



Research opportunity: Post-doctoral position at the Coastal and Marine Research Institute, Nelson Mandela Metropolitan University

We invite applications for the below post-doctoral position at the Coastal and Marine Research Institute, a rapidly developing and dynamic centre of excellence in marine zoological and environmental research, encompassing fields from oceanography to top predator ecology and ecosystem modelling.

Project title: Bottom-up influence of climate change on endangered marine top predators via trophic coupling and retroactive top-down influence of these predators on their environment

Supervisor: Dr Lorien Pichegru

Co-supervisor: Prof Nadine Strydom (NMMU)

PROJECT OUTLINE

Understanding the effects of climate change on marine ecosystems is complicated by a lack of research into trophic interactions at different spatio-temporal scales. In the Benguela Upwelling Ecosystem off South Africa, climate driven oceanographic processes are known to have a significant impact on the distribution and abundance of small pelagic fish and these secondary consumers play an important role in regulating the entire ecosystem from primary producers to top predators. Dramatic declines in top predator populations that prey on these fish have prompted scientists to intensify research efforts into possible causes of this phenomenon. Trends in these predator populations provide useful signals to explore fluctuations in dynamic ecosystem processes. Populations of African Penguins have decreased by 70% over the last 12 years with most of the remaining breeding population residing in Algoa Bay. This species biology has been monitored since 2008 to gain insights into possible drivers of these trends. Fine-scale pelagic fish surveys have been conducted since 2011 to gauge the response of various breeding and foraging parameters of penguins to the variation in their prey abundance. A typical missing dimension, however, is an understanding of the bottom-up as well as top-down processes that are fundamental to these systems' functioning. Here we propose an integrated approach that looks at the influence of climate driven processes on primary producers, secondary consumers and ultimately top predators to understand the relationship between projected climate change scenarios on the dynamics of these ecosystems. The top-down influence of the predator colony in their environment via nutrient input will be integrated in our ecosystem model. This research aims to discover those limiting factors that can help inform adaptive strategies for effective resource and biodiversity management.

The research will be based on two long-term datasets that were collected in parallel and will unite them for the first time. Data on penguin behaviour and population dynamics have been collected on Bird and St Croix islands in Algoa Bay since 2008, data on small pelagic fish have been collected since 2011, and oceanographic data, both biotic and abiotic, have been collected by SAEON since 2008. In parallel, this project will assess for the first time water quality and nutrient content, and the nature of the phyto- and zoo-plankton community near the African penguin world largest colony, St Croix Island.

In this project, the candidate will evaluate the influence of nutrient input from a large penguin colony on the feeding environment for larval anchovy and sardine, by first assessing water quality and nutrient content, and identifying the phyto- and zooplankton species community near and away St Croix Island, and then by modelling the amount of

nitrate and phosphate produced by the penguin colony across the species breeding cycle and run-off in their surrounding environment.

To understand the drivers of small pelagic fish abundance and distribution in Algoa Bay, we will identify the major phytoplankton and zooplankton species consumed by sardine and anchovy adult and larvae in Algoa Bay, by assessing the spatio-temporal relationship between the plankton communities and pelagic fish abundance in the bay, and determining the short (months) and medium (years) term oceanographic drivers of conditions favourable to pelagic fish in Algoa Bay.

The result will be used to produce a strong habitat model for African penguins and predict population trajectories under different climatic scenarios, by establishing critical prey abundance thresholds that influence energy expenditure and breeding parameters of African Penguins in Algoa Bay, as well as forecasting habitat suitability for pelagic fish and African Penguins, as well as consequential changes of nutrient inputs in the ecosystem from the penguin population under different hypothetical climate change scenarios.

APPLICATIONS AND FUNDING

Candidates should have a PhD degree in the field of marine ecology and modelling. The candidate should have experience in planktology and of complex data processing and modelling techniques in R. Experience in RNA-DNA body condition indices would be preferred. The successful candidate will form part of a dynamic research team.

The value of the bursary is R150 000 per year for up to three years. Renewal each year will be contingent on satisfactory academic progress.

To apply, please send a CV (including academic records & names and contact details of three referees) and a short motivation letter to Dr Lorien Pichegru (lorien.pichegru@nmmu.ac.za).

Closing date: 21st January 2017