Morgane TOUZOT

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PhD in Ecophysiology

Laboratoire d'Ecologie des Hydrosystèmes Naturels et Anthropisés
UMR 5023 LEHNA, CNRS, ENTPE
Université Claude Bernard Lyon 1
Bât Darwin C, 43 Bd du 11 Novembre 1918
69622 Villeurbanne – France

Academic education

2017 – 2020 PhD thesis in Ecophysiology, *University of Lyon, France*

2015 – 2017 Master of Science degree in Integrated Physiology in Extreme Conditions, *University of Lyon, France*

2014 – 2015 Bachelor of Science degree in Physiology, *University of Lyon, France*

2012 – 2014 Veterinary Higher School Preparatory Classes, *High School Assomption Bellevue, Lyon, France*

Professional experiences

Since Oct. 2020 Temporary Lecturer, *University of Lyon*
Laboratoire d'Ecologie des Hydrosystèmes Naturels et Anthropisés (UMR 5023)
Supervision : N. Mondy

Oct. 2017 – Oct. 2020 PhD Thesis in Ecophysiology with a Complementary Teaching Activity, *University of Lyon*
Laboratoire d'Ecologie des Hydrosystèmes Naturels et Anthropisés (UMR 5023)
« Integrative study of the consequence of artificial light at night in the common toad, *Bufo bufo*: Molecular, physiological and behavioral effects »
Supervision : C. Duchamp et N. Mondy

Jan. 2017 – Jun. 2017 Master 2 Internship, *University of Lyon*
Laboratoire d'Ecologie des Hydrosystèmes Naturels et Anthropisés (UMR 5023)
Supervision : N. Mondy

Jan. 2016 – Feb. 2016 Master 1 Internship, *Catholic University of Lyon*
Laboratoire de Biologie générale – Reproduction et Développement comparé (UMRS 449)
Supervision : E. Moudilou

Skills training

2021 « How to make distance students active » (1.5 hours), *University of Lyon*

2020 SBEA National Network Webinar (3 hours), *Alpha Visa Congrès*

2020 « Pain, stress, suffering and limit points in animals » (6 hours), continuing education for project designers - Level B1, *University of Lyon*

2020 « Regulations and ethics applied to the use of animals for scientific purposes » (7 hours), continuing education for project designers - Level B1, *University of Lyon*

2019 « Being read: how to ensure the circulation of your publication on the web? » (3 hours), *University of Lyon*

2019 « Voice work and body expression » (2 hours), *University of Lyon*

2018 Research Ethics formation (25 hours), *University of Lyon*

2018 Animal Experimentation Degree level B1 – Diploma: Designer of scientific projects using animal (56 hours), *University of Lyon*

2017 « RNA seq *de novo* » formation (24 hours), *University of Lyon*

Scientific work and educational activities

Theme

My research work, **at the interface between conservation biology and ecophysiology**, aims to study the **molecular, physiological and behavioral mechanisms** enabling organisms **to cope with environmental constraints.** I am particularly interested in the influence of **artificial light at night** on the **ecophysiological mechanisms** regulating the **life history traits of anuran amphibians**.

Keywords: Breeding behavior and success – Physical activity – Energy balance – Endocrinology – Gene expression

Theorical and Technical skills:

- **Laboratory and Field Experiments:** Capture, housing and breeding of anuran amphibians of different species, salivary and blood sampling on amphibians
- **Hormonal assays by EIA et ELISA** (corticosterone, testosterone, melatonin), and **mitochondrial and oxidative stress assays** by **enzymology**
- **Energy Balance:** Measurement of oxygen consumption by respirometry and actimetry on vertebrates
- **Molecular Biology:** Protein assay, Protein and RNA extraction, qPCR, Transcriptomic libraries preparation
- **Bioinformatics:** Transcriptomic analysis of differential gene expression and gene ontology

Data processing / Specialized software:

Biostatistics: R
Informatics: MS Office, Inkscape, Image J
Energy Balance: Oxygen Logger (Pyroscience), Camera trap
Genetic: NCBI, Seaview, GeNorm, Normfinder
Visio conference: Cisco Webex, Zoom, Skype

Languages:

French: Native language
English: Fluent practice
German: Conversational
Spanish: Notions

TOEIC : 910/990

Scientific projects

Artificial light at night (ALAN), recognized as environmental pollution, affects the photoperiod, a major external synchronizer of many biological processes. Using an integrative approach, my research work allows to experimentally evaluate the molecular, physiological and behavioral influence of ALAN in anuran amphibians, particularly in the common toad, *Bufo bufo*.

- **Behavioral and physiological consequences of ALAN in adult amphibians** (results valued by 2 original articles + 1 article in minor revisions)

The aim of this first study was to evaluate experimentally during the breeding period the influence of ALAN on physical activity using video recordings by infrared camera and on energy balance using respirometry measurements in male common toads (Touzot *et al.,* 2019).

Given that the importance of photoperiod in the regulation of biological rhythms is contested along the latitudinal gradient, it is suggested that the biological influence of ALAN is different along this gradient. Thus, in order to search for a common pattern of biological consequences of ALAN, I evaluated the influence of ALAN on physical activity and energy balance outcome in a tropical species, the Cane toad, *Rhinella marina* (Secondi *et al.,* under minor revisions in *Behav Ecol*). At the same time, a measurement of corticosterone level, the stress hormone in amphibians, was carried out by salivary sampling.

Since changes in physical activity and energy balance during reproduction are likely to affect the reproductive behavior and success of amphibians, I studied the influence of ALAN on the reproduction of the male common toad (Touzot *et al.,* 2020). The effects of ALAN were studied on the reproductive behaviors (initiation, stability and duration of mating), on the fertilization rate, as well as on the level of salivary testosteronemia in males.

- Influence of ALAN on physiology and gene expression in tadpoles (results valued by 1 article in preparation)

At the tadpole stage, I am looking for the influence of ALAN on molecular mechanisms using two complementary approaches. On the one hand, using RNAseq, I am evaluating the transcriptomic response of common toad tadpoles exposed or not to ALAN and sampled at nighttime or daytime (Touzot *et al.,* in preparation). On the other hand, given the importance of melatonin and clock genes in the integration of the photoperiod by the organism, I am conducting a target gene approach by qPCR on genes coding for enzymes involved in melatonin synthesis or coding for melatonin receptors, as well as on clock genes. In order to seek a generalization of molecular consequences of ALAN, at least in anurans, this study is conducted on tadpoles of the common toad and the agile frog, *Rana dalmatina*.

Furthermore, taking into account the results obtained in adults, I am experimentally investigating the influence of ALAN on the energy metabolism in tadpoles of the common toad. More particularly, I am interested in the enzymes involved in the regulation of oxidative stress and metabolism. To do so, I am using an integrative approach at the organismal level by evaluating the expression of genes coding for these enzymes by qPCR and the activity of these enzymes using physiological assays.

Teaching activities

Total of 288.25 h (equivalent of practical work) as PhD student and temporary lecturer.

Biodiversity Science:

- Lecture course in Ecophysiology, for students in third year of Biodiversity Science or Physiology Bachelor (14.25h, 196 students)

Lecture course on urbanization and anthropization, using « artificial light at night » as a case study. This course consists of the presentation of the phenomenon of artificial light at night, the known biological consequences and the different options for night lighting management.

- Tutorial work in Ecophysiology, for students in third year of Biodiversity Science or Physiology Bachelor (7h, 175 students)

Tutorial work on cold tolerance in animals, comparing endothermia vs. ectothermia, with a focus on cold tolerance strategies in ectotherms.

- Practical work in Ecophysiology, for students in third year of Biodiversity Science or Physiology Bachelor (21h, 161 students)

Practical work on cold tolerance by comparing an acute stress vs. chronic stress in two ectotherms: Drosophila vs. American seed beetle, using survival measures, oxygen consumption and enzyme assays.

- Practical work in Diversity of Living Systems for students in first year of Biodiversity Science Bachelor (114h, 182 students)

Practical work of dissection and observation of microscopic slides on the diversity of functioning of the nervous, circulatory, respiratory, digestive, reproductive and excretory systems in different groups of animals: annelids, mollusks, pancrustaceans and chordates.

Physiology:

- **Practical work in Physiological Regulations for students in third year of Physiology Bachelor** (96h, 352 students)

Practical dissection work to study the influence of thyroid status (euthyroid, hyperthyroid et hypothyroid) on body mass, haematocrit and mitochondrial enzyme activity in rats.

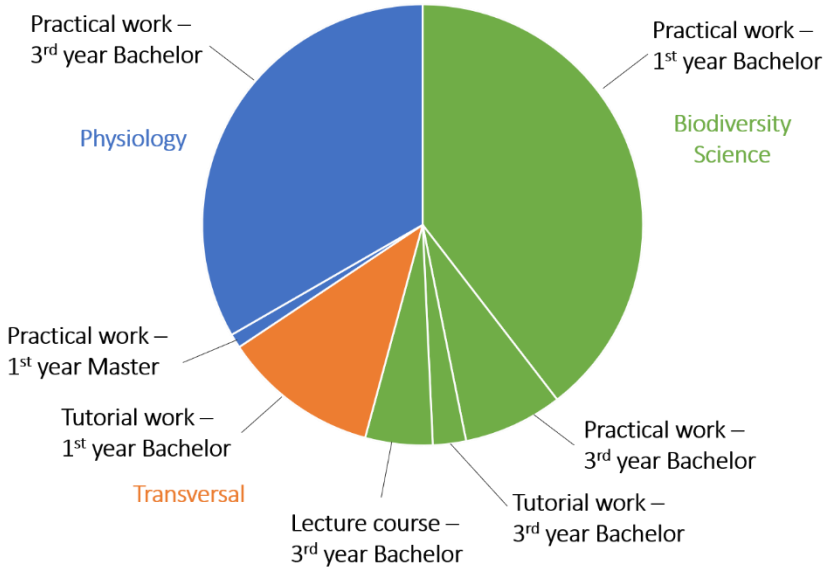
- **Practical work in Integrative Physiology and Neurobiology for students in first year of Physiology Master** (3h, 8 students)

Practical work on the influence of thyroid status (euthyroid, hyperthyroid et hypothyroid) on energy balance (food and drink intake, energy expenditure and body mass) in rats.

Transversal:

- **Tutorial work on Professional and Personal Project for students in first year of Scientific Bachelor** (33h, 195 students)

Diagram showing the hourly distribution of teaching carried out according to field, type and level of education



Since March 2020, I have been involved in the innovation and the implementation of distance learning *via* the use of Cisco Webex software. I adapt the courses to distance learning, in particular through the implementation of interactive courses (questions-answers in a chat, multiple choice questions and interactive surveys), as well as through the organization of questions-answers and discussion with the students.

Students' Supervision

2021
6 weeks

1 student of first year of Integrative Biology and Physiology Master

- J. Lherbeil on the subject « Influence of artificial light at night on the expression of clock genes in tadpoles of *Bufo bufo* and *Rana dalmatina* »

2019
6 weeks

2 students of third year of Biodiversity Science Bachelor

- L. Quentin on the subject « The effects of artificial light at night on the oxidative balance and the mitochondrial functioning in the common toad, *Bufo bufo* »
- C. Prothet-Demoux on the subject « Impact of nocturnal light pollution on the larval development of the common toad »

Administrative and collective experiences

2021 — **Member of the LEHNA Unit Council** as representative of **post-doctoral students**

2018 – 2020 — **Member** of the organization of **weekly Scientific Events** at the LEHNA

2018 – 2020 — **Member** of the organization of **yearly Doctoral Students' Day** at the LEHNA

2020 — **Peer-review** of an article in *Environmental Pollution*

Participation in two research contracts, in particular for the **Ecophysiology part:**

2018 – 2021

- **IDEX breakthrough Lyon 1**: Nocturnal light pollution: measurements and extent of the phenomenon, consequences on animals and human health and reflection on current regulations. Leader: T. Lengagne, 200 000€

2017

- **PEPS « Pollux Tropic »**: Impact of light pollution in biodiversity hotspots: are equatorial species particularly threatened? Leader: T. Lengagne, 14 670€

Grants and Awards

2020 — **Mobility Grant,** FR Bio-Environnement et Santé of University of Lyon for the project « Use of new imaging techniques to assess wildlife reproductive capacity» at the Centre d'Etudes Biologiques de Chizé, CEBC CNRS UMR 7372: 300 €

2017 — **Best Oral Communication Award,** 3ème Colloque d'EcoPhysiologie Animale, *Strasbourg, France*: 200 €

2017 – 2020 — **PhD Grant,** French Ministry of Higher Education and Research

National and International Scientific Collaborations

2020 — **Mario Lo Valvo** for the study of the **« Effects of artificial light at night across the latitudinal gradient »**. Professeur assistant*, University of Palermo, Italy*

2019 — **Steffen Roth** for the study of the **« Effects of artificial light at night across the latitudinal gradient »**. Ingineer*, University Museum of Bergen, Norway*

2019 — **Pole Rhône Alpes de BioInformatique (PRABI)** for the study of the **« Molecular consequences of artificial light at night in the tadpole *Bufo bufo* »**. *University of Lyon, France*

2019 — **Tristan Lefébure** for the study of the **« Molecular consequences of artificial light at night in the tadpole *Bufo bufo* ».** Lecturer*, Laboratoire d'Ecologie des Hydrosystèmes Naturels et Anthropisés, University of Lyon, France*

Scientific Publications

Scientific Articles

First Author

- In preparation -

1. **M. Touzot.,** T. Lefébure., T. Lengagne., J. Secondi., A. Dumet., L. Konecny-Dupre., P. Veber., V. Natravil., C. Duchamp., N. Mondy. **Large scale deregulation of gene expression by artificial light at night in tadpoles of common toads.**

- Published -

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 (Q1) ; citations : 6

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 (Q1) ; citations : 12

Co-Author

- Under minor revisions -

1. J. Secondi., N. Mondy., JMW. Gippet., **M. Touzot.,** V. Gardette., L. Guillard., T. Lengagne. **Artificial light at night alters activity, body mass and corticosterone level in a tropical anuran.** *Under minor revisions in Behav Ecol.*

Scientific communications

Oral communications

- National -

9. M. Touzot., T. Lengagne., J. Secondi., N. Mondy. 2020. **Pollution lumineuse des écosystèmes : Présentation, Modélisation et Conséquences biologiques.** Journée de l'IXXI: From Finance to Environment and Ecology, 18th November, visio conference. **Invited conference.**

8. A. Davranche., T. Lengagne., J. Secondi., **M. Touzot.,** T. Joliveau., M. Théry., N. Mondy. 2020. **Perception de la pollution lumineuse depuis les zones humides de la Dombes. Approche par modélisation multi-agent.** Journée de l'IXXI: From Finance to Environment and Ecology, 18th November, visio conference. **Invited conference.**

7. T. Lengagne., J. Secondi., **M. Touzot.,** T. Joliveau., A. Davranche., M. Théry., N. Mondy. 2020. **Pollution lumineuse des écosystèmes : Présentation, Modélisation et Conséquences biologiques.** Journée de l'IXXI: From Finance to Environment and Ecology, 18th November, visio conference. **Invited conference.**

6. M. Touzot., T. Lefébure., M. Sémon., T. Lengagne., J. Secondi., A Dumet., L. Konecny-Dupré., C. Duchamp., N. Mondy. 2019. **Expression différentielle de gènes chez les têtards de crapaud commun, *Bufo bufo*, exposés à la lumière artificielle nocturne.** 4ème Colloque d'EcoPhysiologie Animale, 28th-30th October, *Rennes, France*.

5. T. Lengagne., **M. Touzot.,** J. Secondi., N. Mondy. 2019. **Impact de la pollution lumineuse sur le crapaud commun (*Bufo bufo*).** 47ème Congrès de la Société Herpétologique de France, 12th October, *Saint-Girons, France*.

4. M. Touzot., T. Lefébure., M. Sémon., T. Lengagne., J. Secondi., A Dumet., L. Konecny-Dupré., C. Duchamp., N. Mondy. 2019. **Expression différentielle des gènes chez les têtards de crapaud commun, *Bufo bufo*, exposés à la lumière artificielle nocturne.** Journée annuelle de l'école doctorale EDISS, 9th October, *Villeurbanne, France*.

3. T. Lengagne., J. Secondi., M. Théry., **M. Touzot.,** N. Mondy. 2018. **La nuit animale : une nouvelle nuit avec l'anthropocène.** Workshop Lumière(s) sur la nuit, 12th January, *University of physiology Lyon 3, France*.

2. T. Lengagne., N. Mondy., J. Secondi., M. Théry., **M. Touzot.** 2017. **Pollution lumineuse**. Workshop big data, 30th November-1st December, *Toulon, France.*

1. M. Touzot., L. Teulier., T. Lengagne., J. Secondi., M. Théry., PA Libourel., L. Guillard., A. Dumet., N. Mondy. 2017. **Artificial light at night disturbs the energy balance and activity of common toad during breeding period.** 3ème Colloque d'EcoPhysiologie Animale, 6-8th Novembre, *Strasbourg, France*. **Best oral communication award**

- International -

3. M. Touzot., T. Lefébure., T. Lengagne., J. Secondi., C. Duchamp., N. Mondy. 2021. **Large scale deregulation of gene expression by artificial light at night in the common toads**. The Society for Integrative & Comparative Biology, Virtual Annual meeting, 3-7th January.

2. J. Secondi., N. Mondy., A. Davranche., M. Théry., JMW. Gippet., **M. Touzot.,** T. Lengagne. 2020. **The latitudinal photoperiod gradient and artificial light at night, a missing link.** 6th International Conference of Artificial Light at Night, Online E-ALAN 2020, 16th June.

1. M. Touzot., T. Lengagne., J. Secondi., M. Théry., A Dumet., L. Guillard., E. Desouhant., C. Duchamp., N. Mondy. 2018. **Artificial light at night disturbs the reproduction of common toad.** Société Française d'Ecologie et d'Evolution, International Conference on Ecological Sciences, 22-25th October, *Rennes, France.*

Poster communications

- International -

1. M. Touzot., T. Lefébure., T. Lengagne., J. Secondi., A Dumet., M. Sémon., L. Konecny-Dupré., C. Duchamp., N. Mondy. 2020. **Transcriptomic response of common toad, *Bufo bufo*, tadpoles to artificial light at night.** 6th International Conference of Artificial Light at Night, Online E-ALAN 2020, 16th June.

Science Popularisation

Highlights in scientific journals

1. A. 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.,** 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.

Popularisation in national television programmes

2. « Soupes, boissons chaudes, raclette : la science étonnante des aliments stars de l'hiver! », E=M6, M6, broadcast on 24th February 2019.

1. « Quand nos animaux disparaissent… », Envoyé spécial, France 2, broadcast on 3rd May 2017.

Scientific project popularised in a local newspaper internationally

1. « Eit av dei beste paddevatna I Europa », published in the local Norwegian newspaper « Hordaland Folkeblad », *Norway*, on the 7th May 2019.