ECR Spotlight

ECR Spotlight – Jessica Reemeyer

ECR Spotlight is a series of interviews with early-career authors from a selection of papers published in Journal of Experimental Biology and aims to promote not only the diversity of early-career researchers (ECRs) working in experimental biology but also the huge variety of animals and physiological systems that are essential for the ‘comparative’ approach. Jessica Reemeyer is an author on ‘Estimating maximum oxygen uptake of fishes during swimming and following exhaustive chase – different results, biological bases and applications’, published in JEB. Jessica is a PhD candidate in the lab of Lauren Chapman at McGill University, Canada, investigating the effects of environmental stressors on fishes and utilizing eco-physiology to inform their conservation.

How did you become interested in biology?
Growing up on the west coast of North America, I spent a lot of time around the ocean. My family did a lot of camping and sailing in my early childhood, which helped foster my love of the outdoors. I have distinct fond memories of playing in tidepools and looking for fish in streams behind our house. As I got older, I loved learning about animals in a school setting and biology naturally became my favourite subject, which led me to my current path pursuing a graduate degree in biology.

Describe your scientific journey and your current research focus
I started my undergraduate degree at McGill University unsure of what I wanted to study, but knew I was broadly interested in the life sciences. I was fortunate to be hired as a work-study fish care helper in the laboratories of Dr Lauren Chapman and Dr Rüdiger Krahe early in my degree, which then led to independent studies in Lauren’s lab. The sense of community fostered by both Lauren and Rüdiger in their labs was very nurturing and really helped develop my interest in fish research. To further explore my interests, I moved to New Orleans to pursue a master’s with Dr Bernard Rees at the University of New Orleans, USA. For my master’s thesis, I explored interindividual variation in aerobic metabolic traits in response to environmental change in an estuarine fish. I then came back to McGill to pursue my PhD with Lauren, where I am currently at the tail end of my degree. My PhD research integrates much of the knowledge of my previous degrees, but with a specific focus on the conservation of Canadian fish species at risk. My dissertation explores the effects of multiple environmental stressors on various species at risk native to the Great Lakes region. My main research interests really lie at the intersection of physiology and conservation and I hope to continue this flavour of research after my PhD.

How would you explain the main message of your paper to a member of the public?
Most animals require oxygen to fuel their metabolism, and so their maximum ability to uptake oxygen from the environment sets the upper limit of energy production to do activities like forage for food, escape from predators, migrate, reproduce and grow. In humans, this maximum is referred to as ‘V̇O₂,max’ and higher values are associated with elevated athletic performance, as well as reduced risks of all-cause mortality. In fish, the analogous term is ‘ṀO₂,max’ and there are two popular methods for estimating it: the first relies on measuring oxygen uptake while a fish is swimming at increasing speeds (similar to humans running on a treadmill), while the second involves rapidly chasing a fish and then measuring their oxygen uptake while they are recovering from the chase. In this paper, we compiled data from several fish species and evaluated results when each individual’s ṀO₂,max was determined by both methods. We found that the average oxygen uptake rates for a group of fish differed between techniques. In addition, an individual’s oxygen uptake during swimming did not correlate with its oxygen uptake during recovery from chasing. We suggest that these methods are not interchangeable estimators of maximum oxygen uptake. Rather, they measure different physiological processes, and each method is suited to address different questions in fish biology. By appreciating these differences, we hope to enrich our understanding of the underlying determinants and ultimate consequences of variation in maximum oxygen uptake in fishes.

What do you enjoy most about research, and why?
As an outdoorsy biologist, field work is definitely my favourite part of doing research. There’s incredible value in getting to know the ecosystem in which your study species resides. More broadly

Jessica Reemeyer’s contact details: McGill University, Montreal, QC, Canada, H3A 1B1. E-mail: Jessica.reemeyer@mail.mcgill.ca
though, I really enjoy the problem-solving aspect of doing research. As researchers, we’re pushing the boundaries of what’s known and there’s often a million different ways to approach a problem. I enjoy the process of optimizing methods and crafting custom solutions that are specific to the question we’re asking. A large part of my research is field based, and I enjoy getting to ‘MacGyver’ equipment together on the fly.

Do you have a top tip for others just starting out at your career stage?
I highly recommend learning a programming language! R is probably the most used in biology and being able to manipulate data and automate processes in R can be huge time savers. It may feel like a big time investment now to learn, but you will reap the reward later when you can re-use your scripts in future projects. Learning the tidyverse suite of packages is also super helpful when you’re working in R, and it can help you make really gorgeous figures with just a few lines of code.

What is one thing about you that others might find surprising?
People are usually surprised to find out that I am fluent in Spanish because I spent a significant portion of my childhood and teen years living in Puerto Vallarta, Mexico. My father was an avid sailor during my childhood, and when I was around 10 years old my parents decided we would sail from Canada to Mexico along the West coast. Originally, we planned to return to Canada, but we liked Puerto Vallarta so much we ended up staying. I graduated from high school there and then came back to Canada for university.

What’s next for you?
I am currently finishing up my PhD and hoping to defend before the end of this year. After that, I hope to keep the ball rolling with more research on Canadian fish species at risk.

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