

# Ken Jeffries

**K**en Jeffries is an Associate Professor at the University of Manitoba, Canada. His lab uses comparative transcriptomic approaches to examine how environmental stressors affect the cellular stress response and overall health of ectotherms.



process samples I had collected from wild minnows downstream of major cities. This opportunity got me really excited about using molecular biology and physiology to understand patterns in wild fish.

For my PhD, I knew I wanted to continue using transcriptomic approaches to understand stress in fish. I completed a project using microarrays to investigate the effects of high water temperatures on wild-caught Pacific salmon, supervised by Scott Hinch and Kristi Miller at the University of British Columbia. During my postdoctoral work at the University of California, Davis with Richard Connon and Nann Fangue, I started using RNA

sequencing approaches to study stress in fish. This is of course because my professional hockey career did not work out!

*What is your lab working on currently?*

My lab uses transcriptional profiling to understand the effects of pollution and climate change-related stressors on aquatic ectotherms. We do this using high-throughput qPCR and RNA-sequencing. We typically work with fishes of conservation concern or of economic importance, however, we have also begun studying bivalves in the Arctic. The central goals of the research are to understand whether populations will be able to cope with

*Tell us about your background. How did you first become interested in fish physiology and ecology?*

I was pretty obsessed with fishing growing up. When I was young we would sometimes go fishing in fairly remote places in northern parts of where I lived in Canada. I was curious about how there could be mercury contamination warnings on these fish in such a remote location. I started thinking about how interesting it is that we could use fish to tell us about the conditions of the lakes and rivers where they live.

I studied fish ecology at university. Around the time that I was starting my MSc work in fish ecotoxicology in Lee Jackson's lab at the University of Calgary, I met molecular endocrinologist Hamid Habibi after a talk that he gave on the effects of endocrine disrupting compounds on fish. More accurately, I ran up to him afterwards! We chatted and then he offered to let me work in his molecular biology laboratory to



Above: Dr. Jeffries is battling with a clam as the tide is coming in on Baffin Island, Nunavut.

certain stressors in the future and to determine which populations may be in trouble. In recent years, we have started some population genomics studies to help understand genetic structure in species of conservation concern. We have also been developing multi-species ultra high-throughput qPCR chips through the GEN-FISH project (Genomic Network for Fish Identification, Stress and Health) to be able to assess the physiological status of wild fishes in Canada. The results from this work will start coming out over the next several years.

#### *What does a typical day look like for you?*

It is hard to describe a typical day because I teach classes, run a molecular laboratory, and have a field program. It seems to be a constant cycle of trying to keep up with classes, lab maintenance or permits. Whatever it takes to keep the work moving forward, but the variability keeps things interesting for sure.

#### *What do you most enjoy about your work?*

I especially like working with graduate students and postdocs. I enjoy watching them learn, grow as scientists and become successful. Whether that success is through awards, papers, getting new dream academic positions or a permanent job, I love seeing good people succeed in science.

#### *What do you find most challenging?*

Emails. There are too many emails and too much time is spent dealing with them. If I do not get back to you, it is probably not personal!



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#### *What is your lab hoping to work on in the future?*

We are moving towards using different omics technologies to understand the effects of environmental conditions on aquatic ectotherms. Now that our ability to quantify transcriptome-level changes has advanced, I think that as a field we will need to understand some of the other processes that regulate changes in gene expression patterns in wild animals. I would like to understand the significance of changes in mRNA transcript levels observed in wild animals, for example by studying processes regulating gene transcription or by looking at the end results of changes in gene expression.

#### *What advice would you give to aspiring scientists in this area?*

My advice to people working in my field is to really love your research topic. Science can be hard and frustrating sometimes, and if you are not truly passionate about your research, it might be difficult to maintain your enthusiasm for the job. Additionally, data will only get bigger and bigger, and so becoming proficient in data analysis and computational biology will always be useful in the future.

*Left:* Dr. Jeffries placing a lake sturgeon into a transport tank as part of study collecting gametes from wild spawning fish in Manitoba, Canada.

#### *Who are your scientific heroes?*

I do not think heroes is the right word to describe people in science. There are many incredible scientists that I get to work with consistently and I am very grateful for that opportunity. Canada (especially the University of Manitoba) is very fortunate to have some awesome comparative physiologists and conservation genomics experts, who are also nice and fun to work with. I get to work with some of the people I admire most in science on a daily basis, and that is one of the best parts of my job.

#### **Selected Publications from SEB or affiliated journals.**

Bugg WS, Yoon GR, Schoen AN, Laluk A, Brandt C, Anderson WG, Jeffries KM. 2020. [Effects of acclimation temperature on the thermal physiology in two geographically distinct populations of lake sturgeon \(\*Acipenser fulvescens\*\)](#). *Conservation Physiology* 8, coaa087.

Jeffrey JD, Carlson H, Wrubleski D, Enders EC, Treberg JR, Jeffries KM. 2020. [Applying a gene-suite approach to examine the physiological status of wild-caught walleye \(\*Sander vitreus\*\)](#). *Conservation Physiology* 8, coaa099.

Jeffries KM, Cannon RE, Davis BE, Komoroske LM, Britton MT, Sommer T, Todgham AE, Fanguie NA. 2016. [Effects of high temperatures on threatened estuarine fishes during periods of extreme drought](#). *Journal of Experimental Biology* 219, 1705–1716.

Mackey TE, Hasler CT, Durhack T, Jeffrey JD, Macnaughton CJ, Ta K, Enders EC, Jeffries KM. 2021. [Molecular and physiological responses predict acclimation limits in juvenile brook trout \(\*Salvelinus fontinalis\*\)](#). *Journal of Experimental Biology* 224, jeb241885.

Thorstensen MJ, Turko AJ, Heath DD, Jeffries KM, Pitcher TE. 2022. [Acute thermal stress elicits interactions between gene expression and alternative splicing in a fish of conservation concern](#). *Journal of Experimental Biology* 225, jeb244162.