

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 **14 publications (9 as first author)** in internationally recognised peer reviewed journals with a total of **336 citations and an h-index of 9**. Additionally, I have 1 paper in review * = joint first authorship

14. M Rincon-Sandoval, **R De-Kayne**, SD Shank, S Pirro, A Ko'ou, et al. (2024) Ecological diversification of sea catfishes is accompanied by genome-wide signatures of positive selection. Nature Communications 15:10040

13. R Greenway, **R De-Kayne**, A Brown, H Camarillo, C Delich et al. (2024) Integrative analyses of convergent adaptation in sympatric extremophile fishes. Current Biology 34:4968-4982.e7

12. **R De-Kayne**, B Perry, K McGowan, J Landers, L Arias-Rodriguez, R Greenway, CM Rodríguez Peña, M Tobler, JL Kelley (2024) Evolutionary rate shifts in coding and regulatory regions underpin repeated adaptation to sulfidic streams in poeciliid fishes. Genome Biology and Evolution 16:evae087
11. **R De-Kayne**, R Schley, JMI Barth, LC Campillo, C 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 a041448
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 38:631-642
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 French-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

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**
- Best student poster at PopGroup51 2018 – **2nd Place - £150/\$200**

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 IB DEIB committee at UC Berkeley (08/2024-present)
- Postdoc representative and member of the Inclusion, Diversity, Equity, & Action (IDEA) committee at UC Santa Cruz (05/2023-08/2024).

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. Uncovering overlooked variation - the role of structural variants in adaptation. *Biology Department Seminar Series*, USF, USA 11/2024

13. Uncovering overlooked variation - the role of structural variants in adaptation. *EEOB 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**