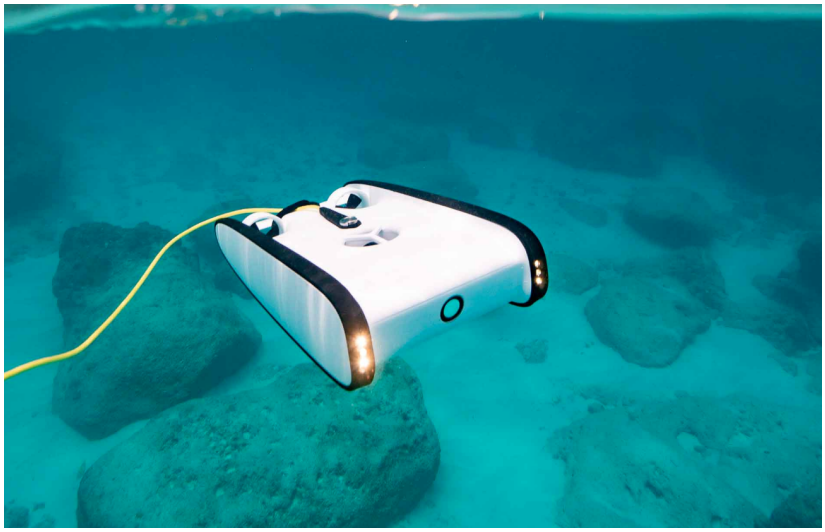
SUPERNOVA
DALHOUSIE UNIVERSITY | HALIFAX, NOVA SCOTIA



What is a Trident ROV (Polaris)?

An ROV or a remotely operated vehicle is an underwater submersible that is driven from the ocean's surface rather than from within the vehicle itself. This means with ROVs, you don't have to send humans deep in the ocean where there's no oxygen, very little light and a lot of pressure.

In Nova Scotia, we have a deep underwater canyon off the coast of Sable Island that, when explored on research expeditions, almost always reveals new species, yet to be discovered in our waters.

ROVs can be used for a number of jobs and tasks. Some have small robotic arms that allow the vehicle to take samples of sediment, algae or animals. Most have a video camera to record images of what's seen in the deep. A lot of plants and animals that live deep in the ocean are so accustomed to high pressures, they liquify when brought to the surface where there's less pressure. So the best way we can study them, is in their own habitat.

The Video

Check out some of our Polaris videos. Start off with *The Launch*. It seems a little strange to just toss our equipment into the ocean, but it's built for that! The Trident ROV has three motors to help it go up and down, and forward and backwards. It also has some removable weights on the bottom to attach or remove, depending on whether we're launching in a lake or the ocean. *Can you think of a reason why we would have to change the weight of our drone to suit different types of water?* Check out our video *Polaris: Behind the Scenes* to learn more about ROVs.

The Life

The diversity of life we have in our ocean environment is enough to make the most seasoned scientist awestruck! Non-marine aquatic environments (freshwater) are also home to a whole world of unique plants and animals. Animals and plants are specifically adapted to the habitat they live in. A habitat is a place that an animal or plant lives that meets *all* the needs of that animal or plant. *Choose your favourite animal. What does it need to survive?*

The different characteristics of each habitat make each habitat unique and liveable for a certain type of plant or animal. All of the animals in a habitat are considered a community because they live close to each other, interacting with each other and depending on other species in the community.

Habitats are connected to each other by plants and animals that might move or be moved. For example, in the fall when Atlantic Salmon are running from the ocean, back up rivers to lay their eggs, bears will hunt the fish in large numbers. These bears will only eat the most nutritious parts of salmon, leaving the carcasses on land where they'll decompose and provide important nutrients for forest habitats. Over longer periods of time, rain will wash some of those nutrients in the soil away from the forest ecosystem and back into the ocean.

Habitats

So far, we've launched Polaris in a few different habitats:

Marine: Rocky/Mud - The Halifax Harbour is home to hundreds of shipwrecks, some a little more accessible than others. The SS Daisy was a police boat built in 1912 that was later sunk on the shore of the Dartmouth side of the harbour. This was common practice decades ago, building out the shore and using the derelict boats as new structures. Shipwrecks and other sunk objects can become habitat in the ocean, as a number of the animals that live here need hard surfaces to attach themselves to. These are known as artificial reefs and are home to animals that start their life as plankton like snails, crabs, mussels and barnacles.

Marine: Rocky - The *Northwest Arm* is a projection of the ocean into the land, a formation caused by the retreat of glaciers over 10,000 years ago. People of settler descent today know this area as 'the Arm', while those before knew it as "Sandwich River." The Mi'kmaq peoples who have been in this area for at least 13,000 years know this place as "We'kwaltijk" (way-a-gwol-tich) which means end of the bay. When glaciers retreated, they left little soil, and instead stripped most sitting on top of hard jagged bedrock. This might make it difficult for some terrestrial animals and plants to live, but under the ocean, hard bedrock is great habitat for all kinds of life!

Brackish: Fresh and Salty - The *Head of Lawrencetown Lake* is the portion of the lake farthest away from where water exits the lake. Even though lakes look like they're a separate body of water, they are connected by networks of brooks, creeks and rivers and all eventually empty into the ocean. Lawrencetown Lake is a lake that is very near the ocean. It has a wide mouth that opens to the ocean,

and during high tide, saltwater enters the
lake mixing with freshwater creating a habitat that is a bit of both; we call this a brackish lake.

Aquatic: Mostly Freshwater - *Porters Lake* is a larger lake that has portions that are quite brackish. We launched Polaris in a part of the lake that may have some salt water intrusion from tides, but is mostly fresh water. Habitats in freshwater usually depend on light penetration into the water, salt and other mineral content, nutrients and temperature. Algae, similar to terrestrial plants, can form on lake bottoms in shallow areas where sunlight reaches the bottom. Sometimes algae blooms can take over when there is too much added nutrients in the water such as fertilizer run-off (phosphorus).

What to Do

1. Print out our worksheet or make a data chart of your own. Take a look at the different columns so you know what you're looking for once the video starts.

2. Next up, you'll want to *get your identification guides ready to go*. You can have these printed out or open them up on your computer. Click the links here for SuperNOVA's Identification Guides. These cover a lot of the common fish, invertebrates and algae you may see in the Northwest Atlantic, however there are a lot of organisms that you won't find in our guides!

3. Start the video but keep your finger on the pause button, you'll need to stop and start the video to collect your data. *First off, make some qualitative observations about what you see in the video.* We want to have an idea of what kind of habitat is here, so we can have a better idea of what animals to look for. For example, if the bottom is entirely sand, we likely won't see barnacles that need hard surfaces to attach themselves to.

4. *Secondly, record the temperature and depth of the ROV.* Some plants can't live too deep in the ocean because not much light makes it through the deeper water for photosynthesis. Red light doesn't penetrate far through the water, so organisms that absorb red light (like green seaweed and coral) must live near the surface. Depth can also tell us about what types of animals and plants we'll see.

5. Next, record any animal or seaweed species you can identify on your worksheet.

6. If you see something you don't recognize, you can do some online research to identify the species, or you can skip it and leave it for the next data collector with different experience!

7. Now it's time to share your data! Visit our form to submit your observations and view our datasets to compare species in different habitats (coming soon!)

Debrief (After worksheet)

- What unique challenges do animals living in water face?
    - Oxygen, temperature regulation, light availability

- Did you notice one species that dominated the habitat? How might this affect other species in the community?

- How might you tell if a habitat is healthy?
    - If there is a great diversity, or a lot of different species, in a habitat, that habitat is most likely a healthy one.
    - What positive or negative impacts might have humans caused on this habitat?

REFERENCES & RESOURCES

More about Sofar Trident ROV: https://www.sofarocean.com/products/trident