

---

### Personal Information

Last Name:Aalund

Dept.:Integrative Biology

First Name:Murielle

e-mail:aalundmu@msu.edu

---

Supervisor: Janette W. Boughman

Supervisor e-mail:boughman@msu.edu

---

### Conference Details

Communication Type:Talk & symposium organization

Date:8/19/2019

Total Expense (USD):\$2800

Location:Turku, Finland

---

Conference Title:2019 Congress of the European Society for Evolutionary Biology

**Communication Title:** Anti-predatory behavior, sensory systems and brain transcriptomics in Icelandic threespine stickleback adapting to turbid environments

---

## ABSTRACT

Developing and maintaining efficient sensory systems is energetically demanding, yet essential for animals to sense their environments and perform life-saving tasks such as finding food and avoiding predators. As different senses are controlled by separate regions of the brain, trade-offs are expected between them, for example, investing in extremely accurate vision might come at the cost of having a poor sense of smell. The threespine stickleback (*Gasterosteus aculeatus*) is a small fish that, while ancestrally living in marine habitats, repeatedly invaded freshwater lakes and rivers in the whole Northern hemisphere. This transition displays an impressive capacity to rapidly adapt to new environments, differing in salinity, nutrients and predation.

We studied fish in replicated populations of marine, spring-fed and glacial water bodies in Iceland, sampling from both ancient and very recently created habitats. Glacial lakes are formed by melting ice, leading to very turbid water and poor visibility. As sticklebacks are a highly visual species, we tested how colonizing clear versus turbid waters affected their capacity at detecting experimentally simulated predator attacks, using visual and olfactory cues in light conditions simulating the natural differences in visual environments. We also collected brain regions controlling vision, olfaction and mechano-sensory organs and compared the expression of genes (or transcriptomics) relevant to these sensory systems and predator evasion behavior. We expect fish populations adapting to turbid environments to have more developed sense of smell and lateral lines (mechano-sensory organs) to compensate for the loss of visual performance. We discuss differences in behavior and brain transcriptomics between populations. Iceland's rapidly changing climate and its melting glaciers provides an ideal "real-life" laboratory for studies of ongoing evolution. Ample genomic tools are available for sticklebacks, a model for studies of rapid divergence. Our study is powerful thanks to the combination of field sampling, analyses of morphology, behavior and use of state-of-the-art molecular methods. Understanding how and the rate at which fish can adapt to highly different sensory environments will help us predict how other organisms might cope with future radical habitat changes.

---

Application must not exceed two pages and must be submitted as a pdf file to [grad.awards.pda@msu.edu](mailto:grad.awards.pda@msu.edu)

More details can be found at <https://grad.msu.edu/pda/how-to-apply-travel-award>

Applications that do not respect these criteria will not be considered for the MSU PDA travel award.

## COMMUNICATION OUTCOMES

At the end of my first year of postdoc, and as I move on to my own fellowship and a new project, I am finishing the analyses of this project on the evolution of Icelandic stickleback sensory systems and writing up the first manuscript of my postdoc. This is a rare dataset, comparing carefully designed behavioral experiments on wild-caught fish from 15 different populations and transcriptomic analyses realized in collaboration with an expert in fish cognition, Dr. Hans Hofmann at University of Texas at Austin. The opportunity to present my results comes at a timely point in this project. Feedback received at this presentation will greatly help me in the final writing phase of this manuscript. Furthermore, this talk will be part of a symposium entitled “Cognitive Evolution and Environment”, organized by Dr. Manuel Nagel and Antonin Crumière. They are experts on the evolution of brain gene expression and on environmental effects on organisms diversification, respectively, which are two complementary strong sides of my project. I expect fruitful discussions at this symposium altogether, which will unite researchers from very relevant fields, as exemplified by the plenary given by Dr. Gabrielle Davidson on the evolution of cognitive abilities in wild birds.

After three years as a postdoc at Michigan State University, I intend to return to Europe where I hope to start my own research group. Attending the biggest European meeting for evolutionary biologists is essential for me to continue to build networks with potential future employers and colleagues, and broadcast the skills already acquired during my postdoc at MSU. I am convinced that this collaborative, multi-disciplinary project will interest many highly recognized scientists and am looking forward to hearing their feedback on my work. Additionally, I have been invited to co-organize a sub-symposium on sexual selection and environmental change during this conference. For the first time in my career, I have the privilege to select abstracts for this symposium and chair a session of one of the biggest international conferences in my field. I expect that this will greatly enhance my opportunities for networking and to gain some recognition in my field. The symposium’s subject is close to my new project, about to start on my own fellowship, awarded by the Swiss National Science Foundation.

This award from the postdoctoral association would be highly valuable in completing a modest budget my own fellowship comprises for conferences, and help covering international flights and housing in Finland. I believe that this investment will be highly rewarding, allowing me to receive feedback at a timely point in my project and combine oral presentation and symposium co-organization at one of the biggest international conferences in my field, enhancing my visibility with members of universities where I will soon start applying for faculty positions.