

Reporting Summary

Nature Portfolio wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Portfolio policies, see our [Editorial Policies](#) and the [Editorial Policy Checklist](#).

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a Confirmed

- The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement
- A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
- The statistical test(s) used AND whether they are one- or two-sided
Only common tests should be described solely by name; describe more complex techniques in the Methods section.
- A description of all covariates tested
- A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
- A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
- For null hypothesis testing, the test statistic (e.g. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
Give P values as exact values whenever suitable.
- For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
- For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
- Estimates of effect sizes (e.g. Cohen's d , Pearson's r), indicating how they were calculated

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection

Data analysis

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

The data generated in this study have been deposited in Figshare: <https://doi.org/10.6084/m9.figshare.27165759>

Research involving human participants, their data, or biological material

Policy information about studies with [human participants or human data](#). See also policy information about [sex, gender \(identity/presentation\), and sexual orientation](#) and [race, ethnicity and racism](#).

Reporting on sex and gender

Reporting on race, ethnicity, or other socially relevant groupings

Population characteristics

Recruitment

Ethics oversight

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

Life sciences Behavioural & social sciences Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see [nature.com/documents/nr-reporting-summary-flat.pdf](https://www.nature.com/documents/nr-reporting-summary-flat.pdf)

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	This study explored how a focal lizard species differed in ecology, behavior, and morphology in populations with and without a competitor species. To do this, we studied 3 sympatric populations where it co-occurred with the competitor and 3 allopatric populations where it did not co-occur with the competitor. Additionally, we conducted a long-term monitoring of a separate population as it transitioned from an 'allopatric population' to a 'sympatric population' by observing the invasion of the competitor in real time.
Research sample	The focal lizard species was the brown anole (<i>Anolis sagrei</i>); the competitor was the crested anole (<i>Anolis cristatellus</i>). These species are highly similar in ecology and morphology and so their recent independent introductions to south Florida provided a unique scenario to investigate the evolutionary phenomena of character displacement. All lizards considered in this study were adults.
Sampling strategy	Sample sizes were determined by protocols used in other studies or determined by local population size. For example, if the objective is to sample the entire population then that would reflect the sample size. To measure ecological resource use, we recorded habitat use by observing perch height of wild lizards. We did this by located an undisturbed lizard and measuring its height from the ground, and the width of the perch it was perching on, using a tape measure. We recorded these data with pen and paper. We also analyzed their diets by examining stomach contents, identifying prey items to the lowest possible taxonomic level and measuring them under a high resolution microscope. We recorded various types of movements, including those between separate trees (both on the ground and above it), changes in perching location, and movements within the same tree using binoculars, pen, and paper. Morphological measurements were taken for both species, including limb length (forelimb and hind limbs) and body size. We used digital calipers for precise measurements of over 200 individuals of each species across allopatric and sympatric populations. To evaluate interspecific behavioral interactions in sympatry, we constructed a mixed species social network at one site. We marked individuals of both species with unique alphanumeric codes and recorded their locations relative to each other over five days using binoculars, pen, and paper.
Data collection	This study was conducted in Miami, Florida, USA, examining two <i>Anolis</i> lizard species (<i>A. sagrei</i> and <i>A. cristatellus</i>) across nine sites: three sites with <i>A. sagrei</i> alone, three with <i>A. cristatellus</i> alone, and three sites where both species occur together. We collected ecological data through three main approaches: Habitat use measurements included perch height observations for 1,198 lizards (47-221 lizards per species per site), recording the vertical distance from ground of undisturbed lizards. Diet analysis was conducted through stomach content examination (9-15 lizards per species per site), with prey items measured to 0.1mm under 10-60x magnification. Movement behavior was documented through field observations of 178 <i>A. sagrei</i> (28-31 individuals per site), with observation periods ranging 8-20 minutes per lizard (median 15 minutes, total observation time 2,609 minutes). Morphological measurements were taken using digital calipers (Neiko 01470A, accuracy 0.01mm) on 242 <i>A. sagrei</i> (127 allopatric, 115 sympatric) and 211 <i>A. cristatellus</i> (104 allopatric, 107 sympatric). For the character displacement process study, we conducted a longitudinal analysis from 2016-2019 on a 6,000m ² island within the Fairchild Tropical Botanical Gardens. We measured survival and morphological traits of 905 male <i>A. sagrei</i> , individually marked with 3mm fluorescent tags. Survival assessments were conducted every six months. Social network analysis was performed at one sympatric site, tracking 72 marked lizards (35 <i>A. sagrei</i> , 37 <i>A. cristatellus</i>) for 50 hours over 5 days, with locations recorded every 30 minutes between 0830-1730 daily. All research was conducted under appropriate institutional animal care permits and location access permissions. Measurements were taken by a single researcher (JTS) to ensure consistency.

Timing and spatial scale	Information on study site location and sampling periods is included in the manuscript.
Data exclusions	No data were excluded in this study.
Reproducibility	All data collection methods are provided in detail in the manuscript, and GPS location data for all study sites are provided in the supplementary materials.
Randomization	All morphological traits were measured by the lead author and each individual agnostic to its study site.
Blinding	No blinding occurred during data analysis, but no data were excluded from this study.
Did the study involve field work?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Field work, collection and transport

Field conditions	All fieldwork was conducted in Miami, Florida USA which has a subtropical climate. Miami FL has a humid subtropical climate with mean annual precipitation of 1,470 mm, an average maximum temperature of 28 °C during the summer wet season, and an average minimum temperature of 20 °C during the winter dry season.
Location	Miami, Florida USA.
Access & import/export	This study involved no import/export.
Disturbance	No disturbance was associated with this study.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

Methods

n/a	Involvement in the study	n/a	Involvement in the study
<input checked="" type="checkbox"/>	<input type="checkbox"/> Antibodies	<input checked="" type="checkbox"/>	<input type="checkbox"/> ChIP-seq
<input checked="" type="checkbox"/>	<input type="checkbox"/> Eukaryotic cell lines	<input checked="" type="checkbox"/>	<input type="checkbox"/> Flow cytometry
<input checked="" type="checkbox"/>	<input type="checkbox"/> Palaeontology and archaeology	<input checked="" type="checkbox"/>	<input type="checkbox"/> MRI-based neuroimaging
<input type="checkbox"/>	<input checked="" type="checkbox"/> Animals and other organisms		
<input checked="" type="checkbox"/>	<input type="checkbox"/> Clinical data		
<input checked="" type="checkbox"/>	<input type="checkbox"/> Dual use research of concern		
<input checked="" type="checkbox"/>	<input type="checkbox"/> Plants		

Animals and other research organisms

Policy information about [studies involving animals](#); [ARRIVE guidelines](#) recommended for reporting animal research, and [Sex and Gender in Research](#)

Laboratory animals	No laboratory animals were used in this study.
Wild animals	All lizards in this study were captured using standard methods. No captive animals were used in this study. Species included in this study are Anolis sagrei and Anolis cristatellus. All lizards were adults, approximately 1 year or older.
Reporting on sex	Only males were considered in this study; all sample sizes are included in the manuscript or supplementary information.
Field-collected samples	No captive animals were used in this study.
Ethics oversight	Animal procedures were approved by institutional animal care and use committees (IACUC) at Florida International University IACUC #13-070 & #16-059 and Washington University IACUC #20180101. All research was conducted with permission from Florida State Parks Permit #05261635, Miami-Dade Parks Research Permit #208R, and Florida Fish and Wildlife Permit #EXOT-17-48.

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Plants

Seed stocks

Report on the source of all seed stocks or other plant material used. If applicable, state the seed stock centre and catalogue number. If plant specimens were collected from the field, describe the collection location, date and sampling procedures.

Novel plant genotypes

Describe the methods by which all novel plant genotypes were produced. This includes those generated by transgenic approaches, gene editing, chemical/radiation-based mutagenesis and hybridization. For transgenic lines, describe the transformation method, the number of independent lines analyzed and the generation upon which experiments were performed. For gene-edited lines, describe the editor used, the endogenous sequence targeted for editing, the targeting guide RNA sequence (if applicable) and how the editor was applied.

Authentication

Describe any authentication procedures for each seed stock used or novel genotype generated. Describe any experiments used to assess the effect of a mutation and, where applicable, how potential secondary effects (e.g. second site T-DNA insertions, mosaicism, off-target gene editing) were examined.