

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

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 , BIOS ² 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)

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

BIOS²

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

PREPRINTS

- [1] Fuster-Calvo, A., Higino, G.T., Parent, C., Caron, D., **Banville, F.**, Massol, F., Blanchet, F.G., Hebert, K., Pollock, L., Maiorano, L., Guimaraes, P.R., Silva, P., Thuiller, W., and Gravel, D. (2025). Tracking community change via network coherence. *bioRxiv*. <https://doi.org/10.1101/2025.11.04.686602> 2025

PHD THESIS

Presentations

ORGANIZED SESSIONS

- [4] Groom, Q., Schwantes, C., **Banville, F.**, Hoyos, J., Marceló-Díaz, D., Upham, N., and Poisot, T. (2025, October 23). Biodiversity data for One Health: Integrating open data to address global health challenges [Symposium]. Living Data 2025, Bogota, Colombia. 2025
- [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

INVITED TALKS

- [1] Poisot, T., **Banville, F.**, Hall, I. and Samuels, A. (2025, November 14). Rethinking One Health through biodiversity [Panel discussion]. Symposium Une seule santé, GEO BON One Health Working Group session, Brossard, Canada. 2025

CONTRIBUTED TALKS

- [14] **Banville, F.** and Poisot, T. (2025, November 14). Relevance of biodiversity indicators for One Health action tracks [Oral presentation]. Symposium Une seule santé, GEO BON One Health Working Group session, Brossard, Canada. 2025
- [13] **Banville, F.** and Poisot, T. (2025, October 23). Biodiversity monitoring and biosurveillance are fellow travellers [Oral presentation]. Living Data 2025, Bogota, Colombia. 2025
- [12] **Banville, F.**, Carlson, C., Paz Velez, A., and Poisot, T. (2025, October 23). Monitoring biodiversity for human, animal, and environmental health [Oral presentation]. Living Data 2025, Bogota, Colombia. 2025
- [11] **Banville, F.**, Carlson, C., Paz Velez, A., and Poisot, T. (2025, July 28). Monitoring biodiversity for human, animal, and environmental health [Webinar presentation]. GEO BON One Health Working Group Webinar: Towards biodiversity and health indicators, virtual. 2025
- [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

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

Peer reviewer

Virtual
Jan. 2025 - present

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

Blitz the Gap 2025

Participant

- helping fill gaps in our knowledge of biodiversity in Canada

Saint-Hippolyte, CAN

July 2025

Quebec Center for Biodiversity Science (QCBS)

Volunteer

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

Longueuil, CAN

Feb. 2025

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

Participant

- science communication and exchange with the general public

Montreal, CAN

Nov. 2021-23

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

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

U. de Montréal

Aug. 2022 - Apr. 2023

Centre de l'engagement étudiant

Student mentor

- providing assistance to new students on campus

U. de Montréal

Sept. 2022 - Dec. 2022

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

Environmental Coordinator

- organization of awareness-raising activities related to the environment

U. de Montréal

Feb. 2016 - Aug. 2016

Club Végé de l'Université de Montréal

Treasurer

- organization of awareness-raising activities related to meat consumption

U. de Montréal

Jan. 2015 - Aug. 2015