

## Warmer Waters Disrupt Pacific Food Chain

"July 24, 2006 - By Marcus Wohlsen, Associated Press "

"FARALLON NATIONAL WILDLIFE REFUGE, Calif. - On these craggy, remote islands west of San Francisco, the largest seabird colony in the contiguous United States throbs with life. Seagulls swarm so thick that visitors must yell to be heard above their cries. Pelicans glide."

"But the steep decline of one bird species for the second straight year has rekindled scientists' fears that global warming could be undermining the coastal food supply, threatening not just the Farallones but entire marine ecosystems."

"Tiny Cassin's auklets live much of their lives on the open ocean. But in spring, these gray-and-white relatives of the puffin venture to isolated Pacific outposts like the Farallones to dig deep burrows and lay their eggs."

"Adult auklets usually feed their chicks with krill, the minuscule shrimp-like crustaceans that anchor the ocean's complex food web."

"But not this year. Almost none of the 20,000 pairs of Cassin's auklets nesting in the Farallones will raise a chick that lives more than a few days, a repeat of last year's "unprecedented" breeding failure, according to Russ Bradley, a seabird biologist with the Point Reyes Bird Observatory who monitors the birds on the islands."

"Scientists blame changes in West Coast climate patterns for a delay in the seasonal upwelling of cold, nutrient-rich waters from the ocean's depths for the second year in a row. Weak winds and faltering currents have left the Gulf of the Farallones without krill, on which Cassin's auklets and a variety of other seabirds, fish and mammals depend for food."

"The seas are warmer. And the number of krill being produced is lower," said Bradley as he held a Cassin's auklet chick, the only one from a study of 400 nests he expected to survive."

"Normally we would have hundreds," he said."

The failure of last year's Pacific upwelling killed seabirds from California to British Columbia. Scientists had hoped the change was just a natural temperature fluctuation in what is known as the California Current.

But the return of higher ocean temperatures and scarce food resources this year has scientists wondering whether last year's erratic weather was not a fluke but

the emergence of a troubling trend.

"How many years in a row do you see this before you start raising your eyebrows?" said Frank Schwing, an oceanographer with the National Oceanic and Atmospheric Administration in Pacific Grove.

Climatologists describe global warming as a worldwide rise in temperatures caused by the buildup of carbon dioxide and other greenhouse gasses thought to trap heat in the atmosphere. Predictions of global warming's effects include rising sea levels, fiercer storms, more wildfires and warmer oceans.

Without long-term data, scientists have so far found it difficult to make direct links between specific natural events and global warming.

But the Farallones present a special case. Researchers have kept Cassin's auklet counts there every day since 1967. Never before have they seen such a drop-off in numbers. That decline comes as California ocean temperatures hover three to five degrees above average.

"One of the things that the climate models predict is that we're going to have unpredictable weather, extreme weather, that the whole seasonal cycle of events will not be what we expect," said Bill Peterson, a NOAA oceanographer in Newport, Ore. "We aren't seeing normal patterns."

Perhaps nowhere is this ecological disruption felt more than here on the Farallones, a 200-acre island chain often described as California's Galapagos. The U.S. Fish and Wildlife Service keeps the national wildlife refuge closed to visitors except for a small group of scientists and volunteers who live there year-round.

The krill-dependent whales and salmon that inhabit the surrounding waters have not appeared to suffer from the changes in food supply. But during a visit to the islands this summer, scientists pointed to other species feeling the consequences.

The absence of krill has led to a collapse of the juvenile rockfish population. This is the main food source for young of the common murre, a bird that resembles a flying penguin. Though the murre has made a dramatic comeback recently, with about 200,000 adults nesting on the islands this year, nearly three-quarters of murrelets breeding this year are not expected to raise chicks that survive.

"At this point it's way too late in the season for the birds to initiate another attempt at breeding," said Peter Warzybok, a Farallones-based biologist with the Point Reyes Bird Observatory. "They'll just have to wait around for next year and hope that it's better."

"Significant drops in murre and Cassin's auklet numbers occurred during the El Nino years of 1983 and 1992, when warmer Pacific waters near the equator upset weather patterns worldwide."

"A January conference of more than 40 climatologists, oceanographers, and wildlife biologists issued a report describing last year's altered coastal climate as El Nino-like conditions in a non-El Nino year. Some researchers have given the new climate shift its own name: "El Coyote.""

"The report said a "ridge" of winter air blocking winds from the Gulf of Alaska lingered more than two months longer than normal in 2005, which delayed the upwelling until well past the birds' breeding seasons."

"It's not just a local effect," Schwing said. "It's related to global-scale changes in atmospheric circulation."

But it could take researchers another decade to determine whether global warming caused those changes. Some climatologists warn against drawing overly broad conclusions from only two years of unusual weather.

"Definitive results are "not around the corner," said Nick Bond, a research meteorologist at the University of Washington who has studied the upwelling's failure."

"We just don't know how much the deck is stacked" by the effects of global climate change, Bond said. "It's hard to tell from just a deal or two."

"But whatever the cause, the ecological outcome if the trend continues is already clear, according to scientists."

"The Cassin's auklet is unlikely to adapt to the sudden loss of its main food source. And other animals could follow, Schwing said."

"In the worst case, he said, "we could see a great depression of the entire ecosystem."

Source: Associated Press

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