

VIANEY LEOS BARAJAS

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CURRENT POSITION

Postdoctoral Researcher

August 2019 - Present

Modeling the prevalence of Nontuberculous Mycobacteria in the Hawaiian Islands.

Dept of Statistics & Dept of Forestry and Environmental Resources

North Carolina State University

EDUCATION

Ph.D., Statistics

July 2019

Iowa State University

Ames, IA, USA

Dissertation Title: *Incorporating Multi-Scale Structures and Physiological Processes into the Modeling of Animal Movement.*

B.S., Mathematics with minor in Applied Statistics

June 2011

California State University, Bakersfield

Bakersfield, CA, USA

RESEARCH INTERESTS

Time Series, State-Space Models, Hidden Markov Models, Bayesian Statistics, Spatio-Temporal Models, Statistical Ecology, Data Science

RESEARCH PUBLICATIONS

Peer-Reviewed Journals

1. Ruiz-Suarez, S., **Leos-Barajas, V.**, Alvarez-Castro, I. and Morales, J.M. (2020) *Approximate Bayesian inference for a “steps and turns” continuous-time random walk observed at regular time intervals* PeerJ (*In Press*).
2. Ötting, M., Deutscher, C., Langrock, R. and **Leos-Barajas, V.** (2019) *The hot hand in professional darts.* Journal of Royal Statistical Society: Series A (*In press*).
3. Gardiner, R.Z., Hamer, R., **Leos-Barajas, V.**, Peñaherrera-Palma, C., Jones, M. and Johnson, C. (2019) *State-space modelling reveals habitat perception of a small terrestrial mammal in a fragmented landscape.* Ecology and Evolution.
4. Adam, T., Grieves, C., **Leos-Barajas, V.**, Meese, E., Lowe, C., Langrock, R. and Blackwell, P. (2019) *Joint modeling of multi-scale animal movement data using hierarchical hidden Markov models.* Methods in Ecology and Evolution
5. Papastamatiou, Y.P., Watanabe, Y.Y, Demšar, U., **Leos-Barajas, V.**, Bradley, D., Langrock, R., Weng, K., Lowe, C.G., Friedlander, A.M. and Caselle, J.E. (2018) *Activity seascapes highlight central place foraging strategies in marine predators that never stop swimming.* Movement Ecology 6:9
6. Papastamatiou, Y.P., Iosilevskii, G., **Leos-Barajas, V.**, Brooks, E.J, Howey, L.A., Chapman, D.D., Watanabe, Y.Y. (2018) *Optimal swimming strategies and behavioral plasticity of oceanic whitetip sharks.* Scientific reports, 8, 551.
7. Langrock, R., Adam, T., **Leos-Barajas, V.**, Mews, S., Miller, D.L., Papastamatiou, Y.P. (2018) *Spline-based nonparametric inference in general state-switching models.* Statistica Neerlandica, 72,179-200

8. **Leos-Barajas, V.**, Gangloff, E., Adam, T., Langrock, R., van Beest, F., Nabe-Nielsen, J. & Morales, J.M. (2017) *Multi-scale modeling of animal movement and general behavior data using hidden Markov models with hierarchical structures*. Journal of Agricultural, Biological, and Environmental Statistics, **22**, 232–248.
9. Gangloff, E., Chow, M., **Leos-Barajas, V.**, Hynes, S., Hobbs, B., Sparkman, A.M. (2017) *Integrating behaviour into the pace-of-life continuum: Divergent levels of activity and information gathering in fast-and slow-living snakes*. Behavioural processes, **142**, 156–163.
10. **Leos-Barajas, V.**, Photopoulou, T., Langrock, R., Patterson, T.A., Watanabe, Y.Y., Murgatroyd, M. and Papastamatiou, Y.P. (2017) *Analysis of animal accelerometer data using hidden Markov models*. Methods in Ecology and Evolution, **8**, 161–173.
11. Towner, A.V., **Leos-Barajas, V.**, Langrock, R., Smale, M.J., Kaschke, T., Jewell, O.J.D. and Papastamatiou, Y.P. (2016) *Sex-specific and individual preferences for hunting strategies in white sharks*. Functional Ecology, **30**, 1397–1407.

Conference Proceedings

1. Adam, T., **Leos-Barajas, V.**, Langrock, R. and van Beest, F. (2017) *Using hierarchical hidden Markov models for joint inference at multiple temporal scales*. Proceedings of the 32nd IWSM Vol. 2.
2. Hofmann, H., Cook, D., Kaplan, A., Hare, E., **Leos-Barajas, V.**, Sievert, C. and Tyner, S. (2015) *On the move at DinoFun world*. Visual Analytics Science and Technology (VAST), 2015 IEEE Conference on, 159-160.
3. Hofmann, H., Cook, D., Kaplan, A., Hare, E., **Leos-Barajas, V.**, Sievert, C. and Tyner, S. (2015) *Visualizing communication patterns at DinoFun World*. Visual Analytics Science and Technology (VAST), 2015 IEEE Conference on, 161-162.

Reports

1. **Leos-Barajas, V.**, Wang, Z., Kaiser, M.S. and Zhengyuan, Z. (2017) *Improving Estimates of Real-Time Traffic Speeds During Weather Events for Winter Maintenance Performance Measurement*. InTrans Project 13-485.

Pre-prints

1. Betancourt, M., Margossian, C.C. and **Leos-Barajas, V.** (2020) *The Discrete Adjoint Method: Efficient Derivatives for Functions of Discrete Sequences* <https://arxiv.org/abs/2002.00326>
2. **Leos-Barajas, V.** and Michelot, T. (2018) *An Introduction to Analyzing Animal Movement Data with Hidden Markov Models using Stan for Bayesian Inference*. <https://arxiv.org/abs/1806.10639> (Stan Case Study in Preparation)

CURRENT WORK

Submitted

- *Introduction to state-space modelling of ecological time series*.
Auger-Méthé, M., Newman, K., Cole, D., Empacher, F., Gryba, R., King, A.A., **Leos-Barajas, V.**, Fleming, J.M., Nielsen, A., Petris, G. and Thomas, L.
Under Review: *Ecological Monographs*
- *Functional constraints govern activity patterns of a coastal top predator: novel insights provided from biologists and hidden Markov models*
Byrnes, E.E., Daly, R., **Leos-Barajas, V.**, Langrock, R. and Gleis, A.C.
Under Review: *Behavioural Ecology*
- *Movement patterns and residency of Bull Sharks, Carcharhinus leucas, in the Cabo Pulmo National Park*
Lara-Lizardi, F., Castro, E., **Leos-Barajas, V.**, Hoyos-Padilla, E.M. and Ketchum-Mejía, J.T.
Submitting to: *Marine Ecology*.
- *Diving Behavior of the Totoaba (Totoaba macdonaldi) in the Upper Gulf of California*
Tlapale-Hernández, C., **Leos-Barajas, V.**, Ketchum-Mejía, J.T., Valenzuela-Quiñonez, F., Trasviña-Castro,

A., Fabián-Muhlia, A. and De-Anda-Montañez, J.A.

Under Review: *Fisheries Science*.

- *Characterizing habitat use of the white shark, *C. charcharias*, at Guadalupe Island*
Aquino-Baleytó, M., **Leos-Barajas, V.**, Villalobos-Ortiz, H., Hoyos-Padilla, E.M., González-Armas, R.,
Lowe, C.G., Adam, T. and Galván-Magaña, F.
Submitting to: *Functional Ecology*.

In Preparation

- **Methodology**

- *Hidden Markov Models with Multi-Scale State Processes in Ecology.*

Leos-Barajas, V., Kaiser, M.S., Holland, K. and Papastamatiou, Y.P. (*Dissertation Chapter*)

Will submit to: *Methods in Ecology and Evolution*

- *Incorporating body condition into the analysis of animal movement.*

Leos-Barajas, V., Kaiser, M.S., di Virgilio, A. and Morales, J.M.. (*Dissertation Chapter*)

Will submit to: *Biometrics*

- **Applications**

- *Neonate garter snakes (*Thamnophis elegans*) exhibit consistent among-individual variation in multiple behavioural measures and habituation at multiple time scales*

Gangloff, E., **Leos-Barajas, V.**, Demuth, G., Zhang, H., Kelly, C.D. and Bronikowski, A.M.

Will submit to: *Animal Behavior*

- *Movement behavior of manta rays (*Mobula birostris*) in Ecuador's continental waters*

Peñaherrera-Palma, C.R., Espinoza, E.R., Vallejo, F., Baquero, A., Gardiner, R.Z., Quintero, L. and

Leos-Barajas, V. Will submit to: *PLOS One*

RESEARCH EXPERIENCE

Research Assistant

October 2018– July 2019

Dashboards for data visualization

Iowa State University, Office of the Vice President for Research

Researcher

March 2018–October 2018

Develop novel statistical methods for making biological inference on niche choices from behavioural time series data.

Bielefeld University, Statistics & Data Analysis Group, Dept. of Business Administration and Economics.

Research Assistant

August 2014–July 2016

Improving Estimates of Real-Time Traffic Speeds During Weather Events for Winter Maintenance Performance Measurement.

Iowa State University, Dept. of Statistics.

TEACHING EXPERIENCE

Instructor

2016 – 2017

Introduction to Business Statistics

Iowa State University, Dept. of Statistics.

Lab Instructor

2013 – 2014, 2017

Statistical Methods for Research Workers, Regression for Social and Behavioral Research, Introduction to Business Statistics II

Iowa State University, Dept. of Statistics.

WORKSHOPS

Instructor

Markov-switching models in Ecology September 27, 2019
Comisión Nacional para el Conocimiento y Uso de la Biodiversidad
Mexico City, Mexico

Movement Ecology 2019: A to Z with Lots of R (co-instructor w/ Garrett Street, Jerod Merkle) July 22-26, 2019
A British Ecological Society, Movement Ecology Special Interest Group event.
Noble Research Institute
Ardmore, OK, USA

Hidden Markov Models Workshop (co-instructor with Roland Langrock) September 4-7, 2018
Versatile Tools for Analysing Animal Movement and Other Time Series Data
Bielefeld, Germany

MigraMar Annual Meeting December 2017
Half-day workshop on R packages moveHMM and momentuHMM.
Panama City, Panamá

MigraMar Annual Meeting November 2016
One-day workshop on hidden Markov models and their application in animal movement modeling.
La Paz, México

Assistant

Inferencia Bayesiana y Stan (lead instructor Michael Betancourt) Sept 23–25, 2019
An introduction to Bayesian inference and Stan.
Mexican Statistical Association – Ciudad de Mexico, MX

Stan (+R) (lead instructor Jonah Gabry) June 10–12, 2019
An introduction to using Stan for Bayesian data analysis
Calvin College – Grand Rapids, MI, USA

Attendee

New Perspectives on State-Space Models September 2017
Casa Matemática, Oaxaca, México.

PRESENTATIONS

Oral Presentations

- *Hidden Markov model architectures for the analysis of ecological and environmental data.* January 2019
Department of Statistics
University of Washington
- *Historias con impacto a través de la ciencia de datos* September 2019
Mexican Statistical Association School on Data Science – **Invited Talk**
Mexico City, Mexico
- *Incorporating body condition into the analysis of animal movement* July 2019
Department of Statistics at Iowa State University
Ames, IA, USA
- *Multi-scale modeling of animal movement data* August 2018
Joint Statistical Meeting – **Invited Talk**
Vancouver, Canada
- *Modeling the feedback between movement and condition in Merino sheep* July 2018
International Statistical Ecology Conference – **Invited Talk**
St Andrews, Scotland

- *An overview of the R package moveHMM* November 2017
Department of Ecology at Iowa State University
Ames, IA, USA
- *Analyzing animal accelerometer data using hidden Markov models* July 2016
International Statistical Ecology Conference
Seattle, Washington, USA
- *A data-driven Bayesian model monitoring approach for monitoring lake function* May 2016
Universidad Nacional del Comahue
San Carlos de Bariloche, Argentina
- *Visualizing the movement of white sharks around South Africa* March 2015
Graphics Group at Iowa State University Ames, IA, USA
- *Estimating red snapper harvest by charter boats in the Gulf of Mexico* July & September 2014
International Statistical Ecology Conference & Graybill Conference on Statistical Ecology
Montpellier, FR / Ft. Collins, Colorado, USA

Poster Presentations

- *Hidden Markov Models with Multi-Scale State Processes* April 2019
44th University of Arkansas Spring Lecture Series
- *Semi-parametric hidden Markov models using Stan for Bayesian inference.* June 2018
International Society for Bayesian Analysis World Meeting
Edinburgh, Scotland

RESEARCH VISITS

Hosted

- Miguel Gomez Garcia February 2020
from Centro Interdisciplinario de Ciencias Marinas
Visiting North Carolina State University
- Cristina Tlapale Hernández August – October 2018
from Centro de Investigaciones Biológicas del Noroeste, México
Visiting Bielefeld University

Hosts

- James Ketchum December 10-13, 2018
Pelagios Kakunjá
La Paz, Baja California Sur, México
- Alex Hearn April 30 - May 5, 2018
Galapagos Academic Institute for the Arts and Sciences (GAIAS)
San Cristobal, Galápagos, Ecuador
- Juan M. Morales April – June 2016
National Scientific and Technical Research Council (CONICET)
Bariloche, Argentina
- Roland Langrock August 2014
Centre for Ecological and Environmental Modeling (CREEM)
St Andrews, Scotland

ADVISING

Advisor

- Sofía Ruiz Suarez, *PhD Student* (co-advising with Juan M. Morales) March 2018 – Present
Department of Statistics

National University of Rosario, Argentina

Committee Member

Emily Spurgeon, *Master's Student*

October 2019 - Present

Advised by: Chris Lowe

Dept of Marine Biology

California State University, Long Beach

Estefanía Bravo, *Master's Student*

February 2020 - Present

Advised by:

Ciento Interdisciplinario de Ciencias Marinas

La Paz, Mexico

Unofficial capacity *role and university at the time

Eric Gangloff, PhD student, Iowa State University

Publication: *Integrating behaviour into the pace-of-life continuum: Divergent levels of activity and information gathering in fast-and-slow-living snakes*

Riana Gardiner, PhD student, University of Tasmania

Publication: *State-space modelling reveals habitat perception of a small terrestrial mammal in a fragmented landscape.*

Cristina Tlapale-Hernández, PhD student, Instituto Politécnico Nacional

Paper: *Diving Behavior of the Totoaba (*Totoaba macdonaldi*) in the Upper Gulf of California*

Marc Aquino-Baleytó, PhD student, Instituto Politécnico Nacional

Paper: *Characterizing habitat use of the white shark, *C. charcharias*, at Guadalupe Island.*

Courtney E. Norris, Bachelors student, Murdoch University

Thesis: *Testing the Efficacy of Unsupervised Machine Learning Techniques to Infer Shark Behaviour from Accelerometry Data*

Evan Byrnes, PhD student, Murdoch University

Project in progress: *Application of hidden Markov models to shark accelerometer data.*

Emily Meese, Master's student, California State University, Long Beach

Project in progress: *Integrating positional and accelerometer horn shark data to uncover behavioral patterns.*

Publication: *Joint modeling of multi-scale animal movement data using hierarchical hidden Markov models.*

AWARDS

- SACNAS travel scholarship
- First place award for Mathematics/Statistics presentation at SACNAS conference
- RStudio Scholarship to attend 2020 conference - \$1000

SOCIETIES

Member of:

- American Statistical Association (ASA)
- International Society for Bayesian Analysis (ISBA)
- American Elasmobranch Society (AES)
- Society for the Advancement of Chicanos and Native Americans in Science (SACNAS)

LANGUAGES

Programming: R, Rcpp, C++, Stan, JAGS, JMP, SAS

Reading, Speaking and Writing: Fluent in English and Spanish, Beginner's level in French