

The SKY'S

the Limit

Drones Offer Opportunities and Challenges

BY HILLARY RICHARD

It was an otherwise normal day on the water, where researcher Dr. Lance Barrett-Lennard and his colleagues were flying a drone camera 100 feet above a pod of killer whales. Suddenly, the boat's remote on-screen view went black. Something was blocking the drone camera. It took a few minutes for Barrett-Lennard to identify the intrusion. Hovering about 70 feet directly beneath their drone was ... another drone.

"It turned out it was a guy on the beach about two miles away, who couldn't see our boat, our drone, anything—he was just seeing the whales," recalled Barrett-Lennard, director of the Marine Mammal Research Program at Ocean Wise in Vancouver, B.C., who anticipates this kind of thing happening more frequently until tighter restrictions come into play. "Research use is considered commercial

use, so we have to jump through a lot of hoops that recreational drone users in the U.S. and Canada don't."

Drones have captivated the world in recent years. These space-age aircraft seem like something straight out of a vintage science fiction movie and have given people a bird's eye view of the natural world. But, while the technology has developed at lightning speed, rules and regulations have struggled to keep up. The resulting "Wild West" of aerial nature imagery has both pros and cons.

For wildlife researchers, drones have the potential to fast-track conservation efforts by providing new ways to study endangered animals in their natural habitats.

Ocean Wise at the Vancouver Aquarium recently offered its scientists drone pilot classes, since this technology has become integral to its whale conservation programs.

Ocean Wise has for years joined colleagues in the Canadian Department of Fisheries and Oceans in an annual photo identification survey to track killer whale populations. A previous Ocean Wise researcher found a striking link between certain salmon populations and killer whale mortality, which led Barrett-Lennard to realize that a lack of real-time data was holding their conservation efforts back.

"If we could go out and photograph the whales and develop a rough assessment of their fat and body conditions in real time, instead of counting the bodies the following season to see who went missing, we could make better recommendations for fisheries so killer whales will have enough to eat," he explained, noting that both the U.S. and Canada can bring in emergency measures at any time to stop salmon fishing if food for the whales becomes scarce.



In 2014, after receiving a grant, Barrett-Lennard and his NOAA colleagues spent a month testing the drone around pods of whales to be certain it had no impact on their habits, like shortening their dive time or changing their course. Then, they began their annual three-month research stint, which includes hundreds of 15-minute drone flights every season with the goal of getting 10 good photos of each killer whale.

“It’s been very efficient. In most of our field stints we’ve photographed the entire southern resident population in a month [76 whales]. We’re interested in change so it’s important to see the same ones repeatedly,” he said, noting that he can identify them easily now from catalogs collected throughout the years.

For scientists at the San Diego Zoo Institute for Conservation Research, drone technology has allowed them to enter the extreme climates where polar bears live.

In 2016, as part of a collaboration with the Northrop Grumman Corporation, scientists for San Diego Zoo Global in San Diego, Calif., used autonomous flight technology to map out Arctic sea ice in an effort to better understand the region’s rapid climate change. In 2017, they embarked on an exciting new mission to remotely observe polar bears in the wild.

“There are few studies of polar bears based on direct observation. With the development of this autonomous system, we are hoping to gain a perspective into polar bear lives rarely seen before,” said Dr. Nicholas Pilfold, scientist in population sustainability at the San Diego Zoo Institute for Conservation Research.

In 2017, a research team of two San Diego Zoo Global scientists and five Northrop Grumman engineers collaborated for an inaugural (and successful) mission in Canada’s Hudson Bay. They created a specialized unmanned

aircraft system that could withstand the unique and extreme conditions. In 10 days, the aircraft system flew 11 missions that resulted in three-dimensional sea ice maps of polar bear habitats.

“This mission demonstrates what is possible when advanced technology is integrated into conservation research for threatened species like the polar bear,” Pilfold said. “To be able to analyze polar bear habitat in three dimensions will allow us to answer pertinent questions that have previously eluded scientists.”

There seems to be no end to the adaptability and customization of drone technology—an aspect that thrills wildlife researchers who have long searched for solutions to highly specific, species-based problems.

The World Wildlife Fund has developed some creative uses for drones as part of its critical mission to save the black-footed ferret (one of the most





For wildlife researchers and endangered species, this technology has provided missing pieces of puzzles when it comes to animal behavior.

endangered animals in America). A large part of black-footed ferret recovery revolves around prairie dogs, a main food source for the ferrets. Surveyors across areas of Montana, South Dakota, Colorado and Wyoming typically map out prairie dog colonies in person. Knowing the density and size of colonies helps determine the most suitable areas for ferret reintroduction—and with only about 400 breeding adults in the country, there is very little room for error.

In 2015, Kristy Bly, senior wildlife conservation biologist and black-footed ferret recovery specialist with the WWF, had her team attempt colony mapping by drone in Montana. The results were mixed.

“We found that we could collect very nice images of colonies but processing those images into a mosaic was hugely labor intensive and took a lot of computer power,” said Bly. Even after developing a computer algorithm that could identify and count burrows from the drone footage, the processing was just too time consuming to outweigh the in-person system. “People on the ground can do just as great a job in the same amount of time—or faster,” she added.

Instead, Bly and her team decided to test whether drones could streamline another laborious yet critical task: delivering vaccines. Sylvatic plague (transmitted by fleas) is a very real threat for both black-footed ferrets and

prairie dogs. The ferrets are trapped and vaccinated, but prairie dogs also needed plague protection. For this purpose, the University of Wisconsin developed a plague vaccine within a peanut-butter flavored, candy-sized bait. The baits had to be dropped by hand every nine meters on test plots, which was labor intensive.

In 2016, Bly, along with Randy Matchett from the U.S. Fish and Wildlife Service and Kurt Kreiger from Model Avionics, developed a vaccine delivery system that included a specially built multi-rotor drone and a triple shooter. This was such a success that they developed more triple shooters for other black-footed ferret recovery sites.

“When attached to a drone or an ATV, it was highly effective at distributing life protecting plague medication across thousands of acres. Innovations to develop vaccines and deliver them at scale are critical to recover this highly endangered animal, so it’s pretty exciting,” said Bly. “They’re a great tool in the toolbox for wildlife biologists, but they need to be used by responsible people in a very smart and safe way.”

The Columbus Zoo in Powell, Ohio, learned this firsthand in 2015, when a man flew a drone into the wide-open savannah in their Heart of Africa exhibit. While he only recorded four minutes of video (which was later posted online),

he sent the drone all over the exhibit and caused a number of issues for the animals.

“An unfamiliar device flying over the animals comes across as a predatory type of threat. Birds and hoofstock animals in particular have a physiological reaction that becomes a flight response,” said Daniel Swingle, the Zoo’s director of security.

After this incident, the Zoo created a policy that banned drones on its 580 acres. There have been some random flyovers since then (mostly unintentional rule breakers), which resulted in the drone pilots being asked to leave the property.

“The initial incident opened our eyes to how drones can affect our animal population. Now we have a policy so at least we know there’s a course of action we can take with the legal system if it has to go that route,” added Swingle.

Recreational drone users tend to see them as a fun new way to view the world rather than as a small aircraft with potentially serious consequences to wildlife and nature.

For wildlife researchers and endangered species, this technology has provided missing pieces of puzzles when it comes to animal behavior. As scientists continue to innovate and protect animals in brand new ways, it gives new meaning to “the sky’s the limit.”

Hillary Richard is a writer based in Bloomfield, N.J.