

CURRICULUM VITAE
NICHOLAS C. MANOUKIS

CONTACT INFORMATION

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EDUCATION

PhD University of California, Los Angeles (Los Angeles, CA). Ecology and Evolutionary Biology. Dec 2006
BA Reed College (Portland, OR). Biology. Jan 1997

POSITIONS HELD

Agricultural Research Service (USDA)

2016 – pres. **Supervisory Res. Biologist/ Research Leader (GS-14)** Provide research and administrative leadership to the Tropical Crop and Commodity Protection Research Unit, comprised of seven scientists and staff. Manage unit budget and act as a research liaison state, federal, university and other stakeholders. Conduct personal research on Tephritid fruit fly and other invasive pest biology and control.

2010 – 2016 **Research Biologist (GS-12, GS-13)** Designed and implemented a research program on Tephritid fruit fly biology and control. Planned and executed research, supervised up to six employees and published impactful research results.

National Institutes of Health (NIH)

2007 – 2010 **Post-doctoral Fellow** Researched *An. gambiae* ecology and evolution in the laboratory of Dr. José M.C. Ribeiro. Focused on mosquito sexual behavior and dry season ecology.

University of California, Los Angeles (UCLA)

2001 – 2006 **Graduate Student Researcher** Conducted research under the supervision of Dr. Charles E. Taylor in mosquito ecology, evolution and malaria epidemiology.

2003 – 2004 **Systems and Integrative Biology Fellow** Awarded NIH-funded fellowship to pursue courses in mathematical modeling and theory.

Long Beach Unified School District

1998 – 2000 **Teacher** Provided instruction on all subject areas to Fifth graders who were English language learners (Garfield Elementary, Long Beach Unified School District).

University of Southern California

1997 – 1998 **Laboratory Assistant** Prepared laboratories for introductory Life Science course.

Reed College

1995 – 1997 **Head Lab Assistant** Maintained an amphibian colony, aided with experiments and assisted with training in the laboratory of Dr. Robert H. Kaplan.

GRANTS, AWARDS, AND MEMBERSHIPS

2016-2018 Awarded \$140,000 ARS Administrator's Research Associate to support modeling (class of 2016)

2016-2017 Received \$110,000 to support postdoctoral researcher to implement Coffee Berry Borer Area-Wide Research

2016-2018 Cooperator on \$170,000 Farm Bill section 10007 project to model Medfly risk in continental US

2014-2015 Awarded \$80,000 USDA grant to create GIS-based spatial model of Coffee Berry Borer on Hawaii Island

2013-2015 Co-PI on \$230,000 USDA-APHIS grant to support continuing work with Agent Based Simulation, 2012-2014

2013-2014 Awarded \$13,000 contract to model increased efficiency trapping networks and parametrize model with field work by IAEA/FAO

2012–present Hawaiian Entomological Society, member

2011–present Entomological Society of America, member

2001–present American Association for the Advancement of Science, member

2003–2004 Recipient of Systems and Integrative Biology Training Grant (NIH)

2000–2001 Recipient of California Genetic Resources Conservation Program Grant

1995 Recipient of Reed College Independent Fieldwork Grant

INVITATIONS, APPOINTMENTS, AND PROFESSIONAL SERVICE

Nominated and selected to be a member of International Atomic Energy Agency/Food and Agriculture (IAEA/FAO) International Fruit Fly Steering Committee (2018-present).

Affiliate Faculty, Tropical Conservation Biology and Environmental Studies Program at the University of Hawaii, Hilo.

Editorial board member, *Journal of Insect Behavior* (2018-present)

Editorial board member (Ecology and Evolution) *Scientific Reports* (2015-2017).

Member of Technical Advisory Group on tephritid trapping (New Zealand Fruit Fly Council; 2017-2018)

Member of the Entomological Society of America Diversity and Inclusion Committee (2015-2017)

Invited to National Taiwan University as featured speaker on trapping tephritids, Taipei, November 2016 (funding provided by host).

Participant in International Atomic Energy Agency Research Coordination Meeting (RCM) on Male mosquito biology and behavior in Petrolina, Brazil, March 2013 (funding provided by host).

Invited to participate in Degree-day modeling workshop at USDA-APHIS, Raleigh, NC, March 2011 (funding provided by host).

Invited to present “Adaption and diversification in *Anopheles gambiae*, and their implications for malaria transmission”, special seminar at the Smithsonian National Zoo, Washington, DC, 2009.

Presented “Population size and migratory patterns of *Anopheles gambiae* in the Bancoumana region of Mali and their significance for efficient vector control.” at the Fundação Luso-Americana (FLAD) Workshop on Malaria, Lisbon, Portugal, July 2009 (funding provided by host).

California State Science Fair Judge (1998–2002)

Reviewer for *Theoretical Population Biology*, *J. of Economic Entomology*, *Acta Tropica*, *J. of Vector Ecology* *PLoS Neglected Tropical Diseases*, *Entomologia Experimentalis et Applicata*, *Insects*, *J. of the American Mosquito Control Association*, *Physiological Entomology*, *Bioinformatics*, *J. of Asia-Pacific Entomology*, *PLoS ONE*, *Conservation Genetics Resources* and *Arthropod-Plant Interactions*.

TEACHING EXPERIENCE

Spring 2013 Taught a graduate-level class titled “Computer Modeling and Simulation” in the Tropical Conservation, Biology and Environmental Science Department of the University of Hawaii, Hilo.

Fall 2012 Co-instructor of a one week bioinformatics workshop at University of Hawaii, Hilo.

Fall 2009 Taught a course titled “Introduction to Dynamic Biological System Modeling” in the Mathematics department of the Foundation for Advanced Education in the Sciences, National Institutes of Health, Bethesda Maryland.

2000-2005 Teaching assistant for various courses, including Introductory Biology, Evolutionary

Biology and Biological Computation in the Organismic Biology, Ecology and Evolution Department at University of California, Los Angeles

- 1998–2000 Fifth grade teacher at Garfield Elementary, Long Beach Unified School District, Long Beach, California.
- 1995 – 1997 Student teacher and first coordinator of Reed College Biology Outreach Program, Portland Oregon.
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FIELD AND LABORATORY WORK

- Managing ecological surveys on the invasive Coffee Berry Borer (*Hypothenemus hampei*) on Hawaii Island (2016 – 2017).
 - Led Mark-Release-Recapture experiments with fruit flies in Hawaii Island in tropical coastal areas and arid lava flats (2011 – 2016)
 - Conducted field work in Bamako and Niono, Mali (2002 – 2010)
 - Proficient in population genetic molecular lab technique
 - Completed a demographic survey of threespine sticklebacks (*Gasterosteus aculeatus*) in Reed Canyon (1995)
 - Conducted survey of the nectivorous bat *Glossophaga soricina* in Rio de Janeiro, Brazil (1992)
 - Fluent in Portuguese; Proficient in French and Spanish
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COMPUTATION EXPERIENCE

- UNIX and GNU/Linux operating systems. Proficient programmer in Java, Python and R
 - Agent-based and matrix modeling
 - Computer Vision (CV)
 - High Performance Computing (HPC) system design and administration. Currently manage HPC cluster moana (<http://moana.dnsalias.org>)
 - Data and metadata archiving and curation (metacat, morpho)
 - GIS and spatial modeling
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SELECTED PRESENTATIONS

[1] N. C. Manoukis. Climate and Mediterranean Fruit Fly Invasion Persistence: Insights from Agent-Based Simulations. Oral Presentation at Third FAO-IAEA International Conference on Area-wide Management of Insect Pests: Integrating the Sterile Insect and Related Nuclear and Other Techniques, Vienna, Austria, 2017

[2] N. C. Manoukis, B. Hall and S. M. Geib. A Computer Model of Attractant-Based Fruit Fly Traps and its Utility for Optimizing Trapping Networks. Poster Presentation at 9th International Symposium

on Fruit Flies of Economic Importance, Bangkok, Thailand 2014.

[3] N. C. Manoukis. Effect of host *Bactrocera dorsalis* fruit fly sex on the parasitoid *Fopius arisanus*. Poster Presentation given at the Entomology 2013, Annual meeting of the Entomological Society of America, Austin TX.

[4] N. C. Manoukis. An Agent-Based Simulation of Tephritid Fruit Flies: Time to Extirpation of *Ceratitidis capitata*. Oral Presentation given at the 8th Meeting of the Tephritid Workers of the Western Hemisphere, Panama City, Panama 2012.

[5] N. C. Manoukis, S. Butail, D. A. Paley, A. S. Yaro, M. Diallo, S. F. Traoré, A. Dao, T. Lehmann and J. M. C. Ribeiro. Quantifying and analyzing the mosquito dance in mating swarms. Oral presentation given at the 2011 Entomological Society of America Pacific Branch Meeting, Waikaloa HI 2011.

[6] N. C. Manoukis, Y. Lee and C. E. Taylor. Detecting recurrent extinction in a metapopulation of *Anopheles gambiae*. Oral presentation given at the California Population and Evolutionary Genetics Group (CalPEG), San Diego CA, 2004

[7] N. C. Manoukis, M. A. Diuk-Wasser, M. B. Touré, G. Dolo, S. F. Traoré and C. E. Taylor. Malaria transmission and intraspecific competition in *Anopheles gambiae* at an irrigation project in Mali. Oral presentation given at 53th Annual Meeting of the American Society of Tropical Medicine and Hygiene, Miami FL, 2004

[8] N. C. Manoukis and C. E. Taylor. Effective Population Size of *Anopheles gambiae* s.s. in Mali: Some Implications for Malaria Control Through Genetically Modified Vectors. Oral presentation given at the Molecular and Population Biology of Mosquitoes Workshop (EMBO), Kolymbari, Greece, 2003

TECHNICAL PAPERS

N. C. Manoukis. Description of a method for localizing swarming mosquitoes and other insects in 3d space with visualizations. Available from Nature Precedings, December 2008.

N. C. Manoukis and E. C. Anderson. Guiliner: A configurable and extensible graphical user interface for scientific analysis and simulation software. arXiv:0806.0314v1 [cs.HC], June 2008.

N. C. Manoukis and D. K. Jacobs. Conservation of the California tree frog, *Hyla cadaverina*, from desert oasis areas in Joshua Tree National Park. Technical report, Genetic Resources Conservation Program, U.C. Davis, 2001.

BOOKS AND BOOK CHAPTERS

R. I. Vargas and J. C. Pinero and L. Leblanc and **N. C. Manoukis** and R. F. L. Mau. Area-Wide Management of Fruit Flies in Hawaii *In: Fruit Fly Research and Development in Africa - Towards a Sustainable Management Strategy to Improve Horticulture*, S. Ekesi, S. Mohamed, and M. Meyer, Editors, Springer International, Switzerland, 2016.

H. J. Barclay, W. Enkerlin, J. Reyes-Flores and **N. C. Manoukis**. Guidelines for the Use of Mathematics in Operational Area-Wide Integrated Pest Management Programmes Using the Sterile Insect Technique with a Special Focus on Tephritid Fruit Flies IAEA, Vienna, Austria, 2013.

C. E. Taylor and **N. C. Manoukis**. Effective Population Size in Relation to Genetic Modification of *Anopheles gambiae* s.s. *In: Ecological Aspects for Application of Genetically Modified Mosquitoes*, W. Takken and TW Scott, Editors, Kluwer Dordrecht, The Netherlands, 2003.

PEER-REVIEWED PUBLICATIONS

- [1] K. Lehman, D. Barahona, **N. C. Manoukis**, L. Carvalho, S. De Faveri, J. Auth, and M. Siderhurst. Raspberry ketone trifluoroacetate trapping of *Zeugodacus cucurbitae* in Hawaii. *Journal of Economic Entomology*, In Press(-):-, 2019.
- [2] **N. C. Manoukis** and T. Collier. Computer vision to enhance behavioral research on insects. *Annals of the Entomological Society of America*, In Press(-):-, 2019.
- [3] P. Follett, **N. C. Manoukis**, and B. Mackey. Comparative cold tolerance in *Ceratitis capitata* and *Zeugodacus cucurbitae* (diptera: Tephritidae). *Journal of Economic Entomology*, 111(6):2632–2636, 2018.
- [4] **N. C. Manoukis**, D. Cha, R. Collignon, and T. E. Shelly. *Terminalia* larval host fruit reduces the response of *Bactrocera dorsalis* (diptera: Tephritidae) adults to the male lure methyl eugenol. *Journal of Economic Entomology*, 111(4):1644–1649, 2018.
- [5] M. A. Johnson, R. H. Hollingsworth, S. Fortna, and **N. C. Manoukis**. The Hawaii Protocol for scientific monitoring of coffee berry borer: A model for coffee agroecosystems worldwide. *Journal of Visualized Experiments*, 133:e57204, 2018.
- [6] T. E. Shelly and **N. C. Manoukis**. Capture of melon flies, *Zeugodacus cucurbitae* (Diptera: Tephritidae), in a food-baited multilure trap: Influence of distance, diet, and sex. *Journal of Asia-Pacific Entomology*, 21(1):288–292, 2018.
- [7] L. Aristizabal, M. A. Johnson, S. Shriner, R. H. Hollingsworth, **N. C. Manoukis**, R. Myers, P. Bayman, and S. Arthurs. Integrated pest management of coffee berry borer in Hawaii and Puerto Rico: Current status and prospects. *Insects*, 8:123, 2017.
- [8] T. Collier and **N. C. Manoukis**. Evaluation of predicted Medfly (*Ceratitis capitata*) quarantine length in the United States utilizing degree-day and agent-based models. *F1000 Research*, 6:1863, 2017.
- [9] E. B. Jang, R. V. Dowell, and **N. C. Manoukis**. Mark-release-recapture experiments on the effectiveness of methyl eugenol-spinosad male annihilation technique against an invading population of *Bactrocera dorsalis*. *Proceedings of the Hawaiian Entomological Society*, 49(1):37–45, 2017.
- [10] M. A. Khan, **N. C. Manoukis**, T. Osborne, I. M. Barchia, G. M. Gurr, and O. L. Reynolds. Semiochemical mediated enhancement of males to complement sterile insect technique in management of the tephritid pest *Bactrocera tryoni* (Froggatt). *Scientific Reports*, 7:13366, 2017.
- [11] J. Gaertner, V. B. Genovese, C. Potter, K. Sewake, and **N. C. Manoukis**. Vegetation classification of coffee on Hawaii island using Worldview-2 satellite imagery. *Journal of Applied Remote Sensing*, 11:046005, 2017.

- [12] R. da Silva Gonçalves, **N. C. Manoukis**, and D. E. Nava. Effect of *Fopius arisanus* sonan oviposition experience on parasitization of *Bactrocera dorsalis* hendel. *BioControl*, 62(5):595 – 602, 2017.
- [13] **N. C. Manoukis**, E. B. Jang, and R. V. Dowell. Survivorship of male and female *Bactrocera dorsalis* in the field and the effect of male annihilation technique. *Entomologia Experimentalis et Applicata*, 162:243–250, 2017.
- [14] **N. C. Manoukis** and T. E. Mangine. Response of the pearly eye melon fly *Bactrocera cucurbitae* (coquillet) (diptera: Tephritidae) mutant to host-associated visual cues. *Proceedings of the Hawaiian Entomological Society*, 48:15–20, 2016.
- [15] **N. C. Manoukis**. To catch a fly: Landing and capture of *Ceratitidis capitata* in a Jackson trap with and without an insecticide. *PLoS ONE*, 11:e0149869, 2016.
- [16] M. S. Siderhurst, S. J. Park, C. N. Suttles, I. M. Jaime, **N. C. Manoukis**, E. B. Jang, and P. W. Taylor. Raspberry ketone trifluoroacetate, a new attractant for the Queensland fruit fly (*Bactrocera tryoni* (Froggatt)). *Journal of Chemical Ecology*, 42:156–162, 2016.
- [17] **N. C. Manoukis** and S. M. Gayle. Attraction of wild-like and colony-reared *Bactrocera cucurbitae* (Diptera:Tephritidae) to cue lure in the field. *Journal of Applied Entomology*, 140:241–249, 2016.
- [18] **N. C. Manoukis**, M. Siderhurst, and E. B. Jang. Field estimates of attraction of *Ceratitidis capitata* to trimedlure and *Bactrocera dorsalis* to methyl eugenol in varying environments. *Environmental Entomology*, 44:695–703, 2015.
- [19] **N. C. Manoukis**, B. Hall, and S. M. Geib. A computer model of insect traps in a landscape. *Scientific Reports*, 4:7015, 2014.
- [20] S. M. Geib, B. Calla, B. Hall, S. Hou, and **N. C. Manoukis**. Characterizing the developmental transcriptome of the oriental fruit fly *Bactrocera dorsalis* (Diptera: Tephritidae) through comparative genomic analysis with *Drosophila melanogaster* utilizing modENCODE datasets. *BMC Genomics*, 15:942, 2014.
- [21] D. Shishika, **N. C. Manoukis**, S. Butail, and D. A. Paley. Male motion coordination in anopheline mating swarms. *Scientific Reports*, 4:6318, 2014.
- [22] **N. C. Manoukis**, S. M. Geib, and R. I. Vargas. Effect of host *Bactrocera dorsalis* sex on yield and quality of the parasitoid *Fopius arisanus*. *BioControl*, 59:395–402, 2014.
- [23] R. S. Lees, B. Knols, R. Bellini, M. Q. Benedict, A. Bheecarry, H. C. Bossin, D. D. Chadee, J. Charlowood, R. K. Dabiré, L. Djogbenou, A. Egyir-Yawson, R. Gato, L. C. Gouagna, M. M. Hassan, S. A. Khan, L. L. Koekemoer, G. Lemperiere, **N. C. Manoukis**, R. Mozuraitis, R. J. Pitts, F. Simard, and J. Gilles. Review: Improving our knowledge of male mosquito biology in relation to genetic control programmes. *Acta Tropica*, 132 Supplement:S2–S11, 2014.
- [24] **N. C. Manoukis**, S. Butail, M. Diallo, J. M. Ribeiro, and D. A. Paley. Stereoscopic video analysis of *Anopheles gambiae* behavior in the field: Challenges and opportunities. *Acta Tropica*, 132 Supplement:S80–S85, 2014.
- [25] **N. C. Manoukis** and K. Hoffman. An agent-based simulation of extirpation of *Ceratitidis capitata* applied to invasions in California. *Journal of Pest Science*, 87(1):39–51, 2014.

- [26] C. L. Chang, I. K. Cho, Q. X. Li, **N. C. Manoukis**, and R. I. Vargas. A potential field suppression system for *Bactrocera dorsalis* hendel. *Journal of Asia-Pacific Entomology*, 16(4):513–519, 2013.
- [27] S. M. Gayle, M. McKenney, P. Follett, and **N. C. Manoukis**. A novel method for rearing wild tephritid fruit flies. *Entomologia Experimentalis et Applicata*, 148(3):297–301, 2013.
- [28] R. I. Vargas, J. D. Stark, J. Banks, L. Leblanc, **N. C. Manoukis**, and S. Peck. Spatial dynamics of two Oriental Fruit Fly (diptera: Tephritidae) parasitoids, *Fopius arisanus* (Sonan) and *Diachasmimorpha longicaudata* (Ashmead) (Hymenoptera: Braconidae), in a guava orchard in Hawaii. *Environmental Entomology*, 42(5):880–901, 2013.
- [29] S. Butail, **N. C. Manoukis**, M. Diallo, J. M. Ribeiro, T. Lehmann, and D. A. Paley. The dance of male *Anopheles gambiae* in wild mating swarms. *Journal of Medical Entomology*, 50(3):552–559, 2013.
- [30] **N. C. Manoukis** and E. B. Jang. The diurnal rhythmicity of *Bactrocera cucurbitae* (diptera: Tephritidae) attraction to cuelure: Insights from an interruptable lure and computer vision. *Annals of the Entomological Society of America*, 106(1):136–142, 2013.
- [31] R. I. Vargas, L. Leblanc, E. J. Harris, and **N. C. Manoukis**. Regional suppression of *Bactrocera* fruit flies (diptera: Tephritidae) in the pacific through biological control and prospects for future introductions into other areas of the world. *Insects*, 3(3):727–742, 2012.
- [32] S. Butail, **N. C. Manoukis**, M. Diallo, J. M. Ribeiro, T. Lehmann, and D. A. Paley. Reconstructing the flight kinematics of swarming and mating behavior in wild mosquitoes. *Journal of the Royal Society Interface*, 7(9):2624–2638, 2012.
- [33] **N. C. Manoukis**, I. Baber, M. Diallo, N. Sogoba, and J. M. Ribeiro. Seasonal climate effects anemotaxis in newly emerged adult *Anopheles gambiae* Giles in Mali, West Africa. *PLoS ONE*, 6(11):e26910, 2011.
- [34] **N. C. Manoukis**, S. M. Geib, D. M. Seo, M. P. McKenney, R. I. Vargas, and E. B. Jang. An optimized protocol for rearing *Fopius arisanus*, a parasitoid of tephritid fruit flies. *Journal of Visualized Experiments*, 53:e2901, 2011.
- [35] J. M. Ribeiro, J. M. Anderson, **N. C. Manoukis**, Z. Meng, and I. M. Francischetti. A further insight into the sialome of the tropical bont tick, *Amblyomma variegatum*. *BMC Genomics*, 12(136), 2011.
- [36] I. Francischetti, J. M. Anderson, **Nicholas C Manoukis**, V. M. Pham, and J. M. Ribeiro. An insight into the sialotranscriptome and proteome of the coarse bontlegged tick, *Hyalomma marginatum* rufipes. *Journal of Proteomics*, 74(12):2892–2908, 2011.
- [37] I. Baber, J. P. Tamby, **N. C. Manoukis**, D. Sangaré, S. Doumbia, S. F. Traoré, M. S. Maiga, and D. Dembélé. A python module to normalize microarray data by the quantile adjustment method. *Infection, Genetics and Evolution*, 11(4):765–768, 2011.
- [38] I. Baber, M. Keita, N. Sogoba, M. Konate, M. Diallo, S. Doumbia, S. F. Traoré, J. M. Ribeiro, and **N. C. Manoukis**. Population size and migration of *Anopheles gambiae* in the Bancoumana region of Mali and their significance for efficient vector control. *PLoS ONE*, 5(4):e10270, 2010.

- [39] A. Diabaté, A. Dao, A. S. Yaro, A. Adamou, R. Gonzalez, **N. C. Manoukis**, S. F. Traoré, R. W. Gwadz, and T. Lehmann. Spatial swarm segregation and reproductive isolation between the molecular forms of *Anopheles gambiae*. *Proceedings of the Royal Society B*, 276(1676):4215–4222, 2009.
- [40] **N. C. Manoukis**, A. Diabaté, A. Abdoulaye, M. Diallo, A. Dao, A. S. Yaro, J. M. Ribeiro, and T. Lehmann. Structure and dynamics of male swarms of *Anopheles gambiae*. *Journal of Medical Entomology*, 46(2):227–235, 2009.
- [41] **N. C. Manoukis**, J. R. Powell, M. B. Touré, A. Sacko, F. E. Edillo, M. B. Coulibaly, S. F. Traoré, C. E. Taylor, and N. J. Besansky. A test of the chromosomal theory of ecotypic speciation in *Anopheles gambiae*. *Proceedings of the National Academy of Sciences, USA*, 105(8):2940 – 2945, 2008.
- [42] **N. C. Manoukis**. FORMATOMATIC: A program for converting diploid allelic data between common formats for population genetic analysis. *Molecular Ecology Notes*, 7(4):592 – 593, 2007.
- [43] J. Marshall, K. Morikawa, **N. C. Manoukis**, and C. E. Taylor. Predicting the effectiveness of population replacement strategy using mathematical modeling. *Journal of Visualized Experiments*, 5:07/04/2007, 2007.
- [44] R. Calsbeek, C. Bonneaud, S. Prabhu, **N. C. Manoukis**, and T. B. Smith. Multiple paternity and sperm storage lead to increased genetic diversity in *Anolis* lizards. *Evolutionary Ecology Research*, 9(3):495 – 503, 2007.
- [45] **Nicholas C Manoukis**, M. B. Touré, I. Sissoko, S. Doumbia, S. F. Traoré, M. A. Diuk-Wasser, and C. E. Taylor. Is vector body size the key to reduced malaria transmission in the irrigated region of Niono, Mali? *Journal of Medical Entomology*, 43(5):820–827, 2006.
- [46] M. A. Diuk-Wasser, G. Dolo, M. Bagayoko, N. Sogoba, M. B. Touré, M. Moghaddam, **Nicholas C. Manoukis**, S. Rian, S. F. Traoré, and C. E. Taylor. Patterns of irrigated rice growth and malaria vector breeding in Mali using multi-temporal ERS-2 synthetic aperture radar. *International Journal of Remote Sensing*, 27:535–548, 2006.
- [47] M. A. Diuk-Wasser, M. B. Touré, G. Dolo, M. Bagayoko, N. Sogoba, S. F. Traoré, **N. C. Manoukis**, and C. E. Taylor. Vector abundance and malaria transmission in rice-growing villages in Mali. *American Journal of Tropical Medicine and Hygiene*, 16:725–731, 2005.