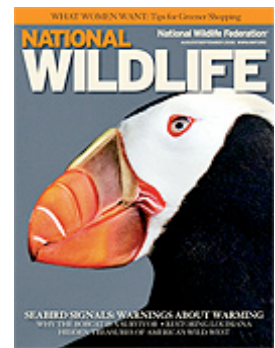


Seabird Signals

By Doreen Cubie

Off the U.S. West Coast, several seabird species are suffering, and biologists suspect that global warming's impact on the Pacific is to blame



CASSIN'S AUKLETS may look nothing like canaries, but in a way that's what they are. These plump, dusky gray seabirds, like the proverbial birds in the coal mine, are telling scientists there is something wrong in the Pacific Ocean. In the 1970s, about 100,000 pairs of auklets nested on California's remote Farallon Islands. Today only 20,000 pairs remain. In 2005 and 2006, not one of the birds' eggs hatched, and only about a third of the pairs fledged young in 2007.

"We see signals in birds," explains seabird biologist Bill Sydeman. "They're the best indicators of what's going on." As president of the Petaluma, California-based Farallon Institute for Advanced Ecosystem Research, Sydeman and his colleagues have been following the islands' seabirds for the past 35 years. "We know there are changes to the ecosystem," he says, and those changes are also hurting other species, namely tufted and horned puffins and rhinoceros auklets.

These birds, all members of the auk family, spend their lives at sea, coming ashore only to raise their young. More at home in the ocean than on land or even in the air, they use their wings to "fly" underwater to catch prey, often diving as deep as 100 to 300 feet. Over the past century, auk populations have been depleted by introduced predators on nesting islands, oil spills, pollution and fishing nets that entangle and drown them. But today there are new threats. The seabirds' food web appears to be unraveling, and scientists suspect that global warming is at the heart of the problem. Certainly Cassin's auklets seem to be running up a red flag. These diminutive birds, about the size and shape of quail, lay their eggs in shallow burrows or rock crevices on coastal islands from Baja California to Alaska. Once their chicks hatch, the adults leave the young alone during the day, flying back each night with food. During good times, mom and dad auklets return with their expandable throat pouches stuffed with krill. But these are not good times. Krill, which feed a variety of wildlife ranging from salmon to blue whales, have been in short supply the last few years when Farallon auklets are trying to raise their chicks.

Tufted puffins are another “barometer of biological change,” says John Piatt, a research biologist with the U.S. Geological Survey’s Alaska Science Center in Anchorage. “They reflect the ocean regimes they live in,” says Piatt, who calls the birds “seabird tough guys” both for their appearance, which he likens to bikers in leather regalia, and their lifestyle, which includes winters spent far out to sea surviving on squid and lanternfish.

As colorful as Cassin’s auklets are plain, most tufted puffins nest in North America, from the Aleutians to California. The birds’ northernmost colonies are thriving but—tough guys or not—their southern colonies are declining dramatically. At Oregon’s Three Arches Rocks, for example, puffin numbers have plummeted, and only a fraction remain. In Washington, nearly a third of all colonies have disappeared.

A CASSIN'S AUKLET FEEDS ON FISH IN
Farallon Islands National Wildlife Refuge.
 More than 10 miles off the coast of
 California, these remote islands are
 prime seabird breeding sites. Cassin's
 auklets and Bonin's shearwaters nest
 in the refuge. Right: Tufted puffins on
 the Farallones are increasingly declining,
 down from 100,000 pairs in the
 1970s to only about 25,000 today.

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Distressed auklets are also facing
 tough times. Closely related tufted
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 small "horn" that grows on the base of
 their bill. Rhinos, as they're often
 called, range from California to
 Alaska and across the Pacific to Rus-
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 breeding colony, some 600,000 birds, is
 based on the Sea of Japan's Teuri
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 "We are seeing an
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One explanation
 may be an ocean that's
 heating up. From 1937
 to 2002, the sea surface
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 They've found the
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"Breeding birds are
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 As a result, parents
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 "The timing of prey
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PHOTOGRAPHY BY JEFFREY M. HARRIS

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Rhinoceros auklets are also facing tough times. Closely related to puffins, these birds get their name from a small “horn” that grows on the base of their bill. Rhinos, as they’re often called, range from California to Alaska and across the Pacific to Russia, Japan and Korea. Their largest breeding colony, some 600,000 birds, is found on the Sea of Japan’s Teuri Island. In the United States, biologist Julie Thayer of Petaluma, California-based PRBO Conservation Science has been studying the birds on the Farallones and on central California’s Año Nuevo Island.

Unlike the Cassin’s auklets, the rhinos and puffins feed fish rather than krill to their chicks. Nonetheless, from California to British Columbia, they, too, are having trouble finding enough food for their youngsters. In times past, when the birds laid their eggs, the waters surrounding their nesting islands were roiling with rockfish, sand lance, sablefish and squid. Today the fish are often AWOL. “We are seeing an alarming decrease in appropriate-sized prey,” says Thayer.

One explanation may be an ocean that’s heating up. From 1937 to 2002, the sea surface temperature in the vicinity of British Columbia’s Triangle Island has fluctuated from year to year but increased overall by nearly 1 degree C. Researchers from the Canadian Wildlife Service and several universities have monitored breeding seabirds on the island since 1975, including a colony of 50,000 tufted puffins. They’ve found the puffins’ fledgling success is virtually zero when the sea surface exceeds 9.9 degrees C. When the water is that warm, biologists believe prey fish move elsewhere, forcing adult puffins to follow and leave their eggs and chicks behind.

“Breeding birds are tied to specific places,” explains Thayer. Although some auk species can take their chicks to sea when they are only a few days old, the young of puffins and auklets must stay in or near their burrows until they are able to fly. As a result, parents are tethered to their nesting island for as long as three months, usually unable to forage more than about 30 miles away. “The timing of prey is very important to these birds,” adds Thayer.

Changing climate seems to be throwing that timing out of kilter. In particular, changes to coastal

upwelling—the critical movement of nutrient-rich water from the depths of the ocean to its surface—may be having disastrous consequences. Upwelling delivers food to phytoplankton, the single-celled plants that are the foundation of marine food chains. Because phytoplankton can live only in the top 100 feet or so of the ocean, where light permeates, their existence depends on upwelling.



Today it often takes longer for upwelling to occur, and sometimes it doesn't happen at all. When mixing does take place, the waters usually come up from a shallower level, which means they are poorer in nutrients. This sets off a domino effect in the food chain: disappearing phytoplankton, a drop in krill and other animal plankton, a scarcity of certain fish and starving seabirds.

Rhinoceros auklets, which time their breeding to coincide with coastal upwelling and its abundant prey, are especially hard hit. Because mixing is often delayed, the rhinos are now nesting later. But there is still often a mismatch, times when the fish simply are not there. "Some years, there's massive abandonment of eggs," says Thayer.

A newer theory—so far not widely accepted—is that changes in major ocean currents are disrupting Pacific food chains. One of these "rivers in the sea," as Sydeman calls them, is known as the North Pacific Drift. The current flows from Japan to the coast of North America, where it divides into the northern Alaska Current and the southern California Current. Exactly where that split occurs is very important to marine life, says Sydeman. "When it bifurcates more to the north, the water reaching British Columbia and California is colder and saltier, with more subarctic plankton," he says. "But when the current splits more to the south, the water is warmer and has less plankton."



A RHINOCEROS AUKLET, named for the small horn at the base of the bird's bill, displays its summer breeding plumage on St. George Island in Alaska's Pribilof Islands.

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all, the young of puffins and auklets must stay in or near their burrows until they are able to fly. As a result, parents are tethered to their nesting island for as long as three months, usually unable to forage more than about 50 miles away. "The timing of prey is very important to these birds," adds Threlk.

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plankton, a scarcity of certain fish and starling seabirds.

Rhinoceros auklets, which time their breeding to coincide with coastal upwelling and its abundant prey, are especially hard hit. Because nesting is often delayed, the chicks are now nesting later, but there is still only a meager amount of prey when they finally arrive.

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"Colder is better for seabirds," says Sydeman. In 2002, when the North

Pacific Drift divided at the Queen Charlotte Islands in northern British Columbia, Cassin's auklets on the Farallones fledged many chicks. But in 2005–2006, when it split off central Oregon, "the auklets suffered complete reproductive failure," he says. Oceanographers remain uncertain whether such fluctuations are part of a natural cycle or another indication that the Pacific is starting to go haywire.

Whatever their cause, changes to the Pacific food web may be extending far beyond the breeding season. According to Julia Parrish, an associate professor of zoology at the University of Washington, winter seabirds seem to be sending a message by washing up dead on beaches in ever-increasing numbers. As executive director of the Coastal Observation and Seabird Survey Team, she has been tracking the number of beached seabirds in California, Oregon, Washington and Alaska since 2000—a program that gives biologists a snapshot of how many birds are dying. "It mirrors what's going on in the colonies," says Parrish, adding that the team has noticed a spike in beached Cassin's and rhinoceros auklets every January. "We didn't see this before," she says. "It suggests there might be something new going on, perhaps a change in the amount of winter food resources."

LITTLE AUKS: LOST AT SEA?

SCIENTISTS ARE SEEING SIGNS OF GLOBAL WARMING'S IMPACT ON SEABIRD WINTERINGS. In the North Atlantic, for instance, a record number of immatures of the same species were spotted last year off the coast of Great Britain (88,000 in November 8 and 29,000 three days later), hundreds of miles south of the species' winter range. Closely related to puffins, starling-sized divers are among the world's most common, breeding in huge colonies on islands in the North Atlantic. In fact, the birds have colonized to feed for generations long ago and, invertebrates, biologists at the British Trust for Ornithology are observing similar increases by studying their nesting sites, that have contributed to the birds' "range displacement," said Piatt.



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The team also has seen an uptick in the number of dead horned puffins. This look-alike of the Atlantic puffin breeds primarily in Alaska, where it has begun nesting farther to the north as the summer pack ice shrinks. Horned puffins winter in the Pacific, usually far from land, and are rarely found washed up on the coast. But that has changed over the past few years, mystifying researchers who wonder if more birds are dying or if shifting conditions are forcing them to forage closer to shore.



TWO HORNED PUFFINS (foreground) and a tufted puffin perch on a cliff near St. Paul in the Pribilof Islands, Alaska. Biologists are hoping that these and other long-lived birds are adaptable enough to cope with global warming's indirect effects on their ocean habitat.

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Piatt agrees. "These birds are very long-lived," he says, pointing out that it's not unusual for auks to survive 20 years or more. "A pair only has to raise two chicks to replace themselves."

But Piatt. "If they can manage that, they will sustain their populations. Because of the birds' long life spans, some biologists suspect it may be typical for auks to have more years with breeding failures than successes.

Despite such changes, Parrish remains cautiously optimistic. "Sea-birds are pretty adaptable," she says. Piatt agrees. "These birds are very long-lived," he says, pointing out that it's not unusual for auks to survive 20 years or more. "A pair only has to raise two chicks to replace themselves," adds Piatt. If they can manage that, they will sustain their populations.

Because of the birds' long life spans, some biologists suspect it may be typical for auks to have more years with breeding failures than successes. Worldwide, the populations of most puffins and auklets remain high, often numbering in the millions. Nonetheless, when these "canaries" start dying, it's time to pay attention to what's happening in the coal mine. Parrish cautions that we must not ignore what the birds are saying. "They're shouting at us," she says. "We tend to have trouble listening."

This look-alike of the Atlantic puffin breeds primarily in Alaska, where it has begun nesting farther to the north as the summer gack is shrinks. Herring gullions winter in the Pacific, usually far from land, and are rarely found washed up on the coast. But that has changed over the past few years, according to researchers who have worried if more birds are dying or if shifting conditions are forcing them to forage closer to shore.

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FIGHTING GLOBAL WARMING
Combating the threat of global warming is a top priority for NWF, which is promoting congressional legislation to reduce greenhouse gases, publishing reports on warming's impact on wildlife and collaborating with state affiliates on grassroots efforts. For more information on these and other programs, go to www.nwf.org/globalwarming.

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South Carolina journalist **DOREEN CUBIE** was the winner of NWF's 2007 Trudy Farrand/John Strohm Magazine Writing Award.

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Little Auks: Lost at Sea?

Scientists are seeing signs of global warming's impact on seabirds worldwide. In the North Atlantic, for instance, a record number of dovekeys, or little auks, were spotted last year off the coast of Great Britain (18,000 on November 8 and 29,000 three days later) hundreds of miles south of the species' ordinary range. Closely related to puffins, starling-sized dovekeys are among the world's smallest seabirds, breeding in huge colonies on islands in the high Arctic. Like all auks, the birds swim underwater to hunt for prey, primarily tiny fish and invertebrates. Biologists at the British Trust for Ornithology say changing climate, accompanied by shifting food supplies, may have contributed to the birds' "mass displacement" last fall.

NWF Priority: Fighting Global Warming

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Web Exclusive

Pacific "Dead Zones" Grow

First noted by crab fishermen off the coast of Oregon six years ago, a "dead zone" of extremely low-oxygen water—devoid of the abundant sea life ordinarily found in the region—has become an annual event off the northern U.S. West Coast. In a study published earlier this year in *Science*, marine ecologist Jane Lubchenco and colleagues at Oregon State University reported that these low-oxygen zones, which have reappeared each summer and fall since 2002, have expanded north into Washington and south to the California border. "We seem to have crossed a tipping point," says Lubchenco. "Low-oxygen zones off the Northwest coast appear to be the new normal." She and her colleagues believe the dead zones may be a sign that global warming has interfered with wind-driven upwelling of nutrient-rich waters in the California Current running along the coast.—*Laura Tangley*

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