

Seabirds Face Risks from Climate Change

RESEARCH IN REMOTE REGIONS CAN ALSO BE DANGEROUS *by Kate Madin*



Clara Peron/CEFE, France

A wandering albatross stretches its wings on Kerguelen Island in the Southern Ocean, facing the sun and an uncertain future.

The research expedition ended in near-disaster. Stephanie Jenouvrier, aboard the ship *Marion Dufresne II*, was heading to the Southern Ocean to study seabirds. On Nov. 14, 2012, while making a stopover at tiny windswept island about 1,800 miles from Cape Town, South Africa, the *Dufresne* struck a shoal that opened an 82-foot breach along its hull. The ship's bow thruster was disabled, and damaged watertight compartments filled with icy seawater.

"We felt like the ship was sinking," said Jenouvrier, a biologist at Woods Hole Oceanographic Institution (WHOI). "If the captain had not realized our trajectory was wrong, we would have hit with the front of the ship and sunk right away. We were lucky."

The 110 people aboard the wounded ship were helicoptered to a research station on the island, which already housed 50.

"We left for the trip very confident," Jenouvrier said. But there they were, stranded on Île de la Possession in the Crozet Islands, waiting for rescue.

Jenouvrier and colleagues had been headed to French-held Kerguelen Island to gather information on black-browed albatross, wandering albatross, macaroni penguin and other seabirds— animals at the top of their Southern Ocean food chain. As such, Jenouvrier said, "seabirds are sentinels of climate change."

Impacts of climate change are already affecting some regions at Earth's poles, as well as the creatures that dwell there. In the Arctic, polar bears that depend on dwindling sea ice are now endangered. In Antarctica, seabirds also depend on ice: Seabirds eat fish, which eat shrimplike crustaceans called krill. The krill eat algae, and the algae grow underneath sea ice.

Jenouvrier is investigating how seabirds will fare in the face of climate change. To do that, she needs data on all the myriad interlocking environmental factors that affect seabirds' lifestyles.

Winners and losers

Seabirds fly very long distances to forage at sea, but they return to nesting sites on land to breed. Many seabirds mate for life and sometimes live and reproduce into their fifth or sixth decades.

Studying climate change requires a long-term perspective, so the researchers make multiple trips to seabird nesting sites, just as the birds do. The French researchers Jenouvrier collaborates with have been gathering information on these species for a half-century in colonies where pairs return year after year. They weigh and count seabirds, count eggs, band chicks, and equip birds with satellite tags to record the ranges and duration of their foraging flights.

"In Antarctica you cannot be alone, so we do this as a team," she said. "And I need the data from other researchers for my own study, because for modeling their responses to climate change, it's very valuable for me to understand what they eat, where they go, how much time they forage."

She integrates the information from fieldwork, data on sea ice and other environmental variables, species' ecology, and climate projections from the International Panel on Climate Change into mathematical models to project seabirds' responses to climate change.

Jenouvrier and WHOI biologist Hal Caswell previously used models to predict the future of emperor penguin populations in one part of Antarctica. Emperors breed annually, and need the presence of sea ice to breed and feed. The scientists calculated that emperor penguins there had a 42 percent chance of declining by more than 90 percent by 2100. (See next page.)

In seabirds' projected futures, "there are winners and losers," Jenouvrier said.

Wild turkeys and chickadees have different sizes, life spans, and reproduction rates, and fit into their woodland environment differently. So it is with penguins and petrels in Ant-

arctica—different life strategies create differences in species’ flexibility to deal with rapid climate change.

Petrels might be able to cope with climate change better than penguins, for example. Jenouvrier found that petrels can skip breeding in a year when warming conditions diminish sea ice and decrease food resources. They can reproduce in subsequent years, so they have time over their long lives to skip years without seriously affecting a bird’s lifetime number of offspring.

The tale of the hexacopter

On this cruise, Jenouvrier brought along a new research tool: miniature, electric, remotely operated aerial vehicles with a camera and six rotors—“hexacopters”—developed in WHOI scientist Hanumant Singh’s lab. Jenouvrier trained with it at WHOI for two months. Then she trained workers in France to fly it before the *Dufresne* left for the Southern Ocean.

“The aim was to have workers use the hexacopter to count penguins every year,” Jenouvrier said. “Ground counts are hard, because the birds stand so close together. Aerial photos are better, but with a helicopter you can’t go close and scare the birds. The hexacopter is simpler, cheaper, and ‘greener,’ or less polluting.”

But they never made it to Kerguelen.

Stuck on 58-square-mile Île de la Possession, the researchers tripped up in the space at Alfred Faure Station, and waited days until a rescue ship from the coast of Africa could reach them.

“We slept in the library, we slept in the gym, in labs, closets, everywhere. We showered in the bath used for cleaning penguins. But we had time, so we made a mission with the hexacopter, still training.

“The biggest challenge to using the hexacopter is wind,” she said. “The Crozet Islands are extremely windy, and there were only a few hours when the wind dropped enough to fly it.”

Jenouvrier left the hexacopter with workers on the island, who flew it. But the wind came up, and it crashed.

“That’s how science goes, sometimes,” she said. “We did not give up on the hexacopter! It is still there, and the people I trained have put it together to use again.”

Ten days after they were marooned, another French ship arrived from South Africa to rescue the researchers, and they didn’t reach land again for another week. Their 2012 field season was over, but Jenouvrier’s work continues. In 2014 she will invite international scientists and policy specialists to a Morss Colloquium at WHOI to discuss conservation strategies for polar species endangered by climate change.

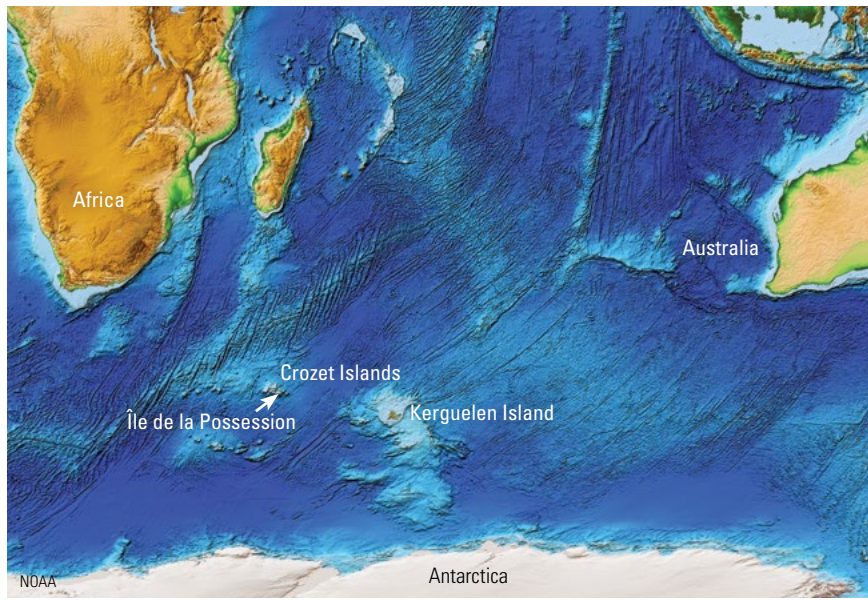
“The aim of this is to move beyond borders for conservation,” she said. “We need a new paradigm of global cooperation and need to move quicker to mitigate the impacts of climate change on polar seabirds.” ▲

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Stephanie Jenouvrier, holding an Antarctic snow petrel at top, was stranded on Île de la Possession in 2012. She had been en route to assess Southern Ocean seabird colonies using a hexacopter (right).



Courtesy of Stephanie Jenouvrier/WHOI



Stephanie Jenouvrier/WHOI