Using camera-trap data to simultaneously estimate Jaguar (Panthera onca) density and resource selection in the Paraguayan dry chaco

Jeffrey J. Thompson, Marianela Velilla, Hugo Cabral, Nicolás Cantero, Viviana Rojas Bonzi, Evelyn Brítez, Juan M. Campos Krauer, Roy T. McBride Jr, Rodrigo Ayala, Tatiana Galluppi Selich, Camilo Benítez Riveros, Marcela Ferreira Riveros, Belén Achón & José Luis Cartes

Abstract

Habitat loss and human-caused mortality have led to an approximate 50% reduction of the distribution of the jaguar (Panthera onca). The large contraction in the jaguar's occurrence points to a need to understand its population size and habitat preferences to apply to the species' conservation. Typically, jaguar densities are estimated with capture–recapture modeling of photographic captures of individually identifiable individuals, while habitat selection is estimated from telemetry data. However, advances in spatial capture-recapture modeling now permit the simultaneous estimation of density and habitat selection based solely upon photographic detection data from camera-trapping grids. Here, we used data from 356 double camera-trap stations across five sites in the Paraguayan Dry Chaco to simultaneously estimate jaguar density and resource selection. We found that jaguar densities ranged from 0.58 to 1.39 individuals/100 km2. At the spatial scale of our analysis, jaguars showed a strong preference for forest cover, while space use was not affected by the Human Footprint Index. Our density estimates were consistent with previous estimates based upon a subset of our data, as well as with estimates for jaguar populations in other dryland ecosystems. Furthermore, the strong selection for forest was also consistent with range-wide patterns in jaguar space use and habitat selection derived from telemetry data. Due to extensive and ongoing deforestation in the Dry Chaco, combined with high human-caused mortality, the jaguar is critically endangered in Paraguay. Although we show that jaguars can persist in anthropogenically altered landscapes in Paraguay, their long-term survival at the national level is strongly dependent upon the effective enforcement of the national jaguar conservation law, and application of the national jaguar management plan, to mitigate negative population effects from habitat loss and human-caused mortality.