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Reporting Summary

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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	NA
Data analysis	All data were analyzed using the free and open software JAMOVI (Version 0.9; GAMLj module; https://www.jamovi.org). We analyzed count data (e.g. number of egg cases, number of spiderlings) with generalized linear models (GZLM) incorporating a quasi-Poisson distribution to account for overdispersion. Cyclones represented a fixed effect, while number of attackers and colony size were included as covariates. For our retrospective comparison across 13 populations, we used a linear mixed model (GLM) fit by ordinary least squares regression. For all statistical tests, we used a significance threshold of α = 0.05.

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/reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research 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 list of figures that have associated raw data
- A description of any restrictions on data availability

We have included the entirety of the raw data as a supplementary file.

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

Ecological, evolutionary & environmental sciences study design

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

Study description	We intercepted three cyclones in hurricane season 2018 and documented the selection imposed by these storms relative to control sites.
Research sample	Colonies and sites were selected entirely opportunistically, both for the cyclone-induced selection component and the correlative field component.
Sampling strategy	All colonies detected at our focal sites were marked and monitored.
Data collection	Methods Observers: Pruitt JN, Little A Cyclone-Induced Selection: Cyclone Interception & Colony Phenotyping Atlantic hurricane season 2019 was monitored using regional and national media outlines. As landfall sites of cyclones materialized, we flew or drove to the anticipated points of landfall 2-3 days before the cyclone was scheduled to strike. In the path of each storm, we established 1-3 strike sites and a paired control site within the same general region, but that clearly fell outside the cyclone's predicted path (Extended Data Table 1). Site selection was determined based on a suitable number of colonies being present and accessibility to the shoreline. Furthermore, we only selected sites where colonies were overhanging a water surface. For each colony we assessed the following variables prior to the cyclone's landfall: number of adult females present in the colony, the diameter of the branch supporting the entire web of the colony, the colony's height above the water, the web volume, and the number of attackers that the colony deployed in response to simulated prey. The number of females was determined last by gently opening the colony and counting the number of females present therein with the assistance of a pen flashlight. The height above was estimated using a conventional measuring tape. The web volume was estimated using the product of the orthogonal length, width, and depth measurements of the web. The width of the supporting branch was estimated using calipers, and the point of measurement was selected as the most distal point of the branch that could still capture all the colony's web, which can sometimes be spread across multiple twigs and branches. Colony aggressiveness was determined using a standardized vibratory stimulus. A 1.5 cm x 1.5 cm piece of paper was placed in the colony's web ~6cm away from the retreat containing the female spiders. An Oral B Cross Action electric toothbrush with an 8cm metal rod extending from its end was used to generate the vibration. The vibrating metal rod was gently placed in contact with the paper, causing it to flitter in the web. We then recorded the number of females that emerged to attack the paper over the next 2 minutes. Colonies that deployed more females to attack the stimulus were deemed more aggressive. This is a common method of assessing aggressiveness in web-building spiders 35,36. Colony Performance: Persistence, Egg Cases, Spiderling Survival We measured colony performance in cyclone strike and control sites at three time points. First, we returned to each colony within 48h of the cyclone's departure to evaluate which colonies persisted through the storm. Colonies that vanished were had often been submerged and swept away in the river following an increase in water level or had fallen into the river when their supporting branches were broken off in the wind and rain. We recorded evidence of both of these outcomes or whether each colony persisted through the storm. For colonies that persisted, we returned to each colony in September-October 2018 to count the number of egg cases produced by each colony. Egg cases are produced in A. studiosus from mid-summer to mid-fall, though experimentally generated colonies can have unorthodox phenologies. Egg case numbers were determined by gently slicing open the web's interior using a box cutter and counting the number of small, white circular egg cases therein. Finally, we returned to our colonies again in December 2018 to count the number of spiderlings that survived the fall. We timed this census to occur after the fall, when we deemed cyclone's impacts would be most pronounced, and early spring, when many spiderlings disperse to found their own colonies. Because of the difficulty of tracking colony performance once a subset of its members disperse, we counted the number of surviving spiderlings prior to this event. Spiderlings are small and cryptic. Thus, whole colonies were collected and dissected by hand over white bed sheets to increase spiderling contrast. Excluded from this final analysis were four sites in which all the focal colonies had been removed for reasons unknown (Broad River, Bulow Creek, Sutton Park, Warrior) and a small number of colonies at each remaining site where the colony could not be rediscovered, nor any of its remnants. Geographic Survey In summer 2018, we performed a large-scale geographic meander survey across the Gulf and Atlantic coasts of the United States to test for associations between colony behavior and a history of cyclone strikes. Sites were selected haphazardly and opportunistically based on the presence of many A. studiosus colonies and accessibility to a suitable shoreline where all the focal colonies resided

immediately above a waterbody. We selected 13 such sites spread across 5-degrees latitude (Extended Data Table 2). We used our knowledge of these sites to guide the selection of our hurricane strike sites in fall. This is because establishing study sites in the cyclone's trajectory immediately prior to its landfall is a time-sensitive matter.

For each colony we assessed the following variables: number of adult females present in the colony, the diameter of the branch supporting the entire web of the colony, it's height above the water, its web volume, and the number of attackers the colony deployed to simulated prey. We used the same protocols described above for the geographic survey component of our studies.

County by count cyclone strike counts over the past 100 years were obtained on IBTrACS: Tropical Cyclone Best Track database.

Timing and spatial scale: Start: May 2018, End: December 2018
SE USA, Gulf and Atlantic Coasts

Data exclusions: Not applicable

Reproducibility: We replicated the study across three cyclones and six focal sites plus three no-cyclone reference sites.

Randomization: Not applicable

Blinding: Colony performance data were obtained blind with regard to colony behavioral tendencies, but we could identify large and small colonies, as well as microhabitat attributes.

Did the study involve field work? ☒ Yes ☐ No

Field work, collection and transport

Field conditions: Riparian environments throughout the Gulf and Atlantic coast, USA.

Location:

Site Lat, Long # of Colonies
Bulow Creek, FL 29.365825, -81.124608 24
Estero River, FL 26.437736, -81.816947 15
FakahatcheeCanal, FL 25.960031, -81.509276 15
Grandaddy Branch, FL 30.531806, -81.596483 15
Lettuce Late, FL 28.071191, -82.377040 15
Longbranch, MS 30.628408, -89.708327 15
Loxahatchee River, FL 26.936639, -80.139995 15
Milbranch, FL 30.429233, -84.934480 15
Northwest River, VA 36.567894, -76.198857 15
Ogeechee River, GA 31.977358, -81.286831 16
South Santee River, SC 33.185478, -79.404023 15
Tar River, NC 35.553723, -77.081867 15
Tensaw River, AL 30.937683, -87.904230 21
Extended Data Table 1. Site information and number of colonies sampled for the geographic survey analyses.

Cyclone Site ID Strike/Control Lat, Long # of Colonies
Alberto Bulow Creek, FL Control 29.365825, -81.124608 24
Alberto Warrior, FL Strike 30.473771, -84.407016 23
Florence Ogeechee River, GA Control 31.977358, -81.286831 16
Florence Broad River, SC Strike 34.485128, -81.424724 32
Florence Orangeburg, SC Strike 33.483913, -80.874374 36
Michael Tensaw River, AL Control 30.937683, -87.904230 21
Michael Earle May Boat Basin, GA Strike 30.897549, -84.599125 24
Michael Fort Gaines, GA Strike 31.638637, -85.049025 40
Michael Sutton Park, GA Strike 31.599279, -84.141509 24
Extended Data Table 1. Cyclone, site information and number of colonies sampled for the cyclone-induced selection analyses.

Access and import/export: Not applicable.

Disturbance: We recollected all of the flagging tape used to mark colonies at the end of the study or when colonies had been submerged and swept away. Our data are otherwise strictly observational

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

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology
☐	☒ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Animals and other organisms

Policy information about studies involving animals; ARRIVE guidelines recommended for reporting animal research

Laboratory animals	Not applicable.
Wild animals	Wild, naturally-occurring Anelosimus studiosus colonies.
Field-collected samples	Not applicable.
Ethics oversight	Not required for USA or Canada at the present time

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