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DISTRIBUTION MODELING OF SOCOTRA CORMORANT USING MAXENT

by

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Date & Venue

09:30 AM

Friday, 3 June 2022

https://eu.bbcollab.com/guest/4188a9d0cd2445dba3fe9ca2769cd57d

Abstract

This thesis is concerned with species distribution modeling of the Socotra Cormorant (*Phalacrocorax nigrogularis*), a regionally endemic seabird to the Arabian Gulf, the Arabian Sea, and the Gulf of Aden. Socotra Cormorants are important for the marine ecosystem as they apply top-down control and maintain the balance between trophic levels. They also contribute to the cycling of nutrients significantly. The bird is categorized as vulnerable by the IUCN. Large portions of their suitable habitat are disturbed or degraded due to oil exploration and coastal development. The seabird is poorly studied in every ecological aspect. The main objective of this thesis is to predict the potential current and future marine distribution of the species and estimate the effect of climate change on its distribution. The thesis also aims to analyze the important environmental variables for the species distribution. Occurrence data were collected over several years (2013-2015, 2019-2020) using satellite transmitters attached to the birds. Data were obtained from 28 birds in total covering 3 different colonies in the Arabian Gulf. Data were fed to Maxent software along with a chosen set of environmental variables. Results showed that there is a total of 64,100 km2 of potential current highly suitable areas for the species. These areas existed mainly in the Arabian Gulf and the Red Sea. However, projecting the model on 2050 indicated a sharp decline with nearly 73% loss in suitable areas according to the climate change scenario used. Most contractions occurred in the Arabian Gulf and the Red Sea. However, the Red Sea was still holding considerable areas of moderate suitability. Mixed layer thickness and sea floor depth are the most important variables to the distribution of the seabird. This study showed that there are large highly suitable areas not colonized yet in the Red Sea. It also indicated that if GHGs continue to rise, Socotra Cormorants will be at great risk. It also highlighted the importance of mixed layer thickness and shallow depth for the species foraging grounds.

Keywords: Socotra Cormorant; Arabian Gulf; Arabian Sea; Red Sea; habitat suitability; habitat loss; distribution modeling; Maxent.