

Rishi De-Kayne, PhD

Evolutionary Biologist

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I am an evolutionary biologist using computational genomics to study the genetic basis of traits and evolutionary processes, including adaptation and speciation.

EMPLOYMENT:

- 09/2024-present** **Postdoctoral Researcher**
Peter Sudmant Lab – University of California, Berkeley, USA
Project: Structural variation and somatic evolution in primates
- 04/2023-08/2024** **Postdoctoral Researcher**
Joanna Kelley Lab – University of California, Santa Cruz, USA
Project: Convergent adaptation to extreme environments in Poeciliid fishes
- 02/2021-03/2023** **SNSF Early Postdoc Mobility Fellow – Independent Postdoctoral Researcher**
Simon Martin Lab – University of Edinburgh, UK
Project: The evolution and maintenance of wing-pattern supergenes in *Danaus* butterflies

EDUCATION:

- 10/2016-12/2020** **PhD** – Pass with honours - *insigni cum laude*
University of Bern, Switzerland
Title: The genetic basis of adaptation and speciation in the Swiss Alpine whitefish radiation
Project supervisors: Prof. Ole Seehausen & Dr. Philine G. D. Feulner
- 10/2015-10/2016** **MRes Tropical Forest Ecology** – Pass with Distinction
Imperial College London, UK
Thesis: Endophytic fungal, not bacterial, communities differ between sympatric palm species
Project supervisor: Prof. Vincent Savolainen
- 10/2012-10/2015** **BSc Biology** – 1st Class Honours
Imperial College London, UK
Thesis: Resolving the phylogeny of the sharks using 20 transcriptomes
Project supervisor: Prof. Vincent Savolainen

PUBLICATIONS:

I have **13 publications (9 as first author)** in internationally recognised peer reviewed journals with a total of **292 citations and an h-index of 9**. Additionally, I have 2 papers in review * = joint first authorship

13. R Greenway, **R De-Kayne**, A Brown, H Camarillo, C Delich et al. (in press) Integrative analyses of convergent adaptation in sympatric extremophile fishes. Current Biology

12. **Rishi De-Kayne**, Blair Perry, Kerry McGowan, Jake Landers, Lenin Arias-Rodriguez, Greenway. Ryan, Carlos M. Rodríguez Peña, Michael Tobler Tobler, Joanna L. Kelley (2024) Evolutionary rate shifts in coding and regulatory regions underpin repeated adaptation to sulfidic streams in poeciliid fishes. Genome Biology and Evolution

11. **Rishi De-Kayne**, Rowan Schley, Julia MI Barth, Luke C Campillo, Catalina Chaparro-Pedraza et al. (2024) Why do some lineages radiate while others do not? Perspectives for future research on adaptive radiations. Cold Spring Harbor Perspectives in Biology
10. J Cerca, DD Cotoras, VC Bieker, **R De-Kayne**, P Vargas, et al. (2023) Evolutionary genomics of oceanic island radiations. Trends in Ecology & Evolution
<https://doi.org/10.1016/j.tree.2023.02.003>
9. **R De-Kayne**, OM Selz, D Marques, D Frei, O Seehausen, PGD Feulner (2022) Genomic architecture of adaptive radiation and hybridization in Alpine whitefish. Nature Communications 13:4479
8. K-W Kim*, **R De-Kayne***, IJ Gordon, KS Omufwoko, DJ Martins, SH Martin (2022) Stepwise evolution of a butterfly supergene via duplication and inversion. Philosophical Transactions of the Royal Society B 377:20210207
7. D Frei, **R De-Kayne**, OM Selz, O Seehausen, PGD Feulner (2022) Genomic variation from an extinct species is retained in the extant radiation following speciation reversal. Nature Ecology and Evolution 6:461-468
6. KS Singh*, **R De-Kayne***, KS Omufwoko, R ffrench-Constant, C Bass, D Martins, SH Martin (2022) Genome assembly of *Danaus chrysippus* and comparison with the Monarch. *Danaus plexippus*. G3: Genes, Genomes, Genetics 12:jkab449
5. **R De-Kayne***, D Frei*, R Greenway, SL Mendes, C Retel, PGD Feulner (2021) The future of next generation sequencing datasets: technological shifts provide opportunities but pose challenges for reproducibility and reusability. Molecular Ecology Resources 21:653–660
4. **R De-Kayne**, S Zoller, PGD Feulner (2020) A de novo chromosome-level genome assembly of *Coregonus* sp. “Balchen”: one representative of the Swiss Alpine whitefish radiation. Molecular Ecology Resources 20:1093–1109
3. **R De-Kayne**, PGD Feulner (2018) A European whitefish linkage map and its implications for understanding genome-wide synteny between salmonids following whole genome duplication. G3: Genes, Genomes, Genetics 8:3745-3755
2. OG Osborne*, **R De-Kayne***, MI Bidartondo, I Hutton, WJ Baker, CGN Turnbull, V Savolainen (2017) Arbuscular Mycorrhizal fungi promote coexistence and niche divergence of sympatric palm species on a remote oceanic island. New Phytologist 217:1254-1266
1. PGD Feulner, **R De-Kayne** (2017) Genome evolution, structural rearrangements and speciation. Journal of Evolutionary Biology 30:1488-1490

IN REVIEW

M Rincon-Sandoval, **R De-Kayne**, SD Shank, S Pirro, A Ko’ou, et al. High Incidence of Positive Selection Following Marine-to-Freshwater Catfish Transitions. Nature Communications

R De-Kayne, I Gordon, R Terblanche, S Martin Extensive haplotype diversity in a butterfly wing pattern supergene is fuelled by incomplete recombination suppression. PLOS Biology

GRANTS, PRIZES, and AWARDS:

- PacBio SMRT Sequencing grant 2023 – **runner up (Co-I) - funded**
- SMBE Young Investigator Travel Award 2023 – **\$3,500**
- SNSF Postdoc Mobility fellowship (18 months) 2023 – **CHF 78,000/\$78,170**
- SNSF Early Postdoc Mobility fellowship (18 months) 2020 – **CHF 73,150/\$73,310**
- Best student talk at PopGroup53 2020 – **1st Place - £250/\$280**

- Best conference poster at Biology20 2020 – **2nd Place - CHF 150/\$150**

TEACHING EXPERIENCE:

UC Santa Cruz - Undergraduate Coding Club

05/2024-08/2024

This hands-on course involved weekly meetings where I taught bioinformatics and general programming skills to 6 summer undergraduate researchers. I established the course and prepared and delivered all course material.

UC Santa Cruz - Undergraduate Genomics Training

05/2023

This course offered an extra-curricular comprehensive introduction to bioinformatics for BSc students, covering a typical bioinformatics project workflow from start to end. I taught general bash scripting, read trimming, and read mapping.

OH-KNOW Bioinformatics Workshop

09/2021

I co-organised this four-day online workshop aimed at teaching the latest k-mer based tools for bioinformatics using high-performance computing platforms. The course was attended by 61 participants spanning 10 different time zones. I organised the logistics of the workshop, designed, wrote, and taught a comprehensive bash scripting course, and assisted with all subsequent teaching topics.

University of Bern – Practical in Aquatic Ecology and Evolution

03-05/2018, 03-05/2019, and 04/2021

In this course, students designed their own practical investigation to study the ecology and evolution of fish in Swiss lakes. I assisted throughout the practical, wrote and presented an 'introduction to scientific writing' guide for students, and graded the final reports. In 2021 I provided a guest lecture on scientific writing.

University of Bern – Introduction to R for Beginners

09/2019

In this five-day course, second- and third-year BSc students received an introduction to R. I was a teaching assistant for the course and graded final homework reports.

STUDENT MENTORSHIP:

Co-supervision of Jeremy Davis – University of California, Santa Cruz BSc Student

2023-Present

Jeremy's project aims to identify structural variation between Poeciliid fish species to identify structural variation associated with the adaptation of some lineages to survive in hydrogen-sulfide rich springs.

Co-supervision of Frances Swift – University of Edinburgh BSc Evolutionary Genetics Student

12/2022-05/2023

In this project, Frances used published Lepidoptera reference genome assemblies to investigate both SNP and structural variant diversity across this clade. I co-supervised all stages of the project from project planning through to the analysis and write up.

Co-supervision of Sam Mitchell – University of Edinburgh MSc Evolutionary Genetics Student

05-08/2022

This project focussed on understanding the consequences of a population bottleneck using whole-genome sequences collected for African monarch butterflies on the remote island of St. Helena. I co-supervised and mentored Sam throughout all stages of the project.

Co-supervision of Michelé Leemann – University of Bern MSc Bioinformatics Student 07-09/2021

This project aimed to use existing sequencing data for Alpine whitefish to assemble and annotate the Alpine whitefish mitochondrial genome. My co-supervision involved setting up Michelé on the computer cluster and discussing each of the analytical approaches.

Co-supervision of Romano Josi – University of Bern BSc Summer Research Student 06-07/2017

This research project used diagnostic microsatellites to determine the pedigree of lab-reared whitefish larvae and test for the presence of gynogenetic haploid individuals. My co-supervision involved training Romano in molecular lab techniques.

OUTREACH, SCIENCE COMMUNICATION, and ADVOCACY:

- Interviewed 100 PhD students from around the world between 2018 and 2020 as part of my blog PhDetails: phdetails.blogspot.com to promote diverse students in biology.
- Written technical articles about bioinformatics approaches both on PhDetails and The Molecular Ecologist Blog: molecularecologist.com.
- Written articles on navigating academia aimed at disseminating information to students and postdocs without formal mentorship, something I consider a substantial source of inequity in academia.
- PhD and Postdoc representative (Unteren Mittelbau) on the hiring committee for a new Professor for Theoretical Ecology and Evolution at the University of Bern (2019).
- Postdoc representative and member of the Inclusion, Diversity, Equity, & Action (IDEA) committee at UC Santa Cruz (05/2023-present).

ACADEMIC SERVICE:

- Scientific manuscript reviewing for: Nature Ecology and Evolution, Molecular Biology and Evolution, Genome Biology and Evolution, G3, Molecular Ecology, Molecular Ecology Resources, Journal of Evolutionary Biology, and Philosophical Transactions of the Royal Society B.
- Scientific grant reviewing for: Great Lakes Fisheries Commission.

INVITED SEMINARS:

14. TITLE TBD. *XXX Seminar Series*, USF, USA 11/2024

13. TITLE TBD. *XXX Seminar Series*, UC Riverside, USA 10/2024

12. The roles of evolutionary rate shifts and structural variation in sulfide adaptation. *Bierbach Lab Group Seminar*, Humboldt Universität zu Berlin, Germany 05/2024

11. Uncovering overlooked variation - the role of structural variants in adaptation. *EEB Seminar Series*, UC Santa Cruz, USA 04/2024

10. Uncovering overlooked variation - the role of structural variants in adaptation. *Sudmant Lab Group Seminar*, UC Berkeley, USA 03/2024

9. Adaptation across scales – from SNPs to supergenes and lakes to continents. *Schumer Lab Group Seminar*, Stanford University, USA 12/2022

8. The genomic basis of adaptation and speciation in the Alpine whitefish radiation. *Betancur FishLab Group Seminar*, University of Oklahoma, USA 09/2022

7. Adaptation across scales – from supergenes to adaptive radiations. *MVZ Seminar*, UC Berkeley, USA 05/2022
6. Adaptation across scales – from supergenes to adaptive radiations. *CPB Seminar*, UC Davis, USA 03/2022
5. The genomic basis of adaptation and speciation in the Alpine whitefish radiation. *Next Generation Genomics MSc Course*, University of Edinburgh, UK 02/2022 (**Guest Lecture**)
4. The evolution of complex wing-pattern supergenes in *Danaus* butterflies. *Lepinar Seminar Series*, Online 02/22
3. The genomic basis of adaptation and speciation in the Alpine whitefish radiation. *COMgen Seminar Series*, University of Nottingham 02/2021
2. Genomic insights into the evolution of the Alpine whitefish radiation. *CIGENE Seminar Series*, Norwegian University of Life Sciences 02/2021
1. From palms to whitefish – understanding the genetic basis of adaptation and speciation. *Eawag Aquatic Ecology & Macroevolution Seminar Series 2020*, Kastanienbaum, Switzerland 04/2020

CONTRIBUTED SEMINARS and POSTERS (as presenting author):

20. The (un)predictability of sulfide adaptation in Poeciliid fishes across scales of biological organization. *Evolution 2024*, Canada, 07/2024 - **Oral Presentation**
19. Evolutionary dynamics of a modular supergene in the African monarch butterfly (*Danaus chrysippus*). *SMBE 2023*, Italy, 07/2023 - **Oral Presentation**
18. Stepwise supergene evolution in a butterfly: multiple duplications preceded multiple inversions. *Bay Area Population Genomics meeting XIX*, Stanford University, USA 04/2022 - **Oral Presentation**
17. Stepwise evolution of a butterfly supergene via duplication and inversion. *55nd Population Genetics Group Meeting (PopGroup55)*, Norwich, UK (online) 01/2022- **Oral presentation**
16. A mixed genetic architecture and gene flow facilitate adaptive radiation. *Understanding 'reproductive isolation'? ESEB satellite symposium*, Online 09/2021 - **Oral presentation**
15. Dissecting the evolutionary mechanisms driving Alpine whitefish diversification, *54nd Population Genetics Group Meeting (PopGroup54)*, Liverpool, UK (online) 01/2021 - **Oral presentation**
14. Towards understanding adaptation and speciation in the Swiss Alpine whitefish radiation. *Biology20 Conference*, Freiburg, Switzerland 02/2020 – **Poster presentation**
13. Towards understanding adaptation and speciation in the Swiss Alpine whitefish radiation. *53rd Population Genetics Group Meeting (PopGroup53)*. Leicester, UK 01/2020 - **Oral presentation**
12. A de novo chromosome-level genome assembly of *Coregonus steinmanni* – towards understanding adaptation and speciation in the Swiss Alpine whitefish radiation. *4th International Conference on Integrative Salmonid Biology (ICISB2019)*. Edinburgh, UK 11/2019 - **Oral presentation**
11. Genomics of adaptation in the Alpine whitefish radiation - genomic resources to study adaptation and speciation. *2019 Congress of the European Society for Evolutionary Biology (ESEB2019)*. Turku, Finland 08/2019 - **Poster presentation**

10. Assembling the genome of *Coregonus steinmanni* – unlocking the secrets of the Swiss Alpine whitefish radiation. *EAWAG Fish Ecology and Evolution Symposium 2019*. Kastanienbaum, Switzerland 07/2019 - **Oral presentation**
9. Towards the understanding of adaptation and speciation in the Swiss Alpine whitefish radiation. *Biology19 Conference*. Zurich, Switzerland 02/2019 - **Oral presentation**
8. Towards the understanding of adaptation and speciation in the Swiss Alpine whitefish radiation. *52nd Population Genetics Group Meeting (PopGroup52)*. Oxford, UK 01/2019 - **Oral presentation**
7. The Swiss Alpine whitefish radiation – first steps in understanding the genomic basis of adaptation and speciation. *Programming for Evolutionary Biology (PEB) Conference 2018*. Buttermere, UK 09/2018 - **Oral presentation**
6. The Swiss Alpine whitefish radiation – genomic resources to study adaptation and speciation. *2018 Congress of the European Society for Evolutionary Biology (ESEB2018)*. Montpellier, France 08/2018 - **Poster presentation**
5. Producing genomic resources for pre-Alpine whitefish and what they can tell us about genome evolution. *EAWAG Fish Ecology and Evolution Symposium 2018*. Kastanienbaum, Switzerland 06/2018 - **Oral presentation**
4. Constructing a linkage map for Swiss Alpine whitefish. *Biology18 Conference*. Neuchatel, Switzerland 02/2018 - **Poster presentation**
3. Constructing a linkage map for Swiss Alpine whitefish. *51st Population Genetics Group Meeting (PopGroup51)*. Bristol, UK 01/2018 - **Poster presentation**
2. Investigating the genomic basis of adaptation and speciation in the Alpine whitefish radiation. *EAWAG Fish Ecology and Evolution symposium 2017*. Kastanienbaum, Switzerland 06/2017 - **Oral presentation**
1. The genomic basis of adaptation and speciation in the Swiss Alpine whitefish radiation. *Biology17 Conference*. Bern, Switzerland 01/2017 **Poster presentation**