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 — *Montreal, CAN*

Université de Montréal — *Jan. 2025 - Nov. 2025*

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

Microprogram in Higher Education — *Montreal, CAN*

Université de Montréal — *Jan. 2025 - Aug. 2026*

- GPA: 4.300 (6 / 15 credits)

COMPLETED

Ph.D. in Biological Sciences — *Montreal, CAN*

Université de Montréal — *Sept. 2019 - Dec. 2024*

- 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)

B.Sc. in Biological Sciences — *Montreal, CAN*

Université de Montréal — *Jan. 2016 - Apr. 2018*

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

INTERRUPTED

M.Sc. in Biological Sciences — *Montreal, CAN*

Université de Montréal — *Sept. 2018 - Aug. 2019*

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

B.Sc. in Mathematics — *Montreal, CAN*

Université de Montréal — *Sept. 2013 - Aug. 2015*

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

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

Awards

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

Teaching and mentoring

Teaching assistance

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

Tutoring and mentoring

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

Workshops

S-2025 **Presentation assistant**, CSEE workshop, Data analysis and visualization in Python for ecologists (1 day) *Sherbrooke, CAN*
W-2025 **Co-presenter**, BIOS² workshop, R and Git: From code to collaboration (1 day) *Montreal, CAN*
S-2022 **Co-presenter**, Poisot lab Twitch workshop, Species distribution models in Julia (3 hours) *virtual*
F-2021 **Co-presenter**, Software carpentry, Programming in R (4 days) *Rimouski, CAN*
F-2021 **Presentation assistant**, Software carpentry, Introduction to Git (1 day) *Rimouski, CAN*
W-2021 **Presentation assistant**, QCBS R workshops, Generalized linear models in R (3 hours) *virtual*
W-2021 **Presentation assistant**, QCBS R workshops, Generalized additive models in R (3 hours) *virtual*
W-2020 **Lead presenter**, IVADO's Data.Trek program, Machine learning and ecological networks in Julia (2 hours) *Montreal, CAN*
W-2020 **Co-presenter**, IVADO's Data.Trek program, Introduction to R (3 hours) *Montreal, CAN*
F-2019 **Lead presenter**, QCBS R workshops, Programming in R (3 hours) *Montreal, CAN*

Professional experience

Group on Earth Observations Biodiversity Observation Network (GEO BON)
Montreal, CAN

Research agent
May 2021 - Aug. 2021

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

Institute for Data Valorization (IVADO)
Montreal, CAN

Event co-organizer
Jan. 2020 - Apr. 2020

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

Université de Montréal
Montreal, CAN

Research assistant
May 2019 - Aug. 2019

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

Université de Montréal
Montreal, CAN

Research assistant
May 2018 - Aug. 2018

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

Université de Montréal
Montreal, CAN

Research assistant
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
Montreal, CAN

Research agent
Jan. 2015 - July 2015

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

Working groups

BIOS²
Montreal, CAN

Working group co-organizer
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
virtual

Working group participant
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
virtual

Working group participant
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] **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

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

S-2025	**PPA6075,** Apprentissage en enseignement supérieur	*U. de Montréal*
W-2025	**ETA6045,** Évaluation en enseignement supérieur	*U. de Montréal*
W-2021	**BIO860M,** Séminaire thématique en écologie	*UQAM*
F-2019	**BIO6037,** Analyse des réseaux écologiques	*U. de Montréal*
S-2019	**BIO6063,** Travail dirigé 1	*U. de Montréal*
S-2019	**BIO6065,** École d'été en synthèse écologique de données	*U. de Montréal*
W-2019	**BIO6032,** Biologie computationnelle et modélisation	*U. de Montréal*
W-2019	**BIO6033,** Méthodes quantitatives en biologie	*U. de Montréal*
W-2019	**BIO611,** Progrès en phylogénie systématique	*U. de Montréal*
W-2019	**MSO6028,** Introduction aux théories de la mesure	*U. de Montréal*
F-2018	**BIO6004,** Communication scientifique	*U. de Montréal*
F-2018	**BIO6077,** Analyse quantitative des données	*U. de Montréal*
F-2018	**BIO6260,** Génomique microbienne	*U. de Montréal*
F-2018	**GEO6321,** Travaux pratiques en géomatique	*U. de Montréal*

Extracurricular courses

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

Extracurricular certificates

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

Affiliations and professional memberships

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

Services and outreach

Scientific journals — *Virtual*

Peer reviewer — *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*

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, CAN*

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