Survey Toolkit for Marine Species Data Collection: 2015 Annual Progress Report

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Cover Photo Credit:

Humpback whale flukes (*Megaptera novaeangliae*). Photo taken by Michael Richlen under National Marine Fisheries Service permit no. 16239.

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FIgures

Acronyms and Abbreviations

GIS	Geographic Information Systems
MSM	Navy Marine Species Monitoring
QC	Quality Control

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1. Background

The Navy has identified the need to develop a survey data collection platform based on the standardized Navy Marine Species Monitoring (MSM) program data standards. The platform needs to streamline collection scenarios, minimize manual data management requirements, facilitate QA/QC and reporting, and ensure consistency of data collection across the program. In response to this need, and in collaboration with the Navy Living Marine Resources program, *fin* (no associated acronym) is intended to be an integrated survey data collection and data management system to facilitate work conducted during marine species surveys. The final product will include a mobile platform for data collection, a web portal to set up surveys and access data products, and a server database management system.

The MSM program supports a variety of data collection scenarios and technologies. The preliminary version of the *fin* platform is to address the needs of the most common visual survey types: shore-based (theodolite), vessel-based, and aerial-based. All platform types will maintain consistency with the Navy's MSM Program data standard which specifies field names, aliases, data types, units and descriptions for data that are collected in the field. Each collection scenario will use a subset of fields specified in the data standard.

HDR's *fin* survey toolkit integrates current mobile and web technologies to allow efficient real-time data collection, processing, reporting, and delivery of marine species data. This system consists of both a mobile mapping application that functions in areas without network or cellular connectivity, and a web-based interface utilized for survey setup, Quality Control (QC), team collaboration, and preliminary data processing/reporting.

2. *fin* Technical Details

2.1 Mobile Application

The mobile application (app) will run on the Apple iPad platform, and will be the primary interface for the collection of field data. The mobile app will include mapping capabilities for navigation and data collection. It will have the ability to display the data stream (e.g., sightings and effort), relevant auxiliary data (e.g. range complex boundaries, exclusion zones, Passive Acoustic Monitoring stations, pinnacles, etc.), and customizable basemap layers (e.g., bathymetry, ortho-imagery). Users will be able to pan and zoom on the map, and control the visibility of data layers on the map. Users will have the ability to search the attributes of collected data and auxiliary data, and zoom to the search results.

Customizable data fields will allow users to collect data relevant to each survey type with ancillary objects (e.g. focal-follow studies, biopsy collection, satellite tagging, etc.). All data collected will be stored in relational databases adhering to the Navy MSM data standard.

Data collected with the mobile app will be synchronized to a central database server via Wi-Fi, cellular data connection, or removable media storage such as a USB drive or external hard drive. Transmitting collected data ensures that information is archived and protected, while allowing for collaborative QC review and editing through a web-based user interface. Data will also be able to be backed up, edited, and managed on the local device when internet/network connectivity is unavailable.

2.2 Web-based Application

The web-based application will be the central interface for the management of marine species surveys and data. It will also allow access from any internet-connected computer, allowing field crews, biologists, and program managers from multiple locations to actively collaborate on surveys.

Field crews will use the web application to verify and perform QC checks on data uploaded from the mobile app. Accessing this data via the web will not only allow field crews to verify that collected data has been successfully transmitted to the server, but also provide an opportunity to review and annotate field data remotely from laptop computers (Windows based and Mac). If internet access is unavailable, QC checks in the field can be conducted in the mobile app.

Prior to initiating a survey, the web-portal will be used to create a new survey, assign authorized users to a survey and configure survey information including tracklines, waypoints, species lists, equipment descriptions, etc. The web portal will also provide instructions for the loading of pre-built basemaps. These basemaps will be available for the most common survey areas. Pre-built basemaps will cover the instrumented Navy training ranges and other areas of interest. Instructions will detail the creation and loading of custom basemaps directly onto the field iPad for surveys. The web portal will also provide instructions to load any additional feature data required for the survey including tidal data, track lines, waypoints of interest, passive acoustic mooring positions, etc.

After the survey is completed and the data is synced to a central database server, the primary access to the survey data will occur through a web-based interface. This user interface allows access to the centralized back end database, and facilitates QC review and editing. It allows a broader set of specified users (field crews, biologists, program managers, external clients) access to the data, while controlling access through the use of user accounts and permissions. Program managers will use the web application interface to monitor data collection, QC activity, generate summary reports, and export data.

While primary data transmission will be via wireless sync to the central database server, methods to manually backup the field data locally and save to removable media will also be available.

3. Progress

A functional requirements document outlining *fin* development, specifications, user “stories” for functional operation, and overall capabilities has been completed. This living document serves as a roadmap for the development team and provides a basis for application benchmark testing. The Geographic Information Systems (GIS) Data Model documentation has also been finalized and incorporated into the base application. Programming for the web application as well as the mobile field app including the three primary survey platforms (aerial, vessel, and shore-based) is ongoing. Desktop and initial development testing and validation will commence in summer 2016, followed by functional field testing by a focused user group. The final toolkit is anticipated to be complete and available for general use by spring of 2017.

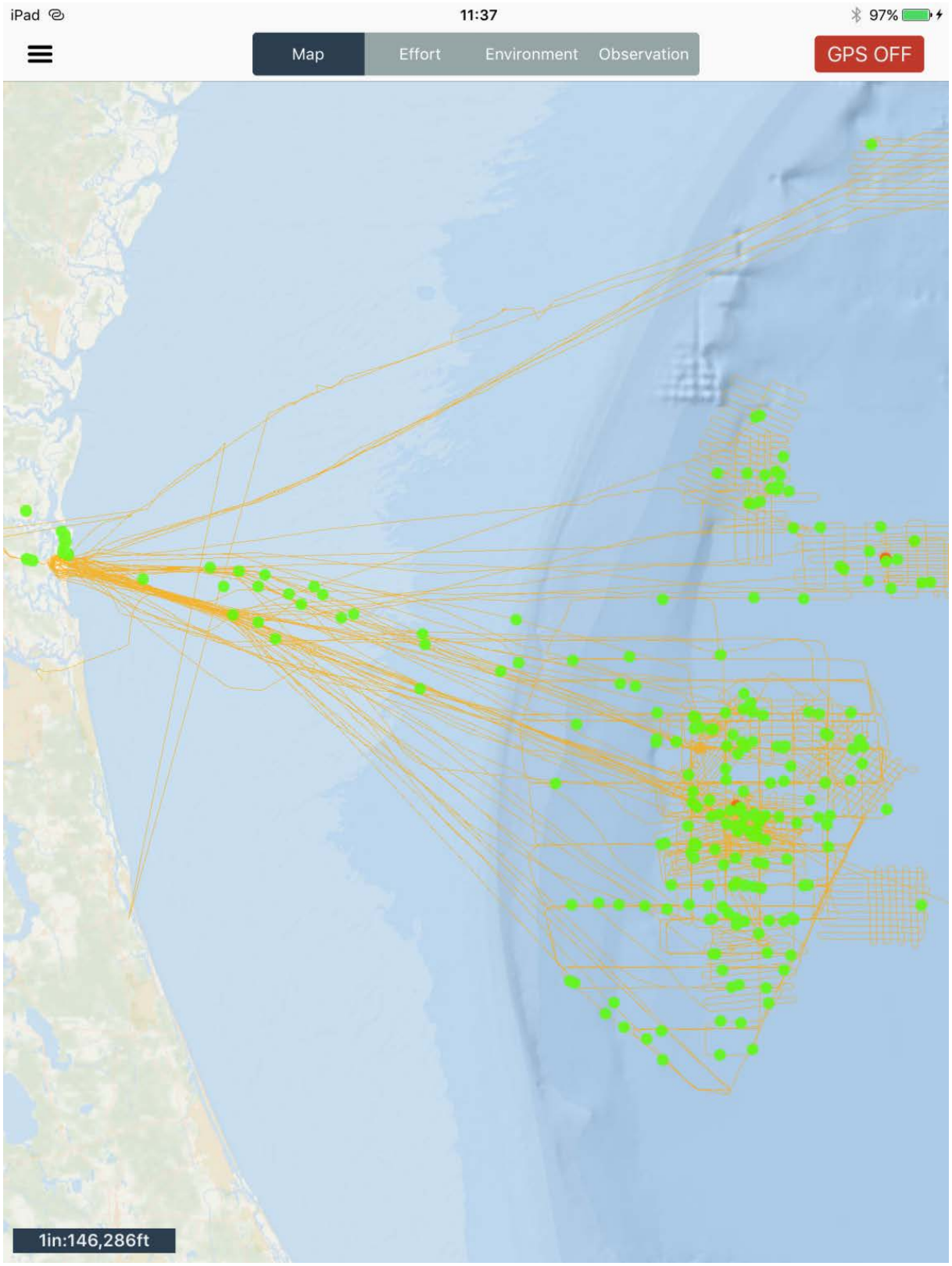

Figure 1. Screenshot of the map view of cumulative aerial survey data collected with *fin* off of the Florida coast. The orange lines are the airplane's tracks, the green dots are the sightings, and the red dots are re-sightings.

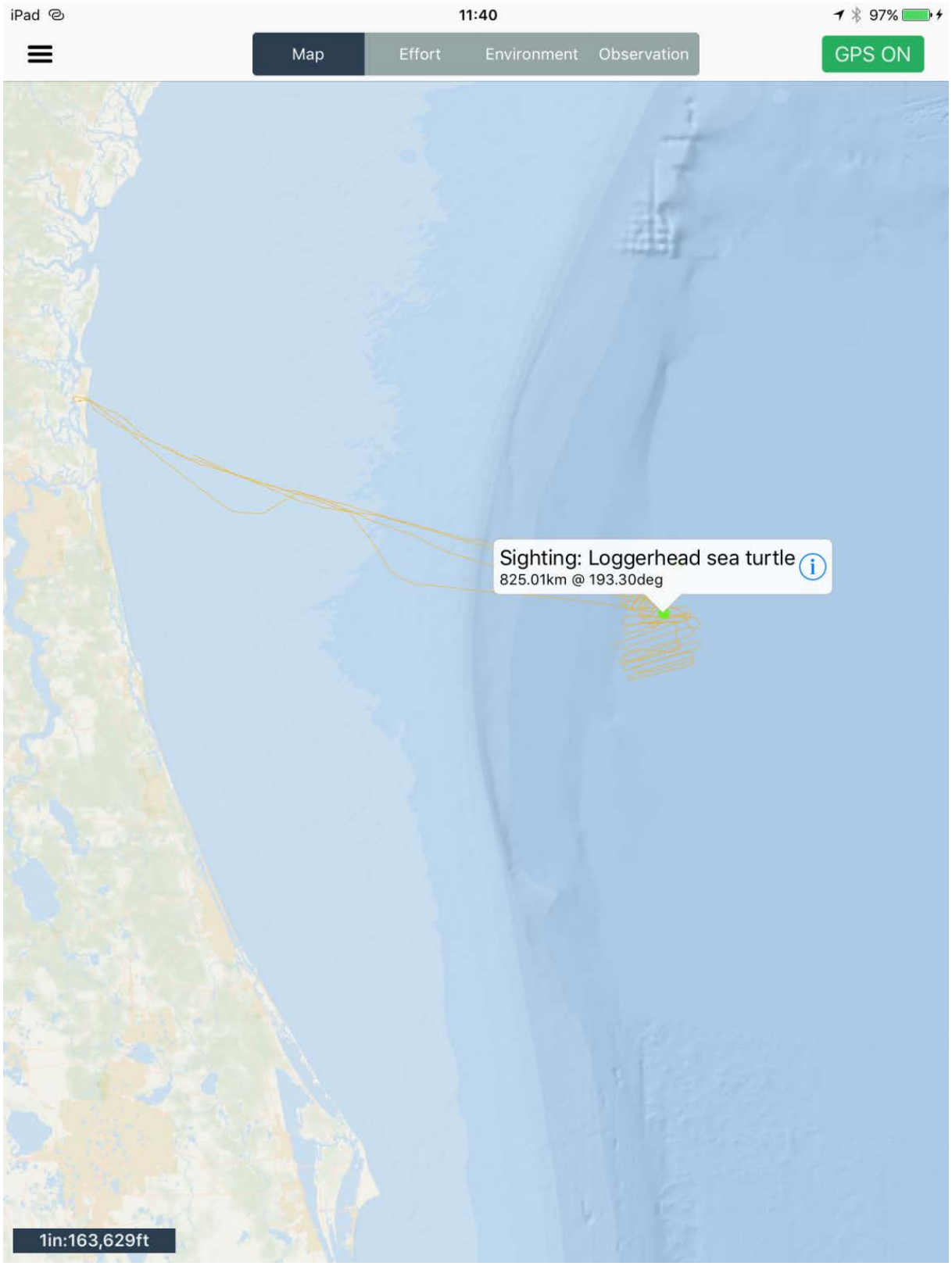

Figure 2. Screenshot of a single day of aerial surveys with sighting information highlighted (note: the distance and bearing are taken from the platform and in this instance, the screenshot was taken with the iPad in Virginia Beach).

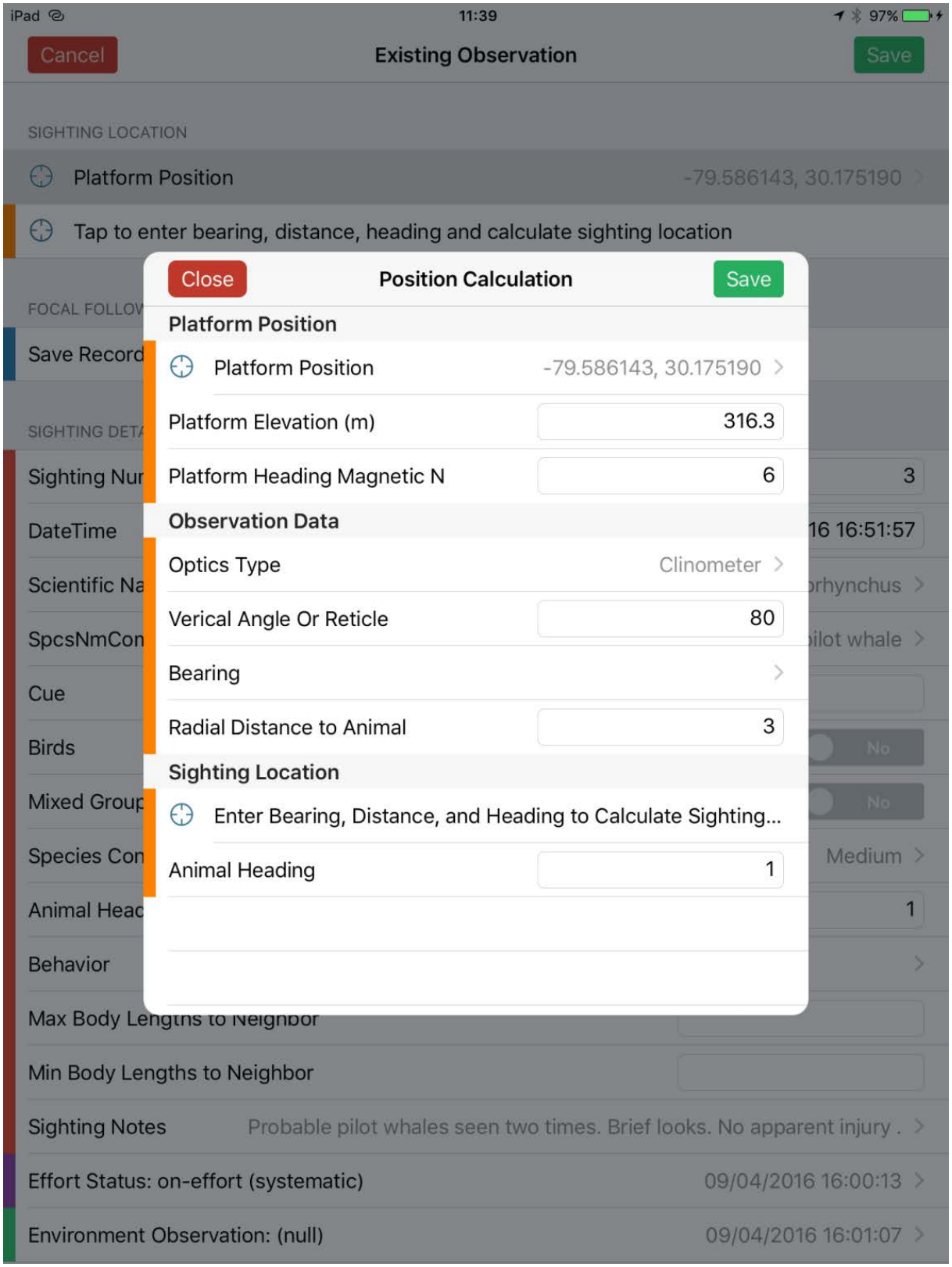

Figure 3. Screenshot of the data collection view of *fin*. This figure shows the sighting input for an aerial survey observation.