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COMMON RAVEN POPULATIONS IN JOSHUA TREE NATIONAL MONUMENT, CALIFORNIA

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Common Raven (*Corvus corax*) numbers in the Mojave Desert have grown substantially, with increases ranging from 5 to 15% annually over the past 20 years (Robbins et al. 1986, USDI 1990). These population increases, and the location of Desert Tortoise (*Gopherus agassizii*) shells near raven nests and perches, have resulted in ravens being suggested as a cause of the decline of tortoise populations (Berry 1985, Berry et al. 1986).

The conclusion that raven populations have increased is based on Breeding Bird Surveys, in which birds are counted from roadsides (Robbins et al. 1986). Estimates of raven populations are thus based on data from areas of diverse human land uses including agriculture, livestock grazing, and urban/suburban development. Knight and Kawashima (in press), however, found that raven numbers can be considerably greater along highways than away from them. Currently, there is no information on raven numbers in areas away from roads and not grazed by livestock.

Accordingly, we surveyed raven numbers in native desert scrub away from roads. Our goal was to determine a baseline estimate of raven population density in a part of the Mojave Desert suitable for nesting ravens but free from contemporary land-use changes.

Our study area was heterogenous and located in the Pinto Basin and Eagle Mountains of Joshua Tree National Monument and U.S. Bureau of Land Management wilderness and natural lands, San Bernardino County, California (33°55' N, 115°30' W). Elevations ranged from 420 to 1210 m. Rain (< 110 mm annually) falls predominantly in the winter, though there are occasional summer thundershowers. The dominant vegetation consisted of widely spaced shrubs, including creosote bush (*Larrea divaricata*) and shadscale (*Atriplex brevifolia*) (Munz and Keck 1959). The

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area was free of anthropogenic nest-site structures although suitable nesting sites in cliffs were abundant.

We counted ravens from 15 May through 18 June 1992 by walking 32 transects comprising 176.04 km (mean transect length 5.50 km, standard deviation [SD] 1.35 km) between 0530 and 1745 hours. Transects began along Big Wash, ran parallel to each other 1.61 km apart, and followed a compass azimuth (true north) of either 49° or 229°. Ten and 22 transects lay in the Pinto Basin and the Eagle Mountains, respectively. The total area covered by the transects was 283 km² with 108 km² and 174 km² in basin and mountain habitat, respectively. Starting and ending points of the transects were located by means of a Magellan Global Positioning System (GPS) unit (2D Mode) and altimeter. Navigation along transects was maintained with the GPS unit and compass. For each transect, the number of ravens per kilometer was calculated. These numbers were then used to calculate means and standard deviations (SD) of ravens per 100 km.

Only eight ravens were seen for a density of 4.63 per 100 km (SD 9.78). Six ravens were seen along mountain transects for a density of 4.38 per 100 km (SD 9.84). Two ravens were seen along basin transects for a density of 2.49 per 100 km (SD 5.24). All sightings were of solitary birds; no ravens were seen in flocks.

As a basis for comparison, Knight and Kawashima (in press) reported a mean (\pm SD) per 100 km along paved highways in the Mojave Desert of 36.5 ± 92.4 ravens. Their estimate of ravens per 100 km in grazing land away from highways was 6.6 ± 18.1 , not unlike what we found in the present study. These results suggest that ravens may not have increased uniformly in the Mojave Desert and that in natural areas without linear right-of-ways ravens are still uncommon.

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