Uriah Daugaard

Computational ecologist · PhD Ecology, University of Zurich · MSc Biostatistics

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GOOGLE SCHOLAR scholar.google.ch/citations?user=JI10T7QAAAAJ
WEB OF SCIENCE webofscience.com/wos/author/record/AFC-9360-2022

EDUCATION

PhD in Ecology, University of Zurich — 05/2020 to 11/2024

Thesis: *Ecological Forecasting and Environmental Change: Researching Biological Drivers of Prediction Skill.* Defended November 2024.

- Supervisor: Prof. Owen Petchey.
- Doctoral committee: Stephan Munch, Anna-Liisa Laine, Jordi Bascompte and Frank Pennekamp.
- Funded by Swiss National Science Foundation grant 310030_188431.

MSc in Biostatistics, University of Zurich — 09/2018 to 02/2020

Final grade 5.8 / 6. Thesis: *Analysis of Behaviors Affecting Predation Success in a Ciliate Predator-Prey System* (co-supervised R. Furrer and O. Petchey).

BSc in Biology, minor Environmental Sciences, University of Zurich — 09/2015 to 06/2018

RESEARCH INTERESTS

Computational ecologist working at the intersection of data and theory. PhD research investigated the biological drivers of ecological forecast skill, including species interactions, biodiversity and multiple stressors, using empirical dynamic modelling, Bayesian community models and machine learning on microbial microcosms, lake plankton time series and simulated data. The same quantitative toolkit now extends to microbiome bioinformatics, with a consistent focus on reproducibility and open science.

RESEARCH PUBLICATIONS

§ indicates joint first authorship (equal contribution). Author name in bold.

PEER-REVIEWED JOURNAL ARTICLES

2025 Limberger R.§, **Daugaard U.**§, Choffat Y., Gupta A., Jelić M., Jyrkinen S., Krug R.M., Nohl S., Pennekamp F., van Moorsel S.J., Zheng X., Zuppinger-Dingley D. and Petchey O.L. Mixed evidence for species diversity affecting ecological forecasts in constant versus declining light. *Global Change Biology* 31, e70364. CODE + DATA

2024 **Daugaard U.**, Merkli S., Merz E., Pomati F. and Petchey O.L. The dependence of forecasts on sampling frequency as a guide to optimizing monitoring in community ecology. *Ecosphere* 15, e4786. CODE + DATA

2023 Limberger R., **Daugaard U.**, Gupta A., Krug R.M., Lemmen K.D., van Moorsel S.J., Suleiman M., Zuppinger-Dingley D. and Petchey O.L. Functional diversity can facilitate the collapse of an undesirable ecosystem state. *Ecology Letters* 26, 883–895.

2022 **Daugaard U.**, Munch S., Inauen D., Pennekamp F. and Petchey O. Forecasting in the face of ecological complexity: number and strength of species interactions determines forecast skill in ecological communities. *Ecology Letters* 25, 1974–1985. CODE + DATA

2022 Suleiman M., **Daugaard U.**, Choffat Y., Zheng X. and Petchey O.L. Predicting the effects of multiple global change drivers on microbial communities remains challenging. *Global Change Biology* 28, 5575–5586.

2021 Suleiman M., Choffat Y., **Daugaard U.** and Petchey O.L. Large and interacting effects of temperature and nutrient addition on stratified microbial ecosystems in a small, replicated, and liquid-dominated Winogradsky column approach. *MicrobiologyOpen* 10, e1189.

2019 **Daugaard U.**, Petchey O.L. and Pennekamp F. Warming can destabilize predator-prey interactions by shifting the functional response from Type III to Type II. *Journal of Animal Ecology* 88, 1575–1586. **BES ELTON PRIZE**

PREPRINTS

2024 **Daugaard U.**, Limberger R. and Petchey O.L. Modeling algal defenses under multiple stressors: impacts on explanatory and predictive performance. University of Zurich (PhD thesis chapter).

2021 **Daugaard U.**, Furrer R. and Petchey O.L. Prey speed up, predators slow down: non-consumptive effects on movement behavior of a ciliate predator-prey pair. *bioRxiv* 2021.11 (MSc thesis chapter).

RESEARCH AND PROFESSIONAL EXPERIENCE

Computational ecologist, Cybiome GmbH, Basel — 02/2025 to present

- Built and maintained two production microbiome bioinformatics pipelines from scratch (sole developer): one for amplicon sequencing (16S and ITS to ASVs, taxonomy, function, pathogenicity), one for bacterial whole-genome analysis (assembly, annotation, per-strain trait profiling).
- Curated a reference collection of 20,000 complete bacterial genomes from NCBI RefSeq with full per-genome trait profiles (phylogeny, ecological niche, metabolic capacity, secondary metabolites, biosafety).
- Designed the pipeline architecture: containerised per-module execution over a hierarchical database, automatic dependency resolution, two-layer versioning separating codebase from data population, and provenance tracking with schema evolution that avoids downstream reprocessing.
- Built a predictive-modelling codebase for microbiome-to-outcome questions in plant health, disease pressure and soil health. Trait-based feature engineering with gradient-boosted trees and SHAP interpretation; a trait-based model reached R^2 0.43 versus 0.32 for the published OTU-based baseline (+35%).
- Built a genome-scale and community metabolic modelling stack (GSMM, FBA), choosing open-source solvers (SCIP, HiGHS) over licence-restricted alternatives for commercial deployment.
- First author on a consortium poster for the EU Horizon Europe COUSIN project (plant-microbiome contributions to crop resilience).

R · Python · Docker · HDF5 · XGBoost · CarveMe · Quarto · Git

Doctoral researcher, University of Zurich — 05/2020 to 12/2024

- Four-year independent doctoral project of four chapters: three published as first or joint-first author (2022, 2024, 2025) and one as a preprint, all on ecological forecast skill.
- Empirical dynamic modelling as the methodological centre (one parameter sweep fit over 7.4 million forecast models), with ARIMA, MARSS, random-forest and RNN comparators, convergent cross mapping for time-series causality, and Bayesian semi-mechanistic community modelling (brms, Stan).
- Ran multiple long-term laboratory microcosm experiments, up to nine months each, and analysed lake-plankton monitoring time series.
- Updated the laboratory's video-microscopy protocol (LEEF v2 manual), served as its named maintainer, and trained colleagues on it.

R · rEDM · brms · Stan · randomForest · keras · Quarto · Git

Research assistant (80%), University of Zurich — 08/2018 to 09/2018

Department of Evolutionary Biology and Environmental Studies, Petchey lab. Work on a scientific project and its publication (led to the 2019 Elton Prize paper).

Technical staff (20%), University of Zurich — 06/2017 to 11/2019

Zebrafish facility care and maintenance, Neuhauss lab.

Event staff, Servx AG, Zurich — 09/2014 to 05/2018

Access control, screening and ushering.

TEACHING AND MENTORING

LECTURER

BIO 144, Data Analysis in Biology, University of Zurich — spring 2024

Four lectures (data visualisation and processing, hypothesis testing, linear regression, ANOVA) to roughly 300 second-year biology students.

TEACHING ASSISTANT

BIO 144, Data Analysis in Biology, University of Zurich — spring 2021 to 2023

Head teaching assistant. Screened and briefed the teaching-assistant team, organised practical sessions, was primary contact for statistical questions and wrote a statistics and computation FAQ.

R4All, An Introduction to the Basics of R — 2022

MENTORING

Student and intern mentoring, University of Zurich — 2020 to 2024

Informally mentored interns and BSc, MSc and PhD students on statistics, coding and experimental design.

PRESENTATIONS

CONTRIBUTED TALKS

2024 Biodiversity has opposite effects on the forecastability of species abundances in constant versus declining light.
SFE², biennial meeting of the French Society of Ecology and Evolution, Lyon, France.

2023 The dependence of forecasts on sampling frequency as a guide to optimizing monitoring in community ecology.
GfÖ, meeting of the Ecological Society of Germany, Austria and Switzerland, Leipzig, Germany.

2022 Forecasting in the face of ecological complexity: number and strength of species interactions determine forecast skill in ecological communities.
Biology, Swiss conference on organismic biology, Basel, Switzerland. Also at SFE² GfÖ EEF, International Conference on Ecological Sciences, Metz, France.

2021 Non-consumptive and resource-availability effects in a ciliate predator-prey pair.
ESA, meeting of the Ecological Society of America, virtual.

2020 Warming can destabilize predator-prey interactions by shifting the functional response from Type III to Type II.
BES, meeting of the British Ecological Society, virtual.

POSTERS

2026 COUSIN: plant-microbiome contributions to crop resilience (EU Horizon Europe project).
Let's Liberate Diversity, Scandicci (Florence), Italy, May. First author (with A. Jousset).

2022 Forecasting in the face of ecological complexity: number and strength of species interactions determine forecast skill in ecological communities.
INTECOL, 13th International Congress of Ecology, Geneva, Switzerland. Selected as one of ten posters for an opening-plenary flash talk.

2022 Forecasting in ecological communities.
LSZGS Ecology Symposium, Life Science Zurich Graduate School, Zurich, Switzerland.

FUNDING AND AWARDS

- **BES Elton Prize, 2019.** British Ecological Society, awarded each year for the best paper in the *Journal of Animal Ecology* by an early-career author.
- Departmental travel grants, Evolutionary Biology and Environmental Studies, University of Zurich, 2022, 2023 and 2024.

PEER REVIEW

Reviewer for *Ecology* (2024), *Journal of Animal Ecology* (2022, 2021), *Ecology Letters* (2021), *PeerJ* (2021) and *Protist* (2019). Six reviews across five international journals.

SKILLS

Programming	R (primary language, over nine years daily, fluent tidyverse and literate reporting); Git and GitHub; Python (basic, refreshing for active use); Bash and SQL (basic).
Bioinformatics	Amplicon and ASV pipelines (DADA2); bacterial genomics (assembly, annotation, taxonomy, trait prediction); genome-scale metabolic modelling (GSMM, FBA); functional annotation and specialty tools (KEGG orthology, AMR, virulence, biosynthetic gene clusters); pipeline architecture and design.
Statistics and ML	Classical statistics (regression, ANOVA, mixed models, maximum likelihood); time-series forecasting and empirical dynamic modelling; machine learning (XGBoost, random forests, elastic net, SHAP); Bayesian modelling (brms, Stan); ordination and clustering; experimental design and simulation studies.
Reproducibility	Docker and containerisation; literate reporting (Quarto, R Markdown); environment pinning (renv, conda); two-layer versioning; targets; open code and data archiving on Zenodo alongside every first-author paper.
Markup	LaTeX (Sweave, knitr), Markdown, Quarto.
Strengths	Cross-disciplinary fluency across biology, biostatistics, ecology and bioinformatics; systems and architecture thinking; scientific communication to specialist and non-specialist audiences.

LANGUAGES

German	Native (Swiss German and fluent Hochdeutsch, C2 written).
Italian	Native (Ticino), less actively used.
English	Fluent (C1 to C2); PhD, publications and international talks in English; daily working language.
French	Basic (A1 to A2).

REFERENCES

References available on request.