Ornithological Observations

An electronic journal published by BirdLife South Africa and the Animal Demography Unit at the University of Cape Town

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Editor: Arnold van der Westhuizen

SEVENTH INTERNATIONAL PENGUIN CONFERENCE, BOSTON, USA: ABSTRACTS OF PRESENTATIONS ON THE AFRICAN PENGUIN OR BY RESEARCHERS BASED IN AFRICA

LG Underhill

Recommended citation format:
Underhill LG 2011. Seventh International Penguin Conference, Boston, USA: Abstracts of presentations on the African Penguin or by researchers based in Africa. Ornithological Observations 2:9-21

URL: http://oo.adu.org.za/content.php?id=16

Published online: 28 March 2011

- ISSN 2219-0341 -

SEVENTH INTERNATIONAL PENGUIN CONFERENCE, BOSTON, USA: ABSTRACTS OF PRESENTATIONS ON THE AFRICAN PENGUIN OR BY RESEARCHERS BASED IN AFRICA

LG Underhill

Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch, 7701 South Africa
les.underhill@uct.ac.za

The Seventh International Penguin Conference (IPC7) took place in Boston, USA, in September 2010, hosted by the New England Aquarium (http://www.neaq.org). This is the first time the penguin conference has taken place in the northern hemisphere and the first time it has been hosted outside of a university research environment. The previous conferences in this series took place in 1988 – Dunedin, New Zealand,1992 – Cowes, Australia, 1996 – Cape Town, South Africa, 2000 – La Serena, Argentina, 2004 – Ushuaia, Chile, 2007 – Hobart, Australia. The Eighth International Penguin Conference is planned to take place in Bristol, UK, in 2013, maintaining the pattern of a three-yearly conference. The proceedings from IPC3, the conference held in Cape Town, were published as an issue of the journal *Marine Ornithology*, and are available online at
http://www.marineornithology.org/cgi-bin/getpage.cgi?vol=27

IPC7 was attended by about 220 people, of whom around half represented the zoos and aquaria of North America. Their attendance was motivated by the concept that they could learn about the wild counterparts of their captive penguins. Indeed, a strong theme running through one session of the conference was the idea that captive penguins could be ambassadors for their wild counterparts, and several presentations dealt with this topic. One of these was presented by Sarah Misslin-Dunn, from Mystic Aquarium, Mystic, Connecticut. The Mystic Aquarium has African Penguins on display, and therefore the abstract of her talk is included below. Its thrust is representative of the talks in this session.

There were 73 oral presentations and 50 posters. The full set of conference abstracts is available on the conference website: http://www.penguinconference.org/. The abstracts presented below are those which dealt with the African Penguin, and also includes those on other species presented by researchers with African addresses. The objective of this paper is to make these papers more readily accessible to a southern African audience. The presentations are listed alphabetically by first author in two groups, oral presentations and poster presentations.

ORAL PRESENTATIONS

The oiled penguin problem in South Africa: recent evidence for sunken ships, natural seeps, and chronic oil dumping

Cox S, Ontario Veterinary College, University of Guelph, Canada, **Strauss V** Southern Africa Foundation for the Conservation for Coastal Birds (SANCCOB), Bloubergrant, 7443, South Africa, **Losier R, Cook A** Environmental Science Centre, Environment Canada, Moncton NB, Canada

Oil fingerprinting enhances our ability to identify oil types and compare various samples to determine whether they originated from the same or difference sources. It is a valuable tool to support enforcement of illegally discharged bilge oil or other fuel in the environment through forensic analysis; to determine the source of the oil; to determine if there may be more than one spill; and/or to determine the type of oil to help inspectors or investigators narrow the search for a vessel. While this process may be cost prohibitive

for every spill, it serves as another tool to aid in the identification and subsequent enforcement of polluters.

In collaboration with the Ontario Veterinary College at the University of Guelph, Environment Canada, and the Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), oil from 171 African Penguins *Spheniscus demersus* admitted to SANCCOB for rehabilitation was analyzed using gas chromatography. Twenty-five different sources of oil were identified. In several cases, oil spread over time and place likely originated from the same source, which suggests a sunken ship or a natural seep as the cause. Additionally, 20 samples were unique in place but not time, which speaks to the ongoing discussion of the prevalence of oil dumping in the region. Similarities between the oil from African Penguins and oil analyzed from Magellanic Penguins in South America and seabirds in Canada are discussed.

South Africa's penguins collapse following intensified competition with fisheries for food, thought attributable to environmental change

Crawford RJM, Department of Environmental Affairs, Private Bag X2, Rogge Bay 8012, South Africa; Animal Demography Unit, University of Cape Town, Rondebosch 7701, South Africa, **Altwegg R**, Animal Demography Unit, University of Cape Town, Rondebosch 7701, South Africa; South African National Biodiversity Institute, Private Bag X7, Claremont 7735, South Africa, **Durant JM**, Centre for Ecological and Evolutionary Synthesis (CEES), Department of Biology, University of Oslo, PO Box 1066, Blindern, 0316 Oslo, Norway, **Underhill LG**, Animal Demography Unit, University of Cape Town, Rondebosch 7701, South Africa

Numbers of African Penguins *Spheniscus demersus* breeding in South Africa collapsed from 57 000 pairs in 2001 to 21 000 pairs in 2009. Their main food is anchovy *Engraulis encrasicolus* and sardine *Sardinops sagax*, which are also targeted by fisheries. In the east, numbers of penguins halved between 2001 and 2003, following a large increase in that area's catch of sardine. In the west, numbers fell by 70% between 2004 and 2009, after an eastward shift in the distribution of prey. First-time breeders may recruit to colonies where conditions are favourable at the time. However, the shift to the east also increased distances between fish processing plants and fish. Fishers caught as much fish as possible near to processing plants and heavily out-competed penguins for food. From 1999–2006, more than 450 000 t of fish were caught within 20 miles of Dassen Island, then the largest colony, including 30% of the overall catch of anchovy in 2006, and the colony decreased by 80%. At Dyer Island, where the eastward displacement of prey should have enhanced its availability, more than 200 000 t of sardine were harvested within 20 miles of the island from 2002–2004.

Penguin status in troubled oceans

Garcia-Borboroglu P, CONICET, Argentina, **Boersma D**, University of Washington, U.S., **Trathan P**, British Antarctic Survey, U.K., **Pütz K** Antarctic Research Trust, Germany, **Wienecke B**, Australian Antarctic Division, Australia, **Le Maho Y**, CNRS, France, **Kooyman G**, University of California San Diego, U.S., **Mattern T**, University of Otago, New Zealand, **Crawford RJM**, Department of Environmental Affairs, South Africa; Animal Demography Unit University of Cape Town, South Africa, **Underhill LG**, Animal Demography Unit University of Cape Town, South Africa, **Kemper J**, Animal Demography Unit University of Cape Town, South Africa; Ministry of Fisheries and Marine Resources, Namibia, **Dann P**, Phillip Island Nature Parks, Australia, **Ellenberg U, Seddon P, Van Heezik Y**, University of Otago, New Zealand, **Steinfurth A** Animal Demography Unit, University of Cape Town, South Africa, **Vargas, FH**, The Peregrine Fund, U.S., **Jiménez-Uzcátegui G**, Charles Darwin Foundation, Puerto Ayora, Galápagos, Ecuador, **Naranjo S**, Galapagos National Park Service, Puerto Ayora, Galápagos,

Ecuador, **Bost C, Delord K**, CNRS, France, Lynch, H. University of Maryland, U.S, **Davis L**, University of Otago, New Zealand, **Cerdena M, Majluf P**, Universidad Cayetano Heredia, Peru, **Cuthbert R**, RSPB, U.K, **Trivelpiece W**, NOAA, U.S., **Hindel M**, University of Tasmania, Australia

Marine and coastal ecosystems are undergoing unprecedented alterations in their processes and structure. Penguins are sensitive species impacted by these phenomena. As top predators, they are key constituents of marine ecosystems, and are indicators of the oceanic and coastal ecosystem health. We integrated the most updated information on distribution, abundance and trends for all penguin species. IUCN has listed 60% of the 18 penguin species as vulnerable or endangered. Some species are at their lowest recorded populations: Galapagos, yellow-eyed, and Fiordland, with their restricted ranges, have less than 3,000 pairs; Humboldt, Snares and African, have less than 30,000 pairs. Even abundant species like the macaroni, and the two rockhopper species are in steep decline. Around 80% of the threatened species occur on islands, increasing their vulnerability to threats such as introduced predators. Threatened penguins are mainly concentrated in New Zealand, East-Pacific Coast (Galapagos and Peru-Chile), and South-Africa. The status of penguin species is not improving. Anthropogenic sources of mortality are likely to increase and are drivers of penguin decline. Oceanic threats include climate change, marine pollution, and fisheries mismanagement. Prey availability potentially linked to climate variation is one of the most commonly suggested causes of population decline. Human activities, including irresponsible tourism, coastal development, and introduced predators, have a major impact on penguin populations. Larger scale ecosystem-based conservation planning and more focused local efforts are needed for the successful conservation of many penguin species.

Feather-loss disorder in African and Magellanic Penguins

Kane OJ, Smith Jeffrey R, Boersma PD Department of Biology, University of Washington and the Wildlife Conservation Society, Seattle, WA, USA, **Parsons NJ, Strauss V** Southern African Foundation for the Conservation of Coastal Birds, PO Box 11 116, Bloubergrant, South Africa, **Garcia-Borboroglu P, Villanueva C** Centro Nacional Patagónico CONICET, Blvd Brown 2825 Puerto Madryn 9120, Chubut, Argentina

A new feather-loss disorder of unknown cause, first reported in African Penguin *Spheniscus demersus* chicks in 2006 and in Magellanic Penguin *Spheniscus magellanicus* chicks in 2007, reduced growth and likely survival. The disorder disrupted feather growth in both species, resulting in chicks with bare skin for several weeks.

Feather loss caused most African Penguin chicks to grow adult instead of juvenile plumage. In contrast, Magellanic Penguin chicks grew juvenile plumage, the same as chicks without the disorder. The phase of feather development at which feather loss occurs may explain this disparity. African featherless chicks in the rehabilitation centre took 16 days longer to reach release weight than feathered chicks.

Magellanic featherless chicks grew slower and were smaller than featherless chicks. In the African rehabilitation center, mortality rates were similar for featherless and feathered chicks. Unlimited food and time for development supplied by the center likely contributed to featherless chick survival. Feather loss likely increases mortality in the wild because of the higher energy needs of the chick and their longer chick rearing period. The disorder order could be detrimental to Antarctic penguin populations where loss of down would result in death.

Return of the pink brigade: monitoring rehabilitation success and return of African Penguins oiled in Namibia and released in South Africa after rehabilitation

Kemper J Ministry of Fisheries and Marine Resources, Lüderitz Marine Research, PO Box 394, Lüderitz, Namibia, **Roux J-P** Ministry of Fisheries and Marine Resources, Lüderitz Marine Research, PO Box 394, Lüderitz, Namibia; Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, Cape Town, South Africa, **Jones R, Delport J-A, Bartlett P, Ndjengua S, Macquers R and Lilonga, S** Ministry of Fisheries and Marine Resources, Lüderitz Marine Research, PO Box 394, Lüderitz, Namibia, **Ludynia K** Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, Cape Town, South Africa, **Strauss V** Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), PO Box 11114, Bloubergrant, South Africa

Following an oil spill along the southern coast of Namibia in April 2009, 129 of the 171 African Penguins oiled and subsequently cleaned in Lüderitz, Namibia, were transferred to the SANCCOB rehabilitation centre in Cape Town, South Africa, for further rehabilitation. Of 42 penguins rehabilitated in Namibia, 40 survived and were released locally. Altogether 113 of the 125 penguins that survived the rehabilitation process at SANCCOB were released in Cape Town; the remainder were repatriated by air and released near Lüderitz. Each penguin released in Cape Town was marked with a steel flipper band and a spot of pink dye on the chest to facilitate the monitoring of these penguins following their release. The first penguin was seen back in Namibia at Mercury Island 14 days after release, having covered a linear distance of 1000 km. By January 2010, eight months after being released in Cape Town, 50% of the "pink" penguins had been seen back on the Namibian islands. We report back on the most recent observed return rates and initial breeding efforts of penguins released in Cape Town, and compare them with those of penguins released locally and those recorded after previous spills affecting African Penguins.

Patterns of attendance of African Penguins at colonies

Makhado AB Marine and Coastal Management, Private Bag X2, Roggebay, 8012, Cape Town, South Africa; Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, South Africa, **Barham B** H H Wills Physics Laboratory, University of Bristol, Tyndall Avenue, Bristol BS8 1TL, UK, **Crawford** Error! Bookmark not defined. **RJM** Marine and Coastal Management, Private Bag X2, Roggebay, 8012, Cape Town, South Africa; Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, South Africa, **Hampton**Error! Bookmark not defined. **S and Le Bohec C** Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, South Africa, **Parsons**Error! Bookmark not defined. **NJ** Marine and Coastal Management, Private Bag X2, Roggebay, 8012, Cape Town, South Africa, **Underhill LG** Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, South Africa, **Upfold**Error! Bookmark not defined. **L** Marine and Coastal Management, Private Bag X2, Roggebay, 8012, Cape Town, South Africa

Attendance of African Penguins *Spheniscus demersus* at the two largest colonies in South Africa's Western Cape was investigated from the deployment of transponders on breeding adults and the use of automatic stations to detect when penguins enter or leave the colony. Mean lengths of trips away from the islands were related to the annual cycle of the penguins, including periods of fattening before and after moult and the incubation, guard and crèche stages of breeding. Times of departure to sea and return to the island were related to day length and highlight periods when penguins will be most susceptible to predation around islands by Cape Fur Seals *Arctocephalus pusillus pusillus* and hence when observations of predation should be conducted to estimate mortality caused by such

predation. Although most birds showed fidelity to paths used to access breeding colonies, on occasion alternative pathways were used. This is a behaviour that needs to be accounted for in estimating survival rates from transponder data. The relative influences of food availability and time available for foraging on the timing of breeding are considered.

Dietary salt supplementation for African Penguins Spheniscus demersus housed in freshwater habitats -- yes or no?

Mazzaro L, Tuttle A and Dunn JL Mystic Aquarium, a Division of Sea Research Foundation, Inc., Mystic, CT, USA, **Wyatt JS** Park Zoo, Rochester, NY, USA, **Goodman J** Potawatomi Zoo, South Bend IN, USA, **Kadyszewski, EP,** Groton, CT, USA

Comparing plasma electrolyte concentrations, this study addresses whether electrolytes of salt-supplemented penguins maintained in freshwater differ from those of non-supplemented conspecifics.

Thirty-eight penguins from four facilities were utilized. Additionally, electrolyte data from free-ranging birds (n=20), long-term residents (n=13) and rehabilitated oil spill birds (n=47) in South Africa were compared. Assessment of normality of data used the Shapiro-Wilk test and comparisons of means between groups and between time periods used analysis of variance (ANOVA) and repeated measures ANOVA.

Comparison of electrolytes of salt-supplemented verses unsupplemented birds showed no differences between groups. The temporal pattern of electrolyte values over the study was the same for both groups suggesting that supplementation has no lasting effect on serum electrolytes and that a natural seasonal variation in electrolyte levels may exist in this species. Similarly in SA healthy penguins had equivalent electrolyte levels. Oil-contaminated birds had significantly lower sodium and higher potassium concentrations. Comparing U.S. birds and healthy SA birds showed no significant difference in plasma sodium or chloride concentrations, but SA birds exhibited significantly higher potassium concentrations likely resulting from different sample handling techniques.

This study supports the hypothesis that African Penguins maintained in freshwater exhibits, on similar diets, do not require salt supplementation.

Ambassadors for the plight of the African Penguin at Mystic Aquarium

Misslin-Dunn S, Macha L, Giantonio, B and Osborn, M Mystic Aquarium, Division of Sea Research Foundation, Inc., Mystic, CT, USA

Mystic Aquarium, a division of Sea Research Foundation, Inc., has exhibited African penguins (*Spheniscus demersus)* since 1989 and has participated in the U.S. Species Survival Plan for African Penguins. Over the past decade, the aquarium has contributed to research and education to raise a higher public awareness to the plight of the African Penguin. The Aquarium has prioritized conservation efforts by sending staff to South Africa and Peru to assist with oil spills, research projects and guano harvest monitoring. The research department at Mystic Aquarium has conducted valuable studies on the captive care of penguins as well as provided sample data to complement ongoing field research. Research, education and conservation efforts are possible through the development of several unique programs (raising more than $265, 00.00); a Penguin Encounter program, penguin night functions, a fundraising campaign, an annual run/walk, partnerships with conservation-focused organizations and media appearances.

The African Penguins at Mystic Aquarium have become ambassadors for those in South Africa because of these programs. The aquarium plans to continue and expand its efforts to help support ongoing research in South Africa. Mystic Aquarium hopes to

become a leader, inspiring organizations and researchers to help prevent the further depletion of the African Penguin.

Hand-rearing and release of African Penguin chicks abandoned by moulting parents in the Western Cape, South Africa, 2001–2009.

Parsons NJ and Strauss V (SANCCOB) Southern African Foundation for the Conservation of Coastal Birds, South Africa, **Schwitzer, C** Bristol Conservation and Science Foundation, Bristol Zoo Gardens, **Underhill LG** Animal Demography Unit (ADU), University of Cape Town, **Crawford RJM** Department of Environmental Affairs, Marine and Coastal Management, **Waller, LJ** Cape Nature, ADU, University of Cape Town, Geldenhuys, Deon CapeNature, **Leshoro TM** Robben Island Museum, **Sherley, RB** School of Biological Sciences, University of Bristol and Animal Demography Unit, University of Cape Town

Hand-rearing of African penguin Spheniscus demersus chicks has become a standard conservation intervention in South Africa due to demonstration of later breeding by birds hand-reared as chicks and returned to the wild. Adult birds moult between September and January and at this time abandoned chicks are often admitted to SANCCOB for hand-rearing. From 2001 to 2005, an average of 61 chicks was admitted each year due to abandonment by moulting parents, with a release rate of 54%. From 2006 to 2009, a total of 1 559 chicks (841 in 2006, and 481 in 2007) were removed from colonies, because they had been abandoned by parents, with an average release rate of 85%. These chicks were from the Dyer Island, Betty's Bay and Robben Island colonies. Veterinary concerns during hand-rearing of chicks include avian malaria, airsacculitis and pneumonia, aspergillosis, feather-loss and bumblefoot. Released birds are monitored as part of a research program to identify factors that influence selection of breeding colony. It is hoped that this will provide information on how captive rearing of birds may be used to bolster declining colonies or establish new ones in favourable localities, e.g. close to forage food resources.

Spatial and temporal variation in growth and condition of African Penguin chicks at five colonies in South Africa

Sherley RB Centre for Behavioural Biology, School of Biological Sciences, University of Bristol, Woodland Road, Bristol, UK; Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, South Africa, **Waller LJ** Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, South Africa; CapeNature, 16 Seventeenth Avenue, Voëlklip, Hermanus 7200, South Africa, **Underhill LG** and **Lubbe**Error! Bookmark not defined. **A** Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, South Africa

Seabirds show high plasticity in chick growth, which can be constrained by both food availability and type. We show that growth rates and body condition are related to breeding productivity of the Vulnerable African Penguin *Spheniscus demersus* both spatially and temporally.

Data were available from five penguin colonies (Robben, Dassen, Dyer, St. Croix, Bird islands) in both 2008 and 2009, and from a selection of these colonies in various years from 1989 to 2004. Gompertz growth coefficients were calculated for all years and body conditions for each chick in 2004, 2008 and 2009.

Growth was generally poorer in years of population decease than in periods of recovery and both growth and body condition were poorer in 2009 than in 2008. Overall, growth and condition peaked in April and June respectively and agreement between monthly variation in growth and condition was high (Pearson's correlation coefficient = 0.41, $p<0.001$). Monthly fluctuations within and between years even at colonies in close proximity supported the notion that feeding conditions vary unpredictably.

In addition, annual growth rates at Dassen Island were related to the availability of sardine in the previous year, suggesting that breeding productivity depends on adults attaining adequate condition prior to breeding.

Breeding behaviour of the Galápagos Penguin *Spheniscus mendiculus*: Implications for conservation

Steinfurth A Charles Darwin Research Station, Puerto Ayora, Santa Cruz, Galápagos, Ecuador; Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch, 7701 Cape Town, South Africa, **Vargas FH** Charles Darwin Research Station, Puerto Ayora, Santa Cruz, Galápagos, Ecuador; The Peregrine Fund, 5668 W. Flying Hawk Lane, Boise ID, USA, **Macdonald D** Department of Zoology, Wildlife Conservation Research Unit, University of Oxford, Tubney House, Abingdon Road, Tubney, Oxfordshire, UK

In 2004 and 2005 we studied the breeding behaviour of the Galápagos Penguin *Spheniscus mendiculus* an endemic and endangered species in the Galápagos Islands with a current population of less than 2000 individuals. A total of 115 nests at 17 different locations was found across the penguin's distributional range in the archipelago. Breeding sites ranged in size from one to 43 nests. Twelve breeding sites (71 %) were found on Isabela Island with the highest aggregations of active nests (85 %, n = 98) concentrated in the island's southwest. At the penguin's two main breeding sites, Caleta Iguana and Playa de los Perros, we identified two well-defined breeding peaks: March to May and July to September. In 2004, the monitored nests at Caleta Iguana showed that 54 % (n = 15) of the adults bred once, while 43 % (n = 12) of the adults bred twice and one pair laid three clutches. In 2005, 41 % (n = 7) birds bred once and 59 % (n = 10) bred twice.

All nest sites occurred within the Galápagos National Park. However, a spatial evaluation of nest sites in relation to the protection provided by the zoning of the Galápagos Marine Reserve raised serious concerns, because only 29 nests (25 %) were afforded the highest protection level, while 86 nests (75 %) were found in areas designated for extractive uses such as fishing.

Eastern Equine Encephalitis infection in a flock of African Penguins *Spheniscus demersus*

Tuttle AD, Dunn JL Sea Research Foundation's Mystic Aquarium, Mystic, CT, USA, **Andreadis TG** The CT Agricultural Experiment Station, New Haven, CT, USA, **Frasca**Error! Bookmark not defined. **S** University of Connecticut, Department of Pathobiology, Storrs, CT, USA

Eastern Equine Encephalitis (EEE) was diagnosed in a flock of African penguins in Connecticut. Diagnosis was based on history, clinical signs, serology, virus isolation, RT-PCR and histopathology. One affected penguin exhibited no clinical signs; however, the majority had clinical signs including anorexia, behavior changes, depression, regurgitation, and ataxia. A small percentage of penguins additionally exhibited recumbency, vomiting, seizures, and diarrhea. While penguins recovered in 12 (+/- 5) days, 50% of affected birds maintained a subtle ataxia. Hematologic changes consisted of an initial heterophilic leukocytosis and regenerative anemia followed by increases in absolute lymphocyte and monocyte counts. Common plasma chemistry abnormalities included liver and muscle enzyme elevations, decreased electrolytes, hyperglycemia, and elevated globulin. Resolution of bloodwork abnormalities occurred in 67 (+/- 24) days. Treatments consisted of supportive care including antimicrobials, fluids and nutrition, and anti-convulsants where necessary. All infected birds survived except one juvenile bird that was euthanized due to severe disease and lack of therapeutic response. The high morbidity of EEE disease in penguins emphasizes the potential severity of arbovirus infections, suggests a potential need for EEE vaccination of penguins maintained in

endemic areas, and stresses the importance of mosquito control at zoological institutions in the prevention of arbovirus infections.

A new approach to track analysis: evaluating the scales of movement of foraging penguins

Underhill LG, Navarro RA, Steinfurth A and Waller, LJ Animal Demography Unit, Department of Zoology, University of Cape Town, Cape Town, South Africa

Quantifying spatial patterns of animal movement, particularly searching for prey, is of primary importance for understanding an animal's foraging strategy. Evaluating the scale of movement provides insight into how animals perceive their environment. We present a new track analysis algorithm, the distance-ratio scale (DRS) method, which is based on the straightness of the track, in relation to a pre-defined tolerance. We present a graphical method which conveniently assesses the scales at which animals seem to be operating. Fine scale DRS identifies active feeding zones. Coarse scale DRS indicates long distance movement between breeding colony and foraging areas, or between feeding patches. We apply the method to GPS tracks of African and Galapagos Penguins, and compare their foraging strategies.

African Penguin breeders and adult moulters: colony relationships to surrounding fish stocks

Waller LJ Western Cape Nature Conservation Board, 16 17th Avenue, Voelklip, Hermanus, 7200 South Africa; Animal Demography Unit, Zoology Department, University of Cape Town, 7701 South Africa, **Underhill**Error! Bookmark not defined. **LG** Animal Demography Unit, Zoology Department, University of Cape Town, 7701 South Africa, **Crawford RJM** Animal Demography Unit, Zoology Department, University of Cape Town, 7701 South Africa; Marine and Coastal Management, Private Bag X2, Roggebaai, 8012 South Africa

African Penguin *Spheniscus demersus* populations have shown a sustained population decline from 2004, to the extent that the 2009 breeding census was the lowest on record since regular surveys began in the 1950s. The breeding population at Dassen Island for example, historically the largest African penguin colony, dropped by 50% from 2006 to 2007.

Previous studies have linked the overall trends in African Penguins to the overall abundance and distribution of the pelagic sardine and anchovy biomass.

Each year since 1984, pelagic fish recruitment surveys were conducted in May, and fish biomass surveys conducted in November along the western and southern coastline of South Africa. Surveys were performed within the same boundaries (strata) each year.

This study looks at the relationship between the breeding population and number of adult moulters of African Penguins at five Island colonies (Dassen, Robben, Dyer, St Croix and Bird Islands), and two mainland colonies (Boulders and Stony Point). The African penguin colonies at each location are shown to have different and unexpected relationships to the fish abundance within their relevant strata. The results are considered in terms of spatial management strategies required for the conservation of the African penguin.

POSTER ABSTRACTS

African Penguin Spheniscus demersus – the preliminary findings in a guano study (2007-2010) done at the Penguins Eastern Cape Rehabilitation Center (PEC) in South Africa.

Horne EC, Bousfield B Penguins Eastern Cape Rehabilitation Centre, Cape St. Francis, Eastern Cape, South Africa

The rehabilitation of African Penguins at PEC has given the opportunity for non-invasive research and the identification of the

endoparasites and eggs found. Examples of the helminth fauna, their eggs, location found during necropsies, clinical signs and pathogenicity have been recorded. This ongoing research project has identified the trematodes *Cardiocephaloides physalis* and *Renicola sloanei* Wright 1954, the nematodes *Contraceacum sp*. and *Cyathostoma sp.* as well as the cestode *Tetrabothrius sp.* and the presence of *coccidia*.

Penguins without borders: oiled African Penguins rescued and cleaned in Namibia are rehabilitated in South Africa

Kemper J Ministry of Fisheries and Marine Resources, Lüderitz Marine Research, PO Box 394, Lüderitz, Namibia, **Strauss V** Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), PO Box 11114, Bloubergrant 7443, South Africa, **Ludynia K** Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, Cape Town, South Africa, **Roux J-P** Ministry of Fisheries and Marine Resources, Lüderitz Marine Research, PO Box 394, Lüderitz, Namibia; Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, Cape Town, South Africa, **Gous T** Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), PO Box 11114, Bloubergrant 7443, South Africa

Altogether 171 African Penguins were oiled in April 2009 along Namibia's southern coast during the country's worst oiling incident affecting penguins in Namibia to date. The birds were rescued from four islands, spanning 150 km of coastline, and were brought to the small Lüderitz seabird rehabilitation facility for cleaning and rehabilitation by staff of the Namibian Ministry of Fisheries and Marine Resources (MFMR). It soon became apparent that the facility was unable to cope with the unprecedented influx of oiled penguins, and the 129 strongest birds were evacuated 1300 km by road to the SANCCOB rehabilitation facility in Cape Town, South Africa, for further rehabilitation. Two penguins died shortly after arrival, and a further two penguins died later. A total of 113 penguins were released in Cape Town; twelve were returned to Namibia by air to be released locally. We detail the first international evacuation operation of African Penguins from Namibia to South Africa. The success of the evacuation operation was due to the prompt initial rescue of the oiled penguins, excellent collaborative efforts between MFMR and SANCCOB, careful preparation of the penguins for the journey, and immediate financial and administrative support from various agencies.

Influence of nesting habitat on breeding success of African Penguins *Spheniscus demersus* at Robben Island, South Africa

Leshoro TM Robben Island Museum, Robben Island, 7400, South Africa, **Barham B and Barham PJ** HH Wills Physics Laboratory, University of Bristol, Tyndall Avenue, Bristol BS8 1TL, UK, **Crawford RJM** Marine and Coastal Management, Private Bag X2, Roggebay, 8012, Cape Town, South Africa, **Dyer BM** Marine and Coastal Management, Private Bag X2, Roggebay, 8012, Cape Town, South Africa, **Makhado AB** Marine and Coastal Management, Private Bag X2, Roggebay, 8012, Cape Town, South Africa; Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, South Africa, **Robinson G** Marine and Coastal Management, Private Bag X2, Roggebay, 8012, Cape Town, South Africa, **Sherley RB and Underhill LG** Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, South Africa, **Visagie L** Marine and Coastal Management, Private Bag X2, Roggebay, 8012, Cape Town, South Africa

From 2001–2009, breeding success of African Penguins *Spheniscus demersus* was monitored at Robben Island, South Africa. About 100 nests were followed each year. The nesting habitat was recorded for each nest monitored: on surface and shaded, on surface but not shaded, in building, in artificial nest box, in artificial burrow. Breeding success was defined as the number of chicks fledged per chick hatched. The overall breeding success was highest in the artificial nest boxes, followed by other shaded sites. Nests that were not

shaded performed worst. High temperatures and high insolation at Robben Island caused adults to abandon nesting attempts. The boxes permitted more wind cooling than the burrows but have been known to flip over in exceptionally strong winds. Historical collections of guano have precluded African Penguins from nesting in burrows at many islands, causing them to nest on the surface, where they are more subject to climate extremes (flooding, heat). Climate warming will further stress breeding African Penguins unless alternative suitable nesting habitat can be provided.

Foraging behaviour of Rockhopper Penguins during different breeding stages at New Island, Falkland Islands

Ludynia K Vogelwarte Radolfzell, Max-Planck Institute for Ornithology, Schlossallee 2, 78315 Radolfzell, Germany; Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, Cape Town, South Africa, **Dehnhardt N and van Noordwijk HJ** Vogelwarte Radolfzell, Max-Planck Institute for Ornithology, Schlossallee 2, 78315 Radolfzell, Germany, **Strange I** New Island Conservation Trust, Dairy Cottage, Swans Farm, Winchfield, Hook RG27 8DB UK, **Masello JF and Quillfeldt P** Vogelwarte Radolfzell, Max-Planck Institute for Ornithology, Schlossallee 2, 78315 Radolfzell, Germany

Changes in numbers of Rockhopper Penguins *Eudyptes chrysocome* are believed to be related to altered environmental conditions and food availability. During the incubation period, birds are known to spend longer periods away from the colony, thus being able to reach more distant and possibly more productive areas at sea. During guard and crèche stages, penguins are limited to foraging areas closer to the colony, having to return more frequently to feed their chicks.We studied the foraging behaviour of rockhopper penguins using GPS data loggers during the entire breeding season 2009-10 at New Island, Falkland Islands. Our aim was to identify differences in foraging behaviour between the breeding stages and relate these to oceanographic and feeding conditions. During incubation, male penguins travelled large distances foraging over the Patagonian shelf. Females during incubation but also during guard and crèche stages presented short foraging trips in close vicinity to the island. The foraging effort was lower during crèche when both partners were involved in chick provisioning. These findings indicate favourable feeding conditions for Rockhopper Penguins at New Island during this breeding season, compared to other breeding sites in the South Atlantic where birds have been found to stay at sea for longer periods.

The first Namibian Islands' Marine Protected Area: a conservation measure for endangered seabirds in the Benguela Upwelling system

Ludynia K Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch 7701, Cape Town, South Africa; Marine Research Institute, University of Cape Town, Rondebosch 7701, South Africa, **Kemper J** Ministry of Fisheries and Marine Resources, Lüderitz Marine Research, PO Box 394, Lüderitz, Namibia and African Penguin Conservation Project, PO Box 583, Lüderitz, Namibia

The northern Benguela Upwelling system supports a range of seabirds, including several globally and locally endangered species. Threats to these species include a lack of food, human disturbance, habitat destruction and severe weather conditions.

Namibia's first Marine Protected Area (MPA) was proclaimed in 2009. It stretches 400 km along the southern Namibian coast and covers almost 10 000 km², including all seabird breeding islands in Namibia. One of the MPA's key objective is to protect the breeding sites as well as foraging areas of three endangered seabirds breeding and feeding along Namibia's coast. Using a zoned approach, the MPA places restrictions on human activities, including fishing, mining, guano harvesting and recreational activities.

We present data on the foraging distribution of endangered African Penguins *Spheniscus demersus*, Cape Gannets *Morus capensis* and Bank Cormorants *Phalacrocorax neglectus*; this information played a crucial role in the design of the MPA. Monitoring programmes to track the species' foraging distributions, diet, breeding success and population trends will be continued to evaluate the MPA's success as a seabird conservation tool. We will give an overview of some of the management measures implemented in the MPA and will highlight some of the potential shortcomings of the MPA.

A collective effort to save the African Penguin: the role of maintaining an accurate regional studbook

Shaw TR and Rehse TP National Zoological Gardens of South Africa, P.O. Box 754, Pretoria, Gauteng, South Africa, 0001

The African Penguin *Spheniscus demersus*, one of Southern Africa's flagship endemic species, is currently undergoing an alarmingly rapid population decline and has recently been uplisted to the 'Endangered' category in the 2010 IUCN Red List. This charismatic species is being harshly affected by commercial fisheries and shifts in prey populations. There is no sign of this declining trend reversing, and unless immediate conservation action is taken, the African penguin could face an uncertain future. The National Zoological Gardens of South Africa is currently responsible for maintaining the regional African penguin studbook. Studbooks have been recognized as essential tools in the coordinated and scientific management of endangered species. If we are able to formulate an effective captive breeding program, this will be an important contribution, on the behalf of captive holding institutions, to the conservation of the African Penguin. Preliminary analysis of the current studbook data received, from 1980 to date, revealed that there are currently nine institutions in South Africa holding African Penguins, with the total captive population amounting to 169 birds, 56 of which are considered as potential founders. Given the parameters established through the studbook, in order to be able to maintain a genetically stable population, a minimum population size of approximately 150 animals needs to be maintained. This is well within the current carrying capacity of the South African captive population. In order for our captive management program to be successful, we however need more complete studbook information from each of the holding institutions. In order to effectively manage this small population, captive institutions will have to permanently mark their birds; determine sex; note exact hatch, acquisition, transfer and death dates; and keep accurate parentage records.

Computer vision monitoring of African Penguins *Spheniscus demersus*: new data on the field capacity from Robben Island

Sherley RB Centre for Behavioural Biology, School of Biological Sciences University of Bristol, Woodland Road, Bristol, UK; Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch, South Africa, **Burghardt T** Department of Computer Science, Merchant Venturers Building, University of Bristol, Woodland Road, Bristol, UK; HH Wills Physics Laboratory, University of Bristol, Tyndall Avenue, Bristol, UK, **Barham PJ** HH Wills Physics Laboratory, University of Bristol, Tyndall Avenue, Bristol, UK; Animal Demography Unit, Department of Zoology, University of Cape Town, 10 Rondebosch, South Africa, **Cuthill IC** Centre for Behavioural Biology, School of Biological Sciences University of Bristol, Woodland Road, Bristol, UK

In light of the uncertainty surrounding flipper banding in some species, there is growing interest in alternative penguin identification methods that minimise disturbance but still allow for robust population monitoring. We have previously reported on the development of a prototype computer vision system that automatically identifies individual African Penguins *Spheniscus demersus* using natural markings. Here we demonstrate the potential for fully-automated, non-invasive, monitoring in the field at Robben Island, South Africa.

False individual identifications of detected penguins occurred in less than 0.01% of comparisons (n = 73,600) to known individuals. The monitoring capacity in the field was estimated to be above 13% of the birds that passed the camera (n = 1453), with a significant increase under favourable conditions. Theoretical and empirical development of this capacity suggests high levels of enrolment and recapture over time frames of a few months. Finally, we present results from captive birds that confirm the long-term stability of the adult plumage pattern.

In conclusion, the demonstrated sensitivity is comparable to computer-aided animal biometric monitoring systems in the literature, while a full deployment of the system would identify more penguins than is possible with complete exploitation of the current levels of flipper banding at Robben Island.

Predatory impact of feral cats *Felis catus* on the Galápagos Penguin *Spheniscus mendiculus* at its main breeding site, Caleta Iguana, Isabela Island, Galápagos

Steinfurth A Animal Demography Unit, Department of Zoology, University of Cape Town, Rondebosch, Cape Town, South Africa; Charles Darwin Foundation, Isla Santa Cruz, Galápagos, Ecuador, **Forman D** Department of Pure and Applied Ecology, Institute of Environmental Sustainability, Swansea University, Singleton Park, Swansea, UK, **Carrion V** Galápagos National Park/Parque Nacional Galápagos, Isla Santa Cruz, Galápagos, Ecuador, **Vargas FH** Charles Darwin Foundation, Isla Santa Cruz, Galápagos, Ecuador; The Peregrine Fund, 5668 W. Flying Hawk Lane, Boise ID, USA

Insular breeding seabirds are extremely vulnerable to introduced mammalian predators as they have not evolved behavioural, morphological or life-history responses against them. We undertook the first study on *in situ* predation of Galápagos penguins (*Spheniscus mendiculus*) by feral cats (*Felis catus*) at the penguin's main breeding site to investigate whether cats pose a threat to this species. We examined five cat digestive tracts and eight scats and identified the occurrence of prey remains. Feathers and the tarsal bones of adult Galápagos penguins were identified in a total of two digestive tracts and four scat samples. Additionally, seven adult penguin carcasses were recovered within one month, six of which showed distinctive signs of predation by cats. One observation of a feral cat feeding on a penguin carcass was also recorded. These data importantly demonstrate that Galápagos penguins are actively predated by feral cats.

Prior Population Viability Analysis showed that high survivorship of adult birds is essential for the long-term persistence of the Galapagos penguin. After our study, the Galapagos National Park initiated a campaign aimed at controlling cat populations at Caleta Iguana and other important nesting sites on Isabela Island. Further work however is urgently needed to assess the wider impact of feral cat predation on Galápagos penguin populations.

How *ex-situ* and *in-situ* organizations can work together to raise the profile of African penguins

Strauss V, Roestorf M SANCCOB (Southern African Foundation for the Conservation of Coastal Birds), **Leiden T** Leiden Conservation Foundation

SANCCOB is an *in-situ* organization which works closely with the Association of Zoo and Aquarium's African Penguin Species Survival Plan (SSP) and a host of *ex-situ* international organizations. SANCCOB's goal is to raise the profile of African Penguins and to keep the US organizations informed about the many challenges this species faces in the wild.

US Zoological Institutions have access to millions of visitors annually and are a vital link in the dissemination of information about wild penguins. It's important that they are continually updated with fresh, relevant information and research about wild African Penguins so

that their visitors may feel a connection to a species that lives on a distant continent and onethey may never see *in-situ.*

In the spirit of WAZA's conservation strategy, this poster session will showcase successes and suggest practical ways of working together.

- ISSN 2219-0341 -