Penguin Conservation

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In This Issue

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Editors: Linda Henry, Linda.Henry@SeaWorld.com
Jessica Jozwiak, jjozwiak@detroitzoo.org

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From the Editors

In this issue we continue to feature information presented at the Penguin Husbandry Workshop held during the 2015 AZA Mid-year Meeting. The workshop, jointly organized by the Avian Scientific Advisory Group (ASAG) and the Penguin TAG, included information on a variety of topics. (See PCN Vol 19; No. 1). PowerPoints for all presentations are available on the ASAG website www.aviansag.org in the "Member's Only" section. You can obtain the required password by contacting Colleen Lynch at clynch@riverbanks.org.

In *Penguins as Marine Sentinels*: *Building Science and Education Partnerships*, Dee Boersma describes penguins as environmental sentinels, alerting us to climate change, pollution and resource management issues. Penguins in human care can act as ambassadors for penguins in the wild. Dee explains how zoos and aquariums are in a unique position to reach a large audience and can focus their message to create a connection between people and conservation in the wild.

Sharon Jarvis provides information on the creative techniques and structures used by zoos and aquariums to maximize and enhance penguin breeding space. Included are descriptions and photos of items that can be used to make temporary or permanent changes to rookeries in Antarctic/sub-Antarctic and temperate penguin habitats.

Zoos and aquariums include enrichment in their habitats to elicit natural behaviors. These items and methods increase the well-being of the animal and also improve the guest experience. Michelle Hartman describes the unique ways penguin enrichment is used by twenty-five AZA institutions.

Tricia McDeed describes the husbandry challenges AZA penguin managers face as the numbers of geriatric penguins in their care become more prevalent. She discusses how modifications to the physical and social environment and medical care can provide the best welfare for penguins in the later years of life.

Population biologists at the Lincoln Park Zoo / AZA Population Management Center use computer models to analyze the demographics and genetics of AZA animal populations. These Population Viability Analyses (PVAs) determine each population's long-term health and sustainability, and identify key management strategies. In 2014, PVAs were completed for penguins. An overview is presented here.

Penguin guest encounters have become an increasingly popular way for zoo and aquarium visitors to connect with these charismatic animals. Stacy Johnson describes how enrichment items and training were used to shape the behavior of African penguins participating in their guest interaction program.

Frank Fischer provides a history of identification methods used for penguins in the wild and in human care. He describes the advantages and disadvantages of each type of identification method, from aluminum bands to transponders. In continuing the quest to find the best possible identification method, the St. Louis Zoo began testing silicon bands designed by Bristol Zoo on their Humboldt penguins.

And finally, Peter Dickinson describes the development of the penguin program at Snow Penguin, Ski Dubai. This program provides a very unique, fun and educational experience for guests. We congratulate the training team on receiving the IMATA 1st place award in the Research Advancements category for their work.

We thank all of those who contributed to this issue including Dee Boersma (University of Washington), Sharon Jarvis (SeaWorld Orlando), Michelle Hartman (SeaWorld Orlando), Tricia McDeed (SeaWorld Orlando), Brent Johnson (Lincoln Park Zoo), Lisa Faust (Lincoln Park Zoo), Lauren Mechak (Lincoln Park Zoo), Stacy Johnson (Denver Zoo), Frank Fischer (St. Louis Zoo), Peter Dickinson (Snow Penguin, Ski Dubai) and Tom Schneider (Detroit Zoo). We also thank the AZA for allowing us to reprint *Building a SAFE Future*.

Penguin TAG Mission: To provide leadership for the management of penguins *ex situ* in order to maintain healthy, sustainable populations for the purpose of:

- Engendering appreciation for these charismatic species that are indicators of the health of marine and coastal environments.
- Promoting conservation concern and conservation action through education programs and internet resources.
- Furthering *in situ* conservation and research in support of *ex situ* management.

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Penguins As Marine Sentinels: Building Science and Education Partnerships

P. Dee Boersma, Ph.D. , *Dept. of Biology, University of Washington, Seattle, WA*

Educating Aquarium and Zoo Visitors

Each year over 181 million people visit aquariums and zoos in North America and 700 million visit worldwide (AZA 2015). The potential to positively impact conservation through these visits is tremendous, which is why the main role of zoos and aquariums should be education. Most people will never see gorillas, sharks, or penguins in the wild. Once people are introduced to wildlife, seeing these animals and experiencing them in a personal way, they become interested in their natural history and what these species need to survive in the wild.

Caring for animals is costly, as they require feeding, housing, and frequent attention. Captivity is, therefore, of very limited value in maintaining biodiversity. At best, captivity may buy a little time for some species. If the focus of aquariums and zoos is on their educational mission and the conservation of species in the wild, meaningful conservation may happen. Education is key to raising funds to successfully keep viable populations of species in the wild. For conservation of wild animals to succeed, we need public support, financially and politically. Animals and exhibits at aquariums and zoos can act as ambassadors, connecting the public to animals in the wild.

The best management, husbandry, and care may keep Species Survival Plans (SSP) successful in maintaining the genetic diversity of the species intact for fifty, or even one hundred, years or more, but these efforts are inadequate to conserve the species in the wild. People need to value species in the wild. The transformative potential when a connection is made between seeing a species and helping the population survive in the wild can alter the conservation path of a species so it has a future.

One of the ways to increase connections between people and conservation in the wild is to tell stories about the lives and needs of the animals on display. The story of the species, habitat, and individual animals must be told compellingly. Signs providing the name of the species, where the species is found and its International Union for the Conservation of Nature (IUCN) status are helpful, but do not make a compelling story. Stories are what make people care, think, and ultimately act. Ideally, each visitor should leave the zoo or aquarium with a better understanding of: 1) the importance of keeping the species in the wild, 2) what the aquarium or zoo is doing to reach that goal through the support of marine protected areas, parks, and field conservation and 3) how, by their visit to the aquarium or zoo, they have contributed to the goal of keeping viable populations in the wild.

Using Our Captive Creatures Creatively

The natural charisma of penguins makes them ideal ambassadors to advocate for the health of our planet. Penguins are environmental sentinels alerting people to everything from climate change to pollution (Boersma 2008). To conserve penguins in the wild, we need detailed knowledge of natural history, population trends, and the threats impacting each species across its range. There are 18 species of penguins and the threats and needs of each species differ. Science can inform our decisions, and political pressure applied effectively can make these decisions stick.

To solve large conservation problems, we must go far beyond the AZA model of husbandry and rehabilitation. Institutions comprising the AZA can lead the way by working together to build new partnerships with governments, NGOs, universities, and global institutions dedicated to conservation in the wild. Educating visitors in the value and nature of these partnerships can further the reach of conservation.

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What AZA Institutions Can Do for Conservation

A visit to an aquarium and zoo must be linked directly to conservation in the wild by focusing our message on what needs to be done and how visiting an aquarium or zoo contributes to species' survival. Habitat loss and degradation caused by local human activities are likely the greatest threats to biodiversity (Vié et al. 2009). The primary reason for having species in captivity is to help their chances of survival and well-being in the wild.

One of the first steps towards this goal is to alter existing business models. Before each new exhibit is opened, the aquarium or zoo should provide evidence to the visitor of how their visit contributes to helping the species in the wild. A visitor needs to know how their visit is supporting meaningful science and conservation in the wild. There needs to be a story to engage the visitor about conservation needs for each species, where the animal is from and what is interesting about its biology and behavior. Every institution should provide details about how the conservation of this species can be aided so visitors can become part of the solution.

Helping people fall in love with animals and their habitat motivates them to give to conservation. Seeing, watching, meeting, interacting with and touching creatures can alter people's desire to help species and their habitats. Showing visitors how altering their lifestyle or donating to conservation makes a positive and tangible contribution to the survival of species in the wild can enrich their lives and those of the creatures they want to protect.

Simply put, a visitor should learn and believe that visiting the aquarium or zoo is an act of support for conservation in the wild. Many zoos and aquariums are generating funds for conservation in the wild. For example, upon opening the "Congo Gorilla Forest" in 1999, the Bronx Zoo imposed a separate entrance fee and voting process to finance tropical African conservation (Conway 2013). Every new exhibit should follow this model, generating funding for species in the wild. If funds are not going to conservation in the wild, the organization isn't being an effective conservation partner because the critical need is to keep populations in the wild healthy and robust.

Each visit should expose guests to how they can financially, politically, and personally help species in the wild. Some of the messages may be complex but they need to be presented. For example, a small change in human harvest and consumption patterns could benefit wild penguins. These seabirds eat small schooling prey such as fish, squid, or shrimp that we call forage fish. Visitors should learn that the commercial take of forage fish, that penguins and so many other seabirds depend upon, is often processed into fishmeal to feed farm-raised fish, chickens and pigs. We must use this protein resource more judiciously. Scientific evidence suggests that the harvest of forage fish should be limited to two thirds of existing populations (Pikitch et al. 2012, Cury et al. 2001). In other words, ocean ecosystems need about one third of the forage fish left in the water to feed seabirds, sharks, whales and other marine life. In addition to fishmeal, many guests don't know that forage fish are also used to make fish oil vitamins they themselves may consume.

If people understand the connections between what they do and how it affects wildlife, they can modify their personal habits and foster political change in the harvest of forage fish. Eating anchovy on your pizza is better for the health of our oceans than eating farm-raised salmon that are fed fishmeal. Leaving one third of the forage fish in the ocean supports ecosystems, penguins, and people. Aquariums and zoos are in an important position to demonstrate these issues to visitors through their exhibits.

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While institutions that comprise the AZA are keeping penguins alive in captivity, maintaining their genetic diversity through SSPs and conducting rehabilitation programs, these essential activities do not result in the conservation of species in the wild. Institutions within the AZA must work together and there is room for improvement in our collaboration. The World Association of Zoos and Aquariums Global Species Management plan has been slow to be implemented even though it focuses on husbandry and management. Though it was conceived in 2003, a decade later, the Global Species Management plan has only 4 active plans. How species are managed among institutions, however, is less important than if conservation in the wild succeeds.

Conservation success in the wild alleviates pressure of captive management. Working together globally for conservation success and funding conservation in the wild must become the norm. Boise, Idaho defines their zoo as "…a garden or park where wildlife is kept for exhibitions for the primary purpose of generating funds for the conservation of animals in the wild." Shouldn't this be the only suitable purpose for captivity?

For success, ultimately, the AZA must partner with global institutions focused on conservation, such as the International Union for the Conservation of Nature (IUCN), where a new Penguin Species Specialist Group is just getting underway. In some cases, penguin conservation may mean buying land or helping governments establish Marine Protected Areas. Aquarium and zoo conservation activities will be more effective if partnered with existing field conservation efforts. Education, the AZA's most important tool, is needed to build meaningful science, conservation, and management programs to take advantage of the ambassador species we have in captivity. All our institutions must be field-oriented conservation organizations and seen by our guests as engines for funding and maintaining wildlife populations in their native habitat. The goal of captivity must be to maintain viable populations in the wild.

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Acknowledgments

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Silicon Flipper Bands: A Method for Individual Identification of Penguins in Human Care

Frank Fischer, *Penguin Keeper, St. Louis Zoo, St. Louis, MO*

The banding of penguins for individual identification and monitoring has progressed over the last century from leg bands to flipper-bands. A number of different materials, including metals and plastics, have been used to make the bands. Different mechanisms of attaching bands or tags have also been developed. The identification of individual penguins for research in the wild or for management purposes in zoos and aquariums is an essential tool. Within the last twenty years, banding of free-living penguins has become a target of considerable scrutiny due to the negative effects that banding has on flipper hydrodynamics in water, on longevity of birds, and on reproductive success of several species of penguins. New technology has incorporated microchips, data loggers and other types of electronic tagging to monitor diving and foraging trips of penguins in human care versus those in the wild. This report will review past and current methods of marking penguins in all scenarios and offer silicon bands as an alternative to metal bands or cable ties for identifying penguins in human care. Despite the short time period and limited sample size in this trial, silicon bands show significant promise.

Historically, flipper banding of penguins originated in the 1940s to identify wild penguins after initial leg banding proved unsuccessful. Two criteria were identified for the development of a flipper band:
1) that the band would outlive the bird and 2) that the band would remain legible to read from a distance without the need to catch or handle the bird. Metal bands were applied to the proximal end of the flipper and became the norm for monitoring penguins. Initially, aluminum was the choice of metal as it was easily affixed to the wing, inexpensive, and numerically imprinted. However, aluminum bands proved inadequate, as the bands wore out more readily, had a higher percent loss rate, were not suitable for long-term studies, and more importantly, caused injury to wings. (Ludwigh 1967; Sladen & Penney 1960; Ainley *et al*. 1983) This type of band is no longer used in research for monitoring penguins.

Photo 1. Silicon band on Humboldt penguin.
Photo by Frank Fischer.

As aluminum bands were found to be inadequate, field researchers turned to other types of metal. Monel, an alloy of copper and nickel, was thought to be an ideal option for banding seabirds due to its corrosion resistance in salt water. Monel bands did not work long term as they tended to open, causing damage to wings and therefore were not a reliable alternative (Culik *et al* 1993). Other types of metal alloys were also investigated, as well as different methods for fastening the bands to the wing. However, research showed that penguins manipulate bands with fasteners, causing damage to the wings (Clarke & Kerry 1998). And bands manufactured from alloys were more expensive than stainless steel bands, which are now commonplace in penguin research.

Banding penguins using any type of metal band have been widely reported. As of 2006, nine studies have been published on six different species of free-living penguins. Four of the six species were shown to have deleterious effects on normal behavior as a result of metal bands being too tight or too loose on the wings (Petersen *et al.*2005). Studies on several species of penguins detailing the increase in percent energy costs required to propel banded wings through the water and reduction of foraging efficiency prove that metal bands inhibit penguin behavior (Saraux *et al*. 2011; Fraser & Trivelpiece 1994; Culik *et al*. 1993; Stonehouse 1999). Additional research on single and double-banded king penguins demonstrated a reduction in both breeding success and survival rate post–banding (Froget *et al.* 1998).

Plastics have also been used for penguin identification starting in the 1960s with the development of Darvic and Teflon. These plastics were rigid. Some required steel rivets to connect the two plastic strips together around the wing but they had limited ability to expand during molt. Colored cable ties then became popular in zoos and aquariums after 1990 when the majority of institutions holding penguins eliminated metal flipper-banding. Cable ties remain the primary method of flipper-banding penguins in human care. They are inexpensive, readily available, easily read from a distance, and can be removed and replaced during molt. Cable ties can be used in conjunction with transponders to keep accurate records of birds within an institution as well as those individuals transferring to new institutions. However, cable

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ties are not without disadvantages. Because they are made of hard plastic they can constrict blood flow during molt and must be removed and replaced at the appropriate time. Cable ties are unreliable for long-term identification as they are prone to breaking in cold weather extremes.

As the emphasis shifted from observing how long markers remained on penguins to how the bands were affecting the birds' normal behavior, many penguin experts were calling for new methods of monitoring penguin behavior in the wild. New technology led researchers to develop alternatives to flipper-banding. This new technology involves implanting a transponder or microchip subcutaneously. The original study (Jackson *et al.* 2002) was conducted on Adelie penguins (*Pygoscelis adeliae)* and king penguins (*Aptenodytes patagonicus)* using transponder tags implanted under the skin. Identification took place as tagged individuals passed over transponder readers buried underground along specific routes towards a colony. Handheld tag readers also allow for data collection on more stationary nesting birds.

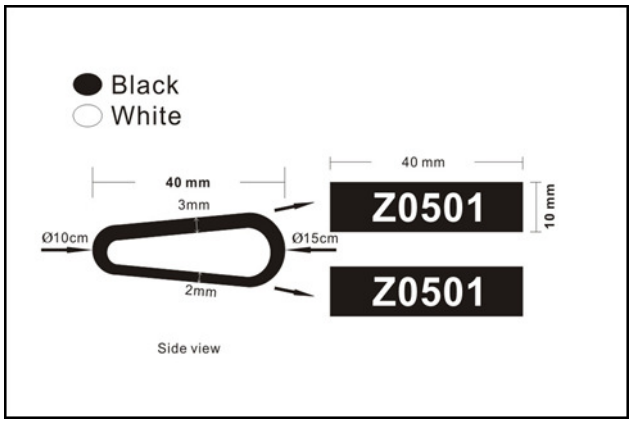

Figure 1. Humboldt silicon ban dimensions. *(Figure from Nigel Simpson, Bristol Zoo).*

The advantages of transponders include the elimination of feather wear, reduction of potential injury to flippers, the potential to track large numbers of birds, and unimpaired movement through water without the drag associated with metal flipper bands. However, there are several disadvantages associated with transponders. They may not be suitable for *Spheniscus* penguins that may not follow specific routes towards a colony. Transponders also have limited range, may be cost prohibitive, can be prone to failure after five years or migrate through and often out of the body, and are essentially invisible. This last aspect is particularly difficult because the majority of penguin research is still done visually. The ideal system for monitoring both free-living and zoo and aquarium penguins would be a combination of transponders along with some form of visual identification marker.

As a result, long-term markers are identified as a necessity even though the detrimental effects of flipper-banding have been well documented. Multiple conferences and workshops have been convened over the last thirty years to redesign bands and banding methods (Fraser & Trivelpiece 1994; SCAR-Scientific Committee on Antarctic Research 1996; CCAMLR-Commission for the Conservation of Antarctic Marine Living Resources 1982). The conclusions of these meetings remind researchers that they need to fully understand the differences between types of bands, species of penguins, and even individual penguins within the same species in order to appropriately implement a banding program. For example, measurements were taken of Blackfoot penguin flippers during non-molting and the maximum molting periods (Jarvis 1970). The thickness of the flipper expanded from 10mm in the non-molting period to 27mm in the maximum flipper molt period. The width of the flipper expanded from 21mm to 30mm in respective molt periods. The overall expansion of the wing is significant during molt and may be characterized differently among birds, making the entire banding process a guessing game. A metal band that is applied too tight may cause more injury than a band applied too loosely. A metal band applied too loosely will create more drag through the water than a band applied too tightly. In a study on Little Blue penguins (*Eudyptula minor)* on Phillip Island in Australia, the decreasing survival rate of banded penguins was more evident in the year immediately following banding, showing the detrimental effects begin with the first molt following banding (Chiaradia & Kerry 1999).

Fieldwork on Blackfoot penguins (*Spheniscus demersus*) in South Africa's Robben Island may add new information to the penguin banding and identification conversation. Along with research on captive Blackfoot penguins at the Bristol Zoo, researchers have found that silicon bands or flexible bands have been successful (Barham 1999). The bands expand when penguins molt and create less drag as the flipper propels through the water resulting in reduced energy cost during foraging trips. Silicon bands are easy to apply, non-toxic, high-strength, UV resistant, easy to read from a distance, and non-invasive if damaged. Continued research will be necessary before implementing a banding program directed towards free-living penguins, as reports from Robben Island suggest the birds are often able to remove the bands from their wings.

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In January of 2014 two male and three female Humboldt penguins, *Spheniscus humboldti*, at Saint Louis Zoo's Penguin and Puffin Coast habitat were fitted with flexible silicon flipper bands purchased from the Bristol Zoo. The bands were attached on their wing then monitored to determine how long the bands would remain in place. The bands were being tested to withstand the variation in climate of a mid-western summer and a freshwater pool chilled to 45 degrees Fahrenheit. A combination of letters and numbers were imprinted into the black silicon on both the inner and outer portion of the band and the indentation was filled with white ink, making them readable from a distance. The bands have a rigid shape and conform to the shape of the wing close to the body to prevent the band from rotating and hiding the identification numbers (Photo 1). The outer portion of the band is thicker than the inner portion and the shape of the band is similar to the proximal end of the wing (Figure 1). The Humboldt penguin colony at the Saint Louis Zoo is outside throughout the year except during cold temperature extremes, when they are shifted to inside holding. The expansion of the band to accommodate for the wing swelling during a penguin's period of molt is of primary concern.

For penguins in human care, silicon bands may be a valid future solution for flipper-banding. The ease of application is less stressful on the birds and because the bands expand there is no need to remove them during molt. The Saint Louis Zoo is committed to purchasing silicon bands for identification of its entire Humboldt penguin colony and is considering their use on its sub-Antarctic penguin species residing at the zoo. The price per silicon band is £1.80 Sterling or approximately $2.80 per band. The cost to produce the bands is £0.33 Sterling or approximately $0.51 per band, with the proceeds going to the penguin conservation program at the Bristol Zoo. (For additional information regarding the purchase of silicon bands from the Bristol Zoo please contact Nigel Simpson at nsimpson@bristolzoo.org.uk). The conversation may continue on how best to identify free-living penguins for penguin studies, but at least silicon bands may become the new standard for penguins in human care.

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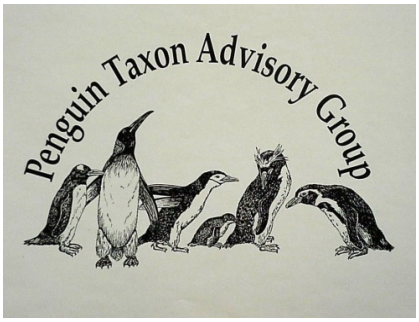
Summary: 2014-2015 Penguin TAG Annual Report

Tom Schneider, *Chair, Penguin TAG*



- The annual report was submitted to AZA on 15 July.
- The Animal Care Manual (ACM) was published in June 2014 with a predicted revision due date of June 2019.
- With regard to field conservation and research projects the TAG did not directly support penguin conservation programs in 2013. Many AZA institutions support penguin conservation, research, and conservation organizations. The African Penguin SSP works closely with SANCCOB to support and promote participation in the Chick Bolstering Project. This successful conservation project rescues hundreds of abandoned chicks each year and returns them to the wild. Additionally, the SSP provided funding to purchase data loggers used by researchers to help track the movements of juvenile penguins to determine where new breeding sites could be established. The Humboldt Penguin SSP supports in-range census and protection of the Humboldt penguin colony at Punta San Juan in Peru.
- Current TAG Steering Committee members and Advisors to the Steering Committee:

Steering Committee

Tom Schneider - *Detroit Zoological Society*
Heather Urquhart - *New England Aquarium*
Gayle Sirpenski - *Mystic Aquarium*
Mary Jo Willis - *Denver Zoo*
Lauren DuBois - *SeaWorld San Diego*
Alex Waier - *Milwaukee County Zoo*
Sherry Branch - *Sea World of Orlando*
Colleen Lynch - *Riverbanks Zoological Park*
Steve Sarro - *National Zoo*
Rick Urban - *Newport Aquarium*
Susan Cardillo - *Central Park Zoo*
Stephanie Huettner - *Omaha Zoo*
Diane Olsen - *Moody Gardens*
Geneve Darnell - *Jacksonville Zoo*
Mike Macek - *St. Louis Zoo*

Advisors

Education - Elizabeth Mulkerrin, *Henry Doorly Zoo*
Sustainability - Colleen Lynch, *Riverbanks Zoo*
Medical - Roberta Wallace, *Milwaukee Zoo*
Nutritional - Kerri A. Slifka, *Dallas Zoo*
Field - Patty McGill, *Dallas Zoo*
Field - P. Dee Boersma, *University of Washington*
Field - Pablo Garcia Borboroglu, *Global Penguin Society*

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WCMC - Sherry Branch, *SeaWorld Orlando*
PMC - Sarah Long, Lincoln Park Zoo
AZA - Candice Dorsey
Animal Welfare - Stephanie Allard, *Detroit Zoological Soc.*
EAZA TAG - Pierre de Wit, *Zoo Emmen*
JAZA TAG - Masanori Kurita, *Port of Nagoya Public Aq.*
ZAA TAG - Nick Boyle, *Taronga Zoo*

- The TAG has worked with the PMC to complete Population Viability Analyses for all program penguin species. Based on population analyses from the PVAs and the history of the species in AZA institutions, the TAG is recommending managing the two sub-species of gentoo penguins separately. The previous recommendation was to manage both sub-species as one population. Recommendations for the two sub-species will be made in the next BTP that is scheduled for fall 2015.
- All program leaders have completed Species Fact Sheets and these were included in the last RCP and are posted on the AZA website.
- The TAG held a half day Avian Scientific Advisory Group-sponsored Penguin Workshop at the Mid-Year AZA meeting on 23 March 2015. Copies of the presentations will be available on the ASAG website and summaries will be included in the TAG's fall newsletter, Penguin Conservation.
- The report also included an Animal Program Summary and Animal Program Roles, Goals and Essential Actions for each species. This information is available via the Member's section of the AZA website www.aza.org.

Creative Nesting: Maximizing Your Exhibit Space

Sharon Jarvis, *Senior 1 Aviculturist, SeaWorld Orlando, Orlando, FL*

Twenty penguin holding facilities gave input on different ways to utilize and maximize exhibit space for penguin breeding. It doesn't take long to see that penguin exhibits come in many sizes and shapes with varied landscapes. The idea behind the original presentation was to collect ideas on the best ways to maximize land space for breeding.

Photo 1. Mystic Aquarium off-exhibit African penguin breeding area, including halved heat-stretched PVC burrows.

One of the major ways that institutions make more space for breeding is by annexing different back or support areas. Mystic Aquarium (Photo 1), Pittsburgh Zoo, Omaha's Henry Doorly Zoo, Cincinnati Zoo, and the New England Aquarium all utilize support and/or off exhibit areas for breeding space. For burrow nesters, varied burrow sizes and shapes can help increase space. Submitted burrows included: kennels, whole or partial kitty litter boxes (Photo 2), Rubbermaid® bins (Photo 3), igloos (Photo 4), constructed A-frames (Photo 5), or natural landscape constructions (Photo 6). Institutions that have snow machines, such as Omaha and SeaWorld Orlando, turn one or more of these machines off, thaw the snow pile, and then use the land space for breeding season. Sometimes the best way to create more breeding space is to use a barrier of some type to prevent a pair from monopolizing an area that could be used by multiple pairs. Common barriers include: real or fake rocks (temporary or permanently installed), ice and/or Plexiglas walls, or baby gates. (Photos 7 and 8).

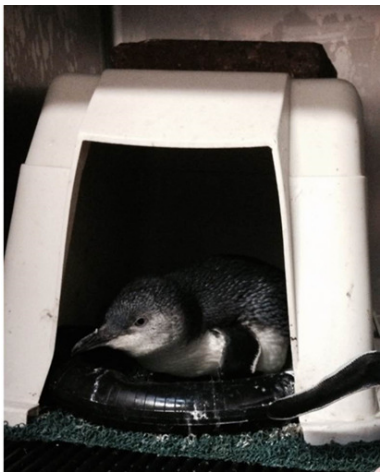

Photo 2. New England Aquarium kitty litter box top nests.

There are also several ways to make difficult-to-access or unused areas of an exhibit more attractive. Small platform nests can be constructed from fiberglass grating or feeding tubs with PVC pipe cut for legs. (Photos 9 and 10) These "starter" nests can be placed in areas that may not otherwise be optimal breeding areas. In exhibit areas consisting of higher or somewhat uneven rockwork, sand bags made from tire inner tubes (Photo 11) or larger granite rock can be used to hem in nests and allow birds to build in areas that would not normally hold nests. Short pieces of PVC pipe cut in half can be placed under the sand bag to allow for drainage (Photo 12). The St. Louis Zoo has developed a unique way to tackle uneven areas as well. In house, they developed nest rings made out of fiberglass and sculpting epoxy (Photos 13 and 14). The nest rings are added to level areas and prevent the rocks from falling out of the nest.

Although I am not able to share all of the pictures, in closing, I would like to thank all the colleagues from each of the zoos and aquariums who responded to the listserv request for information: Steve Ruscko, Racine Zoo; Bob Flores and Linda Weisenmiller, SeaWorld San Antonio; Samantha Griffin, St. Louis Zoo; Heather Neldner, Milwaukee County Zoo; Tamara King, Indianapolis Zoo; Jessica Jozwiak, Detroit Zoo; Katy Wozniak, Pittsburgh Zoo; Mark Myers, Woodland Park Zoo; Jamie Ries, Minnesota Zoo; Aimee Greenebaum, Monterey Bay Aquarium; Heather Urquhart, New England Aquarium; Jen Kottyan, Maryland Zoo; Gayle Sirpenski, Mystic Aquarium; Diane Olsen, Moody Gardens; Lauren DuBois, SeaWorld San Diego; Stephanie Huettner, Omaha's Henry Doorly Zoo; Emily Macko, Brookfield Zoo; Crystal Crimbchin, Steinhart Aquarium; Anthony Nelson, Cheyenne Mountain Zoo; and SeaWorld Orlando.

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Photo 3. SeaWorld Orlando bin burrows.

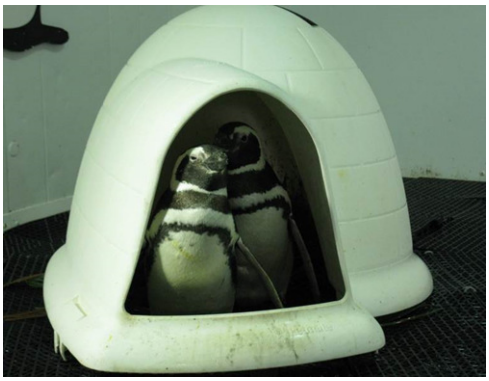

Photo 4. SeaWorld Orlando igloo burrow.

Photo 5. SeaWorld San Diego A-Frame burrows.

Photo 6. SeaWorld San Diego natural landscape burrows.

Photo 7. Omaha's Henry Doorly Zoo divider rock; made in-house.

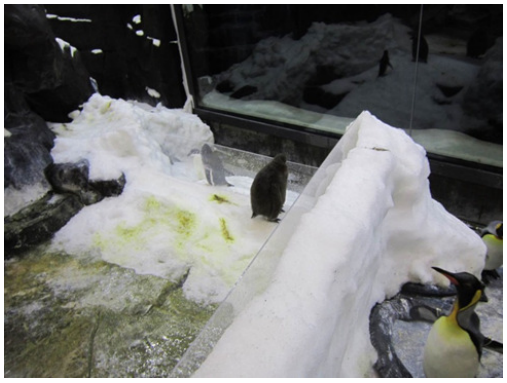

Photo 8. SeaWorld Orlando ice wall with Plexiglas divider used here as a king chick corral.

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Photo 9. SeaWorld Orlando small platform nest. These can be cut to any size and/or shaped to fit specific areas. SeaWorld San Diego and Pittsburgh Zoo also use versions of platform nests.

Photo 10. Detroit Zoo and SeaWorld Orlando use or have used modified feeding tubs for additional or starter nests.

Photo 11. SeaWorld Orlando tire inner tube sand bag; valve is removed; tube is filled with sand; ends are cable-tied.

Photo 12. SeaWorld Orlando sand bag nest with half section of PVC pipe for drainage.

Photo 13. St. Louis Zoo nest rings.

Photo 14. St. Louis Zoo gentoos using nest rings.

Do You Waddle Play?

Michelle Hartman, *Senior 1 Aviculturist, SeaWorld Orlando, Orlando, FL*

The penguins in our care rely on us for food, "fun" and friends. Their entire quality of life is in our hands. Our commitment to them helps create the "happiest", healthiest animals for guests to appreciate.

Close to 30 AZA accredited institutions returned my enrichment survey for the purpose of the presentation. The seven-question survey was posted on the AIG listserv [Eds note: listserv for the Avian Scientific Advisory Group www.aviansag.org] and a few personal emails were sent out. Many of the responding emails included photos and/or videos. There were many common requirements for enrichment items. Nearly all respondents listed that the items must:

- Be sturdy
- Not be too big or too small
- Be easy to clean
- Have a strict approval process
- Be used sparingly so as not to bore birds
- Be limited during breeding season

There were a few differences between many of the institutions as to what their enrichment items consisted of and how they presented the items to their birds and guests. Several institutions:

- Had set schedules (or at least tentative) while others' enrichment use was very random
  Include and often elicit guest interactions with the birds
- Permit guest donations of toys
- Include breeding season and nesting items as reoccurring yearly enrichment
- Only use solid, synthetic substrates while others utilize natural and organic material
- Ensure keepers are available/accessible for questions/concerns from guests
- Only give enrichment while supervised by keepers while others allow EEDs [Eds. note: Environmental Enrichment Devices] to be given without any keepers around

Other than being around for guest discussion, there are several reasons many EEDs are given only while supervised. Many zoos or aquariums have had past issues with and try to avoid:

- Items getting stuck (or stuffed) in filtration systems
- Birds "hogging" items
- Birds becoming aggressive with one another
- Attempts at mating with or incubation of item
- Injury
- Ingestion
- Frightened birds

Only a few respondents observed (out of the ordinary) benefits of using enrichment:

- Milwaukee County Zoo has seen a greater use of the pool, observed more social interactions and better play between the birds, as well as noticed birds with joint issues become more flexible.
- Georgia Aquarium utilizes certain items during public programming to divert attention away from unusual/crazy clothes guests sometimes wear. This allows for better interactions between those guests and the birds.

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- Cincinnati Zoo & Botanical Garden developed training sessions using enrichment to elicit more natural behaviors in the pool.

The majority of the presentation went through photos the zoos and aquariums had submitted of their enrichment items. Although many of the enrichment items we use can be classified many different ways, I had categorized each of them into one of the groups as follows:

- Physical toys on land or in the water: Balls, gelatin, colored ice, Kong® toys, Frisbees®, figurines, starfish/coral replicas, mirrors, disco balls/laser pointers, browse, etc.
- Interactions with keepers or guests: Guest feeds, interaction through glass, husbandry/scale training, relationship building (just hanging out with birds), etc.
- Changing the environment: Props (large pumpkins, movable false rocks), snow mounds/sculptures, taking birds outside their usual habitat, light strands/decals/drawings on other side of glass/acrylic panels, etc.
- Sound: Playing of music, ringing bells or chimes, playing sounds of other animals, etc.
- Feeding time: Hand feeding, pouring fish in the water, trays/tubs of fish, freezing fish in ice or putting in gelatin, fish inside balls with holes, live fish, etc.

A few common issues institutions reported were dealing with "naughty" birds, dealing with skittish birds, how guests perceive EEDs and how the penguins are interacting with it. Penguins, if given the opportunity, like many animals, occasionally make their own enrichment by venturing into areas that were not meant for them. We have several penguins at SeaWorld Orlando that routinely porpoise out of the pool onto a piece of rockwork separating two acrylic pool panels by our guest pathway. Occasionally, they overshoot the rock or go out over the acrylic panel itself to land on the guest pathway. Indianapolis Zoo reports their penguins are very skittish of any of their inflatable items and steer clear of the area they are in rather than approaching to investigate or "play" with them. As penguins are usually quite curious animals, almost anything can be considered enrichment for them. Due to guest perception, however, we must be careful of what we give our birds to enjoy. In darker lighting, some toys may be perceived as random trash thrown in by guests when they cannot make out what the item actually is. Similarly, things like plastic bottles filled with colored paper or glitter, which Milwaukee County Zoo reported as one of their penguins' favorite toys, will often also be perceived as random trash. To assist with this issue, many institutions only give these items during times keepers or other staff members are available to clarify to guests what and why the items are with the animals. A few places, such as the Columbus Zoo, display signs explaining why potential items in animal habitats, that guests might find odd or out of place, are there. While most keepers find guests to be excited and amused by any enrichment they see our animals interacting with, not everyone finds happiness in their fun. The Monterey Bay Aquarium had someone complain that the bubbles they were using for enrichment were not scientific enough and too pet-like. We have all learned we can't please everyone all that time.

A few of the most unique ideas reported to me:

- Moody Gardens: piano mat like in the movie "Big"
- Milwaukee County Zoo: coconuts, colored golf balls
- Aquarium of the Pacific: iPad for cats game
- St Louis Zoo: playhouse
- Akron Zoo: guest feeding smelt – hand feed or water feed
- Memphis Zoo: guest shadows on sunny days, whiffle ball with fish inside attached to buoys to float in the water
- Racine Zoological Society: alpaca/llama hair and snake shed
- Caldwell Zoo: plastic drinking straws used for nesting
- Brookfield Zoo: terns and grey gulls share the exhibit with the penguin breeding colony

Communication between our penguin-housing institutions to share our enrichment ideas and issues with one another can only help our commitment to our birds. By expanding our enrichment base, we develop greater ways to ensure the "happiest", healthiest animals by how we provide their food, "fun" and friends.

Building a SAFE Future

Kate Silver, a writer based in Chicago, IL

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When Steve Sarro and Gayle Sirpenski traveled to South Africa last fall, they were shocked by what they saw. As the Association of Zoos and Aquariums (AZA) African Penguin Species Survival Plan® (SSP) coordinator and vice coordinator, respectively, they'd flown to Cape Town multiple times in the past to work with African penguins—a species that's seen a severe decline in recent years. But on this trip, the drop in the penguin population was so extreme it was actually visible. "It is on the table that if things don't change, this species could easily become extinct in the wild in our lifetime," said Sarro. "And that's devastating to me."

Sarro and Sirpenski were in South Africa, along with other AZA representatives, to contribute to conservation efforts supporting the African penguin as part of SAFE: Saving Animals From Extinction. In its first year, SAFE will focus on two additional species and a class of fish—including cheetahs, western pond turtles and sharks. Six additional species will be added in 2015, and AZA will then continue adding ten new species to the list each year for at least a decade. Sarro, who is curator at the Smithsonian National Zoological Park, in Washington, D.C., and Sirpenski, who is an animal management specialist at Mystic Aquarium, in Mystic, Conn., were thrilled that penguins were selected as part of SAFE: Saving Animals from Extinction. "The fact that we were chosen, to me, validates all our hard work for the last 20 years," said Sarro. "We want this species to survive in the wild. We want our children's children to see African penguins in the wild."

The Plight of the African Penguin

The timing for SAFE: Saving Animals From Extinction couldn't have been better. No sooner had AZA added the African penguin to the list, when they learned that a November 2014 conference was scheduled in Cape Town focusing on the African Penguin Biodiversity Management Plan (BMP). A SAFE team, which included Sarro and Sirpenski, along with Dr. Debborah Luke, AZA senior vice president for conservation and science; Joel Merriman, AZA director of conservation action planning; Rob Vernon, AZA senior vice president of external affairs; and Dr. Susie Ellis, executive director of the International Rhino Foundation, in Strasburg, Va., flew to the conference and participated in meetings with representatives of the South African Department of Environmental Affairs, South African National Parks, CapeNature and Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), along with others dedicated to the plight of African penguins. They also toured penguin colonies at Boulders Beach/Burghers' Walk, Robben Island and Stony Point, as well as SANCCOB, the premiere bird rescue, rehabilitation and research organization in the region.

While in South Africa, the team learned that the current population—an estimated 17,263 breeding pairs—is the result of a more than 60 percent reduction in the population that occurred between the years 2001 to 2009. That's a huge change from 1956, when experts estimate there were 141,000 breeding pairs in the wild. "Food and habitat loss seem to be the things that are really limiting these birds from any kind of recovery," said Sirpenski. "There are so many forces working against African penguins right now." Sirpenski said the challenges associated with food stem from two disruptors: an increase in commercial fishing and the fact that the fish the penguins eat—anchovies and sardines—have shifted location. At some of the colonies, Sirpenski said, food is so sparse that penguins will spend three or four days foraging for what, at one time, was readily available. To make matters worse, Sirpenski said the lack of food puts chicks at risk of being abandoned by their parents. In 2014, she said more than 500 chicks were taken to the SANCCOB rehabilitation facility for rearing because of abandonment.

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Nest building has also presented a challenge. In the past, the birds burrowed deep into their own guano that had accumulated over years. The material would maintain a moderate temperature, never getting too hot or cold. It wouldn't flood, and it protected the birds from predators. But sometime in the 19th century, humans discovered that the guano was an excellent fertilizer and harvested it, leaving the penguins vulnerable and without shelter. Ever since, colony mangers have experimented with a number of different artificial habitats but have yet to find the perfect solution as flooding, temperature extremes and protection from predators have all been issues.

And then there are oil spills. Around 30,000 penguins died in oil spills in 1994 and 2000. That threat will only continue to grow—in the next ten years, up to 30 new oil rigs are being built off shore of the eastern colonies where nearly half of the penguins' breeding takes place. Sirpenski thinks back to the year 2000, when she and Sarro flew to Cape Town to help out after the MV Treasure sank off the coast of South Africa, spilling more than 1,300 tons of oil. Nearly 20,000 birds were covered in oil, says Sirpenski, and thanks to an international response, rescuers were able to clean and release almost 18,000 of them. "That was a huge success," she said. But she worries that in the future, with dwindling numbers it may be more challenging. "That could wipe out this population," she said. "If there was another big spill, that would be it."

Still, there's hope. Both Sirpenski and Sarro have watched the population of African penguins increase dramatically in managed programs at AZA-accredited facilities. "If we didn't control our breeding in zoos and aquariums, we'd be up to our armpits in birds because they are that prolific," said Sirpenski. "When they've got food and appropriate shelter and they're healthy, they will rear lots and lots of babies". By contributing to the ongoing conservation efforts in South Africa, Sirpenski hopes the AZA can make an impact. "I think with our marketing power and the resources that we have, we can really gain some momentum for this program," said Sirpenski. "I think we can do really good things and make a difference for the African penguin."

The Power of Numbers

AZA members have a lot to offer when it comes to conservation. Among its 220-plus members, AZA-accredited facilities contribute approximately $160 million to field conservation efforts each year, said Dr. Debborah Luke. Within the organization there are more than 25,000 scientists, animal care experts and field conservationists caring for more than 750,000 animals representing approximately 7,000 species. And then there's the audience. "Our members have a reach of more than 180 million people per year coming through the gates. That's more than the attendance at all professional sporting events in America combined, annually," said Luke. Because of that, said Luke, the AZA community is in a position to contribute to marketing, education, research and outreach in a way that will make SAFE: Saving Animals From Extinction the largest and most comprehensive effort by AZA members to date—and at a critical time. According to the World Wildlife Fund's 2014 Living Planet Report, the number of mammals, birds, reptiles, amphibians and fish across the globe has declined 52 percent since 1970. The International Union for Conservation of Nature (IUCN) lists 22,176 species listed as threatened, with 21 percent of those considered critically endangered, and climate change posing an increasing threat.

"SAFE: Saving Animals From Extinction is going to provide leadership for helping certain species of animals from becoming extinct", said Luke. Right now, Luke says the SAFE conservation and science team is in the process of devising three-year conservation action plans for each of the first three species and one class, which will outline specific projects, needs, funding and resources. Within those plans, the possibilities for conservation contributions are endless. Luke said that during the trip to South Africa, the participants discussed a number of ways that AZA members could play a leading role, from testing the viability of synthetic habitats in U.S. zoos and aquariums to traveling to South Africa and conducting tests on penguin feces to determine stress levels in the dwindling population.

Although it's early, Joel Merriman says the response from AZA members has already been impressive. "It has generated an incredible amount of enthusiasm within the community, and we are getting a very positive response from people at all levels," said Merriman. "Almost everybody that we speak to thinks we're doing the exact right thing. People are very interested in finding out how they can be involved." Luke emphasizes that it's that spirit of collaboration that will make SAFE: Saving Animals From Extinction a success. "I think of AZA as a convener and a coordinator. There are so many remarkable conservation programs being led and developed by AZA-accredited facilities and partner organizations and each, in its own way, is making a valuable contribution to saving endangered species and habitats. SAFE: Saving Animals From Extinction will endeavor to bring these efforts together and support them in a coordinated fashion while growing and enhancing the overall conservation impact of the AZA-accredited community," said Luke. "That's what we're trying to do."

Using Enrichment to Create an Interactive African Penguin Encounter

Stacy Johnson, *Bird Keeper, Denver Zoo, Denver, CO*

Introduction

Denver Zoo has been offering informal penguin tours with one of our African penguins, Maddy, for several years. In 2013, Animal Adventures: Penguin Encounters began as an official paid tour offered to our guests. This guided tour begins a behind-the-scenes look of Bird World (an indoor facility for several bird species) and ends with an African penguin encounter.

Photo 1. Juniper 9 months old.

Maddy (7 years old) had to be hand raised by keepers when it was discovered her parents were not feeding her appropriately. Because of this, Maddy was already imprinted on humans so she transitioned easily when meeting new people during informal encounters. Following the Species Survival Plan (SSP) breeding recommendation, Maddy was paired with her recommended breeding mate. While Maddy focused on this pair bonding, we knew we were going to be in need of another ambassador penguin for our encounter program in order to continue educating our guests about these endangered birds.

Juniper (Photos 1 & 2) hatched May 9, 2013 and was returned to her parents for parent rearing until 30 days of age, at which point she was hand raised by a few keepers. Our goal was to desensitize her to being handled and being around new people in preparation for the Animal Encounter Program. Unfortunately, Juniper contracted avian malaria at around 55 days old and had to be nursed back to health. This meant all interactions had to cease until she made a full recovery. The healing process took over three months, and as a result, Juniper had a major setback with being around people she did not know. We knew immediately we were going to have to try different techniques in order to get Juniper comfortable with the Animal Encounters and being around strangers.

The Penguin Encounter Program

The program was originally designed to provide guests with knowledge of African penguins, both in the wild and in zoos. Guests were allowed to sit on the floor and a keeper would bring in Maddy for an encounter. Maddy is extremely friendly with anyone and as she made her pass around the room, guests would be able to touch her. At the same time, keepers educate the guests on the Denver Zoo penguin flock, the husbandry of penguins, and also the problems African penguins face in the wild.

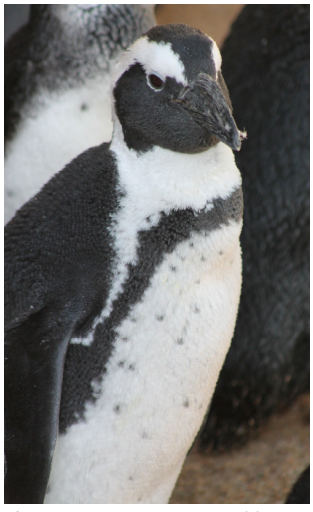

Photo 2. Juniper 1.5 years old.

Since we knew we were planning on temporarily pulling Maddy out of the program for several months in order to pair her with her SSP selected mate, we started bringing Juniper in the encounter room, with Maddy to get her acquainted with the room. As soon as Juniper was comfortable entering the room voluntarily, we slowly started adding several keepers that Juniper was not used to seeing on a daily basis to begin acclimating her to the program. Juniper was very nervous around strangers, sticking close to the keepers that raised her. We asked Denver Zoo staff to begin volunteering their time with Juniper so that she could be exposed to all types of clothing and accessories. She also needed to be calm around all ages and large groups of people, so we also asked that staff bring in their families with kids 6-12 years old. It took several months of introducing Juniper to other bird keepers, and other Denver Zoo staff, before she was comfortable moving around the room and interacting with other people on her own without being guided by her familiar keepers.

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Once Juniper was comfortable with zoo staff, we started having her do tours on her own; by this time she was approximately 9 months old. We realized as a juvenile, she was extremely curious about everything, including jewelry, clothes, fast hand movements, etc., and she began nipping at all these new and exciting items. She was also scared of younger children, mostly due to their faster movements. We didn't want her to become aggressive as a result these responses. We would need a routine that would work for Juniper, while also still being a great interactive and educational program for our zoo guests.

Photo 3. Juniper using peacock feather.

In the encounter room we asked the guests to sit on cube-shaped seats during the interaction instead of on the floor to reduce the chances of Juniper biting someone. This quickly caused Juniper to lose interest in visiting with our guests and she would just stand in the corner. Keepers tried moving around the room to encourage her to interact, but she would just remain close to the keepers. When a guest moved their hands to touch her as she came near, she would be attracted to the movement and would try to bite them. As a result, we began asking people not to touch her so our guests would not get hurt. After many discussions on how to curb this potentially aggressive behavior, enrichment was a tactic we thought might keep her focused on an item instead of people's movements.

The Enrichment

Our penguin flock enjoys various types of enrichment, such as boomer balls, ice blocks, sprinklers, and bubbles. We were hopeful enrichment would lengthen Juniper's attention span and increase her interactions with guests. We wanted items that would be fun for the guests, safe for all of the encounter penguins and also create a distance between the guests and their beaks.

The first enrichment item we tried with Juniper was a peacock feather (Photo 3). This immediately grabbed her attention. The feather is passed around from guest to guest encouraging Juniper to chase it around the room and interact with each guest (Photo 4). She will often chase it, go back to her keepers, and then run back over to the feather.

Photo 4. Guests using the peacock feathers during a paid encounter.

Other enrichment items used are felt string (Photo 5), small plastic springs (Photo 6), sisal tubing (Photo 7), wiffle balls, and tin foil balls. So far, peacock feathers seem to hold Juniper's attention the most. She now waits underneath the enrichment shelf in the encounter room, expecting her enrichment any time she is in that room, whether with paid guests or with her keepers.

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Recently we started working with two new juveniles, Ramon and Rylie (Photo 8), to begin rotating with Maddy and Juniper for the encounters. Using enrichment for these new juveniles was also a huge success in getting them comfortable with the room and with people (Photo 9). They were so relaxed in the room that at 3 months old, they were ready to be involved in the tours and now find the people way more interesting to be near than their enrichment!

Photo 5. Felt string.

The penguins' interactions with the enrichment items illustrate their natural behaviors, while we educate our guests. We are able to discuss their keen vision and attraction to movement, and how they use these senses for hunting fish in the wild. Guests can also discover how inquisitive they are and how this curiosity could cause problems for these birds in the wild.

Other Benefits of the Enrichment Program

Keepers have been working with the African penguin flock on voluntary scale training (Photo 10). The flock has two scheduled feedings that are open for guest view at the zoo. Due to these feeding demonstrations, using food as a reward for our flock is not an option during training sessions. Instead, keepers use enrichment as the reward for participating.

Photo 6. Plastic spring.

Denver Zoo houses 23 African penguins. From that group, only six have not participated in the training. Those six are the main breeding adults who do not appear to have any interest in getting on the scale. The scale does have to be placed in a "neutral zone" that is not too close to any particular pairing's kennel or less dominant birds will not participate. Also, not every bird participates in every training session but of the participating birds, weights can be obtained about once a month.

Enrichment used for the scale training differs from that used in the encounter room. During scale training, the penguins can choose an acrylic target stick (of which they actually prefer the handle portion) or a small plastic wand. There are other varieties of enrichment offered to them while on exhibit and also while in holding. We withhold the special enrichment both for training and the encounter room.

Conclusion

From the start of this program, it has been very important that we keep the encounter penguins fully integrated with the flock. When the birds are not participating in tours, they reside with the rest of the African penguin flock. We want to ensure SSP-recommended breeding continues to take place and to not put additional stress on a molting penguin, therefore if a bird is nest building, incubating eggs, prepping for molt or in molt, they do not participate in the program.

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We have gone through many trials with Juniper, and the other encounter birds, to create a fun and interactive program, not only for our guests, but also one in which the birds want to voluntarily participate. It has taken a lot of time and effort, but the result has been wonderful. We have seen the birds' confidence in entering a room full of strangers increase tremendously, especially for Juniper.

Staff and guests have given us positive feedback of how excited they were to participate in the program, even if they couldn't touch a penguin. Enrichment has allowed our guests to have a special connection with these amazing birds. Excited guests can take their experience in a zoo setting home to help them make changes critical to the conservation of African penguins and other animals around the world.

Acknowledgements

The managers in the bird department have been great in helping us problem solve and achieve our goals. Several other keepers and staff members of Denver Zoo have also graciously volunteered their time to help Juniper and our newest youngsters, Ramon and Rylie, to become acquainted with strangers. And a big thank you to Travis Garrett (penguin keeper) for all his help, support and ideas! I have been so thankful to be a part of this program. All of the birds involved inspire me every day.

Photo 7. Sisal tube.

Photo 8. Ryle and Ramon's first time in the encounter room.

Photo 9. Ryle and Ramon using enrichment with an intern.

Photo 10. Scale training in the exhibit with a target stick.

Overview of Penguin TAG Population Viability Analyses (PVAs)

Brent Johnson, *Population Biologist, Lincoln Park Zoo, Chicago, IL*
Lauren Mechak, Population Biologist, Lincoln Park Zoo, Chicago, IL
Lisa Faust, Vice President of Conservation and Science, Lincoln Park Zoo, Chicago, IL

Maintaining sustainable zoo and aquarium populations is critical if AZA institutions are to continue to serve as advocates for conservation and education. An important new toolset to help zoo managers predict the future demographic and genetic status of AZA Animal Programs are Population Viability Analyses (PVAs). PVAs are computer simulation models that provide more in-depth analyses than those in an SSP's Breeding and Transfer Plan, which typically focus on the short-term actions needed to manage a population from year to year. PVAs are long-term analyses that incorporate historical studbook data and current zoo management practices to determine the trajectory of a population over the next 100 years. PVAs explore what happens if management continues as it has been occurring recently (over the past 10 years) and additional scenarios are used to explore how specific actions, such as increased breeding rates or increased space, would improve the population's sustainability. A team from the Alexander Center for Applied Population Biology (Lincoln Park Zoo), the Population Management Center, and the AZA is conducting PVAs for AZA TAGs until December 2016 with funding from the Institute of Museum and Library Services. Together with Program Leaders, Studbook Keepers, and the TAG Chair, our team completed PVAs for all populations within the AZA Penguin TAG in 2014 and into 2015.

At the time of the analyses, AZA penguin populations are generally large in size, with many founders, high gene diversity, and very low inbreeding. Penguins have high popularity and demand among AZA zoos and aquariums and are likely to remain a desired part of collections in the long term. However, AZA penguin programs do face certain challenges to their persistence, which the PVAs helped identify, including:

1) Space limitations, which are most notable among Antarctic species that require indoor, refrigerated exhibits.
2) Breeding effort and expertise are focused at few institutions for some programs, making the populations more vulnerable to changes in institutional interest and catastrophic events such as disease outbreaks or natural disasters.
3) Mortality and fecundity data for older age classes are limited for the majority of penguin populations that were established in the 1980s. As a result, managers are not certain about the maximum longevity and breeding ages for many populations. This is especially noteworthy given that these populations retain large cohorts of older penguins from when the populations were established, and it is unknown when these animals will age out; if this occurs in a big enough pulse, populations may experience abrupt declines and need to compensate with increased breeding.

Despite these challenges, PVA results suggest that all AZA penguin populations could be sustainable in the long term with either no changes or reasonable adjustments in management. Two of the populations – chinstrap (*Pygoscelis antarcticus*) and macaroni penguins (*Eudyptes chrysolophus*) – are projected to persist at or above their current size over the next century under average breeding rates from the past decade (and average import and export rates as applicable). Eight of the other populations could remain near their current sizes or grow to fulfill increasing institutional interest by maintaining higher breeding rates. On average, these populations are recommended to increase breeding by ~3 hatches per year, but recommendations range from 1 to 6 additional hatches per year. For the two smallest populations, little blue (*Eudyptula minor*) and long-crested rockhopper penguins (*Eudyptula moseleyi*), a balance between increased breeding and increased importation could improve both their demographic and genetic outlook. Rather than increasing

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reproduction, gentoo (*Pygoscelis papua ellsworthi* and *Pygoscelis p. papua*) and king penguins (*Aptenodytes patagonicus*) could be kept demographically stable by reducing exportation out of AZA. For certain populations, focusing breeding efforts at few institutions may be a valuable management strategy for developing optimal husbandry practices and increasing hatch rates. However, spreading breeding among a greater number of zoos and aquariums could help to share husbandry knowledge, maintain even genetic representation of founder lineages, and reduce risks associated with catastrophic events at one or more institutions. Populations that could benefit from spreading breeding among institutions include Adelie (*Pygoscelis adeliae*), chinstrap, king, macaroni, and short-crested rockhopper penguins (*Eudyptes chrysocome chrysocome*).

Under the alternate management strategies explored through our use of PVAs, we believe that AZA penguin population can continue to remain robust in size with good genetic health over the next 100 years. Our results estimate that, with adjustments in management, the populations could collectively grow from approximately 3100 individuals to nearly 3500 individuals over the next 25 years. As members of the Penguin TAG and wider zoo community, it is important to continue working with your Program Leaders to assist in SSP sustainability, whether it is focusing on producing the target number of hatches among institutions as identified by the PVA, helping to place new individuals among AZA zoos and aquariums and reduce exportation, or partnering to bring additional individuals into small populations. PVA reports for the penguin populations are available on the AZA webpage for those with AZA membership and can be distributed to anyone involved in these programs. Results from the PVAs are also being incorporated into the Penguin TAG's next Regional Collection Plan (RCP). In combination with Breeding and Transfer Plans, RCPs, and other program resources, PVAs are a valuable tool when setting goals and objectives for managing sustainable penguin programs long into the future.

I have often had the impression that, to penguins, man is just another penguin -- different, less predictable, occasionally violent, but tolerable company when he sits still and minds his own business.

—Bernard Stonehouse, 1968

9th International Penguin Congress
Avenue, Waterfront, Cape Town, South Africa
5-9 September 2016

Dear IPC9 Delegates

Herewith the 3rd Announcement for IPC9:

CALL FOR ABSTRACTS

Dates for Abstract Submissions
The call for Abstracts is now open and will close at the end of December 2015. For those of you that will be in the field and not able to make this deadline please contact the Chair at enquiries@penguincongress.org.

Call for specific sessions

- Submissions from all aspects of penguin science are welcome. We would however welcome submissions on the following two aspects:
- Given the grave conservation status of penguins globally, we would like to have a session that highlights how science is informing conservation management strategies and implementation that mitigate threats to penguins and improves their population trajectory.
- Submissions that showcase how zoos and aquaria support penguin conservation efforts in the wild.

Format
The format for abstract submissions can be found on the website (www.penguincongress.org). Please email abstracts to: enquiries@penguincongress.org and put '**Abstract submission**' in the subject line.

Invitations to propose workshops
For those delegates who would like to host conference workshops, please could you contact the chair at enquiries@penguincongress.org and put '**Workshop proposal**' in the subject line. For any further enquiries, please use the following email address: enquiries@penguincongress.org.

Please pass this announcement along to any interested colleagues and friends. If you would like to be added to our mailing list please send an email with the word '**subscribe**' in the subject line to enquiries@penguincongress.org.

AARP(enguins)

Tricia McDeed, *Senior Aviculturist, SeaWorld Orlando, Orlando, FL*

Geriatric penguins in a zoological setting are becoming increasingly prevalent across AZA institutions. This longevity speaks to the husbandry expertise demonstrated by zoo professionals but at the same time creates new challenges and often the need for husbandry modifications to address the changing social, environmental and medical needs of elderly birds. While euthanasia plays a small part in what we do, the responsibility is immense and the decision to euthanize must be reached humanely and respectfully. Many institutions have implemented a Risk Assessment Tool to aid them in this process. After all, aging is a part of life and it is our responsibility to keep that in mind when moving forward with a colony of geriatric penguins.

Topics that will be discussed include the history of penguins in a zoological setting, defining "geriatric", age-related diseases, husbandry modifications including environmental, social, and medical treatments, public perception, and euthanasia.

Frank Todd, the then Corporate Curator of Birds at SeaWorld San Diego, California and working with the National Science Foundation collected penguin eggs between 1983 and 1988 from the Sub-Antarctic regions. Seven species were hand reared by trained staff. Historically, this was the first and largest, sustainable colony of penguins. These founder birds provided offspring which helped to populate new and old penguin exhibits all over the world, helping disperse the genetics.

A questionnaire about geriatric penguins was submitted to the IR (Institutional Representatives), the TAG IR (Taxon Advisory Group) and the AAZV (American Association of Zoo Vets). Twelve species of penguins were represented in their responses, including the Magellanic *Spheniscus magellanicus*, African *Spheniscus demersus*, Humboldt *Spheniscus humboldti*, king *Aptenodytes patagonicus*, emperor *Aptenodytes forsteri*, fairy *Eudyptula minor*, northern rockhopper *Eudyptes moseleyi*, southern rockhopper *Eudyptes chrysocome*, macaroni *Eudyptes chyrsolophus*, gentoo *Pygoscelis papua*, chinstrap *Pygoscelis antarcticus*, and Adelie *Pygoscelis adeliae* penguins.

Defining the word *geriatric* was left open to interpretation. Half of the responses considered 15 years as the beginning of the "golden years" and the other half thought that 20 years was a more appropriate age. Reputable resources claim 20 to 25 years is the average lifespan of a penguin in a natural setting. Richard Weigl, a recognized authority on the longevity of captive animals, currently working at the Frankfort Zoo in Germany, has collected data of the oldest living or deceased penguins in captivity, worldwide. Some of his research includes a wild caught 40 year old King penguin still alive today, as well as thriving 40 plus year old Adelies that were also wild caught. Most common medical concerns seen in geriatric penguins include arthritis or degenerative joint disease, gout, cataracts (Photo 1), aspergillosis (Photo 3), abnormal eggs, pododermatitis (Photo 2), overgrown nails and bills, broken or cracked bills, neoplasia, and atherosclerosis. Improper lighting and physical moves are known to be stressful on older birds causing them to partially molt or not molt at all (Photo 4).

L to R, **Photos 1-4**, Cataract L eye, bilateral pododermatitis, aspergillosis lesions, abnormal molt pattern. *Photos taken at SeaWorld Orlando by the aviculture and veterinary staff.*

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Husbandry modifications used to aid the elderly are broken down into three categories: environmental, social, and medical:

Environmental

Since competition for food can be a major challenge for older birds, supplying trays of fish on land in several locations will help suppress the problem. Target feeding hydrated fish (fish injected with water or electrolyte solution) to the underweight birds can be beneficial, especially when elevated uric acid levels are present, a symptom of early renal dysfunction. Encouraging them to swim with the motivation of their favorite food items offered in the pool helps get them off of their feet and practicing their natural behaviors – fishing! Offering ramps for easy access in and out of the pool versus steps eases the challenge in arthritic birds. Soft substrates such as indoor/outdoor carpeting can comfort those who spend much time lying down or suffer from arthritis. Changing their environment can be beneficial; at SeaWorld San Diego their geriatric macaroni penguins were moved into a "cool" room from their original freezing habitat. This warmer temperature not only improved their behavior, but also their physical appearance.

Exhibits housed outdoors have the extreme temperature challenges. On hot days, facilities have planted shade trees, installed sprinkler systems, and built a cool room on and off exhibit. On cold days, the Bronx Zoo provides pine needles and juniper prunings for burrows because they do not degrade as quickly as grasses or other leafy materials. Many facilities add heating elements such as heat lamps and pig blankets, core, and radiant electric heaters. Future penguin habitats should consider including a retirement area alongside the colony versus isolation away from the colony, offering flattened land space with ramps in and out of the pool.

Social Treatment

When geriatric penguins have to remain dry for certain treatments possibly leaving them isolated from the colony, providing a mate or buddy for the duration of the treatment can help prevent pacing and stress. Breeding season can be stressful as birds fend off others in defense of territories or mates. Removing the aggressors or using visual and physical barriers provides peace.

Methods of encouraging penguins to get off of their feet can be used as an aid to improve their physical health. The kings at SeaWorld Orlando are conditioned to take daily walks together to a ramp that leads them into the pool. As they get close to the water's edge, a "dinner bell" is rung rewarding them with a pool feeding including some of their favorite fish, Herring!

Disease/Medical Treatment

Frequent weights and veterinary visits as well as the monitoring of trends and issues will be a beneficial reference tool. Pictures and video of condition progression and changes as penguins age are invaluable. Some medications work differently depending on the individuals making detailed record keeping vital.

Mild to severe arthritis can be managed with a common method of treatment including Cosequin® (a joint health supplement) along with Meloxicam (an NSAID), Tramadol (a synthetic opiate), Gabapentin (anti-seizure/anti-convulsant used for arthritis pain), and or Ibuprofen (also an NSAID).

There doesn't seem to be a huge correlation between age and foot issues, like Pododermatitis, but it may be a secondary issue from the lack of mobility and interest to swim. There has yet to be an effective cure discovered.

Neoplasia, while incurable, can be treated with radiation and or chemotherapy, surgery, or palliation prescribing high doses of steroids and pain medications.

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Aspergillosis can be treated and cured with antifungals such as Voriconazole, Terbinafine, and Amphotericin B. Stem Cell injections have anti-inflammatory properties which are used to treat both arthritis and bumble-foot. There is no good treatment for Gout and Atherosclerosis.

Cataracts can be treated with a fairly quick surgery and recovery period, leaving the birds with the ability to maneuver around the exhibit, breed, and self-sufficiently feed with ease.

For the older females that lay abnormal eggs, or in one case, a reproductive tract was partially removed at the Brookfield Zoo, Lupron® injections help shut down production, protecting these females from complications during the breeding season.

"Beak repair is an art." says Dr. Todd Schmitt from SeaWorld San Diego. After trying several products on broken bills in different climates, he discovered that nail acrylic adheres well to the keratin and lasts longest in a freezing habitat. For the temperate habitat, a product called Integrity®, a self-mixing dental bridge is working well.

Photos taken by SeaWorld San Diego veterinary staff.

Social media is a growing trend that has evolved over the last few years. This allows guests to share their experiences with others easily and help spread awareness, but the public's perception can be easily skewed. AnimalVision.com, a 24 hour interactive camera, is one way observers can enjoy viewing different animals in their environments at home or school, etc. The downfall to this technology is that the viewer cannot have the satisfaction of having the answers to their questions right away, unlike in person, leaving the perception up to their imagination. If an arthritic penguin is in view and is noticeably walking differently than the others, a viewer may perceive that as a lack of care or neglect.

Dr. Roberta Wallace from the Milwaukee County Zoo described aging animals quite well, "Just like other old animals, many can do quite well for a significant period of time with patience to baby them a bit and nurse them along. Sometimes the decision to euthanize is very obvious, other times not."

Having the proper tools in place can justify uncertainties when making a decision. Here are three different methods used from our AZA facilities:

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Quality of Life Evaluation Tool

Symptoms Exhibited	Enter 5 if present	Auto Calculator
vomiting	0	
anorexia	0	
lameness	5	
pain when standing up	5	
dehydration	0	
diarrhea	0	
reluctance to move	5	
muscle atrophy	0	
lesser roll in hierarchy	0	15
Treatments Administered	**Enter 5 for each** (if considered ineffective or if delivery of treatment is stressful)	
Gabapentin	0	
Tramadol	0	0
General Assessment	**Enter 0-10 (0 = no pain, 10 = high level of pain)**	
pain	5	
discomfort	9	
quality of life	8	22
Additional Assessment	**Enter -5 if:**	
value to conservation of genetic lineage	-5	
breeding interest	0	
ability to reproduce, etc. outweighs potential suffering	0	-5
		Total score 32

Scoring System: 1-30 = treatment recommended

31-51 = prognosis doubtful

> 51 = euthanasia should be considered

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Quality of Life Scale

(The HHHHHMM Scale)

Pet caregivers can use this Quality of Life Scale to determine the success of Pawspice care. Score patients using a scale of: 0 to 10 (10 being ideal).

Score	Criterion
0-10	**HURT** - Adequate pain control & breathing ability is of top concern. Trouble breathing outweighs all concerns. Is the pet's pain well managed? Can the pet breathe properly? Is oxygen supplementation necessary?
0-10	**HUNGER** - Is the pet eating enough? Does hand feeding help? Does the pet need a feeding tube?
0-10	**HYDRATION** - Is the pet dehydrated? For patients not drinking enough water, use subcutaneous fluids daily or twice daily to supplement fluid intake.
0-10	**HYGIENE** - The pet should be brushed and cleaned, particularly after eliminations. Avoid pressure sores with soft bedding and keep all wounds clean.
0-10	**HAPPINESS** - Does the pet express joy and interest? Is the pet responsive to family, toys, etc.? Is the pet depressed, lonely, anxious, bored or afraid? Can the pet's bed be moved to be close to family activities?
0-10	**MOBILITY** - Can the pet get up without assistance? Does the pet need human or mechanical help (e.g., a cart)? Does the pet feel like going for a walk? Is the pet having seizures or stumbling? (Some caregivers feel euthanasia is preferable to amputation, but an animal with limited mobility yet still alert, happy and responsive can have a good quality of life as long as caregivers are committed to helping their pet.)
0-10	**MORE GOOD DAYS THAN BAD** - When bad days outnumber good days, quality of life might be too compromised. When a healthy human-animal bond is no longer possible, the caregiver must be made aware that the end is near. The decision for euthanasia needs to be made if the pet is suffering. If death comes peacefully and painlessly at home, that is okay.
***TOTAL**	*A total over 35 points represents acceptable life quality to continue with pet hospice (Pawspice).

Original concept, *Oncology Outlook*, by Dr. Alice Villalobos, *Quality of Life Scale Helps Make Final Call*, VPN, 09/2004; scale format created for author's book, *Canine and Feline Geriatric Oncology: Honoring the Human-Animal Bond*, Blackwell Publishing, 2007. Revised for the International Veterinary Association of Pain Management (IVAPM) 2011 Palliative Care and Hospice Guidelines. Reprinted with permission from Dr. Alice Villalobos & Wiley-Blackwell.

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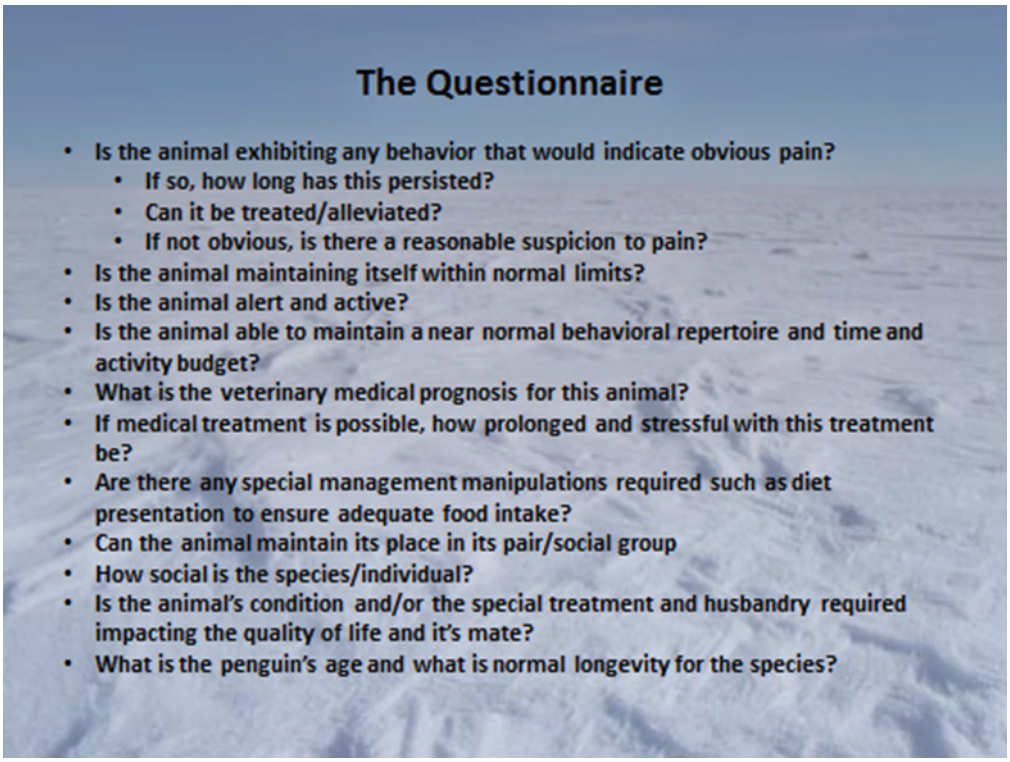

Quality of life is a very gray area. With every case comes an opportunity, not a problem. Euthanasia is the last resort when all the options have been exhausted. As our animals age, the goal should be to provide them with a desirable life. Having methods of dealing with their ailments and by developing alternative treatment, we can continue to work on improving our care and learn more about these animals. We owe it to ourselves to explore other options and continue to expand upon them. While some of this material may not be ground-breaking for you, I hope it will inspire you to take a look at what your facilities are doing and continue to improve upon the lives of animals. After all, this is about giving the best possible care.

The Penguin Programme In Ski Dubai

Peter Dickinson, *Penguin Curator, Snow Penguin, Ski Dubai, Dubai*

Penguins in the Middle East? Why not? The first penguins to arrive in the United Arab Emirates arrived in Al Ain Zoo circa 1980 and were displayed in a rather inadequate enclosure. They did not do well. The Scientific Centre in Kuwait have kept them for a number of years now. The first birds to arrive in Dubai were imported by the Dubai Mall in 2008.

Ski Dubai first opened to the public in 2005. For those of you who are not familiar with Ski Dubai it is a huge Ski Dome attached to one end of Mall of the Emirates, one of the premier shopping malls in Dubai. The Ski Dome was built as sort of 'extra' to attract visitors to the Mall. It very quickly became more than that, becoming famous in its own right and is now firmly established as a 'must see' for visitors to Dubai. It is not however just a tourist attraction but is a popular amenity which is utilised daily by residents of Dubai. Skiing and snowboarding take place every day and the expertise of some of the regular users could easily compare with those using Alpine slopes. It is only a matter of time before we have Emiratis competing and winning in the Winter Olympics.

The Ski Dome comes into periodic criticism by Green Groups who have claimed that it uses as much energy to keep cool as a small country. There is no denying the Dome does use some power but it is so well insulated that it actually uses less energy than some Dubai Hotels. This is no mean feat because the temperature inside is maintained at around minus four Centigrade [24.8F] all year round whilst outside in the summer it is regularly forty five plus degrees [113F+]. Besides, there are indoor Ski Slopes in Europe so why not Dubai?

So where did the idea of Penguins in Ski Dubai come from? There was never any early intention of housing animals at all but penguins passed through the minds of several staff shortly after opening. It was not until early in 2011 that more serious thought was given to the idea. Whatever was decided upon would need some serious planning because there was no way of adding an extension to the dome.

Consultants were brought in, an architect was signed up and planning got under way. I was lucky enough to be offered the post of curator of penguins. The offer was very opportune because, although happily settled in Thailand, I was looking for a new challenge. I had two offers on the cards but this one was different. I have never claimed to be a 'trainer' or an expert on anything much less penguins but I had worked with gentoos in 1967 and had been offered the post based on my curatorial experience and by virtue of the fact I had been working with penguins in Northern China just a few years before. Plus I had worked with innumerable Humboldt's over the years.

I knew Ski Dubai because I had visited shortly after it opened and when I was offered the post it really had no immediate appeal. It went against what I believed in. However I was assured that the company were sincere about conservation, education and research and so I accepted. I flew to Dubai to learn more. The management of Ski Dubai impressed me with their ideas and dedication. The idea really seemed to have merit.

Nobody (well hardly anybody) goes to a zoo to be educated. What about a Ski Dome? They may go to learn about skiing but learn about penguins? The more I thought about it the stronger my conviction became.

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We would be in a position to tell a group of people about pollution, climate change and penguins; a group of people who may never visit a zoo or read a newspaper. It was an opportunity to feed the minds of a whole new sector of society.

I arrived in Dubai in September 2011. The first thing I did was start two personal lists. One was 'Why I believe in Penguins in Ski Dubai' and the other 'Why I don't believe in Penguins in Ski Dubai'. Nothing had been built so I was in from the beginning. I spent days and weeks visualising the project and how it would pull together. We wanted the birds comfortable and 'happy'. We wanted to provide our public with something new and different, something which had never been done before.

At this point we had no birds and no staff but building got under way. We needed Penguin Trainers. There weren't any. There were dolphin and sea lion trainers and there were people who had experience with penguin marches in various facilities. We set about interviewing people from all over the world and pulled together a core group of caring people who had different skills from which the whole team and the penguins would benefit. It would be unfair to single out any of them contributing more than the others, but I will. Nikki Morrison who joined us from the Cayman Islands was the leading light of the training team.

As the facility pulled together the team started to arrive. They set to work on writing Standard Operating Procedures and generally familiarising themselves with Penguins. At this point we had no birds although gentoos were our intended species. We had intended to bring them in from Japan. We even had them in quarantine there. However the UAE denied import because of Bird Flu. Then it looked like we would get them from France, then Sweden, then Scotland. We then had a huge stroke of luck and were offered ten king (*Aptenodytes patagonicus*) and ten gentoo (*Pygoscelis papua*) penguins from San Antonio, Texas - third generation captive bred.

We sent one of our new team over to the US to familiarise himself with the birds before they left and to travel with them back to Dubai. Back at base, all the other things which needed to be done, purchased and pulled together were well under way. I for one was very happy with the way things were going. We planned and rehearsed the arrival time and again until it was off pat perfect. The birds all arrived in good health on the 1st January 2012.

They were given time to settle in and familiarise themselves with their new home. At the same time the Penguin Training Team were watching and learning the characteristics of the individual birds. The two species are different and each and every bird is different in its own right.

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Because the penguins were going to be expected to meet a large number of people every day it was important to desensitise them to the unfamiliar. We put them through the equivalent of Police Horse Training. Penguins have a lot more going for them than most people can imagine. They are hardy, clever and loveable birds. Once they were settled they were divided up amongst the Trainers who became responsible for their care, wellbeing and training. Although we have learned a lot along the way this has not changed. We have a Primary Trainer and a Secondary Trainer who are wholly responsible for two or three birds. These Training Teams change every few months to avoid the birds being fixated on any particular Trainer. Although we had a basic plan of what we wanted to achieve we have always recognised and accepted that change was inevitable and the whole programme has developed with time.

Our Penguins are maintained on South Georgia time so their day length changes throughout the year, month by month. We believe that this is important for both moult and breeding. We have had to adjust the timings but only a little. The Penguins wake up early some months and later on others. We try never to disturb them till dawn. Their working day starts at twelve noon and goes on till about ten in the evening. No team of Penguins works the whole day (though some may like too), they take turns, and all get a 'day off' once a week. There are inevitable glitches during moult and breeding but, generally speaking, the whole process works extremely well.

What we offer to our visitors is 'Penguin Encounters'. The opportunity to meet, learn about and touch a penguin. All parts of the penguin programme are important but the touching is probably foremost. Once a visitor has touched a penguin they will surely never feel the same about them ever again. The basic package is the ordinary encounter. This is limited to 12 guests at a time. The encounters take place every half hour (more often if we are busy) and guests must be early in order to get dressed in warm clothes. It is lower than minus four where the encounters take place. The guests are collected by a 'runner' who takes them to our pre-encounter room. Here they are shown an instructive video and told what they can and cannot do in the encounter. This is important. We have people of all nationalities visiting and there are cultural differences of what is acceptable and what is not. The pre-encounter proves its worth all the time.

The Guests are then taken into 'Encounter Area one' where first they get the opportunity to see the penguins swimming in their Penguinarium or standing on the beach. Next the guests are seated and the trainer introduces them to two gentoo penguins. All of the trainers have a wonderful rapport with the visitors and educate them whilst the gentoos "edutain" them. Key issues of conservation, climate change are imparted. Guests get the opportunity to ask questions and learn more. All the while the gentoos play around their feet,

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chase skittles or retrieve. The guests then have a photographic opportunity and two or three at a time are asked to go and sit on some rocks. The trainer then asks the birds to go and sit amongst them. Some very memorable photos are taken. Next they proceed through to 'Encounter Area Two' to meet the king penguins. Another trainer takes over. More information is given and all are given the opportunity to stroke and hug a king penguin. Last questions….and the guests go away happy. We know from regular research that the guests love the experience that we offer. Some make several repeat visits and letters of commendation are common.

Further to the ordinary encounter, we also offer an 'Exclusive' and an 'Ultimate' Encounter. These are for smaller parties but offer more time, more information and the opportunity to meet more penguins. They allow the guests supervised tours behind the scenes and up onto the Penguinarium Beach. They are taken through the penguin sleeping quarters, into the kitchen and the filtration room. They also meet more of the staff. It is very much a personal tour and we have not had anyone who has not enjoyed it. We add little perks like a penguin painting to take home. The 'Ultimate' goes a step further in that guests also get access to a VIP room to rest afterwards and a mug of the famous Ski Dubai hot chocolate.

A recent addition to the Encounter programmes is 'Swimming with Penguins'. This goes a step beyond the 'Ultimate'. The swim programme takes place just once a week and is limited to two people at a time. It takes up more staff time and so is a little more pricey but it is probably a once in a lifetime experience for anyone who takes it up.

Moving towards the swim programme we thought we would need to desensitise the birds to the activity. The staff then took turns either sitting on the side of the pool with their legs in the water or actually going into the pool with the birds. As it turned out the penguins themselves were not fazed at all and positively enjoyed the activity. The birds make the experience unforgettable. The guests themselves very quickly forget that the water temperature is just nine degrees [48.2F] and we have to persuade them to exit to move on with the experience.

Our shop window is our 'Penguin March' which is not really a march at all. A march is what was intended but the topography of Ski Dubai does not really lend itself to the activity. Our 'march', which can also be viewed from outside of Ski Dubai on a balcony in the Mall, is a short introduction to the birds plus a primer on pollution and climate change and an introduction to the research work we are sponsoring in Antarctica. The March is the only 'happy clappy' activity we carry out. Visitors to Ski Dubai love it and so too, all importantly, do our penguins. A few selected visitors are invited in to meet and greet a penguin. Those who were not chosen all have the opportunity to purchase a ticket and join a full encounter.

What about breeding? Our birds were young when they joined us at the start of 2012 so we were not too hopeful of anything during their settling in period. They had to adjust to the lighting cycle and a new way of life. The facilities themselves do not really lend themselves to breeding. This said, it quickly became obvious to us that after being desensitised that our birds were so relaxed that anything was possible. We were not too surprised then when in 2013 we had two pairs of gentoos each lay two eggs and one pair of kings.

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Sadly the eggs did not hatch but we had fertility in both. However, in 2015 we had our first king penguin chick parent reared and very healthy. Although we were more than happy to give the breeding pairs a holiday whilst incubating it wasn't necessary. The penguins themselves chose to continue with encounters and marches when they were not on egg duty.

I haven't said much about training but then I am not a trainer in the full sense of the word. I have several certificates somewhere for people-training but not for animals….and really there isn't a huge degree of difference. All zoo keepers train (whether they realise it or not) and all trainers keep (or should). One thing I have always believed is that training is enrichment and I would go so far as to say it is the most important form of enrichment. All our training is positive, there is no negative and many of our birds are as happy with a word or stroke reward as they are with a fish treat.

I would like to give very special thanks to the Penguin Team, both past and present who have worked so hard to pull together what is a unique world class experience. The present team is made up of trainers from South Africa, Sweden, Mexico, England, the Philippines, India and Ethiopia and not forgetting our twenty five king and gentoo penguins. Between us we know we have only just scratched the surface of what these remarkable birds are capable of.

And my lists? A long time ago the one took over from the other. I now firmly believe that Penguins in Ski Dubai was and is a very good idea.

Penguin Listserv Update

A question was posed as to what diets are fed to penguins.

Original Listserv Question		Just curious as to what else other facilities feed their penguins. I would like to try and get a bit more of a variety into their diet, especially for those birds that will only eat capelin at the moment. Also does anyone have a supplier for smaller sized herring?
Long Island Aquarium and Exhibit Center	African	We currently have our penguins on a diet of mostly capelin and some of them will also eat herring. We currently just cherry pick some smaller ones [herring] out of our boxes but sometimes they are just all too big.
California Academy of Sciences, Steinhart Aquarium	African	We feed day smelt in addition to the herring and capelin.
Calgary Zoo	Humboldt, king, rockhopper, gentoo	For complete nutrition we feed them a mix of capelin, herring, ocean smelt, squid and we make sure that none of the food types is over 30% of their diet over the course of 1 week. We also feed krill weekly but that is more for enrichment (though we see a big difference in the colouration of their beaks and feet). We do yearly x-rays of the penguins to check for coins in the fall after the busy season. We have a plastic box that the penguins lay in for a quick x-ray. It works well. We tried metal detectors but they were too sensitive; they picked up the rebar in the exhibit and the metal in our boots. The penguins had no issues with the wands but we found them to be very unreliable. Pretty much all our herring is small, so much so that even the small southern rockhoppers eat them no problem. For the herring we get it from Pacific Salmon Industries Inc., 8305 128th Str, Surrey, BC Canada (604) 501-7602.

News and Updates

- A movie about a Maremma dog that protects a colony of little blue penguins opened in Australia on 17 September. *"Oddball"* is based on the true-life Middle Island Maremma Dog Project. The project was started in 2006 to protect the Middle Island Little Blue Penguins from fox predation. The dogs stay on the island to ward off the foxes that can access the island via a sandbar that appears during warmer months. Learn more about the project at http://www.warrnambool.vic.gov.au/middle-island-maremma-project.

- The Oamaru Blue Penguin Colony announced in September that it has received approval to expand. On the south island of New Zealand, the Oamaru penguin colony is a popular tourist attraction. The expansion plan is not yet finalized but may likely enlarge the visitor center to make it more research-focused.

- In September several articles were published in the popular media expressing alarm for the drop in seabird populations and the impact of plastics in the oceans on seabirds (*After 60 million years of extreme living, seabirds are crashing*, The Guardian, 22 September 2015, http://www.theguardian.com/environment/radical-conservation/2015/sep/22/after-60-million-years-of-extreme-living-seabirds-are-crashing; *Seabirds suffering massive population declines*, CBS News, 14 July 2015, http://www.cbsnews.com/news/seabirds-suffering-massive-population-declines.). Most recently, research published in a paper by Paleczny *et al*, shows seabird populations are suffering severe declines (see link in Recommended References). Palezny calls for the creation of International Marine Protected Areas to protect seabirds. Less than 1% of the ocean is closed to fisheries and only 2% of the world's oceans are under any form of protection.

- Plastics are also cited as a looming threat with up to 90% of seabird species believed to carry plastic in their stomachs according to a study published in August. The researchers used modeling to evaluate the relative oceanographic concentration of plastic and seabird exposure. The model was then used to predict the risk to seabird species globally. It was a surprise that the highest predicted impact is expected to be the Southern Ocean boundary and stated that plastic ingestion is increasing among seabirds, including penguins. Plastic ingestion is a concern both because the plastic bits can build up in the stomach and occlude space for food as well as for the ability of plastics to bind and concentrate environmental pollutants that are released after ingestion.

- Also in August, the debate continues in South Africa regarding the best approach to saving the African penguin. While commercial fishing was banned in four key areas seven years ago in an effort to address the African penguin population decline, fisheries scientists are skeptical that fisheries activities are responsible for the drop in numbers. Both fisheries and bird scientists agree that the penguin decline began in 2004 when anchovies and sardines shifted south away from the colonies. Though the cause for the shift is unknown, penguin scientists believe that fisheries competition is a factor. They contend that as a result of the shift penguins must now swim farther to find fish both for themselves and for provisioning chicks, often abandoning chicks when sufficient food is not available. Fisheries scientists opposing the ban cite causes other than fishing as being responsible for the drop in penguin numbers, including fur seal and shark predation, and argue that there is enough fish for both penguins and fisherman. But penguin scientists are advocating continuing the ban until more can be learned about the complicated factors affecting African penguins in South Africa. Fortunately, in the meantime, SANCCOB is working to rescue abandoned chicks through their Chick Bolstering Project.

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- In August the Alexander Center for Applied Population Biology (Lincoln Park Zoo) announced the finalization of the Penguin TAG Population Viability Assessment (PVA) summary report. The report will be available on the AZA Penguin TAG webpage www.zoopenguins.org. Included in this report is a comparison of all penguin PVA results as well as the 2-page PVA summary report for each of the 11 programs.

- Moody Gardens announced in August they will be renovating the Aquarium Pyramid in "waves". In Wave 1 the Aquarium Pyramid will be closed through November 13. In Wave 3, the Pyramid will be open but the penguin exhibit will be closed for 3 months after the first of the year. The renovation will include the addition of a new tropical penguin exhibit.

- August: Sometimes the most obvious solution is the best. The Chessington Zoo (Surrey, UK) now hands out "nose pegs" to visitors to help them enjoy the new Penguin Bay exhibit without any olfactory discomfort. http://travel.aol.co.uk/2015/08/01/nose-pegs-chessington-zoo-penguin-poo-smell-picture.

- In August a study published in Geophysical Research Letters suggests that shifts in wind currents over the past 30 years have moved the Equatorial Undercurrent north, bringing nutrient-rich colder water further north along the coasts of the Isabela and Fernandina Islands. As a consequence, the study authors contend, the Galapagos penguin population has nearly doubled due to bolstered fish numbers. This is another example of the potential complicated effects and outcomes of climate change which may inadvertently benefit some species while many others will be put at risk.

- The Guadalajara Zoo welcomed several Adelie penguins to their new Reino de Pinguinos (Kingdom of Penguins) attraction in July.

- At the 64th International Conference of the Wildlife Disease Association 2015 a poster was presented by Anna-Karina Gonzalez Argandona *et al* titled Forced Moult in Sub-Antarctic Yellow-eyed Penguins *(Megadyptes antipodes).* The penguins were referred to Massey Wildbase in 2014 for poor plumage as well as other medical concerns. The poster describes the oral administration of fresh beef thyroid to induce molt in the penguins. This induced molt was cited as being complete at about fourteen days post treatment. The penguins were subsequently released after the full feather replacement. These findings were also reported at the 2015 Effects of Oil on Wildlife Conference in Alaska in May.

- The San Diego Zoo launched a penguin web cam in June to showcase a pair of African penguins in their Children's Zoo. The Zoo will soon be home to up to 50 African penguins when its new Penguin Beach exhibit opens in 2017. http://patch.com/california/ramona/new-penguin-cam-san-diego-zoo-0.

- The Global Penguin Society published a new educational booklet in May. The booklet, titled MENSAJEROS DEL MAR (Sea Messengers), will be distributed, free, to schools in South America where penguin species occur.
https://www.facebook.com/GLOBAL-PENGUIN-SOCIETY-GPS-202636488994/timeline/.

- Penguin and Puffin Coast at the St. Louis Zoo reopened in April after being closed for about a year and a half during construction of the adjacent Polar Bear Point.

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Events and Announcements

- African Penguin Awareness Day: 17 October 2015 www.facebook.com/africanpengins.
- 2nd World Seabird Conference: 26-30 October 2015, Cape Town, South Africa, www.worldseabirdconference.com.
- Penguin Awareness Day: 20 January 2016.
- International Earth Hour: 19 March 2016 www.earthhour.org.
- Earth Day**:** 22 April 2016 www.earthday.org.
- World Penguin Day**:** 25 April 2016.
- Endangered Species Day**:** 20 May 2016 www.endangered.org.
- 3RD Annual Tuxedo Trot 5K**:** 21 May 2016**.** Presented by the Greensboro Science Center, www.tuxedotrot.com. Jessica Hoffman, Curator of Birds and Mammals at the Center, shared on the listserv "We actually host a 5K race (and a kids fun run) titled Tuxedo Trot and promoted by our ambassador penguin *Tux*. All proceeds from this event go to support SANCCOB. We encourage runners to wear fun black and white-themed costumes, and have a "fish" runner that starts out the race for the penguins to "catch". We also have penguin-themed awards for various categories". In 2015 this event raised $12,847.90 for SANCCOB!
- World Oceans Day**:** 8 June 2016 www.worldoceansday.org.
- International Penguin Congress 9 (IPC9): 5-9 September 2016, Cape Town, South Africa. Contact Lauren Waller, Chair organizing committee at enquiries@penguincongress.org. Heather Urquhart wrote the Listserv on 5 October: *"If you haven't already heard the 9th International Penguin Congress (a name change for this conference) will be held in Cape Town, South Africa - September 5-9, 2016. The call for abstracts is attached [Eds. note: we've included the call for abstracts in this issue] – they are due by end of December 2015. There will be a session dedicated to showcasing how zoos and aquaria support penguin conservation efforts in the wild. This event is a great networking and learning opportunity so put on your thinking caps and submit some abstracts."*