

# Francis Banville

POSTDOCTORAL FELLOW · COMPUTATIONAL ECOLOGY

Université de Montréal, 1375 Thérèse-Lavoie-Roux avenue, Montreal, QC H2V 0B3, Canada (room B-5439)

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*I use mathematics and statistics to tackle critical ecological questions.*

## Education

### IN PROGRESS

#### Postdoc in Biological Sciences

Université de Montréal

- advisors: Drs. Timothée Poisot, Andrea Paz Velez, and Colin Carlson (Yale University)

Montreal, CAN

Jan. 2025 - Nov. 2025

#### Microprogram in Higher Education

Université de Montréal

- GPA: 4.300 (6 / 15 credits)

Montreal, CAN

Jan. 2025 - Aug. 2026

### COMPLETED

#### Ph.D. in Biological Sciences

Université de Montréal

- option General Biology
- advisors: Drs. Timothée Poisot and Dominique Gravel (Université de Sherbrooke)
- thesis: Towards a maximum entropy theory of food webs (classified as excellent, 84 research credits)
- GPA: 4.150/4.3 (6 course credits)

Montreal, CAN

Sept. 2019 - Dec. 2024

#### B.Sc. in Biological Sciences

Université de Montréal

- option Biodiversity, Ecology, and Evolution
- GPA: 4.198 / 4.3 (91 credits)

Montreal, CAN

Jan. 2016 - Apr. 2018

### INTERRUPTED

#### M.Sc. in Biological Sciences

Université de Montréal

- option Quantitative and Computational Biology (course-based M.Sc.)
- GPA: 4.217 / 4.3 (35 / 45 credits)

Montreal, CAN

Sept. 2018 - Aug. 2019

#### B.Sc. in Mathematics

Université de Montréal

- option Applied and Pure Mathematics
- GPA: 4.161 / 4.3 (33 / 90 credits)

Montreal, CAN

Sept. 2013 - Aug. 2015

## Skills

<b>Research interests</b>	Ecological networks, Computational biology, Mathematical modeling, Biostatistics, Machine learning
<b>Programming</b>	R, Julia, Git, Bash, Markdown, LaTeX
<b>Specialized software</b>	OpenRefine, QGIS, SPSS, Maxima, Excel
<b>Languages</b>	French, English, Spanish (B2.2)

## Grants and awards

### GRANTS

2024	<b>Scholarship for end of PhD studies (5th year)</b> , Graduate and Postdoctoral Studies, U. de Montréal	\$8,000
2023-24	<b>Fully funded fellowship</b> , Computational Biodiversity Science & Services program (BIOS <sup>2</sup> )	\$10,500
2019-24	<b>Mobility grants</b> , Computational Biodiversity Science & Services program (BIOS <sup>2</sup> )	\$10,000
2023	<b>Excellence Scholarship</b> , Fonds de bourses en sciences biologiques, U. de Montréal	\$1,500
2023	<b>Perseverance Scholarship</b> , Département de sciences biologiques, U. de Montréal	\$2,000
2019-23	<b>PhD Excellence Scholarship</b> , Institute for Data Valorization (IVADO)	\$100,000
2019-21	<b>Fast-track Master's to PhD program</b> , Graduate and Postdoctoral Studies, U. de Montréal	\$14,000
2019	<b>Research internship grant</b> , The Lapierre lab, Université de Montréal	\$6,000
2018	<b>Research internship grant</b> , The Lapierre lab, Université de Montréal	\$8,400
2017	<b>Undergraduate Student Research Awards</b> , Natural Sci. and Engr. Research Council of CAN (NSERC)	\$7,625

## AWARDS

2024	<b>Best presentation by a PhD student</b> , 34th Biology Symposium of the University of Montreal	U. de Montréal
2014-18	<b>Dean's Award of the Faculty of Arts and Sciences</b> , Distinction for academic excellence	U. de Montréal
2011	<b>Governor General's Academic Medal</b> , Distinction for the best overall average of the 2011 cohort	Polybel high school
2011	<b>Lieutenant Governor's Youth Medal</b> , Honorary medal for academic excellence and social involvement	Polybel high school

## Teaching and mentoring

### TEACHING ASSISTANCE

F-2024	<b>Head teaching assistant</b> , BIO2041 Biostatistique 1	U. de Montréal
F-2024	<b>Teaching assistant</b> , BIO2043 Statistique pratique pour sciences de la vie	U. de Montréal
S-2024	<b>Head teaching assistant</b> , BIO2041 Biostatistique 1	U. de Montréal
W-2024	<b>Head teaching assistant</b> , BIO2042 Biostatistique 2	U. de Montréal
F-2023	<b>Head teaching assistant</b> , BIO2041 Biostatistique 1	U. de Montréal
S-2023	<b>Teaching assistant</b> , BIO2041 Biostatistique 1	U. de Montréal
W-2023	<b>Teaching assistant</b> , BIO2042 Biostatistique 2	U. de Montréal
F-2022	<b>Head teaching assistant</b> , BIO2041 Biostatistique 1	U. de Montréal
S-2022	<b>Teaching assistant</b> , BIO2041 Biostatistique 1	U. de Montréal
W-2022	<b>Grader</b> , BIO2811 Dynamique des populations	U. de Montréal
F-2021	<b>Grader</b> , BIO1001 Méthodes de recherche en biologie (TP)	U. de Montréal
S-2021	<b>Teaching assistant</b> , BIO6065 École d'été en synthèse écologique de données	U. de Montréal
W-2021	<b>Grader</b> , BIO2811 Dynamique des populations	U. de Montréal
F-2020	<b>Teaching assistant</b> , BIO3043 Théorie des réseaux	U. de Montréal

### TUTORING AND MENTORING

F-2024	<b>Tutor</b> , BIO2041 Biostatistique 1	U. de Montréal
S-2024	<b>Tutor</b> , BIO2041 Biostatistique 1	U. de Montréal
W-2024	<b>Tutor</b> , BIO2042 Biostatistique 2	U. de Montréal
F-2023	<b>Tutor</b> , BIO2041 Biostatistique 1	U. de Montréal
S-2023	<b>Tutor</b> , BIO2041 Biostatistique 1	U. de Montréal
W-2023	<b>Tutor</b> , BIO2042 Biostatistique 2	U. de Montréal
S-2022	<b>Tutor</b> , BIO2041 Biostatistique 1	U. de Montréal
W-2022	<b>Mentor</b> , IVADO's Data.Trek training program	virtual
S-2021	<b>Tutor</b> , BIO2041 Biostatistique 1	U. de Montréal
S-2020	<b>Tutor</b> , BIO2041 Biostatistique 1	U. de Montréal
W-2020	<b>Mentor</b> , IVADO's Data.Trek training program	virtual

### WORKSHOPS

S-2025	<b>Presentation assistant</b> , CSEE workshop, Data analysis and visualization in Python for ecologists (1 day)	Sherbrooke, CAN
W-2025	<b>Co-presenter</b> , BIOS <sup>2</sup> workshop, R and Git: From code to collaboration (1 day)	Montreal, CAN
S-2022	<b>Co-presenter</b> , Poisot lab Twitch workshop, Species distribution models in Julia (3 hours)	virtual
F-2021	<b>Co-presenter</b> , Software carpentry, Programming in R (4 days)	Rimouski, CAN
F-2021	<b>Presentation assistant</b> , Software carpentry, Introduction to Git (1 day)	Rimouski, CAN
W-2021	<b>Presentation assistant</b> , QCBS R workshops, Generalized linear models in R (3 hours)	virtual
W-2021	<b>Presentation assistant</b> , QCBS R workshops, Generalized additive models in R (3 hours)	virtual
W-2020	<b>Lead presenter</b> , IVADO's Data.Trek program, Machine learning and ecological networks in Julia (2 hours)	Montreal, CAN
W-2020	<b>Co-presenter</b> , IVADO's Data.Trek program, Introduction to R (3 hours)	Montreal, CAN
F-2019	<b>Lead presenter</b> , QCBS R workshops, Programming in R (3 hours)	Montreal, CAN

## Professional experience

### Group on Earth Observations Biodiversity Observation Network (GEO BON)

Research agent

Montreal, CAN

May 2021 - Aug. 2021

- part-time internship in biodiversity science
- supervision: Drs. Andrew Gonzalez and Timothée Poisot

### Institute for Data Valorization (IVADO)

Event co-organizer

Montreal, CAN

Jan. 2020 - Apr. 2020

- part-time internship co-organizing the Data.Trek training program
- supervision: Barbara Decelle

### Université de Montréal

Research assistant

Montreal, CAN

May 2019 - Aug. 2019

- full-time research project in quantitative limnology
- supervision: Drs. Jean- François Lapierre and Roxane Maranger

### Université de Montréal

Research assistant

Montreal, CAN

May 2018 - Aug. 2018

- full-time research project in quantitative limnology
- supervision: Drs. Jean- François Lapierre and Marc Amyot

### Université de Montréal

Research assistant

Montreal, CAN

May 2017 - Aug. 2017

- full-time research project in plant molecular biology
- supervision: Drs. Daniel Philippe Matton and Valentin Joly

### Collège des médecins du Québec

Research agent

Montreal, CAN

Jan. 2015 - July 2015

- full-time internship in applied statistics and psychometry
- supervision: Johanne Thiffault

## Working groups

### BIOS<sup>2</sup>

Working group co-organizer

Montreal, CAN

Sept. 2022

- title: Black holes and revelations: Identifying priority sampling locations for local food webs in CAN
- led by Gabriel Dansereau, **Francis Banville**, Michael Catchen, and Tanya Strydom

### Living Data Project

Working group participant

virtual

Sept. 2021

- title: Finding indicator species by assessing the utility of sampled abundance indices
- led by Dr. Robin Freeman, Dr. Jessica Currie, and Dr. Valentina Marconi

### Canadian Institute of Ecology and Evolution

Working group participant

virtual

Jan. 2021 - Mar. 2022

- title: Assembling, predicting and refining a predator-prey metaweb for CAN
- led by Dominique Caron and Tanya Strydom

## Publications

### PEER-REVIEWED ARTICLES

- [11] **Banville, F.**, Strydom, T., Blyth, P., Brimacombe, C., Catchen, M.D., Dansereau, G., Higino, G., Malpas, T., Mayall, H., Norman, K., Gravel, D., and Poisot, T. (2025). Deciphering probabilistic species interaction networks. *Ecology Letters*. <https://doi.org/10.1111/ele.70161> 2025
- [10] Strydom, T., Bouskila, S., **Banville, F.**, Barros, C., Caron, D., Farrell, M.J., Fortin, M.-J., Mercier, B., Pollock, L.J., Runghen, R., Dalla Riva, G.V., and Poisot, T. (2023). Graph embedding and transfer learning can help predict potential species interaction networks despite data limitations. *Methods in Ecology and Evolution*. <https://doi.org/10.1111/2041-210X.14228> 2023
- [9] **Banville, F.**, Gravel, D., and Poisot, T. (2023). What constrains food webs? A maximum entropy framework for predicting their structure with minimal biases. *PLOS Computational Biology*, 19(9), e1011458. <https://doi.org/10.1371/journal.pcbi.1011458> 2023
- [8] Higino, G.T., **Banville, F.**, Dansereau, G., Forero-Muñoz, N.R., Windsor, F., and Poisot, T. (2023). Mismatch between IUCN range maps and species interactions data illustrated using the Serengeti food web. *PeerJ*, 11, e14620. <https://doi.org/10.7717/peerj.14620> 2023
- [7] Lawlor, J., **Banville, F.**, Forero-Muñoz, N.R., Hébert, K., Martínez-Lanfranco, J.A., Rogy, P., and MacDonald, A.A.M. (2022). Ten simple rules for teaching yourself R. *PLOS Computational Biology*, 18(9), e1010372. <https://doi.org/10.1371/journal.pcbi.1010372> 2022
- [6] Strydom, T., Bouskila, S., **Banville, F.**, Barros, C., Caron, D., Farrell, M.J., Fortin, M.-J., Hemming, V., Mercier, B., Pollock, L.J., Runghen, R., Dalla Riva, G.V., and Poisot, T. (2022). Food web reconstruction through phylogenetic transfer of low-rank network representation. *Methods in Ecology and Evolution*, 13(12), 2838-2849. <https://doi.org/10.1111/2041-210X.13835> 2022
- [5] Strydom, T., Catchen, M.D., **Banville, F.**, Caron, D., Dansereau, G., Desjardins-Proulx, P., Forero-Muñoz, N.R., Higino, G., Mercier, B., Gonzalez, A., Gravel, D., Pollock, L., and Poisot, T. (2021). A roadmap towards predicting species interaction networks (across space and time). *Philosophical Transactions of the Royal Society B: Biological Sciences*, 376(1837), 20210063. <https://doi.org/10.1098/rstb.2021.0063> 2021
- [4] Higino G., Forero-Muñoz, N.R., **Banville, F.**, Dansereau, G., and Poisot, T. (2021). Computers can help us find raccoons and other living creatures. *Front. Young Minds*. 9(595275). <https://doi.org/10.3389/frym.2021.595275> 2021
- [3] **Banville, F.**, Vissault, S., and Poisot, T. (2021). Mangal.jl and EcologicalNetworks.jl: Two complementary packages for analyzing ecological networks in Julia. *Journal of Open Source Software*, 6(61), 2721. <https://doi.org/10.21105/joss.02721> 2021
- [2] Dansereau, G., **Banville, F.**, Basque, E., MacDonald, A.A.M., and Poisot, T. (2020). [Re] Chaos in a three-species food chain. *ReScience C*, 6(3), 5. <https://doi.org/10.5281/zenodo.4022518> 2020
- [1] MacDonald, A.A.M., **Banville, F.**, and Poisot, T. (2020). Revisiting the links-species scaling relationship in food webs. *Patterns*, 0(0). <https://doi.org/10.1016/j.patter.2020.100079> 2020

## PHD THESIS

- Banville, F.** (2024). Vers une théorie de l'entropie maximale des réseaux trophiques. Papyrus, Université de Montréal. <https://hdl.handle.net/1866/40637> 2024

## Presentations

### ORGANIZED SESSIONS

[3] Arce Plata, M.I., **Banville, F.**, Cruz Rodriguez, C., Dansereau, G., Forero-Muñoz, N.R., and Poisot, T. (2024, October 24). Connecting the dots: Bringing together scientists, policymakers, and practitioners to better implement biodiversity indicators [Side event]. GEO BON pavilion, 2024 United Nations Biodiversity Conference (COP16), Cali, Colombia. 2024

[2] Leroux, E., Mélançon, V., **Banville, F.**, Brémaud, J., Robitaille, F., and Gholamhosseini, M. (2023, March 16-17). Complexity matters: subjectivity as practice in contemporary biology [Conference]. 33rd Biology Symposium of the University of Montreal, Montreal, Qc, Canada. 2023

[1] Dansereau, G., **Banville, F.**, and Strydom, T. (2022, August 14-19). Space Oddity: Thinking about ecological networks across space [Inspire session]. ESA and CSEE Joint Meeting, Montreal, Qc, Canada. 2022

## CONTRIBUTED TALKS

[10] **Banville, F.**, Gravel, D., and Poisot, T. (2025, July 6-9). Towards a maximum entropy theory of food webs [Conference presentation]. 2025 Annual Conference of the Canadian Society for Ecology and Evolution, Sherbrooke, Qc, Canada. 2025

[9] **Banville, F.**, Gravel, D., and Poisot, T. (2025, February 24-26). Vers une théorie de l'entropie maximale des réseaux trophiques [Conference presentation]. 2025 QCBS Symposium, Longueuil, Qc, Canada. 2025

[8] **Banville, F.**, Gravel, D., and Poisot, T. (2024, March 21-22). Quoi, quand et où manger ? À la découverte des interactions trophiques entre contraintes et incertitudes [Conference presentation]. 34th Biology Symposium of the University of Montreal, Montreal, Qc, Canada. 2024

[7] **Banville, F.**, Gravel, D., and Poisot, T. (2024, February 19-21). Quoi, quand et où manger ? À la découverte des interactions trophiques entre contraintes et incertitudes [Conference presentation]. 2024 QCBS Symposium, Montreal, Qc, Canada. 2024

[6] **Banville, F.**, Gravel, D., and Poisot, T. (2023, May 8-12). Comment les réseaux de prédateurs et de proies sont-ils structurés dans les milieux naturels? [Conference presentation]. 90e congrès de l'ACFAS, Montreal, Qc, Canada. 2023

[5] **Banville, F.**, Gravel, D., and Poisot, T. (2022, August 14-19). What constrains food webs? A maximum entropy model for predicting their structure with minimal biases [Conference presentation]. 2022 Annual Meeting of the Ecological Society of America (ESA), Montreal, Qc, Canada. 2022

[4] **Banville, F.**, Gravel, D., and Poisot, T. (2022, March 25). Food webs of maximum entropy: A story of ecology and stochasticity [Conference presentation]. 32nd Biology Symposium of the University of Montreal, Montreal, Qc, Canada. 2022

[3] **Banville, F.**, Gravel, D., and Poisot, T. (2020, October 22). Predicting networks of species interactions [Conference presentation]. IVADO Digital October 2020, virtual. 2020

[2] **Banville, F.**, MacDonald, A.A.M., Gravel, D., and Poisot, T. (2020, February 19). How to estimate network structure without interaction data [Conference presentation]. Extreme Climate Events Symposium 2020, Toronto, On, Canada. 2020

[1] **Banville, F.**, MacDonald, A.A.M., Gravel, D., and Poisot, T. (2019, December 18-20). How to estimate network structure without data [Conference presentation]. 10th Annual QCBS Symposium, Montreal, Qc, Canada. 2019

## LIGHTNING TALKS

[4] **Banville, F.**, Gravel, D., and Poisot, T. (2022, March 29). Interactions entre espèces : une histoire d'écologie et de hasard [Conference short presentation]. My IVADO research project in 180 seconds, Montreal, Qc, Canada. 2022

[3] <b>Banville, F.</b> , Gravel, D., and Poisot, T. (2021, October 28). Predicting food webs across space: First estimates of food-web structure derived from species richness [Conference short presentation]. IVADO Digital October 2021, virtual.	2021
[2] <b>Banville, F.</b> , Gravel, D. and Poisot, T. (2020, December 14-16). Trophic-METE: A parsimonious theory of food-web structure [Conference short presentation]. 11th Annual QCBS Symposium, virtual.	2020
[1] <b>Banville, F.</b> , Vissault, S., Bélisle, Z., Hoebeke, L., Stock, M., Szefer, P., and Poisot, T. (2020, July 29-31). Analyzing species interaction networks in Julia [Conference short presentation]. Juliacon 2020, virtual.	2020

## POSTERS

[3] <b>Banville, F.</b> , Carlson, C., Paz Velez, A., and Poisot, T. (2025, July 6-9). Monitoring biodiversity for human, animal, and environmental health [Poster presentation]. 2025 Annual Conference of the Canadian Society for Ecology and Evolution, Sherbrooke, Qc, Canada.	2025
[2] <b>Banville, F.</b> , Gravel, D. and Poisot, T. (2021, December 8-10). Given limited knowledge, what can we say about a food web's properties? [Poster presentation]. 12th Annual QCBS Symposium, virtual.	2021
[1] <b>Banville, F.</b> , Gravel, D. and Poisot, T. (2020, December 14-16). Trophic-METE: A parsimonious theory of food-web structure [Poster presentation]. 11th Annual QCBS Symposium, virtual.	2020

## PHD DEFENSE

<b>Banville, F.</b> (2024, December 2). Vers une théorie de l'entropie maximale des réseaux trophiques [PhD defense]. University of Montreal, Montreal, Qc, Canada.	2024
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# Completed graduate courses and certificates

## CREDITED COURSES

S-2025	<b>PPA6075</b> , Apprentissage en enseignement supérieur	U. de Montréal
W-2025	<b>ETA6045</b> , Évaluation en enseignement supérieur	U. de Montréal
W-2021	<b>BIO860M</b> , Séminaire thématique en écologie	UQAM
F-2019	<b>BIO6037</b> , Analyse des réseaux écologiques	U. de Montréal
S-2019	<b>BIO6063</b> , Travail dirigé 1	U. de Montréal
S-2019	<b>BIO6065</b> , École d'été en synthèse écologique de données	U. de Montréal
W-2019	<b>BIO6032</b> , Biologie computationnelle et modélisation	U. de Montréal
W-2019	<b>BIO6033</b> , Méthodes quantitatives en biologie	U. de Montréal
W-2019	<b>BIO611</b> , Progrès en phylogénie systématique	U. de Montréal
W-2019	<b>MSO6028</b> , Introduction aux théories de la mesure	U. de Montréal
F-2018	<b>BIO6004</b> , Communication scientifique	U. de Montréal
F-2018	<b>BIO6077</b> , Analyse quantitative des données	U. de Montréal
F-2018	<b>BIO6260</b> , Génomique microbienne	U. de Montréal
F-2018	<b>GE06321</b> , Travaux pratiques en géomatique	U. de Montréal

## EXTRACURRICULAR COURSES

S-2023	<b>EFI</b> , Short Course on Forecasting for Decision-Making: An Epidemiological and Ecological Perspective	U. of Toronto
S-2023	<b>ECL807</b> , Advanced Field School in Computational Ecology 2023	U. de Sherbrooke
F-2022	<b>LDP</b> , Scientific collaboration in ecology and evolution	Living Data Project
F-2021	<b>LDP</b> , Synthesis statistics for ecology and evolution	Living Data Project
S-2021	<b>ECL807</b> , École d'été en modélisation de la biodiversité 2021	U. de Sherbrooke

## EXTRACURRICULAR CERTIFICATES

S-2024	<b>CIT</b> , Certified Carpentries Instructor	The Carpentries
W-2022	<b>LDP</b> , Cert. in Synthetic and Collaborative Science	Living Data Project

## Affiliations and professional memberships

2025	<b>Lab member</b> , The Carlson Lab	Yale U.
2025	<b>Student member</b> , The Viral Emergence Research Initiative (Verena)	USA
2025	<b>Student member</b> , Groupe de recherche en épidémiologie des zoonoses et santé publique (GREZOSP)	U. de Montréal
2024-25	<b>Certified Carpentries Instructor</b> , The Carpentries	USA
2023-25	<b>Student member</b> , Group on Earth Observations Biodiversity Observation Network (GEO BON)	CAN
2019-25	<b>Fellow</b> , Computational Biodiversity Science & Services program (BIOS <sup>2</sup> )	CAN
2019-25	<b>Student member</b> , Quebec Centre for Biodiversity Science (QCBS)	Quebec, CAN
2019-25	<b>Lab member</b> , Quantitative and Computational Ecology Lab	U. de Montréal
2019-24	<b>Lab member</b> , Integrative Ecology Lab	U. de Sherbrooke
2019-23	<b>Scholarship recipient</b> , Institute for Data Valorization (IVADO)	Quebec, CAN
2023	<b>Student member</b> , Ecological Forecasting Initiative (EFI)	USA
2023	<b>Student member</b> , Association canadienne-française pour l'avancement des sciences (ACFAS)	CAN
2022	<b>Student member</b> , Ecological Society of America (ESA)	USA

## Services and outreach

### Scientific journals

Peer reviewer

Virtual  
Jan. 2025 - present

- Human and Ecological Risk Assessment: An International Journal (1 peer review)
- Oikos journal (1 peer review)

### Quebec Center for Biodiversity Science (QCBS)

Longueuil, CAN  
Feb. 2025

Volunteer

- providing help during the annual symposium, including the moderation of oral presentations

### La Nuit des chercheuses et des chercheurs, Espace pour la vie

Montreal, CAN  
Nov. 2021-23

Participant

- science communication and exchange with the general public

### Association des étudiants-chercheurs en biologie de l'Université de Montréal (AECBUM)

U. de Montréal  
Aug. 2022 - Apr. 2023

Co-organizer of the annual symposium of the department of biological sciences

- organization of the theme and talks of the symposium and choice of caterers

### Centre de l'engagement étudiant

Student mentor

U. de Montréal  
Sept. 2022 - Dec. 2022

- providing assistance to new students on campus

### Association étudiante de biologie de l'Université de Montréal (AEBUM)

Environmental Coordinator

U. de Montréal  
Feb. 2016 - Aug. 2016

- organization of awareness-raising activities related to the environment

### Club Végé de l'Université de Montréal

Treasurer

U. de Montréal  
Jan. 2015 - Aug. 2015

- organization of awareness-raising activities related to meat consumption