Kevin Cazelles

› Theoretical and computational ecologist

I am ecologist who uses algebra, analysis, probability, statistics, data science and computational sciences to study ecological networks and how global change affects them in order to conserve ecosystem functions and biodiversity that are essential to our good health and well being.

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Education

- 2016: **Doctor of Philosophy in Ecology (grade: Excellent)**. Université du Québec À Rimouski, Canada / Université de Montpellier, France (Joint PhD).
- 2012: **M.Sc, Ecology and Evolution**. AgroParisTech, Paris, France.
- 2011: **General agronomy diploma**. AgroParisTech, Paris, France.

Professional experience

10/2020–present: Co-founder of inSileco Inc.

Guelph, ON, Canada

- Developed a shiny application for DFO Halifax that generates reproducible reports including spatial analysis.
- Led 2 workshops on using R as a GIS and 1 worshop on reproducible research with R.
- Developed 2 chapters of a course that introduces students to spatial data science (TELUQ université) and handled the deployment of the online material (bookdown).

03/2021–present: Research Associate

McCann Lab, University of Guelph, ON, Canada

- Theoretical investigations on metaecosystem theory (working on dynamical systems using Julia to solve ordinary differential equations).
- Develop an R package that provides several statistical analyses of species co-occurrence.

03/2020–present: Postdoctoral Researcher

McCann Lab, University of Guelph, ON, Canada

- Analysis of homogenization of fish communities in freshwater lakes (designed an R pipeline to retrieve, clean and analyze data ot that end).
- Worked on using multiple biotracers as spatial fingerprints to determine the geographical origin of food products (numerical implementation in R and Julia, extensive simulations on Compute Canada's servers).
- Helped students and colleagues with designing data pipeline and numerical implementations various projects.

10/2012–12/2016: PhD candidate

Université de Montpellier, France/ Université du Québec à Rimouski, QC, Canada

- Theoretical investigations on the integration of biotic and abiotic in the theoretical theory in biogeography (worked on the mathematical modeling and a numerical implementation using R and C++).
- Worked on co-occurrence inference of biotic imteractions from co-occurrence data (used probability theory and numerical implmentations in R).
- Developed several tutorials on probability and statistics (theory and applications with R).

06/2012–09/2012: Research Associate

Ecole Normale Supérieure, Paris, France

- Ported wavelets code written in Matlab to C++.
- Develped a data visualisation of the spread of dengue in Southern Asia.

01/2011–11/2011: Research assistant

Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

- Carried out germination experiments.

07/2010–12/2010: Research assistant

SIMBIOS Centre, Abertay University, Dundee, United Kingdom

- Expanded a model (coded in C++) of fungal growth dynamics in a realistic soil environment to integrate a new phisiological process.

Computational Skills

Scientific programming

- ■ ■ ■ ■ ■ R
- ■ ■ ■ □ □ Julia
- ■ ■ □ □ □ Python
- ■ ■ ■ □ □ Matlab/Octave
- ■ ■ ■ □ □ C/C++
- ■ ■ □ □ □ Sage
- ■ ■ ■ □ □ Bash
- ■ ■ ■ □ □ Torque/Slurm

Reproducibility

- ■ ■ ■ ■ □ Git
- ■ ■ ■ ■ □ GNU make
- ■ ■ ■ ■ □ GitHub Actions
- ■ ■ □ □ □ Docker

Database

- ■ ■ ■ □ □ SQLite
- ■ ■ □ □ □ postgreSQL

Modern web technologies

- ■ ■ ■ ■ □ HTML/CSS
- ■ ■ □ □ □ Javascript
- ■ ■ ■ □ □ JSON/XML
- ■ ■ ■ ■ ■ YAML/TOML
- ■ ■ ■ ■ □ Jekyll/Hugo
- ■ ■ ■ ■ □ Shiny App

Document preparation

- ■ ■ ■ □ □ SQLite
- ■ ■ □ □ □ postgreSQL

Teaching

- 2021: *Led a workshop on manipulating and visualizing spatial data with R* Environment and Climate Change Canada, Dartmouth, NS, Canada, 2 days.
- 2021: *Led a workshop on creating reproducible workflows* Bedford Institute of Oceanography, Halifax NS, Canada, 2 days.
- 2021: *Led a workshop on manipulating and visualizing rasters with R* Bedford Institute of Oceanography, Halifax NS, Canada, 2 days.
- 2020: *Led an advanced statitsics workshop (QCBS R workshop series)* Université du Québec à Rimouski, Rimouski QC, Canada, 1 week.
- 2019: *Led an introduction to R* Université du Québec à Montréal, Montreal QC, Canada, 2 days.
- 2018: *Use R as a geographic information system* Institut de recherche en biologie végétale, Montreal QC, Canada, 3h.
- 2017: *Instructor in a meta-analyses workshop* Centre de la Science de la Biodiversité du Québec (CSBQ), Canada, 3 days.
- 2017: *Instructor in the summer school "Bayesian Statistics for Ecologists"* University of Sherbrooke, Sherbrooke QC, Canada, 5 days.
- 2016: *Organized a two-days event on data visualization in biodiversity science for graduate students* Quebec Centre For Biodiversity Science, Canada, 2 days.
- 2015: *Led an introduction to Markov chains* Université du Québec à Rimouski, Canada, 3h.
- 2014–2016: *Presenter for the QCBS R workshop series* Université du Québec à Rimouski, Canada, 16h/year.

- 2014–2015: *Advanced R course on data visualization and graphics editing* Université du Québec à Rimouski, Canada, 1 day/year.
- 2013–2015: *Practical course for first year undergraduates in developmental biology (TA)* Université de Monpellier, France, 64h/year.
- 2014: *Led an advanced R course on map editing* Universidade Federal de Minas Gerais, Brazil, 1 day.

Publications

Peer reviewed

1. Harvey E., Marleau J., Gounand I., Leroux S., Firkowski C., Altermatt F., Blanchet F., **Cazelles K.**, Chu C., DAloia C., Donelle L., Gravel D., Guichard F., McCann K., Ruppert J., Ward C. & Fortin M. (2021). A general meta-ecosystem model to predict ecosystem function at landscape extents. *Preprint*. doi: 10.22541/au.162799968.80128369/v1.
2. Poisot T., Bergeron G., **Cazelles K.**, Dallas T., Gravel D., MacDonald A., Mercier B., Violet C., Vissault S. & Chapman D. (2021). Global knowledge gaps in species interaction networks data. *Journal of Biogeography*. doi: 10.1111/jbi.14127.
3. Beauchesne D., **Cazelles K.**, Archambault P., Dee L. & Gravel D. (2021). On the sensitivity of food webs to multiple stressors. *Ecology Letters*. doi: 10.1111/ele.13841.
4. McCann K., **Cazelles K.**, MacDougall A., Fussmann G., Bieg C., Cristescu M., Fryxell J., Gellner G., Lapointe B. & Gonzalez A. (2020). Landscape modification and nutrient-driven instability at a distance. *Ecology Letters*. doi: 10.1111/ele.13644.
5. **Cazelles K.**, Zemlak T., Gutgesell M., Myles-Gonzalez E., Hanner R. & McCann K. (2021). Spatial fingerprinting: Horizontal fusion of multi-dimensional bio-tracers as solution to global food provenance problems. *Foods*. doi: 10.3390/foods10040717.
6. Blanchet F., **Cazelles K.** & Gravel D. (2020). Co-occurrence is not evidence of ecological interactions. *Ecology Letters*. doi: 10.1111/ele.13525.
7. Warne C., McCann K., Rooney N., **Cazelles K.** & Guzzo M. (2020). Geography and morphology affect the ice duration dynamics of northern hemisphere lakes worldwide. *Geophysical Research Letters*. doi: 10.1029/2020gl087953.
8. Solarik K., **Cazelles K.**, Messier C., Bergeron Y. & Gravel D. (2019). Priority effects will impede range shifts of temperate tree species into the boreal forest. *Journal of Ecology*. doi: 10.1111/1365-2745.13311.
9. Poisot T., Bergeron G., **Cazelles K.**, Dallas T., Gravel D., MacDonald A., Mercier B. & Vissault S. (2020). Environmental biases in the study of ecological networks at the planetary scale. *Preprint*. doi: 10.1101/2020.01.27.921429.
10. Brice M., **Cazelles K.**, Legendre P. & Fortin M. (2019). Disturbances amplify tree community responses to climate change in the temperateboreal ecotone. *Global Ecology and Biogeography*. doi: 10.1111/geb.12971.
11. **Cazelles K.** (2019). Homogenization of freshwater lakes: Recent compositional shifts in fish communities are explained by gamefish movement and not climate change. *Global Change Biology*. doi: 10.1111/gcb.14829.
12. Albouy C., Archambault P., Appeltans W., Araújo M., Beauchesne D., **Cazelles K.**, Cirtwill A., Fortin M., Galiana N., Leroux S., Pellissier L., Poisot T., Stouffer D., Wood S. & Gravel D. (2019). The marine fish food web is globally connected. *Nature Ecology & Evolution*. doi: 10.1038/s41559-019-0950-y.
13. **Cazelles K.** & McCann K. (2019). Diversity-stability and the structure of perturbations. *Peer Community In Ecology*. doi: 10.24072/pci.ecology.100017.
14. Bartley T., Guzzo M., **Cazelles K.**, Verville A., McMeans B. & McCann K. (2019). Thermal preference influences depth use but not biomass of predatory fishes in response to lake morphometry. *Preprint*. doi: 10.1101/572925.
15. Bartley T., McCann K., Bieg C., **Cazelles K.**, Granados M., Guzzo M., MacDougall A., Tunney T. & McMeans B. (2019). Food web rewiring in a changing world. *Nature Ecology & Evolution*. doi: 10.1038/s41559-018-0772-3.
16. Wheeler H., Berteaux D., Furgal C., **Cazelles K.**, Yoccoz N. & Grémillet D. (2018). Identifying key needs for the integration of social-ecological outcomes in arctic wildlife monitoring. *Conservation Biology*. doi: 10.1111/cobi.13257.
17. Geschke J., **Cazelles K.** & Bartomeus I. (2018). Rcites: An r package to access the CITES speciesplus database. *Journal of Open Source Software*. doi: 10.21105/joss.01091.

18. Galiana N., Lurgi M., Claramunt-López B., Fortin M., Leroux S., **Cazelles K.**, Gravel D. & Montoya J. (2018). The spatial scaling of species interaction networks. *Nature Ecology & Evolution*. doi: 10.1038/s41559-018-0517-3.
19. MacDougall A., Harvey E., McCune J., Nilsson K., Bennett J., Firn J., Bartley T., Grace J., Kelly J., Tunney T., McMeans B., Matsuzaki S., Kadoya T., Esch E., **Cazelles K.**, Lester N. & McCann K. (2018). Context-dependent interactions and the regulation of species richness in freshwater fish. *Nature Communications*. doi: 10.1038/s41467-018-03419-1.
20. Legagneux P., Casajus N., **Cazelles K.**, Chevallier C., Chevrinais M., Guéry L., Jacquet C., Jaffré M., Naud M., Noisette F., Ropars P., Vissault S., Archambault P., Bêty J., Berteaux D. & Gravel D. (2018). Our house is burning: Discrepancy in climate change vs. Biodiversity coverage in the media as compared to scientific literature. *Frontiers in Ecology and Evolution*. doi: 10.3389/fevo.2017.00175.
21. Kopelke J., Nyman T., **Cazelles K.**, Gravel D., Vissault S. & Roslin T. (2017). Food-web structure of willow-galling sawflies and their natural enemies across europe. *Ecology*. doi: 10.1002/ecy.1832.
22. Massol F., Dubart M., Calcagno V., **Cazelles K.**, Jacquet C., Kéfi S. & Gravel D. (2017). Island biogeography of food webs. *Networks of invasion: A synthesis of concepts*. doi: 10.1016/bs.aecr.2016.10.004.
23. **Cazelles K.**, Mouquet N., Mouillot D. & Gravel D. (2016). On the integration of biotic interaction and environmental constraints at the biogeographical scale. *Ecography*. doi: 10.1111/ecog.01714.
24. **Cazelles K.**, Araújo M., Mouquet N. & Gravel D. (2015). A theory for species co-occurrence in interaction networks. *Theoretical Ecology*. doi: 10.1007/s12080-015-0281-9.
25. Stradic S., Silveira F., Buisson E., **Cazelles K.**, Carvalho V. & Fernandes G. (2015). Diversity of germination strategies and seed dormancy in herbaceous species of campo rupestre grasslands. *Austral Ecology*. doi: 10.1111/aec.12221.
26. Cazelles B. & **Cazelles K.** (2014). Major urban centers have weak influence on the timing of dengue epidemics in southeast asia. *International Journal of Infectious Diseases*. doi: 10.1016/j.ijid.2014.03.873.
27. Cazelles B., **Cazelles K.** & Chavez M. (2013). Wavelet analysis in ecology and epidemiology: Impact of statistical tests. *Journal of The Royal Society Interface*. doi: 10.1098/rsif.2013.0585.
28. **Cazelles K.**, Otten W., Baveye P. & Falconer R. (2013). Soil fungal dynamics: Parameterisation and sensitivity analysis of modelled physiological processes, soil architecture and carbon distribution. *Ecological Modelling*. doi: 10.1016/j.ecolmodel.2012.08.008.

Popularization

1. **Cazelles K.** (2014). La Biodiversité en territoire isolée. *Accromath*.
2. Legagneux P., **Cazelles K.** & Gravel D. (2019). Sommes-nous bien informés ? : écarts entre la couverture du changement climatique et de la biodiversité par les médias et la littérature scientifique. *Climatoscope*.

Editorial and review activities

As an academic, I have been actively involved in the peer-review process and I have been a reviewer for the following journals: American Naturalist, Biodiversity data journal, Canadian Journal of Fisheries and Aquatic Sciences, Diversity and Distributions, Ecography, Ecological Applications, Ecology, Ecology Letters, eLife, Entropy, Environment, Development and Sustainability, Global Ecology and Biogeography, Journal of Animal Ecology, Journal of Vegetation Science, Methods in Ecology and Evolution, Nature Ecology and Evolution, Oikos, PeerJ, Population Ecology, Proceedings of the Royal Society B, Theoretical Ecology and Scientific ReportsI have also been a 'recommender' for PCI Ecology since 2019.

Software

This section includes a subset of my contributions to open-source software. If you are interested in seeing more, most of my contributions can be found on my GitHub account, see also the section "notes" of my website.

packages

Below is a selection of R packages I significantly contributed to.

- **rcites** (maintainer): R client to access the Speciesplus database via the Speciesplus/CITES Checklist API. .
- **graphicsutils** (maintainer): Miscellenous graphical functions .

- **inSilecoMisc** (maintainer): Miscellenous R functions .
- **disker** (maintainer): Rcpp implementation of 5 isotropic dispersal kernels .
- **motifcensus** (maintainer): Rcpp implementation that counts the different positions occupied by the different species in all the 3 species motifs of a given unipartite network .
- **rmangal** (contributor): R Client for the Mangal database .
- **rgovcan** (contributor): R package to interact with the Open Canada API .

Research compendia

I am strongly committed to making the science I do reproducible. To that end, every study I lead come with a research compendium. Below is a list of selected research compendia that were published along side with the corresponding paper.

- **Spatial Fingerprinting**: Creation of spatial fingerprint combining biotracers, determination of geographic origin using machine learning (paper's doi: 10.3390/foods10040717). 10.5281/zenodo.4602032
- **NDID**: Theoretical investigations in metaecosystem theory, build and solve ordinary differential equations (paper's doi: 10.1111/ele.13644). 10.5281/zenodo.4081347
- **coocNotInteract**: Theoretical investigations that explain why co-occurrence is not evidence of ecological interaction (paper's doi: 10.1111/ele.13525). 10.5281/zenodo.3733206
- **HomogenFishOntario**: Analysis of homogenization in fresh water lakes (paper's doi: 10.1111/gcb.14829). 10.5281/zenodo.3383237
- **monitoringOutcomes**: Networks analysis to identify key needs for the integration of social–ecological outcomes in arctic wildlife monitoring (paper's doi: 10.1111/cobi.13257). 10.5281/zenodo.1652737
- **burningHouse**: Comparison of media coverage of climate change and media coverage of biodiversity crisis (paper's doi: 10.1111/cobi.13257). 10.5281/zenodo.1134897
- **Biogeonet**: Theoretical investigations in metaecosystem theory Build and solve Markov chains (paper's doi: 10.3389/fevo.2017.00175). 10.3389/fevo.2017.00175

Manuals

- Casajus N. & **Cazelles K.** Visualiser vos données avec R (2020)
- **Cazelles K.** Utiliser R Markdown pour créer des documents dynamiques (2020)

Presentations

Talks

1. **Cazelles K.**, Myles-Gonzalez E., Zemlak T. & McCann K.. Embracing the blessing of dimensionality to determine species' provenance. QCBS Annual symposium. Montreal, QC, Canada (2019-12-19).
2. **Cazelles K.**, Gravel D. & McCann K.. Towards an Energetic Theory of Island biogeography. ESA Annual Meeting. New-Orleans, LA, USA (2018-08-01).
3. **Cazelles K.**, Myles-Gonzalez E., Zemlak T. & McCann K.. Fighgting Noise with dimensionality. CSEE Annual Meeting. Guelph, ON, Canada (2018-07-01).
4. **Cazelles K.**, Gravel D. & McCann K.. Towards an Energetic Theory of Island biogeography. Ecology Across Borders. Ghent, Belgium (2017-12-01).
5. **Cazelles K.**, Gravel D. & McCann K.. Do ecological interactions impact geographic distributions of species?. Ecology Across Borders. Ghent, Belgium (2017-12-01).
6. Vissault S. & **Cazelles K.**. Teaser of the alien R package. R à Québec. Québec, QC, Canada (2017-01-08).
7. **Cazelles K.**, Mouquet N. & Gravel D.. Do ecological interaction impact geographical distributions of species?. QCBS - Annual Symposium. Montreal, QC, Canada (2015-12-01).
8. **Cazelles K.**, Mouquet N., Mouillot D. & Gravel D.. Integration of ecological networks in a theoretical stochastic model of biogeography. CSEE - Annual Meeting. Saskatoon, SK, Canada (2015-08-01).
9. **Cazelles K.**, Mouquet N., Mouillot D. & Gravel D.. Integration of ecological networks in a theoretical stochastic model of biogeography. BES-SFE - Joint Annual Meeting. Lille, France (2014-12-01).

10. **Cazelles K.** & Cazelles B.. Wavelet Clustering, a tool to integrate spatial and temporal patterns based on their dynamical properties, application to dengue in Thailand. Model in Population Biology. Santa Maria, Brazil (2012-08-01).

Seminars

1. **Cazelles K.**. Do biotic interactions affect species distribution?. Université de Sherbrooke. Université de Sherbrooke (2018-10-12).
2. **Cazelles K.**. Do biotic interactions affect species distribution?. Department of Integratove Biology, University of Guelph. Department of Integratove Biology, University of Guelph (2018-03-13).
3. **Cazelles K.**. Do biotic interactions affect species distribution?. Institut de recherche en biologie végétale, Montréal. Institut de recherche en biologie végétale, Montréal (2018-02-02).
4. **Cazelles K.**. Do biotic interactions affect species distribution?. Department of Ecology & Evolutionary Biology, University of Toronto.. Department of Ecology & Evolutionary Biology, University of Toronto. (2018-01-08).
5. **Cazelles K.**. Do biotic interactions affect species distribution?. Laboratoire d'ECologie Alpine, Université Grenoble Alpes.. Laboratoire d'ECologie Alpine, Université Grenoble Alpes. (2017-02-09).

Posters

1. Vissault S., Gravel D., **Cazelles K.** & Poisot T.. Mangal, a global ecological interactions database. biodiversitynext. Leiden – The Netherlands (2018-08-01).
2. Brice M., Legendre P., **Cazelles K.** & Fortin M.. Long-term forest community changes in the boreal-temperate ecotone. ESA Annual Meeting. New-Orleans, LA, USA (2018-08-01).
3. Myles-Gonzalez E., **Cazelles K.**, Zemlak T. & McCann K.. Using Distributions of Biotracers to Predict Global Food Traceability. 69th Pacific Fisheries Technologists' (PFT) conference 2018. Alaska (2018-02-01).
4. Beauchesne D., **Cazelles K.**, Archambault P. & Gravel D.. Predicting the spatial distribution of ecological networks. CSEE Annual meeting. Victoria, BC, Canada (2017-08-01).
5. Legagneux P., Casajus N., **Cazelles K.**, Chevallier C., Chevrinais M., Guéry L., Jacquet C., Jaffré M., Naud M., Noisette F., Ropars P., Vissault S., Archambault P., Bêty J., Berteaux D. & Gravel D.. The Earth Tribune. ArcticNet Meeting. Winnipeg, MB, Canada (2016-12-01).

Grants and awards

- **2017**, CA$1,500. (ACFAS award for the best joint PhD France-Canada (French laureate)).
- **2016**, CA$20,000. (Grant from the FRQNT (Fonds de Recherche du Québec Nature et Technologies)).
- **2016**, CA$1,500. (Excellence awards of the Quebec Centre for Biodiversity Science (QCBS)).
- **2015**, CA$150. (Award for the second best oral presentation of the QCBS annual meeting).
- **2015–2016**, CA$6,000/year. (Grant from the Frontenac program (mobility program for joint Phd between France and Québec)).
- **2012–2015**, €24 000/year. (Grant from the Ministry of Higher Education and Research of France).
- **2012–2015**, CA$4,000/year. (Grant from the FRQNT).

Media Coverage

- : Une carte des interactions entre les poissons de toutes les mers – Québec Science (2020, fr).
- : Trees stumped – Science (2019, en).
- : La biodiversité dans l'ombre des changements climatiques – la Presse (2018, fr).
- : As biodiversity declines, so does public attention – Anthropocenemagazine (2018, en).
- : La crisi della biodiversità non interessa i media – Greenreport (2018, it).
- : Pourquoi parle-t-on bien plus du changement climatique que de l'érosion de la biodiversité ? – 20 minutes (2018, fr).

- 🎤 : Interview de Pierre Legagneux à RFI – RFI (2018, fr).
- ✎ : Une grande chance, malgré un manque de soutien – le Devoir (2018, fr).