

# NICOLAS BEKKA

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## RESEARCH INTERESTS

- Urban-driven selection & trait-fitness relationships in urban passerines
- Plumage signals as eco-evolutionary indicators
- Quantitative ecology: mixed models, multivariate analyses, spatial/remote-sensing covariates (R, QGIS)

## EDUCATION

**Ph.D. in Ecology & Evolution**  
*Sorbonne University, Paris, France*  
Doctoral school grant (ED227)

(Defended: December 2025)

"Selection and phenotypic variation in Great (*Parus major*) and Blue tits (*Cyanistes caeruleus*) plumage colouration in cities".  
Supervisor: Dr. Clotilde Biard

**M.Sc. in Biodiversity, Ecology, Evolution**  
Evolutionary Ecology curriculum,  
*Sorbonne University, Paris, France*

(With High Honours, 2022)

- Master's Research Project: "*Plumage colouration as a bioindicator of habitat and individual quality: The case of great tits (Parus major) in urban environments*".

**B.Sc. in Life Sciences**  
*Sorbonne University, Paris, France*

(With Honours, 2020)

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## PROFESSIONAL SKILLS & QUALIFICATIONS

### Fieldwork & Experimental Skills

- **Bird Ringing Permit (Specialist level)** - *Parus major* & *Cyanistes caeruleus*  
*Bird Population Biology Research Center (CRBPO)*  
Permit #02367
  - Capture, ringing, morphometric measurements, blood and feather sampling.
- **Training in the use of non-housed wild animals for scientific purposes, intended for people designing or carrying out experimental procedures** - ExpeFS-FI Designer (57 hours - 2024)  
*National Museum of Natural History (MNHN), Paris*

### Digital & Analytical Tools

- **Programming**: R (advanced), Python (intermediate)
- **Statistical modelling** (LMM, GLMM, multivariate stats, data viz), **machine learning** (intermediate)
- **Data visualisation**: ggplot2 (advanced), QGIS
- **Spectrophotometry**: adapted protocols, *pavo*-based workflows (R)
- **Voluntary professional development in Data Science & Artificial Intelligence** - 130+ contact hours alongside PhD  
*Sorbonne University*  
Open data: retrieve and publish open data (21h), Introduction to Python (30h), Elements of AI (30h), Machine Learning - Introduction (30h), Machine Learning - Intermediate (20h)

## Geographic Information Systems (GIS) & Remote Sensing

- **QGIS** (advanced), environmental mapping, spatial analyses and modelling
- **Satellite image processing** for meter-scale mapping
- **Geospatial data management pipeline:** ingestion, harmonisation, and processing of georeferenced databases (PhD project, Paris Data + Copernicus sources)

## Scientific Integrity & Research Ethics

- Internal training for prospective ethics committee members, open data principles, and scientific integrity (55 contact hours)
- Member of the Society for Open, Reliable, and Transparent Ecology and Evolution (SORTEE).

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## DOCTORAL RESEARCH EXPERIENCE

### PhD Researcher

(2022 - 2025)

*Institute of Ecology and Environmental Sciences (IEES), Department of Ecology & Evolution, Sorbonne University,*

- **Research Focus:** Investigating the role of urbanisation in shaping avian phenotypic traits.
- **Approach:**
  - Led fieldwork campaigns in urban and rural areas (capture, morphometry, feather and blood sampling of passerine birds populations)  
*2000+ birds ringed over 4 years*
  - Conducted spectrophotometry analyses of feather colouration.
  - Modelled trait-fitness and trait-environment relationships using polynomial terms within LMM & GLMM frameworks and multivariate analyses in R
  - Derived meter-scale landscape covariates using QGIS and supervised land-cover classification; integrated Paris OpenData and Copernicus products
  - Coordinated a Europe-wide collaboration on urban imperviousness and colouration (5 countries, 6 cities, 838 samples); CRediT roles: *Conceptualization; Data curation; Investigation (spectrophotometry + land-cover classification); Methodology; Formal analysis; Visualization; Supervision (MSc intern); Project administration; Writing - original draft.*
- **Outputs:** 1 published research article, 2 manuscripts under review, 1 in preparation
- **Departmental Service:** Organized local Ph.D. candidates seminar and mentored new graduate students (2023).

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## PRIOR RESEARCH EXPERIENCE

### Master's Thesis Research Intern

(6 months - 2022)

*Institute of Ecology and Environmental Sciences (IEES), Department of Ecology & Evolution, Institute of Environmental Transition (ITE-SU), Sorbonne University,*

- Investigated variation and selection on carotenoid-based colouration in urban birds.
- Analysed large datasets on colouration, morphology and phenology using R libraries (GLMs, mixed models).
- Environmental mapping (QGIS)
- Produced an internal report summarising key findings and future research directions.

**Data Analyst** (2 months - 2021)  
*Laboratoire d'Océanographie et du Climat : Expérimentations et Approches Numériques - (LOCEAN)*

- Implementation and monitoring of automated colorimetric dosage protocols for Nitrates, Nitrites, and Silicates.
- Conducted data analysis, quality control and visualisation.

**Undergraduate Research Assistant** (2 months - 2021)  
*Institute of Ecology and Environmental Sciences (IEES), Department of Ecology & Evolution,*

- Assisted in field data collection on urban and rural bird populations
- Performed preliminary data processing and statistical analyses.

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## TEACHING EXPERIENCE

**Teaching Assistant** (2023 - 2025)  
*Sorbonne University,*

- Conducted practical and tutorial sessions in **Ecology & Evolution** (72h), **Ethology** (36h) with groups of 30+ undergraduate students, and **Geographical Information Systems** (72h - using QGIS software) for groups of 15+ graduate students.
- Developed and graded assignments and supervised student projects.
- 192 hours of tutorials and practical courses in total.

**Research Mentor** (2023 - 2025)  
*Institute of Ecology and Environmental Sciences, Department of Life Sciences,*

- Co-supervised **10+ interns per year** on fieldwork logistics, ecological data management, animal ethics, and animal handling.
- Introduced students to R for basic and intermediate statistical modelling; assisted with troubleshooting and data interpretation.

**Science communication & public outreach**  
*Urban field campaigns*

- **Public engagement** - Explaining ecological issues linked to urbanisation to the general public.
- **Animal Ethics awareness** - Presenting the regulatory framework and best practices in research.
- **Demonstration of scientific protocols** - Explaining bird monitoring methods and data collection procedures.
- **Non-academic presentations** - Presented PhD project aims and results to the Paris Department of Green Spaces and the Environment (DEVE) (2024); presented PhD project work and results to the green space teams and the menagerie staff at the Jardin des Plantes (2024)

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## SOFT SKILLS & LANGUAGES

- **Languages:**
  - French: Native
  - English: Proficient (C1/C2)
  - Polish: Limited (A2)
  - German: Beginner (A1), Italian: Beginner (A1)

- **Leadership & Science Communication:**
  - Conference presentations (domestic and international)
  - Mentoring junior students
  - Collaboration with interdisciplinary and cross-cultural teams

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## PUBLICATIONS

1. **Bekka, N.**, Agostini, S., Perret, S. and Biard, C. (2025); *Colours of urban selection: carotenoid-based signals reveal divergent urban/rural evolutionary trajectories in two closely related passerines*. **Editor's Choice** for the Feb. 2026 Issue, *Oikos*, 2025: e11617. DOI: <https://doi.org/10.1002/oik.11617>  
 - Data & code associated (Zenodo): <https://doi.org/10.5281/zenodo.17105118>  
 (README, curated dataset + metadata; reproducible scripts for main and additional analyses, figure-generation code).
2. **Bekka, N.**, Sandmeyer, L., Chardine, N. Eens, M., Eeva, T., Gregoire, A., Grunst, S.A., Grunst, M.L., Isaksson, C., Janas, K., Salmón, P., Szulkin, M., Biard, C. (Under Review); *Paler in the city: carotenoid-based colouration covaries with imperviousness in great tits across Europe*. *Journal of Animal Ecology*  
 - Data & code associated (Zenodo): <https://doi.org/10.5281/zenodo.17841092>  
 (README, curated dataset + metadata; reproducible scripts for analyses, figure-generation code).
3. **Bekka, N.**, Agostini S., Perret, S., Biard, C. (Under Review); *Urbanisation and the evolution of sexually dimorphic traits: Evidence from black-tie ornamentation in great tits*. *Ecology and Evolution*  
 - Data & code associated (Zenodo): <https://doi.org/10.5281/zenodo.17336064>  
 (README, curated dataset + metadata; reproducible scripts for analyses, figure-generation code).
4. **Bekka, N.**, Agostini, S., Perret, S. and Biard, C. (In prep.); *Context-dependent selection on carotenoid colouration across urban imperviousness in great tits*
5. Nardou, N., **Bekka, N.**, Chatelain, M., (In prep.); *Picture-based plumage colour analyses provide a reliable alternative to spectrophotometry*

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## CONFERENCES & PRESENTATIONS

- **"Birds In The Grey Zone: High resolution satellite imagery reveals a continental colouration pattern in urban great tits *Parus major*"**  
*Poster presentation at:*
  - Congress of the European Society for Evolutionary Biology (ESEB) 2025, Barcelona, Spain
  - Ecology and Behaviour, Montpellier, France

Presented preliminary results of an European collaboration.  
**Poster DOI :** <https://doi.org/10.13140/RG.2.2.10982.95048>
- **"Urbanisation and the Evolution of Sexually Dimorphic Traits: Evidence from Black-Tie Ornamentation in Great Tits"**  
*Oral presentation at the RT ParusNet Meeting, November 2024, Paris*
  - Presented findings on black-tie sizes selection patterns within Great tits in urban vs. rural environments.
- **"The colouration of urbanisation: Great tits are paler in more urbanised areas within the city"**  
*Oral presentation at the British Ornithologists' Union (BOU), April 2024, Nottingham*
  - Highlighted Great tits' colouration correlates with fine-scale landscape properties within the urban environment.

- **"Colours of evolution: Plumage colouration as a marker of divergent selection between city and countryside"**  
*Oral presentation at the British Ornithologists' Union (BOU), April 2023, Nottingham*
    - Highlighted divergent selection patterns on great and blue tits' yellow breast feathers that could account for the widely observed dullness of carotenoid-based colouration in cities.
  - **"Colours of selection: plumage colouration as the marker of possible convergent evolutive pathways between two closely related species in cities."**  
*Oral presentation at the "ParidMeeting", February 2023, Montpellier, France*
    - Presented findings on patterns of selection on yellow carotenoid-based colouration.
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## REFEREES

### RESEARCH :

**Dr. Clotilde Biard**  
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### TEACHING :

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