

# MAREK L. BOROWIEC

petiolus[at]gmail.com

Arizona State University ◊ Tempe, AZ 85281, USA

website: [phylohacks.com](http://phylohacks.com)

## EDUCATION

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### Arizona State University, Tempe, AZ

2016-Present

Postdoc

Genomics of speciation and evolution of social parasitism in *Formica* ants

Advisor: Christian Rabeling

### University of California, Davis, CA

2010-2016

Ph.D. in Entomology

Dissertation: Systematic and phylogenomic studies on the ant subfamily Dorylinae, and a phylogenetic investigation of early branching lineages of ants (Hymenoptera: Formicidae)

Advisor: Philip S. Ward

### University of Wrocław, Poland

2007-2009

M.Sc. in Zoology

Thesis: Taxonomy of the *Cerapachys sexspinus* species-group

Advisor: Wanda Wesolowska

### University of Wrocław, Poland

2005-2007

B.Sc. in Biological Sciences/Zoology

## PUBLICATIONS

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### Submitted

- **Borowiec M.L.**, Rabeling C., Brady S.G., Fisher B.L., Schultz T.R., Ward P.S. 2017. Compositional heterogeneity and outgroup choice influence the internal phylogeny of the ants. *bioRxiv* DOI: 10.1101/173393 [Submitted for initial consideration to *Molecular Phylogenetics and Evolution*].
- **Borowiec M.L.** 2017. Convergent evolution of the army ant syndrome and congruence in big-data phylogenetics. *bioRxiv* DOI: 10.1101/134064 [Submitted for initial consideration to *Current Biology*].

### Published

- Kjer K., **Borowiec M.L.**, Frandsen P., Ware J., Wiegmann B.M. 2016. Advances using molecular data in insect systematics. *Current Opinion in Insect Science*, 18: 40-47.
- **Borowiec M.L.** 2016. Generic revision of the ant subfamily Dorylinae (Hymenoptera, Formicidae). *ZooKeys*, 608: 1-280.
- **Borowiec M.L.** 2016. AMAS: A fast tool for alignment manipulation and computing of summary statistics. *PeerJ*, 4:e1660.
- **Borowiec M.L.**, Lee E.K., Chiu J.C., Plachetzki D.C. 2015. Extracting phylogenetic signal and accounting for bias in whole-genome data sets supports the Ctenophora as sister to remaining Metazoa. *BMC Genomics*, 16(1):987.
- **Borowiec M.L.**, Kimsey, L.S. 2015. The first host record for the wasp subfamily Brachycistidinae (Hymenoptera: Tiphidae). *Proceedings of the Entomological Society of Washington*, 117(1): 62-64.
- Snelling R.S., **Borowiec M.L.**, Prebus M.M. 2014. Studies on California ants: new species in the genus *Temnothorax* Mayr (Hymenoptera: Formicidae). *ZooKeys*, 372: 27-89.

- Johnson B.R., **Borowiec M.L.**, Chiu J.C., Lee E.K., Atallah J., Ward P.S. 2013. Phylogenomics resolves evolutionary relationships among ants, bees, and wasps. *Current Biology*, 23: 2058-2062.
- **Borowiec M.L.**, Borowiec L. 2013. New data on the occurrence of ants (Hymenoptera: Formicidae) in Lower Silesia and other regions of Poland [in Polish with English summary] *Wiadomości Entomologiczne*, 32: 49-57.
- **Borowiec M.L.** 2013. Two species of myrmecophilous Diapriidae (Hymenoptera) new to Poland. *Wiadomości Entomologiczne*, 32: 42-48.
- **Borowiec M.L.**, Wiśniowski B., Żyła W. 2012. *Xenos vesparum* Rossius, 1793 - a strepsipteron new to Poland (Strepsiptera: Xenidae) *Acta Musei Moraviae, Scientiae Biologicae*, 97: 7-12.
- **Borowiec M.L.** 2012. New record of *Elenchus tenuicornis* (Kirby, 1815) (Strepsiptera: Elenchidae) in Poland [in Polish] *Wiadomości Entomologiczne*, 31: 210.
- Seltmann K.C., Yoder M.J., Mikó I., Forshage M., Bertone M.A., Agosti D., Austin A.D., Balhoff J.P., **Borowiec M.L.**, Brady S.G., Broad G.R., Brothers D.J., Burks R.A., Buffington M.L., Campbel H.M., Dew K.J., Ernst A.F., Fernández-Triana J.L., Gates M.W., Gibson G.A.P., Jennings J.T., Johnson N.F., Karlsson D., Kawada R., Krogmann L., Kula R.R., Mullins P.L., Ohl M., Rasmussen C., Ronquist F., Schulmeister S., Sharkey M.J., Talamas E., Tucker E., Vilhelmsen L., Ward P.S., Wharton R.A., Deans A.R. 2012. A hymenopterists' guide to the Hymenoptera Anatomy Ontology: utility, clarification, and future directions. *Journal of Hymenoptera Research*, 27: 67-88.
- Wetterer J.K., Kronauer D.J.C., **Borowiec M.L.** 2012. Worldwide spread of *Cerapachys biroi* (Hymenoptera: Formicidae: Cerapachyinae). *Myrmecological News*, 17: 1-4.
- **Borowiec M.L.**, Longino J.T. 2011. Three new species and reassessment of the rare Neotropical ant genus *Leptanilloides* (Hymenoptera, Formicidae, Leptanilloidinae). *ZooKeys*, 133: 19-48.
- **Borowiec M.L.**, Schulz A., Alpert G.D., Baňář P. 2011. Discovery of the worker caste and description of two new species of *Anomalomyrma* (Hymenoptera: Formicidae: Leptanillinae) with unique abdominal morphology. *Zootaxa*, 2810: 1-14.
- **Borowiec M.L.** 2011. First record of *Lasius sabularum* (Bondroit, 1918) (Hymenoptera: Formicidae) in Poland. *Myrmecological News*, 14: 137-140.
- **Borowiec M.L.**, Ruta R., Kubisz D. 2010. New records of *Claviger longicornis* Müller, 1818 and *C. testaceus* Preysslner, 1790 (Coleoptera: Staphylinidae: Pselaphinae) in Poland with review of their habits. *Polish Journal of Entomology*, 79: 261-269.
- **Borowiec M.L.** 2009. New data on the occurrence of formicoxenine ants (Hymenoptera: Formicidae) in Poland. *Wiadomości Entomologiczne*, 28: 237-246. [in Polish with English summary]
- **Borowiec M.L.** 2009. New records of the ant *Camponotus truncatus* (Spinola, 1808) (Hymenoptera: Formicidae) in Wrocław and its surroundings. *Wiadomości Entomologiczne*, 28: 200. [in Polish]
- **Borowiec M.L.**, Borowiec L., Csósz S., Radchenko A. 2009. Ants (Hymenoptera: Formicidae) collected during 2006 Polish expedition to Kyrgyzstan. *Genus*, 20: 367-379.
- **Borowiec M.L.** 2009. New ant species related to *Cerapachys sexspinus* and discussion of the status of *Yunodorylus* (Hymenoptera: Formicidae). *Zootaxa*, 2069: 43-58.
- **Borowiec M.L.** 2007. A third species of *Mayriella* from the Oriental Region (Hymenoptera: Formicidae). *Genus*, 18: 773-776.
- **Borowiec M.L.** 2007. A new species of *Tyrannomyrmex* (Hymenoptera: Formicidae: Myrmicinae) from India. *Zootaxa*, 1642: 65-68.
- **Borowiec M.L.** 2007. *Camponotus truncatus* (Spinola, 1808) (Hymenoptera: Formicidae) - ant species new to Poland. *Polish Journal of Entomology*, 76: 41-45.
- **Borowiec M.L.** 2007. Second record of the ant *Leptothorax kutteri* Buschinger, 1966 (Hymenoptera: Formicidae) in Poland. *Przegląd Zoologiczny*, 50: 37-40. [in Polish]

- Stankiewicz A.M., Sielezniew M., **Borowiec M.L.**, Czechowski W. 2005. *Formica uralensis* Ruzsky (Hymenoptera: Formicidae) in Poland. *Fragmenta Faunistica*, 48: 175-180.

## ABSTRACTS AND PRESENTATIONS

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- **Borowiec M.L.**, Rabeling C. 2017. Phylogenomics of *Formica* ants reveals complex evolution of socially parasitic life histories. Evolution meeting, Portland, USA. Poster presentation.
- **Borowiec M.L.** 2016. Resolving Dorylinae: promises and pitfalls of phylogenomics. International Congress of Entomology, Orlando, USA. Oral presentation.
- **Borowiec M.L.** 2016. AMAS: a fast tool for alignment manipulation and computing of summary statistics. Evolution meeting, Austin, USA. Poster presentation.
- **Borowiec M.L.** 2016. Phylogenies of rapid radiations can be extremely prone to bias: a cautionary tale from army ants. Evolution meeting, Austin, USA. Oral presentation.
- **Borowiec M.L.** 2015. Phylogenomics of an ancient rapid radiation: inferring the evolution of doryline ants. ESA Annual Meeting 2015, Minneapolis, USA. Oral presentation.
- **Borowiec M.L.**, Boudinot B.E., Prebus M.M. 2014. Phylogenetic placement of the ant *Lasius atopus* with implications for the evolution and subgeneric classification of the genus. ESA Annual Meeting 2014, Portland, USA. Poster presentation.
- **Borowiec M.L.** 2011. Generic revision of dorylomorph ants. ESA Annual Meeting 2011, Reno, USA. Oral presentation.
- Janda M., **Borowiec M.L.**, Economo, E.P. 2010. The structure of biodiversity in the melanesian ant fauna: scaling up from populations to continents. IUSSI 2010, Copenhagen, Denmark. Oral presentation.
- Janda, M., **Borowiec M.L.** 2009. Where the wild things are: diversity and biogeography of Melanesian ant communities. Central European Workshop of Myrmecology and IUSSI 2009, Fraueninsel, Germany. Oral presentation.
- **Borowiec M.L.**, Janda M. 2007. Regenwälder von Neuguinea - ein Blick auf die Ameisenfauna eines fernen Landes. Internationale Tagung zum Schutz Hängel bauender Waldameisen, 2007, Zittau, Germany. Oral presentation.
- Janda M., Klimeš P., **Borowiec M.L.** 2007. Ecology of New Guinea ants (Hymenoptera: Formicidae) - exploring an unknown fauna. Central European Workshop of Myrmecology, 2007, Szeged, Hungary. Oral presentation. [Abstract published in: Myrmecological News, 10: 109.]

## GRANTS AND AWARDS

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### Research grants

Standard Research Grant from <b>Mazamas</b> , 2017	\$975
Microsoft Azure Research Award from <b>Microsoft</b> , 2015	\$20,000
Doctoral Dissertation Improvement Grant from <b>National Science Foundation</b> , 2014	\$19,932
Henry A. Jastro Awards from the Dept. of Entomology, <b>UC Davis</b> , 2011, 2012, and 2013	\$5,900
Young Explorers Grant from <b>National Geographic Society</b> , 2012	\$5,000
SYNTHESYS grant from the <b>Natural History Museum, Paris</b> , 2010	2-week visit to Paris
SYNTHESYS grant from the <b>Natural History Museum, London</b> , 2010	2-week visit to London
Ernst Mayr Travel Grants from <b>Harvard University</b> , 2008, 2009, and 2010	\$2,700

### Awards

- Systematics, Evolution, and Biodiversity Award from the **PBESA**, 2017
- George C. Eickwort Student Research Award from the **IUSSI**, 2016
- Scholarship for outstanding academic performance from the **Polish Ministry of Education**, 2008

## COMPUTING SKILLS

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<b>Languages</b>	Python, R, Bash, SQL, Perl (basics), C++ (basics); L <sup>A</sup> T <sub>E</sub> X, HTML
<b>Software</b>	Variety of tools for sequence processing, alignment, and phylogenetic inference: Sequencher, mafft, muscle, PartitionFinder, RAxML, IQ-TREE, MrBayes, RevBayes, BUCKy, BEAST, ASTRAL, ASTRID, BioGeoBEARS, BMM, Phyloce pipeline, and other. Adobe Photoshop and Illustrator, standard office suite software.
<b>Other skills</b>	Version control using Git, working on remote computers.

## LABORATORY TECHNICAL EXPERTISE

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- DNA extraction and amplification
- RNA isolation
- Next-generation DNA and RNA library preparation
- Target enrichment
- Optical and Scanning Electron Microscopy
- Curation of natural history collections

## RESEARCH EXPERIENCE

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**Doctoral Research** September 2010 - June 2016

- Applied molecular phylogenetic methods to the inference of the evolution of ants and other organisms
- Worked on a monographic treatment of doryline ants, including revision of taxonomy and classification, identification keys, and a review of their biology
- Performed a phylogenomic investigation of doryline ants using Ultraconserved Elements

**Masters Research** September 2007 - June 2009

- Designed and conducted a taxonomic revision of a Southeast Asian group of ants, including specimen imaging, development of a dichotomous key, and new species descriptions

**Research Assistant/Volunteer** August 2006 - June 2009

*Project: Diversity, biogeography, and ecology of ants of Papua New Guinea* *PI: Milan Janda*

- My responsibilities included sorting, identification, curation, and databasing of specimens collected in New Guinea

**Research Assistant** May - June 2003

*Project: Role of plumage contrast in foraging of the Painted Redstart* *PI: Piotr Jabłoński*

- Collected data on behavior and diet of birds at the Southwestern Research Station, Portal, AZ, USA

## TEACHING EXPERIENCE

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### Instructor

- **Basic Computing for Biologists** UC Davis, Spring 2015  
Designed the course and taught basics of command line interface, regular expressions, and Python programming.  
[Course materials website](#)

**Teaching Assistant**

- **Introduction to Biology: Biodiversity and the Tree of Life**, UC Davis, 2013 & 2016.  
Taught laboratory section of the class, including introductions to the relevant material and assistance with lab activities. Lower division class.
- **Insect Taxonomy and Field Ecology**, UC Davis, 2012 & 2014.  
Assisted in teaching this intensive field course on morphology, diversity, identification, and ecology of insects. Upper division class.
- **California Insect Diversity**, UC Davis, 2011 & 2015.  
Assisted in teaching field collecting methods, morphology, family-level identification of California insects, and specimen curation techniques; helped update course curriculum. Upper division class.

**PROFESSIONAL DEVELOPMENT**

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**Workshops (research)**

- **Advanced Beginner Python**, UC Davis, April 2016.  
Python modules, code organization, argparse, testing strategies and tools including code coverage, using virtualenv (half day).
- **Ultraconserved Elements (UCEs) as Phylogenomic Markers**, UC Davis, September 2014.  
Genomic DNA library preparation, molecular probe enrichment techniques. and quality control. UCE sequence data analysis (one week).
- **Phylogenetic Analysis Using RevBayes**, NESCent, August 2014.  
Bayesian analysis in a phylogenetic context, using R-like environment of RevBayes. Theory and practice of tree inference, divergence dating, and comparative methods (one week).
- **Online Catalog and Bibliography of Ant Systematics (AntCat) Workshop**, Corte Madera, August 2013.  
A collaborative effort to develop an online, community-based resource for the taxonomy of ants of the world with references (two days).
- **Next-Generation Sequencing for Phylogenetics and Phylogeography**, NESCent, June 2013.  
Handling large data sets obtained using recent sequencing methods, phylogenomics, species tree inference, molecular species delimitation (one week).
- **Software Carpentry**, UC Davis, May 2013.  
Introduction to shell, version control, Python scripting (two days).
- **Bodega Bay Applied Phylogenetics**, UC Davis/Bodega Marine Laboratory, March 2013.  
Theory and practice of a variety of methods in phylogenetic inference, including character evolution, divergence time estimation, correlated trait evolution, and diversification (one week).
- **Symposium and Workshop on New Methods for Phylogenomics and Metagenomics**, UT Austin, February 2013.  
Theory and practice of recently developed methods in phylogenetic inference, focusing on large/phylogenomic data sets (two days).
- **Galaxy Workshop**, UC Berkeley, November 2012.  
Tutorials on the use of Galaxy, a tool-kit for next-generation sequencing data analysis (one day).
- **Workshop to Forward Development of the Hymenoptera Anatomy Ontology**, NCSU, October 2010.  
Contribution to the project of bringing all morphological terminology pertaining to hymenopterous insects under one interactive web portal (five days).
- **Ant Course**, Southwestern Research Station in Portal, AZ, August 2009.  
Practical training in ant systematics, methods of field ecology, identification, and specimen curation (ten days).

**Workshops (teaching)**

- **Series on “Learner-Centered Teaching”**, Center for Excellence in Teaching and Learning, UC Davis, August-September 2013

A series of weekly workshops on teaching strategies to maximize student learning. Completed with a certificate.

**ACADEMIC SERVICE**

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**Peer-review for the following journals:**

*Acta Entomologica Musei Nationalis Pragae, Acta Entomologica Silesiana, Asian Myrmecology, Biodiversity Data Journal, European Journal of Taxonomy, The Canadian Entomologist, Genus–International Journal of Invertebrate Taxonomy, Insect Systematics and Evolution, Journal of the Entomological Research Society, Journal of Hymenoptera Research, Journal of Natural History, Journal of Zoological Systematics and Evolutionary Research, Myrmecological News, Nature Journal-Opole Scientific Society, North-Western Journal of Zoology, PeerJ, PLoS ONE, Proceedings of the Royal Society B, Przegląd Zoologiczny, Sociobiology, Systematic Entomology, Wiadomości Entomologiczne, ZooKeys, Zootaxa.*

**Editorial board membership:**

*Biodiversity Data Journal* since 2013 (subject editor for Formicidae, other Hymenoptera), *ZooKeys* since 2013 (subject editor for Formicidae), *Polish Journal of Entomology* 2006–2010 (language editor), *Genus–International Journal of Invertebrate Taxonomy* 2006-2015 (language editor).

**Contributions to online resources and databases:**

[Hymenoptera Anatomy Ontology](#), [AntWiki](#), [Navajo Ant Project](#), [Ants of New Guinea](#), [AntCat](#).

AntCat is a taxonomic catalog of the ants of the world that serves ant biologists worldwide, by providing references on the taxonomy, evolution, and comparative biology of ants. I have been the main person responsible for reference updates in the 2010-2014 period and was involved in the development of the interface.

**PROFESSIONAL SOCIETY AFFILIATIONS**

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Society of Systematic Biologists  
 International Society of Hymenopterists  
 International Union for the Study of Social Insects  
 Entomological Society of America