

# BREVIORA

Museum of Comparative Zoology



US ISSN 0006-9698

CAMBRIDGE, MASS.

22 FEBRUARY 2022

NUMBER 574

## ECOLOGICAL RELEASE ANALYZED AMONG INDIVIDUALS, ACROSS TWO GENERATIONS, AND ALONG MULTIPLE NICHE AXES IN *ANOLIS CAROLINENSIS*

NICHOLAS C. HERRMANN,<sup>1</sup> ALLISON M. RABE,<sup>1</sup> SAMUEL COATES,<sup>2</sup> LEVI STORKS,<sup>3</sup> JONATHAN B. LOSOS,<sup>4</sup> AND AMBIKA KAMATH<sup>5,6</sup>

**ABSTRACT.** A population freed from a constraining interspecific interaction (e.g., competition or predation) may experience niche shifts and expansions. This phenomenon, termed ecological release, is an eco-evolutionary process driven by individual behaviors and interindividual interactions. However, empirical studies of these interactions seldom observe them directly, instead inferring process from pattern. Here, we set up experimental conditions for ecological release of the lizard *Anolis carolinensis* (green anole) from constraining interactions with its congener, *Anolis sagrei* (brown anole), by constituting populations of lizards on small islands. We monitored individual and population habitat use along three niche axes (perch height, perch diameter, and lateral movement between perches) on one experimental (one-species) and one control (two-species) island, for three time periods: 1) preremoval, when both islands had both species; 2) postremoval, shortly after *A. sagrei* were cleared from the experimental island; and 3) delayed postremoval, 7 months later, when long-lived lizards were joined by a second generation born in the intervening months. We found that green anole perch height decreased on the one-species island and increased on the two-species island. These shifts did not occur during postremoval but were evident by delayed postremoval, when both generations on the one-species island were perching nearly 130 cm lower than their counterparts on the two-species island. We also documented correlated changes in perch diameter at both the individual and population level but no changes in the extent of individuals' lateral movement. Lastly, changes in population-level niche width (i.e.,

<sup>1</sup> Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, Massachusetts 02138, U.S.A.; e-mail: nherrmann@oeb.harvard.edu, allisonmrabe@gmail.com.

<sup>2</sup> Department of Environmental Studies, Eckerd College, St. Petersburg, Florida 33711, U.S.A.; email: sam.coates86@gmail.com.

<sup>3</sup> Department of Biology, University of Nebraska Omaha, Omaha, Nebraska 68182, U.S.A.; email: storksle@gmail.com.

<sup>4</sup> Department of Biology, Washington University, St. Louis, Missouri 63130, U.S.A.; email: losos@wustl.edu.

<sup>5</sup> Miller Institute for Basic Research in Science and Department of Environmental Science, Policy and Management, University of California Berkeley, Berkeley, California 94720, U.S.A.; email: ambika.kamath@colorado.edu.

<sup>6</sup> Department of Ecology and Evolutionary Biology, University of Colorado Boulder, Boulder, Colorado 80309, U.S.A.; email: ambika.kamath@colorado.edu.

# BREVIORA

Museum of Comparative Zoology



US ISSN 0006-9698

CAMBRIDGE, MASS.

30 MAY 2022

NUMBER 575

## PROVENANCE OF THE RED-BELLIED SNAKE, *STORERIA OCCIPITOMACULATA* (STORER) (SQUAMATA: NATRICIDAE), COLLECTED FROM EASTERN NEBRASKA, U.S.A., IN THE 19TH CENTURY

LOUIS A. SOMMA<sup>1</sup>

**ABSTRACT.** I reaffirmed the existence of a red-bellied snake, *Storeria occipitomaculata* (Storer, 1839), collected in an allopatric locality in eastern Nebraska, U.S.A., in the 19th century. I utilized data associated with this snake, MCZ Herpetology R-135 (Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts), to determine it was probably collected in the 1850s, approximately 170 years ago, either in the eastern portion of the Platte River Valley in western Douglas County or in the Missouri River Valley in eastern Washington County, bordering Iowa. I used this information to discuss the biogeographic and conservation implications for populations of *S. occipitomaculata* occurring in the Prairie Peninsula of the American Midwest and in the grassland-dominated plains. Moreover, I demonstrate the importance of reevaluating historic specimens in collections and the data associated with them to generate critical insights into species biogeography, ecology, and conservation.

**KEY WORDS:** biogeography; distribution; historical; Nebraska; Squamata; *Storeria occipitomaculata*

## INTRODUCTION

*Storeria occipitomaculata* (Storer, 1839), the red-bellied snake, is a small (210–270 mm average total length [TL], 406 mm maximum TL), terrestrial natricid snake, generally distributed across much of eastern North America from Nova Scotia west to south-eastern Saskatchewan, Canada, south to

central Florida and the Gulf Coastal region, and west to eastern regions of Texas, Oklahoma, Kansas, and the Dakotas, U.S.A. (Trapido, 1944; Ernst, 2002; Ernst and Ernst, 2003; Powell et al., 2016; Pyron et al., 2016). Western disjunct populations exist in the Black Hills of South Dakota and adjacent Wyoming; Phillips County, north-central Kansas; and the Sierra Madre Oriental of Mexico (Taylor, 1942; Trapido, 1944; Fishbeck and Underhill, 1959; Smith, 1963; Ballinger et al., 2000; Collins et al., 2015; Pyron et al., 2016; Kiesow and Davis, 2020). The Mexican populations are often

<sup>1</sup> Florida State Collection of Arthropods, Division of Plant Industry–Entomology Section, Florida Department of Agriculture and Consumer Services, Gainesville, Florida 32608, U.S.A.; email: louis.somma@fdacs.gov.