



Re-shuffling of species with climate disruption: a no-analog future for California birds?

As the climate changes, bird species are expected to shift their distributions independently, in some cases resulting in combinations of co-occurring species that have not been seen before. As much as half of California could be occupied by novel bird communities by 2070, according to a study entitled “Reshuffling of species with climate disruption: A no-analog future for California birds?” published in the September 2, 2009 issue of PLoS ONE. These novel (or “no-analog”) communities may disrupt complex webs of species interactions, with unanticipated consequences for species and ecosystems.

In collaboration with researchers from Stanford University, UC Santa Cruz, and the Klamath Bird Observatory, we took advantage of a wealth of bird survey data and newly refined regional climate model projections for California to project current and potential future statewide distributions for 60 relatively common bird species. We used a multivariate approach borrowed from paleoecology to quantify the potential change in California terrestrial breeding bird communities based on these species-distribution models.

A few species, primarily those associated with coniferous forests, were projected to shift their distributions upslope in similar ways as the climate changes. But other typically co-occurring species were projected to shift in very different ways, resulting in novel species assemblages.

The expected percentage of no-analog bird communities was dependent on the community scale examined, but consistent geographic patterns indicated several locations that are particularly likely to host novel bird communities in the future. Most of these areas occurred in interior portions of

California (valleys and deserts), where changes in climate may be more extreme.

It is now well-known that many species may shift their distributions in response to climate change, but these new results suggest that the cumulative effects of independent shifts by multiple species on community composition may be of equal or greater importance. While ecological communities are dynamic, as evidenced by the fossil record, this projected rate of climate-induced community change is unprecedented in human history.

Management Implications

- New and novel approaches will be needed to manage and conserve biodiversity.
- Single-species approaches may not work well in the context of rapidly-changing climates and ecological communities.
- Adaptive management will become even more important as conservation targets shift and new ones emerge in unanticipated ways.
- Frequent communication between scientists, managers, and decision-makers, will be needed more than ever.
- Maps of individual species projections are available on-line at www.prbo.org/cadc.

Stralberg, D., D. Jongsomjit, C. A. Howell, M. A. Snyder, J. D. Alexander, J. A. Wiens, and T. L. Root. 2009. Re-shuffling of species with climate disruption: a no-analog future for California birds? PLoS ONE 4:e6825. doi:10.1371/journal.pone.0006825