

Genetics study reveals good news for the southern California population of California gnatcatchers

A study distinguishing recent dispersal from historical genetic connectivity in the coastal California gnatcatcher, found that although the threatened California gnatcatcher populations were fragmented in southern California coastal sage scrub habitat, genetic signatures indicated that recent long-distance dispersal has occurred within this species and that it formed a single genetic unit throughout most of its US range. This is good news for resource managers who are interested in understanding California gnatcatcher populations as they grapple with problems of habitat loss and fragmentation.

Results indicated that California gnatcatchers retain genetic connectivity across most of the current distribution of coastal sage scrub fragments, with the exception of some outlying aggregations. These outlying aggregations could be of concern to resource managers in relation to habitat availability at a broad scale. Specifically, there was a positive and non-linear relationship between genetic diversity and the availability of suitable habitat within 30-km surrounding aggregations. This means that genetic diversity, a measure closely linked to population size and evolutionary potential, declined steeply when suitable habitat within 30 km fell below 10%.

In regions where habitat connectivity was greater, genetic data showed evidence of recent long distance dispersal between geographically widespread aggregations of gnatcatchers. This genetic approach provided novel and important information about the species. Particularly, that the dispersal capabilities of California gnatcatchers appear to be much greater than previously estimated from banding studies.

It is encouraging that gnatcatchers retain genetic similarity and a large effective population size across the majority of their range in southern California. Both are positive indicators that gnatcatchers could persist in southern California under current conservation and management strategies, which rely on a network of preserves. However, the detection of lower connectivity and diversity within the smallest aggregations surrounded by low proportions of suitable habitat, cautions that further habitat degradation throughout the range could lead to future loss of diversity.

Genetic studies such as those provided by the scientists at the USGS Western Ecological Research Center are powerful tools for resource managers. The good news for the California gnatcatcher is that current habitat conditions and management appear to support gnatcatcher population connectivity in much of southern California.

This Brief Refers To:

Amy G. Vandergast, Barbara E. Kus, Kristine L. Preston, and Kelly R. Barr. 2019. Distinguishing recent dispersal from historical genetic connectivity in the coastal California gnatcatcher. *Scientific Reports* 9:1355. <https://doi.org/10.1038/s41598-018-37712-2>

Kelly R. Barr, Barbara E. Kus, Kristine Preston, Scarlett Howell, Emily Perkins, and Amy G. Vandergast. 2015. Habitat fragmentation in coastal southern California disrupts genetic connectivity in the cactus wren (*Campylorhynchus brunneicapillus*). *Molecular Ecology*. 24(10):2349-2363. <https://doi.org/10.1111/mec.13176>



MANAGEMENT IMPLICATIONS

- California gnatcatchers are genetically similar across their range in southern California, and form a single genetic population with a large effective population size. These are positive indicators that gnatcatchers could persist in southern California under current conservation and management strategies, which rely on a network of preserves.
- Using this study's results as a baseline, land managers can use future genetic monitoring to assess how well gnatcatcher population connectivity is being maintained and to identify where additional conservation and management efforts are needed to retain or improve connectivity.
- The detection of lower connectivity and diversity within the smallest aggregations surrounded by low proportions of suitable habitat is important information for resource managers as further habitat degradation throughout the range could lead to future loss of diversity.
- Genetic studies such as these build on our current understanding of the species enhancing information provided from banding studies alone.

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