



METRO

N.H. kidnapping  
suspect a mystery



MAGAZINE

Secret world of the  
Dunkin' Donuts kings



POLITICS

Ireland relis  
Walsh

# Mucus-harvesting drone could help researchers study whales

By Carolyn Y. Johnson | GLOBE STAFF | SEPTEMBER 10, 2014



COURTESY OF OCEAN ALLIANCE

**The Snot Bot, designed by Olin College students, hovers over a catamaran meant fitted with sensors that allow researchers to measure what a whale would feel and hear when being approached by a drone.**

To monitor whether whales are experiencing stress, researchers have to do things that seem, paradoxically, stressful for whales. In noisy motorboats, they sidle up to surfacing whales while wielding 15-foot fiberglass poles fitted with collection devices and seek to catch the spray the majestic marine mammals spout from their blowhole.

Whale mucus, it turns out, is more valuable than it might seem. Like a blood sample, the whale’s “blow” contains hormones that allow researchers to tell whether the whale is stressed.

CONTINUE READING BELOW ▼

A team of students from Olin College of Engineering in Needham is developing a higher-tech, less obtrusive way to harvest these informative samples of whale mucus: a drone that hovers directly in their spray. The name for this sophisticated robotic device? Snot Bot.

Thus, whale watching is added to the long list of possible scientific use for drones, whose ability to map archeological sites and monitor forests are already being explored by researchers. It also plunges the Olin College scientists into the middle of an ongoing debate about the use of drones. Over the protests of many in the scientific community, the Federal Aviation Administration published rules this summer that imposed tight limits on commercial uses of drones, including research and teaching at private universities.

A team from Olin and the Gloucester-based whale conservation nonprofit Ocean Alliance spent the summer gathering data they hope will help them earn a federal permit to monitor whales with their robot. In the Gulf of Mexico, they tested their drone’s ability to harvest pseudo-snot, ejected from a fake whale: an inflatable catamaran fitted with an array of sensors that measured what a real whale would feel and hear when it was being followed by a drone, a small helicopter with four rotors that is bigger than a shoebox but smaller than a minifridge.

The research team hopes to show just how much wind and noise their device generates at different elevations, providing baseline data that could guide the development of federal rules to govern the use of the new technology in marine research.

“The government could issue rules that say, ‘Never fly lower than this altitude over a whale with a drone,’ ” said Andrew Bennett, a professor of mechanical engineering at Olin. “Right now, the rule for flying over a whale is 1,000 feet, because they assume you’re a person in an airplane. And the FAA gets angry if we fly a drone higher than 400 feet.”

The team estimates that a device could cost less than \$3,000 and could allow researchers to test assumptions about what causes whales distress.

“Our ultimate dream is, somebody says something like, ‘When ships are passing by, it stresses whales during feeding,’ ” Bennett said. “Then we can look at it and say the stress level did go up or, actually, no, the whale didn’t seem to care.”

To get to this point, the researchers have been working on Snot Bot for several years; they are now on version five. Their initial challenge was to figure out how to craft a helicopter drone resistant to harsh conditions, which might include an occasional plunge into salt water. Bennett said they tried to build watertight shields to encase the motors and rotors. The researchers found that it added too much weight to maneuver the robot effectively.

Now, they have settled on a simpler solution, based on the realization that it is just cheaper to dunk their robot in distilled water to clean off salt and replace motors when they inevitably rust. Instead of a cup to scoop up the whale blow, they attach a sterilized surgical sponge to their robot.

This fall, researchers are planning to work on algorithms that will give the robot better autopilot capabilities that will make the biological harvesting mechanism foolproof, even for the seasick biologist with no expertise in robotics.

Currently, the robot needs a person to fine-tune its position, but researchers would also like to make sure the robot can detect what sort of a whale it is tracking and maneuver to be in the right position. Whales have idiosyncrasies when it comes to how they blow: the spouts of sperm whales tilt a bit forward and off to an angle, for example, and right whales blow in two streams.

Before they can use their device to collect the whale specimens, however, researchers need permission from federal officials. Iain Kerr, chief executive of Ocean Alliance, said he expects the report on the effects of close drone monitoring of whales to be submitted to officials at the National Marine Fisheries Service by the end of September.

“We found that at 10 feet above our whale surrogate, it was basically almost undetectable,” Kerr said.

*Carolyn Y. Johnson can be reached at [cjohnson@globe.com](mailto:cjohnson@globe.com).*