

# Francis Banville

PH.D. CANDIDATE · 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

### 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. in Synthetic and Collaborative Science

Living Data Project

Canada

Aug. 2021 - Nov. 2022

## Skills

<b>Research interests</b>	Ecological networks, Computational biology, Mathematical modeling, Biostatistics, Machine learning
<b>Programming</b>	R, Julia, Git, Bash, Markdown, LaTeX
<b>Specialized software</b>	OpenRefine, QGIS, SPSS, Maxima, Excel
<b>Languages</b>	French, English, Spanish (B2.2)

## Grants and awards

### GRANTS

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
2019-23	<b>PhD Excellence Scholarship</b> , Institute for Data Valorization (IVADO)	\$100,000
2023	<b>Perseverance Scholarship</b> , Département de sciences biologiques, U. de Montréal	\$2,000
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

2014-18	<b>Dean's Award of the Faculty of Arts and Sciences</b> , Distinction for academic excellence	<i>U. de Montréal</i>
2011	<b>Governor General's Academic Medal</b> , Distinction for the best overall average of the 2011 cohort	<i>Polybel high school</i>
2011	<b>Lieutenant Governor's Youth Medal</b> , Honorary medal for academic excellence and social involvement	<i>Polybel high school</i>

## Teaching and mentoring

### TEACHING ASSISTANCE

F-2023	<b>Head teaching assistant</b> , BIO2041 Biostatistique 1	<i>U. de Montréal</i>
S-2023	<b>Teaching assistant</b> , BIO2041 Biostatistique 1	<i>U. de Montréal</i>
W-2023	<b>Teaching assistant</b> , BIO2042 Biostatistique 2	<i>U. de Montréal</i>
F-2022	<b>Head teaching assistant</b> , BIO2041 Biostatistique 1	<i>U. de Montréal</i>
S-2022	<b>Teaching assistant</b> , BIO2041 Biostatistique 1	<i>U. de Montréal</i>
W-2022	<b>Grader</b> , BIO2811 Dynamique des populations	<i>U. de Montréal</i>
F-2021	<b>Grader</b> , BIO1001 Méthodes de recherche en biologie (TP)	<i>U. de Montréal</i>
S-2021	<b>Teaching assistant</b> , BIO6065 École d'été en synthèse écologique de données	<i>U. de Montréal</i>
W-2021	<b>Grader</b> , BIO2811 Dynamique des populations	<i>U. de Montréal</i>
F-2020	<b>Teaching assistant</b> , BIO3043 Théorie des réseaux	<i>U. de Montréal</i>

### TUTORING AND MENTORING

S-2023	<b>Tutor</b> , BIO2041 Biostatistique 1	<i>U. de Montréal</i>
W-2023	<b>Tutor</b> , BIO2042 Biostatistique 2	<i>U. de Montréal</i>
S-2022	<b>Tutor</b> , BIO2041 Biostatistique 1	<i>U. de Montréal</i>
W-2022	<b>Mentor</b> , IVADO's Data.Trek training program	<i>virtual</i>
S-2021	<b>Tutor</b> , BIO2041 Biostatistique 1	<i>U. de Montréal</i>
S-2020	<b>Tutor</b> , BIO2041 Biostatistique 1	<i>U. de Montréal</i>
W-2020	<b>Mentor</b> , IVADO's Data.Trek training program	<i>virtual</i>

### WORKSHOPS

S-2022	<b>Co-presenter</b> , Poisot lab Twitch workshop, Species distribution models in Julia (3 hours)	<i>virtual</i>
F-2021	<b>Co-presenter</b> , Software carpentry, Programming in R (4 days)	<i>Rimouski, Canada</i>
F-2021	<b>Presentation assistant</b> , Software carpentry, Introduction to Git (1 day)	<i>Rimouski, Canada</i>
W-2021	<b>Presentation assistant</b> , QCBS R workshops, Generalized linear models in R (3 hours)	<i>virtual</i>
W-2021	<b>Presentation assistant</b> , QCBS R workshops, Generalized additive models in R (3 hours)	<i>virtual</i>
W-2020	<b>Lead presenter</b> , IVADO's Data.Trek program, Machine learning and ecological networks in Julia (2 hours)	<i>Montreal, Canada</i>
W-2020	<b>Co-presenter</b> , IVADO's Data.Trek program, Introduction to R (3 hours)	<i>Montreal, Canada</i>
F-2019	<b>Lead presenter</b> , QCBS R workshops, Programming in R (3 hours)	<i>Montreal, Canada</i>

## Professional experience

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

Research agent *Montreal, Canada*

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

*May 2021 - Aug. 2021*

### Institute for Data Valorization (IVADO)

Event co-organizer *Montreal, Canada*

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

*Jan. 2020 - Apr. 2020*

### Université de Montréal

Research assistant *Montreal, Canada*

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

*May 2019 - Aug. 2019*

### Université de Montréal

Research assistant *Montreal, Canada*

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

*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

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### 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

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### 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] 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

## 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

- [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	<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

## Affiliations and professional memberships

2019-23	<b>Fellow</b> , Computational Biodiversity Science & Services program (BIOS <sup>2</sup> )	Canada
2019-23	<b>Scholarship recipient</b> , Institute for Data Valorization (IVADO)	Quebec, Canada
2019-23	<b>Lab member</b> , Quantitative and Computational Ecology Lab	U. de Montréal
2019-23	<b>Lab member</b> , Integrative Ecology Lab	U. de Sherbrooke
2019-23	<b>Student member</b> , Quebec Centre for Biodiversity Science (QCBS)	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
2023	<b>Student member</b> , Group on Earth Observations Biodiversity Observation Network (GEO BON)	Canada
2022	<b>Student member</b> , Ecological Society of America (ESA)	USA

## Student involvement and outreach

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

Participant

- science communication and exchange with the general public

*Montréal, Canada*

*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*