

Francis Banville

PH.D. CANDIDATE · 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

Ph.D. in Biological Sciences

Université de Montréal

- option General Biology
- advisors: Drs. Timothée Poisot and Dominique Gravel
- expected graduation: Dec. 2024

Montreal, Canada

since Sept. 2019

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 - August 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

EXTRACURRICULAR

Cert. Carpentries Instructor

The Carpentries

USA

May 2024

Cert. in Synthetic and Collaborative Science

Living Data Project

Canada

Aug. 2021 - Nov. 2022

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

| | | |
|--------|---|----------------|
| 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

| | | |
|--------|--|----------------|
| 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-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*.

<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] Higinio, 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., Higinio, 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] Higinio 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., Higinio, 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>

Presentations

ORGANIZED SESSIONS

[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

[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

Completed graduate courses

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 |

Affiliations and professional memberships

| | | |
|---------|---|------------------|
| 2024 | Certified Carpentries Instructor , The Carpentries | USA |
| 2019-24 | Fellow , Computational Biodiversity Science & Services program (BIOS ²) | Canada |
| 2019-24 | Lab member , Quantitative and Computational Ecology Lab | U. de Montréal |
| 2019-24 | Lab member , Integrative Ecology Lab | U. de Sherbrooke |
| 2019-24 | Student member , Quebec Centre for Biodiversity Science (QCBS) | Quebec, Canada |
| 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 |
| 2023 | Student member , Group on Earth Observations Biodiversity Observation Network (GEO BON) | Canada |
| 2022 | Student member , Ecological Society of America (ESA) | USA |

Student involvement and outreach

| | |
|---|------------------------|
| La Nuit des chercheuses et des chercheurs, Espace pour la vie | Montréal, Canada |
| Participant | Nov. 2021-23 |
| <ul style="list-style-type: none"> 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 |
| <ul style="list-style-type: none"> 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 |
| <ul style="list-style-type: none"> 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 |
| <ul style="list-style-type: none"> organization of awareness-raising activities related to the environment | |
| Club Végé de l'Université de Montréal | U. de Montréal |
| Treasurer | Jan. 2015 - Aug. 2015 |
| <ul style="list-style-type: none"> organization of awareness-raising activities related to meat consumption | |