

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 and Colin Carlson (Yale University)

Montreal, Canada

Jan. 2025 - Nov. 2025

Microprogram in Higher Education

Université de Montréal

- GPA: none (0 / 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	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 Canada (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

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

BIOS²

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	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)	Canada
2019-25	Fellow , Computational Biodiversity Science & Services program (BIOS ²)	Canada
2019-25	Student member , Quebec Centre for Biodiversity Science (QCBS)	Quebec, Canada
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, Canada
2023	Student member , Ecological Forecasting Initiative (EFI)	USA
2023	Student member , Association canadienne-française pour l'avancement des sciences (ACFAS)	Canada
2022	Student member , 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