THE DEVELOPMENT OF LOCAL AND GLOBAL CITIZEN-SCIENCE SEA TURTLE MONITORING

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Geographic Information Systems (GIS) are changing how ecosystems and individual species are monitored by providing ease of access to wide-scale spatial views. With recent developments in web-based GIS, citizen-scientists are now able to participate with researchers in scientific studies by providing data points of their own observations. Recently, we developed and launched two interactive maps with nine editable fields for logging in-water turtle sightings around the islands of Roatán and Utila, located in the Bay Islands of Honduras. Ninety-eight dive site locations for the island of Roatán and 74 dive site locations for the island of Utila were mapped with lat/long positions on Esri's ArcGIS Online web map. We embedded these maps on the website for the Protective Turtle Ecology Center for Training, Outreach, and Research, Inc. (ProTECTOR, Inc.) and distributed it to dive shops on Roatán for use in logging turtle in-water sightings, and uploading photographs and metadata. Dive shops on Utila have not yet been provided with the sightings link because we have not returned to that island since the maps were launched. To date, 105 sea turtle sightings have been logged for the Roatán map. However, we recognized that dive tourists do not always have immediate access to a computer to log sea turtle sightings. In order to facilitate the collection of important information, smartphone applications designed to map wildlife sightings are used for citizen-scientists to aid researchers in collecting scientific data. Many smartphone applications are currently available for Androids and iPhones that help log animal information worldwide utilizing GPS positions from the user's phone. We recently designed a smartphone application called *Turtles Uniting Researchers and Tourists (TURT)* for logging global citizen-science sea turtle sightings. We utilized Esri's AppStudio native quick report template to specify the basic identifying application information, insert the feature class, and create custom code to provide instructions for logging information. The feature class was then linked to our interactive web map in order to facilitate the ease of logging sightings on Roatán without having to use a computer. We limited identifying information provided to the user to prevent poachers from taking advantage of GPS locations for turtle sightings. After TURT was released to the Google Play and Apple App stores, we announced the release of the application to the C-Turtle e-mail list and to dive shops in the Caribbean and southeast Asia. Currently, 146 separate turtle sightings consisting of 39 Greens, two Leatherbacks, 102 Hawksbills, two Loggerheads and one undetermined turtle have been logged for the United Kingdom, U.S. Virgin Islands, Honduras, Guam, and in the United States, Florida, Hawaii, and Texas. We suggest that dive guests should be engaged directly to inspire self-motivation to act as

citizen-scientists. However, we have found it challenging to engage the public and other researchers to use these applications, and are currently considering the use of incentives. These data may allow marine protected area managers to easily estimate and monitor sea turtle populations with the combined use of TURT and region-specific web maps.

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