



## Sébastien Nusslé, PhD

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### Research statement

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*Trained researcher in ecology and evolution and biostatistics expert, I am specialized in freshwater systems, and particularly interested in eco-evolutionary processes. A major focus of my work explores human-induced evolution linked to applied questions, such as fishery management and conservation biology.*

**Quantitative genetics:** my experience includes disentangling the parental effects in specific breeding designs, estimating selection differentials for salmonid growth, statistical dissection of selection differentials, and the study of eco-evolutionary processes.

**Conservation biology:** I am specialized on fishery management (fishing-induced evolution, mass mortality events, climate change, and land use). I have also investigated the effect of land use on bird and mammal distributions. Additionally, I have performed scientific consulting for state fishery departments and the ecological industry.

**Biostatistics:** I am an expert in R programming (assistant and lecturer in statistics) and statistical analyses, specialized in mixed-model methodology, data mining, Bayesian statistics, genetic data analyses, and hierarchical modeling. I am also consultant for industry.

### Teaching statement

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With a master in high school education and extensive teaching experience, I am well prepared to teach any academic topic related to evolution, conservation, or genetics. My considerable experience as a statistical mentor has also prepared me to teach statistics to non-mathematicians, using a very intuition-based approach.

I use well-defined objectives in my teaching, where students know beforehand what is expected from them. Apart from *ex-cathedra* lectures that may not suit practice-oriented students, I diversify my teaching with real-case studies, modeling, experiments, and field observation that will involve students directly and stimulate trans-disciplinary skills.

## Current position

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Postdoctoral researcher on fishery-induced evolution and wild fish management

Since 2013

(Supervision: Prof. Stephanie Carlson)

*Department of Environmental Science, Policy and Management*

*University of California Berkeley, USA*

## Education

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**PhD in Ecology and Evolution**, Department of Ecology and Evolution, University of Lausanne, CH 2012

*Thesis: Growth decrease in Alpine whitefish: investigating the relative contribution of fishing induced selection and environmental change*

**Master of Advanced Studies in high-school education**, HEPL, Lausanne, CH 2011

**Diploma of Statistics**, Faculty of Economical Sciences, Neuchâtel University, CH 2005

**Master and Bachelor of Biology**, Dept. of Ecology and Evolution, University of Lausanne, CH 2002

## Academic experience

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*Eco-evolutionary processes are the core of my research interests. My Masters studies focused on host-parasite interactions and sexual selection. During my PhD, I analyzed fishery-induced evolution and its link with environmental change and conservation. After my PhD, I took an academic break to become a High-School teacher, but kept collaborating on environmental issues with Bern University and state agencies.*

Postdoctoral researcher in the Department of Environmental Science, Policy and Management, 2013 - 2016  
University of California Berkeley: Evolutionary ecology of freshwater fishes.

*Fishery-induced evolution, worldwide mass mortality events, interactions between global warming and land use on river temperature.*

Postdoctoral researcher in Conservation Biology, University of Bern, Switzerland: biostatistics 2012 - 2013  
expert.

*Effects of land use on chiropters and birds*

Academic break High School teacher, details below 2010 - 2012

Doctoral student at Lausanne University, Switzerland: fishery-induced selection on whitefish 2006 - 2010

*Selection differential estimations, eco-evolutionary processes (lake trophic state and response to selection), management strategies modeling (individual-based models).*

*Analyses on full-factorial breeding design to disentangle parental effects on fish embryos.*

Research assistant, Lausanne University. 2004 - 2006

*Sperm competition and sexual behavior of shrews, biotic costs needed for immune system mobilization by *Microtus arvalis*, and population genetics of bat acarian parasites.*

## Teaching and supervision experience

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*I have been teaching to children and young adults since 2001. I started teaching to to pay my way through university, and it became a second career because of my pleasure in transmitting my knowledge.*

Biology Teacher, Nyon High school, Switzerland 2012 - 2013

Taichi (martial art) instructor, Switzerland 2009 - 2013

Science Teacher in Gland public school, Switzerland 2011 - 2012

HEP Trainee in Nyon High school, Switzerland 2010 - 2011

Teaching assistant, Lausanne University (statistics, scientific writing, experimental design, conservation biology, zoology) 2004 - 2010

Science teacher in public schools 2001 - 2004

Teaching assistant (zoology), Lausanne University 2001 - 2002

*My inclinations for assisting others, my empathy, and my didactic skills have led me to supervise several students, postdocs and trainees during extended periods. I have supervised:*

Four civil servants or trainees: C. Bornand, S. Guduff (2006 - 2007), T. Szekely (2008), O. Darbellay (2010)

Five masters students for project in the experimental design course: S. Cotting, T. Deléglise, E. Gehring, M. Tanadini & L. Villard (2008)

Eight master students for research projects related to their masters: M. Tanadini, E. Gehring, M. Beysard, S. Biollay, S. Burgy, E. Luzio, C. Pusterla & P. Pfäuti (2008 & 2009)

Two masters students for their master thesis' research project: C. Pusterla (2008) & S. Wellig (2012 - 2013)

Six PhD students and two postdocs for statistical mentoring: A. Jacob & B. von Siebenthal (2006 - 2010), P. Burri (2012-2013), J. Hwan, K. Cervantes-Yoshida, S. Kelson, Mike Bogan & Anna Sturrock (2013 - 2016)

## Statistics and scientific consulting experience

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*My strong quantitative skills associated with my motivation to help others, have provided opportunities for me to get involved in several collaborations and consulting activities. I have also help dozens of students, postdocs, and professors with statistical issues during my career. In some cases, these interactions have resulted in publications for which I provided statistical expertise, including on topics not directly related to my research in ecology and evolution (see publication list).*

Statistics consulting for environmental industry: analysis of Swiss amphibians red list data	Since 2015
Researcher for “Maison de la Rivière”, foundation for freshwater management, Switzerland: modeling global warming impact on rivers, and whitefish management	Since 2011
Scientific consulting for state nature department, SFFN, Vaud, Switzerland: whitefish fishing management in Lake Joux	Since 2006
Statistics consulting for medical industry and medical research, Switzerland: fecundity science, smoking cessation and metabolism, organ transplantation and kidney function	2009 - 2010
Head of the zoological part of a biodiversity study on Mount Hombori (Mali)	2003 & 2005

*In order to analyze complex datasets, I specialized in various areas of biostatistics, in particular mixed-models.*

Hierarchical statistical models in ecology, University of California Berkeley, USA	2015
Spatial Stream Statistics workshop, University of Idaho, USA	2014
Movement Ecology Discussion group, University of California Berkeley, USA	2013
Bayesian population analysis using WinBUGS, Vogelwarte, CH	2012
Applied statistics to research, University of Lausanne	2009
Mixed models in R using the lme4 package, University of Lausanne	2009
Managing adaptive genetic variation in conservation biology, University of Lausanne	2009
New insights into mixed model methodology with applications to genomics and biostatistics, INRA	2007
Evolutionary Conservation Biology Discussion Group, University of Lausanne	2006

## Other skills

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**Data science:** I have experience with large dataset analyses (genetic data), including data mining and visualization, and database management.

**Modeling:** I am experienced in individual-based modeling, matrix population modeling, population dynamics, and hierarchical modeling (state-space models).

**Communication:** I have been a teacher (from primary to university), a statistics consultant for industry, a martial arts instructor, and a chief scout.

**Biodiversity:** I have been responsible of the zoological part of a biodiversity study in Mali ([www.hombori.org](http://www.hombori.org)) financed by WWF. I also founded a Naturalist Club “Les Blaireaux”, worked as a trainee on Wood Ants in Swiss National Park, micro-mammals trapping, and a watcher of birds, bats, mammals, and amphibians.

**Language spoken:** French (maternal), English (fluent), German (basic), Spanish (notions).

**Hobbies:** Martial Arts (Black belt, 1 Dan, Taichi instructor), hiking, scuba diving, traveling, comic books.

## Fundraising

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1. Parrotia foundation: 10'000 CHF for a project on the genetics of fishing induced evolution (**2015**)
2. Swiss National Science Foundation: ~100'000 CHF, Quantification of the strength of fishing-induced selection and consequences for evolutionarily enlightened management (1.5 years) (**2013**)
3. Maison de la rivière: 20'000 CHF for a project on fishing induced evolution on Minnows (**2010**)
4. Société Académique Vaudoise: 8'000 CHF for extending PhD salary (**2009**)
5. Vaud state fishery department: ~30'000 CHF for different projects on whitefish management (**2006-2010**)

## References

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1. Prof. Stephanie Carlson, University of California Berkeley, USA, Department of Environmental Science, Policy and Management. [smcarlson@berkeley.edu](mailto:smcarlson@berkeley.edu)
2. Prof. Andrew Hendry, McGill University, Montreal, Canada, Dept, of Biology. [andrew.hendry@mcgill.ca](mailto:andrew.hendry@mcgill.ca)
3. Prof. Daniel Cherix, University of Lausanne, Switzerland, Department of Ecology and Evolution. [Daniel.Cherix@unil.ch](mailto:Daniel.Cherix@unil.ch)
4. Prof. Raphael Arlettaz, University of Bern, Switzerland, Division of Conservation Biology, Institute of Ecology and Evolution. [raphael.arlettaz@iee.unibe.ch](mailto:raphael.arlettaz@iee.unibe.ch)
5. Prof. Nicolas Perrin, University of Lausanne, Switzerland, Department of Ecology and Evolution. [Nicolas.Perrin@unil.ch](mailto:Nicolas.Perrin@unil.ch)
6. Dr. Kathleen Matthews, United States Forest Service, Albany, USA. [kmatthews@fs.fed.us](mailto:kmatthews@fs.fed.us)

## Publications

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### Peer reviewed publications in my major field of interest, i.e. ecology and evolution

1. Nusslé S, Hendry, AP & Carlson SM (2016). Spotlight: When should harvest evolution matter to population dynamics? Trends in Ecology and Evolution.
2. Nusslé S, Matthews K & Carlson S (2015). Mediating water temperature increases due to livestock and global change in high elevation meadow streams of the Golden Trout Wilderness. PLOS One.
3. Fey SB, Siepielski AM, Nusslé S, et al. (2015). Recent shifts in the occurrence, cause, and magnitude of animal mass mortality events. Proceedings of the National Academy of Sciences.
4. Arlettaz, R, Nusslé S et al. (2015). Disturbance of wildlife by outdoor winter recreation: allostatic stress response and altered activity-energy budgets. Ecological Applications.
5. Nusslé S, Bornand CN, Hofmann F & Rubin JF (2014) Bilan de trois décennies de suivi des palées du lac de Joux (*Coregonus palaea*). Bulletin de la Société Vaudoise des Sciences Naturelles.
6. Laugen AT et al. (2014). Evolutionary impact assessment: accounting for evolutionary consequences of fishing in an ecosystem approach to fisheries management. Fish and Fisheries.
7. Heino M et al. (2013). Can fisheries-induced evolution shift reference points for fisheries management? ICES Journal of Marine Science.
8. Pompini M et al. (2013). Temperature-induced sex reversal is not responsible for sex-ratio distortions in grayling *Thymallus thymallus* or brown trout *Salmo trutta*. Journal of fish biology.
9. Arlettaz R, Maurer M, Mosimann P, Nusslé S, et al. (2012). New vineyard cultivation practices create patchy ground vegetation, favouring Woodlarks. Journal of Ornithology.
10. Nusslé S, Bréchon A & Wedekind C (2010). Change in individual growth rate and its link to gillnet fishing in two sympatric whitefish species. Evolutionary Ecology.
11. Nusslé S, Bornand C & Wedekind C (2009). Fishery-induced selection on an Alpine whitefish: quantifying genetic and environmental effects on individual growth rate. Evolutionary Applications.
12. Wedekind C, Jacob A, Evanno G, Nusslé S & Muller R (2008). Viability of brown trout embryos positively linked to melanin-based but negatively to carotenoid-based colours of their fathers. Proceedings of the Royal Society B-Biological Sciences.
13. Parapanov R, Nusslé S, et al. (2008). Testis size, sperm characteristics and testosterone concentrations in four species of shrews (Mammalia, Soricidae). Animal Reprod. Science.
14. Parapanov R, Nusslé S, Hausser J & Vogel P (2008). Histological description of seminiferous epithelium and cycle length of spermatogenesis in the water shrew *Neomys fodiens* (Mammalia: Soricidae). Animal Reproduction Science.
15. Parapanov R, Nusslé S, Hausser J & Vogel P (2008). Relationships of basal metabolic rate, relative testis size and cycle length of spermatogenesis in shrews (Mammalia, Soricidae). Reprod. Fertility & Dev.
16. Jacob A, Nusslé S, et al. (2007). Male dominance linked to size and age, but not to 'good genes' in brown trout (*Salmo trutta*). BMC Evolutionary Biology.
17. Parapanov R, Nusslé S & Vogel P (2007). Cycle length of spermatogenesis in shrews (Mammalia: Soricidae) with high and low metabolic rates and different mating systems. Biol. of Reproduction.

18. Giorgi MS, Arlettaz R, Guillaume F, Nusslé S, et al. (2004). Causal mechanisms underlying host specificity in bat ectoparasites. Oecologia.

#### Publications in preparation or submitted

19. Nusslé S, Hendry AP, Bogan M, Knapp R & Carlson SM (*in prep*). Repeated experimental salmonid eradication reveals the mechanisms of fishery-induced selection? Nature
20. Nusslé S, Matthews K & Carlson S (*in prep*). Vegetation recovery from grazing could take decades in the Golden trout habitat.
21. Nusslé S et al. (*in prep*). Investigating the link between fishery-induced evolution, environmental changes and species-specific trophic niche.
22. Wellig S et al. (*in prep*) Mitigating the negative effects of tall wind turbines on bats: vertical activity.
23. Kissling J, Nusslé S et al. (*revision sent*). Desertification in the Sahel: anthropogenic pressure or climate change. PLOS One

#### Scientific reports & thesis chapters

24. Nusslé S. (2016). Palées du Lac de Joux : Monitoring 2015. Internal report. Service de la Faune, de la Forêt et de la Nature Saint-Suplice, Suisse.
25. Nusslé S. (2015). Palées du Lac de Joux : Monitoring 2014. Internal report. Service de la Faune, de la Forêt et de la Nature Saint-Suplice, Suisse.
26. Matthews K. and Nusslé S. (2014). California golden trout and climate change: Is their stream habitat vulnerable to climate warming? Pages 51-57 in R. F. Carline and C. LoSapio, editors. Wild Trout XI: Looking Back and Moving Forward. Wild Trout Symposium, West Yellowstone, Montana.
27. Nusslé S. (2014). Palées du Lac de Joux : Monitoring 2013. Internal report. Service de la Faune, de la Forêt et de la Nature Saint-Suplice, Suisse.
28. Nusslé S. (2013). Palées du Lac de Joux : Monitoring 2012. Internal report. Service de la Faune, de la Forêt et de la Nature Saint-Suplice, Suisse.
29. Wellig S., Nusslé S., Miltner D., Obrist M. K., Kohle O., Glaizot O., Braunisch V., Arlettaz R. (2013). Mitigating the negative effects of tall wind turbines on bats: vertical activity profiles and relationships to wind speed. Sascha Wellig Master thesis, University of Bern, Bern, Switzerland.
30. Nusslé S. (2012). Palées du Lac de Joux : Monitoring 2010-2011. Internal report. Service de la Faune, de la Forêt et de la Nature Saint-Suplice, Suisse.
31. Nusslé S. (2011). Palées du Lac de Joux : Monitoring 2009-2010. Internal report. Service de la Faune, de la Forêt et de la Nature Saint-Suplice, Suisse.
32. Jacob A., Nusslé S, von Siebenthal B. and Wedekind C. (2009). Stress-induced change in the quantitative genetics of hatching timing in brown trout. Alain Jacob PhD thesis chapter 7, University of Lausanne, Lausanne, Switzerland.
33. von Siebenthal B., Jacob A., Nusslé S. and Wedekind C. (2009). Genetic and pathogen-linked effects on the timing of hatching in a salmonid. Beat von Siebenthal PhD thesis chapter 3, University of Lausanne, Lausanne, Switzerland.
34. Nusslé S., Guduff S. & Bornand C. (2008). Evolution de la population de palées (*Coregonus palaea*) du lac de Joux entre 1980 et 2007 et réflexions sur sa gestion. Internal report. Service de la Faune, de la Forêt et de la Nature, Suisse.
35. Nusslé S. & Bornand C. (2007). Compte rendu de l'Evolution de la population de palées (*Coregonus palaea*) du lac de Joux. Internal report. Service de la Faune, de la Forêt et de la Nature Saint-Suplice, Suisse.

#### Publications linked to collaborations in medical research

36. Gonseth S et al. (2015). Maternal Folate Intake at Peri-Conception and Genome-Wide DNA Methylation Modifications at Birth in Children. Epigenetics
37. Gonseth S, Nusslé S, et al. (2015). Excess winter deaths caused by cardiovascular diseases are associated with both mild winter temperature and socio-economic inequalities in the U.S. International Journal of Cardiology.
38. Gonseth S et al. (2014). Leptin and smoking cessation: secondary analyses of a randomized controlled trial assessing physical activity as an aid for smoking cessation. BMC Public Health.



## Public presentations

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### In international conferences

1. Lausanne, Switzerland. European society for evolutionary biology meeting. Is fishery selection repeatable? Lessons learned from fish removal experiments in Sierra Nevada Lakes. (poster) **(2015)**
2. Sacramento, CA, USA, Ecological Society of America meeting. Fisheries-induced evolution: from Swiss alpine whitefish to introduced Sierra Nevada salmonids. **(2014)**
3. Raleigh, NC, USA, Society for the Study of Evolution meeting. Fisheries-induced evolution: from Swiss alpine whitefish to introduced Sierra Nevada salmonids. **(2014)**
4. Neuchâtel, Switzerland. Biology10. Past and future fishery-induced evolution on growth in an Alpine Whitefish. **(2010)**
5. Berlin, Germany. International Conference on Evolutionary Ecology of Fishes. Fishery-induced evolution on growth and management options. **(2009)**
6. Prague, Tcheque Republic. European Congress of Conservation Biology. Fishery-induced rapid evolution and fishing-gear adjustment in population management. **(2009)**
7. Bern, Switzerland. Biology09. Fishery-induced rapid evolution and fishing gear adjustment in population management (poster). **(2009)**
8. Lausanne, Switzerland. Biology08. Fishery-induced selection on Alpine whitefish: quantifying genetic and environmental effects on growth rate. **(2008)**
9. Copenhagen, Denmark. Study-Group on Fishery-Induced Adaptive Change. Fishery-induced selection on Alpine whitefish: quantifying genetic and environmental effects on growth rate. **(2008)**
10. Uppsala, Sweden. 11th Congress of the European Society for Evolutionary Biology. Fishery-induced decrease in individual growth rates: disentangling genetic from environmental effects (poster). **(2007)**
11. Lausanne, Switzerland. University of Lausanne D.Day. Fishery-induced decrease in individual growth rates: disentangling genetic from environmental effects (poster). **(2007)**
12. St. Andrews, Scotland. 12th Annual European Meeting of PhD students in Evolutionary Biology. Phenotypic changes in alpine coregonids revealed from monitoring surveys covering up to 60 years. **(2006)**
13. Eger, Hungary. European Congress of Conserv. Biology. Phenotypic changes in Alpine coregonids revealed from monitoring surveys that cover up to 60 years (poster). **(2006)**

### As invited speaker

1. Santa Cruz, CA, USA. NOAA Fisheries Seminar. A journey in fishery-induced evolution, from alpine whitefish to introduced salmonids in Sierra Nevada lakes and beyond. **(2015)**
2. Yosemite Valley, CA, USA. Yosemite Forum. Fishery-induced selection: What can be learned from introduced salmonids in Sierra Nevada lakes? **(2015)**
3. UC Berkeley, USA, Freshwater ecology seminar. Invited speaker for a lecture on Fisheries-induced evolution. **(2015)**
4. UC Berkeley, USA, Wildlife, Conservation and Management seminar. Fisheries-induced evolution: from Swiss alpine whitefish to introduced Sierra Nevada salmonids. **(2013)**
5. L'Abbaye, Switzerland. Consultative assembly for fishing in Lake Joux. Monitoring de la palée du lac de Joux **(2015, 2013, 2012, 2011, 2010)**
6. Le Sentier, Switzerland. Consultative assembly for fishing in Lake Joux. Compte rendu de l'évolution de la population de palées du lac de Joux. **(2009, 2008, 2007)**
7. Konstanz, Germany: University of Konstanz. Fishery-induced selection on Alpine whitefish: quantifying genetic and environmental effects on growth rate. **(2008)**
8. Lausanne, Switzerland. Hotspots Training course. Evolutionary Processes, Molecular Tools and Bioinformatics. GLM and LMM models in R (invited lecturer). **(2008)**
9. Kastanienbaum, Switzerland. Swiss Federal Institute of Aquatic Science and Technology (EAWAG). Fishery-induced selection on Alpine whitefish: quantifying genetic and environmental effects on growth rate. **(2008)**
10. Lausanne, Switzerland. University of Lausanne, Dept. of Ecology and Evolution, Internal Seminar. Fishery-induced selection on Alpine whitefish: quantifying genetic and environmental effects on growth rate. **(2007)**