

# SCIENCE SPOTLIGHT



# INVADERS IN OUR WATERS



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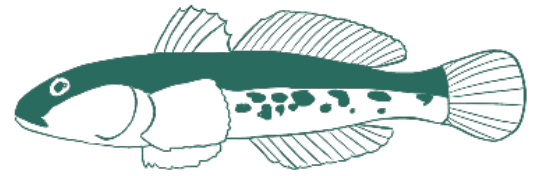
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# INVADERS IN OUR WATERS



## Origin Story: WHAT IS AN INVASIVE SPECIES?

An exotic, or introduced species, is a living organism that is not native to an ecosystem in which it lives. An invasive species is an exotic species whose population grows rapidly and causes damage to the ecosystem, property, or the economy. These invasions can happen naturally over time, but more often the introduction of invasive species is caused by humans. Aquatic invertebrates (animals without backbones that live in the water) and fish have been spread to new bodies of water by ship, fungi have been carried across continents by hikers' boots, and ornamental plants have been imported for landscaping and escaped into wetlands. Invasive species are everywhere, but increasing average water temperatures, and changing water levels due to climate change are likely to increase the rates of invasion across the globe.

It can be really difficult to reduce the impact of invasive species, but the best place to start is by understanding how the species are impacting the ecosystem that they have invaded.

## Coping With Change: THE ROUND GOBY

The round goby is a small bottom-dwelling fish from Central Eurasia that was first reported in the St. Lawrence in 1997. Since their invasion they have had a huge influence on the St. Lawrence River ecosystem, outcompeting native fish species like darters and sculpins for spawning habitat and food, and eating the eggs of other fish. However, round gobies have also impacted the ecosystem in other ways: they are a natural predator of the zebra mussel, which is another extremely devastating invasive species in the St. Lawrence River. Some scientists speculate that they might be helping control the population of these

invasive mussels. Round gobies are now also a large source of food for important sport fish like the smallmouth bass. Though scientists are not yet sure if they are a healthy source of energy for other fish. This is where Cristina Charette's research comes in.

Part of Cristina's PhD thesis focuses on the impact of the round goby on the St. Lawrence River and how different habitats can influence the invasive species role in the food web. Not a lot is known about how abiotic factors like light, salinity, and temperature affect the impacts of invasive species, but Cristina's research shows that some of these things can play a huge role in the behaviour of the round goby.

One abiotic factor that scientists have noticed that affects the spread of the round goby is conductivity—the amount of salts and minerals dissolved in water. Round gobies have moved through the St. Lawrence and the small rivers and streams that connect to it, but were unable to make their way into the Ottawa River. Studies have shown that round gobies are unable to settle in areas with very low conductivity. Cristina's research has shown that conductivity also influences how the round goby feeds. In places where conductivity is lower, gobies feed primarily on benthic invertebrates—those that live on the bottom of the river. In places where conductivity is higher, gobies feed primarily on zebra mussels and on pelagic invertebrates—those that live floating in the water.

The fact that these abiotic factors can so strongly influence the behaviours of these fish demonstrates the importance of mitigating the impacts of climate change. It is impossible to predict exactly how the changing water levels and, temperatures will influence animal behaviour, but we know the impact will not be small.



# Time for **GENACTION!**

Try this at home:

## **ETHICAL INTERVENTIONS**

How do we decide if an action is right or wrong? We often consider what kind of impacts our actions have on others, and when it comes to the environment, how our actions impact nature. Do you think we should intervene in nature to solve a problem? Think about each of the statements below and decide if you agree or disagree, or if you might change your mind depending on the situation.

1. It is a good idea to move species to where they don't normally live.
2. We should reintroduce species to places they used to live.
3. We should rescue wild animals.
4. We should plant trees to help solve climate change.
5. We should conserve more natural areas.

Often we need a bit more context to decide if intervening in nature is a good idea. Talking with others about these decisions can also be helpful – try asking a friend or family member if they agree with the statements above.

## **Climate Action: GET OUTSIDE**

One of the simplest actions that you can do to help the environment is to spend time in nature.

To understand our connection with all living things, the best place to be is outside! When you experience nature first-hand, it reminds you why the environment is so important.

1. Find a sit spot, a place to enjoy nature and observe it on a regular basis, what lives there? How does it change over time?
2. Take a hike. Use all your senses to take in the environment around you. Listen for birds, smell the plants, feel the trees.
3. Take a closer look, try and identify the plants and animals you see while enjoying the outdoors.
4. Start a field journal, it's a great place to store your observations, your feelings, and any photos or drawings

## **MEET OUR LOCAL SCIENCE HERO**



**Cristina Charette**

is a PhD candidate at the Université du Québec à Montréal

### **Why did you decide to become a scientist?**

"Like many young kids, I loved marine mammals growing up and for as long as I can remember I wanted to become a marine biologist. I grew up on the St. Lawrence River and I would spend my summer in the water, fishing with my dad, or just staring into the water to see what the fish were up to. All of these exceptional moments, and the fact that I was so curious about nature led me to become a scientist. I still cannot believe that I get to do to research in my own backyard!"

### **What is your favourite thing about being a scientist?**

"My favourite part of being a scientist is to spend my summer working outside on a boat or in the water sampling for fish. I also enjoy analyzing my data. It is during that time that I feel like I am on a quest to solve really interesting mysteries. As part of my job, I also get to teach kids how to become the best field assistants. I love sharing my excitement with them when we catch cool fish!"



# Climate Change

## Past, Present, and Future

Earth is the only planet in the solar system known to support life. What makes our home so special? Earth has an atmosphere, a layer of gases between our planet and space. Some of these gases, like carbon dioxide, are called **greenhouse gases**. They are crucial parts of our atmosphere; they trap in the heat of the sun, similar to how heat is trapped in a greenhouse, or in a car on a hot day. This process, called the **greenhouse effect**, keeps Earth's temperature warm enough for living things to thrive.

The sun's rays hit our round, tilted planet unevenly. This uneven heating of Earth's surface leads to differences in temperature, which drives weather patterns. We call the patterns in temperature and weather over long periods of time **climate**. Different parts of the world have vastly different climates; it depends on how much heat they receive, as well as what landscape features are nearby. Water, mountains, ocean currents, and forests all impact our climate. In turn, living things around the world have adapted to the climate they live in.

Something, though, is changing. Over the past two hundred years, humans have been burning fossil fuels, such as coal and oil, to make energy to power our daily lives. Fossil fuels are made from decomposed plant matter and microscopic life millions of years old. This matter is full of carbon, and, burning it releases, or emits, billions of tonnes of **carbon dioxide** gas into the atmosphere every year. When too much carbon dioxide is emitted, the delicate balance of greenhouse gases maintaining

Earth's climate is upset. More and more heat is trapped, causing the planet to warm. Weather patterns change, water levels rise, storms get worse.

Climate has changed many times throughout Earth's history, from

ice ages to periods much hotter than today. So why is this time any different? Scientists agree on two things. One, temperatures are rising faster than they ever have in documented climate history. Two, this climate change is driven by human activities, due primarily to greenhouse gas emissions.

Climate change is already impacting people's ways of life all over the world. Powerful storms, droughts, forest fires, and floods are threatening people's access to food, water, and safe homes.

The most important step we can take to prevent serious climate change is to reduce greenhouse gas emissions. Incredibly brave and caring people around the world are finding new ways to reduce emissions and make our communities climate resilient every single day. And you can join them! These Science Spotlights are here to help us learn more about climate change and how you can take action.

## Our Commitment to the Decolonization of Science

Institutions of GenAction initiative respect and affirm the inherent and Treaty Rights of all Indigenous Peoples across what we now know as Canada. We give thanks to the Indigenous Peoples who care for this land since time immemorial and pay respect to their traditions and ways of knowing. We acknowledge their many contributions to innovations in Science, Technology, Engineering, and Mathematics, past and present, and are committed to deepening engagement and collaborating with Indigenous Peoples as partners in order to advance truth and reconciliation and the decolonization of science.

