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Conference Abstract

Beyond habitat: integrating ecological niche dynamics and sociodemographic predictors to understand the urban invasion of *Trachemys scripta* in South America

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Abstract

Biological invasions in urban environments are shaped by both environmental suitability and human-driven processes; yet most studies address these dimensions independently. Here we present an integrative framework combining ecological niche modelling and sociodemographic analysis to understand the invasion dynamics of the red-eared slider (*Trachemys scripta*) in cities along a latitudinal gradient encompassing the Chilean Matorral and Valdivian Temperate Forests ecoregions (33°–40°S).

In a first component, we assessed habitat suitability for *T. scripta* across Chile using species distribution models calibrated on native range occurrence data from global databases (GBIF), field surveys, and unpublished local citizen science records, and evaluated the niche conservatism hypothesis by comparing environmental conditions occupied in the native and non-native ranges using multivariate analyses in environmental space. Results indicate moderate niche overlap (D = 0.364), with similarity significantly greater than expected by chance (Pd = 0.012) and high conservation of the

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native niche (stability = 0.788), while a fraction of the native niche remains unfilled in Chile (unfilled = 0.199), indicating the species is in an active expansion stage with additional colonization potential in the Chilean Mediterranean zone.

In a second component, we modelled the occurrence of *T. scripta* across 49 urban water bodies in cities of central Chile using a Generalized Linear Mixed Model with a model averaging approach (MuMIn::dredge, delta AICc ≤ 4). We incorporated sociodemographic variables extracted at census block resolution (Censo 2024, INE Chile) within 500 m buffers around each water body, urban infrastructure predictors, a composite physical accessibility index, an index of active conservation management at the site level (environmental signage and NGO presence), and landscape composition metrics.

Preliminary results suggest that physical accessibility to water bodies, the socioeconomic context of the surrounding area, and the level of active site management emerge as the main mediators of invasion success in urban environments. Among the sociodemographic variables evaluated, average educational attainment — interpreted as a proxy for consumer capacity and exotic pet ownership — was the only significant predictor of *T. scripta* presence (OR = 2.87; 95% CI = 1.46–6.41), while indicators of structural poverty, population density, and age structure showed no association. This pattern suggests that the invasion is driven by middle-to-upper socioeconomic strata with capacity to access the exotic pet trade, rather than by demographic pressure or material deprivation.

Collectively, these findings position the urban invasion of *T. scripta* as a socioecological process that cannot be fully understood through ecological lenses alone. This integrative approach offers a transferable framework for managing reptile invasions in rapidly urbanizing cities of South America.

Keywords

red-eared slider, ecological niche modelling, urban invasion, sociodemographic predictors, biological invasions, Chile

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Hosting institution

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Ethics and security

This study did not involve manipulation of animals, human participants, or sensitive personal data. No ethical or biosecurity approvals were required.

Author contributions

Karim Abufarhue: conceptualization, data collection, formal analysis, writing – original draft. Lucila Moreno: field support, logistics, data collection, data analysis. Reinaldo Rivera: methodology, supervision, data validation. Aníbal Pauchard: resources, technical support, supervision.

Conflicts of interest

The authors have declared that no competing interests exist.