Mélanie BOËL
Ecosystèmes, Biodiversité, Evolution – Ecobio UMR 6553 CNRS, UR1

06 98 60 37 58
melanie.boel@live.com
https://melanieboe8.wixsite.com
@boel_melanie

Skills

- Indirect calorimetry (gaz exchanges)
- Bioenergetics (mitochondrial isolation & measurements of oxygen consumption and ATP or ROS productions)
- Behavior
- Enzymatic activity

ACADEMIC FORMATION

01/10/2016 – 04/03/2020: PhD in Ecophysiology
Summa cum Laude (University of Lyon, France)
01/09/2014 – 01/07/2016: MSc in Integrative Physiology under Extreme Conditions
With high honours (University of Lyon, France)
01/09/2013 – 01/07/2014: BSc in Biology
With honours (University of Lyon, France)
01/09/2011 – 01/09/2013: DUT (technological university degree) in Biology
With honours (University of Lyon, France)

SCIENTIFIC EXPERIENCE

Since 01/09/2022: Temporary Lecturer and Research Assistant (Ecobio, France)
Collaborations: D. Renault, C. Wiegand, S. Derocles
Key words: metabolism, behavior, life history traits, insects, enzyme activity, calorimetry

- ***Effects of nanoplastic ingested on behavior and physiology of insects.*** The project aims to study the food choice and the locomotion behavior as well as the metabolism in insects having ingested or not microplastics.

01/09/2021 – 31/08/2022: Teacher in Ecology and Biology (agricultural high school, Cibeins, France) **& Supervisor of 2nd year master student** (LEHNA, France)
Collaborations: F. Veyrunes, C. Duchamp, C. Romestaing, Y. Voituron, L. Herpe, F.X. Dechaume-Moncharmont
Key words: bioenergetics, sexual genotype, mammals

- ***Impact of sexual genotype on physiology and behavior of African mice.*** African pygmy mouse has a sexual determinism that differs from the classical XX / XY sexual determinism system. In this species, a "feminizing" X* chromosome inevitably results in a female when it is present, even in the presence of a Y chromosome: thus we find XY males as well as XX, X*X and X*Y

females (all females are then fertile, including the X*Y females). The objective of the project is to continue the phenotyping in *M. minutoides* by performing behavioral and physiological measurements (enzymatic activity, mitochondrial bioenergetics and indirect calorimetry), to evaluate the impact of the sexual genotype on the measured parameters.

01/09/2020 – 31/08/2021: Temporary Lecturer and Research Assistant (LEHNA, France)
Collaborations: F. Veyrunes, N. Pichaud, C. Duchamp, F.X. Dechaume-Moncharmont, C. Romestaing, A. Stier, M. Alund, A. Qvarnström, D. Roussel, Y. Voituron
Key words: bioenergetics, behavior, enzymatic activity, endotherms, thermoregulation, hybridization

- ***Muscle work as a possible source of heat in African pygmy mice?*** The project aims to investigate whether the African pygmy mouse *M. mattheyi* uses its locomotor activity to maintain its body temperature or another thermoregulation mechanism. For this purpose, the locomotor activity (behavioral analysis) and metabolism of individuals belonging to this species were studied. Also, the expression and activity of some enzymes as well as the mitochondrial activities of their skeletal muscle and brown adipose tissue were measured.
- ***Effect of hybridization between two flycatcher species on the metabolism of individuals.*** Collared and pied flycatchers are capable of hybridizing and producing sterile individuals. Mitochondrial bioenergetics measurements were performed to assess the impact of hybridization on the metabolism of individuals. To do this, I set up a scientific field laboratory, trained a thesis student in the protocols of the high resolution respirometer (OROBOROS) and helped punctually with the identification of these birds in the field (rings and DNA). Field mission: setting up a scientific field laboratory on the island of Öland (Sweden) to study the two bird species (collared and pied flycatcher).
- ***Understanding the differences between birds and mammals through mitochondrial bioenergetics.*** I helped the main actor (J. Barbe) of the project to collect mitochondrial bioenergetics variables in different avian species in order to compare, in fine, mammals to birds.

01/10/2016 – 4/03/2020: PhD in Ecophysiology (LEHNA, Villeurbanne, France)
Supervision: D. Roussel and Y. Voituron
Collaborations: C. Duchamp, C. Romestaing, F. Veyrunes, G. Escarguel, J. Clavel, S. Renaud, J.P. Robin, M. mortz
Key words: bioenergetics, enzymatic activity, endotherms, allometry, domestication, food privation

- ***Mitochondrial bioenergetics as a physiological basis for understanding life history traits in mammals.*** I evaluated the relationship between mitochondrial bioenergetics parameters and body mass in mammals to provide a physiological basis for understanding life history traits of organisms. For this purpose, measurements of oxygen consumption, ATP synthesis and ROS production were performed on isolated skeletal muscle or liver mitochondria from different mammalian species (5 g to 600 kg).
- ***Influence of young diet and refeeding on mitochondrial bioenergetics.*** The objective was to set up a protocol to measure mitochondrial oxidative cost (ROS/ATP), i.e. the amount of ROS generated per molecule of ATP synthesized.
- ***Effects of domestication on mitochondrial function.*** I assisted the main actor (C. Romestaing) of the project by performing measurements of bioenergetics parameters for mitochondria isolated from liver in wild-type and SWISS mice. The goal was to identify changes in mitochondrial function that may be related to domestication.

04/01/2016 – 03/06/2016: Internship (LEHNA, Villeurbanne, France)
Supervision: D. Roussel
Key words: bioenergetics, enzymatic activity, bird, fasting

- ***Influence of dietary juvenile on mitochondrial efficiency and lipid metabolism of Muscovy duck.*** The objective was to evaluate the effect of fasting on skeletal muscle mitochondria of duckling (*Cairina moschata*) in the presence of lipid substrates.

26/01/2015 – 28/02/2015: Internship (MARBEC, Montpellier, France)
Supervision: J.H. Lignot and G. Rivera-Ingraham
Key words: invertebrate, metabolism, oxidative stress

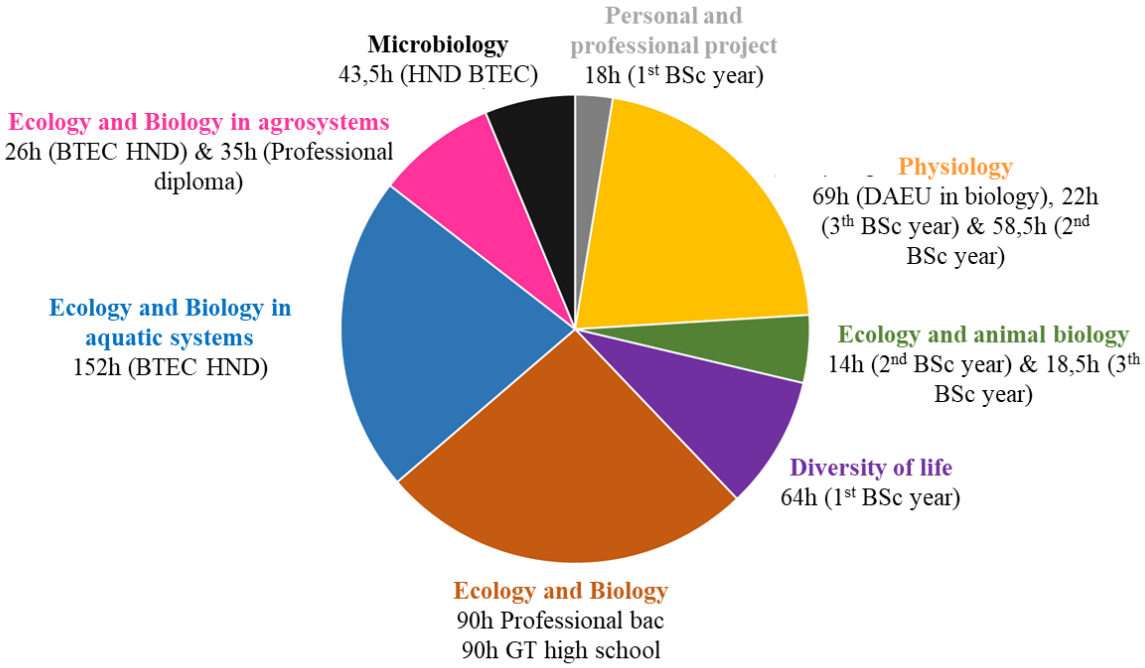
- ***Impact of salinity on the respiratory capacity and oxidative balance of Mediterranean crab gills.*** The objective was to study the oxidative adaptation of Mediterranean green crab (*Carcinus maenas*) gills to salinity variations, by measuring the activity of enzymes involved in the oxidative balance and the metabolic rate of the individual placed at different salinities.

15/04/2013 – 21/06/2013: Internship (ISARA, Lyon, France)
Supervision: Y. Demarigny

- Collection of microbial strains producing exopolysaccharides and diacetyl

TEACHING AND STUDENT SUPERVISION

Teaching activity: 700,5h in total in different disciplines: physiology, ecology and animal biology, transversal.



Student supervision: 8 MSc students and 1 BSc student.
2022: L. Herpe (MSc student) – *Impact of sex in behaviour and physiology of African pygmy mice*
2021: P. Vouhe (MSc student) – *Impact of changing housing conditions on the physiology and behaviour of African pygmy mice.*
2021: O. Desbois (MSc student) & L. Aicardi (BSc student) – *Behavioural differences between two African pygmy mice: M. minutoides and M. mattheyi.*
2021: R. Ricard-Boulieu (MSc student) – *Metabolic differences between two African pygmy mice: M. minutoides and M. mattheyi.*
2021: L. Herpe (MSc student) – *Muscular work as potentially source of heat in African pygmy mice?*
2019: L. Sagrange (MSc student) – *Relationship between metabolism and body mass in birds.*
2018: L. Moutet (MSc student) – *Relationship between metabolism and body mass in mammals.*
2018: T. Verdier (MSc student) – *Age effect on metabolism in chicks of royal penguins.*

PROFESSIONAL FORMATION

2022: Recognizing and welcoming pollinators (Arthropologia, France)
2020: Pain, stress, suffering, limit points (Animal Welfare Consulting, France)
2020: French regulations and ethical principles applicable to the use of animals for scientific purposes (University of Lyon, France)
2020: « Living with other animals » (UVED, France)
2019: « Voice work and body expression » (University of Lyon, France)
2018: Research Ethics Training **(**University of Lyon, France)
2017: English communication (International Language & Training Consultant, France)
2016: Level 1 animal experimentation accreditation (University and ENS of Lyon, France)

OTHER ACADEMIC ACHIEVEMENT AND GRANTS

2017 – 2020: doctoral student representative on the laboratory council (LEHNA, Villeurbanne, France)

2018: Fellowship of the GFB for the 20th European Bioenergetics Conference (600€)
2016 – 2020: Ministerial scolarship (France)

SCIENTIFIC PUBLICATIONS

Since 2016 (google scholar, 03/10/2021): 81 citations and h-index = 5.

Original articles in international scientific journals:

1) **Boël, M**., Veyrunes, F., Roussel, D. and Voituron, Y. (2022) "Does high mitochondrial efficiency carry an oxidative cost? The case of the African pygmy mouse (Mus mattheyi)". *Comparative Biochemistry and Physiology – Part A*.
2) Voituron, Y., **Boël, M.,** Roussel, D. (2020) "Mitochondrial threshold for H2O2 release in skeletal muscle of mammals" *Mitochondrion*, 54, 85-91.
3) **Boël, M.,** Romestaing, C., Duchamp, C., Veyrunes, F., Renaud, S., Roussel, D., Voituron, Y. (2020) "Improved mitochondrial coupling as a response to high mass-specific metabolic rate in extremely small mammals" *Journal of Experimental Biology*, 223: jeb215558.
4) **Boël, M.,** Romestaing, C., Roussel, D., Voituron, Y. (2019) "Allometry of mitochondrial efficiency is set by metabolic intensity" *Proceedings of the Royal Society B: Biological Sciences*, 286, 20191693.
5) Roussel, D., **Boël, M.,** Mortz, M., Romestaing, C., Duchamp, C., Voituron, Y. (2019) "Threshold effect in the H2O2 production of skeletal muscle mitochondria during fasting and refeeding" *Journal of Experimental Biology*, 222, jeb196188.
6) Roussel, D., **Boël, M.,** Romestaing, C. (2018) "Fasting enhances mitochondrial efficiency in ducklings skeletal muscle by acting on the substrate oxidation system" *Journal of Experimental Biology*, 221, jeb172213.
7) Rivera-Ingraham, G. A., Barri, K., **Boël, M.,** Farcy, E., Charles, A-L., Geny, B., Lignot, J-H. (2016) "Osmoregulation and salinity-induced oxidative stress: is oxidative adaptation determined by gill function?" *Journal of Experimental Biology*, 219, 80–89.

Finalized: (1)

1) Mortz M., Romestaing C., **Boël M.,** Roussel D., and Duchamp C. "Potential involvement of mitochondrial NO synthase in skeletal muscle metabolic flexibility during nutritional transitions"

CONFERENCES (* denotes the author of presentation)

Oral presentations: (* author presenting)

1. **Boël, M.***, Roussel, D., Voituron, Y. « A three-quarter reduction of muscular metabolism in mammals: A universal mitochondrial threshold for Reactive Oxygen Species release?". Janvier 2021, SICB, Washington, Etats-Unis.
2. **Boël, M.*,** Romestaing, C., Duchamp, C., Veyrunes, F., Renaud, S., Roussel, D., Voituron, Y. "Compromis bioénergétique chez un "nano" mammifère". Octobre 2019, 4ème CEPA, Rennes, France.
3. **Boël, M.***, Romestaing, C., Roussel, D., Voituron, Y. "Le versant mitochondrial oublié dans la relation métabolisme-masse corporelle : la synthèse d'ATP". Octobre 2018, Rencontre doctorale EDISS, Villeurbanne, France.
4. **Boël, M.***, Romestaing, C., Roussel, D., Voituron, Y. "Revisiting relationship between metabolism and body mass, incorporating ATP synthesis and mitochondrial efficiency". Octobre 2018, SFECOLOGIE, Rennes, France.
5. **Boël, M.***, Romestaing, C., Roussel, D., Voituron, Y. "Mitochondrial approach to study the relationship between metabolism and body mass of individual". Novembre 2017, 3ème CEPA, Strasbourg, France.

Posters: (* author presenting)

1. **Boël M,** Herpe L.*, Duchamp C., Romestaing C., Dechaume-Moncharmont F.-X., Veyrunes F., Pichaud N., Voituron Y. et Roussel D. "Locomotion as a mechanism for heat production in a very small endotherm?". Mars 2022, 15th meeting Ecology and Behavior, Strasbourg, France.
2. **Boël, M.,** Voituron, Y.*, Roussel, D.*, Duchamp, C., Romestaing, C., Dechaume-Moncharmont, F-X., Veyrunes, F., Pichaud, N. Thermoregulation in an extremely small mammal: a complex picture. Octobre 2021, 5ème CEPA, Montpellier, France.
3. Robin, J-P.*, Voisin, M., Leplat, E., Verdier, T., Barbe, J., **Boël, M.**, Roussel, D. " Métabolisme musculaire des ceintures pelviennes et pectorales chez le jeune poussin de manchot royal (Aptenodytes patagonicus)". Octobre 2019, 4ème CEPA, Rennes, France.
4. **Boël, M.,** Romestaing, C., Roussel, D., Voituron, Y*. "Body mass dependence of mitochondrial efficiency is set by metabolic rates". Août 2019, 10th ICCPB Ottawa, Canada.
5. **Boël, M.***, Romestaing, C., Roussel, D., Voituron, Y. "ATP, the forgotten nucleotide in relationship between metabolism and body mass of individuals". Août 2018, 20th EBEC, Budapest, Hongrie.
6. **Boël, M.***, Romestaing, C., Roussel, D., Voituron, Y. "Allométrie et ATP : un versant mitochondrial encore inexploré ». Mai 2018, 10ème Colloque Meetochondrie, Pornichet, France.
7. Rivera-Ingraham, G. A., Barri, K., **Boël, M.**, Farcy, E., Charles, A-L., Geny, B., Lignot, J-H*. "Is an hormetic effect of free radicals mediating salinity acclimation in crabs?". Novembre 2015, 2nd CEPA, La Rochelle, France.
8. Rivera-Ingraham, G. A.*, Barri, K., **Boël, M.,** Farcy, E., Charles, A-L., Geny, B., Lignot, J-H. "How do osmoregulating tissues cope with oxidative stress? A Mediterranean crab as a study". Août 2015, 9th ICCPB, Kraków, Pologne.

POPULARISATION OF SCIENTIFIC KNOWLEDGE

2021: Interview by a journalist of *Science & Vie Junior* for the section on the thermoregulatory mechanisms that could be put in place if humans lived naked and in a cold environment

2020: Popularisation of my article entitled "Improved mitochondrial coupling as a response to high mass-specific metabolic rate in extremely small mammals" by K. Knight in *Inside JEB* of *Journal of Experimental Biology*.