Megan S. Reich

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SUMMARY

In my current and future research, I am interested in developing and applying techniques to track the long-range movements of animals, clarifying the genetic basis of migration, and exploring how environmental conditions influence migratory and dispersal behaviour. My doctoral research so far has focused on developing isotope-based geographic assignment to trace the natal origins of wild-caught migratory insects.

EDUCATION

PhD Candidate, University of Ottawa, Biology — Sept/*18-Present*

- Fourth year; Fast-track from MSc Earth Sciences
- Thesis topic: Developing Novel Geolocation Tools to Assess the Genetic Controls of Migratory Behaviour in Lepidoptera
- Advisors: Prof Clément Bataille and Prof Heather Kharouba

BSc, University of British Columbia**,** Environmental Sciences — *2011- 2015*

- International exchange to the University of New South Wales — *2013*
- 1st and 2nd year at the University of the Fraser Valley — *2008-2010*

RECOGNITION

- Mitacs Globalink Research Award — *2023*
- Ontario Graduate Scholarship — *2022-2023*
- Best graduate talk, 18th Annual Ottawa-Carleton Institute of Biology Symposium — *2021*
- Ontario Graduate Scholarship — *2021-2022*
- Excellence Scholarship-Doctorate, University of Ottawa — *2020-2023*
- ORIGIN Graduate Fellowship 2021, University of Utah — *2020*
- Queen Elizabeth II Graduate Scholarship in Science and Technology — *2020-2021*
- Danks Scholarship, Entomological Society of Canada — *2020*
- Admission Scholarship-Doctorate, University of Ottawa — *2019-2020*
- Admission Scholarship-Master's, University of Ottawa — *2018-2019*

FUNDING

- Ministerio de Ciencia e Innovación, Proyectos de I+D+i (PID2020-117739GA-I00): "Behavioral and ecological genomics of insect migration (ENTOMIGROME)" (196000 €), PI: Gerard Talavera, working team *2021-2024*

RESEARCH CONTRIBUTIONS

Peer-reviewed Publication

Talavera, G., García-Berro, A., Talla, V. N. K., Ng'iru, I., Bahleman, F., Kébé, K., Nzala, K. M., Plasencia, D., Marafi, M. A. J., Kassie, A., Goudégnon, E. O. A., Kiki, M., Benyamini, D., **Reich, M. S.**, López-Mañas, R., Benetello, F., Collins, S. C., Bataille, C. P., Pierce, N. E., Martins, D. J., Suchan, T., Menchetti, M., Vila, R. (2023). The Afrotropical breeding grounds of the Palearctic-African migratory painted lady butterflies (*Vanessa cardui*). Proceedings of the National Academy of Sciences, 120(16), e2218280120. https://doi.org/10.1073/pnas.2218280120

Dargent, F., Candau, J.-N., Studens, K., Perrault, K. H., **Reich, M. S.**, & Bataille, C. P. (2023). Characterizing eastern spruce budworm's large-scale dispersal events through flight behavior and stable isotope analyses. Frontiers in Ecology and Evolution, 11, 1060982. https://doi.org/10.3389/fevo.2023.1060982

Reich, M.S., Kindra, M., Dargent, F., Hu, L., Flockhart, T., Norris, R., Kharouba, H., Talavera, G., Bataille, C.P. (2023) Metals and metal isotopes incorporation in insect wings: Implications for geolocation and pollution exposure. *Frontiers in Ecology and Evolution*, 11. 10.3389/fevo.2023.1085903

Lindroos, E.E., Bataille, C.P., Holder, P.W., Talavera, G., **Reich, M.S.** (2023). Temporal stability of δ^2H in insect tissues: Implications for isotope-based geographic assignments. *Frontiers in Ecology and Evolution*, 11. 10.3389/fevo.2023.1060836

López-Mañas, R., Pascual-Díaz, J.P., García-Berro, A., Bahleman, F., **Reich, M.S.**, Pokorny, L., Bataille, C.B., Vila, R., Domingo-Marimon, C., Talavera, G. (2022). Erratic spatiotemporal vegetation growth anomalies drive population outbreaks in a trans-Saharan insect migrant. *Proceedings of the National Academy of Sciences*, 119:19. 3-5. 10.1073/pnas.2121249119

Reich, M.S., Flockhart, D.T.T., Norris, D.R., Hu, L., Bataille, C.P. (2021). Continuous-surface geographic assignment of migratory animals using strontium isotopes: A case study with monarch butterflies. *Methods in Ecology and Evolution,* 1-13. 10.1111/2041-210X.13707.

Amundrud, S.L., Clay-Smith, S.A., Flynn, B.L., Higgins, K.E., **Reich, M.S.**, Wiens, D.R.H., & Srivastava, D.S. (2019). Drought alters the trophic role of an opportunistic generalist in an aquatic ecosystem. *Oecologia*, 189:3. 1–12. 10.1007/s00442-019-04343-x

Manuscripts in Preparation

Ghouri, S., **Reich, M. S.**, Lopez-Mañas, R., Talavera, G., Bowen, G., Vila, R., Talla, V. N. K., Collins, S. C., Martins, D. J., & Bataille, C. (2023). A hydrogen isoscape for tracing the migration of terrestrial herbivorous insects across the Afro-Palearctic range. https://doi.org/10.22541/au.168897547.72773944/v1

Conference Presentation (* presenter)

Reich, M.S.*, Ghouri, S., Talavera, G., Bataille, C. P. (July 2023). Isotope-based geographic assignment provides valuable insights into long-distance butterfly migration. Biology of Butterflies 2023, Prague, Czech Republic.

Talavera, G.*, Gorki, L., Toro-Delgado, E., López-Mañas, R., **Reich, M. S.**, Pascual-Díaz, J. P., García-Berro, A., Menchetti, M., Domingo-Marimon, C., Pierce, N. E., Vila, R., Suchan, T., Bataille, C. P. (July 2023). Migratory ecology and population dynamics of the Painted Lady butterfly, Vanessa cardui. Biology of Butterflies 2023, Prague, Czech Republic.

Ghouri, S.*, Talavera, G., **Reich, M. S.**, Bataille, C. P. (July 2023). Hydrogen and strontium isoscapes for the African Palearctic range to reconstruct insect migration and connectivity. Biology of Butterflies 2023, Prague, Czech Republic.

Bataille, C.P.*, **Reich, M.S.,** Hassler, A. (July 2023). Metals and their isotopes: An opportunity to study insect ecology and physiology. Goldschmidt 2023, Lyon, France.

Reich, M.S.*, Ghouri, S., Zabudsky, S., Talavera, G., Bataille, C.P. (April 2023). There and back again: Combining hydrogen and strontium isotopes refines the trans-Saharan migratory patterns of the butterfly Vanessa cardui. European Geosciences Union (EGU) General Assembly 2023, Vienna, Austria.

Talavera, G.*, Gorki, L., Toro-Delgado, E., López-Mañas, R., **Reich, M.,** Menchetti, M., Domingo-Marimon, C., Sáez, L., Pierce, N., Vila, R., Bataille, C., Suchan, T. (April 2023). Migration ecology in insects: integrative approaches to trace long-distance movements of the Painted Lady butterfly (Vanessa cardui). European Geosciences Union (EGU) General Assembly 2023, Vienna, Austria.

Reich, M.S.*, Shipilina, D., Talla, V., Bahleman, F., Khebe, K., Talavera, G., Bataille, C.P., Backström, N. (Nov 2022). Lack of population structure between trans-Saharan migrants for the butterfly *Vanessa cardui* revealed by hydrogen and strontium isotope-based geographic assignment and genomics. 2022 ESA, ESC, and ESBC Joint Annual Meeting, Vancouver, Canada. [20 minute talk]

Dargent, F.*, Benvidi, N., Candau, J-N., **Reich, M.S.,** Bataille, C.P. (Nov 2022). Dual sulfur-hydrogen assignment of a boreal pest species (*Choristoneura fumiferana*) using a novel foliar sulfur isoscape for eastern Canada. 2022 ESA, ESC, and ESBC Joint Annual Meeting, Vancouver, Canada.

Reich, M.S.*, Lindroos, E., Kindra, M.K., Dargent, F., Hu, L., Flockhart, D. T. T., Norris, D.R., Talavera, G., Kharouba, H.M., Bataille, C.P. (September 2022). Testing the assumptions of geolocation using metals and metal isotopes in insect wings. 159th Annual General Meeting of the Entomological Society of Ontario, Virtual Meeting. [12 minute talk]

Reich, M.S.*, Lindroos, E., Kindra, M.K., Dargent, F., Hu, L., Kharouba, H.M., Bataille, C.P. (June 2022). Are insect wings really 'inert'? Testing a core assumption of isotope-based geographic assignment. IsoEcol: 12th International Conference on the Applications of Stable Isotope Techniques to Ecological Studies, 2022, Gaming, Austria. [20 minute talk]

Reich, M.*, Flockhart, D. T. T., Norris, D. R., Hu, L., Bataille, C.P. (June 2021). Geographic assignment of monarch butterflies using strontium isotopes. 18th Annual Ottawa-Carleton Institute of Biology Symposium, 2021, Virtual Meeting. [12 minute talk]

Reich, M.*, Flockhart, D. T. T., Norris, D. R., Bataille, C.P. (Nov 2020). Combining strontium and hydrogen isotopes to estimate the provenance of monarch butterflies. Entomological Society of America Annual Meeting, 2020, Virtual Meeting. [10 minute talk]

Amundrud, S. L.*, Clay-Smith, S., Flynn, B., **Reich, M.**, and Srivastava, D. S. (2016). Drought indirectly affects a bromeliad food web by altering predator survival and omnivory. ATBC Conference, Montpellier, France: oral presentation

Poster Presentation

Reich, M., Flockhart, D. T. T., Norris, D. R., Hu, L., Bataille, C.P. (May 2021). Continuous-surface geographic assignment of monarch butterflies using strontium isotopes. IsoEcol: 11.5 International Conference on the Applications of Stable Isotope Techniques to Ecological Studies, 2021, Virtual Meeting. [Poster]

Reich, M., Flockhart, D. T. T., Norris, D. R., Bataille, C.P. (Aug 2020). Conservation of monarch butterflies using a novel strontium isotope geolocation tool. Ecological Society of America Annual Meeting, 2020, Virtual Meeting. [Poster]

Other Publications

Reich, M. (2021). "Strontium isotopes can map monarch butterfly migrations and help conservation efforts". The Conversation (Canada), September 28, 2021. Available at: https://theconversation.com/strontium-isotopes-can-map-monarch-butterfly-migrations-and-help-conservation-efforts-168031?utm_source=dlvr.it&utm_medium=twitter

Gosselin, E., Johnson, L., MacKay, S. and **Reich, M.** (2015). "Baseline soil composition data for the Delta Nature Reserve". cIRcle: UBC's Digital Repository: ENVR 400 Undergraduate Essay, Spring 2015. Available at: http://hdl.handle.net/2429/53052.

Reich, M. (2012). "Repercussions and remediation of tar sand tailings". cIRcle: UBC's Digital Repository: ENVR 200 Undergraduate Essay, spring 2012. Available at: http://hdl.handle.net/2429/42453.

Invited Presentations (* presenter)

Reich, M.S.* (May 2022). Isotope tools for geolocation of migratory insects. 1st Meeting on Butterfly Migration, Barcelona, Spain: oral presentation.

Reich, M.S.* (Feb 2021). Geographic assignment of migratory butterflies using hydrogen and strontium isotopes. International Day of Women and Girls in Science Seminar, Department of Earth and Environmental Sciences, University of Ottawa, Canada: oral presentation

Amundrud, S. L., Clay-Smith, S.*, Flynn, B.*, **Reich, M.***, and Srivastava, D. S. (2016). Tipulidae Predation interacts with drought to affect Culicidae and Chironomidae survival. Srivastava Lab, UBC Vancouver, Canada: oral presentation

Conference Attendance

- Biology of Butterflies, Prague, Czech Republic 2023
- European Geosciences Union, Vienna, Austria *2023*
- ESA, ESC, and ESBC Joint Annual Meeting, Vancouver, BC, Canada *2022*
    - Organized a member symposium with Dr Felipe Dargent, "Leveraging Isotopic Tools to Understand Insect Ecology"
- 159th Annual General Meeting of the Entomological Society of Ontario *2022*
- IsoEcol: 12th International Conference on the Applications of Stable Isotope Techniques to Ecological Studies *2022*
- 1st Meeting on Butterfly Migration *2022*

- 18th Annual Ottawa-Carleton Institute of Biology Symposium, Virtual Meeting *2021*
- IsoEcol: 11.5 International Conference on the Applications of Stable Isotope Techniques to Ecological Studies, Virtual Meeting *2021*
- Ecological Society of America, Virtual Annual Meeting *2020*
- Entomological Society of America, Virtual Annual Meeting *2020*
- ESA, ESC, and ESBC Joint Annual Meeting, Vancouver, BC, Canada *2018*
- Roundup, Vancouver, BC, Canada (Volunteer) *2015*

Manuscript Reviews

- Ecography *2022*
- Biological Journal of the Linnean Society *2022*
- Science of the Total Environment (2) *2021*

EMPLOYMENT

Academic Work Experience

University of Ottawa

Teaching Assistant (GEO5191 – Global Biogeochemical Cycles) *Sept/22-Dec/22*

- Marked laboratory reports on the carbon cycle based on box modelling with Insight Maker

Greenhouse staff *Jan/21-Aug/22*

- Watering and monitoring of plants in the Department of Biology's research greenhouse

Teaching Assistant (BIO3333 - Entomology) *Jan/22-Apr/22*

- Guided students through the identification of insect families and the use of dichotomous keys
- Led students through experiments with bean beetles, Manduca sexta, and a cockroach dissection
- Marked lab reports and provided feedback

Teaching Assistant (GEO1111 - Introduction to Earth Systems) *Jan/19-Apr/19*

- Invigilated and marked exams
- Held office hours and answered student's questions

Teaching Assistant (EVS3101 - Environmental Issues) *Sept/18-Dec/18*

- Guided students with the development of group projects on environmental issues
- Marked exams and provided feedback on presentations

University of Guelph *Apr/18-June/18*

Graduate Research Assistant

- Fieldwork for graduate thesis
- Collected over 155 *Asclepias* spp. (milkweed) samples from 22 states in the eastern USA
- Created a volunteer network to assist with sample collection

University of British Columbia – Srivastava Lab *Aug/15-Dec/15*

Field Assistant – Costa Rica

- Sampled aquatic insect ecosystems within bromeliads along an elevation gradient in Monteverde, Costa Rica to explore the potential effects of climate change on this system
- Assisted in carrying out ecological and physiological experiments
- Created a field guide consisting of sketched and photographed pictures of aquatic larvae

Non-academic Work Experience

Canadian Museum of Nature - Research Collection *May/19-Aug/19*

Assistant

- Practiced museum curation in the entomological collection (beetles)
- Specimen preparation and collection organization and labelling

Fraser Riverkeeper/Swim Drink Fish Canada *Nov/17-Mar/18*

Water Literacy Coordinator

- Organized the 11th Annual Fraser River Clean-up, where 650 volunteers collected 12 tonnes of garbage from the riverbank
- Deliver water literacy presentations to schools and community groups to encourage sustainable use of our local waterbodies
- Contribute to social media and the development of other digital tools

PhytoInformatix *May/17-Sept/17*

Research Assistant

- Performed pesticide screening trials and efficacy assessments in an agricultural setting

Projects Abroad - Himalayan Mountain Conservation Project *Mar/16-Feb/17*

Field Coordinator - Nepal

- Led international volunteers in biological surveys of lepidoptera, bird, primate, mammal, and herpetological species using non-invasive methods
- Analyzed survey data and wrote monthly reports, responsible for data management
- Conducted volunteer feedbacks, reported incidents, and created action plans

British Columbia Tree Fruits Cooperative *May/15-Aug/15*

Survey Technician

- Evaluated 110000 cherries for insect infestation using a dissecting microscope in order to fulfill the Government of Japan's survey requirements
- Extracted and assessed the quantity of plant-parasitic nematodes present in soil samples

Federal Government of Canada – Internal Integrity and Security *Sept/14-Apr/15*

Marketing & Communications Strategy Agent (FSWEP Student)

- Facilitated Security Awareness Week to increase security awareness of employees
- Organized an in-person focus session of managers and team leaders that reviewed policies and procedures to generate constructive feedback
- Used feedback to generate recommendations and create new user guides

E.S. Cropconsult Ltd.

IPM Field Technician *Apr/14-Aug/14*

- Scouted and recorded cranberry pests as part of an integrated pest management monitoring program

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ACTIVITIES

Leadership and Organization

- Biology Graduate Student Association – Executive Member (The Councillor) *May/20-April/22*
- Graduate Students Association des Étudiant.e.s Diplômé.e.s (GSAÉD)–Director *May/20- April/22*
- Informal Seminar Without A Name (ISWAN) – Organizer *Sept/20-April/21*
- GSAÉD Social Committee – Member *May/20-Apr/21*
- UBC Environmental Sciences Student Association - Executive Member *2011-2014*

Supervisory Activities

- Undergraduate mentorship: Eve Lindroos (University of Ottawa) *2021-2022*
- Undergraduate mentorship: Sana Ghouri (University of Ottawa) *2020-2021*
- Undergraduate mentorship: Mira Kindra (University of Ottawa) *2019-2020*

Media coverage

Andrew Carter. (July 2022). "The Andrew Carter Morning Show (Monday July 25, 2022)." The Andrew Carter Podcast, CJAD 800AM, iHeart Radio. https://www.iheart.com/podcast/962-the-andrew-carter-podcast-62506089/episode/the-andrew-carter-morning-show-monday-99747497/?cmp=web_share&embed=true

Nicole Chu. (Oct 2021). "Tracking isotopic "fingerprints" of monarch butterflies." Episode 92, Beats Research Radio, University of Ottawa Heart Institute. http://beatsresearch.com/Radio.php

David Frey. (Oct 2021). "Isotope mapping sheds light onto monarch journeys." The Wildlife Society. https://wildlife.org/isotope-mapping-sheds-light-onto-monarch-journeys/

Ali Khalegi. (Oct 2021). "Monitoring monarchs: New technique may contribute to conserving key breeding grounds in southern Ontario" Capital Current. https://capitalcurrent.ca/endangered-monarch-butterfly-migration/

Maryam Rana. (Sep 2021). "Monarch Butterflies: From strontium isotope mapping to migratory routes." The Fulcrum. https://thefulcrum.ca/sciencetech/monarch-butterflies-from-strontium-isotope-mapping-to-migratory-routes/

Can Geo Staff. (Sep 2021). "Wildlife Wednesday: Animals are "shape-shifting" to cope with climate change." Wildlife Wednesday, Canadian Geographic. https://www.canadiangeographic.ca/article/wildlife-wednesday-animals-are-shape-shifting-cope-climate-change

Outreach

- Guest speaker to Lac La Hache Elementary School, Grade 1-2 *Jun/22 & May/23*
- Guest speaker to Scriber Lake High School, Environmental Sciences Class *Apr/21*

- Guest speaker to Scriber Lake High School, Biology Class *Feb/21*

Skype a Scientist (virtual classroom visits)

- University of Houston, PED331- Science Teaching *Sep/22*
- University of Houston, EED3315-Effective Teaching Strategies: Science Education *Sep/22*
- Amana Academy, Grade 3 *Oct/21*

Non-academic Volunteer Experience

Canadian Museum of Nature - Research Collection *2018-2020*

- Volunteer in the Entomological Collection (*5 hours per week)*
- Mount and label specimens, organize the collection, and perform other curatorial tasks

Girl Guides of Canada

- Unit Leader for the 16th Guides Ottawa *(3 hours per week)* *2018-2021*
  - Mentor girls aged 9-11 in games and activities to develop their leadership skills
  - Organize camping trips and community engagement activities
- Unit Leader for the 43rd Guides Vancouver *(3 hours per week)* *2011-2015*
  - Managed unit finances

Professional Development

- Introduction to the UNIX/LINUX Commandline, Lund University *2020*
- Python Workshop, IT Solutions, University of Ottawa *2020*
- Programming in R Workshop, IT Solutions, University of Ottawa *2020*
- Spill Response Training, University of Ottawa *2019*
- Teaching Assistants Training Day, University of Ottawa *2018, 2019*
- WHMIS 2015 - for laboratory workers *2018*
- Grad Talk - Thesis Proposal Workshop, University of Ottawa *2018*
- Field Technician, Canadian Aquatic Biomonitoring Network (CABIN) *2017*

Skills

- Software: R, ArcGIS, Microsoft Word, Excel, and PowerPoint
- Analytical: Isotope Mass Spectrometry (MC-ICP-MS, ICP-MS)
- Field: Wilderness & Remote First Aid & CPR/AED Level C, OFA Level 1

MEMBERSHIPS

- British Ecological Society – Student Member *2022*
- Earth Science Women's Network *2022*
- Entomological Society of Ontario - Student Member *2018-2022*
- Entomological Society of Canada - Student Member *2015-2022*
- Entomological Society of British Columbia - Student Member *2015-2019, 2022*
- Ecological Society of America - Student Member *2020*
- Entomological Society of America - Student Member *2016-2018, 2020*