



Luca Carraro

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Current position

University of Zurich – Zurich, Switzerland

Oct 2019 – present Postdoctoral Fellow

Advisor: Prof. Dr. Florian Altermatt

Unit: Department of Evolutionary Biology and Environmental Studies

Hosted at: Department of Aquatic Ecology, Eawag, Dübendorf, Switzerland

Previous positions

Swiss Federal Institute of Aquatic Science and Technology (Eawag) – Dübendorf, Switzerland

Oct 2018 – Sep 2019 Postdoctoral Fellow

Advisors: Prof. Dr. Jukka Jokela, Prof. Dr. Florian Altermatt

Unit: Department of Aquatic Ecology (ECO)

École Polytechnique Fédérale de Lausanne (EPFL) – Lausanne, Switzerland

May 2018 – Sep 2018 Postdoctoral Fellow

Advisor: Prof. Dr. Andrea Rinaldo

Unit: Laboratory of Ecohydrology (ECHO)

Education

École Polytechnique Fédérale de Lausanne (EPFL) – Lausanne, Switzerland

Apr 2014 – May 2018 Ph.D., Doctoral Program in Civil and Environmental Engineering

Thesis title: *Ecohydrological and Metacommunity Studies of Proliferative Kidney Disease Spread in Freshwater Salmonid Fish* (awarded with EPFL Outstanding PhD Thesis Distinction)

Advisors: Prof. Dr. Andrea Rinaldo, Prof. Dr. Enrico Bertuzzo

Unit: Laboratory of Ecohydrology (ECHO)

Fields: Mathematical modelling, hydrology, ecology, epidemiology

University of Padua – Padua, Italy

Jan 2012 – Apr 2014 M.Sc., Civil Engineering - specialization in Hydraulics (Grade: 108/110)

Sep 2008 – Nov 2011 B.Sc., Civil Engineering (Grade: 110/110)

Publication record*

Total articles: 11

Total citations: 170

h-index: 7

Publications

Peer-reviewed articles

- [12] **Carraro, L.**, Stauffer, J. B., Altermatt, F. (2020). How to design optimal eDNA sampling strategies for biomonitoring in river networks. *Environmental DNA*. <https://doi.org/10.1002/edn3.137>.
- [11] **Carraro, L.**, Mächler, E., Wüthrich, R., Altermatt, F. (2020). Upscaling spatial patterns of biodiversity in freshwater ecosystems. *Nature Communications*, 11(1), 3585. <https://doi.org/10.1038/s41467-020-17337-8>.
- [10] **Carraro, L.**, Bertuzzo, E., Fronhofer, E. A., Furrer, R., Gounand, I., Rinaldo, A., Altermatt, F. (2020). Generation and application of river network analogues for use in ecology and evolution. *Ecology and Evolution*, 10(14), 7537-7550. <https://doi.org/10.1002/ece3.6479>.
- [9] Gatto, M., Bertuzzo, E., Mari, L., Miccoli, S., **Carraro, L.**, Casagrandi, R., Rinaldo, A. (2020). Spread and dynamics of the COVID-19 epidemic in Italy: Effects of emergency containment measures. *Proceedings of the National Academy of the United States of America*, 117(19), 10484-10491. <https://doi.org/10.1073/pnas.2004978117>.
- [8] **Carraro, L.**, Toffolon, M., Rinaldo, A., Bertuzzo, E. (2020). SESTET: a spatially explicit stream temperature model based on equilibrium temperature. *Hydrological Processes*, 34(2), 355-369. <https://doi.org/10.1002/hyp.13591>.
- [7] González-Ferreras, A.M., Bertuzzo, E., Barquín, J., **Carraro, L.**, Alonso, C., Rinaldo, A. (2019). Effects of altered river network connectivity on the distribution of *Salmo trutta*: Insights from a metapopulation model. *Freshwater Biology*, 64(11), 1877-1895. <https://doi.org/10.1111/fwb.13379>.
- [6] **Carraro, L.**, Hartikainen, H., Jokela, J., Bertuzzo, E., Rinaldo, A. (2018). Estimating species distribution and abundance in river networks using environmental DNA. *Proceedings of the National Academy of Sciences of the United States of America*, 115(46), 11724-11729. <https://doi.org/10.1073/pnas.1813843115>.
- [5] **Carraro, L.**, Mari, L., Gatto, M., Rinaldo, A., Bertuzzo, E. (2018). Spread of proliferative kidney disease in fish along stream networks: A spatial metacommunity framework. *Freshwater Biology*, 63(1), 114-127. <https://doi.org/10.1111/fwb.12939>.
- [4] **Carraro, L.**, Bertuzzo, E., Mari, L., Fontes, I., Hartikainen, H., Strepparava, N., Schmidt-Posthaus, H., Wahli, T., Jokela, J., Gatto, M., Rinaldo, A. (2017). Integrated field, laboratory, and theoretical study of PKD spread in a Swiss prealpine river. *Proceedings of the National Academy of Sciences of the United States of America*, 114(45), 11992-11997. <https://doi.org/10.1073/pnas.1713691114>.
- [3] **Carraro, L.**, Mari, L., Hartikainen, H., Strepparava, N., Wahli, T., Jokela, J., Gatto, M., Rinaldo, A., Bertuzzo, E. (2016). An epidemiological model for proliferative kidney disease in salmonid populations. *Parasites and Vectors*, 9(1), 487. <https://doi.org/10.1186/s13071-016-1759-z>.

*Verified on Scopus on October 3, 2020.

- [2] Queloiz, P.[†], **Carraro, L.**[†], Benettin, P., Botter, G., Rinaldo, A., Bertuzzo, E. (2015). Transport of fluorobenzoate tracers in a vegetated hydrologic control volume: 2. Theoretical inferences and modeling. *Water Resources Research*, 51(4), 2793-2806. <https://doi.org/10.1002/2014WR016508>.
- [1] Queloiz, P., Bertuzzo, E., **Carraro, L.**, Botter, G., Miglietta, F., Rao, P. S. C., Rinaldo, A. (2015). Transport of fluorobenzoate tracers in a vegetated hydrologic control volume: 1. Experimental results. *Water Resources Research*, 51(4), 2773-2792. <https://doi.org/10.1002/2014WR016433>.

Invited seminars

- [3] **Carraro, L.** (May 2020). *Generating synthetic river networks and perspectives in freshwater biodiversity assessment* (webinar). Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Birmensdorf, Switzerland.
- [2] **Carraro, L.** (Oct 2019). *eDNA as a tool to reconstruct biodiversity patterns in river networks*. University of Zurich, Zurich, Switzerland.
- [1] **Carraro, L.** (May 2018). *Using environmental DNA to study species distributions in river networks*. Eawag, Dübendorf, Switzerland.

Conference presentations

- [3] **Carraro, L.**, Hartikainen, H., Jokela, J., Rinaldo, A., Bertuzzo, E., Mächler, E., Little, C. J., Wüthrich, R., Altermatt, F. (2019). Reconstructing species distribution and abundance patterns in rivers with environmental DNA. *European Geophysical Union General Assembly*, Vienna, Austria.
- [2] **Carraro, L.**, Rinaldo, A., Toffolon, M., Bertuzzo, E. (2018). A spatially-explicit stream temperature model for ecohydrological applications. *5th IAHR Europe Congress - New Challenges in Hydraulic Research and Engineering*, Trento, Italy.
- [1] **Carraro, L.**, Hartikainen, H., Jokela, J., Bertuzzo, E., Rinaldo, A., (2018). Using environmental DNA to study species distributions in river networks. *EGU General Assembly*, Vienna, Austria.

Conference posters

- [4] **Carraro, L.**, Mächler, E., Wüthrich, R., Altermatt, F. (2020). Environmental DNA allows upscaling of spatial patterns of biodiversity in freshwater ecosystems. *World Biodiversity Forum*, Davos, Switzerland.
- [3] **Carraro, L.**, Bertuzzo, E., Toffolon, M., Rinaldo, A. (2018). A spatially-explicit stream temperature model for ecohydrological applications. *EGU General Assembly*, Vienna, Austria.
- [2] **Carraro, L.**, Bertuzzo, E., Mari, L., Gatto M., Rinaldo, A. (2017). A metacommunity model for the spread of proliferative kidney disease in stream networks. *Impact of Environmental Changes on Infectious Diseases*, Trieste, Italy.
- [1] **Carraro, L.**, Bertuzzo, E., Mari, L., Gatto, M., Strepparava, N., Hartikainen, H., Rinaldo, A. (2015). An epidemic model for the interactions between thermal regime of rivers and transmission of proliferative kidney disease in salmonid fish. *EGU General Assembly*, Vienna, Austria.

[†]Equally contributing authors.

Other publications

- [5] Vasemägi, A., Wahli, T., Debes, P., **Carraro, L.**, Bailey, C. (2020) Exploring proliferative kidney disease in a disease ecology context. *Book chapter*. Accepted.
- [4] **Carraro, L.**, Altermatt, F., Fronhofer, E. A., Furrer, R., Gounand, I., Rinaldo, A., Bertuzzo, R. (2019). OCNNet - Generate and analyze Optimal Channel Networks. *R Package*. Hosted on CRAN: <https://cran.r-project.org/web/packages/OCNNet/index.html>.
- [3] **Carraro, L.** (2018). Ecohydrological and metacommunity studies of proliferative kidney disease spread in freshwater salmonid fish. *Ph.D. Thesis*. EPFL, Lausanne, Switzerland. Advisors: Prof. Dr. Andrea Rinaldo, Prof. Dr. Enrico Bertuzzo. Accepted on May 8, 2018.
- [2] **Carraro, L.** (2014). Inferring age mixing processes and travel time distributions from a lysimeter experiment. *M.Sc. Thesis*. University of Padua, Padua, Italy and EPFL, Lausanne, Switzerland. Advisor: Prof. Dr. Gianluca Botter. Accepted on April 9, 2014.
- [1] **Carraro, L.** (2011). Use of remote control techniques for the management of water supply networks. *B.Sc. Thesis* (in Italian). University of Padua, Padua, Italy. Advisor: Prof. Dr. Luca Carniello. Accepted on November 30, 2011.

Outreach

- [2] **Carraro, L.**, Altermatt, F., Blackman R. C. (2020) Environmental DNA reveals hidden diversity in riverine ecosystems. *Hotspot* (magazine of the Forum Biodiversität Schweiz).
- [1] **Carraro, L.**, Mariani, D. (2020). In Italy, 200'000 hospitalizations averted thanks to lockdown. Interview with the Swiss Italian television (in Italian). <https://tinyurl.com/ybtcdsgj>.

Teaching activities

University of Zurich – Zurich, Switzerland

Sep - Oct 2020 Block Course in Aquatic Ecology (B.Sc. in Biology)

Role: Teaching assistant (supervision of student project)

Aug 2020 Field Course in Biodiversity Assessment and Monitoring (M.Sc. in Quantitative Environmental Sciences)

Role: Teaching assistant (support in data analysis)

École Polytechnique Fédérale de Lausanne (EPFL) – Lausanne, Switzerland

Apr 2014 – Jan 2018 Water Resources Engineering (M.Sc. in Environmental Sciences and Engineering)

Role: Teaching assistant (course material preparation, exercise sessions, project supervision, preparation and grading of final exams)

Feb 2017 – Jul 2017 Mathématiques 2A, 2B (B.Sc., remedial classes on linear algebra and geometry)

Role: Teaching assistant (exercise sessions, grading of final exam)

Student supervision

Swiss Federal Institute of Aquatic Science and Technology (Eawag) – Dübendorf, Switzerland

Summer 2019 Julian Stauffer, B.Sc. summer project: "Assessing the effectiveness of environmental DNA sampling design strategies in river networks" (co-supervisor)

École Polytechnique Fédérale de Lausanne (EPFL) – Lausanne, Switzerland

Spring 2019 Pascal Arbella, M.Sc. Thesis: "Patching large missing gaps of dissolved oxygen data in an intermittent stream: comparison of interpolation techniques, including machine learning models" (external examiner)

Spring 2017 Mattia Petar, M.Sc. Thesis: "A spatially explicit water temperature model for the river Wigger" (co-supervisor)

Fall 2016 Charlotte Burki, M.Sc. semester project: "Water temperature modelling in the river Wigger" (co-supervisor)

Fall 2015 Yasmin Dressler, M.Sc. semester project: "Proliferative Kidney Disease in brown trout: modelling the disease evolution in fish" (co-supervisor)

Awards

2019 EPFL Outstanding Ph.D. Thesis Distinction in Civil and Environmental Engineering

Academic service

Since 2019 15 reviews[‡] for journals *Acta Veterinaria Scandinavica*, *Advances in Water Resources*, *Diversity and Distributions*, *Environmental DNA*, *Freshwater Biology*, *Hydrological Processes*, *Molecular Ecology*, *Molecular Ecology Resources*, *Proceedings of the National Academy of the United States of America*.

Languages

Mother tongue: Italian

Others: English (C1/C2), French (B2/C1), German (A2/B1)

Computer skills

Text editor/office suite: Microsoft Office (advanced), \LaTeX (advanced), Markdown (intermediate)

Programming: MATLAB (advanced), R (advanced), Mathematica (beginner), Fortran (intermediate)

Graphics & Design: Adobe Illustrator (advanced), AutoCAD (intermediate)

GIS software: ArcGIS (advanced)

Zurich, October 3, 2020

[‡]Verified on Publons on October 3, 2020.