

# Heterogeneous Responses of Small Mammals to an El Niño Southern Oscillation Event in Northcentral Semiarid Chile and the Importance of Ecological Scale

Peter L. Meserve John A. Yunker Julio R. Gutiérrez Luis C. Contreras W. Bryan Milstead Brian K. Lang Kenneth L. Cramer Sergio Herrera Victor O. Lagos Sergio I. Silva Elier L. Tabilo Miguel-Angel Torrealba Fabian M. Jaksic

## Abstract

A prolonged El Niño Southern Oscillation (ENSO) event during 1991–1992 with three times the normal annual 85-mm rainfall was accompanied by major changes in numbers of small mammals at a semiarid Mediterranean site in northcentral Chile. Several demographic patterns were evident. *Akodon olivaceus*, an omnivore, had a rapid increase in population size of more than an order of magnitude. *Phyllotis darwini*, a granivore-herbivore, showed somewhat delayed, smaller increases superimposed on annual oscillations. *Octodon degus*, an herbivore, showed a delayed response with larger increases and extended breeding in 1992–1993. Finally, *Oligoryzomys longicaudatus*, a granivore, experienced increases during both a dry (1990, ppt = 32 mm) and a wet year (1992). Other species such as *Abrothrix longipilis*, *Abrocoma bennetti*, and *Thylamys elegans* had smaller, delayed demographic responses. Reproductive rates for the first three species were higher due to the ENSO event only in *O. degus* males and *P. darwini* as a quadratic function of time. Survival rates of all four principal species were significantly greater during the 1991–1992 ENSO. Finally, average movement between captures was lower during ENSO years, suggesting behavioral changes. Explanations for these patterns include rainfall-related increases in food-resource levels (*A. olivaceus* and *P. darwini*), the importance of source-sink processes in vagile species from more mesic, adjacent habitats (*O. longicaudatus*), and delayed responses to extrinsic events in species with long gestation (*O. degus*, *A. bennetti*). The heterogeneity of species responses suggests different capabilities for small mammals to respond to an extrinsic, large-scale event, and it emphasizes the importance of long-term studies in semiarid systems.

## Keywords

Sigmodontines, caviomorphs, population fluctuations, El Niño (ENSO) events, Chile, semiarid zone