Penguin Conservation

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In This Issue

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From the Editors

In this issue we provide information on an in-depth penguin cataract study presented at the Penguin Husbandry Workshop held during the 2015 AZA Mid-year Meeting. Detroit Zoo veterinarian, Dr. Sarah Woodhouse, and board-certified veterinary ophthalmologist, Dr. Suzette Aquino, completed eye exams on macaroni and southern rockhopper penguins at eight North American institutions. The objective of the study was to identify the extent of cataracts in the zoo population and determine why they occur. Participating institutions completed a survey addressing husbandry factors. Information obtained from this important study will aid penguin managers with making husbandry decisions that will decrease the incidence of cataracts for penguin in their care.

David MacFarlane, Yellow-eyed Penguin Trust (YEPT) field manager, provides an update on the recent yellow-eyed penguin breeding season. Continual decline in the number of yellow-eyed penguin (YEP) nests and fledging chicks along the southern range has prompted the YEPT to focus their efforts to save this species at the individual level. MacFarlane describes two new, exciting developments facilitating this effort: the appointment of a conservation scientist to conduct research on marine issues affecting YEP productivity, and a wildlife veterinary specialist, to provide medical care to YEPs injured during chick fledging and adult molt. The YEPT is also looking into the feasibility of opening a wildlife hospital in Dunedin. A dedicated hospital will be a critical component for providing quick medical attention for the critically endangered YEPs and other penguin species that occur along the Otago coast. The PCN editors encourage supporting the important work of the Yellow-eyed Penguin Trust at an institutional and/or individual level.

The Detroit Zoological Society supports the important work of polar ecologist, Dr. Bill Fraser, and the Polar Oceans Research Group. Dr. Fraser provided a unique opportunity for a Detroit Zoo staff member to join his field team during the 2015/16 field season. Bird Department zookeeper, Matthew Porter, traveled to the U.S. Palmer Station, located on the Western Antarctic Peninsula, where he spent three months assisting with the study of penguins and other seabirds. Matthew provides an account of his work in the field and life at the station.

Megan Cimino provides an excerpt of a study completed at the U.S. Palmer Station on the Western Antarctic Peninsula, which has become one of the most rapidly warming places on Earth. Here, gentoo penguin numbers are increasing while Adelie penguin numbers are drastically decreasing. The study analyzes data taken from satellite transmitters and data recorders applied to breeding penguins, and oceanographic data taken with an autonomous underwater vehicle. The results were used to determine whether this population shift is caused by competition for prey or is driven by climate change.

John Werth, Pan-African Association of Zoos and Aquaria (PAAZA) executive director, describes the objectives behind the PAAZA ArK program. This unique program combines data and resources from three components: the living collection, the biomaterial bank and the people conducting research, to develop a conservation action plan for saving targeted species. The African penguin is one of the species for which a specific plan has been developed. Gene flow between breeding sites, epidemiological research, and the establishment of new colonies are among some of the key objectives outlined for this endangered species.

We thank all of those who contributed to this issue including Dr. Sarah Woodhouse (Detroit Zoo), David MacFarlane (Yellow-eyed Penguin Trust), Matthew Porter (Detroit Zoo), Megan Cimino (University of Delaware), John Werth (Pan-African Association of Zoos and Aquaria), Dr. Andre Chiaradia (Phillip Island Nature Parks), Shawn Pedersen (Woodland Park Zoo), Heidi Ollek (Toronto Zoo) and Gayle Sirpenski (Mystic Aquarium).

We are always looking for content that would be of interest to our readers. An abbreviated version of the next issue will be included in the 9th International Penguin Congress (IPC9) packets. Please submit all articles by August 1st.

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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Risk Factors for Cataracts in Macaroni and Southern Rockhopper Penguins*

Sarah J. Woodhouse, DVM, *Detroit Zoological Society*, *Royal Oak, MI*

*Adapted from a talk given at the 2015 AZA Mid-Year Meeting Penguin Workshop

Many of you who work with captive penguins have probably seen cataracts in your birds. At the Detroit Zoological Society, we'd seen cataracts too, but we didn't realize the extent of our problem until we asked our friends the veterinary ophthalmologists to do complete eye exams on our penguins. It was then that we found that more than 50% of our Macaroni penguins (*Eudyptes chrysolophus*) and Southern Rockhopper penguins (*Eudyptes chrysocome*) had cataracts. After recovering from the shock of this staggering prevalence, we thought, "Are we doing something wrong?! …do other zoos and aquaria have this problem?". We then set out on a research project to find out. Through a generous grant from the Michigan-based Aline Underhill Orten Foundation, Dr. Sarah Woodhouse, staff veterinarian at the Detroit Zoo, and Dr. Susette Aquino, board-certified veterinary ophthalmology specialist, traveled throughout North American examining penguin eyes. Eight institutions graciously donated time and allowed access to their penguins for this study: Detroit Zoological Society, Indianapolis Zoo, Louisville Zoo, Montreal Biodome, Newport Aquarium, Pittsburgh Zoo & PPG Aquarium, SeaWorld San Diego, and Tennessee Aquarium.

Cataract prevalence

We examined 160 Macaroni penguins—over 90% of the North American population—at 6 institutions and 90 Rockhopper penguins at 5 institutions (3 institutions housed both species). Both penguin species had very similar cataract prevalence rates: 46.5% of Macaronis and 45.5% of Rockhopper penguins had a cataract in one or both eyes. Cataracts were more common as penguins aged: the mean age of a penguin with cataracts was about 23 years. Cataracts undergo changes in appearance and size as more of the lens gets involved—this process is known as 'cataract maturation' and has been divided into different stages for descriptive purposes (See Photos 1-6). Incipient cataracts are the first stage and are often small and difficult to see without an ophthalmoscope. The next two stages, immature and mature, become more noticeable as they involve more of the lens and begin to look more opaque or 'white' in appearance. In the hypermature stage, the entire lens is white and the cataract is very obvious. After this stage, the cataract may actually start to 'dissolve' and have a sparkling appearance or may become inapparent as the remainder of the lens resorbs. As cataracts mature, they often cause inflammation in the eye, which can be seen as 'rubeosis' or redness of the iris due to an increase in blood vessels (Photos 4 and 5). Penguins with eye inflammation can be recognized by frequent squinting or tearing.

The most frequent stage of cataract in Macaroni penguins was the hypermature stage, while the most frequent stage in Rockhoppers was the incipient stage. The mean age of a Macaroni penguin with an incipient cataract was about 13 years, while in Rockhoppers, it was 21 years. Taken together, this suggests that Macaroni penguins begin to develop cataracts at an earlier age and progress more completely through the maturation stages compared with Rockhoppers.

Cataract risk factors

Identifying the extent of the cataract problem was only our first objective. Our second and more important goal was to try to determine why captive penguins might be getting cataracts…and how we might be able to prevent them. In order to do this, each institution took the time to fill out a survey that addressed husbandry factors, such as diet, vitamin supplementation, photoperiod, and exhibit attributes. When we visited each institution for penguin eye exams, we measured light intensity (or brightness) as well as ultraviolet (UV) spectrum light within each habitat (Photo 7). This information was broken down into individual factors, and statistical analysis was performed to determine which factors could predict penguin cataracts. Unfortunately, this type of analysis cannot tell us what *causes* penguin cataracts: an experimental study where penguins

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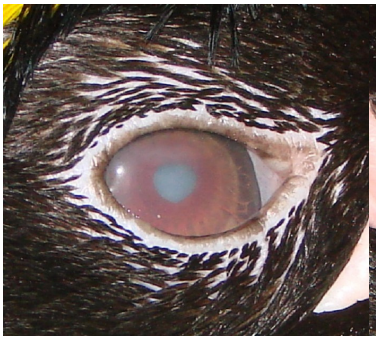
exposed to each factor are compared with a control group (not exposed to the factor) would be required to do that. But, it can tell us which factors were more strongly associated with higher rates or lower rates of cataract prevalence.

1: Incipient (first stage) cataract. S. Aquino

2: Immature cataract. S. Woodhouse

3: Mature cataract. S. Aquino



4: Hypermature cataract with rubeosis (redness) of the iris. S. Aquino

5: Resorbing cataract with rubeosis of the iris. G. Sila

6: Resorbing cataract. S. Woodhouse

Macaroni penguin cataracts: most significant factors

The most significant factors associated with an increased risk for Macaroni penguins included age, hand feeding the majority of the diet, and fluorescent lighting in the habitat.

Factors associated with a decreased risk of cataracts were use of pool filtration and sterilization systems, routine water quality monitoring (specifically alkalinity, pH, and salinity), providing UV spectrum lighting in the habitat, brighter light intensities, and use of metal halide light bulbs in the habitat.

Rockhopper penguin cataracts: most significant factors

Increased cataract risk in Rockhoppers was associated with age and increasing density of Rockhoppers in the habitat.

Factors associate with a decreased risk of cataracts in Rockhoppers included krill and herring in the diet, increasing habitat land area and decreasing Rockhopper penguin density).

Neutral factors

Male vs. female: Males and females were equally likely to have cataracts.

Northern hemisphere vs. Southern hemisphere photoperiod: The study institutions were evenly distributed, with 4 using Northern and 4 using Southern hemisphere photoperiod schedules. Neither schedule was associated with cataract prevalence.

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Heredity: Because of the Macaroni and Rockhopper SSP® studbooks, we were able to look at the potential of cataracts as a heritable trait. Heritability analysis was performed using the Animal Model, which is a pedigree-based explanation of traits. As expected, the model indicated that sex is unassociated but that increasing age is predicted to increase the probability of having cataracts. The model with age included gave a predicted heritability of 0.0027 for Macaroni and 0.0030 for Rockhoppers. This equates to cataracts being 0.27% and 0.3% heritable, respectively. In other words, cataracts are very unlikely to be a heritable trait in these penguin species.

Mixed penguin species exhibits: Most exhibits housed additional penguin species with the *Eudyptes* penguins. Neither the presence of other penguin species nor the total penguin density correlated with cataract prevalence. For Rockhoppers, only *Eudyptes* penguin density was a risk factor.

Vitamin supplementation: The vast majority of penguins were given a daily vitamin supplement, so we were unable to statistically compare cataract prevalence in penguins that were supplemented with penguins that were not.

What can you do to help prevent cataracts in your penguins?

Although this study cannot answer the question 'What causes penguin cataracts?' it can answer the question 'What can we do to decrease the risk of cataracts in our penguins?'. Make sure you are using pool filtration and sterilization systems. Monitor your pool water quality and be prepared to make adjustment to alkalinity and pH. Consider decreasing or discontinuing use of fluorescent bulbs in your exhibit in favor of metal halide bulbs, which provide UV spectrum and tend to produce brighter light. Consider decreasing hand feeding by adding pool feeding or free feeding. Finally, evaluate your *Eudyptes* penguin density, making sure that everyone seems to have enough personal space.

For more information and more thorough discussion on each of the cataract risk factors, please watch for an upcoming publication entitled 'Evaluation of potential risk factors associated with cataract in captive Macaroni and Rockhopper penguins' by authors SJ Woodhouse, EL Peterson, and T Schmitt in the 2016 issues of *Journal of Zoo and Wildlife Medicine*.

7: Dr. Woodhouse measuring light intensity in a penguin habitat. S. Aquino

Light intensity was measured using the Extech 407026 heavy duty light meter (Extech Instruments Corporation, Nashua, New Hampshire 03063, USA) on the 'L' setting for Tungsten/Daylight. Ultraviolet radiation was measured using a UV meter and sensor with a spectral response to wavelengths ranging from 260 nm to 400 nm. (Solar Light PMA 2107 Non-Weighted UVA + UVB Sensor, Solar Light Company Inc., Glenside, Pennsylvania 19038, USA).

Yellow-eyed Penguins Facing Uncertain Future but New Initiatives Offering Hope

David McFarlane, Field Manager, *Yellow-eyed Penguin Trust, New Zealand*

Season Summary

The knock on effect of the last 3-4 seasons of indifferent breeding success for yellow-eyed penguins (*Megadyptes antipodes*) is once again evident, with many fewer nests and therefore fewer chicks fledging along the mainland coast of Otago-Southland and on Stewart Island. There were 203 active nest sites recorded, around half of the 400 usually found.

On Yellow-eyed Penguin Trust reserves a similar pattern was apparent, with fledging numbers at Long Point - Irahuka and Cosgrove Creek at 22 chicks and 12 chicks respectively, well down from the 80 and 18 chicks that fledged annually as recently as the 2012/13 season. In an ironic twist the condition of the fledging chicks was generally excellent with average fledging weights of over 5kg and the heaviest chick ever recorded at the Trust's Otapahi Reserve on Otago Peninsula being measured at 6.85kg.

Yellow-eyed penguin survival at this northern limit of their range remains on a knife edge and has been the driving impetus for the Trust in developing some significant conservation initiatives. In an important departure from previous practice the Trust is now very conscious that it is no longer simply managing a population of yellow-eyed penguins but that the welfare of individual animals must be safe guarded.

Trust Science & Veterinary Roles

In the first of two exciting developments the Trust has appointed a conservation scientist to advise and lead research with emphasis around marine issues affecting yellow-eyed penguin productivity. For too long the mysteries of the marine ecology of yellow-eyed penguins has been exactly that, a mystery. In an almost unprecedented move for a New Zealand conservation NGO the appointment of Dr. Trudi Webster brings science alongside our conservation management. Look out for Trudi at the 9th International Penguin Congress in Cape Town, South Africa.

In another development, spurred on by the number of yellow-eyed penguins suffering from barracouta bites in the January – February 2015 breeding season, the Trust ran a highly successful fundraising campaign to employ a specialist wildlife veterinarian over the busy and challenging fledging / adult moult period.

Dr. Lisa Argilla, previously employed by the Massey University Veterinary School and Wellington Zoo, was contracted for 6 weeks and operated on 18 yellow-eyed penguins (13 adults and five chicks), travelling hundreds of kilometres to retrieve injured penguins from up and down the coast. Of concern was the realisation that the majority of injured yellow-eyed penguins were female.

Dr. Argilla's contribution was outstanding, operating and stitching badly bitten penguins and relieving the suffering of some, where euthanasia was the only option. Sue Murray (Yellow-eyed Penguin Trust General Manager) commented that: "Without Lisa and her passionate commitment to the welfare of these endangered penguins many more would have died, further compounding an already difficult situation". Indeed the success of Dr. Argilla's work has highlighted the need for a much more organised and systematic approach to providing wildlife veterinary services in the southern South Island of New Zealand.

Proposed Wildlife Hospital

Dr. Argilla has begun scoping the feasibility of a wildlife hospital in Dunedin, considered widely to be the 'wildlife capital of New Zealand.' In addition to yellow-eyed penguins, Dunedin and the Otago coastal region are home to the world's only mainland breeding colony of royal albatross (*Diomedea sanfordi*) and a small

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but growing population of New Zealand sea lions (*Phocarctos hookeri*), among other threatened marine animals, as well as endemic forest birds such as tui (*Prosthemadera novaeseelandiae*) and kereru *(Hemiphaga novaeseelandiae*). A local facility would significantly decrease the time between discovery of an injured or sick animal and when it receives expert veterinary intervention. "At the moment, we have to send injured yellow-eyed penguins and other animals to the North Island when they require treatments beyond superficial wounds that can be handled by local vets," says Dr. Argilla. "This means the animals are subject to the stressors of travel in less than ideal conditions, and a prolonged period of time before they receive expert care."

Dr. Argilla cites the case of a yellow-eyed penguin that came into her care this season presenting with "classic barracouta" wounds to both feet and legs. The penguin was found and brought in on a Sunday morning, and by afternoon was on intravenous antibiotics and stable enough for the first of multiple surgeries Monday morning. "In previous seasons a penguin with these wounds would have been waiting until Monday to get on a flight, typically arriving to the hospital late afternoon, with surgery likely to be Tuesday morning." With serious infections setting in within 24 hours of injury, and bone infections common in penguins when wounds are not treated quickly, there is little time to waste. Dr. Argilla adds that "this particular bird wasn't stable enough to have survived the initial flight north."

The yellow-eyed penguin season was indicative of the greater need for rapid interventions in critically threatened species. Dr. Argilla also treated Fiordland crested penguins (*Eudyptes pachyrhynchus*), a common visitor to Otago, and blue penguins (*Eudyptula minor*). In addition to her penguin work, Dr. Argilla has experience treating albatross, kakapo (*Strigops habroptilus*) and takahe (*Porphyrio hochstetteri*), as well as forest birds and kiwi (*Apteryx sp*).

Initial conversations with stakeholders regarding launching a hospital have been positive, with the Otago Polytechnic interested in hosting the facility at their Veterinary Nursing School. A wider community stakeholder group meeting with local and national conservation groups will be held in April 2016 to identify potential partnerships and funding scenarios.

Further enquires can be sent to Dr. Argilla at l.s.argilla@protectbirds.com. You can help support the work of the Yellow-eyed Penguin Trust by visiting http://www.yellow-eyedpenguin.org.nz/passion/support-the-trusts-work/become-a-trust-supporter.

Dr. Lisa Argilla provides medical care for injured yellow-eyed penguins during the 2015 breeding season. Photos provided by the Yellow-eyed Penguin Trust.

Joining a Field Team on the Western Antarctic Peninsula

Matthew Porter, *Bird Department Zookeeper, Detroit Zoological Society, Royal Oak, MI*

Last year the Detroit Zoological Society offered me the extraordinary and rare opportunity to assist the Polar Oceans Research Group with the study of penguins and other seabirds at the U.S. Palmer Station located on the Western Antarctic Peninsula. The Polar Oceans Research Group is led by world-renowned polar ecologist Bill Fraser who has been studying seabirds in Antarctica for over 40 years. After passing vigorous medical testing, a couple of wisdom teeth extractions, and a gauntlet of paperwork, I was qualified to go. I flew all the way down to Punta Arenas, Chile where I boarded the 230 foot *Laurence M. Gould*. This is the primary transport and supply vessel for the U.S. Palmer Station, which is the smallest of the U.S. Antarctic stations. After a five-day journey, which included crossing a surprisingly calm Drake Passage, we made it to the station.

Arriving at the U.S. Palmer Station. Mathew Porter

A breeding colony of gentoo and chinstrap penguins. Mathew Porter

In the austral summer there are around 40 people stationed at Palmer, half support staff and half researchers, who work together to accomplish science. On station our research group nickname was the "birders". Once I settled in and went through orientation, I made my way down to the "birder" hut. I joined up with three amazing, expert field biologists who were already at station working hard. Much of our work was part of the Long-Term Ecological Research (LTER) which studies how climate change impacts seabirds. LTER is a collaboration of research that analyzes the whole ecosystem from the physical forces driving it, to phytoplankton, up to the apex predators such as penguins. Our field study area encompassed a couple dozen islands which we visited on a routine basis. Although Adelies are the dominant species in the area they have suffered a significant decline over the last couple of decades, while gentoo numbers are on the rise. We went into the field daily, weather permitting. The wind and ice must be watched carefully; it is very easy to get trapped by ice so great caution is exercised. It's light out all the time with the sky turning gray in the middle of the night. During an average day we would get up early, look at the forecast, gear up, prep the zodiacs and head on out. On any given day we may go to as many as seven or eight islands studying the birds. We looked at the penguin population of the entire area and we also look at specific colonies on a regular basis counting adults, nests, and chicks frequently.

In the beginning of the season there was still a large amount of snow on the ground. The Adelies were already nesting and laying eggs even though they couldn't get to a lot of their nesting rocks. There is no time to wait as the short, bountiful summer will pass by quickly. We also worked with south polar and brown skuas, banding birds, surveying nests, routinely weighing chicks and more. The brown skuas mainly feed on penguin eggs and penguin chicks. Southern giant-petrels (GIPES) are another species that we worked with. Donna Patterson-Fraser has worked with these birds for years and the birds in our area have been habituated to human presence. The GIPES are definitely the coolest species I've ever worked with. They are

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Measuring a young GIPE chick. Photo provided by Mathew Porter.

intelligent, confident predators that allowed us to put transmitters on them with no restraint. Our work with this species included applying bands, tracking breeding, measuring chicks, and deploying satellite transmitters.

A great deal of our time was spent studying and working with the Adelie, gentoo, and chinstrap penguins. There weren't a lot of "chinnies" in our area but we did complete censuses of individuals and nests. The Adelies constituted a large portion of our work. We completed population surveys and looked at indictor colonies. We counted individuals, nests and chicks in indicator colonies every couple of days; these same colonies are studied year after year. Satellite transmitters are deployed on the birds to gather information on penguin behavior and foraging trips. The Adelies are very regimented in their ways and seem to live a very routine life, while the gentoos appear more adaptable and playful. The gentoos are also very energetic and frenetic, always moving about and swimming. Most of the gentoos in the area breed on one island in numerous colonies. When studying the gentoos, we used methods that are similar to those used for Adelies.

All of the penguin chicks were awesome but the gentoos get my vote for having the cutest and cleanest chicks. The gentoos and the chinstraps manage to stay surprisingly clean in the otherwise messy colony, whereas the Adelie chicks become extremely filthy. Throughout their growth they are covered in pinkish, krill-colored guano.

Throughout the season it was incredible watching the penguin's lifecycle and struggle to raise the next generation. The birds took turns incubating, brooding, and tirelessly catching krill to feed their chicks. They live on an incredibly rocky terrain and do significant climbing to get to some of their nesting sites. It was fascinating to see how much the birds swim and use the water, way more than I had ever imagined. This is one element we have incorporated into the Detroit Zoo's new penguin facility, the Polk Penguin Conservation Center. The penguin habitat will have a 326,000-gallon pool that is 25 feet deep allowing very natural swimming and serious diving.

Gentoo penguin with transmitter attached. Mathew Porter

Adelie penguins on a berg bit. Mathew Porter

As my time in Antarctica was coming to a close, the Adelie chicks had crèched and were starting to molt, while the gentoo chicks were beginning to crèche. And there were still plenty of large icebergs in the area. Antarctica is now a part of me, a very special part of our world, and the most pristine environment I have ever seen. The Western Antarctic Peninsula is one of the fastest changing places in the world due to the effects of climate change. It will take a worldwide effort to help our planet, but every conscious decision we make to respect, recycle, and conserve will help turn the tides. I am so honored to have had this opportunity to work with the Polar Oceans Research Group and to be a zookeeper for the Detroit Zoological Society.

Using Underwater Robots to Test for Foraging Competition Between Adélie and Gentoo Penguins

Megan A. Cimino, Mark A. Moline, *University of Delaware, College of Earth, Ocean and Environment, Newark, DE,* William R. Fraser, Donna L. Patterson-Fraser, *Polar Oceans Research Group, Sheridan, MT* & Matthew J. Oliver, *University of Delaware, College of Earth, Ocean and Environment, Newark, DE*

For hundreds of years, Adélie penguins have been breeding on the West Antarctic Peninsula (WAP), which has recently become one of the most rapidly warming areas on Earth. At Palmer Station, located along the WAP, there were 15,000 breeding pairs of Adélie penguins in 1975; but today only a few thousand pairs are left. Over the last two decades, gentoo penguins have established a new and growing breeding colony, which calls into question whether the two species are competing for the same food resource and whether this might exacerbate the Adélie population decline. To test if the species were competing during the chick-rearing period, penguins were tagged with satellite transmitters and time-depth recorders to track where the penguins went and how deep they were diving. Additionally, an autonomous underwater vehicle called a REMUS provided measurements on temperature, salinity, light, chlorophyll and krill (the main food source for both species), allowing for comparisons of species behavior and the distribution of their prey. Environmental sampling from the REMUS was informed by the location of the penguins. Using the oceanographic data measured by the REMUS, krill were found to be in waters where it became darker at a shallower depth and the bulk of phytoplankton was located deeper. This likely allows them to eat without being eaten by visual predators, like penguins.

Penguin dive data revealed that while the Adélie and gentoo penguins generally foraged in different areas, there was a small area of overlap between the two species. Within the overlapping region, the gentoo penguins shifted behavior and foraged at deeper depths below the Adélie penguins, a strategy that likely limits competition. Both penguin species are capable of dives to 150 m, yet, the Adélie penguins generally foraged in the upper 50 m and didn't change their behavior in areas overlapping with gentoo penguins but gentoo penguins often foraged to 150 m. This suggests that climate-driven sympatry does not necessarily result in competitive exclusion of Adélie penguins by gentoo penguins and that increased competition for krill is not one of the major drivers of the Adélie penguin population decline. Read more here: http://www.nature.com/articles/srep18820.

The REMUS conducts environmental sampling near Palmer Station on the Western Antarctic Peninsula. Mark Moline

Gentoo penguin tagged with satellite transmitters and time-depth recorders. Megan Cimino.

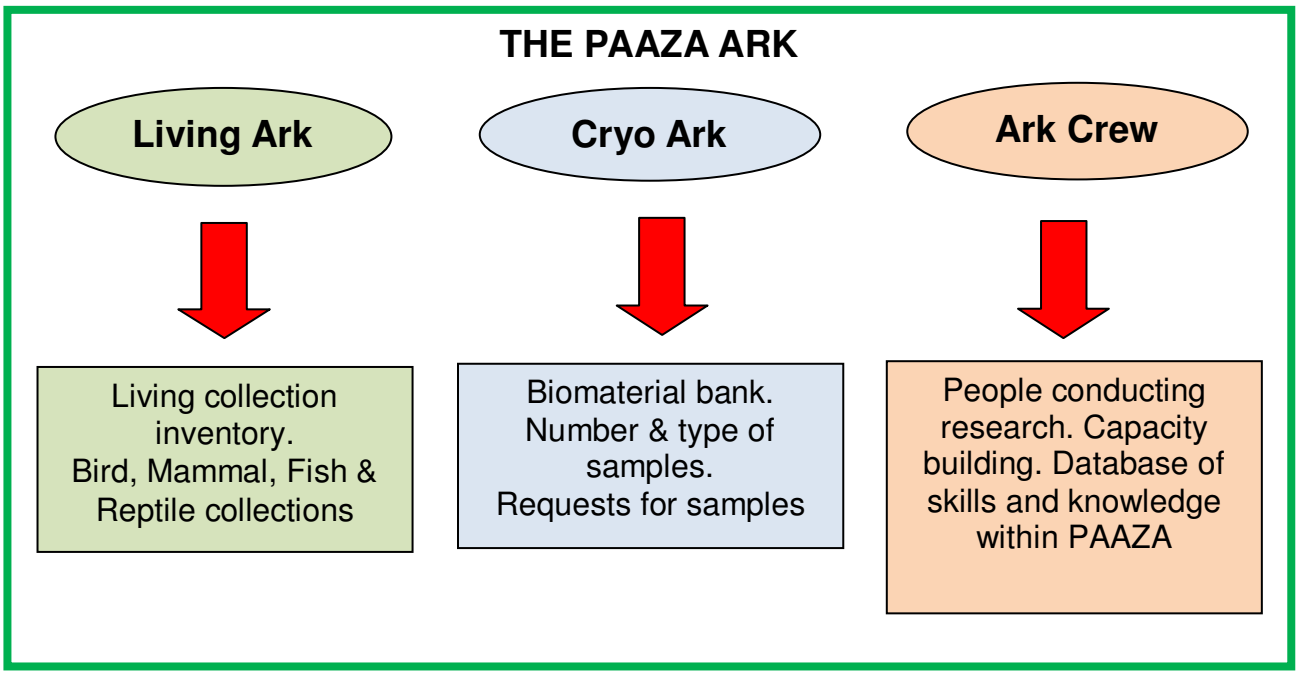
PAAZA Conservation Research Project - ArK

John Werth, *Executive Director, Pan-African Association of Zoos and Aquaria (PAAZA), Gauteng, South Africa*

The 'PAAZA Ark' will strive to be the place offering "*Shelter and Refuge*" within the realms of the global conservation of biodiversity. It will align its vision with the latest WAZA strategy, 'Committing to Conservation'.

The ArK project is guided by three components:

1. Living Ark
2. Cryo Ark
3. Ark Crew



1. Living Ark: African zoos and aquaria conserving biodiversity

A target to relieve the pressure on global biodiversity is to prevent the extinction of species. The International Union for Conservation of Nature (IUCN) and the CBD (Article 9) [Convention on Biological Diversity http://www.cbd.int/] recognized the need for combining *in situ* conservation actions with *ex situ* approaches. PAAZA [http://www.zoosafrica.com/] should therefore be a recognized role player and show impact in the policies of governments, conservation organizations and research institutions. A relevant project to determine the potential contribution to conservation and to estimate the number of threatened species held in PAAZA facilities was identified. A preliminary study in 2011 showed that the critically endangered species in our care increased from 10 in 1997 to 19 species in 2007. The data to generate these figures were taken from inventories. Unfortunately the trend over the last years cannot be determined as inventories were not seen as important and efforts were totally abandoned in 2008 until the rebranding of PAAZAB in 2015 and the renewed African Preservation Programme (APP) and African Studbooks (ASB). This was supported by an incredible offering by ZIMS/ISIS of their software to PAAZA facilities.

This project will provide information on the different threat categories and total conservation contribution of PAAZA to world biodiversity; demonstrate the role of African Zoos and Aquaria in conservation; increase

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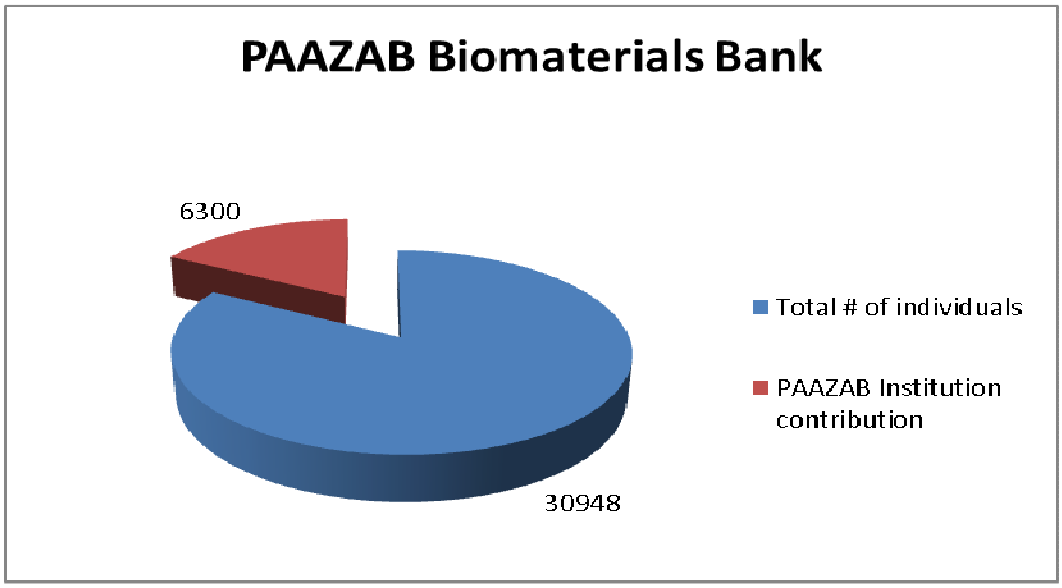
the credibility of African Zoos and Aquaria as true conservation organizations and improve the public image of African Zoos and Aquaria. This project aims to involve all African facilities and to link the project into the international community.

2. Cryo Ark: Biomaterials Bank

Below figures indicate the number of PAAZA biomaterials banked by the participating PAAZA institutions circa 2011.



3. Ark Crew:

Capacity building

Capacity building included the Fourth African Symposium on Zoological Medicine in 2015 (bi-annual). The programme included a full day of practicals on the first day with the next two days focused on a variety of taxa both terrestrial and marine. In a first, the symposium was open to animal keepers to offer a cross learning opportunity.

Some background: PAAZA currently monitors approximately 180 'bona-fide' zoos in 47 countries of which 40 are in South Africa itself. In addition there are many smaller 'zoos' often of very low standards which are not included in this total. Sixty of these 180 institutions in 11 countries are PAAZA members and many employ full time veterinarians. With few exceptions the veterinarians that work for these zoos have very limited or no training in zoological medicine. In addition the provision of high quality CPD [continuing professional development] for veterinarians, vet nurses and vet technicians involved in African zoos and aquaria are limited. The symposium serves to raise the profile of zoological medicine as a career option amongst the veterinary students in South Africa and Africa. The symposium further facilitated exchange of new knowledge, skills and information; promoted veterinary research and disease surveillance in African zoos and aquaria and provided guidelines and standards for the provision of veterinary services in African zoos and aquaria.

People conducting research

We would like to highlight some key research projects where PAAZA institutions are either leading the research or are significant collaborators. A summary of some of these APP projects follows:

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Sungazer (*Smaug giganteus*), Ground-hornbill (*Bucorvus leadbeateri),* Cheetah, Pickersgill's Reed frog, Amphibian Chytrid Fungus (*Batrachochytrium dendrobatidis*), African Penguin (*Spheniscus demersus*), Turtles, Sharks.

Some of the academic institutions linked to these research projects include, but are not limited to: TUT, WITS, UP, UFS, NWU, UCT, NMMU. In addition to this is a linkage to national departments: DEA, Oceans & Coasts, SanParks and also wildlife agencies: Zimbabwe Museum, Kenyan Wildlife Services, Uganda Wildlife Centre, Bristol Zoo, Provincial agencies.

OBJECTIVES

Below are key objectives of the ArK programme:

- Determine the genetic and reproductive structure of these species; Population dynamics – linked to dispersal
- Re-assess the IUCN status of the species
- Develop an *ex situ / in situ* management plan for species
- Conduct disease presence on ancient and modern samples
- Provide a diagnostic service to the *ex situ* community
- Investigate illegal trade in species
- Linking the studbook to biomaterials, DNA profiles, necropsy and disease information
- A veterinary care programme together with Deltamune [http://www.deltamune.co.za/] developing Newcastle's Disease Vaccines and collating the vet protocols for the species – for both the captive breeding programmes and the reintroduction programmes

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- Participate in the Species Recovery Plans with major stakeholders
- Develop a protocol for submission of samples and identification of such with a resultant issue of a certificate of genetic proof of origin, 'Passport', which is linked to the studbooks of the relevant species

Specific to species:

Cheetah

- To enhance the knowledge on the populations in the view of conservation management and to combine behavioural and genetic approaches to explore social and genetic groupings of cheetahs
- To contribute to real world conservation actions
- DNA screening initiative for the South Africa Cheetah studbook and meta-population management
- Develop a protocol for submission of samples and identification of such with a resultant issue of a certificate of genetic proof of origin for cheetah cubs

African Penguin

- Applying molecular genetic techniques (single nucleotide polymorphisms and microsatellite markers) at multiple hierarchical levels to develop a genetic management plan for African Penguin in South Africa to inform the extent of gene flow between breeding sites and overall genetic variation within *ex-situ* and *in-situ* populations
- Determine reproductive fitness of penguin populations: Evaluate techniques for the collection of semen, to define quality in order to cryopreserve sperm and ultimately to conserve the diversity of the gene pool
- Conduct disease epidemiological research
- Establishment of new colonies, re-introduction of captive bred birds; risk assessment, population modelling, non-detriment findings, sample collection guidelines, satellite logger work; recaptured chick modelling, acoustic telemetry, hand-rearing

IMPLEMENTATION

The Ark programme is run predominantly under the Research and Veterinary Portfolio. However, the inclusion of DNA and photo ID to initially PAAZA TOPS species Studbooks has linked the operations of the '*Research and Veterinary'* and the '*Population Sustainability'* portfolios.

One of the most important developments is the commitment to collaboration between The National Zoological Gardens, South Africa (NZG) http://www.nzg.ac.za/, the National Research Foundation (NRF) http://www.nrf.ac.za/ and PAAZA for the DNA typing and Bio-banking of samples. Together we will be developing protocols and tools in line with legislative requirements.

Why did PAAZA align itself with NZG/NRF?

- NZG/NRF accommodates national requirements
- The NZG/NRF database is dynamically evolving to keep pace with modern developments
- Chain of custody sampling (a well thought out process to obtain a quality sample with metadata that is verified)
- Credibility through scientific research and expertise

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- Maintained by government with regards to infrastructure, capacity, continuation and sustainability
- A National Biobank that is well-developed with a well-established database, SPECIFY. This centralised database supports strength for regulation
- All samples are optimally stored in a recognized national Biobank
- Workflow is well-established from receiving samples at the Biobank to the DNA laboratory and a final report on site
- Linked to studbooks – this is possible within SPECIFY with DNA profiles and sample metadata

To ensure the validity of the process, it is critical to do chain of custody sampling. At this stage, NZG prefers to take responsibility for this part of the process with its own trained teams, to ensure optimal sampling. DEA (Department of Environmental Affairs) and their TOPS (Threatened or Protected Species) division is well aware of the initiative for CITES species.

For all studbook related DNA profiling the other critical component is to use a validated marker set. Markers between laboratories differ and thus the NZG as a non-commercial entity has optimized an informative marker set suitable for sustainable DNA profiling based on their scientific expertise and evidence-based knowledge. DNA samples will be bio-banked and along with a photo ID, the data will be added to the Studbook data set.

In addition to DNA, at a TOPS workshop it was noted that CITES regulations stipulate compulsory transponder/permanent marking for Appendix 1 species. As per the advice from CITES, below is an excerpt of the relevant clauses for clarification:

STAATSKOERANT, 5 MAART 2010 No. 33002 21

(6) Specimens of animal species listed in Appendix I that have been bred in captivity may not be traded unless they originate from a breeding operation registered by the Management Authority, and have been individually and permanently marked in a manner so as to render alteration or modification by unauthorized persons as difficult as possible.

(7) The conditions for registration are determined by the Management Authority.

(8) The markings on or tagging of specimens must be done in accordance with the relevant Resolutions adopted by the Conference of Parties as amended from time to time.

The first species and facility was identified according to TOPS and BMP (Biodiversity Management Plan) requirements - the African Penguin population at the East London Aquarium, South Africa. Transponders as recommended by the BMP working group were purchased and since transponder insertion is classified as a veterinary or para-veterinary procedure, the NZG team underwent additional training.

The inaugural event under the ArK programme was a huge success.

Visit the link at http://www.zoosafrica.com/news-events/2015-02-09-13-18-28.html to learn more.

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Added to this success, PAAZA is very proud to have two WAZA branded projects now linked to the ArK programme:

www.penguinpromises.com

PARTNER of

World Association of Zoos and Aquariums | WAZA
United for Conservation®
Registered Project #15004
www.zoosafrica.com

www.penguinfind.com

PARTNER of

World Association of Zoos and Aquariums | WAZA
United for Conservation®
Registered Project #16001
www.zoosafrica.com

This has all culminated in every animal being issued a unique 'Passport' which links it through the Studbook to the DNA databank and vice-versa:

NRF National Research Foundation | NZG National Zoological Gardens of South Africa

African Penguin (*Spheniscus demersus*) Passport

PAAZA Pan-AFRICAN ASSOCIATION of ZOOS and AQUARIA

The information below incorporates the DNA unique to the animal

INSTITUTION: East London Aquarium, South Africa

ANIMAL INFORMATION:

FIELD ID:	APEL001	**CATALOGUE #:**	46150	**SAMPLING DATE:**	24/11/2015
HOUSENAME:	Ice	**PENGUIN ID:**	283	**STUDBOOK #:**	A2382
MICROCHIP #:	989001004470178			**SEX:**	
SAMPLE ORIGIN:	Captive born			**PARENT ORIGIN:**	

PHOTOGRAPHIC ID:

UNIQUE CHEST PATTERN

PENGUIN TAG ID

Penguin Listserv Summaries

Original Listserv Question		**Toronto Zoo posted:** Has anyone ever moved/shifted their African penguin breeding season? Our breeding season is usually between November-March/April. Has anyone had any experience doing this? How did you go about doing this? Is it as simple as putting nest boxes out earlier?
Greensboro Science Center	African	...We haven't tried to do this specifically but our birds start nesting in August and continue through December. We even have some double clutches that go as late as Jan/Feb. We do not put nest boxes out to encourage this. We only provide access to boxes once it appears a female is broody and seems to be seeking out a nest. We have an indoor exhibit with an artificial light cycle that is set with sunrises and sunsets. We also have skylights in the building which do provide some natural light cycling.
Minnesota Zoo	African	We do not provide access to nesting opportunities year-round. They are pretty interested in breeding when not in molt, so if you provide access early, they should go early.
Calgary Zoo	Humboldt	I've never tried to change my penguins' breeding time but in my experience I'd say the only thing that makes a difference is the photoperiod, not temperature or availability of nesting material. I'd suggest that you don't give access to burrows/nest areas and materials and flood them with it when you want to, but if they are off breeding that may not be enough to trigger breeding behaviors. We have Humboldts (very similar to Africans) and despite the fact that they don't have material or access to nests, they go crazy in early march. By then it is still very cold here so they are indoors only (very constant temperatures) so I think the cue is the increase in day light. We have to hold them in (we only allow nesting outside, where they have burrows) until around April when nighttime temperatures are more stable and by then they are [eager to access anything] nesting material.

Original Listserv Question		**New England Aquarium posted:** We are asking for small herring to be packed for us and the distributer is asking if any other penguin institutions would be interested in the product. **Long Island Aquarium and Exhibition Center posted:** Also, does anyone have a supplier for smaller sized herring? We currently just cherry-pick some smaller ones out of our boxes but sometimes they are just all too big.
		The distributer, Salmon Pacific Industries, Inc., says: "We can set-up the line to pull the 3"-7" herring out of the production line for you." Those interested can contact the distributor directly at Michael Sato, Salmon Pacific Industries, Inc., Scanner Enterprises, Michael Sato msato@pacificsalmon.com.

Original Listserv Question		**Woodland Park Zoo posted:** For any of you out there that have outdoor penguin exhibits, I was wondering if you've come up with any clever ways to deter wasps/yellow jackets/hornets during feeding time. At this time of year the wasps start increasing their protein needs and are all over our fish, keepers and penguins. We have plenty of traps set up, which help, but don't eliminate the problem.
Institution not reported		Install a large fan or misting fan to make it difficult for the yellow jackets to fly.
Institution not reported		This facility reported that they don't have much of a problem in the morning, so they hand feed all of the birds in the morning, but in the afternoon they do a pool feeding which the birds enjoy and the keepers don't have to be concerned with the wasps.

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Penguin Listserv Summaries

Original Listserv Question		**Milwaukee posted:** We are considering using an addition of a softer nesting materiel to our Humboldt penguin nest boxes this year. Currently our birds nest on river rock and have had no issues with egg breakage but we know that some zoos offer softer nesting materiel as well. We think the penguins would really enjoy the addition of softer material and it would offer an enrichment opportunity as they can forage for it and take it back to their nests. Our vets will not approve anything that will mold-such as natural leaves, grasses, etc.. I know I have seen one zoo use long pieces of aquarium tubing as nesting material but I don't know which one or the specifics. We are thinking about using car wash felt cut into thick strips about 6 inches long or perhaps artificial grasses. We have some concerns about birds eating things given to them. If anyone is using softer items for nesting, we would like to hear your experience with them! What is the product, where did you purchase it, what size is it, how often do you replace these items and/or wash them, how do the penguins like them, etc.
Racine Zoo	African	Cut nomad matting and tubing they get donated from a company in Milwaukee. Both items are cut 6 inches long. They use a bleach soak for cleaning. No issues with ingestion.
Woodland Park Zoo	Humboldt	Nomad matting cut into 2 inches by 6 inches rectangles. No problems with ingestion. Easy to clean.
Long Island Aquarium and Exhibition Center	African	Plastic aquarium plants. They have used this for years. They get the plants that have a thicker blade to them. Not grass like ones as those tend to get pulled apart by the birds into tiny shreds. They take the plant itself and pull the leaves off the base so it's just a bunch of individual leaves. Gets cleaned daily and put back into the nesting box. Once they lay an egg it gets left there until the chick hatches. To clean it can be soaked in bleach or other disinfectants and then let dry as its non-absorbent.
Monterey Bay Aquarium	African	Aquarium tubing and fake grasses but they were eaten by some of the birds. They no longer use either and only use river rock.
South African Association for Marine Biological Research	African	Have a colony of African Penguins in a humid climate in an outdoor enclosure. They started using Lavender which they dry out. They chose this as it is similar to the nesting material they naturally use, has anti mold, bacteria and insect properties, and is biodegradable if they ingest it. They tie it in bunches and the birds have to forage for it. They have been using it for years with an improvement in nesting success. They replace it whenever it gets damp.
Minnesota Zoo	African	Line nest boxes with nomad matting.
Akron Zoo	Humboldt	Carwash felt and fire hose pieces cut 3-4 inches by 8-10 inches. No ingestion issues due to it being cut so long. They clean it once a week. Can be put in the washer and dryer and is very durable and cleans well.

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Penguin Listserv Summaries

Columbus Zoo	Humboldt	Pea gravel covered with Enkamat® inside a medium sized pet kennel with door removed. As extra material, they give dried lavender. The birds also collect the larger river rocks that cover the exhibit and add to the boxes. They change the nest boxes every 10-12 days. The pea gravel is easy to rinse and they soak it along with the nest box and the Enkamat® in dilute bleach for 12-24 hours before rinsing. They have found that the Enkamat® covering the small pea gravel gives enough cushioning for the penguins to successfully lay eggs but also allows for adequate drainage. They get the Enkamat® (Nylon, 39 inches by 5 yards; 0.50 inches thick; 0.025 inches diameter) through Aquatic Eco-Systems® at https://pentairaes.com and have had very successful nesting seasons.
Henry Vilas Zoo	African	10-12 inch airline tubing and artificial grasses (10-12 inches). Both can be soaked in chlorhexidine for cleaning. They have not had any issue with birds trying to eat it since they cut them so long.
Great Plains Zoo and Delbridge Museum	African	Wet suit material as a softer option for nesting penguins. Their birds really seem to like it and have chosen to use it over other substrates that were offered. They get the wet suits donated from a local scuba diving store. Pieces can be cleaned and reused. They have stated that baking soda will actually take out the penguin smell completely! The pieces will float so less likely to clog filters or pump intakes. They usually switch the pieces out once a week for cleaning. The only problem they reported is birds stealing from each other so they have lots on hand to prevent fighting.
Toronto Zoo	African	Aquarium tubing in the past. They noted that the tubing is hollow and if moisture gets inside it could produce mold /bacteria. To solve that problem they disinfected them, dried them out and then hot glued the end shut so no moisture could enter. They noted that it was time consuming to make and hot glue plugs don't always adhere to the tubing. They have also use cable ties (zip ties). The penguins love them, they are cheap, soft and flexible, easy to find, endless supply and very easy to disinfect.
Keeper response, *zoo affiliation not reported*		Six-inch long pieces of hose also cut in half length-wise so you can clean out the inside. The hoses are really thick and heavy-duty. They get them for free from their maintenance department when there are hoses that can't be repaired. They wash and disinfect them when they clean the nest boxes, which is about once a month, or longer if they have chicks or eggs. They also used aquarium plants but the ones they were using have fallen apart into smaller pieces quickly so they are looking for an alternative. They have also tried airline tubing melted together on each end and it seems to work well.
Keeper response, *zoo affiliation not reported*		Long aquarium grass. They are long single pieces, not segments put together. They just soak them to disinfect them and give them a good spray down once their nesting period comes to an end. They had previously used plastic drinking straws. The penguins never chewed them and like the grasses, they float. They were also very easy to clean if they got too disgusting and could not come clean, they were easily replaced. They prefer the grass because it looks more natural.
[Eds. Note]		*Thank you to Heather Neldner, Milwaukee County Zoo, for compiling and posting these responses to the Penguin Listserv. Additional information on nesting materials is reviewed in Vol 18 No 2 under Penguin Listserv Summaries.*

News and Updates

- El Manual de AZA Pinguiño Animal Care ha sido traducido al español! Rebecca Greenberg, AZA Conservation and Science Coordinator, announced this month that the 2014 AZA Penguin Care Manual has been translated into Spanish! Congratulations to Martín Zordan and the team at ALPZA for their help in translating this ACM. This was an incredible amount of work and a great accomplishment. Find the published ACM at: http://www.aza.org/animal-care-manuals/.

- In March Lauren Wilson announced that AZA will soon launch the Sustainability Database Project. The reports will serve to help align resources with species needs. An AZA member login is required to view the compiled reports for penguins at www.aza.org. The reports will go live in May 2016.

- Penguin Sentinels Spring Update focused on Galapagos penguins. The penguins are experiencing some difficulties from the current El Nino. Dr. Boersma reports finding no nests in February and many penguins with algae on their feathers, presumably because they are spending more time in the water and less on land. Despite these findings, Dr. Boersma says that the birds look better overall than the 1998 El Nino event and shared that she continues to see resiliency in these birds even when faced with a variable environmental conditions.

- Dr. Brent Stewart, Hubbs-SeaWorld Research Institute, spent about six weeks studying penguin populations and habitats on the Antarctic Peninsula using a type of drone called a quadracopter**.** The drone allows for high resolution photography and remote observation without disturbing the birds behavior.

- During the 2013-14 breeding season researchers studying Adelie penguins reported that most of a colony was gone. The study, published in *Antarctic Science,* investigated the potential impacts of a stranded iceberg, B09B, and the resultant increased sea ice on nesting Adelie penguins at Cape Denison. The study, targeted at possible climate change effects, highlighted that most of the penguins were gone when the scientists returned to the study site. When the scientist published their paper and were interviewed, the mainstream media sensationalized their findings to make it sound as though the stranding of the berg (which occurred in 2010) led to 150,000 penguin deaths "overnight". Dr. LaRue, a prominent penguin ecologist from the University of Minnesota, was interviewed and tempered the conversation by saying that what actually may have happened to the penguins is really unknown. Penguin colonies might move in response to changing conditions, or they may persist and not be successful. And Kerry-Jane Wilson, lead author of the study, went online to correct the errors reported by the mainstream media. Now retired, Dr. Wilson says she does not know where the "150,000" figure came from because it was not in the paper (See Wilson, K-F in Recommended References). This situation highlights the difficulties associated with conveying information related to climate change from the scientist to the popular media, and the challenge of promoting an appropriate understanding of climate issues and maintaining credibility among consumers. Ultimately, it is the human consumer that needs to understand how they contribute to climate change and what actions are required to reduce their "carbon footprint". Read the online conversations at http://www.thedailybeast.com/articles/2016/02/22/the-case-of-the-150-000-dead-penguins.html, http://www.scar.org/2016/840-no-150-000-adelie-penguins-did-not-die-overnight and http://www.pri.org/stories/2016-03-26/antarctica-displaced-penguins-may-be-sign-climate-change.

- Researchers journeyed to the Crozet Islands to investigate the biomechanics of the king penguin walk relative to their body weight. Their findings show that heavier king penguins, though still able to walk, are more likely to stumble or fall when compared with less heavy birds. King penguins were trained to walk on a treadmill for the study.

- The Detroit Zoo announced in February that their new penguin center, the Polk Penguin Conservation Center will open in April. As the largest facility for penguins in the world, the penguin center features a 326,000-gallon, 25-foot -deep aquatic area where visitors can watch more than 80 penguins of four species explore their habitat. An underwater gallery and two acrylic underwater tunnels provide views as the birds swim, soar and deep-dive. Get a head start by taking a virtual tour https://www.youtube.com/watch?v=8u4suqVqesI.

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News and Updates

- Megan Cimino, University of Delaware (UD), shared with PCN "…we recently had an interesting penguin study about tagging penguins and using underwater robots to study foraging competition between Adelie and gentoo" penguins. Read a summary of the study in this issue.

- The Adventure Aquarium, Camden, New Jersey, announced in January that Little Blue Beach is the new home to little blue penguins. The well-traveled penguins were born at the Taronga Zoo in Australia and lived briefly at the Bronx Zoo before moving to their new home.

- A study published in *Nature Communications* contends that the fish caught worldwide is underreported and that the total catch is in significant decline. Accurate data are vital to responsible fisheries management. The bottom line: we are taking far more fish from the oceans than the official data reflects for a revised global estimate of 109 million metric tons of fish annually.

- A new study by French and German scientists suggests that the social thermoregulatory behavior of emperor penguins may be more complex and dynamic than previously thought. They found that emperor penguins sought huddles, then broke up huddles in response to environmental conditions. They observed that the huddles lasted for only minutes to a few hours and could be quickly broken up by just one penguin. They also saw releases of heat/steam as the birds separated. The results were based on video recordings of more than 3,000 emperor penguins at Point Géologie. The study was published in *Animal Behavior* last December.

- The Yellow-eyed Penguin Trust reported that the yellow-eyed penguin population on the Otago Peninsula of New Zealand hit a 25 year low last December. Factors influencing the decline include an outbreak of avian diphtheria and barracuda attacks (See PCN Vol 18 No 2).

- GPS and Penguin Sentinels announced on December 3rd that "the Province of Chubut legislature approved a Marine Protected Area along the coast of Chubut that includes waters around Punta Tombo". The MPA comes on the heels of the incorporation of land around Punta Tombo into the Patagonia Azul Biosphere Preserve, a double win for Magellanic penguins.

- Last December, little blue penguins got help with nesting sites on the mainland of New Zealand through the Muriawai Environmental Action Community Trust. They constructed nest boxes as sheltered nest "burrows" for the birds. http://www.stuff.co.nz/auckland/local-news/nor-west-news/74475588/cosy-abodes-for-little-blue-penguins-in-muriwai.

- In December SANCCOB again rescued hundreds of "Christmas Chicks", African penguin chicks that have been abandoned by their parents. And the cost to support these chicks increases each year. Anyone can take action for conservation by adopting a chick to support the costs of rescue. Visit https://www.sanccob.co.za or https://www.givengain.com/cc/saveachick. Each adoption includes a photograph of the chick, a certificate of adoption, a thank you letter, a sticker that says 'I adopted an African penguin'.

Photo courtesy of SANCCOB.

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News and Updates

- Alastair Wilson, BBCEarth on Instagram, posted a photo in December of an all-white Gentoo penguin he observed at Bird Island, South Georgia. https://www.instagram.com/p/9Srf41Jd_d.

- Climate change continues to impact ecosystems. With temperatures rapidly rising on the Antarctic Peninsula, researchers investigated ice melt run off from glaciers. In the report released last December, they found cause for concern. With run-off comes sedimentation that they found led to a drop in diversity. Link to the full article **CLIMATE CHANGE AND GLACIER RETREAT DRIVE SHIFTS IN AN ANTARCTIC BENTHIC ECOSYSTEM** in Recommended References, this issue.

- In summarizing a paper published in *Environmental Science and Technology*, Conservation Magazine reported in November that scientists investigated the level of microplastics in commercially available sea salt in China. They found amounts of plastic sufficient to predict that even at a low salt intake up to 1,000 pieces of microplastic could be ingested annually by a person in China. Sadly, the risk of such plastic ingestion is even higher in seafood. Link to the article at: http://conservationmagazine.org/2015/11/plastics-are-invading-your-salt-shakers. Such findings highlight the ongoing risks of plastics pollution to marine species at all trophic levels, including penguins.

- A paper published in the *Marine Pollution Bulletin* centimeter suggests that rescue and rehabilitation of oiled wildlife is a justified response to oil spills. Their study looked at rehabilitated versus non-rehabilitated blue penguins and found both sets of birds were behaving similarly. Link to the full paper in Recommended References.

- Two studies in November focused on penguins feathers. In one study, Cassondra Williams, UC Irvine, examined emperor penguins' feathers and debunked prior held notions of feather density. By clipping feathers and counting the feather shafts she and her team found about 9 body contour feathers per square centimeter or about 59 feathers per square inch (not the 70-100 feathers per square inch often quoted). The next surprise was in finding several types of feathers, including downy feathers attached to the skin at four times the density of the contour feathers and filoplumes that combine into a complex insulation system. It is yet to be determined if other penguin species display as complex a feather system. The other study looked at the ice repelling quality of Gentoo penguin feathers. Researchers found tiny pores in the feathers using Scanning Electron Microscopy. These pores combine with preen gland secretions to keep feathers highly water resistant which in turn helps penguin feathers to stay ice free; the water droplet rolls off before it has time to freeze. And Gentoo penguin feathers were more hydrophobic than the feathers of the Magellanic penguin. These findings were presented at the American Physical Society's Division of Fluid Dynamics.

- The 2nd World Seabird Conference was held in October. Find videos and photos at https://www.youtube.com/channel/UCnjWVJvGQk2IY8_W5GBCMEg.

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AZA SAFE Program Call to Action!

Linda Henry, *Editor PCN*

Did you know that any AZA facility can contribute to the AZA SAFE (Saving Animals From Extinction) African Penguin Conservation Action Plan? AZA has recognized that efforts to engage the public apply to all member institutions, and not just to those with African penguins. All penguin species in North American Zoos and Aquariums are ambassadors for marine species at risk. Therefore, there are many opportunities for zoos and aquariums to become involved. Go to https://www.aza.org/safe-african-penguin to download the Call for Participation pdf to see the list of conservation projects for African penguins. See the menus listing the action items and ways your facility might contribute. You can also click on the link to the "SAFE Update and Next Steps" **webinar** to learn more. See what you, your penguins or your facility can do to help save African penguins and to increase awareness for the challenges facing all penguins and other seabirds.

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Websites We Love

Read the Fall Update for Magellanic penguins at Punta Tombo: http://www.penguinstudies.org/wp-content/uploads/2015/11/Penguin-Sentinels_Fall-2015-Update.pdf.
http://www.falklandsconservation.com

ABC Birds recently featured the Galapagos penguin http://abcbirds.org/bird/galapagos-penguin.

Visit http://www.worldseabirdconference.com/ to download the Abstract Book (pdf) from the conference last October. Read abstracts summarizing recent research on penguin populations and foraging ecology (including several on fisheries impacts in South Africa), diseases, disease monitoring and priority conservation actions.

Events and Announcements

- Earth Hour, 19 March 2016, 8:30-9:30 PM local time worldwide.
- AZA 2016 Mid-Year Meeting: 19-24 March 2016, hosted by the Omaha's Henry Doorly Zoo, Omaha, Nebraska, USA www.aza.org.
- Earth Day: 22 April 2016 www.earthday.org.
- World Penguin Day: 25 April 2016
- Endangered Species Day: 20 May 2016 www.endangered.org.
- 27TH Conference and Annual General Meeting, Pan-African Association of Zoos and Aquaria (PAAZA): Park 31 May – 2 June 2016, hosted by Lion & Safari Park, South Africa, http://www.zoosafrica.com/conference-2016.html.
- 3RD Annual Tuxedo Trot 5K: 21 May 2016, presented by the Greensboro Science Center, Greensboro, North Carolina, USA www.tuxedotrot.com. In 2015 this event raised US$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.
- AZA 2016 Annual Conference: 7-11 September 2016, hosted by the San Diego Zoo, San Diego Zoo Safari Park and SeaWorld San Diego, San Diego, California, USA. https://www.aza.org/annualconference.