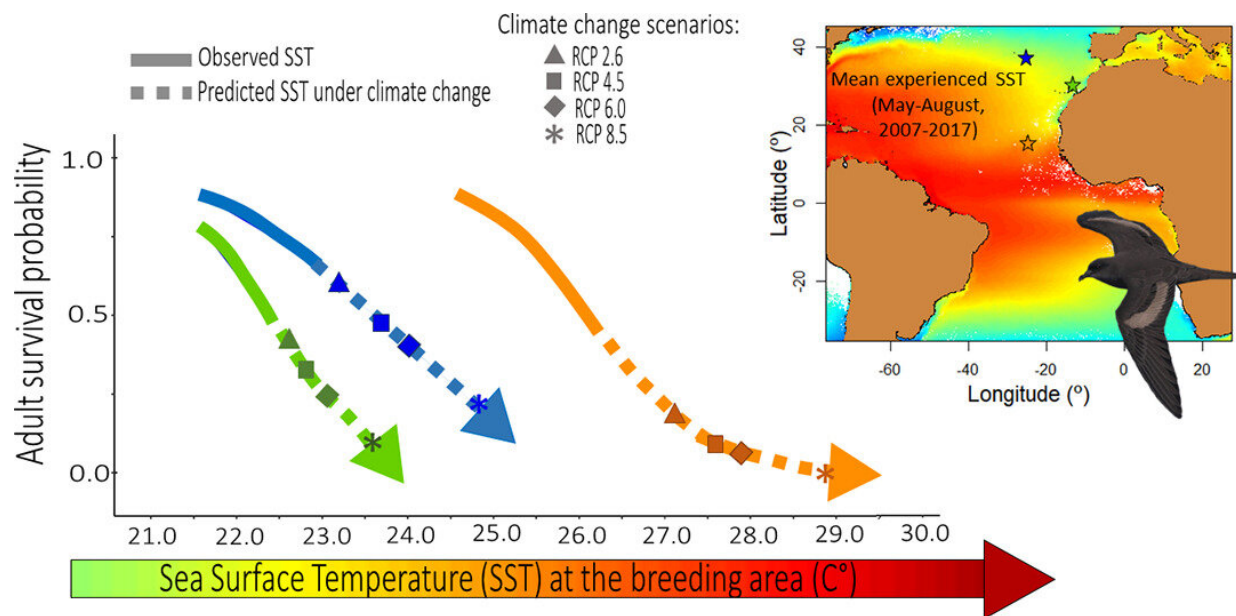


Rising sea temperatures threaten Atlantic populations of Bulwer's petrels

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Graphical abstract. Credit: *Science of The Total Environment* (2022). DOI: 10.1016/j.scitotenv.2022.157352

The impact of the rise in sea temperatures predicted by the Intergovernmental Panel on Climate Change (IPCC) could affect the survival of the North Atlantic populations of Bulwer's petrel in the Azores, Canary Islands and Cape Verde, according to a study conducted by the Seabird Ecology Group of the Faculty of Biology and the Biodiversity Research Institute (IRBio) of the University of Barcelona.

The [seabird](#) population of Cape Verde would be the most vulnerable to the new climatic conditions, according to the conclusions of the study, published in *Science of The Total Environment*.

Bulwer's petrel (*Bulweria bulwerii*) is a pelagic seabird of the Procellariidae family that feeds on fish, cephalopods and crustaceans. In the Atlantic Ocean, the species nests in the Macaronesian archipelagos, particularly on coastal rocks, small islets and sea cliffs. About half of the specimens from the Azores and the Canary Islands migrate to the South Atlantic, while the rest of the individuals from these archipelagos and all the birds from Cape Verde spend the non-breeding season in the central Atlantic.

The study analyzes the effects of climate change on these [seabird populations](#) in temperate or tropical areas. "The effects of climate change have always been predicted to be severe in polar environments, so most demographic studies on seabirds have prioritized sampling in Arctic or Antarctic areas," says Raúl Ramos, lecturer at the Department of Evolutionary Biology, Ecology and Environmental Sciences of the UB and IRBio.

"Our study provides the opportunity to test that the impact of climate change will certainly not only affect species from polar latitudes, but also other species confined to more tropical environments."

Cape Verde's populations: The most vulnerable ones

The paper analyzes the potential impact of several factors—the rising sea temperature, the North Atlantic Oscillation Index, the Southern Oscillation Index and the wind—on the North Atlantic populations. The rising sea surface temperature is the factor that most negatively influences the adult survival of the three different populations of Bulwer's petrels, according to the conclusions of the study.

"Sea temperatures are expected to affect seabirds indirectly but with common components for all three populations. In other words, it is not that birds may suffer more or less cold because of climate change, but that these negative effects could impact through the trophic chain. Thus, temperature could influence the productivity or abundance of nutrients and plankton in the main feeding grounds of Bulwer's petrels, altering the population density of the birds' potential prey," notes researcher Marta Cruz-Flores (UB-IRBio), first author of the study.

Given the IPCC projections (2090–2100), the tropical population of Cape Verde would be the most affected by the rise in sea temperature, which would be explained by the confluence of several factors. "The first factor, perhaps the most relevant one, is that [tropical regions](#) are the areas where IPCC models predict the sharpest temperature rise in any of the studied scenarios (2090–2100)," says Professor Jacob González-Solís, head of the Seabird Ecology Group of the UB.

"Secondly, the temperature range experienced by petrels in this population is the narrowest of all—they are used to a more stable temperature range—and any increase in temperature could disturb them even more. Finally, the tropical Cape Verde population is resident in nature—it migrates very short distances compared to other subtropical and temperate populations of the species—and so individuals are influenced by the same habitat and environmental conditions throughout the year."

How will the Bulwer's petrel adapt to climate change?

In a future scenario, the Bulwer's petrel's abilities to mitigate the effects of climate change could focus on the species' plasticity in foraging strategies (e.g. shifting areas) and the adaptation of migratory routes.

"Seabirds are very long-lived species that can live between 15 and 50

years, depending on the species. Therefore, when facing any relatively abrupt environmental change, adults tend to prioritize individual survival over reproductive effort, for instance. Thus, although our study predicts a severe [impact of climate change](#) on the survival of the species, we can expect the individual plasticity of these species to allow individuals to adapt to the changes in order to lessen the effects of climate impact on their populations," says Raúl Ramos.

Climate change is not the only threat to the conservation of the species worldwide. In fact, the problems for the conservation of species are worse on the lands, where seabirds only breed.

"The introduction or presence of terrestrial predators—rats, cats, etc.—that prey on eggs, chicks or even adults, endanger petrel populations in the Atlantic, Pacific and Indian Oceans. Another serious problem is the availability of nesting habitat—burrows or holes where adults can lay eggs, incubate eggs and feed chicks—on the few uninhabited islets and islands in the areas where the species is distributed," note the experts.

A global threat for seabirds

Other seabird species in tropical and subtropical oceanic environments may also be affected by the indirect temperature effects described in this article. Examples could include stormbirds, shearwaters and other petrels that breed in Caribbean or Macaronesian archipelagos.

In this context, the article highlights the relevance of metapopulation studies that integrate data and information from different populations of the same species in order to understand demographic processes on a global scale. Demographic studies focused on a specific population, also of great scientific value, are often inconclusive when analyzing the trends and threats affecting a species in a specific place when in fact it

has a wide distribution.

"Therefore, despite being much more expensive at an economic, logistical, temporal and personal level, metapopulation studies such as the one we have just published are decisive for understanding how species interact with the environment, and thus foresee their adaptation strategies in the face of the challenge of climate change," concludes lecturer Raül Ramos.

More information: Marta Cruz-Flores et al, Will climate change affect the survival of tropical and subtropical species? Predictions based on Bulwer's petrel populations in the NE Atlantic Ocean, *Science of The Total Environment* (2022). [DOI: 10.1016/j.scitotenv.2022.157352](https://doi.org/10.1016/j.scitotenv.2022.157352)

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