Sailing drones to capture ecosystem data from Lake Superior

August 17 2022

The first Saildrone, left, departs ahead of the USGS Research Vessel Kiyi at the Ashland, Wisconsin, harbor on Aug. 9. Two Saildrones will record the abundance and distribution of forage fish on Lake Superior. Credit: Saildrones Inc.

Seafaring drones on Lake Superior will soon allow a team of Cornell University scientists to examine fresh details about the abundance and distribution of forage fish—species, such as zooplankton and shrimp,

which provide nourishment for sportier marine species higher on the food chain.

Two Saildrone Explorers—23-foot-long autonomous wind-and-solar-powered research vehicles that look like surfboards outfitted with sonar and other sensors—launched Aug. 9 from Ashland, Wisconsin. They will be part of an acoustic survey of the fish and biomass of western Lake Superior. It runs until Sept. 3.

Forage fish of Lake Superior include several species of cisco, whitefish and rainbow smelt that comprise the diet of a variety of salmon and lake trout. The saildrones will be directly compared with traditional acoustic monitoring by ships.

The work is a cooperative project led by the U.S. Geological Survey (USGS) and the Great Lakes Fishery Commission, with drones provided by Saildrones, Inc., and Cornell leading the scientific analysis.

Scientific information collected from this research will help to inform the sustainable management of the Great Lakes fishing industry, valued at $7 billion a year, according to the USGS.

In addition to the two Saildrone Explorers, two long-range autonomous underwater vehicles (LRAUVs), developed by the Monterey Bay Aquarium Research Institute, will be deployed, along with the USGS Research Vessel Kiyi.

The underwater LRAUVs will detect fish near Lake Superior's surface and seek samples of fish DNA fragments left behind, according to the USGS. The collected DNA samples will be evaluated relative to acoustic measures to estimate fish species abundance.

"The autonomous Saildrones and the underwater vehicles give us an

unprecedented view of the distribution of fish and planktonic invertebrates in the Great Lakes—both day and night," said the principal data investigator Lars Rudstam, professor in the Department of Natural Resources and the Environment.

Rudstam explained that these drones—with 15-foot-tall wing sails and weighted keels—run silently, unlike traditional research vessels. Researchers can gather data from shore and from far away. "Until last year on Lake Huron and Lake Michigan, we haven't had anything like this kind of data gathering before," he said.

Sport fishery is a big business on the Great Lakes, Rudstam said, noting that walleye and Chinook salmon are among the most popular fish. "If there is not enough of the smaller species to feed the salmon, the salmon will obviously decline," he said.

More than a decade ago, there were not enough alewife (herring) to feed Chinook salmon in Lake Huron, Rudstam said. "It crashed the Chinook salmon fishery," he said. "We are now trying to understand the spatial ecology in a much better, more precise way than we used to."

The Cornell researchers will present their formal report from the 2021 research on Lake Huron and Lake Michigan next May at the annual International Association of Great Lakes Research conference in Toronto.

Provided by Cornell University