

## Citizen Scientists Contribute to Dolphin Monitoring Study

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Bottlenose dolphins visit a wide range of marine habitats up and down the East Coast as they pursue favorite prey, and they are known to frequent both oceanic and estuarine waterways. But until very recently, no one associated a strong dolphin presence with the Chesapeake Bay, the largest estuary in the United States stretching some 200 miles from Havre de Grace, Maryland in the upper bay to Virginia Beach in the lower bay. A handful of anecdotal sightings each spring and summer were the only signs of dolphins visiting the Chesapeake Bay at all.

That all changed in 2017 with an uptick in reported sightings that intrigued researchers at the University of Maryland Center for Environmental Science (UMCES). A new report from five scientists at UMCES describing their recent innovative study of the dolphin population in the bay explains that their team had already suspected that water temperatures driving certain species of fish and their marine mammal predators farther north may have instigated a greater presence of dolphins in the Chesapeake and its major tributaries. They also pointed to a relative rebound in numbers following a cetacean disease that had reduced dolphin populations in the Atlantic between 2015-2016. And improvements in the health of the bay in general in recent years had already led to a relative resurgence amongst other marine species. But there was almost no data on the current population of dolphins frequenting the bay.

Given the proximity of coastal bay regions to urban centers, including two of the largest ports in the US in Baltimore and Norfolk, in addition to the Norfolk Navy base, the UMCES team felt it was crucial to investigate just how many dolphins there actually were in the bay from spring to fall. Dolphins are a protected marine mammal species under the stewardship of the National Marine Fisheries Service, and significant numbers in the Chesapeake would merit recommendations for further steps toward mitigating harmful conditions. The question was how to go about the daunting, costly task of surveying such a broad marine area.

The answer represented a confluence of traditional and very new scientific methods, and derived directly from the anecdotal sightings that had intrigued researchers and alerted them to the potential higher presence of bottlenose dolphins than suspected previously. Rather than trying to tackle the problem single-handedly, the researchers at UMCES turned to crowdsourcing via citizen scientists. By spring of 2017, they developed and launched Chesapeake DolphinWatch, an online and mobile app allowing members of the Bay community to report dolphins via photos, videos, and locators.

From 2017 to 2019, gathering data between April and October, the team collected a remarkable amount of evidence from registered users of the app, 2,907 reports altogether. Of these, the team was able to verify 1,788 by directly contacting the sources of the reports, comparing imagery and videos to negate duplication, and aligning these reports with additional scientific data being gathered at the same time through other means. Fortunately for their study, there were no other species of dolphins nor marine mammals for app users to confuse sightings with.

For the whole duration of the DolphinWatch project, the study's authors also deployed hydrophones, acoustic recorders designed to detect cetacean communication, at a few key locations around the bay such as at the mouth of tributaries where more sightings had occurred. They additionally took regular measurements of water salinity and temperature in the coastal parts of the bay that were proving most frequented by dolphins, though dolphins also appeared in the bay's mainstem. Because the documented

ranges of salinity and temperatures matched preferred ranges for dolphins' favorite species of fish, these features were stand-ins for assessing how dolphin distribution aligned with prey distribution.

Ultimately, through this combination of crowdsourcing data collection and using more traditional scientific instruments and measuring tools, the UMCES team was able to assemble a working model of the distribution of dolphins across the Chesapeake Bay. Along the way, they also established predictive criteria based on their combined data and successfully predicted distribution during an upcoming season. With this information in hand, project leaders were able to enhance concerned parties' awareness of the significant numbers of dolphins currently frequenting bay and tributary waters, including the National Marine Fisheries and the naval base at Norfolk. They also specifically advocated for more official protective measures to shield dolphins from the effects of human construction and commercial and naval shipping in addition to general recreation activities around this busy estuary.

In their report, which detailed not only their vital findings but also the success of their investigative methods, the UMCES researchers emphasized that there are both logistical and auxiliary benefits to inviting citizen scientists to play a direct role in an important and geographically widespread investigation. Logistically, the team was able to significantly reduce costs and accelerate the timetable of their research by intentionally incorporating citizen data from the start.

But outside of the immediately obvious benefits to their own project, the authors pointed out, users of the app eagerly immersed themselves in the ecosystem of the Chesapeake Bay, whether through sailing or visiting beaches or swimming. They invested time and energy to pay attention to and help protect another species enjoying the same waters. In that sense, the overall mission of the study – to document and forge better protections for dolphin populations in the bay – was achieved two times over. Based on their highly successful experience, the report writers recommended that this inclusive model of study be used elsewhere in order to increase community members' sense of personal investment in and stewardship of waterways while benefiting scientists by dispersing some of the responsibility of species documentation.