

# Francis Banville

POSTDOCTORAL FELLOW · COMPUTATIONAL ECOLOGY

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

✉ francis.banville@umontreal.ca | 🏠 francisbanville.github.io/ | 📱 FrancisBanville

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

## Education

### IN PROGRESS

#### Postdoc in Biological Sciences

Université de Montréal

- advisors: Drs. Timothée Poisot and Colin Carlson (Yale University)

Montreal, Canada

Jan. 2025 - Nov. 2025

#### Microprogram in Higher Education

Université de Montréal

- GPA: 4.300 (3 / 15 credits)

Montreal, Canada

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, Canada

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, Canada

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, Canada

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, Canada

Sept. 2013 - Aug. 2015

## Skills

Research interests	Ecological networks, Computational biology, Mathematical modeling, Biostatistics, Machine learning
Programming	R, Julia, Git, Bash, Markdown, LaTeX
Specialized software	OpenRefine, QGIS, SPSS, Maxima, Excel
Languages	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 Canada (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

W-2025	<b>Co-presenter</b> , BIOS <sup>2</sup> workshop, R and Git: From code to collaboration (1 day)	Montreal, Canada
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, Canada
F-2021	<b>Presentation assistant</b> , Software carpentry, Introduction to Git (1 day)	Rimouski, Canada
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, Canada
W-2020	<b>Co-presenter</b> , IVADO's Data.Trek program, Introduction to R (3 hours)	Montreal, Canada
F-2019	<b>Lead presenter</b> , QCBS R workshops, Programming in R (3 hours)	Montreal, Canada

## Professional experience

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

Research agent

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

Montreal, Canada

May 2021 - Aug. 2021

### Institute for Data Valorization (IVADO)

Event co-organizer

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

Montreal, Canada

Jan. 2020 - Apr. 2020

### Université de Montréal

Research assistant

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

Montreal, Canada

May 2019 - Aug. 2019

### Université de Montréal

Research assistant

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

Montreal, Canada

May 2018 - Aug. 2018

### Université de Montréal

Research assistant

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

Montreal, Canada

May 2017 - Aug. 2017

### Collège des médecins du Québec

Research agent

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

Montreal, Canada

Jan. 2015 - July 2015

## Working groups

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

Working group co-organizer

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

Montreal, Canada

Sept. 2022

### Living Data Project

Working group participant

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

virtual

Sept. 2021

### Canadian Institute of Ecology and Evolution

Working group participant

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

virtual

Jan. 2021 - Mar. 2022

## Publications

### PEER-REVIEWED ARTICLES

- [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*. 2023  
<https://doi.org/10.1111/2041-210X.14228>
- [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. 2023  
<https://doi.org/10.1371/journal.pcbi.1011458>
- [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. 2023  
<https://doi.org/10.7717/peerj.14620>
- [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. 2022  
<https://doi.org/10.1371/journal.pcbi.1010372>
- [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. 2022  
<https://doi.org/10.1111/2041-210X.13835>
- [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. 2021  
<https://doi.org/10.21105/joss.02721>
- [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

## PREPRINTS

- [1] **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. (2024). Deciphering probabilistic species interaction networks. *EcoEvoRxiv*. 2024  
<https://doi.org/10.32942/X28G8Z>

## PHD THESIS

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

## 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

[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] **Banville, F.**, 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] **Banville, F.**, 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] **Banville, F.**, 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

- [2] **Banville, F.**, 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] **Banville, F.**, 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

- Banville, F.** (2024, December 2). Vers une théorie de l'entropie maximale des réseaux trophiques [PhD defense]. University of Montreal, Montreal, Qc, Canada. 2024

# Completed graduate courses and certificates

## CREDITED COURSES

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>GEO6321</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)	Canada
2019-25	<b>Fellow</b> , Computational Biodiversity Science & Services program (BIOS <sup>2</sup> )	Canada
2019-25	<b>Student member</b> , Quebec Centre for Biodiversity Science (QCBS)	Quebec, Canada
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, Canada
2023	<b>Student member</b> , Ecological Forecasting Initiative (EFI)	USA
2023	<b>Student member</b> , Association canadienne-française pour l'avancement des sciences (ACFAS)	Canada
2022	<b>Student member</b> , Ecological Society of America (ESA)	USA

## Student involvement and outreach

### Quebec Center for Biodiversity Science (QCBS)

Longueuil, Canada

Volunteer

Feb. 2025

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

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

Montreal, Canada

Participant

Nov. 2021-23

- science communication and exchange with the general public

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

U. de Montréal

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

Aug. 2022 - Apr. 2023

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

### Centre de l'engagement étudiant

U. de Montréal

Student mentor

Sept. 2022 - Dec. 2022

- providing assistance to new students on campus

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

U. de Montréal

Environmental Coordinator

Feb. 2016 - Aug. 2016

- organization of awareness-raising activities related to the environment

### Club Végé de l'Université de Montréal

U. de Montréal

Treasurer

Jan. 2015 - Aug. 2015

- organization of awareness-raising activities related to meat consumption