

September 2021

Issue 225

ISSN 03700-9026

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South African Network for Coastal and Oceanic Research



A new project on the at-sea communication of African penguins

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Have you ever had the chance to observe African penguins foraging cooperatively? In a similar way to dolphins, they work as a group to circle fish schools into bait balls which improves their foraging success. And have you wondered how they coordinate these group activities?

A new project has recently been initiated to study how African penguins communicate at sea and coordinate their group foraging behaviours. The project is called 'AFNAP' for *`Acoustic* Foraging Network in African Penguins: significance and vulnerability to anthropogenic noise'. It is an international collaboration between scientists from the CNRS Université Paris-Saclay in France, the Nelson Mandela University, as well as BirdLife South Africa and SANCCOB. The project is funded by the European Union's Horizon 2020 research and innovation program under the Marie Sklodowska-Curie grant agreement No 101026088.

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With this project, the scientists aim to

- describe in detail the at-sea vocal repertoire of African penguins,
- investigate the function of at-sea vocalisations and their use for networking and
- evaluate the vulnerability of African penguins to anthropogenic noise.

Describe the vocal communication used by foraging African penguins

Communications are essential for individuals to interact and for regulating group activities, which can in turn be essential for animals to forage efficiently, find a mate, avoid a predator, etc. Seabirds are known to be very noisy at their colonies, where they congregate in large numbers during the breeding season. However, their communication systems at sea (in a foraging context) are extremely poorly known because of the difficulties of collecting data at sea, even though this is where they spend most of their life.

African penguins have long been known to vocalize when at sea and a recent study by A McInnes *et al.* (published in 2019 in *Ibis*) revealed



African penguins circling a fish school cooperatively (from P Ryan et al. 2012 Ardea). Photo by Lloyd Edwards.

the potential of three different types of vocalizations emitted from the sea surface. It was, however, limited by poor-quality acoustic data. In addition, the existence of underwater vocalisations was recently discovered in other species of penguins (reported in Α Thiebault 2020 The et al. *Conversation*) but remains unknown in African penguins. A detailed description of their at-sea vocal repertoire is thus necessary as a first step, to be able to study the function of these vocalisations as a second step.

Explore the function of at-sea vocalizations in African penguins

Some species of seabirds are

known to cue on each other when at sea to acquire information on the presence of inconspicuous prey. Individuals maintain a relatively short distance from each other to 'rake' the ocean and effectively survey large areas in a form of active cooperation called a 'foraging network'. For flying seabirds which seem to rely mostly on visual cues, such 'foraging networks' mostly operate within 5-10km distances (up to 40km).

However, penguins have a limited visual range (from the sea surface), so we hypothesize that acoustic signals may play a much more central role in their ability to communicate at sea. The recent study by A McInnes et al. (2019) described sea surface vocalizations

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to be associated with social contexts and foraging activities. Further experiments are necessary to study the function of these vocalisations, evaluate the distance at which acoustic signals may operate at sea, and ultimately assess the use of acoustic signals for networking at sea. This is particularly important to understand how anthropogenic noise in the ocean may affect African penguins.

Evaluate the potential impact of anthropogenic marine noise on African penguins

Indeed, anthropogenic noise in oceans has dramatically increased since the industrial age and it is expected to continue increasing with the expansion of the Blue Economy. pollution impacts Noise the physiology, behaviour, and sometimes the survival, of a wide range of marine organisms. Awareness around the problem has increased recently, but most work remains focused on cetaceans and fishes.

The African penguin is classified as 'Endangered' by the IUCN Red List. The population has decreased by 70 % since the early 2000s, largely because of the reduced availability of their prey. Recent scientific evidences (reported in L Pichegru



The aim of the project is to evaluate the vulnerability of African penguins to anthropogenic noise. Photo by Alistair McInnes.

2018 *The Conversation*) showed that they strongly avoid seismic survey activities, suggesting they might be impacted by noise. The emergence of additional threats to their populations is of great conservation concern. This project will thus contribute to the mitigation of anthropogenic marine noise pollution on Endangered seabird populations.

If you are interested, please follow our news and updates on the <u>AFNAP Project</u> webpage!

Further reading

Ryan PG, Edwards L, Pichegru L. 2012. African penguins *Spheniscus demersus*, Bait Balls and the Allee Effect. Ardea 100(1):89-94.

Pichegru L. 2018. Are seismic surveys driving penguins from their feeding grounds? *The Conversation*.

McInnes AM, Thiebault A, Cloete T, Pichegru L, Aubin T, McGeorges C, Pistorius PA. 2019. Social context and prey composition are associated with calling behaviour in a diving seabird. *Ibis* 162(3):1047-1059.

Thiebault A, Charrier I, Pistorius PA, Aubin T. 2020. New discovery: penguins vocalise under water when they hunt. *The Conversation*.

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Tragedy of an abused estuary



Just north of Durban lies the small but potentially important uMhlanga Estuary (Figure 1). Its southern bank is dominated by the magnificent Hawaan Forest (Figure 2), one of the last large remnants of climax coastal dune forest in KwaZulu-Natal. The estuary was home to thousands of fishes belonging to estuarine, marine and freshwater guilds that are ultimately harvested by recreational and subsistence fishers. The system has been well studied by scientists since the 1970s and had a rich invertebrate fauna. There was even a proposed estuarine food web determined for the fish assemblage in the estuary as early as 1978 (Figure 3).

Although subject to various human-induced pressures over the past few decades, especially wastewater discharges from a treatment plant in the Ohlanga catchment, the final 'nail in the coffin' came when the estuary was the casualty of a human-created pollution event unparalleled in the history of environmental degradation of estuaries in South Africa. On the night of 12th July 2021 the UPL chemical plant in Cornubia, just north of Durban in the Ohlanga River catchment, was raided by looters as part of #UnrestSA and then set alight. By the time the fire brigade arrived, the blaze had already been burning for some time. Instead of using foam or chemical retardants to quell the fire, water was sprayed onto the flames in large quantities. This mixed with the unburnt and partially burnt



Figure 1. A view of the uMhlanga Estuary lagoon, taken in 1978, looking south towards Durban (Photo: Alan Whitfield).



Figure 2. View of the uMhlanga Estuary in 1978 looking upstream towards the middle reaches, with the Hawaan Forest in the background (Photo: Alan Whitfield).

chemicals in the depot and sent a slurry of insecticides, herbicides and other poisons rushing down storm water drains and into the Ohlanga River. Within hours, the biota in the river and estuary had been destroyed by the chemical pollution and the air was filled with toxic, carcinogenic fumes that caused many people residing in the Mhlanga and La Lucia suburbs to suffer respiratory stress. Apart from the destruction of the biota in the river and estuary, large numbers of marine biota were also washed up onto beaches in the area and people were warned by the media not to consume any dead cravfish or fish along this section of the coast. Beaches in the area were closed by the eThekweni Municipality and experts are still at odds as to whether the coast should be reopened to surfing, fishing, bait collection, etc. almost two months after the disaster.

Clean-up operations by SpillTech to gather and remove thousands of dead fish from the artificially breached uMhlanga Estuary commenced immediately after the pollution event. This was followed by the temporary blocking and damming of water courses to prevent further flow of contaminated water and catchment soil into the Ohlanga River. Chemicals were added to the water in an attempt to neutralize the impact of the spill and hundreds of tonnes of contaminated soil were then mechanically removed from the catchment and river bed in an attempt to get rid of pollutants that had become bound to the sediments. Although the full range of chemicals that were looted and burnt in the warehouse (Figure 4) are largely unknown, test results have shown that the river, estuary and surrounding wetland have been contaminated by highly toxic chemicals such as arsenic, atrazine and bromoxynil.

There is little doubt that this destruction of the ecology of the Ohlanga River and uMhlanga Estuary is the largest and most devastating single pollution event ever to impact an estuary in South Africa. The KZN Minister of Economic Development and Environmental Affairs has said that the cost of the arson to the economy at Cornubia is estimated to be more than a billion Rand but in reality the actual ecological damage to the river and estuarine environment cannot be calculated. Physical rehabilitation and restoration efforts of the river and estuary are underway and it will take many months





Figure 3. Simplified food chains in the uMhlanga Estuary during 1978 showing the dominant energy pathways to the fishes in this system. Arrows go from food to consumer with the percentages based on standing stock contributions by the respective components (data from Whitfield 1980).



Figure 4. View of the smouldering remains and clean-up operation at the UPL chemical plant near Cornubia that followed looting and arson at the warehouse (Photo: Thabiso Goba).

to complete. Only time will tell whether the biota of this system will ever recover from such a toxic spill to become a functional estuary once again. Regardless of what happens in the future, we can only hope that valuable lessons have been learnt from this disaster and environmental impact nightmare. \mathscr{G}

World-famous sardine migration explained

Scientists have discovered how one of the world's biggest migration runs works.

The Sardine Run involves the movement of hundreds of millions of sardines from their cool-temperate core range into the warmer subtropical waters of the Indian Ocean, on South Africa's east coast.

The run is triggered by the upwelling of cold water on the southeast coast and as they swarm north, the sardine are sandwiched between the coast and a southward-flowing hot current that exceeds their physiological capacity. They are then targeted by huge numbers of dolphins, sharks, seabirds and even whales.

A new study in the journal <u>Science</u> <u>Advances</u> by South African and Australian scientists tested the hypothesis that the Sardine Run represents the spawning migration of a distinct east coast stock adapted to warm subtropical conditions. The scientists generated genomic data for hundreds of sardines from around South Africa, including data from regions of the genome that are primarily associated with differences in water temperature along the coast.

The results showed two sardine populations in South Africa, one in the cool-temperate west coast (Atlantic Ocean) and the other in warmer east coast waters (Indian Ocean). Each regional population appears adapted to the temperature range that it experiences in its native region.

"Surprisingly, we also discovered



The sardine run is a unique experience that attracts tourists from around the world. Photo by Brandon Cole.

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that sardines participating in the migration run are primarily of Atlantic origin and prefer colder water", says Professor Luciano Beheregaray at the Flinders University Molecular Ecology Lab, one of the study authors.

"The cold water of the brief upwelling periods attracts the west coast sardines, which are not adapted to the warmer Indian Ocean habitat", says author Professor Peter Teske from Johannesburg.

"This is a rare finding in nature, since there are no obvious fitness benefits for the migration, so why do they do it? "We think the sardine migration might be a relic of spawning behaviour dating back to the glacial period. What is now subtropical Indian Ocean habitat was then an important sardine nursery area with cold waters", says Professor Teske.

This visually breath-taking migration run attracts tourists from around the world who are keen to get a glimpse of the underwater spectacle, but it may not be around forever.

"Given the colder water origins of sardines participating in the run, projected warming could lead to the



The spawning area in the Atlantic Ocean (blue) is dominated by cool-temperate sardines and the spawning area in the Indian Ocean (orange) is dominated by warm-temperate sardines. Upwelling of cold waters on the southeast coast attracts cool-temperate sardines present on the south coast, which then move northward as part of the Sardine Run. When the upwelling ceases, these sardines eventually find themselves in an ecological trap of suboptimal subtropical habitat.

end of the sardine run", says Professor Beheregaray. Despite the huge numbers of fish involved, the run involves only a small portion of the South African population so while it's end would mean the loss of one of nature's most spectacular migrations, the effects on the population as a whole are likely to be negligible.

Source:

Flinders University News. Worldfamous sardine migration explained. 20 September 2021. Retrieved from https://news.flinders.edu.au/blog/20 21/09/20/world-famous-sardinemigration-explained/

Journal Reference:

Peter R. Teske, Arsalan Emami-Khoyi, Tirupathi R. Golla, Jonathan Sandoval-Castillo, Tarron Lamont, Brent Chiazzari, Christopher D. McQuaid, Luciano B. Beheregaray, Carl D. van der Lingen. The sardine run in southeastern Africa is a mass migration into an ecological trap. *Science Advances*, 2021; 7 (38) DOI: 10.1126/sciadv.abf4514

Hundreds of Cape fur seals entangled in fishing lines and nets every year

Fishing line and nets are having a major impact on Cape fur seals (*Arctocephalus pusillus pusillus*), the most common marine mammal observed around the coastline of South Africa and Namibia, where they are endemic.

While their population numbers are considered healthy, plastic pollution, and particularly fishing line and nets, are causing horrific injuries and can result in a slow, painful death.

These are the first results from an ongoing project, initiated in 2018, to investigate the impact of pollution on Cape fur seals in Namibia. The project involves researchers and conservationists from Stellenbosch University, Sea Search-Namibian Dolphin Project and Ocean Conservation Namibia.

The team monitors the entanglement rates of seals and Ocean Conservation Namibia have been disentangling many of the animals affected. The first results from the project were published this week in the scientific journal *Marine Pollution Bulletin.*

The study demonstrated that a high



Entanglement of fur seals highlight the consequences of plastic waste on marine animals. Of all age classes, mostly juveniles are affected. Citizen scientists contributed 51% of total entanglement data.

number of affected animals were pups and juveniles, which were mainly entangled around the neck by fishing line. Rates of entanglement were roughly 1 per 500 animals and was similar between the colonies two investigated at Walvis Bay and Cape Cross. Of the 347 entangled animals documented, the disentanglement team, led by Naudé Dreyer of Ocean Conservation Namibia, were able to disentangled 191 successfully individuals between 2018 and March 2020.

Working in Africa with limited recourses, the team also compared low cost methods of data collection. They found that photographic scans of the colonies were a fast and accurate method to collect data on entangled individuals and the materials they are trapped in.

Dr Tess Gridley, co-director of the Namibia Dolphin Project and an extraordinary senior lecturer in the Department of Botany and Zoology at Stellenbosch University, says plastic pollution and particularly lost and discarded fishing nets are having a big impact to marine life: "Once entangled, these seals face a very painful and uncertain future: finding food becomes harder and wounds can become deep and debilitating, and likely cause death in many cases. Changes to policy could help, such financial ลร incentives to recover lines, safe disposal of nets and sustainable alternatives to plastics".

Stephanie Curtis, a research student with the Namibian Dolphin Project and lead author, says the impact of

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plastic pollution in the oceans is devastating: "Seals should not have to suffer this way because of our carelessness with waste".

According to Dr Simon Elwen, codirector of the Namibian Dolphin Project and also associated with SU's Department of Botany and Zoology, fur seals are especially vulnerable to becoming entangled: "They are very curious and playful animals and will investigate objects in the water, but their thick, backwards facing fur which keeps them warm at sea easily snags lines and straps and stops it falling back off."

Naudé Dreyer from Ocean Conservation Namibia says the project is ongoing: "Since the start 2021 of we have alreadv disentangled over 600 fur seals in only two colonies. This is the tip of the iceberg. It is imperative that studies such as this highlight the consequences of plastic waste on marine animals, and bring around change for the better".

Source

Stellenbosch University. "Hundreds of Cape Fur seals entangled in fishing lines and nets every year". 20 August 2021. Retrieved from http://www.sun.ac.za/english/Lists/ news/DispForm.aspx?ID=8497

Journal reference

S. Curtis, S.H. Elwen, N. Dreyer, T. Gridley. Entanglement of Cape fur seals (*Arctocephalus pusillus pusillus*) at colonies in central Namibia. *Marine Pollution Bulletin*, 2021; 171: 112759 DOI: 10.1016/j.marpolbul.2021.112 759 Ø

Opportunities

Vacancies

- Scientist Production Grade A-C: Physical Oceanography at DFFE in Cape Town. Closes 27 Sep 2021.
- Environmental Officer Specialised Production: Environmental Impact Assessment (EIA) at DFFE in Cape Town. Closes 27 Sep 2021.
- Graduate Internship at CapeNature in George, Western Cape. Closes 30 Sep 2021.
- Assistant Meteorological Technician: at SAWS based on Marion Island. Closes 4 Oct 2021.
- Senior Meteorological Technician: at SAWS based on Marion Island. Closes 4 Oct 2021.

- Fisheries Observer for the Falkland Islands Government in Stanley, Falkland Islands. Closes 7 Oct 2021.
- Lead for Modelling and Statistics for the International Whaling Commission in Cambridge, UK. Closes 10 Oct 2021.

Research Funding

Science and Technology Research Partnership for Sustainable Development – Call for Proposals: This program is designed to promote international joint research in which the Japan Science and Technology Agency and the Japan International Cooperation Agency and those of recipient countries work together based upon the social needs in recipient countries. Proposals are invited in the following research fields: Environment/Energy, Bioresources, Disaster Prevention and Mitigation, and Infectious Diseases Control. The funding will cover travels to and from Japan, workshops and/or conferences; equipment and machinery for the projects. Click on the links to download the cell for proposals, application form and application guide. Closes 2 Oct 2021.

BRICS Multilateral Call for Pre-proposals 2021: The BRICS STI Framework Programme aims to support excellent research on priority areas which can best be addressed through a multinational approach. The initiative should facilitate cooperation among the researchers and institutions in the consortia which consist of partners from at least three of the BRICS countries. The NRF will support interdisciplinary research projects submitted within the 5 BRICS themes, which include an ocean and polar science and technology theme. Full defails fame. Closes 28 Feb 2022.

New SANCOR Steering Committee Members

The SANCOR Steering Committee is pleased to announce the appointment of two new members on the Steering Committee. We welcome Dr Philile Mbatha as the Social Science Representative and Dr Amber-Robyn Childs as the Eastern Cape Representative. We wish them all the best in their new roles. We thank Drs Nikki James and Serge Raemakers (the former Eastern Cape and Social Science Representatives, respectively) for their time and contribution to SANCOR's activities.



Dr. Philile Mbatha is a young academic and lecturer the in

New	SANCOR	Social	Environmental
Science			
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Science Department at the Universitv of Cape Town. Her research and teaching are within the fields of environmental sustainability and human geography, with a specific focus on coastal resource governance and coastal livelihoods. Philile has over 10 years' experience conducting research on marine and coastal governance and livelihoods related topics in the Western Indian Ocean region of southern Africa, with a specific focus on rural contexts along the coast. Philile is interested in conducting research that can contribute to rural development by linking policymaking platforms and institutional arrangements that manage coastal resources to the people on the livelihood ground and their realities. Philile is also passionate about conducting research on topics that involve fisheries, mining, tourism, as well as broader conservation of coastal resources; exploring different issues including livelihoods, legal pluralism, access, politics, power dynamics, distribution of benefits from resources and plural governance. Over the past 5 years, Philile has various publications and presented her work at numerous national and international conferences and workshops, and has been awarded international various research opportunities to collaborate with researchers in international institutions. These include the Yale Fox Fellowship programme at Yale University, USA (2013/2014),British Council Newton Fund Researcher Links award at Northumbria University, UK (2016), and currently appointed as University of Michigan's African Presidential Scholar at the University of Michigan, USA (2019/2020). She has also been recently recognised as one of 50 influential voices speaking up for the environment in South Africa in recent а article by treeshake.com



New SANCOR Eastern Cape Representative, Dr Amber-Robyn Childs.

Amber-Robyn Childs is a Senior Lecturer in the Department of Ichthyology and Fisheries

Dr

Science at Rhodes University. She holds a PhD in Ichthyology and an MSc in Ichthyology (cum laude) from Rhodes University.

Childs is accomplished Dr an academic and researcher who has published over 30 scientific manuscripts in ISI-rated journals.

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Her research centres on the biology, ecology, physiology and movement behaviour of estuarine and coastal fishes, with implications for fisheries and climate change. She is also involved in the biological and social aspects of recreational fisheries to ultimately improve angler behaviour, and fish health and survival.

Her achievements include being a co-investigator and/or collaborator for several successful research grants (i.e. SA-Norway Bilateral Grants 2007 - 2014, NRF-ACEP Grant 2013, 2018, NRF-Marine Science call 2019). She is a recipient of the S2A3 Bronze Medal, a national award for the best Masters in the Science Faculty, and was also awarded the SANCOR International Student Travel Award. She has received several scholarships through the German Academic Exchange Service, known as DAAD, and the Rhodes University Atlantic Philanthropies Grant.

Dr Childs has supervised over 20

students at honours, masters and doctoral levels. ${\mathscr G}$

Issued by the South African Network for Coastal and Oceanic Research

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Our Focus: Science in the Marine and Coastal Environments

SANCOR's activities are made possible through financial contributions from Department of Forestry, Fisheries and the Environment (DFFE) and the National Research Foundation (NRF).

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