

## STEM SIGHTS: This Concordia grad student scares fish. In order to save them...

Arun Dayanandan toughens up hatchery-raised populations for the wild

August 29, 2017 | By Kenneth Gibson

[Version française](#)



“If we can help hatchery-raised fish survive longer in the wild, restoration programs will be more successful.”

The collapse of major fish populations can have devastating effects on the people who rely on them for jobs and nourishment. Over the last 30 years, the artificial reinforcement of wild fish populations with hatchery-raised fish has become an increasingly common method for preventing collapse.

Yet, hatchery-raised fish tend to lack some of the savviness of their natural-born brothers and sisters, making them vulnerable to predators and reducing their chances of survival to adulthood. But what if fish received a life-skills training course before being released into the wild?

Concordia MSc candidate Arun Dayanandan considers himself a professional fish scarer.

“By making hatchery-raised fish more cautious, I aim to increase their chances of surviving long enough for them to learn about their new environment,” he explains.

The graduate student works under the supervision of biology professor [Grant Brown](#) from Concordia’s [Faculty of Arts and Science](#). Dayanandan is also the president of the [Concordia Biology Graduate Student Association](#) and a junior associate at the [Loyola Sustainability Research Centre](#).

His thesis project, *Neophobic Responses and Long-term Survival in Poststocked Atlantic Salmon*, has important implications for the future of sustainable fishing in Canada and worldwide.

**‘It is critical that we avoid the collapse of fish populations’**



**How does this specific image relate to your research at Concordia?**

**Arun Dayanandan:** During my fieldwork, the fish are kept in enclosures such as these where I give them alarm cues — a chemical scent that tells them to be afraid — before moving them to separate bins for testing.

Manipulations are done to the entire enclosure so that all of the fish within them receive the same changes. While they are tremendously useful, they can also be a challenge to set up.

Researchers will often return to their site following a rough storm to find their enclosures toppled over by fallen debris and their fish nowhere to be seen.

### **What is the hoped-for result of your project?**

**AD:** To increase the baseline level of fear in hatchery-raised fish before they are released into the wild at their juvenile stage of development. Given that they are raised in an artificial and very safe environment, they do not currently learn to identify predators and so are not cautious enough.

Fish often use chemosensory cues to alert them to predators nearby. Thus, if fish can be exposed to these chemicals in the hatchery they can be given “life-skills training” making them more cautious and prepared for the real world.

### **What impact could you see it having on people's lives?**

**AD:** Fish are overharvested from many waterways. In order to continue fishing sustainably we have to supplement wild fish populations with hatchery-raised fish. Currently, only 10 per cent of global fish stocks are being harvested sustainably.

Without the addition of new fish through restoration programs many of these populations will collapse, forcing species into extinction. If we can help hatchery-raised fish survive longer in the wild then these restoration programs will be much more successful.

It is critically important that we avoid the collapse of fish populations because the people that rely on them for sustenance will starve. Currently, fish are the sole source of protein for over 50 per cent of developing nations' populations, especially in rural communities.

Also, \$6.6 billion worth of fish and seafood are exported annually in Canada, employing over 72,000 Canadians in the process, mostly from small coastal communities.

Currently, 20 per cent of all Canadian seafood production comes from aquaculture and this is rapidly increasing. By 2025, over half of all global fish production will come from aquaculture.

### **What are some of the major challenges you face in your research?**

**AD:** Living organisms are very unpredictable. Contrary to popular belief, fish DO have personalities! Attempting to teach a fish to be afraid, especially one that travels large distances during its lifetime, is also a challenge on its own.

In the case of migratory fish such as Atlantic salmon, this means that just because a fish learns to be afraid in one location does not mean that fear will help it in the next. These fish are born in rivers and swim to the ocean to grow before returning to their original river to mate.

What might have originally been a predator for a juvenile fish may now be the perfect prey, and in a highly competitive, resource-starved environment, not eating can spell the difference between life and death.

**What are some of the key areas where your work could be applied?**

**AD:** The results of my research will contribute to ecosystem and environmental restoration projects, sustainable fishery management and sustainable food production for those living in poverty.

I also hope that our findings can one day be used to treat human patients suffering from post-traumatic stress disorder, depression and a host of other stress-based afflictions.

**What person, experience or moment in time first inspired you to study this subject and get involved in the field?**

**AD:** I attended a seminar that interested me during my first term, and afterward, I approached the supervisor of the lab. That led to me getting involved with the [Centre for Studies in Behavioral Neurobiology](#) and working with the PhD student whose presentation I attended.

The research focused on stress responses and circadian rhythms. The more I read and learned, the more I found it to be compelling work, as it had applications in many different fields.

**What advice would you give STEM students interested in getting involved in this line of research?**

**AD:** Ironically, don't be afraid! Approach professors whose research interests you and find out about the work taking place in their labs. Concordia's smaller class sizes helps tremendously with this.

Read their papers, connect with their graduate students (we have a biology graduate–undergraduate mentorship program that organizes events every two weeks), attend seminars and always ask questions.

**What do you like best about being at Concordia?**

**AD:** During my undergraduate education I enjoyed endless opportunities to become involved in the broader community and apply my knowledge outside of the classroom.

Since becoming a graduate student it has been excellent to be involved in a community of high-calibre transdisciplinary researchers, knowing that amazing discoveries are taking place just down the hall.

I also appreciate Concordia's involvement with external agencies, such as being the home of the United Nations initiative [Future Earth](#) and hosting the UN massive open online course "[Wicked Problems, Dynamic Solutions](#)."

**Are there any partners, agencies or other sources of funding or support attached to your research?**

**AD:** I am grateful for the support of a number of organizations including the [Natural Sciences and Engineering Research Council of Canada](#) (NSERC), [Fonds de recherche du Quebec - Nature et technologies](#) (FRQNT), Concordia University, the [Miramichi Salmon Association](#) (MSA) and the [Quebec Centre for Biodiversity Science](#) (QCBS).

*Find out more about the [Loyola Sustainability Research Centre](#).*

---

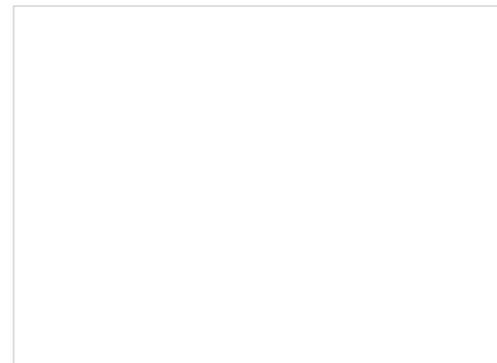
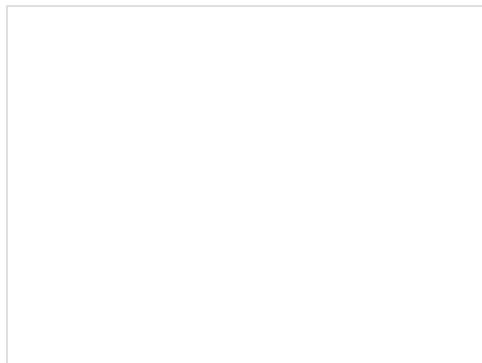
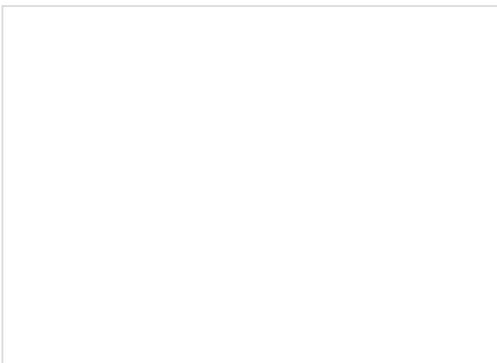
research

environment

biology

stem sights

## Trending





**Concordia is Canada's first university to issue a sustainable bond**

February 11, 2019



**Concordia launches 4TH SPACE — a dynamic public venue for learning and discovery**

January 18, 2019



**Bilinguals hear sounds differently based on the language they think they're listening to, new study shows**

February 6, 2019