

Morgane TOUZOT

18.03.1994

Married with a little daughter

French

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B Licence

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Postdoctoral researcher in Ecophysiology

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[Profile links](#)



Academic education

2017 – 2020

PhD thesis in Ecophysiology with a Complementary Teaching Activity, *Univ. Lyon, France*

2015 – 2017

M. Sc. Integrated Physiology in Extreme Conditions, *Univ. Lyon, France* (1/11)

2014 – 2015

B. Sc. Physiology, *Univ. Lyon, France* (10/108)

2012 – 2014

Veterinary Higher School Preparatory Classes, *High School Assomption Bellevue, Lyon, France*

Professional experience

2022 – Now

Mentorship: Dr. S. Slotsbo
& Pr. Dr. M. Holmstrup

Postdoctoral researcher in Ecophysiology, *Univ. Aarhus, Denmark*

Department of Ecoscience, Terrestrial section, KlimastressLab

Grant from Independent Research Fund Denmark, Danmarks Frie Forskningsfond, Natur og Univers

« Adaptation and responses to thermal stress and the molecular mechanisms underlying these adaptative responses in soil invertebrates »

2021 (2 months)

Mentorship: Pr. Dr. N. Mondy
& Dr. T. Lengagne

Contractual researcher, *Univ. Lyon, France*

Laboratoire d'Ecologie des Hydrosystèmes Naturels et Anthropisés (LEHNA, UMR 5023)

2020 – 2021

Mentorship: Pr. Dr. N. Mondy

Researcher and teaching assistant, *Univ. Lyon, France*

LEHNA, UMR 5023

« Influence of artificial light at night on energy metabolism in *Bufo bufo* tadpoles »

2017 – 2020

Supervision: Pr. Dr. N. Mondy
& Pr. Dr. C. Duchamp

PhD Thesis in Ecophysiology with a Complementary Teaching Activity, *Univ. Lyon, France*

LEHNA, UMR 5023

Grant from French Ministry of Higher Education and Research

« Integrative study of the consequence of artificial light at night in the common toad, *Bufo bufo*: Molecular, physiological, and behavioural effects »

2017 (6 months)

Supervision: Pr. Dr. N. Mondy

M. Sc. Internship, *Univ. Lyon, France*

LEHNA, UMR 5023

« Impact of nocturnal light pollution on energy balance, stress and oxidative stress in adult common toad, *Bufo bufo* »

2016 (2 months)

Supervision: Dr. E. Moudilou

M. Sc. Internship, *Catholic Univ. Lyon, France*

Laboratoire de Biologie générale – Reproduction et Développement comparé (UMRS 449)

« Regulation of hydromineral balance in amphibians »

Scientific research work

Theme

I am a young **ecophysiology** researcher fascinated by the **relationships** between **organisms and their environment**. My research work, at the interface between **conservation biology** and **ecophysiology**, is mainly motivated by understanding the **ecophysiological mechanisms** enabling organisms to cope with **natural** (*e.g.* thermal fluctuations) or **anthropogenic** (*e.g.* artificial light at night) **environmental constraints**. I mainly study **anuran amphibians** and **soil invertebrates** (*e.g.* worms, nematodes, slugs), and occasionally extend my research to other groups (*e.g.* collembola, mussels). My research uses an **experimental and integrative approach** to assess the **molecular, physiological, and behavioural mechanisms** involved in response to a changing environment.

**Environmental constraint – Anthropisation – Ecophysiology – Life history traits – Fitness
Plasticity – Genetic – Physiological parameters – Thermal tolerance**

Research skills

○ Molecular biology and related Bioinformatics

Protein, RNA and DNA extraction and assay, PCR, RT-qPCR, RNA-seq libraries design, dsRNA design, RNAi, Transcriptomic (RNA-seq) analysis of differential gene expression and gene ontology

○ Physiological parameters analysis

Hormonal assays by enzyme immunoassays (EIA), Mitochondrial and Oxidative stress assays by enzymology, Reserves and Membrane composition assays by enzymology and gas chromatography (GC-MS)

○ Physiological and Behavioural components

Energy balance with Oxygen consumption by respirometry and Actimetry, Physical activity (walking and swimming), Breeding behaviour and Fertilization rate, Pupillary reflex

○ Laboratory and Field Experiments

Anurans: Field capture, housing and breeding in lab, morphometric and phenotypic measurement, salivary and blood sampling (diploma of Animal Experimentation B1).

Worms & Collembola: Field sampling, lab culture and survival measurement.

Field experiment along the latitudinal and thermal gradient (Southern to Northern Europe).

○ Writing skills

Capture authorization request of protected species and ethical protocols

Data processing / Specialized software

Biostatistics: R Studio

Informatics: MS Office, Inkscape, Image J

Energy Balance: Oxygen Logger (Pyroscience), Camera trap

Genetic and Physiology: NCBI, Seaview, Bio-Rad CFX Manager, GeNorm, Normfinder, MxPro QPCR, GCMS Real Time Analysis

Languages

French: Native language

English: Fluent practice TOEIC 910/990 (B2)

German: Notions

Scientific Projects

I - Adaptation to thermal stress in soil invertebrates

Climate change increase concerns about whether the ability of species to adapt to temperature changes will sustain populations and biodiversity in the future. Using an **integrative** and **experimental approach**, I investigate the **ecophysiological** and **molecular mechanisms** enabling adaptive thermal responses in soil invertebrates.

AXIS 1 – Plasticity of thermal tolerance in enchytraeids

As **phenotypic plasticity** is increasingly considered a fundamental response to naturally occurring thermal fluctuations, I investigate the plasticity of **thermal tolerance** in a freeze-tolerant worm, *Enchytraeus albidus*. Using **thermal death time landscapes** under static assays, I evaluated new aspects of the tolerance to extreme temperatures of *E. albidus* (Holmstrup *et al.*, 2023). Moreover, using **thermal tolerance measurements** and **reserves and membrane composition analysis** (glycogen, glucose and phospholipids fatty acid), I studied the effect of **cold and heat acclimation** in *E. albidus*. Finally, as this species is widely distributed along an extended climatic gradient (from Arctic to temperate regions of North America and Europe), based on about twenty populations collected along this **thermal gradient**, I looked for a **pattern of plasticity** of thermal tolerance to cold acclimation in relation to **local thermal conditions**.

AXIS 2 – Molecular signature of adaptation to thermal conditions in enchytraeids

Using the same populations of *E. albidus* collected along the **thermal gradient**, I am conducting a **molecular analysis** to identify **genes under selection for thermal adaptation**. More specifically, after **genotyping** the same twenty populations, I am identifying **single nucleotide polymorphisms (SNPs)** in the genomes and testing their involvement in thermal adaptation through **RNA interference (RNAi)** in *E. albidus*.

II - Influence of artificial light at night on life history traits of amphibians

Artificial light at night (ALAN), an anthropogenic pressure expanding worldwide, is recognized as a threat to biodiversity. Using an **integrative and experimental approach**, my research allows to evaluate the **ecophysiological** influence of this pollution on several anuran species.

AXIS 3 – Behavioural and ecophysiological consequences of ALAN in adult anurans

ALAN affects the photoperiod, a major external synchronizer of many biological processes. Thus, my project aimed to evaluate during the breeding period the influence of ALAN on daily and nocturnal **physical activity** using **video recordings** and on **energy balance** using **respirometry measurements** in common toads, *Bufo bufo* (Touzot *et al.*, 2019). Given that the importance of photoperiod in the regulation of biological rhythms is contested along the latitudinal gradient, the biological influence of ALAN could vary along this gradient. I therefore search for a **common pattern of biological consequences of ALAN** in relation to **local photoperiod conditions**. To do so, in field conditions, I evaluate the influence of ALAN in a **tropical species**, the Cane toad, *Rhinella marina* (Secondi *et al.*, 2021) and in *B. bufo* along a European latitudinal gradient (Norway-France-Sicily). Using similar methods, I evaluated **physical activity** and **energy balance outcome**, and measured **stress hormone level** through **salivary samplings**.

As changes in physical activity and energy balance during breeding are likely to affect the reproductive behaviour and success of anurans, I studied the influence of ALAN on **breeding behaviours** (initiation, stability and duration of mating) and **physiological parameters** (fertilization rate and salivary testosterone) of males *B. bufo* (Touzot *et al.*, 2020).

AXIS 4 – Influence of ALAN on physiology and gene expression in tadpoles

At the tadpole stage, I am interested in the influence of ALAN on molecular mechanisms using two complementary approaches. On the one hand, using **RNA-seq**, I evaluated with a day/night cycle the **whole-body transcriptomic response** of *B. bufo* tadpoles exposed to ALAN (Touzot *et al.*, 2021). On the other hand, given the importance of clock genes and melatonin in the integration of photoperiod by the organism, I conducted with a **circadian analysis a target gene approach** by **RT-qPCR** on specific candidate genes (*i.e.*, clock genes, genes encoding for enzymes involved in melatonin pathway). To seek a **common pattern of molecular consequences of ALAN**, this approach was conducted in **two anurans widespread in Europe**, the common toad and the agile frog, *Rana dalmatina* (Touzot *et al.*, 2023).

Furthermore, considering the strong effect of ALAN on **energy metabolism** in adult *B. bufo*, I searched for consequences at an earlier stage. I focused on enzymes involved in the regulation of **oxidative stress** and **metabolism**. To do so, I combined an evaluation of the **expression of genes** encoding for these specific enzymes by **RT-qPCR** and a measurement of the **activity of these specific enzymes** using **physiological assays**.

Administrative and Collective Experience

2020 – Now

- Peer-review of articles

2 articles in *Environmental Pollution*

1 article in *Physiology & Behavior*

1 article in *Science of the Total Environment*

2023

- Career Day at Ecoscience and QGG

Member of the organisation committee of the first **Career Day at Ecoscience and QGG** for PhD students and young doctors of Ecoscience and QGG departments, Aarhus University, 18th September 2023, Aarhus, Denmark (15 participants)

2021

- EUR H2O'LYON

Member of the PhD students and post-doctoral researcher working group EUR H2O'LYON. Organization of the first H2O'jectifs pro day for PhD students and young doctors of Lyon University, 24th November 2021, Lyon, France (46 participants)

- Post-doctoral researcher representative

Member of the LEHNA Unit Council as representative of post-doctoral researchers

2018 – 2020

- Scientific Events at the LEHNA

Member of the organisation committee of weekly Scientific Events at the LEHNA

- Doctoral Students' Day at the LEHNA

Member of the organisation committee of the annual Doctoral Students' Day at the LEHNA, 19th January 2019 & 21st January 2020, Lyon, France (11 & 18 participants)

Teaching and Educational Activities

Teaching Activities

Level	Type	Area	Time	Student number	University	Year
PhD Students Ecotoxicology	Practical work	Ecophysiology	5h	13 students	Univ. Aarhus	2023
1 st year M. Sc. Physiology	Examinator	Internship examination	5h	11 students	Univ. Lyon	2020/21
1 st year M. Sc. Neuroscience	Practical work	Integrative physiology & neurobiology	3h	8 students	Univ. Lyon	2017/18
3 rd year B. Sc. Biodiversity Science	Lecture	Ecophysiology	14h	196 students	Univ. Lyon	2020/21
3 rd year B. Sc. Biodiversity Science	Tutorial work	Ecophysiology	7h	175 students	Univ. Lyon	2020/21
3 rd year B. Sc. Biodiversity Science	Practical work	Ecophysiology	21h	161 students	Univ. Lyon	2020/21
3 rd year B. Sc. Physiology	Practical work	Physiological Regulations	100h	352 students	Univ. Lyon	2017/20
1 st year B. Sc. Biodiversity Science	Practical work	Diversity of living systems	114h	182 students	Univ. Lyon	2017/21
1 st year B. Sc. Science	Tutorial work	Professional & Personal Project	33h	195 students	Univ. Lyon	2017/20

Supervision and evaluation of examinations

- Correction of students' internship reports and supervision and evaluation of internship oral presentations (11 students)
- Correction of students' scientific reports (20 students)
- Organization of second session exam for students in 3rd year of B. Sc. Biodiversity Science or Physiology (10 students). Redaction of exam subject, exam supervision and correction of exam papers.
- Correction of exam papers (182 students)
- Correction of students' professional project reports and supervision and evaluation of oral presentations (102 students)

Distance learning (pandemic period)

- Innovation and implementation of distance learning *via* online software.
- Creation and organization of online interactive courses: live questions-answers sessions, live discussion sessions, live sessions of multiple-choice questions and results, and interactive surveys.

Internship Supervision

2023

A. Quennevat, student of 2nd year of M. Sc. Genetics, Ecology and Evolution – 5 months

2022

J. Lherbeil, student of 2nd year of M. Sc. Integrated Physiology in Extreme Conditions – 5 months

2021

J. Lherbeil, student of 1st year of M. Sc. Integrative Biology and Physiology – 6 weeks

2019

L. Quentin, student of 3rd year of B. Sc. Biodiversity Science – 6 weeks

C. Prothet-Demoux, student of 3rd year of B. Sc. Biodiversity Science – 6 weeks

Main Collaborations

Univ. Aarhus, Denmark

Dept. Ecoscience

Dr. S. Slotsbo

Current mentorship

Pr. Dr. M. Holmstrup

Current mentorship

Univ. Aarhus, Denmark

Pr. Dr. J. G. Sørensen

Research collaborator

Dr. J. Thyrring

Research collaborator

Dr. J. S. Bechsgaard

Research collaborator

Univ. Aalborg, Denmark

Pr. Dr. A. Olsen

Research collaborator

Univ. Lyon, France

UMR 5023

Pr. Dr. N. Mondy

Thesis directrice

Pr. Dr. C. Duchamp

Thesis director

Dr. T. Lengagne

Research collaborator

Dr. J. Secondi

Research collaborator

Dr. T. Lefebure

Research collaborator

Univ. Lyon, France

UMR 5558

Pole Rhône Alpes de

BioInformatique (PRABI)

Research collaborator

Publications

Peer reviewed publications

Published

6. M. Holmstrup., M. Touzot., S. Slotsbo. (2023). **Characterization of the Thermal Death Time landscape for *Enchytraeus albidus*.** *Pedobiologia*. doi.org/10.1016/j.pedobi.2023.150876
IF: 2.128
5. M. Touzot., A. Dumet., J. Secondi., T. Lengagne., H. Henri., E. Desouhant., C. Duchamp., N. Mondy. (2023). **Artificial light at night triggers slight transcriptomic effects on melatonin signalling but not synthesis in tadpoles of two anuran species.** *CBP Part A*, doi.org/10.1016/j.cbpa.2023.111386
IF: 2.888 ; citations: 4
4. M. Touzot., T. Lefébure., T. Lengagne., J. Secondi., A Dumet., L. Konecny-Dupré., P. Veber., V. Navratil., C. Duchamp., N. Mondy. (2022). **Transcriptome-wide deregulation of gene expression by artificial light at night in tadpoles of common toads.** *STOTEN*, doi.org/10.1016/j.scitotenv.2021.151734
IF: 7.963 ; citations: 11
3. J. Secondi., N. Mondy., JMW. Gippet., M. Touzot., V. Gardette., L. Guillard., T. Lengagne. (2021). **Artificial light at night alters activity, body mass and corticosterone level in a tropical anuran.** *Behav Ecol, arab044*; doi 10.1093/beheco/arab044
IF: 2.761 ; citations: 15
2. M. Touzot., T. Lengagne., J. Secondi., E. Desouhant., M. Théry., A. Dumet., C. Duchamp., N. Mondy. (2020). **Artificial light at night alters the sexual behaviour and fertilisation success of the common toad.** *Environ Pollut*, 259, doi 10.1016/j.envpol.2019.113883
IF: 6.793 ; citations: 50
1. M. Touzot., L. Teulier., T. Lengagne., J. Secondi., M. Théry., PA. Libourel., L. Guillard., N. Mondy. (2019). **Artificial light at night disturbs the activity and energy allocation of the common toad during the breeding period.** *Conserv Physiol* 7(1): coz002; doi 10.1093/conphys/coz002
IF: 2.57 ; citations: 50

In preparation

4. M. Touzot., M. Holmstrup., J. G. Sørensen., S. Slotsbo. **Plasticity of thermal tolerance following cold acclimation in a freeze tolerant soil invertebrate distributed along a thermal gradient.** *In prep*
3. M. Touzot., M. Holmstrup., J. G. Sørensen., S. Slotsbo. **Plasticity of thermal tolerance in a freeze-tolerant soil invertebrate following cold or heat acclimation.** *In prep for functional ecology.*
2. M. Touzot., A. Dumet., J. Secondi., T. Lengagne., C. Duchamp., N. Mondy. **Effets of artificial light at night on the circadian rhythm of corticosterone level in the adult common toad.** *In prep.*
1. M. Touzot., D. Roussel., A. Dumet., J. Secondi., T. Lengagne., C. Duchamp., N. Mondy. **Artificial light at night affects metabolism and oxidative balance of tadpoles of common toads.** *In prep.*

Scientific communications

19. **9th International Symposium on the Environmental Physiology of Ectotherms and Plants, ISEPEP9, July 2022, Rennes, France (Oral presentation)**
M. Touzot., et al. Plasticity of thermal tolerance following cold and warm acclimation within a freeze-tolerant soil invertebrate distributed from the Arctic to temperate regions.
18. **Seminary at the Institut for Ecoscience, Aarhus University, May 2022, Silkeborg, Denmark (Oral presentation)**
M. Touzot. Physiological, behavioural and molecular consequences of artificial light at night in amphibians.
17. **Ecology Across Borders, the British Ecological Society and the French Society for Ecology and Evolution, December 2021 (Online Poster presentation)**
M. Touzot., et al. Behavioural, physiological, and molecular consequences in common toads, *Bufo bufo*, in response to artificial light at night.
16. **Technical meeting « Trame noire & Biodiversité », Ile-de-France Regional Biodiversity Agency, November 2021, Paris, France (Invited conference - Oral presentation)**
M. Touzot. La lumière artificielle nocturne affecte-elle la physiologie et le comportement du crapaud commun ?
15. **5^{ème} Colloque d'EcoPhysiologie Animale, November 2021, Montpellier, France (Oral presentation)**
M. Touzot., et al. Large-scale deregulation of gene expression in common toad tadpoles in response to artificial light at night.
14. **Seminary at the Centre d'Etudes Biologiques de Chizé (CEBC), July 2021, Chizé, France (Invited conference - Oral presentation)**
M. Touzot. Conséquences biologiques de la lumière artificielle nocturne chez les amphibiens.
13. **The Society for Integrative & Comparative Biology, Virtual Annual meeting, January 2021 (Oral presentation)**
M. Touzot., et al. Large scale deregulation of gene expression by artificial light at night in the common toads.
12. **Journée de l'IXXI: From Finance to Environment and Ecology, November 2020 (Invited conference - Oral online presentation)**
M. Touzot., et al. Pollution lumineuse des écosystèmes : Conséquences biologiques.
11. **Journée de l'IXXI: From Finance to Environment and Ecology, November 2020 (Invited conference - Oral online presentation)**
T. Lengagne., J. Secondi., M. Touzot., T. Joliveau., A. Davranche., M. Théry., N. Mondy. Pollution lumineuse des écosystèmes : Présentation.
10. **Journée de l'IXXI: From Finance to Environment and Ecology, November 2020 (Invited conference - Oral online presentation)**
A. Davranche., T. Lengagne., J. Secondi., M. Touzot., T. Joliveau., M. Théry., N. Mondy. Perception de la pollution lumineuse depuis les zones humides de la Dombes. Approche par modélisation multi-agent.
9. **6th International Conference of Artificial Light at Night, Online E-ALAN 2020, June 2020 (Online slides)**
J. Secondi., N. Mondy., A. Davranche., M. Théry., JMW. Gippet., M. Touzot., T. Lengagne. The latitudinal photoperiod gradient and artificial light at night, a missing link.
8. **6th International Conference of Artificial Light at Night, Online E-ALAN 2020, June 2020 (Online poster presentation)**
M. Touzot., et al. Transcriptomic response of common toad, *Bufo bufo*, tadpoles to artificial light at night.

7. **4^{ème} Colloque d'EcoPhysiologie Animale, October 2019, Rennes, France (Oral presentation)**
M. Touzot., et al. Expression différentielle de gènes chez les têtards de crapaud commun, *Bufo bufo*, exposés à la lumière artificielle nocturne.
6. **47^{ème} Congrès de la Société Herpétologique de France, October 2019, Saint-Girons, France (Oral presentation)**
T. Lengagne., M. Touzot., J. Secondi., N. Mondy. Impact de la pollution lumineuse sur le crapaud commun.
5. **Journée annuelle de l'école doctorale EDISS, October 2019, Villeurbanne, France (Oral presentation)**
M. Touzot., et al. Expression différentielle des gènes chez les têtards de crapaud commun, *Bufo bufo*, exposés à la lumière artificielle nocturne.
4. **Société Française d'Ecologie et d'Evolution, International Conference on Ecological Sciences, Octobre 2018, Rennes, France (Oral presentation)**
M. Touzot., et al. Artificial light at night disturbs the reproduction of common toad.
3. **Workshop Lumière(s) sur la nuit, January 2018, Lyon 3, France (Oral presentation)**
T. Lengagne., J. Secondi., M. Théry., M. Touzot., N. Mondy. La nuit animale : une nouvelle nuit avec l'anthropocène.
2. **Workshop big data, November - December 2017, Toulon, France (Oral presentation)**
T. Lengagne., N. Mondy., J. Secondi., M. Théry., M. Touzot. Pollution lumineuse.
1. **3^{ème} Colloque d'EcoPhysiologie Animale, November 2017, Strasbourg, France (Oral presentation) [Best talk award]**
M. Touzot., et al. Artificial light at night disturbs the energy balance and activity of common toad during breeding period.

Science Popularisation

○ Highlights in scientific journal

Haynes. (2019). Dark matters: night light stops toads in their tracks. *Conservation Physiology in Action* 7(1): coz085; doi 10.1093/conphys/coz085 based on M. Touzot., et al. (2019). **Artificial light at night disturbs the activity and energy allocation of the common toad during the breeding period.** *Conserv Physiol* 7(1): coz002

○ Popularisation in national television programme

- « Soupes, boissons chaudes, raclette : la science étonnante des aliments stars de l'hiver! », E=M6, M6, broadcast on 24th February 2019.
- [« Quand nos animaux disparaissent... », Envoyé spécial, France 2, broadcast on 3rd May 2017.](#)

○ Scientific interview popularised in a national newspaper

[« Les bienfaits de la nuit noire, un bien commun occulté », published in the national French newspaper « La Croix », France, on the 17th November 2022.](#)

○ Scientific project popularised in a local newspaper internationally

[« Eit av dei beste paddevatna I Europa », published in the local Norwegian newspaper « Hordaland Folkeblad », Norway, on the 7th May 2019.](#)

○ Scientific animation for general public and young people

« La nuit est belle » edition 2021. Organization, preparation, and animation of workshops for the young public in four primary classes (Ecole Les Deux Chênes) of Chaponost, France, in May 2021.

○ Redaction of article of scientific popularization

[« La thèse, un bouquet de compétences », Sciences pour tous, February 2022.](#)