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Research vessel stays on course to monitor health of organisms

Floating lab gathers samples for Institute of Ocean Sciences

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In three-metre, midnight swells, helmeted crew members aboard Canadian Coast Guard Ship Vector wrestle a 1,000-kilogram instrument over the ship's heaving stern into the depths.

The device is lowered several hundred metres, then stopped at selected depths to collect water samples. From Cape Flattery to Campbell River — using winches, stabilizing ropes and brute force — the grappling and sampling is repeated around the clock for five days.

CCGS Vector, based at Patricia Bay, serves as a floating laboratory. Vector is a 40-metre, steel-hulled research vessel, with a 12-person crew and room for eight scientists.

The 1967-vintage ship steams 5,000 kilometres each month, home to many science programs and enveloped in the aroma of its signature cinnamon buns wafting from a hard-working galley.

"We've studied everything from waves to water bugs," says Rob White, Vector's bosun for the past 25 years.

Early in September, researchers from North Saanich's Institute of Ocean Sciences tested 70 locations along the route they trace four times per year. Besides onboard computers, specimen bottles and rubber boots, the main tool used is the CTD/Rosette, which is a heavyweight bundle of sensors and water collection cylinders that records conductivity, temperature and depth data while gulping 10 litres of water at 50-metre intervals.

Most samples are sealed and refrigerated for later analysis at the institute where they will be studied for salinity, density, absorbed matter and nutrient content of local straits. Some water is tested aboard Vector to determine its oxygen content.

"The amount of oxygen tells when that water was at the surface," says Diane Masson, the mission's chief scientist. "It helps determine how long it takes for water to cycle from top to bottom."

There is no simple answer as to why scientists test the water. It's to measure effects of human-caused and naturally occurring pollution but also to recognize environmental changes, quantify them and identify the cause — climatic or otherwise.

Decades of data gathering and study are needed before researchers discover the value of their work.

"This is our backyard," says Masson, "but there hasn't been sufficient data collected long enough to identify changes occurring here."

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Vector: Composition of straits not identical

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The ship dances with the CTD/Rosette so often over such a large territory because the area straits are not identical. "Georgia is warmer. Juan de Fuca is saltier. Haro is an equalizer," Massons says.

The volume of water in all three straits is unevenly replaced annually, thanks to a bottom-hugging saline river flowing in from the Pacific Ocean and a surface outflow of fresher, Fraser River water.

The submerged inbound stream cannot steadily infiltrate due to an irregular bottom that creates major sills. The current can overflow these obstacles only in certain conditions.

Haro Strait's narrow channel and strong tidal currents help the process, controlling the exchange of Pacific Ocean and Georgia Strait waters. This deep water intrusion fully penetrates only twice per year, each time with unique characteristics.

Winter brings cold, saltier, oxygen-rich, low-nutrient water, while summer brings warm, low-oxygen, nutrient-rich water. As a result, the salinity, oxygen and nutrient levels of local waters are constantly fluctuating, with El Nino years disrupting the process.

This water exchange and its content affect plankton growth, which is the low-end staple of the food chain.

"There is as yet relatively little data on the nutrients essential to support our dense ecosystem — particularly how much we get, and when," Masson says.

Besides quantity and timing, quality of the sustenance is vital. Thousands of chemicals go into our environment — particularly pesticides and personal-care products such as shampoos.

Their effects can last decades, doing unknown damage to the environment.

"We're doing things to the planet we can't even measure yet," says researcher Sophia Johannessen. "We need to understand the large-scale, long-term processes. Answers may not be immediately useful, but the more we know, the better choices we can make."

Tedious, unending data collection and analysis often go unnoticed and under-appreciated.

"Ecological changes don't happen fast enough in a human lifespan to have an immediacy to most people," says Jeff Lewis, science team member. "But we're taking a planet created over millions of years and affecting it faster than it can handle."