule that lists what and when enrichment should be done and, if necessary when it should be removed. We have also added to the schedule any specific changes in diet for enrichment purposes, and when the gate should be lifted. Once the schedule is written, actually adding the enrichment takes minimal time but allows maximum variability. Any reaction from the seals is rated, recorded, and evaluated. This schedule is created on a monthly basis by one of the trainers and responsibility for writing the schedule is rotated every 6 months. This keeps one person from getting burned out and allows other trainers to add their own creativity to the schedule. Any additional enrichment or interaction throughout the day is also recorded and rated.

Because a significant amount of enrichment in our program comes from components other than toys, we also needed a way to easily incorporate this non-toy variability into the daily routine. The daily routine is written into a schedule the evening before. Each day’s schedule is different and takes into account a variety of factors including staffing, training goals, number of shows, meetings, and exhibit maintenance. Writing out a daily schedule has the added benefit of keeping us from getting in a monotonous routine and providing enrichment only at “convenient” times. We have also found that our variability of sessions has increased, because without scheduling, we tended to fall back on the same behaviors and toys each session. Training time has become more efficient, as each trainer has a specific goal for the session.

Conclusion

The New Jersey State Aquarium's marine mammal enrichment is accomplished through a science-based program, rather than individual initiative. Our program is constantly evolving as the needs of the animals and trainers change and as we come up with new ideas and become more creative and naturalistic with our enrichment. Our program has come far beyond simply tossing a toy into the exhibit once in a while, yet essentially, the time commitment is the same. The difference lies in the positive impact this coordinated enrichment program has upon the staff, the public, and most importantly, the animals.

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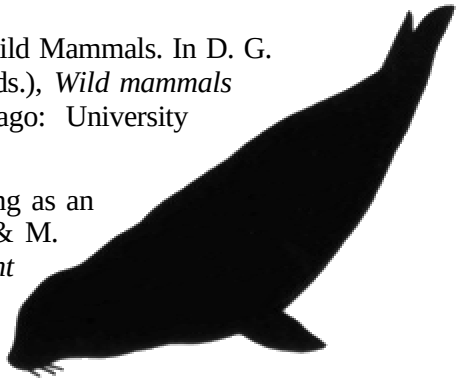


ACHIEVING ZOO-WIDE ANIMAL ENRICHMENT DAYS THROUGH SUCCESSIVE APPROXIMATION AND POSITIVE REINFORCEMENT

Michelle Farmerie
Pittsburgh Zoo and Aquarium http://zoo.pgh.pa.us/

As enrichment and training concepts and programs develop and evolve within institutions often the desire to share these concepts with the public becomes part of that evolution. Depending on the size, resources, and support within any institution this task may be easy or difficult. However, if two of the most familiar concepts of animal training, successive approximation and positive reinforcement are applied the task becomes much less formidable. By approaching the objective of establishing zoo-wide animal enrichment days as if it were a desired behavior to be achieved through a training plan there is then a familiar process that can be implemented. By recognizing that positive reinforcements can be obtained zoo-wide as a result of animal enrichment days many departments within an institution can be motivated to participate in working together towards one common goal, which ultimately enhances animal welfare. This is the process that has occurred at The Pittsburgh Zoo and Aquarium. The continuing development and evolution of this process has resulted in a shift of enrichment and training from an animal department cognizance to a collective zoo-wide consciousness.

The process began in the winter of 1998 when the Director of the Pittsburgh Zoo and Aquarium came across an article on an enrichment day at another zoo where some of that zoo's carnivores were given piñatas of prey animals. The Pittsburgh Zoo's Director then went to the general curator and asked if she thought the enrichment committee at Pittsburgh might be interested in organizing a day like that. The general curator then proceeded to ask the chairs of the enrichment committee if they would like to organize such an event. The enrichment committee at the Pittsburgh Zoo and Aquarium was a relatively new and small committee that had just recently been established in 1997. The invitation to organize such an event was greeted with excitement and enthusiasm. The Committee then tasked themselves with determining what concepts were the most important to be conveyed and how this was going to be accomplished. Because this was uncharted territory, the Committee was not sure how much latitude was going to be allowed and therefore held many meetings to organize their ideals and the steps necessary to reach their desired goal.

Getting Started: One of the first goals was to take this opportunity to educate the public about the concepts of enrichment and training and how these processes were at work at the Pittsburgh Zoo and Aquarium. It was decided that to achieve this goal signage of some sort would be a must. So, at a minimum, the visitors would leave knowing what enrichment and training were and with the knowledge that these things were occurring at the Pittsburgh Zoo everyday, even if visitors had not been aware of these things in the past. It was very evident that to meet this first goal of information dissemination the help of the Graphics Department would be needed and that without them the most fundamental step could not be made with any substantial effect. The Enrichment Committee then contacted the Graphics Department and explained some of the proposed concepts of Enrichment Day that would require signage. The Graphics Department was then asked if they would be willing to help. The Department agreed that they would be willing to assist in this project if the Director allowed them time in their day to work on it. The Director did, and thus the Graphics Department became the Enrichment Committee's first partner in achieving Enrichment Days. The terms that were chosen as the most important to define in print were:

Operant Conditioning – A type of learning in which behaviors are altered primarily by regulating the consequences that follow them. The frequency of behaviors is altered by the consequences that they produce (Scarpuzzi et al., 1991).

Positive Reinforcement – Anything that, occurring in conjunction with an act, tends to increase the probability that the act will occur again (Pryor, 1984).

Successive Approximation (Shaping) – Taking a very small tendency in the right direction and shifting it one small step at a time towards the ultimate goal (Pryor, 1984).

Environmental Enrichment – Any variable introduced into the animal's environment that stimulates mental and/or physical activity (Hanley, 1997).

Various Types of Enrichment

- *Diet Variation* – Allows food to be presented in new and different ways that stimulate behaviors.
- *Browse* – The branches and leaves of trees and shrubs used as food, exhibit furniture, or as play items.
- *Sensory Stimulation* – Can affect and elicit increased use of any of the five senses.
- *Novel Objects* – Anything an animal does not experience on a regular basis.
- *Puzzle Feeders* – Challenge animals to use their problem solving abilities to obtain food.
- *Training* – Provides mental stimulation to the animals through the process of learning.

It should be noted that these terms can be applied not only to animals but also to people and to institutions. It was decided that if the visitors walked away with anything, it should be the understanding of these things and knowing that they occurred not only on enrichment day but daily at the Pittsburgh Zoo and Aquarium. The definitions that were deemed most important were to appear on the special zoo map for the day along with the times and locations for the various enrichments and a number denoting which type of enrichment each activity was. This map also included the locations of the different tables and a brief description of what information, items, or activities would occur there. It was also decided that the commitment to this goal of visitor education and understanding of the event was to remain of the utmost importance as all other aspects of the day were developed.

The next goal was determining what type of enrichment was going to occur during the day. It was decided at this point that a comprehensive approach was most preferable. This meant that the goal was to achieve an example of enrichment for the visitors in each different animal area from primates and cats to the children's zoo and the aquarium. Thus demonstrating that the same "types" of enrichment were occurring in all the different areas of the zoo even though diet variation for an archerfish may look completely different from diet variation for a gorilla. This also then required assistance and support from three different animal curators throughout the zoo. The general curator assured the Enrichment Committee that this support would be there.

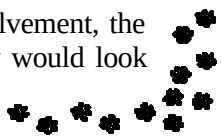
Another goal was to get visitors directly involved with the process of enrichment since first hand experience often assists in understanding. Even though the Enrichment Committee had only existed for a little over a year, one of the things that had already been accomplished was working with the Education Department to explain to students what enrichment is and how it works. One of the formats that had been developed was to have students watch and record ethograms of animal behavior prior to enrichment and then help in making various enrichments that would then be given to the animals. The students could then watch as their efforts provided enjoyment to the animals and record the differences in animal behavior. Two examples of this were bamboo and logs that the Horticulture and Grounds department cut and delivered. The Maintenance Department offered further assistance by drilling holes in the logs. The students could then fill both of these items with various novel foods from peanut butter and cheerios to honey and

mealworms. These items were then offered to the bears and primates to be manipulated and consumed. A very important part of this experience was explaining the importance of safety and the role of the Veterinary Department in the approval and development of various enrichment items throughout the Zoo. This was also helpful in explaining why masks and gloves needed to be worn by participants to protect the primates from any human germs. Because this program had been an overwhelming success, the idea was that this concept could be further expanded to the general zoo visitor on Enrichment Day. Because the Enrichment Committee had worked successfully and positively with the Education, Horticulture and Grounds, Maintenance, and Veterinary Departments in the past on these activities, it was hoped that this type of teamwork would again be possible for Enrichment Day. It was, in fact, overwhelmingly embraced.

At that point in the planning, it was realized that Enrichment Day would offer the perfect opportunity to illustrate not only for the public but also for all zoo staff what an integral role various departments in the zoo play in the ability of the animal staff to provide the highest quality of care possible for the zoo's residents. It was realized that many non-animal care staff did not know how important they were in the overall care of the animals. The general curator was first approached with the idea of various non-animal departments hosting tables to illustrate and explain their role in providing many of the tools and items necessary for the different forms of enrichments that occurred at the Pittsburgh Zoo and Aquarium. Upon her approval, department heads were approached and asked if they would like to participate in Enrichment Day, not only by doing what they always do in providing the logistical and technical support for the myriad of enrichment activities that occur daily zoo-wide, but also to share their role with other zoo departments and the public. Because this was a completely new idea, this first step in sharing so many of the behind the scenes aspects of the zoo was gigantic and was an accomplishment that everyone could be proud of. It was the first step in the shaping of the ultimate goal which was the sharing of this information in a clear and connected way that would eventually employ pictorial illustrations with text and a consistent theme with a continuous flow throughout the Zoo to illustrate how all departments zoo-wide contribute to animal enrichment.

The next question at hand was to determine the established parameters for the types of enrichment that could be shared with the public since the Zoo's policy is that all items on exhibit must be naturalistic. The Enrichment Committee compiled a list of as many naturalistic enrichment items as possible but also compiled a list of non-natural off-exhibit enrichments that the animals enjoyed but the public never saw. This list included items like balls, spools, mirrors, plastic garbage cans, and fire hose but also included more unusual items like the use of televisions and hammocks for primates, bubble baths for orangutans, papier-mâché piñatas for carnivores, and carcass feedings for vultures. The Enrichment Committee approached the General Curator and asked if on Enrichment Day, the solely naturalistic policy could be interrupted to allow visitors to see the complete spectrum of enrichments utilized at the Pittsburgh Zoo and Aquarium. This request was accompanied with the guarantee that the use of the non-naturalistic items would include a complete explanation of how they are used, why they are enriching, and how the non-natural items help to elicit naturalistic behavior in the animals. The General Curator agreed to take this request to the Director for approval or rejection. The Director approved this request, which granted the staff the freedom to truly offer the public a complete look at the lives of the animals both on exhibit and off. In addition to providing various enrichments during the day, the keepers in the different animal areas also had display tables for examples of enrichment and training items utilized in their areas. Keepers who had done posters, papers, or videos about enrichment and training were able to display their work in their areas.

Now that there was a clear understanding of parameters, support, and staff involvement, the Enrichment Committee was able to develop a complete picture of what the day would look



like in its most idealistic form. It included what was reasonable to expect the day to look like in its first year, and what could be done as the event evolved that would set the event up for even further success in the future, which ultimately, would allow for the realization of the complete vision for the event in the years to come.

Because this was the first attempt at a zoo-wide Enrichment Day, much was unknown and a budget was non-existent. Costs for the making of the bear logs and the bamboo feeders were absorbed by the Mammal Department budget and the Veterinary Department donated masks and gloves. As Enrichment Day(s) continued to evolve, the Veterinary Department was able to secure donated masks and gloves. Costs incurred for rentals of tables and chairs were kept down by getting by with the bare minimums. The Graphics Department absorbed left over costs from signage. The Commissary Supervisor secured donations from various vendors with which the Zoo does business. These vendors sponsored individual tables or activities in exchange for advertising. Some of this sponsorship also helped to offset the fee for the table and chair rental. One activity created for Enrichment Day was for visitors to put their handprint next to an actual handprint of a cotton-top tamarin to compare similarities and differences and to provide a take home souvenir from the event. The vendor's donation paid for the printing costs for the activity and the Education Department donated the paint.

The participation of the Docent Council at the Pittsburgh Zoo and Aquarium was crucial to the success of the event. Without their support, the event would not have been able to be maintained at a level consistent with the original goal for the event. Docents manned tables, answered questions, helped to coordinate and facilitate various visitor activities, and as always, shared their enthusiasm for, knowledge about, and commitment to the animals who live at the Pittsburgh Zoo and Aquarium.

As the day of the event neared, the Marketing and Public Relations Department was approached to see if any of the media would be interested in doing a story about the event. One of the city papers did come out to cover the event as it was in progress. This was the first step in shaping the desired goal of greater media coverage, which it was hoped would some day include advanced coverage. The Marketing and Public Relations Department was also involved in helping to organize and distribute various needed supplies during the event since Enrichment Day was considered a special event.

Challenges and Solutions

As the event of the first year took place, it was immediately evident which aspects of Enrichment Day were an overwhelming success and which aspects needed rethinking for the future. Because Enrichment Day was such a large undertaking and something that was never attempted before, there were several things that presented challenges throughout the course of the day.

One of the first items that needed to be readjusted for the next year was the scheduling of the day of the event. The initial date was picked, but it was realized too late to change, that it fell on the Saturday of Labor Day Weekend. This caused difficulty because not only was less zoo staff working because it was a holiday weekend, but also because fewer docents were available for the same reason. When planning the event for the following years, much care was taken to avoid scheduling this event near summer holidays.

Another oversight was that the number of docents needed per table was under estimated as time needed for breaks and lunches was not accurately taken into account. Locations of the tables in relationship to direct exposure to sunlight without any available shade also created a problem over the course of the day. It was also realized that additional information surrounding animal

training and which enrichment items were used for which specific purposes needed more detailed explanation. When planning the event for the following years the number of docents needed for each table was increased along with a decrease in the amount of time each docent signed up for. A floater system was also added so docents could be relieved for breaks and meals by other docents and staff. Care was also taken in future years to place tables in locations that provided shade. An Enrichment Days information packet was also created by the Education Department which included more descriptions of enrichment items which were submitted by keepers from different areas. A special enrichment and training class was offered by the Education Department for the Docent Council. This allowed time for a question and answer period so all the docents participating in the event had an opportunity to become more familiar with all the various aspects of enrichment and training.

Much of the initial signage for the event included the date of the event. This prevented the reuse of signs. In future years no dates were included on signage. As new approaches to sponsorship began to evolve, it also became apparent that sponsor names needed to be on their own sign instead of Enrichment Day signs to again allow the signs to be reused.

The original map included an explanation that the length of time of different enrichments vary from minutes to all day and the duration of any enrichment offered could not be guaranteed. Such disclaimers as "weather permitting" and "while supplies last" were also added to the map in following years. The timing of enrichments was also scheduled in a linear fashion as one might progress through the Zoo whenever possible. However, some offerings of enrichments could not fit into this pattern due to exhibit access and other constraints. At least two cycles of enrichments were offered to allow both morning and afternoon visitors an opportunity to view activities.

As the event grew over the years from one day to a weekend to two weekends, it became obvious that more staff was necessary to staff the increasing activities and events. A greater commitment from senior staff was made and they began staffing tables and assisting in activities as the Enrichment Day schedule became too large for the keepers to prepare and offer all the various enrichments as well as to be available at tables and all activities. With increased success also came other increases across the board from staffing to logistics to providing an engaging opportunity for as many zoo visitors as possible. In staying true to the original goal and commitment of a comprehensive zoo-wide Enrichment Day where each area of the zoo was equally involved to provide the visitor with a well rounded enrichment experience, 4 days was determined to be the maximum capacity or ceiling for this event at this point.

Future Evolution:
As the concept of Enrichment Days evolved, the event began to spur many new creative ways of expressing enrichment and training concepts to the visitors. Events were added that provided more activities that visitors could participate in such as *Forage Like a Primate* where pieces of individually wrapped candy were hidden in several spread out bales of hay. This allowed children to understand firsthand why scattering food in exhibits can create a stimulating and enjoyable activity for animals and can produce behaviors similar to those that the animals would exhibit in the wild.

Another event that was added was *Build a Room* where two PVC shells of a simulated holding room 6 ft. tall x 6 ft. wide x 6 ft. deep were erected side by side with hooks in all the same places. Each room also came with an identical set of materials including rope, milk crates, bread trays, branches, and food bowls. Two teams of children could participate at one time. Each team was given identical materials and the same amount of time to design a room. After they were completed, the children were asked to look at the differences between the two rooms which were

identical at the start. It was then explained to them how rearranging exhibit furniture can create an entirely new environment for the animals in that space and how this is stimulating to the animals and a form of enrichment.

Another display that was added allowed the visitors to see one complete day's diet for the gorilla troop at the Pittsburgh Zoo and one complete day's diet for a golden lion tamarin pair at the Pittsburgh Zoo. There was also signage at the display explaining how offering animals food whole versus in pieces is a form of diet variation and enrichment.

Also, as the Enrichment Days event evolved, it allowed for photos of visitors and animals participating in activities to be captured and added to signs designating where events would occur and what they look like for following years. An Enrichment Day theme look to the signs was developed and many photographs were able to be added to signs to help illustrate what had previously been text only signs thus allowing for a more complete and flowing picture of the many forms enrichment takes and how various departments all play a role in enhancing animal welfare at the Pittsburgh Zoo which was a main goal initially set when Enrichment Days was first conceived.

As the Enrichment Days concept continued to evolve, the role of the Marketing and Public Relations Department continued to evolve with the event. As the concepts of enrichment and training began to be understood more thoroughly, it allowed for marketing and public relations to better assist in educating the public about enrichment and training at the Zoo. With additional help from marketing and public relations, large sponsorships for the Enrichment Days event could be secured. For the second year of Enrichment Days, a single sponsorship of $8,000 was secured and for the third year of Enrichment Days, a sponsorship of $10,000 was secured. These sponsorships not only provided the money for additional supplies for events but also for advanced advertising both in print and on radio and television. Money was also distributed throughout the general fund for the Zoo and approximately $5,000 of the money went directly to the purchase of new enrichment and training items for the animals--items the keepers in each department were able to pick themselves for their animals.

Another department that was effected by the evolving understanding of enrichment and training at the Pittsburgh Zoo and Aquarium was the Development Department. As a deeper knowledge base was growing among staff, it was realized that this information could also be shared with potential Zoo donors and that enrichment and training was not just something that happened during the Enrichment Days event but something that occurred everyday at the Pittsburgh Zoo and Aquarium. In 2001, the Development Department secured $41,615 from donors utilizing the enrichment theme. This money also was allocated to the general fund for the Zoo to ultimately benefit departments throughout the zoo.

As a collective zoo consciousness around enrichment and training emerges and staff in all departments begin to understand that their efforts do in fact have an impact on enhancing the welfare of the animals in the Zoo's collection, an increased sense of pride and ownership emerges. This positive reinforcement creates increased motivation and departmental participation zoo-wide. This happens not only during the Enrichment Days event, but also every other day throughout the year. All members of the staff become more conscious of enrichment and training and more mindful not only of the things they are already doing that contribute daily to animal enrichment, but to the new things they think of daily and the ideas that are yet to come that will continue to have a positive effect on the animals at the Pittsburgh Zoo and Aquarium.

Enrichment Days benefits the entire Zoo because it stimulates positive growth and increases educational opportunities. This, in turn, increases development and public relations opportunities, which increases attendance, which increases revenue, which increases money and support for enrichment and training programs, which increases animal husbandry, which ultimately results in enhanced animal welfare.

In closing, remember this,…*If you can hold it in your head you can hold it in your hand …and … although the vision of one can change the world, the vision of many materializes from thought into form faster …*

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TWO BLACK BEARS PLUS INCONSISTENT TRAINING EQUALS MULTIPLE BEHAVIORAL PROBLEMS: OPERANT CONDITIONING TO THE RESCUE

Ginger M. LeBlanc
California State University, Bakersfield http://www.csubak.edu/

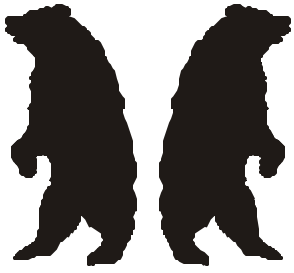
Cindi R. Carder
California Living Museum http://www.creec.org/region7/stories/storyReader$302

In May 2000, 2 orphaned black bears (Ursus americanus) were moved into a new enclosure at the California Living Museum. Upon arrival and thereafter, the bears would not shift into dens upon command. This situation led to the inability to isolate individuals that resulted in injuries to one animal. Furthermore, normal keeper activities such as cleaning and maintenance were generally disrupted. The purpose of this project was to improve the care and management of the bears using positive reinforcement. Specifically, the three main training goals were to shape the bears' behavior to move in and out of their dens upon command, train husbandry related behaviors, and to provide enrichment by training behaviors not related to husbandry. The first part of the program involved clicker training each bear. Next, the bears' shifting behavior was shaped using differential reinforcement of successive approximations. Within a few sessions, the bears were reliably shifting between den boxes upon command. The results of the program also included successful training of the following behaviors: targeting, paw presentation, mouth and eye inspection, should presentation for injections, body touch and a variety of non husbandry-related behaviors. This presentation includes a brief outline of the training goals and a short video showing individual training sessions and the overall success of the program.

Introduction

In the spring of 1996, two 4-month-old orphaned black bears (*Ursus americanus*) were brought to the California Living Museum (CALM) because their mother had been killed in a train collision. From 1996 to May 2000, the bears were housed in a small chain link enclosure (20 ft. x 25 ft. x 8 ft.) with only one separate holding area (17 ft. x 5 ft. x 8 ft.). In order to maintain the enclosure, the staff trained the bears to simultaneously shift into the holding area. This typically involved bribing the animals with their main meal in the holding area. As the bears got older, shifting became more difficult as the bears would often engage in fighting over the food. This prevented staff from successfully isolating each animal. Furthermore, it was nearly impossible to insure that each bear received their own diet as the dominant male bear typically consumed the female's diet. It became readily apparent that a training regimen would have to be put into effect. The goal was to get both bears to shift, on cue, at the same time into the holding area. Clearly, the start of the program was to clicker-train each animal and bring the shifting behavior under stimulus control.

Unfortunately, the training program was unsuccessful due to many factors. One problem was that none of the staff had any knowledge of how to correctly apply operant conditioning principles. In addition, the male bear was so dominating that he prevented the female from obtaining the rewards delivered. Another problem was that the female bear had an unpleasant experience during a guillotine door malfunction. Specifically, as the female was shifting, the door landed on her back. Finally, due to the fact that the enclosure had only one holding area, it was impossible to work with the bears individually.

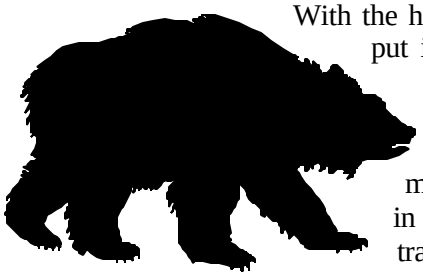


Because of the increasing problems and concerns for the bears' welfare,

a move to a larger enclosure with more room and separate shifting areas was imperative. As a result, these events expedited the modification of an existing enclosure rather than construction of a new bear facility. Subsequently, in May 2000 both bears were moved to their new enclosure. This enclosure consisted of three separate den boxes (9 ft. x 7 ft. x 8 ft.), each of which opened into the enclosure and adjoining den boxes.

Methods and Results

Other facilities suggested that the bears be held in their new den boxes for a few days prior to introduction into the outside enclosure. Initially, both bears had access to all three dens but ultimately needed to be separated for cleaning and then re-shifted. Unfortunately, the bears had not been trained to shift in their old enclosure and were running back and forth between each of the three boxes in the new enclosure. Furthermore, because of the inability to shift the bears on command, there was a concern that on the upcoming press day, the bears would be afraid to enter the enclosure and/or be recalled back into the den boxes. Therefore, a new training program was begun.



With the help of a local university animal behaviorist, a training program was put into effect. The first objective of the behaviorist's program was to train the staff how to correctly apply operant conditioning principles. This preparation would be essential to effectively maintain and further the training program. The instruction consisted of a few mini-lectures on how to clicker train and the essential factors involved in modifying behavior. Education then consisted of staff observing training sessions and then coaching of the staff by the behaviorist.

Typically, animal training consisted of three 15-20 minute daily sessions per bear. The first task, proper clicker training, was completed within one day (three training sessions). The second task was to use the principles of reinforcement to shape shifting behavior. On Day 2, shifting-training sessions were conducted. This training consisted of delivering a special reinforcer (e.g., food not included in their normal diet) only after the shifting behavior occurred. For example, during a training session a den door was open, the bear would move completely from one den to the desired den and remain until the door was completely closed. Once closed, the clicker was sounded and followed by a food reinforcer. By the end of the second day, the bears were reliably shifting on cue.

Concerned for the length of time it took the den doors to open and close (i.e., doors controlled by manual cranks), it became apparent that a target would be needed to hold or position the bear at the gate until the door was completely shut. Target training first consisted of finding an appropriate target stimulus (i.e., one that did not frighten) for each bear. This procedure involved using differential reinforcement of successive approximations to shape the nose-to-target behavior. This target behavior was then combined with the shifting behavior, creating a behavioral chain. Thus, shifting behavior now consisted of a den door opening, the bear moving from one den to the desired den, approaching and holding on a hand held target until the door completely closed. That sequence was followed by the sound of a clicker and then a food reward. In an effort to reduce the total number of humans required for the process (i.e., one holding the target and one operating the door crank), a target was painted on each of the den walls. Within a few trials, the bears generalized the targeting response to the wall target.

On Day 4, the bears were released into their habitat separately due to previous enclosure experiences, and to determine the security of the enclosure (i.e., capturing one bear instead of

two). After exploring the new habitat, each bear was "asked" to return to the den (i.e., den door open cue), and then jackpotted (i.e., a larger than normal reward quantity).

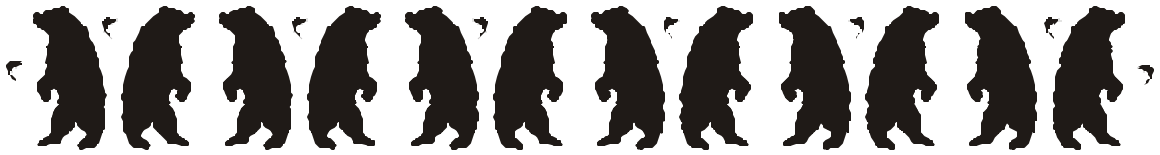
On Day 5, press day, the bears were introduced into their new enclosure and successfully recalled back into their den boxes. By Day 7, the bears were allowed access to their new enclosure and were reunited for the first time in 2 weeks. Thus, within 1 week, the staff had learned how to properly clicker-train and apply principles of reinforcement. In addition, and more importantly, the bears were reliably shifting on cue and holding on a target.

Within the next 2 months, the staff was able to use reinforcement to shape a variety of husbandry related behaviors. These behaviors were ranked in terms of their anticipated importance. For example, the first behavior shaped was paw presentation (i.e., placing pads on paw flat against gate). This training was timely as the female bear had a foxtail embedded in her paw and we were able to easily remove it. Other behaviors trained included shoulder injections, mouth, eye and nose inspections and overall body exams. Enrichment training was initiated to reduce the probability of the bears engaging in stereotypic behaviors (e.g., pacing) and to increase the probability that the bears would engage in more natural behaviors.

Conclusion

The purpose of this presentation was to demonstrate the effectiveness of operant conditioning in the extinction and acquisition of behaviors. For example, in 1 week, keepers at CALM had successfully trained a number of behaviors in bears that had a history of inconsistent training. Application of positive reinforcement resulted in reduced stress for animals, and better management procedures for staff.

In the future, our training program will move in three directions. One goal is the inclusion of more physically and mentally stimulating behaviors. For example, the bears will be trained to engage in natural behaviors such as moving logs, scratching, and climbing. Another goal is to develop a comprehensive medical training program (e.g., "volunteer" blood draw, stethoscope training). Finally, the training program will focus on emergency preparedness procedures (i.e., earthquake, fire, and objects falling into enclosure).



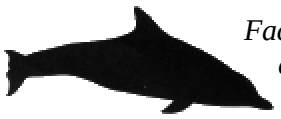
VARIABLE ENVIRONMENT CREATION USING POSITIVE REINFORCEMENT AND ENRICHMENT AT WILD ARCTIC, SEAWORLD, CALIFORNIA

Mike Price and Eric Otjen
SeaWorld, California http://www.seaworld.org/index.asp

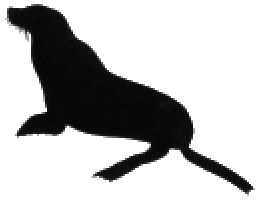
At SeaWorld in San Diego, we've created a variable environment for the three polar bears at the Wild Arctic. Positive reinforcement is an important part of our husbandry training program as well as being cognitively enriching. Training shifting behavior with the polar bears allows us to display multiple combinations of animals throughout the day. Using enrichment that affects all the animals' senses makes the environment even more stimulating. Variability occurs when different food items are delivered in various ways to the polar bears. The combination of training, enrichment devices, changing the social structure, and variety of food and feeding methods creates an environment that is novel. The conjunct use of all four methods created variability; no one method stands alone. For the polar bears at Wild Arctic, no day is the same.

A SPOONFUL OF SUGAR: USING POSITIVE REINFORCEMENT AND ENVIRONMENTAL ENRICHMENT FOR MARINE ANIMAL REHABILITATION

Petra Cunningham-Smith, David R. Smith, Corie L. Baird, Charles A. Manire, Howard L. Rhinehart and Samantha Deckert
Mote Marine Laboratory Dolphin and Whale Hospital and Sea Turtle Rehabilitation Hospital, Sarasota, Florida http://www.mote.org/~cmanire/news-Sep01.phtml

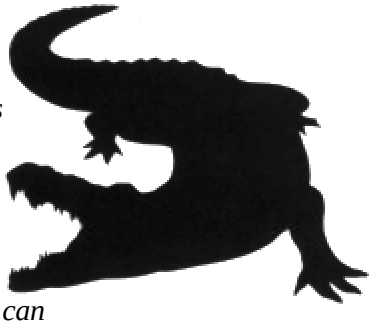


Facilities that care for stranded whales, dolphins, and sea turtles face many challenges during the rehabilitation of these animals. In addition to injury or illness, these animals are subject to medical conditions resulting from the stress of stranding, captivity, inactivity, and isolation, often resulting in a poor prognosis for their rehabilitation and release. At Mote Marine Laboratory Dolphin and Whale Hospital and Sea Turtle Rehabilitation Hospital, the animal care staff has developed a program using operant conditioning techniques and environmental enrichment to reduce the stress of captivity, restore health, and condition these animals for return to the wild. The benefits of such programs have been well documented in long-term captive animal facilities. This paper will discuss the adaptation of these principles for use in a rehabilitation setting and provide examples of their successful use in the rehabilitation of marine animals.



SHIFT TRAINING THE PHILLIPINE CROCODILE AT OMAHA'S HENRY DOORLY ZOO

Jessi Krebs, Teresa Shepard, and Lee Simons
Henry Doorly Zoo, Omaha, Nebraska http://www.henrydoorlyzoo.com/



The Philippine crocodile (Crocodylus mindorensis) is a medium size crocodile that requires special management techniques in captivity. Due to the anima's aggressive behavior toward keepers, no free contact is allowed at Omaha's Henry Doorly Zoo. Starting in June of 1997, the challenge for the keepers was to condition an individual adult male to shift on command from the exhibit to an adjacent holding area. After exhibit maintenance was complete, the animal shifted on command back to a specific spot on exhibit. We share the various techniques used to accomplish this behavior along with the ideas for future behaviors. It can also be used as a guideline for any institution that deals with crocodilians.

The challenges that face crocodilian keepers are many. Safety is one of the most important. Different species require different husbandry methods. The techniques used for the American alligator (*Alligator mississippensis*) must be modified for more aggressive species such as the Cuban crocodile (*Crocodylus rhombifer*), or the Philippine crocodile (*C. mindorensis*). With this in mind, we at Omaha's Henry Doorly Zoo have adjusted our protocols to safely house the aggressive Philippine crocodile. Safety procedures dictated no free contact with the animal at any time. To enable exhibit maintenance and feeding, shifting techniques needed to be established. Shift training was utilized for the animal to enter and exit the holding area.

When we received the Philippine crocodile from the Gladys Porter Zoo in June of 1997, he was already conditioned to come to the sound of a five-gallon bucket banging on the ground. This was the cue they used to bring him into the holding area for feeding and exhibit maintenance. After being at the Omaha Zoo, it took a couple of weeks to reestablish this behavior. As of this writing, this behavior is executed at a 100% success rate. The next challenge was to get the crocodile to return to the exhibit on cue. Due to exhibit design, it is not possible for the keeper to use the bucket technique to call the animal back on display, Unfortunately, the crocodile would not go back on display immediately. Because of this, we would have to give the crocodile access to the exhibit to go out on his own accord. This would sometimes take hours. A wireless doorbell was used in the display to replicate a technique seen in the cat area of Disney's Animal Kingdom. The plan was to have the crocodile to go to that specific point in the exhibit upon exiting the holding area. The goal was to have him shift back on display after feeding, cleaning the exhibit, and in the mornings after being in the holding area overnight.

In September 1999, we started the training process by calling the crocodile back into the holding area, rewarding him, and locking him in. After the animal was secure, we would then place food next to the concealed, wireless doorbell. During the first training session, the food was placed at the target area, and the keeper returned to the holding area. The crocodile was then given access to the exhibit. At this point, the doorbell was rung to establish the cue. After the crocodile went out on exhibit, the deeper watched until he got to the designated area and ate the food. When this occurred, the doorbell was also rung to pair the stimulus (doorbell) with the response (going on display). For our first trial, it took 3½ minutes for the crocodile to go out, as movements were slow. The next training session took far less time with faster movements. On the third training

session, however, he refused to go out on exhibit, so the reinforcement was taken away. The training process was repeated several times during the month, with varying positive results. By the 27th of September, the animal had learned the behavior. When the doorbell was rung, he went out. At this point, we decided to start giving the animal access to the holding area at night. He immediately went to the holding area on his own. In the morning, the big test was to see if the crocodile would go out on cue. At first, unless the crocodile was shown the food (a rat) that was put within visual range, he would not respond. After three sessions, however, he executed the behavior with no problem. Ever since, the animal has executed the required behavior consistently.

During our time on this project, we have encountered a few obstacles. The normal diet for the crocodile was two 100-g rats once a week. Our first concern was that with frequent training using rodents as rewards, the animal would become obese. So the animal's weight was monitored closely, and food rewards were reduced to adult 20-g mice. Secondly, if the crocodile did not see the food item, his response time was very poor. We decided to step back and place the food item in an area where he could see it from the door. We did this for a few training sessions. We also saw that high humidity in the area corroded the remote control. Because of this, after 5 months, the doorbell had to be moved to the holding area and rung from inside. The animal still associated the sound with the original spot and it did not seem to affect the desired behavior. In the future, to add to the training, we want to condition the crocodile to go to different doors with different cues and return to the exhibit. This will show the crocodile can learn multiple cues.

Crocodiles and alligators are intelligent creatures that need special considerations in captivity. The behaviors that we have trained to this individual are the fist steps in understanding the potential of learning for all crocodilians. With creative thinking and a need for protected contact, there are limitless training opportunities for these animals.

THE VIEW FROM WASHINGTON

Denise Sofranko
U.S.D.A. http://www.usda.gov/

No written paper submitted.

Presentations: Saturday, 2 March

SUN BEAR TRAINING WITH GATORADE

Karla Anderson
Minnesota Zoo http://www.mnzoo.org/

Our objective was to develop a training program for our two Asian sun bears (Helarctos malayanus). The purpose for this training was to add to the current bear enrichment program. Also, we wanted to train specific behaviors to help perform simple medical procedures without chemical immobilization. Initially, when the bears did a behavior on their own that we wanted, we voiced a command and gave a hand signal. Then we said "good bear" as a bridge, and Gatorade was sprayed into their mouths as reinforcement. Eventually, the bears understood which command went with which behavior. Now they are asked to do a variety of behaviors, in varying order, for varying lengths of time for intermittent reinforcement. Ten-minute training sessions are held twice a day. So far, the male will do 7 behaviors and the female does 11 behaviors. The training is paying off. As a result of this training, after our male injured his front paw, we were able to debride, clean, and apply ointment to his paw three times a day until it healed. In addition, our female will sit on a scale for monthly weights. We are also able to track her reproductive cycle through daily vaginal cytology. The bear training sessions have become an important part of our enrichment program as well as an aid in their care. Both bears look forward to the sessions, even the female who was once hesitant and easily frightened. The bears continue to learn new behaviors and in the future we hope to be able to do nail trims and mouth examinations for both bears and ultrasound examinations on the female.

The Minnesota Zoo is home to two Asian sun bears (*Helarctos malayanus*). Our male 4-year-old bear was orphaned in Malaysia at 4 months old when his mother was shot for damaging trees at a local plantation. He ended up in a temporary holding facility operated by Sahab Wildlife Department of the Malaysian Government. He spent 2.5 years there before coming to our zoo in June 2000. Our female is also from this same facility. She was captured at 3 years old for unknown reasons. She spent 4 years there until she was transferred to the Cleveland Zoo in September 1996. She came to the Minnesota Zoo in June 1999 and is now 12 years old.

We wanted to develop a training program for these bears for a number of reasons. Bears are extremely intelligent and are prone to stereotypic behaviors if they are not kept stimulated mentally and physically. Our zoo has an enrichment program for the bears and training seemed to be a good addition to it. Also, the Bear Taxon Advisory Group (TAG) brought these bears to North America to establish a strong captive population from bears of known backgrounds. In order for these bears to breed, they need to be well adjusted. Bears that come from small holding facilities often exhibit stereotypic behaviors. Enrichment and training help the bears adjust. The female arrived at the Minnesota Zoo with a history of stereotypic pacing, submissive behavior, and was anti-social towards other bears. We found her to be fear aggressive and very negative towards the staff. The male was generally well adapted, but did some fur plucking. We wanted to discourage this and prevent any other stereotypic behaviors. He was very eager to interact with the staff, so we encouraged this. In addition to helping the bears adapt, our veterinary staff wanted us to train the bears to assist in simple medical procedures without immobilization. We have found that sun bears respond very poorly to anesthesia. Finally, the Bear TAG recommends standardized training for all imported sun bears. This training will provide continuity when they are transferred from institution to institution for breeding thereby making the transition easier.

Our method of training was to use positive reinforcement. First, we needed to teach the bears to accept Gatorade as reinforcement. The male accepted Gatorade from the spray bottle immediately. With the female, we had to begin training very slowly. She would only approach the front of the enclosure when a keeper was present and it was feeding time. She would go to the food shoot. So we sprayed the Gatorade on the floor near the shoot. She would lick up after we left. Later, she would lick it up while we were present. Then she would try to catch the stream of Gatorade from the spray bottle. Eventually, she learned to accept Gatorade directly from the nozzle of the spray bottle. Then it was time for her training to begin. We can't make a bear do anything he doesn't want to do. Therefore, we waited until we saw a behavior we wanted to encourage and then reinforced it. We don't know whether bears learn better by hearing or seeing, so we covered both methods by giving a hand signal and a vocal command with each behavior. When the bears correctly performed a requested behavior, we said, "good bear, good" and name of the command, e.g. "good sit", as a bridge. Then fruit punch flavored Gatorade was sprayed into the bears' mouths for reinforcement. We learned not to change flavors by negative reinforcement delivered by the bears. When a different flavor was offered to the female, she swiped at the keeper. Eventually the bears understood which commands went with which behaviors. Initially the training sessions were very short. Now, training sessions are 5 to 10 minutes long. They occur twice a day, in the morning before the male goes out on exhibit and midday before they both go out on exhibit. Three keepers participate in the program. For consistency, only the head trainer teaches new behaviors. Once the bear performs it reliably, the behavior is added to the routine training program used by the other keepers. Dangerous or aggressive behaviors, such as swiping at the keeper with claws or paws, results in the trainer saying "no" and an immediate end to the training session. The trainer will leave the holding area completely or go to the other bear's training session. This seems to be very effective as they act frustrated like they are missing out. An incorrectly performed new behavior results in the trainer repeating the command until the behavior is done correctly. If the behavior is well established and done incorrectly, it results in the trainer saying, "No". Of course if the bear continues to perform incorrectly or not perform the behavior at all, the trainer will just move on. It's their choice to participate in training. The next time the problem behavior is done correctly; it is reinforced with extra Gatorade.

We have had very positive results from our training. Our male bear has learned 8 behaviors. Our female bear has learned 14 behaviors.

The *paws* behavior allows keepers to examine the bear's front paws. For this, the female places both front paws up on enclosure front at the same time. Our female needed to learn this behavior because of her history of pacing causing injury to her paws. Fortunately, she has not injured her paws at all since she has been at our Zoo. The male puts each front paw through enclosure front one at a time when asked. This has turned out to be a very useful behavior. Last year, our male got a 1-in. diameter wound in the palm of his paw. Because of this training, we were able to debride, clean, and apply ointment to the injury three times a day until it healed.

The *nails* behavior could allow keepers to trim their nails. Fortunately, they seem to keep their nails in good condition. When we began teaching this behavior to the female, she would strike out at the keeper if the keeper tried to touch her. We progressed slowly. Now, she allows the keeper to touch both her front nails and rear nails (this is on the feet command) while she holds her nails still on the front of the enclosure. The male allows the keeper to manipulate the nails on his front paws as he puts them through the front of the enclosure. He allows the keeper to touch the nails on his rear paws (this is on the feet command as well) while he holds them up against the front of the enclosure.

The *feet* command applies to the rear paws. It is useful for examining for injuries. This behavior has been useful with our male because he also slides up close enough to have his legs against the front of the enclosure. We have been able to desensitize him to having a syringe on his leg. In training we do not use a needle, but for his last immobilization, we were able to inject him with the anesthesia. He backed away after half the injection had been given, but returned when asked and allowed us to finish the injection. This was a huge improvement compared to the usual stressful darting procedure.

The *sit* command requires the bear to sit calmly with its rear end and front paws on the floor. It has become very useful with the female because from there she learned to sit in a wooden box and then to sit in the box on top of the scale. We can now get monthly weights on her. We have not been brave enough to put the box and scale in with the male because he likes to shred everything in his possession into tiny pieces. We will continue to work on this with him.

The *climb* behavior has been taught to our female bear. She climbs up on the front of the enclosure. This allows us to examine her abdomen and mammary glands while all four paws remain on the front of the enclosure. We learned that the keepers at Miami Metro Zoo obtained vaginal cytology on their sun bears. The *climb* behavior has allowed us to take vaginal swabs as well for determination of the bear's estrus cycle. We have learned that this bear cycles every 30 to 32 days.

From the *climb* behavior, we were able to teach the female the *belly* behavior. This allows keepers to touch her abdomen. Initially she tried to swipe at the keeper's hand. So we proceeded very slowly with this behavior. We hope to eventually to be able to do an ultrasound on her while she is awake and cooperating.

Both bears have learned the *stand* behavior. This allows us to examine their abdomens. They will stand with their front paws on the front of the enclosure and their rear paws on the floor.

Our female will shift between her two enclosures on command. The *shift* behavior is useful when we need to move her out of her large enclosure to put the scale in for weighing.

The male bear often puts his tongue through the front of the enclosure. For the *tongue* behavior, he will put his tongue in the keeper's hand. The veterinary staff wanted us to put this behavior on a command because they hoped to use this to administer medicines directly to a mucus membrane. This often speeds up the intake of drugs.

Our female bear was taught to touch the keeper's hand with her nose. This *touch* behavior established rules for contact. She is not allowed to swipe at the keeper's hand or open her mouth near the keeper's hand. It took a long time for her to trust the keeper enough to perform this behavior.

The *target* behavior was one of the first behaviors the bears learned. The target is the end of a dowel. Both bears were curious enough to go to the target, which is the desired response. We were able to modify this behavior to extend the length of time the bears are required to stay at the target. The female will stay for about 1 min and the male for only about 30 sec. This can be useful for examinations. Also, the target can be used to teach other behaviors.We were able to teach the female the *down* behavior by placing the target on the floor and giving a hand signal. Eventually, we removed the target and now she will lie down on just a hand signal. In the future, we hope to teach both bears to press different parts of their bodies up to the target.

The *push* behavior was something the female bear started doing on her own. It seemed that she wanted the area at the front of the enclosure clean before she sat down to train. So we put it on a command, but it has no real value right now. We hope that maybe in the future she will push items out under the front of the enclosure.

Our male bear does the *bring* behavior. He will bring an item in his enclosure and push it through to the keeper if it will fit. Otherwise, he will just push it up against the front of the enclosure. He started doing this on his own so we put it on a command. It has no real value, but it seems to make him very happy. Initially he would bring us any item in his enclosure including huge logs, his water tank, paper, cardboard, orange peels, and feces. We had to modify the behavior so he did not bring feces or anything that had feces on it.

The *all done* signal is given at the end of each training session. In the beginning the female would get frustrated at the end of the training session and keep trying to do more to get more Gatorade. Now she understands the session is over.

The training program has improved our management of the sun bears. The most important improvements for the male bear were allowing injections for immobilizations, allowing treatment of paw injuries, and his general pleasure with interacting with keeper staff. The most important improvements for the female bear were allowing vaginal swabs, allowing weighing, and her tremendous change to a positive attitude towards the keeper staff from fear aggression and avoidance.

The bears continue to learn new behaviors and in the future we hope to do nail trims, dental exams, ultrasounds for the female, and weigh the male.

Training is just a part of the bears' enrichment program. The bears receive enrichment items on exhibit twice a day, in the holding area once a day, and they have training sessions twice a day. In their holding area, some of the enrichment items they enjoy are: card board boxes, phone books, logs, various bedding, fire hose and rope hammocks, water tanks, 55 gallon plastic drums, and a variety of treats. On exhibit, some of the enrichment items they enjoy are: pumpkins, boomer balls, scatter feeder, bowling balls, Christmas trees, snow, popsicles, mulch pits, logs, and various treats.

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USING CLASSICAL CONDITIONING TO MANAGE A MIXED SPECIES REPTILE EXHIBIT AT THE JACKSONVILLE ZOO

Kenneth Cole
Jacksonville Zoological Gardens http://www.jaxzoo.org/

The use of classical conditioning to improve management and husbandry for reptiles and amphibians is uncommon, and the literature is limited when compared to that available for mammals and birds. This paper describes the successful use of classical conditioning to locate, examine, and feed two species of snakes. Jacksonville Zoo's exhibit "Wild Florida" includes several large mixed species exhibits that present management challenges. The Mangrove Swamp exhibit provides numerous hiding opportunities for three small mangrove salt marsh snakes (Nerodia clarkii compressicauda) and an Everglades rat snake (Elaphe obsoleta rossalleni). These snakes were conditioned to come to the door of the enclosure after presenting an initial cue of tapping on the branches or the floor of the exhibit. Individual animals were quickly located using this technique, eliminating the risk of injuring a camouflaged snake when entering for exhibit maintenance. As a result, daily husbandry routines were shortened, there was reduced stress on the animals, and a positive enriching experience was provided for the snakes. The training sessions and exhibit maintenance routines also became opportunities to educate the public.

Introduction

On 31 March 2001, the Jacksonville Zoo opened the "Wild Florida" exhibit featuring over 55 species of native Florida wildlife. In the Herpetology Building, over 40 species of reptiles and amphibians are grouped into 19 exhibits, representing different Florida habitats, housing species normally found in that particular habitat type. One of the largest exhibits is a semi-aquatic enclosure with two species of snakes; 1.2 mangrove salt marsh snakes (*Nerodia clarkii compressicauda*), and 0.1 Everglades rat snake (*Elaphe obsoleta rossalleni*); and two species of aquatic turtles; 0.1 three stripe mud turtle (*Kinosternon bauri*), and 1.0 Florida mud turtle (*Kinosternon subrubrum steindeckneri*). The animals can be found in the black and red mangrove swamps, canals, and brackish areas along the southern coasts of Florida (Ashton & Ashton 1988). Mangrove salt marsh snakes are small snakes and we observed them spending quite a bit of time hiding in their enclosure. Locating each snake every morning, servicing the exhibit, and feeding each animal became a challenge for the staff. Although snakes often associate entry into their enclosures with an opportunity to feed (Whitehead 1999, 2000), this was not the case with this exhibit. Opening the service door caused the mangrove salt marsh snakes to either stay hidden or retreat in the water. Hiding in the water when startled is natural behavior for mangrove salt marsh snakes (Flank 2000). Even though the Everglades rat snake was a long term captive, she became difficult to feed in such a large exhibit. Extra long tongs were used to feed her from the keeper door. At times she would eat immediately, but most often a thawed rat would be left in the enclosure overnight. Since servicing the enclosure for daily husbandry required the keeper to enter the exhibit, it became apparent that for safety reasons we needed to locate these snakes on a daily basis. A keeper could easily step on a camouflaged snake, risking serious injury or even death to the snake. To minimize this risk, we needed a method to locate each animal from the keeper door. A conditioning program was initiated to train the snakes to come to the door for food and inspection. This way we could locate all the animals and safely perform daily routines.

At the Jacksonville Zoo, training has been done with Nile crocodiles (*Crocodylus niloticus*) and West African green mambas (*Dendroaspis viridis*). This training has dramatically improved both

management and safety (Lepera et. al. 2000). An audible cue made by popping your lips together, similar to that of a juvenile crocodile, was used in conjunction with feeding the Nile crocodiles. The Nile crocodiles are conditioned to come toward the cue, and enter a holding pen or shift area where they are fed. This allowed us to safely shift these reptiles. With the mamba training, a tapping cue was given; this got the attention of the snakes and seemed to be felt throughout the enclosure. The mambas would respond by shifting into boxes attached to the outside of the enclosure. Once inside the boxes, they were fed their weekly diet of mice. This allowed the keepers safe access into the enclosure for exhibit maintenance. At the National Zoo, all of the Cuban crocodiles (*Crocodylus rhombifer*) are conditioned to come to a whistle during feeding (Davenport 1995). This allowed them to shift very dangerous reptiles in and out of areas for different reasons and improved management and safety. Similar training has been done with amphibians at the Louisville Zoo. Tapping on cage furniture has worked in conditioning Chinese crocodile newts (*Tylototriton shanjing*) to emerge from their burrows for a food reward (Johnson 1998). This type of training and behavior modification would help solve some of the management problems faced with the mangrove salt marsh snakes. By pairing a tapping cue to elicit a feeding response, locating and feeding would be safer for the animals and make it much easier to complete daily tasks. The methods used with our mamba training were incorporated for use with the mangrove salt marsh snakes. A cue of tapping could be heard, felt in the trees or prop roots of the mangrove trees, and even under water if the snakes were hiding.

Materials and Methods

The exhibit is a flat-backed hexagon with three large glass-viewing windows in the front. There is a 250-gallon water feature that allows for underwater viewing. The exhibit has over 810 square feet of floor space. Inside are three artificial red mangrove trees (*Rhizophora mangle*) with their prop roots exposed. The two species of turtles spend most of their time in the prop roots. The walls of the exhibit are painted to represent the salt marshes around the Everglades region of Southern Florida. Inside there are also logs and branches dispersed throughout the exhibit for climbing and security. Dry grasses were used as substrate as these snakes are vulnerable to blisters and infections if they are kept on a damp substrate (Flank 2000).

My first goal was to condition the mangrove salt marsh snakes to come to the door of their enclosure for every feeding. These snakes were fed once per week, so training was incorporated into their regular feeding schedule. Their weekly diet was used as their reward during the training. The second goal was to locate the snakes if they were hiding. For routine maintenance locating the snakes is essential for their safety. To accomplish this, we needed to reinforce the behavior on a variable schedule. Any other time a cue was given to locate or remove the snakes, no food was given. The last goal included desensitizing the snakes to human contact. Newly captured snakes will bite readily and will copiously void all the contents of their cloaca and musk glands (Flank 2000). This would make it difficult and messy to measure, weigh, and periodically check the animals on a routine basis. Once accustomed to being touched, the snakes become easier to handle.

A cue of tapping was used on the exhibit furniture (branches, trees, cage floor) with tongs, forceps, or a snake hook, and paired with the scent of fish. The mangrove salt marsh snakes are forage specialists concentrating mainly on fish trapped by the falling tide (Tennant 1997). With a pair of forceps, pieces of thawed capelin (*Mallotus villosus*), a small fish commonly used at our Zoo in animal diets, were used to lay down a scent trail leading to the keeper door. The snakes responded to the scent with increased tongue flicks and began actively searching the enclosure, investigating and following the scent trails. Once they were on the trail to the door, the snakes were rewarded with very small pieces of fish until they reached the door, then they were fed the

rest of their diet as a bonus. When housing many snakes in a single enclosure, striking snakes may injure each other during feeding (Whitehead 1999). To avoid injury, the snakes were closely monitored while eating. This also ensures accurate record keeping by marking only what was offered and consumed. During feeding, the snakes were regularly handled by stroking their backs or picking them up to get a closer visual inspection of the health and size. The animals were periodically weighed to check for proper growth and weight gain during the sessions. This helped to desensitize them to handling. The snakes would even eat immediately following the handling or weighing procedure, thus reinforcing the behavior.

On 19 July 2001, a second female mangrove salt marsh snake was introduced to the exhibit. We waited to place her on exhibit because of her small size. In addition, she would be difficult to spot, as she was a different color morph, a dark green, and blended in perfectly with the mangrove trees. Initially we housed her in a holding tank behind the exhibit until she reached a more desirable weight and size. She was not included in the training sessions while off display. She was not fed the week prior to putting her out on exhibit hoping she would be hungry and respond to the training. I used the same baiting methods and techniques that were described earlier to feed her at the door. Within two training sessions, this newly added snake was coming to the door with the rest of the snakes for her food reward!

As the snakes grew and needed larger food items, I started adding freshly killed baby mice or pinkies to their diet. As this species forages for fish in the wild, switching diets can be difficult. At first, the snakes refused pinkies, and would eat only fish. Weldon et al. 1994 suggested washing the pinkies under warm water removing any original scent, then rubbing the pinkies on the preferred food item, in this case, thawed fish. This worked and the snakes readily accepted the scented pinkies, so I switched the primary food source to pinkies, and occasionally offer fish as enrichment.

During a training session on 28 August 2000, the female Everglades rat snake unexpectedly came to the door where I was giving the cue. I promptly gave her a rat as a reward to reinforce the behavior. This animal was not the subject of the initial training; however, she has now become part of the feeding session, eliminating the need to leave food in the enclosure over night. Her response not only came as a surprise, but also offered a valuable training lesson: Expect anything and be ready.

Results

During the first month of training, the snakes were acclimating to their new enclosure. Initially time devoted to the training sessions lasted as long as 30 minutes. Currently, training sessions are finished within a few minutes. Feeding is done safely and efficiently with all animals growing and gaining weight. By associating the tapping with a food reward and the opportunity to feed, the snakes were conditioned to come to the door for food. They are fed weekly as part of their training, on a variable reinforcement schedule. There is an advantage for the snakes to investigate the tapping every time. The opportunity for food might be there. These snakes respond to a simple cue and come to the door for feeding, allowing for visual inspection to check for possible problems or husbandry issues. This also allows keepers to locate and count the animals if they were not visible at any time. Once they were desensitized to handling, they could be picked up and weighed periodically, or completely removed for exhibit renovations, maintenance, or encounters with the public. When the snakes are opaque, a condition prior to shedding, they usually respond to the tapping and participate in the training, but will not always feed. This is somewhat unusual since it is our experience that opaque snakes are often immobile and refuse food until ecdysis.

Discussion

These results show that reptiles can be trained and will respond to simple cues. The fundamental principles for training were successful in changing the feeding strategies for these snakes, and improved husbandry practices while creating a safer situation for the snakes. This method of training seemed best for animals that actively forage and are more active, as opposed to the sit and wait predator. Safety is an important component in our daily activities and this training method directly benefited the health and security of the animals. The initial time invested in training paid off because the routine was shortened considerably with each training session. Daily routines were shortened and reduced stress on the animals. No longer are they stressed when the service door opens. The animals are growing quickly and have been observed courting and mating numerous times, sometimes even during the training sessions.

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ANIMALS IN FILMED ENTERTAINMENT: FROM COERCED BEHAVIOR TO POSITIVE REINFORCEMENT

P.J. Muller and K. Goschen
American Humane Association, Los Angeles, California http://www.ahafilm.org/

Animals have played an important role in motion pictures, television, and commercials since the beginning of the film industry in the 1920s. Dogs, cats, and especially horses are among the most common 'animal actors', although increasing numbers of exotics are used. In the early years, the welfare of screen animals was frequently overlooked, and it was not uncommon for some animals to die on set through deliberate attempts to create a dramatic screen image. As recently as the 1980s, certain desired behaviors were achieved though coercion or negative reinforcement rather than positive training. For example, horses were wire-tripped rather than trained to fall, and shock collars were employed to elicit behaviors. While today the shift in philosophies of animal training has led to dogs, cats, birds, and exotics working in film principally being trained through positive reinforcement, there remain trainers who employ force, punishment, food deprivation, and other aspects of the "negative" side of operant conditioning to achieve results. The situation is more severe with horses and other livestock (possibly because of entrenched traditions regarding training and husbandry of these animals), and in non-U.S. filming locations such as Mexico. Practitioners of positive reinforcement have much to learn from and offer to animal actors and the film industry. There continues to be a great need for information and publications, both lay and scientific, regarding the link between animal welfare and positive reinforcement training in film settings.

OLD DOGS…AND ORANGUTANS…CAN LEARN NEW TRICKS

Michael Bates
San Diego Zoo http://www.sandiegozoo.org/

An operant conditioning training program, based on positive reinforcement, was implemented to improve husbandry and veterinary care of the orangutans at the San Diego Zoo. Specific behaviors were taught in order for them to voluntarily participate in procedures necessary for their care. Staff teamwork and facility modifications were key to accomplishing these objectives. Enrichment, reduced stress, and increased safety for both human and ape participants have been evident benefits. The daily management and quality of life of these animals continue to improve as a direct result of this ongoing program.

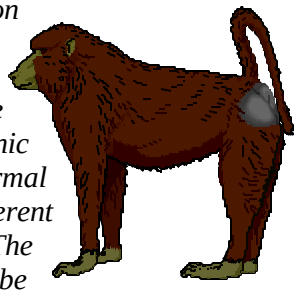
SERENDIPITY: IF YOUR MONKEY GIVES YOU LEMONS…MAKE LEMONADE

Michael Bates
San Diego Zoo http://www.sandiegozoo.org/

Following a routine annual examination in January of 2000, a 14-year-old female golden-bellied mangabey (Cercocebus galeritus chrysogaster) was diagnosed with Type 1 diabetes. Historically, an animal with this condition would require isolation from conspecifics in order to monitor diet, glucose levels, and to administer insulin injections on a daily basis. These requirements were immediately met as a result of previously trained behaviors initiated for husbandry and enrichment purposes. Once the diabetes was regulated, she was returned to her social group of 1.3 individuals where she has maintained her alpha female status and has continued to thrive. Insulin injections are administered morning and afternoon at which time glucose and ketone levels in the urine are determined. Blood glucose levels are also monitored by skin puncture three times daily, twice a week or more, if necessary. A special diet has been formulated to accommodate the diabetic restrictions as well as meet the dietary needs of the other individuals in the group. This individual is being treated successfully for diabetes while it continues to live in the complex environment that she lived in prior to the diagnosis. These results exemplify the importance of establishing training as a fundamental aspect of animal husbandry and enrichment.

MANDRILL POKING 101

Tracy Frampton and Kelli Harvison
The Oregon Zoo http://www.oregonzoo.org/



Primate training has been successful at many institutions, but each situation has its own special challenges. None of the mandrills at the Oregon Zoo had been exposed to operant conditioning when a medical problem was diagnosed in a low-ranking female. At that time, she was so shy that she would not even come to the keeper for treats. Her condition was chronic pharyngitis and the biopsy result kept coming back as allergies. Intradermal allergy testing revealed a host of allergy problems. She was on several different series of oral medication to try to alleviate the problem to no avail. The veterinary staff decided that a series of allergen injections should be attempted. In order to inject a mandrill, the animal must be manually restrained using a squeeze cage. Considering the recommended injection series is every other day for 36 injections, this would be too stressful for the animal and impractical for the staff. With a year and a half of "baby steps," she was finally accepting saline injections every other day. On the day before the series was to start, the consulting veterinarian decided that she should actually receive two different allergen shots. They could not be mixed in a syringe, so that meant two injections every other day. As of this writing, she is half way though one of the allergens series and ¼ of the way thorough the other. Although the primate staff was quite skeptical that this animal was trainable at all, she is now being injected willfully every other day and hopefully, she can breathe a little easier, too.

Mandrills (*Papio sphinx*) are terrestrial primates that live in large groups, usually consisting of an adult male and many females. This species has been exhibited at the Oregon Zoo for many years and presently we have 1.4 animals. In 1998, an 11-year-old female named Victoria was having respiratory problems including one life-threatening episode of anaphylaxis. After several biopsies and tests, it was determined that she had hypersensitivity to inhaled or ingested allergens. Intradermal allergy testing was done in December of 1999 and the results revealed sensitivity to many plants, molds, and insects. Husbandry changes were made such as removing the straw bedding. The keepers disliked this solution because the mandrills enjoy searching through it to find seeds, produce, and insects. Oral medication was also tried. The husbandry changes did not help, and the oral medications were not a hit. Due to the bad taste, she did not take them reliably. Some treatment options were corticosteroids, antihistamines, or fatty acids but these only treat the symptoms and some have negative side affects. A veterinary allergist consultant highly recommended trying allergen injections. Of course, she treats domestic animals that can easily be given injections every other day for 24 days.

Mandrills are another animal all together. They are a highly social primate species with a strong dominance hierarchy. Any false move could be disastrous for their social standing. Those low on the hierarchy are always looking over their shoulder, waiting for an attack. In addition, female mandrills average about 35 pounds and are quite formidable. The keepers do not go in with these animals. The holding area has a built-in squeeze cage which works fine. It still takes a bit of work to get an animal in there and it is very stressful for everyone. Squeezing Victoria down every other day for 24 days would definitely not help her situation. In addition, subcutaneous injections are difficult in a squeeze. It was finally determined that she would benefit from a training plan so she could receive her injections willingly.

The primate collection is quite diverse but only a few training projects have been tried in the area and none with the temperamental mandrills. Other institutions have done training with mandrills but we haven't heard of any with regular injections as a goal.

Make A Plan: In June 2000, her training began. It was decided that it would be better not to have a regular primate keeper train her because she was more nervous around them than around "roving keepers." It was quite slow at first…and at second…and at third. She was the most nervous mandrill in the group. After taking plenty of time to decide it was safe, she did finally come up to get treats 6 or 7 times on the first day of teaching the bridge. She didn't even seem too nervous at the sound of the clicker. After several days, she would come up to the mesh and sit down to wait for treats instead of grabbing one and running away. After about 2 weeks, I stopped bribing her to come up to the mesh by holding the treats where she could reach them. The treats were not flowing as freely. I starting trying to wait for her to make the first move toward the mesh. She was still quite nervous. I even tried holding one finger up to the mesh, which she touched curiously, so I bridged that. After several times she started to squeeze. So, the next day I introduced the target pole, which was just a small dowel. The caging has ½ in. mesh so it needed to be pretty small to fit through the mesh. It took about 2 weeks for her to adjust to this change. That's really when I admitted that this may take a while! I started trying time outs to get her working better. They seemed to have no effect. Then, during one session, I decided to try working another mandrill just next door. This worked. Jealousy can be a valuable tool.

Patience (stubbornness) Pays Off: After about a month, my knees were giving out. The mandrills' holding cages are about 3 feet high, so I need to squat to work the animals. I commandeered a small stool to sit on for the sessions. It took about 1 week to get her used to the stool. Okay. That's when I admitted that this was really going to take some time! Once I got her used to the stool, I decided that I needed to get her used to changes. I started bringing all sorts of weird things in with me during the sessions. These included custodial signs, buckets, and visitor signs with giant primate pictures or anything wacky looking. After a short time, she got to where she didn't seem to notice my strange objects. After about a month and a half, she was grabbing the target pole with authority.

Plan Ahead--Month Two: The long-term plan was to train Victoria to put her arm in a sleeve, holding a handle at the end of the sleeve. She would need to receive a intradermal injection from a member of the veterinary staff while the trainer controlled her. I knew we were many, many steps away from that goal but since Victoria was so sensitive to changes, I wanted to introduce a new person as early as possible. So, on 1 August we introduced the veterinary technician, Kelli Harvison. Victoria suddenly felt outnumbered and decided it was not safe. After a time-out, she came up and worked but was still nervous so the session was kept short. Normally, after the sessions, I usually sat and fed Victoria her breakfast for a little bonding time. This became Kelli's job on days when she was there for the session. This continued for most of August. Kelli would participate 2 days a week, leaving me 3 days alone to work on furthering her targeting. Then, this female mandrill on oral birth control gave birth!

She earned one day off and then, it was back to the drawing board. She came up to me only once the next day but seemed more confused than nervous. Then, during the next week it took bribery to get her to come up to me each day. Suddenly, one day she started working normally again. After 2 weeks, she was working at the same level as before the birth. However, soon after this she went on strike. I would work the other two mandrills in training and then sit down with her for a while. She would just sit in back of the cage and look at me. This continued for a while. I would be there every day and just sit there with her. I knew she would let me know when she was ready to work again. After 10 days of this, she suddenly decided to come up and start working again.

And we were progressing again. Since then, the baby has been comic relief, competition and even a teacher, showing her mother how to take juice out of a syringe.

Month Four: Finally in November 1999, the hole was cut in the mesh and a flange was attached. The removable sleeve would easily fit into the flange for sessions. The prototype was a simple clear tube of 3 in. PVC with two windows cut into it. The end had a fitting with another ¾ in. gray piece of PVC, which acted as a handle. None of the parts were glued so we would have more flexibility with the apparatus. The length of the sleeve was just a guess and had to be adjusted several times. It would not be strong enough to handle lots of abuse from the other mandrills so when not in use, it would be removed and a cap would be placed in the hole. I began sticking the target pole through the cap on the flange to encourage her to target near the sleeve area. Then the sleeve was introduced. It would take many steps to get her from targeting at the near end to grabbing the handle at the far end. I was at the point of asking the maintenance person who built it for me to adjust the length one more time because she just couldn't (wouldn't?) grab the handle. Then, suddenly she reached it. She must really stretch and she can't look at me while her arm is in the sleeve, but that works fine. This stage took about 1 month.

Be Willing to Redesign Your Plan--Month Ten: Getting her to stay in the sleeve for more than a few seconds and desensitizing her to me touching her arm took another month and a half. The next step was introducing a "fake" syringe. This was the same size syringe that we would eventually be using. The needle was filed down and glued on to prevent her from grabbing it. This step took many months. I was making progress on the days I worked her alone, but on days the veterinary technician joined me, we made no progress at all. We finally decided to change gears and have Kelli try to work her alone. That did it. She did great for Kelli when there weren't 2 of us there. So, we had our first major change in plans. Now, I would be doing the injections, too.

Build Trust--One Year: The progress seemed glacial. We would go through cycles where she didn't work well for days and then we would have a few weeks of great sessions again. Changes in the social dynamics of the group would carry over into the sessions. I spoke with a colleague who had trained mandrills at another institution. Her observation was that it really took a full year to build the trust and then they would do anything for you. We were now approaching a year and I must concur.

Make Training Conditions As Close As Possible to the Actual Procedure Conditions: On 15 July 2001, I finally stuck her with a needle for the first time. I only wanted to stick her about once a week and the other days I would continue using the fake syringe. We would carry up the real syringes and fake syringe for every session and switch them back and forth throughout the sessions. We would always use a medication vial and pretend to fill the syringe each session as well. She notices slight changes so we wanted to keep them to a minimum. After a couple of weeks of this, I finally injected her with 0.1cc of saline. There was no reaction, but the next day when I "fake" injected her, she ran to the back of the cage and checked out her arm.

Don't Give Up: As we really began making progress, the vet staff began getting a game plan for the treatments. I was really pleased with the fact that she was letting us inject her once a week with saline. I finally thought that the allergy series may really work. Then, the veterinarians came back with the plan: she would need to be injected every other day for several months. As optimistic as I was throughout this long project, even I was beginning to doubt that we could push her this much. But we persevered.

Month Fifteen: In October 2001 we were finally ready to begin the allergen series. Victoria was being injected every other day with saline without problem. Now the hold up was the consulting veterinarian. We were waiting for her to order the drugs and get us set up. A new complication arose. My husband and I suddenly found out that we were going to be parents in a couple of months (we were adopting a child). I would be starting family leave some time in December. All along, I was the principal trainer and the veterinarian technician, Kelli, was the secondary trainer. Now, we needed to prepare for a shift of roles. I was hoping to still come in occasionally for training while on leave but did not want to make any promises. I was beginning to feel a bit anxious about getting started now.

Coordinate Your Efforts and Plan for the Worst: In preparation for the treatments, we made a plan for execution. This included organizing an emergency kit for worse case scenarios, writing a plan for emergency responses in case of a negative reaction by Victoria, making a schedule of injection days and a schedule of concentrations and volumes, and rearranging work schedules to accommodate the vet staff as well as the keepers. For the last few months, training took place at 6:00 a.m. in order to work around the other keepers' schedules and the construction work in the area. That hour was a bit unreasonable for the veterinary staff, since their workday ends much later than the keepers'. The compromise was a starting time of 7:00 a.m. That is still quite early for me to be in the right frame of mind to draw up drugs correctly. Therefore, Kelli marked the drugs and color-coded them so we wouldn't make a mistake at such an early hour. The planned therapy was to use five different concentrations of the allergen. Each concentration would be given in increasing volumes totaling 6 doses. We would start each vial with a dose of 0.05 ml and finish with 0.55 ml before moving onto the next greater concentration.

Example:

Concentration	Volume
1:100,000	0.05 ml
"	0.1
"	0.2
"	0.3
"	0.4
"	0.55
1:10,000	same 6 volumes
1:1000	same 6 volumes
1:100	0.05
"	0.07
"	0.1
"	0.2
"	0.3
"	0.4
"	0.5
1:10	same 7 volumes

And then a maintenance dose of 0.55 ml every 2 weeks would follow.

Implement Your Plan--Month Seventeen: Wow, that was a lot. By early November, the drugs had arrived and we were ready to go. But, the consulting veterinarian had a last minute change; we would need to use two allergens! The options for handling this change were: 1.) do two injections every other day or 2.) stagger the allergens so she would get one injection every day or 3.) do one whole series (several months worth) and then start the next allergen series. We opted to see how the first allergen went and if things were smooth, we would start the second allergen sometime during the middle of the first series. After 3 weeks of the first series, we decided that

she was doing very well and we added the second, therefore giving her two injections every other day. We are now almost at the maintenance dose of the first allergen and all is going well. Then only injections that were missed were around the holidays and for several days after one of the other female mandrills was killed by her cage mates. She has never refused an injection.

This project has taken much planning, preparation and coordination between departments. We can't yet say if this been a medical success since we haven't determined that her reaction to the environmental allergies was decreased. A full examination under anesthetic will take place once the therapy has been completed. This will tell us if her inflamed tissue has healed. I do feel that this project has been a training success although it will always be a work in progress.

TO THE MAX: ADDRESSING BEHAVIORAL AND HEALTH CHALLENGES WITH A 32-YEAR-OLD MALE GORILLA (*GORILLA GORILLA GORILLA*)

Ingrid Anne Russell and Alan Varsik
Santa Barbara Zoological Gardens http://www.santabarbarazoo.org/

During 2001, we had to address a number of behavioral and health challenges with Max, one of our three male gorillas (Gorilla gorilla gorilla). I will, in brief, present the repertoire of management tools that we have used to improve the care and health of Max. Our specific concerns were obesity (which was affecting his mobility), and his over-grooming behavior that was focused upon a wound on his rump. Over the past few years, we have been working toward reducing Max's weight. The addition of training sessions using positive reinforcement has helped expedite this success. During this process, we have collected data on the frequency of a number of other behavioral concerns including corprophagy, under-grooming, over-grooming in concentrated areas, finger sucking, and head shaking. This information will aid us in identifying the causes and outline steps to decrease these undesirable behaviors. In addition to Max's weight challenge, in February of 2001, Max sustained an injury to his left leg (cause unknown), which led to the presence of a wound on his posterior, which he continued to over-groom. To address these challenges, the Zoo put together a program that included the use of positive reinforcement, removal of perceived negative stimuli, dietary supplements, and 24-hour monitoring. We have been able to surpass the critical point with Max regarding his wound and continue to make progress with addressing his abnormal behavior. A lot of behavioral data has been and continues to be collected to assist in Max's management. The gathering of behavioral data has been critical in our success. We have just completed an in-depth physical examination with Max and hope to continue making progress toward increasing his quality of life.

The Santa Barbara Zoo has addressed a number of behavioral and health challenges with Max, one of three gorillas in our bachelor group. These challenges included obesity, a lingering locomotion problem, and over-grooming behavior that was focused on a wound on his rump. Strategies were developed to address each of these challenges. They included developing and applying a weight-reducing diet, changing Max's environment, veterinary treatment, and collecting and analyzing behavioral data during application. A common element in the strategies has been and continues to be behavioral conditioning. Behavioral conditioning has been applied to reinforce and develop desired behaviors, as well as decrease and eliminate unwanted behaviors. The result of these combined management techniques has been largely successful at meeting the intended goals.

On 19 April 1996, the Santa Barbara Zoological Gardens received its first western lowland gorilla, *Gorilla gorilla gorilla*, Max, a 27-year-old male silverback from the Topeka Zoo. Max was soon joined by two 5-year old males, Goma and Kivu on 7 November, thus forming a bachelor group. A bachelor group is a collection of males that can include various aged animals.

The Santa Barbara Zoo's gorilla exhibit takes full advantage of the coastal California climate. The large outdoor exhibit area includes a running stream and live trees. Guest viewing is from three locations, two overlooks and a glass-fronted viewing area. The gorillas are exhibited year round. The off exhibit area is configured to give flexibility in animal management. It is comprised of two levels. A large *gang room* is upstairs as well as a small-scale room. The downstairs area is comprised of four *bedroom* stalls. A vertical chute or *gorilla-vator* connects the gang room upstairs to the bedrooms downstairs. Both areas have separate access to the exhibit. We can easily shift and separate animals through this system.

During the first 4 years at the Santa Barbara Zoo, Max's weight was not monitored consistently and his diet varied greatly. This along with his usual sedentary behavior resulted in a significant weight gain. Max weighed in at 644 lbs. in May 2000. Compared to other adult male gorillas, Max has a small skeletal frame thus making his weight even more significant. The obesity was even more serious due to Max's age. (In his 30s, Max could be considered an older animal.)

Our goal for Max's weight challenge was a combination of weight loss and an improvement in overall muscle tone. We created an initial goal weight of 500 lbs. to be achieved by the end of 2001. Max's weight loss plan included development and application of a nutritionally complete significant weight loss diet and development and implementation of an exercise program.

Max's was the first diet addressed by our contracted zoo nutritionists. A diet was developed and implemented in May 2000 which included 4,811 kcal/day. The diet included a reduction in high calorie items such as fruits and nuts and an increase in leafy vegetables. The diet remained fairly constant in overall volume of food, but the calorie content changed significantly. Application of the diet changed as well. It was applied with more consistent foraging opportunities that promoted locomotion. The favored items, fruits, became an increasingly effective motivator for behavioral conditioning.

An exercise, "workout", program was created. The keeping staff identified trained behaviors, which would best facilitate these workouts. As Max had received very little formal training previously at the Santa Barbara Zoo, we began by conditioning a bridge. A whistle was used for the primary bridging stimulus and "good boy" was conditioned as a secondary bridge to reinforce a chain or approximations of behaviors.

Max's workouts consisted of walking from one side of the gang room to the other, standing up to his full height and reaching above his head, climbing up onto the benches in the gang room, and reaching to touch a number of different points along the mesh wall of the gang room. Max already knew how to touch a target and this behavior was used to initiate the actions in the workouts. The target behavior was a very important tool in getting accurate weights on Max. The scale platform did not fill the entire surface of the scale room and Max preferred to keep one foot on the curb giving an inaccurate weight. A swimming pool bead/float target was attached to the ceiling mesh. This allowed keepers to center Max on the scale platform as he reached to touch the target, thus getting an accurate weight. The other important behaviors to train for physical therapy were conditioning a *call*, conditioning a *send*, and conditioning a *station.* With these behaviors established, one keeper could facilitate workouts on their own. The *call* behavior brought Max to the keeper to proceed with the work out. The "send" behavior sent Max from one keeper to another or to another place. *Station* positioned Max in a desired location. The call and send behaviors facilitated an *A to B*, which, in Max's case, moved him about 15 feet from one side of the gang room to the other. This repertoire of behaviors allowed workouts to take place even when there was only one keeper working on a given day.

The addition of exercise to Max's diet program expedited weight loss and encouraged movement and activity at all times (whether a keeper was present or not). Max began using his benches more than ever before. From 644 pounds in May 2000, Max began a dramatic weight loss to a weight of 475 pounds in January 2002. Since our initial goal had been met, we set a new goal weight of 400 pounds, which we hope to reach by the end of 2002. Again, his overall condition and muscle tone is being assessed along with setting goal weights.

A second and concurrent challenge with Max began on 20 February 2001 when Max came off exhibit at the end of the day dragging his left leg. It did not appear to be the result of a traumatic incident as no injury was visible and there had been no reported fighting between animals. We decided to treat the symptoms with physical therapy, which was incorporated into the workouts already in progress.

A third challenge was discovered on 28 February 2001. We caught the first glimpse of what was to be a very serious condition. As Max's activity increased, so did the falling away of debris that had previously matted to his hair. We then discovered that Max had a number of pressure sores on his gluteal region. Max continued to bother the sore, thus preventing total healing.

Over the next few months, the wound began to heal to a point then Max picked at it and opened the wound again. Keepers treated the wound topically by pouring a disinfectant on the scale platform and targeting Max to sit in it. This treatment prevented infection but Max prevented total healing of the wound.

On the morning of 15 April 2001, we were alerted into emergency mode when keepers discovered a significant amount of blood in the gang room. The wound continued to worsen over the next few weeks. In response, Max was separated from Goma and Kivu, we started 24 hour video monitoring, and we began to categorize and collect data on his behavior with an ethogram identifying a number of aberrant behaviors we call "Maxisms". Our initial observations indicated that picking at the wound took place most often shortly after keepers left at night and just before they arrived in the morning.

To discourage picking, an attempt was made to change Max's sleep patterns by shading the windows of his holding area. This was effective in increasing his average night's sleep by approximately 2 hours, initially falling asleep earlier and waking later. Keepers increased the amount of behavioral enrichment Max received and spent more daytime hours with him. By 24 June, none of our tactics had proven highly effective, and the bleeding bouts were getting worse. Our veterinarian prescribed the use of a sedative, haloperidol, and two different blood coagulants, as well as vitamin therapy. The animal care staff responded by beginning a 24-hour keeper watch and the using aversive stimulus to stop Max from picking at the wound.

The gorilla keepers knew that Max reacted strongly to the use of the hose or having water sprayed near him. We decided to use this tool to train Max to leave the wound alone. We transferred this reaction from the hose to a large squirt gun. The first time we used it, we paired spraying Max with the verbal cue, "Max, no". Max immediately responded by removing his hand from the wound. In just a few incidents, Max made the connection between touching the wound and the negative application of the squirt gun. Soon, just the visual cue of the squirt gun made Max alert. We could then remove the squirt gun from sight and rely upon, "Max, no" which we reduced to, "Max".

Over the next few months, the picking behavior completely extinguished. We were very lucky to have an aversive stimulus that was so continually effective in deterring Max. We also used positive reinforcement in addressing the picking behavior. When the picking behavior began to fade, we used positive reinforcement in the form of "good boy" and a food reinforcer to encourage Max to extinguish the picking behavior by reinforcing abandoned attempts. The 24-hour team of babysitters that stayed with Max for 2 months also had a very positive effect on Max. Max appeared more relaxed in the absence of Goma and Kivu, utilizing more of his space

and napping during the day. Removal of Goma and Kivu from Max's spaces is a form of negative reinforcement.

The later part of 2001 saw the total healing of Max's wound and the weaning of Max off of all medications and babysitters. We were able to perform a physical exam on Max on 13 December 2001. Anesthesia was performed with increased confidence with the decrease in Max's weight. The physical exam showed a very healthy animal but no definitive source of the limp, which still persists.

Because of the limp, which may put Max in a compromised position with two 10-year-olds that are beginning to assert themselves, we continue to manage the gorillas separately. Max and Goma and Kivu are rotated onto the exhibit and kept separated in the holding area. We are currently exploring options to provide for an appropriate social experience for Max.

The new and improved Max of today is a lighter, cleaner version than what we saw a year ago. We continue to collect and analyze data about the *Maxisms* or aberrant behaviors that we have identified in our observations of Max. We hope through further study and training, we can provide the best management practices for Max and all of our gorillas.

Acknowledgements

The success of *Project Max* was due to the dedication of a team which included: Rob Draughon and Sheryl Cummins, primary gorilla keepers at the Santa Barbara Zoological Gardens, the entire animal care staff at the zoo; the Moorpark College E.A.T.M. class of 2002 for helping with the 24-hour watches; and the Santa Barbara Zoo research interns, Kasi Fowler, Rochelle Marsland and Lauren Abercrombie, who spent countless hours watching "Max TV".

OVER THE FALLS WITH A BARREL OF MONKEYS

Sara Sivertsen, Darren Minier, Mike Rumback, Wendy Ricker, Jennifer Dickey, Karla Gaitan, Gary Wilson, Cindy Wilson, and Mara Rodregez,
Moorpark College http://sunny.moorparkcollege.edu/~eatm/

Using operant training techniques, our objective was to teach a troop of 4.4 Capuchin monkeys (Cebus apella) at Moorpark College in California, America's teaching zoo. The behaviors were:

1) *simultaneously station via protected contact,*
2) *voluntarily take oral antibiotics, and*
3) *gate into a restraining device to allow for us to administer a sedative for TB testing.*

The RD has been presented and the gating behavior is currently in process. We have successfully met two of our goals, stationing and taking antibiotics voluntarily. The difficulties in training include intra-troop dynamics, communication between all six trainers, and rates of training progress among individual animals.

CURIOSTIY TRAINED THE RHINO: OPERANT CONDITIONG IN *DICEROS BICORNIS*

J. David Geurkink and Doug Pyatt
San Antonio Zoological Gardens and Aquarium http://www.sazoo-aq.org/

Operant conditoining has a wide range of uses throughout the zoological community. Although previously employed to train animals to perform for visitor's amusement, this procedure has been adapted in recent years for use in husbandry and general veterinary care. The goal of this project was to condition a male black rhinoceros (Diceros bicornis) to allow non-restrained blood draws from the brachial vein. Using basic operant conditiong techniques, the rhino was trained to position himself along a safe-contact area that facilitated access to his forelimbs. Subsequent training with a succession of blunt to slightly sharp tools acclimated the rhino for the eventual insertion of a butterfly needle; 6 months into training, blood was drawn on the first attempt. This procedure has been continued to allow monthly blood draws, and similar techniques could be easily adapted for other noninvasive veterinary procedures.

Introduction

The subject animal for this study was an 8-year-old male black rhinoceros (*Diceros bicornis*) from the Bronx Zoo. One of the original objectives was to maintain the animal's natural tractability; once achieved, basic veterinary and husbandry procedures were begun. These consisted of routine oral, eye, and ear examinations that required desensitization of the rhino. At no time during conditiong was the rhino restrained; all participation on his part was voluntary. Thus, if the rhino abandoned his training station, all work was halted with no attempt to force his cooperation. Once again, the animal's attentiveness and apparent willingness to participate resulted in the further broadening of the program's objectives to include non-restrained, non-anesthetixed blood collection.

Methods

The method employed in this study was positive reinforcement operant conditioning. The process began with a *target* command/behavior, which involved conditioning the subject to place his upper lip on the trainer's hand when given the proper command. Hands were used as a targeting device for greater ease and simplicity and also due to the subject animal's repeated attempts to eat the artificial target. Furthermore, the rhino was already accustomed to the use of trainers' hands and consequently was not distracted by them.

Once this targeting behavior was well established, the next phase involved moving the rhino into two different positions that would allow easy access to his front legs for eventual blood collection. Trainers used the targeting command to move the subject along a semi-circular row of wooden pylons, providing repeated bridges and rewards when the proper position was attained. After only a few training sessions, the rhino became aware of the desired position and moved to it readily. At his point, training progressed to include desensitization of the animal's legs for the eventual insertion of a needle.

The process of desensitization began with simple tactile stimulation of the area around the brachial veins on both of the subject's front legs, using fingers and other blunt implements to repeatedly stimulate the area until the rhino no longer responded to the stimulation. Once the subject became desensitized to a particular object, a slightly more invasive stimulus was

substituted, with the succession proceeding as follow: fingers, an ink pen, a snapped rubber band, keys, a small key chain screwdriver, and a leather punch (very gently!).

After the subject was successfully desensitized to all of these objects, trainers familiarized the rhino with rubbing alcohol by allowing him to smell it and experience how it felt when applied to his skin. This entire process of desensitization, deceivingly short on paper, spanned nearly 6 full months; the operation was purposely protracted in order to avoid regression due to premature attempts to draw blood before the animal was fully desensitized.

Following the successful desensitization of the rhino as described above, training progressed to the actual blood draw. Materials used were rubbing alcohol and a standard 19-gauge butterfly catheter attached to a 5-ml syringe. Prior to the draw, the area surrounding the brachial vein was first cleaned with the alcohol. Then the needle was inserted into the medial branch of the vein, and once the syringe was filled, the blood was transferred to vaccutainers for storage and examination. Surprisingly, the very first attempt to draw blood from this animal proved successful. The rhino flinched only slightly at the insertion of the needle and otherwise appeared unconcerned about the procedure, during which he was heavily reinforced through bridging with a training whistle as well as a large amount of food.

The success of the first attempt permitted trainers to begin performing blood draws on a monthly basis. Some regression, although minimal and easily countered, did occur during these subsequent procedures; however, these periods of regression usually coincided with the estrus cycle of the female rhino housed in an adjacent yard and therefore could usually be anticipated and training adapted or halted accordingly.

Results

After 6 months of operant conditioning with training sessions occurring three to four times a week, a viable blood sample was obtained from the brachial vein of a male black rhinoceros. Subsequent implementation of the same conditioning process with a female black rhino also proved successful. The latter result is particularly compelling because the female rhino was initially a very fractious animal. As her training progressed; however, she became increasingly more tractable, eventually enabling the trainers to obtain a blood sample from her as they had done with the male.

The fact that similar goals with two such behaviorally opposite animals accentuates the effectiveness of operant conditioning. Though time consuming and occasionally tedious, this process has proved highly useful in the care and maintenance of black rhinos at this institution. The ability to obtain blood samples has given the health center staff a very valuable tool in the research and diagnosis of any health problems that might arise, and the blood obtained is also being made available to other institutions conducting research on this species.

Conclusions

This study demonstrates that operant conditioning is a viable method for behavior management in the black rhinoceros. Using the information and expertise gained through the original conditioning for blood collection, the San Antonio Zoo is currently expanding its training goals to include other non-invasive husbandry procedures. Work has begun with the male toward the eventual collection of semen without the use of electroejaculation, and groundwork has been laid for the possible use of ultrasonography for gestational monitoring of the female. While these are the goals selected for the particular rhinos at this institution, the process of operant conditioning could be applied to numerous other situations and desired behaviors and is clearly a valuable tool in the care and general husbandry of the black rhinoceros.

Poster Presentation Abstracts

PRARIE DOGS: THEY'RE QUICK, THEY'RE INTELLIGENT, AND THEY ARE TRAINABLE

Victoria Kamp
San Diego Wild Animal Park http://www.wildanimalpark.org/

Upon receiving 1.1 black-tailed prairie dogs (Cynomys ludovicianus) at the Wildlife Education Compound at the San Diego Wild Animal Park, it became immediately obvious that if these high-energy animals were going to be used as animal ambassadors, they needed to be safely controlled through the use of operant conditioning. This involved acclimating and desensitizing each animal to a harness, walking on a leash, and standing comfortably on a prop. Safety challenges included eliminating trainer trip hazards, controlling animal excitement levels to preclude injuries to the animals, eliminating biting, preventing animals from climbing up the trainer's leg, preventing animals from running through open gates, auditory sensitivity issues, and controlling running and jumping. Through the use of basic operant conditioning techniques, using food and socialization with the trainer as the primary reinforcers, a safe and manageable working environment was achieved over a period of 5 to 7 months. Presently, the prairie dogs are safely maneuvered and readily respond to many commands. They provide educational opportunities for the public and are used in training demonstrations. These highly motivated and intelligent animals continue to learn and expand their repertoire of behaviors while educating and entertaining the public.

SEAL HUSBANDRY BEHAVIOR TRAINING AT THE NEW JERSEY STATE AQUARIUM

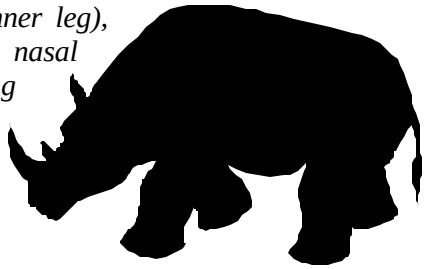
Holly Cowell, Kathy Taht, Denise Aster, Michele Stevens and Kris Demark
New Jersey State Aquarium, Camden, New Jersey http://www.njaquarium.org/

Husbandry behavior training is an important part of the New Jersey State Aquarium's marine mammal training program. The colony of 3.2 harbor seals (Phoca vitulina) and 1.2 grey seals (Halichoerus grypus) is trained a variety of preventative, voluntary behaviors that allow the trainers to care for the animals' physical condition. Tooth brushing, nail clipping, and body examinations are done on a daily basis. Cultures, voluntary blood collection, and injections are performed on an as-needed basis. These behaviors give the trainers a more in-depth assessment of the health of the colony.

THICK-SKINNED YES, THICK-BRAINED, NO! BLACK RHINO TRAINING, A TOOL FOR OPTIMUM HUSBANDRY

Nancy A. Bunn
Los Angeles Zoo http://www.lazoo.org/

Captive black rhinos exhibit numerous problems and concerns. The Los Angeles Zoo began a training program with its four black rhinos in 1998. The objective was to train the rhinos to tolerate various medical procedures without sedation or anesthesia. Positive reinforcement was the technique utilized to teach the rhinos a multitude of behaviors. The successes have been many, including the ability to draw blood (from the foot, ear, inner leg), administer intravenous drugs and vaccinations, and perform nasal washes. In conclusion, black rhinos readily respond to training through positive reinforcement, benefiting them mentally and physically. Important medical care can be provided with minimal intervention, reducing stress on the animal.



TARGET TRAINING IN OSTRICHES

Nichole Dorey, Eddie Fernandez, and Jesus Rosales-Ruiz
University of North Texas, Department of Behavior Analysis http:\\www.unt.edu/behv/

Operant conditioning techniques have been found useful in the daily course of zookeepers. Specifically, targeting techniques have been used for aiding veterinarians in their daily checkups and aiding keepers in feeding, enrichment, and in their husbandry duties. Two techniques have been used for this: the first technique—termed 'following'—is when a target is presented to lead the animal to a final location. During the second technique—termed 'targeting'—the target is placed in several stages leading the animal to the final location. This in turn lets the animal approach the target each step toward the desired destination. Two ostriches (Struthio camelus) at the Frank Buck Zoo are being used in this study. The purpose of this study is to compare the effects of these two techniques and the training of approaching the final location. Data are still being collected.

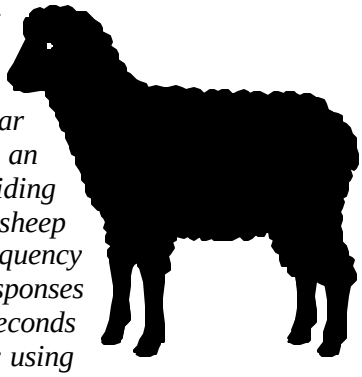
TRAINING APPROPRIATE PETTING ZOO BEHAVIORS IN LA MANCHA GOATS

Eddie Fernandez and Jesus Rosales-Ruiz
University of North Texas, Department of Behavior Analysis, Denton, Texas
http:/www.unt.edu/behv/

Three La Mancha goats (Capra hircus) were clicker trained to be appropriately halter-led at the Frank Buck Zoo's petting zoo. All three goats demonstrated a high frequency of undesired behaviors in the petting zoo including chewing on persons and their clothing, jumping on persons, and head-rearing. Also, halter leading provided an easy method for moving and controlling the goats by keepers and trainers. A changing-criterion design as well as a multiple-baseline-across-goats design was implemented across ten trials per session to measure the frequency of responses on all approximations, the target response, and two responses designated as the undesired responses. A fixed-time schedule of 15 seconds was also implemented during baseline to examine the effects of simply using food and attention on changing the responses. All three goats were able to demonstrate the target response of following a trainer with the halter on without demonstrating an undesired response for at least nine out of ten trails for at least two sessions in a row after completion of the training procedure.

TRAINING PETTING ZOO SHEEP TO ACT LIKE PETTING ZOO SHEEP

Eddie Fernandez and Jesus Rosales-Ruiz
University of North Texas, Department of Behavior Analysis, Denton, Texas
http:/www.unt.edu/behv/



Three sheep (Ovis aries) were clicker-trained to be pet and brushed at the Frank Buck Zoo's petting zoo. All three sheep, one a Hampshire sheep and two Jacob's four-horned sheep, demonstrated a high frequency of moving away from trainers and keepers, and other similar undesired responses. The authors chose being brushed for training as an incompatible response for the undesired responses associated with avoiding persons. A changing-criterion design with a multiple-baseline-across-sheep design was implemented across ten trials per session to measure the frequency of responses on all approximation, the target response, and two responses designated as the undesired responses. A fixed-time schedule of 15 seconds was also implemented during baseline to examine the effects of simply using food and attention on changing the responses. One of the three sheep met the target response criteria during this fixed-time baseline condition, while the other two did not. After a number of unsuccessful sessions of getting the two other sheep to eat a significant amount of food necessary for training in the presence of the trainers, escape in the form of the trainer moving away from the sheep was paired with a clicker. Once the sheep came within 5 feet consistently, the trainers paired food with the clicker and were then successfully able to get both remaining sheep to meet the target response.

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