Using Species Distribution Models for Spatial Conservation Planning of African Penguins

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Keywords: African penguins, Conservation, Species Distribution Model, Suitability map

The African Penguin (*Spheniscus demersus*) is found on the south-western coast of Africa, living between Namibia and Algoa Bay, near Port Elizabeth, South Africa, with the largest colony found on St. Croix Island. The population is currently at about 14 percent of its 1950s level, when the first official census was conducted, and is still continuing its strong downward population trajectory. African penguins are an early warning system for environmental threats, thus studying the factors that affect them is important. Due to their downward population trajectory, immediate conservation action is required to prevent this species' extinction from occurring. The African Penguin is declared as Endangered on the IUCN Red List of Threatened Species. An understanding of the dynamics and causes for this decrease is thus of integral importance. Studies indicate drivers of change include climate change, parasites, pollution (oiling), disease, lack of food resources, predation risk and habitat interference. A large component of this is the anthropogenic impact, especially with human population expansion. A cause of this is ecological traps: these are scenarios in which rapid environmental change leads organisms to prefer to settle in poor quality habitats. The rate of heterogeneous landscape change may be central to

the creation of these traps. Of particular concern are the shifting distributions of forage fish which indicate / result in a spatial mismatch between the main penguin breeding colonies and their preferred prey. It is important for conservation purposes to be able to identify these traps and differentiate them from sinks (a very low quality habitat that, on its own, would not be able to support a population). A species distribution model (SDM) will be established in response to these challenges. It is a predictive, conceptual model of the abiotic (e.g. physical barriers, climate, lack of resources) and biotic (e.g. competition, predators, parasites) factors influencing the role of habitat suitability in controlling species distributions in space, time and scale. R statistical programming language will be used by implementing the locations of the colonies and incorporating the environmental data. Other names, such as habitat suitability, niche modelling, bioclimatic models, resource selection functions and spatial correlation models, are used to describe such species distribution models. Greater consideration needs to be given to the information required to assess the consequences of traps at landscape scales, which are most relevant for conservation management.

References

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