

# Seema Nayan Sheth

ssheth3@ncsu.edu

Phone: (919) 515-4168

<http://www.seemasheth.weebly.com>

Department of Plant and Microbial Biology

North Carolina State University

Raleigh, NC 27695

## PROFESSIONAL APPOINTMENTS

<b>Assistant Professor</b> Department of Plant and Microbial Biology North Carolina State University	2018 - present
<b>National Science Foundation Postdoctoral Fellow</b> Department of Integrative Biology University of California, Berkeley Supporting scientists: Dr. David Ackerly and Dr. Bruce Baldwin	2016 - 2017
<b>Postdoctoral Research Associate</b> Department of Ecology, Evolution, and Behavior University of Minnesota Advisor: Dr. Ruth Shaw	2014 - 2015
<b>Research Scientist: Conservation, Ecology, and Evolution</b> Center for Conservation and Sustainable Development Missouri Botanical Garden	2006 - 2008

## EDUCATION

<b>Ph.D., Ecology</b> Colorado State University Advisor: Dr. Amy Angert	2008 - 2014
<b>M.S., Biology (Ecology, Evolution, and Systematics)</b> University of Missouri - St. Louis Advisor: Dr. Bette Loiselle	2003 - 2006
<b>B.A., Environmental Sciences and Spanish (double major)</b> Washington University in St. Louis	1998 - 2002

## RESEARCH INTERESTS

evolutionary and population ecology; biogeography; plant community responses to climate change

## PUBLICATIONS

Undergraduate student<sup>u</sup>; Graduate student<sup>g</sup>; Postdoctoral associate<sup>p</sup>

22. Vtipil, E.E.<sup>u,g</sup> and **S.N. Sheth**. 2020. A resurrection study reveals limited evolution of phenology in response to recent climate change across the geographic range of the scarlet monkeyflower. *Ecology and Evolution* 10: 14165-14177.
21. Wooliver, R.P., S.B. Tittes, and **S.N. Sheth**. 2020. A resurrection study reveals limited evolution of thermal performance in response to recent climate change across the geographic range of the scarlet monkeyflower. *Evolution* 74: 1699-1710.
20. **Sheth, S.N.**, N. Morueta-Holme, and A. L. Angert. 2020. Determinants of geographic range size in plants. *New Phytologist* 226: 650-665.

19. Briscoe Runquist, R. D., A. J. Gorton, J. B. Yoder, N. J. Deacon, J. J. Grossman, S. A. Kothari, M. P. Lyons, **S. N. Sheth**, P. Tiffin, and D. A. Moeller. 2020. Context dependence of local adaptation to abiotic and biotic environments: a quantitative and qualitative synthesis. In press, *American Naturalist* 195: 412-431.
18. Smithers, B. V., M. F. Oldfather, M. J. Koontz, J. Bishop, C. Bishop, J. Nachlinger, and **S. N. Sheth**. 2020. Community turnover by composition and climate affinity across scales in an alpine system. *American Journal of Botany* 107: 239-249.
17. Oldfather, M. F., M. M. Kling, **S. N. Sheth**, N. C. Emery, and D. D. Ackerly. 2020. Range edges in heterogeneous landscapes: integrating geographic scale and climate complexity into range dynamics. *Global Change Biology* 26: 1055-1067.
16. Lowry D. B., J. M. Sobel, A. L. Angert, T-L. Ashman, R. L. Baker, B. K. Blackman, Y. Brandvain, K. J. R. P. Byers, A. M. Cooley, J. M. Coughlan, M. R. Dudash, C. B. Fenster, K. G. Ferris, L. Fishman, J. Friedman, D. L. Grossenbacher, L. M. Holeski, C. T. Ivey, K. M. Kay, V. A. Koelling, N. J. Kooyers, C. J. Murren, C. D. Muir, T. C. Nelson, M. L. Peterson, J. R. Puzey, M. C. Rotter, J. R. Seeman, J. P. Sexton, **S. N. Sheth**, M. A. Streisfeld, A. L. Sweigart, A. D. Twyford, M. Vallejo-Marin, J. H. Willis, C. A. Wu, and Y. W. Yuan. 2019. The case for the continued use of the genus name *Mimulus* for all monkeyflowers. *Taxon* 68: 617-623.
15. Kulbaba, M. W., **S. N. Sheth**, R. E. Pain, V. M. Eckhart, and R. G. Shaw. 2019. Additive genetic variance for lifetime fitness and the capacity for adaptation in the wild. *Evolution* 73: 1746-1758.
14. **Sheth, S. N.**, M. W. Kulbaba, R. E. Pain, and R. G. Shaw. 2018. Expression of additive genetic variance for fitness in a population of partridge pea in two field sites. *Evolution* 72: 2537-2545.
13. **Sheth, S. N.** and A. L. Angert. 2018. Demographic compensation does not rescue populations at a trailing range edge. *Proceedings of the National Academy of Sciences (USA)* 115: 2413-2418.
12. Pain, R. E., R. G. Shaw, and **S. N. Sheth**. 2018. Costs associated with N-fixing rhizobia early in the life of partridge pea *Chamaecrista fasciculata*. *American Journal of Botany* 105: 796-802.
11. Morueta-Holme, N., M. F. Oldfather, R. L. Olliff-Yang, A. P. Weitz, C. R. Levine, M. M. Kling, E. C. Riordan, C. Merow, **S. N. Sheth**, A. H. Thornhill, and D. D. Ackerly. 2018. The language of climate change: best practices in research and publication. *Nature Climate Change* 8: 92-94.
10. Angert, A. L., M. Bayly, **S. N. Sheth**, and J. R. Paul. 2018. Testing range-limit hypotheses using range-wide habitat suitability and occupancy for the scarlet monkeyflower (*Erythranthe cardinalis*). *American Naturalist* 191: E76-E89.
9. **Sheth, S. N.** and A. L. Angert. 2016. Artificial selection reveals high genetic variation in phenology at the trailing edge of a species range. *American Naturalist* 187: 182-193. (American Naturalist 2016 Student Paper Award)
8. **Sheth, S. N.**, I. Jiménez, and A. L. Angert. 2014. Identifying the paths leading to variation in geographical range size in western North American monkeyflowers. *Journal of Biogeography* 41: 2344-2356.

7. **Sheth, S. N.** and A. L. Angert. 2014. The evolution of environmental tolerance and range size: a comparison of geographically restricted and widespread *Mimulus*. *Evolution* 68: 2917-2931.
6. **Sheth, S. N.**, L. G. Lohmann, T. Distler, and I. Jiménez. 2012. Understanding bias in geographic range size estimates. *Global Ecology and Biogeography* 21: 732-742.
5. Paul, J. R., **S. N. Sheth**, and A. L. Angert. 2011. Quantifying the impact of gene flow on phenotype-environment mismatch: a demonstration with the scarlet monkeyflower *Mimulus cardinalis*. *American Naturalist* 178: S62-S79.
4. Angert, A. L., **S. N. Sheth**, and J. R. Paul. 2011. Incorporating population-level variation in thermal performance into predictions of geographic range shifts. *Integrative And Comparative Biology* 51: 733-750.
3. **Sheth, S. N.**, B. A. Loiselle, and J. G. Blake. 2009. Phylogenetic constraints on fine-scale patterns of habitat use by eight primate species in eastern Ecuador. *Journal of Tropical Ecology* 25: 571-582.
2. **Sheth, S. N.**, L. G. Lohmann, T. Consiglio, and I. Jiménez. 2008. Effects of detectability on estimates of geographic range size in Bignoniaceae. *Conservation Biology* 22: 200-211.
1. Amend, J. P., D. A. R. Meyer-Dombard, **S. N. Sheth**, N. Zolotova, and A. C. Amend. 2003. *Palaeococcus helgesonii* sp. nov., a facultatively anaerobic, hyperthermophilic archaeon from a geothermal well on Vulcano Island, Italy. *Archives of Microbiology* 179: 394-401.

***Manuscripts in review/revision (available upon request)***

Querns, A.<sup>g</sup>, R. Wooliver<sup>p</sup>, M. Vallejo-Marín, and S.N. Sheth. The evolution of thermal performance in native and invasive populations of *Mimulus guttatus*. In revision for *Journal of Ecology*. Pre-print: <https://doi.org/10.1101/2020.09.10.291252>.

Lee-Yaw, J.A., McCune J.L., Pironon, S. and **S.N. Sheth**. On the predictive value of species distribution models in population biology. In revision for *Ecography*.

Wooliver, R.<sup>p</sup>, E.E. Vtipil<sup>g</sup>, A.M. Wiegmann<sup>u</sup>, and S.N. Sheth. Guidelines for unified study of plant thermal performance curves in a warming world. In review at *New Phytologist*.

**GRANTS, FELLOWSHIPS, AND AWARDS**

NCSU Faculty Research and Professional Development Fund, \$5,000	2019 - 2020
<i>Rapid evolution of thermal tolerance across a species' geographic range</i> (PI)	
American Naturalist 2016 Student Paper Award	2017
NSF Postdoctoral Research Fellowship in Biology, \$138,000	2016 - 2017
<i>Relationships among climatic tolerance, trait evolution, and diversification in the California flora</i>	
Postdoctoral Association Career Development Award, Univ. of Minnesota, \$400	2015
Finalist, University of California President's Postdoctoral Fellowship	2014
NSF DEB Evolutionary Ecology, \$14,984	2012 - 2014
<i>Dissertation Research: Role of evolutionary potential in limiting species' distributions</i> (co-PI)	

Outreach Grant, Society for the Study of Evolution, \$800	2012
Global Sustainability Leadership Fellow, Colorado State University	2012
Rosemary Grant Award, Society for the Study of Evolution, \$2,500	2010
Graduate Student Research Award, Botanical Society of America, \$500	2010
Finalist, Environmental Protection Agency STAR Graduate Fellowship	2009
Steinkamp Fund, Colorado Native Plant Society, \$1,000	2009
Women in Natural Sciences Travel Grant, Colorado State University, \$300	2009
Awards from Department of Biology, Colorado State University, \$7,425	2009 - 2014
Grad. Degree Program in Ecology Fellowship, Colorado State University, \$1,000	2008
NSF GK-12 Fellowship, Colorado State University, \$4,000	2008
NSF GK-12 Fellowship, Univ. of Missouri-St. Louis, \$30,000	2005 - 2006
Awards from Department of Biology, Univ. of Missouri-St. Louis, \$3,500	2004 - 2005
Primate Action Fund, Conservation International, \$3,000	2004

## PRESENTATIONS

Undergraduate student<sup>u</sup>; Graduate student<sup>g</sup>; Postdoctoral associate<sup>p</sup>

### Invited symposia

46th Annual Southern California Botanists Symposium (virtual)	2020
Living on the edge - Plants in extreme environments	
“The role of demographic and evolutionary processes in buffering populations from climate change”	
International Biogeography Society Humboldt-250 Meeting, Quito, Ecuador	2019
Symposium: Architects of variation: How climate and physiology shape patterns of biodiversity	
“Can plant thermal tolerance evolve under climate change? A comparison of central and edge populations” ( <u>R. Wooliver<sup>p</sup></u> , S. Tittes, and <b>S.N. Sheth</b> ; presented by R. Wooliver)	
Green Life Sciences, University of Michigan, Ann Arbor, MI	2018
Symposium: Plant-environment interactions across scales	
“Do demographic compensation and adaptation buffer species from changing climate?”	
Society for the Study of Evolution, Portland, OR	2017
American Society of Naturalists Symposium: Across the Nth dimension: Quantitative and conceptual advances in the study of niche breadth	
“Does niche breadth predict vulnerability to changing environments? From population-level traits and demography to diversification in deep time”	
SACNAS, Long Beach, CA	2016
Scientific Symposium: (Day and) Night at the Museum: Exploring Research in Ecology and Evolution Behind the Scenes of Natural History Museums	
“Harnessing the power of herbarium specimen data for ecological and evolutionary studies”	

Jornadas Argentinas de Botanica, Corrientes, Argentina	2007
Symposium: Conservation and Threat Assessments of Plants	
“Riesgo de extinción en Bignonieae (Bignoniaceae): una perspectiva filogenética” ( <b>Sheth, S.N.</b> , L.G. Lohmann, T. Consiglio, and I. Jiménez)	
Botanical Society of America and Plant Biology Joint Congress, Chicago, IL	2007
Colloquium: Integration of spatial and ecological data in evolutionary studies	
“Extinction risk in Bignonieae (Bignoniaceae): a phylogenetic perspective” ( <b>Sheth, S.N.</b> , L.G. Lohmann, T. Consiglio, and I. Jiménez)	

### Invited seminars

Ecology, Evolution, and Behavior Program, Michigan State University	2021
Department of Integrative Biology, University of California, Berkeley	2020
*** <i>Graduate Student Invited Lecture</i> ***	
Department of Ecology and Evolutionary Biology, University of Arizona	2020
Department of Ecology and Evolutionary Biology, Tulane University	2019
Program in Ecology, Duke University	2019
Kellogg Biological Station, Michigan State University	2019
Genetics and Genomics Seminar Series, North Carolina State University	2019
Bio-Pop Seminar Series, Department of Biology, University of North Carolina	2018
Department of Plant Biology, University of Vermont	2018
EEBio Seminar Series, Department of Biology, University of Virginia	2018
Department of Forestry and Environmental Resources, North Carolina State University	2018
Department of Biological Sciences, California Polytechnic State University	2017
Department of Ecology and Evolutionary Biology, University of California, Los Angeles	2017
Environmental Systems Graduate Group, University of California, Merced	2017
School of Integrative Plant Science, Plant Biology Section, Cornell University	2017
Center for Population Biology, University of California, Davis	2017
Department of Biology, University of Utah	2017
Natural History Museum of Utah	2017
Department of Plant and Microbial Biology, North Carolina State University	2017
Department of Biology, Williams College	2016
Department of Biology, University of San Francisco	2016
Department of Biology, Grinnell College	2015
Department of Plant Biology, University of Minnesota	2015
Department of Biology, Washington University in St. Louis	2007
Department of Biology, St. Louis University	2007

### Contributed conference presentations

Smithers, B. V., M. F. Oldfather, M. J. Koontz, J. Bishop, C. Bishop, J. Nachlinger, and <b>S. N. Sheth</b> . “Community turnover by composition and climate affinity across scales in an alpine system.” Ecological Society of America (virtual; presented by B. Smithers)	2020
Wooliver, R. <sup>P</sup> , E.E. Vtipil <sup>g</sup> , and <b>S.N. Sheth</b> . “A call for unified study of plant thermal performance in a warming world.” Botany (virtual; presented by R. Wooliver)	2020
Querns, A. <sup>g</sup> , R. Wooliver <sup>P</sup> , M. Vallejo-Marín, and <b>S.N. Sheth</b> . ”The evolution of thermal performance in native and invasive populations of <i>Mimulus guttatus</i> .” Botany (virtual; poster presented by A. Querns)	2020
*** <i>Winner of Best Graduate Student Poster in Ecology</i> ***	

- Wooliver, R.P., S. Tittes, and **S.N. Sheth**. "Can plant thermal tolerance evolve under climate change? A comparison of central and edge populations." Southeast Population Ecology and Evolutionary Genetics, Clemson, SC (presented by R. Wooliver) 2019
- Vtipil, E.E.<sup>u.g</sup> and **S.N. Sheth**. "The evolution of flowering time in response to climate change in *Erythranthe cardinalis*." Southeast Population Ecology and Evolutionary Genetics, Clemson, SC (poster presented by E. Vtipil). 2019
- \*\*\* Winner of Second Best Graduate Student Poster \*\*\*
- Kulbaba, M., **S.N. Sheth**, R.E. Pain, V.M. Eckhart, and R.G. Shaw. "Adaptive potential and realized changes in fitness in natural populations." Society for the Study of Evolution, Montpellier, France (poster presented by M. Kulbaba) 2018
- Sheth, S.N.** and A.L. Angert. "Demographic compensation does not rescue *Erythranthe cardinalis* populations at the southern edge of the species range." Ecological Society of America, Portland, OR 2017
- Kulbaba, M., R.E. Pain, V.M. Eckhart, **S.N. Sheth**, and R.G. Shaw. "The immediate capacity for adaptation and its realization in natural plant populations." International Botanical Congress, Shenzhen, China 2017
- Sheth, S.N.**, M. Kulbaba, R.E. Pain, and R.G. Shaw. "Expression of additive genetic variance for fitness in a population of partridge pea grown in two field sites." Society for the Study of Evolution, Portland, OR (presented by R.G. Shaw) 2017
- Sheth, S.N.**, W.A. Freyman, B.G. Baldwin, and D.D. Ackerly. "Relationships among rates of climatic niche evolution and diversification." Society for the Study of Evolution, Austin, TX (poster) 2016
- Sheth, S.N.** and A.L. Angert. "Artificial selection reveals high genetic variation in phenology at the trailing edge of a species range." Ecological Society of America, Baltimore, MD 2015
- Sheth, S.N.** and A.L. Angert. "Does a jack-of-all-temperatures have a large geographic range?" Society for the Study of Evolution, Snowbird, UT 2013
- Sheth, S.N.**, I. Jiménez, and A.L. Angert. "Effects of niche properties on variation in geographic range size among species of western North American monkeyflowers." Ecological Society of America, Portland, OR 2012
- Sheth, S.N.**, L.G. Lohmann, T. Distler, and I. Jiménez. "The Wallacean shortfall: bias in estimates of geographic range size." Botanical Society of America, St. Louis, MO (presented by I. Jiménez) 2011
- Sheth, S.N.** and A.L. Angert. "Ecological niche attributes and geographic range size in western North American monkeyflowers." Society for the Study of Evolution, Portland, OR 2010
- Sheth, S.N.**, L.G. Lohmann, I. Jiménez, and T. Consiglio. "Riesgo de extinción en Bignoniaceae (Bignoniaceae) estimado con datos de herbario." Congreso Latinoamericano de Botánica. Santo Domingo, Dominican Republic (presented by L. G. Lohmann) 2006

## TEACHING

### North Carolina State University

Plant Ecology, PB450/550-001, solo instructor

2019 - present

## **Colorado State University**

Principles of Plant Biology Laboratory, teaching assistant	2008 - 2014
Plant Ecology, guest lecturer	2012 - 2013
Plant Ecology, teaching assistant	2011 - 2012
Biology of Organisms, guest lecturer	2009
Cache La Poudre Junior High School, NSF GK-12 fellow, LaPorte, CO	2008 - 2009

## **Missouri Botanical Garden**

Neotropical Plant Families, guest lecturer for University of Michigan course	2008
Conservation Biology, guest lecturer for University of Missouri - St. Louis course	2008

## **University of Missouri - St. Louis**

McCluer High School, NSF GK-12 fellow, Florissant, MO	2005 - 2006
Organisms and the Environment Laboratory, guest lecturer	2005

## **AmeriCorps Partnership for Youth**

Woodward Elementary School, tutor and teaching assistant, St. Louis, MO	2002 - 2003
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## **MENTORING**

### **North Carolina State University**

#### ***Postdoctoral associates***

Dr. Rachel Wooliver	2018 - 2020
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#### ***Graduate students***

Emma Vtipil (Ph.D.)	2020 - present
Aleah Querns (M.S.)	2018 - 2020
Emma Vtipil (M.R.)	2019 - 2020

#### ***Undergraduate researchers***

Devin Adas	2021
Brooke Caldwell	2019 - 2020
Natalie Gold	2019
Mariah Kidd	2019 - 2020
Daisy Ryan	2020 - present
Jessie Torres	2018 - 2019
Emma Vtipil (Honor's thesis student; recipient of NCSU Chilton Research Award)	2018 - 2019
Mia Wiegmann	2018 - present
Collin Yurish	2018 - 2019

#### ***Graduate student committees***

Samuel Flake, NCSU	2018 - present
Kira Lindelof, NCSU	2020 - present
Ryan O'Connell, Duke University	2020 - present
Simon Pinilla-Gallego, NCSU	2018 - present
Anita Simha, Duke University	2020 - present
Greg Wilson, NCSU	2018 - 2019

## **University of California, Berkeley**

Mentored 7th graders at King Middle School as part of Be a Scientist outreach program	2017
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## **University of Minnesota**

Sam Weaver (NSF REU student from St. Olaf College)	2015
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## Colorado State University

Amber Weimer (Honor's thesis undergraduate student) 2013 - 2014  
Trained, mentored, and supervised 17 undergraduates & recent college graduates 2009 - 2014  
Biological Summer Undergraduate Research Experience program committee member 2012

## SERVICE

### University service

Plant Biology Graduate admissions committee, NCSU 2018 - present  
College of Agricultural and Life Sciences greenhouse committee, NCSU 2019 - present  
Ecology faculty search committee, Dept. of Plant and Microbial Biology, NCSU 2019 - 2020  
Biology faculty search committee, Colorado State University 2012 - 2013

### Professional service

Hamilton student award committee member, Society for the Study of Evolution 2020 - present  
Workshop and Regional Society committee member, American Society of Naturalists 2021 - present  
Manuscript reviewer: *American Journal of Botany*, *American Naturalist*, *Annals of Botany*, *AoB PLANTS*, *BMC Evolutionary Biology*, *Current Biology*, *Ecography*, *Ecological Applications*, *Ecology*, *Ecology Letters*, *Evolution*, *Evolutionary Ecology*, *Functional Ecology*, *Journal of Animal Ecology*, *Journal of Ecology*, *Molecular Ecology*, *New Phytologist*, *PNAS*, *Proceedings of the Royal Society B*, *Science Advances*, *Trends in Ecology and Evolution* 2009 - present  
Book proposal reviewer: Oxford University Press 2018  
Proposal reviewer: NSF DEB, Population and Community Ecology 2014

### Other service

Volunteer: Global Observation Research Initiative in Alpine Environments (GLORIA), White Mountains Wilderness, California 2017 - present  
Exhibitor, Darwin Day, North Carolina Museum of Natural Sciences 2019  
Judge, Southeast Population Ecology and Evolutionary Genetics 2019  
Advisory board member: Science Ambassador Scholarship (for undergraduate women in science, technology, engineering, or math), Cards Against Humanity 2017 - 2018  
Collaborated with National Park Service to recruit Navajo Nation students to assist with fieldwork in Canyon de Chelly National Monument, AZ 2009  
Volunteer, Putnam Elementary Science Carnival, Fort Collins, CO 2009  
Volunteer, Unidad Técnica (environmental NGO), Managua, Nicaragua 2001

## WORKING GROUPS AND WORKSHOPS

Agricultural Leadership Learning Institute for Faculty, North Carolina State University, Raleigh, NC 2019  
Evolution in Changing Seas Synthesis Workshop, Shoals Marine Laboratory, Appledore, ME 2019  
Software Carpentry Workshop, Berkeley Institute of Data Sciences, Berkeley, CA 2016  
Early Career Centennial Mentoring Program, Ecological Society of America, Baltimore, MD 2015



Quantitative Genetics and Mixed Models in Quantitative Genetics, Summer Institute in Statistical Genetics, University of Washington, Seattle, WA	2013
Intro to Python for ArcGIS Workshop, Colorado State University, Fort Collins, CO	2013
Science Communication Workshop, Colorado State University, Fort Collins, CO	2012
Living on the edge: integrating science into the management of range-margin populations, University of Wyoming, Laramie, WY	2010
Applied Phylogenetics Workshop, Bodega Bay Marine Laboratory, CA	2010
Working with ArcGIS Spatial Analyst (short course), Environmental Systems Research Institute, St. Charles, MO	2007
Distance Sampling Workshop, University of Missouri - St. Louis, St. Louis, MO	2006
Assessing extinction risk in Bignoniaceae (summer internship), Center for Conservation and Sustainable Development, Missouri Botanical Garden, St. Louis, MO	2005
Geographic Information Systems (course), University of Missouri - St. Louis	2004
Tropical Biology: An Ecological Approach (course), Organization for Tropical Studies, Costa Rica	2004
Historical Biogeography (short course), University of Missouri - St. Louis	2004

## **PROFESSIONAL AFFILIATIONS AND SOCIETIES**

Science Director: GLORIA (Global Observation Research Initiative in Alpine Environments) Great Basin

Faculty Affiliate: Southeast Climate Science Center

American Society of Naturalists

Botanical Society of America

Ecological Society of America

Society for the Study of Evolution

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