

JEFF GARNAS, PHD

Department of Natural Resources and the Environment
University of New Hampshire, Durham
Durham, NH 03824

jeff.garnas@unh.edu
mypages.unh.edu/garnaslab
(603) 862-2094

Profile

I am a population and community ecologist and evolutionary biologist focused on questions related to insects and fungi that interact with plants, primarily forest trees. I use a variety of approaches and tools, including observational studies, field and lab experiments, modeling and molecular analyses to test hypotheses and search for strong inference in the systems I study. I approach ecological and evolutionary questions using a strong theoretical framework while producing and communicating products with applied value to conservation and to land and forest managers. In particular, I am interested in the drivers of host use and community overlap in fungi and insects colonizing native and exotic tree species, and in understanding the evolutionary, population genetic and ecological consequences of invasion of plants, fungi and insects.

Current appointment

Assistant Professor, Department of Natural Resources and the Environment, University of New Hampshire, Durham	2016-present
Extraordinary Faculty, University of Pretoria, South Africa	2017-present

Education and Experience

Sr. Lecturer, Department of Zoology and Entomology, Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, South Africa	2009-2016
PhD Ecology and Evolution, Dartmouth College, Hanover, NH	2009
MSc Ecology and Evolution, University of Maine, Orono, ME	2005
Little Mendelson, Database design/programming; IT support, San Francisco, CA	1999-2002
Macromedia, Application development, San Francisco, CA	1998-1999
B.A. Psychology, University of Colorado, Boulder, CO	1997

Current projects

Biological control of Emerald ash borer: Understanding drivers to predict outcomes
Ontogenetic resistance in American ash to Emerald ash borer: physical and chemical drivers
Community consequences of insect range shifts with focus on the Southern pine beetle
Fungal community variation and landscape genetics of the beech bark disease pathogen complex
Patterns and consequence of global connectivity in invasive populations
Novel associations and communities in forest and plantation ecosystems
Biodiversity and biogeography of insects and fungi

Publications (Researcher ID: C-4363-2008)

- [1] Fitza KN, **Garnas JR**, and Slippers B (2019). Fitness consequences of lineage interbreeding in the nematode *Deladenus siricidicola*, biological control agent of the European woodwasp, *Sirex noctilio*. *In prep.*
- [2] Wondafrash M, Slippers B, Hurley BP, and **Garnas JR** (2019). Local antagonism and resource partitioning among two invasive pine plantation pests. *Agricultural and Forest Entomology*, In press.
- [3] Asbjornsen H, Campbell JL, Damato AW, **Garnas JR**, Gunn JS, et al. (2019). Forest management options for addressing drought in the Midwest and Northeast U.S. In *Forests and Drought*. U.S. Forest Service, Washington, D.C. In press.
- [4] **Garnas JR**, Lombardero F, and Ayres M (2019). Population Dynamics. In J Allison and TD Paine, editors, *Forest Entomology*. Springer, New York, NY. In press.
- [5] Mutitu E, Hoareau T, Hurley BP, **Garnas JR**, Wingfield MJ, et al. (2019). Reconstructing routes of invasion of the Bronze bug *Thaumastocoris peregrinus* (Hemiptera: Thaumastocoridae). *Biological Invasions*, In press.
- [6] Queffelec J, Wooding A, Greeff J, **Garnas JR**, Hurley BP, et al. (2019). Potential mechanisms that influence sex ratio variation in the invasive Hymenopteran *Sirex noctilio* in South Africa. *Ecology and Evolution*, In press.
- [7] Fitza K, **Garnas JR**, Lombardero F, Ayres M, Ahumada R, et al. (2019). The global diversity of *Deladenus siricidicola* in native and non-native populations. *BioControl*, 132:57–65.
- [8] Burgess TI, Tan YP, **Garnas JR**, Edwards J, Scarlett KA, et al. (2018). Current status of the Botryosphaeriaceae in Australia. *Australasian Plant Pathology*, Available online at <https://doi.org/10.1007/s13313-018-0577-5>.
- [9] **Garnas JR** (2018). Rapid evolution of insects to global environmental change: Conceptual issues and empirical gaps (Invited review). *Current Opinions in Insect Science*, 29:93–101.
- [10] Burgess T, McDougall KL, Scott PS, Hardy G, and **Garnas JR** (2018). Predictors of *Phytophthora* diversity and community composition in natural areas across diverse Australian ecoregions. *Ecography*, 42:1–14.
- [11] Wondafrash M, Slippers B, **Garnas JR**, and Hurley BP (2017). Parasitoid assemblage associated with a North American pine weevil in South Africa. *Agricultural and Forest Entomology*, 20:208–216.
- [12] Burgess TI, White D, McDougall KM, **Garnas JR**, Dunstan WA, et al. (2017). Distribution and diversity of *Phytophthora* across Australia. *Pacific Conservation Biology*, 23:1–13. ISSN 1038-2097.
- [13] Mbenoun M, **Garnas JR**, Wingfield N, Boyogueno A, and Roux J (2017). Metacommunity analyses of Ceratocystidaceae fungi across heterogeneous African savanna landscapes. *Fungal Ecology*, 28:76–85.
- [14] Olivier-Espejel S, Hurley B, and **Garnas JR** (2017). Assessment of beetle diversity, community composition and potential threats to forestry using kairomone-baited traps. *Bull Entomol Res*, 1–12.
- [15] **Garnas JR**, Auger-Rozenberg MA, Roques A, Bertelsmeier C, Wingfield MJ, et al. (2016). Complex patterns of global spread in invasive insects: Eco-evolutionary and management consequences. *Biological Invasions*, 18(4):935–952.

- [16] Wondafrash M, Slippers B, **Garnas JR**, Roux G, Foit J, et al. (2016). Identification and genetic diversity of two invasive *Pissodes* spp. Germar (Coleoptera: Curculionidae) in their introduced range in the southern hemisphere. *Biological Invasions*, 18:2283–2297.
- [17] Fitza KN, Tabata M, Kanzaki N, Kimura K, **Garnas JR**, et al. (2016). Host specificity and diversity of *Amylostereum* associated with Japanese siricids. *Fungal Ecology*, 24:76–81.
- [18] Hui C, Richardson DM, Landi P, Minoarivelo HO, **Garnas JR**, et al. (2016). Defining invasiveness and invasibility in ecological networks. *Biological Invasions*, 18(4):971–983.
- [19] Hajek AE, Hurley BP, Kenis M, **Garnas JR**, Bush SJ, et al. (2016). Exotic biological control agents: a solution or contribution to arthropod invasions? *Biological Invasions*, 18(4):953–969.
- [20] Hill M, Bertelsmeier C, Clusella-Trullas S, **Garnas JR**, Robertson M, et al. (2016). Predicted decrease in global climate suitability masks regional complexity of invasive fruit fly species response to climate change. *Biological Invasions*, 18(4):883–891.
- [21] **Garnas JR**, Roux J, Hurley B, Slippers B, and Wingfield MJ (2016). Insects and Diseases of Mediterranean Forests: A South African Perspective. In T Paine and F Lieutier, editors, *Insects and Diseases of Mediterranean Forest Systems*, 397–430. Springer International Publishing.
- [22] Hurley BP, **Garnas JR**, Wingfield MJ, Branco M, Richardson DM, et al. (2016). Increasing numbers and intercontinental spread of invasive insects on eucalypts. *Biological Invasions*, 18(4):921–933.
- [23] Wingfield MJ, **Garnas JR**, Hajek A, Hurley BP, De Beer ZW, et al. (2016). Novel and co-evolved associations between insects and microorganisms as drivers of forest pestilence. *Biological Invasions*, 18(4):1045–1056.
- [24] Roques A, Auger-Rozenberg MA, Blackburn TM, **Garnas JR**, Pysek P, et al. (2016). Temporal and interspecific variation in rates of spread for insect species invading Europe during the last 200 years. *Biological Invasions*, 18(4):907–920.
- [25] Nadel RL, Wingfield MJ, Scholes MC, **Garnas JR**, Lawson SA, et al. (2015). Population dynamics of *Thaumastocoris peregrinus* in *Eucalyptus* plantations of South Africa. *Journal of Pest Science*, 88(1):97–106.
- [26] **Garnas JR**, Groden E, and Drummond FA (2014). Mechanisms of competitive displacement of native ant fauna by invading *Myrmica rubra* (Hymenoptera:Formicidae). *Environmental Entomology*, 43(6):1496–1506.
- [27] Hurley BP, **Garnas JR**, and Cooperbrand CMF (2014). Assessing trap and lure effectiveness for the monitoring of the European woodwasp, *Sirex noctilio*. *Agricultural and Forest Entomology*, 18:921–933.
- [28] Kemler M, **Garnas JR**, Wingfield MJ, Gryzenhout M, Pillay KA, et al. (2013). Ion Torrent PGM as tool for fungal community analysis: A case study of endophytes in *Eucalyptus grandis* reveals high taxonomic diversity. *PLoS ONE*, 8(12):e81718.
- [29] Lantschner MV, Villacide JM, **Garnas JR**, Croft P, Carnegie AJ, et al. (2013). Temperature explains variable spread rates of the invasive woodwasp *Sirex noctilio* in the Southern Hemisphere. *Biological Invasions*, 16(2):329–339.
- [30] Mutitu KE, **Garnas JR**, Hurley B, Wingfield MJ, Harney M, et al. (2013). Biology of *Cleruchoides noackae* (Hymenoptera:Mymaridae), a potential biological control agent for *Thaumastocoris peregrinus* (Hemiptera: Thaumastocoridae). *Journal of Economic Entomology*, 106(5):1979–1985.

- [31] Wooding AL, Wingfield MJ, Hurley BP, **Garnas JR**, de Groot P, et al. (2013). Lack of fidelity revealed in an insect-fungal mutualism after invasion. *Biology Letters*, 9(4):20130342.
- [32] **Garnas JR**, Houston DR, Twery MJ, Ayres MP, and Evans C (2013). Inferring controls on the epidemiology of beech bark disease from spatial patterning of disease organisms. *Agricultural and Forest Entomology*, 15(2):146–156.
- [33] Degefu D, Hurley BP, **Garnas JR**, Wingfield MJ, Ahumada R, et al. (2013). Parallel host range expansion in two unrelated cossid moths infesting *Eucalyptus nitens* on two continents. *Ecological Entomology*, 38(1):112–116.
- [34] Wingfield MJ, Roux J, Slippers B, Hurley BP, **Garnas JR**, et al. (2013). Established and new technologies reduce increasing pest and pathogen threats to Eucalypt plantations. *Forest Ecology and Management*, 301:35–42.
- [35] **Garnas JR**, Hurley BP, Slippers B, and Wingfield MJ (2012). Biological control of forest plantation pests in an interconnected world requires greater international focus. *International Journal of Pest Management*, 58(3):211–223.
- [36] McPhee K, **Garnas JR**, Drummond F, and Groden E (2012). Homopterans and an invasive red ant, *Myrmica rubra* (L.), in Maine. *Environmental Entomology*, 41(1):59–71.
- [37] **Garnas JR**, Houston DR, Ayres MP, and Evans C (2012). Disease ontogeny overshadows effects of climate and species interactions on population dynamics in a nonnative forest disease complex. *Ecography*, 35(5):412–421.
- [38] **Garnas JR**, Ayres M, Liebhold A, and Evans C (2011). Subcontinental impacts of an invasive tree disease on forest structure and dynamics. *Journal of Ecology*, 99:532–541.
- [39] Dukes JS, Pontius J, Orwig D, **Garnas JR**, Rodgers VL, et al. (2009). Responses of insect pests, pathogens, and invasive plant species to climate change in the forests of northeastern North America: What can we predict? *Canadian Journal of Forest Research*, 39(2):231–248.
- [40] **Garnas JR**, Groden E, and Drummond F (2007). Intercolony aggression within and among local populations of the invasive ant, *Myrmica rubra* (Hymenoptera: Formicidae), in coastal Maine. *Environmental Entomology*, 36(1):105–113.

Grants and funding

- 2018** Animal Plant Health and Inspection Service (APHIS), Farm Bill Suggestion, \$116,135. PI: Jeff Garnas, Co-PI: Dr. Juli Gould (APHIS). Patterns and consequences of complex interactions between ash tree size and resistance to Emerald ash borer and effects on parasitoids in the Northeast.
- 2018** Animal Plant Health and Inspection Service (APHIS), Farm Bill Suggestion, \$95,925. PI: Jeff Garnas, Co-PI: Dr. Juli Gould (APHIS). Examining the effects of Emerald Ash Borer density and tree condition on parasitism by the introduced biocontrol wasp, *Tetrastichus planipennis*.
- 2017-2019** USDA, McIntire-Stennis program, \$20,000 per year. Disease-associated bark communities and host resistance as drivers of beech bark disease in eastern North America.
- 2017-2019** US Forest Service, \$22,377. PI: Jeff Garnas, Evaluation of insects associated with southern pine beetle on Long Island.
- 2017** Animal Plant Health and Inspection Service (APHIS), Farm Bill Suggestion, \$88,321. PI: Jeff Garnas, Co-PI: Dr. Juli Gould (APHIS). Examining the effects of Emerald

Ash Borer density and tree condition on parasitism by the introduced biocontrol wasp, *Tetrashichus planipennisi*.

- 2016** Animal Plant Health and Inspection Service (APHIS), Cooperative Agreement, \$88,000. PI: Jeff Garnas, Co-PI: Dr. Juli Gould (APHIS). Title: Examining the effects of Emerald Ash Borer density and tree condition on parasitism by the introduced bio-control wasp, *Tetrashichus planipennisi*.
- 2016-19** National Research Foundation, South Africa, Rated Researcher Incentive Funding, ZAR40,000 (\$3000, renewed annually). Toward enhanced understanding and management of insect threats to South African trees.
- 2015-2016** Sabbatical and research funding for study in the Tom Whitham lab at Northern Arizona University, Flagstaff, AZ USA. Univ. of Pretoria Research Office and the Oppenheimer Memorial Trust, ZAR670 000.
- 2014-2015** Toward a population genomics approach to understanding the biology, movement and global spread of the red gum lerp psyllid (*Glycaspis brimblecombei*) and its primary endosymbiont (*Carsonella ruddii*). Genomics Research Institute (GRI), University of Pretoria, PI, ZAR62 000.
- 2013-2014** Biotic, abiotic and biogeographic determinants of endophyte diversity and community structure in *Senecio inaequidens* in its native and invasive range. Genomics Institutional Research Theme (IRT), PI, University of Pretoria, ZAR60 840.
- 2010-2013** Interactions among forest insect pests – evaluating the potential for synergism and antagonism in an increasingly complex community; University of Pretoria Research Development Programme (RDP), PI, ZAR150 000.
- 2011-2013** Understanding pest and pathogen threats to pine under expanding global cultivation; North Carolina State University-University of Pretoria Collaborative Seed Grant; PI, ZAR120 000.
- 2010-2012** Assessing synthetic pheromone lure effectiveness for the monitoring of *Sirex noctilio*; USDA-APHIS; Co-PI, US\$90 000.
- 2012-2013** The need, effectiveness, and potential success of biological control nematodes for *Sirex noctilio* in North America; Co-PI, US\$20 000.

Awards

National Research Foundation (NRF) Y-rated scientist (established young researcher)

Edith Patch Award for Excellence in Entomology, 2005

Maine Alumni Travel Grant for study at Harvard Museum of Comparative Zoology, 2005

Conference papers (selected)

The importance of molecular characterization of co-invasion by microbial symbionts in invasive arthropod populations. Entomological Society of America, 2018, Vancouver, Canada. *Invited*

Understanding the ecology and evolution of forest insects in an interconnected world. Presentation, 16th International Symposium on Insect-Plant Relationships, 2017. Tours, France.

Biotic and abiotic drivers of variation in size and sex ratio in *Sirex noctilio* F. Presentation, USDA Interagency Research Forum on Invasive Species (IRFIS), 2016. Annapolis, MD, *Invited*

Novel interactions and complex feedbacks: Forests, insects and microbes in a changing world. Witwatersrand University, 2015, Johannesburg, South Africa. *Invited*

- Impacts of insect host diversity, tree species and temperature on parasitism of the Eucalyptus snout beetle (*Gonipterus* spp.) by *Anaphes nitens*. International Union of Forest Research Organizations (IUFRO), 2014, Salt Lake City, UT
- Population genetics studies reveal complex patterns of global movement of pests and pathogens in *Pinus* and *Eucalyptus* plantations. IUFRO 2014, Salt Lake City, UT
- A genomics approach to understanding global spread in the red gum lerp psyllid, *Glycaspis brimblecombei*, Arthropod Genomics Symposium, 2014, Urbana, IL (poster)
- Babies, bathwater and barcoding: assessing the prevalence and consequences of pseudogenes in molecular-based studies of insect diversity, Entomological Society of Southern Africa, 2013, Potchefstroom, South Africa
- Biotic and abiotic determinants of resource quality for the European woodwasp, *Sirex noctilio*, Gordon Research Conference on Plant-Herbivore Interactions, 2013, Ventura, CA (poster)
- Predicting forest pest abundance and distribution in a changing climate: an African perspective, International Union of Forest Research Organizations (IUFRO)-FORNESA Joint Conference, 2012, Nairobi, Kenya
- Predicting and understanding forest insect dynamics changing climate: an African perspective Climate Change and Plantation Health, 2012, Council for Scientific and Industrial Research (CSIR), 2012, Durban, South Africa, Invited
- Cryptic diversity in the Eucalyptus snout beetle swarms that of its biocontrol agent, *Anaphes nitens*, in South Africa. Ecological Society of America Annual Meeting, 2011, Austin, TX
- Origin and diversity of the wood-boring moth, *Coryphodema tristis*, newly associated with *Eucalyptus nitens* in South Africa, IUFRO, 2011, Colonia del Sacramento, Uruguay
- Assessing the consequences of cryptic diversity in a tree pest-biocontrol system: the Eucalyptus snout beetle and its myrmecid parasitoid in South Africa, Entomological Society of Southern Africa, 2011, Bloemfontein, South Africa
- Native and introduced insects as a threat to South African forestry, Institute for Commercial Forest Research (ICFR), Forest Science Symposium, 2010, ICFR, Pietermaritzburg, South Africa
- The shape of forest pestilence – population dynamics of the beech scale and associated *Neonectria* species. Poster, USDA Interagency Research Forum on Invasive Species, 2009. Annapolis, MD
- Spatial dispersion in agents of forest disease: beech bark disease-associated organisms in space and time. Presentation, International Congress of Entomology, 2008. Durban, South Africa
- Modeling the influence of beech bark disease on root sprout regeneration in hardwood forests of northeastern North America. Poster, North American Forest Insect Work Conference (NAFWIC), 2007. Asheville, NC
- The dynamics of eastern hardwood forests with and without beech bark disease. Presentation, USDA Interagency Research Forum on Invasive Species (IRFIS), 2007. Annapolis, MD, Invited

Professional membership and activity

- International Union of Forest Research Organizations (IUFRO)
- Ecological Society of America (ESA)
- Entomology Society of America (EntSoc)
- Entomological Society of Southern Africa (ESSA)
- Society for the Study of Evolution (SSE)
- Southern Africa Association for the Advancement of Science (S2A3)

Teaching experience

Lecturing, course design

Applied evolution in managed systems (graduate seminar) – 2019
Forest Health (Advanced undergraduate/graduate course) – 2016 (annual)
Forest Entomology (Advanced undergraduate) – 2017 (bi-annual)
Population Ecology (3rd year course, shared) – 2010 to 2016 (annual)
Plant-Insect Interactions (Honors [4th year] course) – 2010 to 2016 (annual)
Using R for graphics and statistical analysis (1-2 day workshop, June 2012, 2016)

Teaching Assistantships (Dartmouth College, University of Maine)

Tropical and Marine Ecology, Foreign Studies Program in Costa Rica/Little Cayman, 2008
Ecology and Evolution, 2006 and 2007
Biostatistics, 2006
Introduction to Environmental Science, 2006
Physiological Ecology, 2005
Biology of Organisms, 2003 and 2004

Invited Departmental Seminars

University of Maine, Department of Ecology and Evolution, 2018
University of Vermont, Rubenstein School of Environment and Natural Resources, 2017
University of New Hampshire, Department of Biological Sciences, 2017
Northern Arizona University, Department of Biology, 2015
University of the Witwatersrand, Animal, Plant and Environmental Sciences, 2014

Service to discipline

Regular reviewer for at least 10 journals, including Scientific Reports, PNAS, TREE, Journal of Ecology, Environmental Entomology, PlosOne, Biological Invasions, etc. (approx. 15 per year)
Symposium co-organizer, XXV IUFRO Congress; Biodiversity, Ecosystem Services and Biological Invasions Section, Curcubita, Brazil, 2019

Laboratory, field and other relevant skills

General molecular biology laboratory techniques, population and phylogenetic analyses
Fungal isolation, culturing and identification
Plant and insect identification; expertise with ant and scolytid (beetle) taxa of North America
Expertise in standard forestry sampling and mensuration techniques, numerous and varied ecological sampling methods across habitats, and experimental design and analysis
Statistical and population modeling in R and MATLAB

Computer skills

Strong general skills in Windows, Mac and Linux environments
Statistics and modeling, primarily in R (also MATLAB, Systat, SAS, JMP, Excel, etc.)
Facility with numerous phylogenetic programs and bioinformatics pipelines
Mapping and spatial analysis in R and GIS
Database programming and maintenance using MS Access and MySQL
Basic programming in Python and Perl, working knowledge of C++ and VBA

Extension and service

Classroom and field lecturer, Silviculture Institute, UNH Extension, 2017 (ongoing)

Field day presentations on tree pests and diseases for local foresters and growers (2-3 per year)

Core contributing member, National Sirex Control Programme, South Africa, 2010-2016

Management team, Tree Protection Cooperative Programme (TPCP), South Africa, 2010-2016

Management team, Center of Excellence for Tree Health Biotechnology, South Africa, 2010-2016

Languages

Strong communication skills in native English

Verbal and written fluency in Spanish