Pacific Islands Climate Change Cooperative

PACIFIC ISLANDS CLIMATE CHANGE COOPERATIVE

Breeding success of albatross, an apex predator, definitively linked to large-scale climate events in the North Pacific

Scientists studying two species of wide-ranging Pacific seabirds have definitively shown that a significant portion of breeding success from year to year is related to large-scale climate events affecting the ocean. Using data on Laysan albatross and black-footed albatross, they found that a prominent large-scale productivity zone in the north Pacific Ocean is an important feeding area. Moreover, this feature is predicted to move further north as a result of climate change.

Albatross are apex predators, with adults having no natural predators within their ecosystem. Apex predators play a crucial role in keeping ecosystems in balance, and their decline or removal can have dramatic impacts, including an increase in smaller predators which can lead to declines in prey species.

Albatross rely on a key northern Pacific habitat for food

Both Laysan and black-footed albatross on Tern Island in the northwestern Hawaiian Islands travel to a distinct area of the north Pacific known as the Transition Zone Chlorophyll Front or TZCF. This front is a major feature defined by a sharp increase in productivity that spans 800 km of the North Pacific. Measured by density of chlorophyll -- at the base of the marine food web -- it is easily monitored using ocean color satellite remote sensing.

With the support of the Pacific Islands Climate Change Cooperative, Scientists at UC Santa Cruz analyzed satellite tracking data on the foraging (feeding trips) of tagged birds from 2002 - 2010 combined with nest success data provided by the US Fish & Wildlife Service. They found that as the minimum distance of the TZCF from the breeding colony increased, reproductive success for Laysan albatross decreased. The analysis showed similar results for black-footed albatross, but to a far lesser extent.

Feeding zone influenced by large-scale ocean processes

The TZCF is influenced by several large-scale ocean processes. In particular the El Niño-Southern Oscillation (ENSO) is a naturally occurring cycle that involves fluctuating ocean temperatures in the equatorial Pacific. The warmer waters essentially slosh back and forth across the Pacific, much like water in a bath tub. The warmer state is El Niño and the cooler is La Niña. Laysan Albatross reproductive success in general declined with distance to the TZCF and with the El Niño

cycle, but increased with other oceanographic cycles related to variations in sea surface temperature, sea level pressure and fluctuations in plankton.

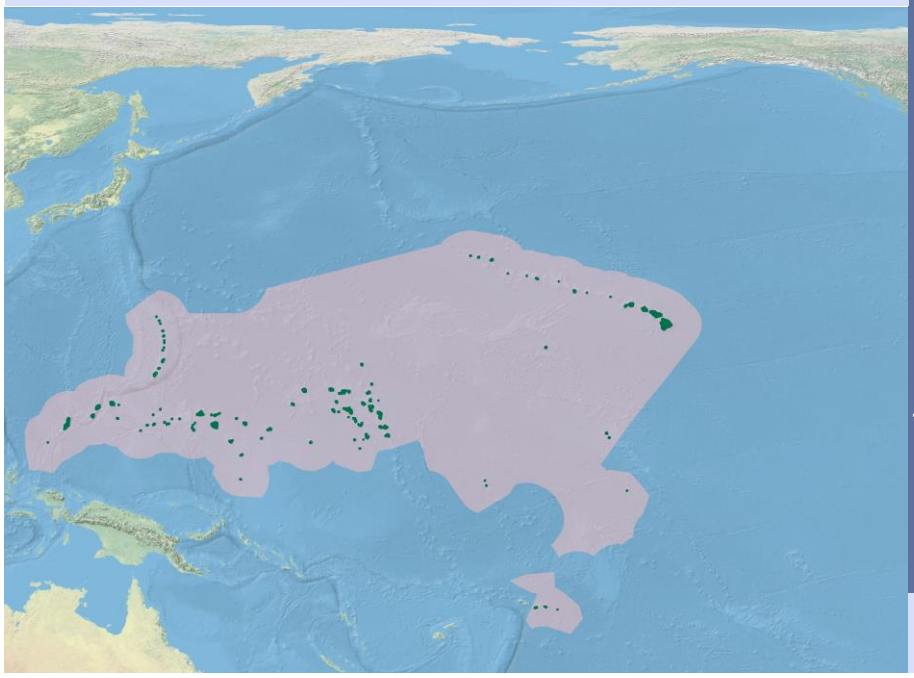
This study also included a relatively simple method for sampling the stomach contents of albatross (without harm to the birds) that shed light on differences in diet between the species, which are considered generalist predators. With this data library of 35 prey species, future long-term collection of this information could explain how prey differences change from year to year and are affected by large-scale ocean events.

Implications for albatross in Hawai‘i

This study confirmed that TZCF habitat has been moving north over the last 30 years, and it is predicted to move even farther north as a result of climate change. This is important for albatross populations that breed in the main Hawaiian Islands (e.g. Kaua‘i, O‘ahu, Lehua) versus other populations farther north (Laysan Island and Midway Atoll). Hawaiian populations may be saved from some climate changes by breeding at higher elevations, but they may also be required to forage in less favorable habitat as the TZCF becomes more distant.

For more details about this project, visit the PICCC projects page: piccc.net/our-projects.

The map below depicts the PICCC geography, which includes Hawai‘i, American Sāmoa, Guam, the Northern Mariana Islands, the Marshall Islands, the Federated States of Micronesia, Palau and 4 Marine National Monuments.



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The Pacific Islands Climate Change Cooperative (PICCC) was established in 2009 to assist those who manage native species, island ecosystems, and key cultural resources in adapting their management to climate change for the continuing benefit of the people of the Pacific Islands. The PICCC provides a range of services and tools to help managers in Hawai‘i, the Mariana Islands, American Sāmoa, and other Pacific Island groups make informed decisions for conservation of natural and cultural resources including climate models at the scale of islands and archipelagos, ecological response models, and implementation and monitoring strategies for island species, resources, and communities. Our goal is to help managers reach explicit biological and cultural conservation objectives in the face of climate change and ongoing threats such as fire, land conversion, and invasive species.

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