

Warming ocean, old-forest loss put a squeeze on an elusive seabird, the marbled murrelet

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Squeezed by changing ocean conditions that limit their food options and the long-term loss of old forest needed for nesting, marbled murrelets would benefit most from conservation efforts that take both ocean and forest into account, new research by Oregon State University shows.

Published in *Conservation Letters*, the findings are based on two decades of murrelet surveys at nearly 20,000 sites in the Oregon Coast Range and illustrate how the elusive seabird is at risk of its habitat gradually shrinking to the point of local extinctions or worse.

“It turns out that the same ocean conditions that influence salmon returns, including the forage fish murrelets need to successfully nest, had a huge influence on the likelihood that murrelets will come inland to breed,” said lead author Matt Betts, a researcher in the Oregon State College of Forestry and the director of the OSU-based Forest Biodiversity Research Network. “Given that these prey items tend to be in lower abundance when ocean temperatures are high, changing climate conditions could reduce prey availability as well as the tendency for murrelets to nest in the future.”

Marbled murrelets are closely related to puffins and murres, but unlike those birds, murrelets raise their young as much as 60 miles inland in mature forests. Disturbance in either the ocean or forest environment has the potential to impact murrelet populations.

“There aren’t many species like it,” said study co-author and project director Jim Rivers, also a faculty member in the College of Forestry. “There’s no other bird that feeds in the ocean and commutes such long distances inland to nest sites. That’s really unusual.”

The dove-sized bird spends most of its time in coastal waters eating krill, other invertebrates and forage fish such as herring, anchovies, smelt and capelin. Murrelets can only produce one offspring per year, if the nest is successful, and their young require forage fish for proper growth and development.

Murrelets generally nest in solitude, although multiple nests sometimes occur within a small area. They typically lay their single egg high in a tree on a horizontal limb at least 4 inches in diameter, with Steller's jays, crows and ravens the main predators of murrelet nests.

“The end goal for these birds is to be very secretive and quiet so predators don't find their nests and they can produce young,’ said Rivers.

Along the West Coast, marbled murrelets are found regularly from Santa Cruz, California, north to the Aleutian Islands. Their populations have been declining by about 4% a year in Washington, Oregon and California, and the species is listed as threatened under the U.S. Endangered Species Act in those states.

“Early on in our work, we noticed strong fluctuations in the numbers of marbled murrelets coming inland to nest, so this study was about trying to get to the bottom of those highs and lows,” Betts said. “We found the first evidence that ocean conditions combined with old-forest nesting habitat influence the murrelets’ long-term occupancy dynamics. In particular, we learned ocean conditions are a key driver of those dynamics.”

The finding has potential key implications for forest policy in Oregon, where any state-owned site that goes two consecutive years without murrelet detection is classified as unoccupied and thus available for timber harvest.

“Our data show that below-average ocean conditions might last for more than two successive years,” Rivers said. “That means there could be a scenario where sites on state lands that are suitable for breeding go unused for more than two years which, under current guidelines, would let them be considered available for harvest. Thus, murrelets might be missing from inland sites not because the forest is unsuitable for nesting, but because they have inadequate forage fish during the summer breeding season. That means it is critical that we consider factors that influence both marine food resources and terrestrial nesting habitat when considering how to recover murrelet populations.”

Betts was part of a research collaboration that published a 2019 paper in the Proceedings of the National Academy of Sciences that showed that old forest is still declining across the Pacific Northwest 25 years into the Northwest Forest Plan, a 100-year federal road map to protect older forests.

“This is now less due to the saw and more due to fire,” he said. “That means that even with strong land conservation measures, climate could not only result in warmer ocean conditions but also greater fire frequency and extent, and therefore more old forest loss.”

Other Oregon State researchers contributing to the study were Kim Nelson and Dan Roby of the College of Agricultural Sciences and Jennifer Fisher of the Cooperative Institute for Marine Resources Studies. Scientists from Trent University in Ontario, Canada, the University of Rhode Island and the U.S. Forest Service also took part.

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