

Mobile Avian Survey Data Collection Software Application (SeaScribe)

Final Report



US Department of the Interior
Bureau of Ocean Energy Management
Office of Renewable Energy Programs



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DISCLAIMER

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ACRONYMS, ABBREVIATIONS, AND SYMBOLS

Ad	adult
BOEM	Bureau of Ocean Energy Management
BRI	Biodiversity Research Institute, Inc.
BSEE	Bureau of Safety and Environmental Enforcement
CSV	comma-separated value format
GMT	Greenwich Mean Time
GPS	geographic positioning system
HDOP	horizontal dilution of precision
JS	JavaScript
Juv	juvenile
M	meter
OS	operating system
QA/QC	quality assurance/quality control
SST	sea surface temperature
TGS	Tilson Government Services, LLC
USFWS	U.S. Fish and Wildlife Service
XML	extensible markup language

1 SUMMARY

Offshore surveys for wildlife, including seabirds, marine mammals, and sea turtles, are necessary to collect baseline and project-specific data for offshore development. We created a modern survey application designed for Android and iOS platforms, such as tablets and smartphones, to leverage the power and ubiquity of these devices. This application, SeaScribe, should greatly improve data standardization and work flow, reduce data entry errors, and decrease time from raw data output to finalized dataset for analysis. SeaScribe was developed using a cross-platform development environment which not only allowed for faster initial development but will make future enhancements and fixes quicker. This application is available freely to the public and we hope it will become the standard application for marine wildlife survey data collection.

2 OBJECTIVES

- 1) Create a multi-platform marine animal survey data collection application for iOS and Android operating system (OS) mobile devices.
- 2) Test and release survey program to BOEM for redistribution.

3 PROJECT TASKS

- Task 1: Initial project meeting with BSEE/BOEM staff.
- Task 2: Gather user requirements of the proposed software.
- Task 3: Formulate a design and plan for the software.
- Task 4: Develop the software (core development).
- Task 5: Alpha test the application within BOEM.
- Task 6: Design beta version and field test the application.
- Task 7: Refine the application and fix bugs.
- Task 8: Final application release.
- Task 9: Final report and application documentation.
- Task 10: iTunes store acceptance and release.

4 APPLICATION DESIGN

4.1 Technical approach

Offshore seabird, marine mammal, and sea turtle surveys are necessary to collect baseline and project-specific data for offshore development. Previously, there were only a couple of computer applications designed to collect such data in the field (e.g., dLOG, Seebird). These programs are antiquated and sometimes difficult to use with little or no ability to be run using current handheld computing infrastructure, such as tablet computers and smart phones. However, computer tablets and smartphones are now ubiquitous, usually have onboard GPS, Wi-Fi, or cellular connectivity, are relatively low cost, and are easy to weather-proof. Creating a modern survey data collection program brings standardization and improved performance to BOEM for deployment to those performing marine animal surveys. We designed this program to have better, built in, on-the-fly data checking, improve data standardization across surveys, improve data entry, and speed up time to availability of quality-controlled data. The application was designed to collect core data but also to give users the flexibility to add data fields as necessary to satisfy research needs. In order to achieve a modern application for this environment, we built SeaScribe from the ground up to best utilize the most current hardware and software. We also used a cross-development platform to allow for development in one language to be deployed across both Android and Apple iOS operating systems. This streamlined our development to reduce redundancy in development and dramatically reduce time to release to both major platforms. This will also assist with future updates to both platforms.

5 APPLICATION DEVELOPMENT

We determined specifications for SeaScribe by both looking at the suite of existing survey applications, and by polling potential end-users for specifications they would like to see in a survey application. Looking at existing applications allowed us to understand the positive and negative aspects of these programs, while polling users gave us a good understanding of their needs and desires in such an application.

5.1 Existing survey applications

We looked at programs dLOG (Ford 1999), SeeBird (Balance 2011), and the Eastern Canadian Seabirds at Sea (ECSAS) database program (Gjerdrum et al. 2012) for reference. All BRI staff had significant practice using dLOG and collecting survey data in general and were aware of design features and flaws that contributed to a good survey application. Specifically, we wanted to improve on those areas of deficiency in these existing programs, such as limits in operating system and hardware, limited standardization, limited field types and lengths, limited or no reporting or export functionality, reduced distribution, and lack of good documentation.

5.2 End-user questionnaire and responses

We developed a Google survey form and sent this to 66 potential end-users. The survey asked respondents about hardware specifications, the fields that should be included as core and ancillary data fields, mapping specifications, additional requirements such as camera and voice, storage and data output types, and additional comments (see APPENDIX 1).

We received responses from 10 survey respondents, but all were experienced end-users involved in many offshore survey programs. We summarized results of the end-user survey in APPENDIX 2: RESPONSES TO THE END-USER QUESTIONNAIRE. Specific responses to the questionnaire helped us hone in on target devices and application specifications for development.

5.3 Design specifications

By combining our efforts to understand existing programs with specifications from end-users, we were able to come up with a list of non-functional and functional design specifications for the app. All of the non-functional requirements, and most of the initially specified functional requirements, were implemented in SeaScribe. The original specifications are outlined below.

5.3.1 Software non-functional requirements

The software non-functional requirements are those that qualitatively describe the application design. These requirements are more conceptual in nature. Avian survey app non-functional requirements were:

- 1) Intuitive design.
- 2) Obvious workflow from one data collection step to the next.
- 3) Follows the natural flow of surveys to lead observers through steps of forms on the application.
- 4) Clear, readable text and buttons.
- 5) Flexibility to expand data collection methods within reason.

5.3.2 Software functional requirements:

The software functional requirements are those that define the operating function of the application to include form and function such as placement of specific fields, data stored, storage type, error checking, and additional functionality necessary to collect all data for avian surveys at sea. Avian survey app functional requirements are broken down by category and are included below.

5.3.2.1 *Geospatial data collection*

This is the core spatial data collected by the device or external GPS receiver. GPS will be used to supply positioning, errors, and date/time in GMT. GPS positioning will also record vertical positioning in the track data to record survey height particularly when used with aircraft.

- 1) GPS positioning and accuracy with the ability to capture either onboard GPS or external GPS via Bluetooth communications.
- 2) Map view of the current position, planned transects, and other geophysical and political features as desired.
- 3) Map viewed in separate tab with option to move to main screen on larger tablets.
- 4) Data field to capture GPS HDOP (horizontal position) errors.
- 5) Border color of screen to indicate GPS functioning, and error within reason or by enabling audible warning.
- 6) Ability to collect observation data while GPS down, but must be clear to user that GPS is down so that they can choose to stop data collection if necessary.

5.3.2.2 *Metadata*

Record key information regarding all aspects of the survey so that users can reconstruct the effort that was made to assist data analysis. This information will typically be collected once at the beginning of the survey to define a series of transects and observations.

- 1) Metadata fields captured and recorded to include survey and transect data as well as conditions that affect detection such as visibility, location on the ship, name and type of vessel, start and end (air)ports, observer names, contact information, and experience levels.
- 2) Describe data collection methodology before starting each survey – fixed width, line transect, and combined. Flying birds counted continuously, snapshot, or vector. Counting on one side of ship or both? Width of transects? Number of observers?

5.3.2.3 *Observation field data collection*

Core fields will capture all necessary data to define survey observations based on the survey type. Ancillary data fields will be available to add to the data form, some being commonly used, others less so, but we will create a standard list of additional variables that can be added to the observation entry form with standardized field names, descriptors, and data types. We will allow the user to create additional fields, but will try to as much as possible to include all possible fields to choose from to improve data standardization.

- 1) Core observation fields, such as species, will be hard coded into the input fields and linked to survey conditions data.
 - a. Auto-entry fields: latitude, longitude, date, time, transect ID.
 - b. User-entered fields: species code, number observed, behavior, direction of movement, age, plumage, sex, flight height, angle to object, distance to object as a value or distance bin (based on method used).
- 2) Ancillary fields
 - a. Association code (what animal was associated with, including cetaceans, garbage, etc.).
 - b. Indication of whether animal was flying or on the water.

- c. Presence of fishing vessels and activity.
- 3) Spreadsheet function to allow quick viewing of data records and editing – location of spreadsheet could be tab or bottom of the screen.
- 4) Extensive comments field.
- 5) Ability to add customized fields, code lists, and constraints.
- 6) Pre-populated picklist fields with the most commonly selected items at the top of the list if possible.
 - a. Picklist-fields: species code, behavior, direction of movement (NE, S, W, etc.), age (1st winter, 3rd year, etc.), plumage, sex.
 - b. Users will be able to start typing entries and have the list scroll to the entry. Info about selected entry may be available to guide user to correct selection. For example, full species name given for species code.
 - c. The species list will be fixed unless the user chooses to add an additional species to the picklist through a separate form.
- 7) Automate observation condition queries with a popup – user can set frequency of popup or we may be able to have the program request conditions upon >75 degree heading change. Carry observation conditions (sea state, visibility, glare, observation position on vessel) to each observation record, changing when prompted or on user change.
- 8) Ability to enter general field observation notes without entering other observation information (e.g. NOTE).
- 9) Ability to enable timer for snapshots for flying birds based on ship speed.

5.3.2.4 *Transect data collection*

These data describe the transects that are being conducted during surveys. Again, core and ancillary data fields will be used to help with data standardization.

- 1) Core transect fields: position at beginning and end of transect, ship speed, ship course, transect number or name (allow for user pre-entered transect IDs), length, vessel activity, whether observer was indoors or outdoors, side of ship used for observations, transect width, visibility for each observer.
- 2) Ancillary fields: lights present (near infrared, street lights, moonlight), seasurface temperature (SST), air temperature, sea state.

5.3.2.5 *Data validation*

Data validation during field collection will be an important process to ensure higher quality data. Some of these steps involve error checking algorithms running when data is entered and others are structural in that they force users to enter data codes (e.g., species codes) or only in a certain format (bearing to object as a numeric). This will greatly aid in post-processing and lessen the time needed to produce high quality data that is more likely to be accepted.

- 1) Use specific sets of codes (species, behavior, age, plumage, sex) predetermined with pick lists and showing species name to observer for visual check of selection.
- 2) Check specific behaviors against taxa (e.g., birds can't breach, whales can't fly).
- 3) Checks on numbers entered for animal observations – have a threshold value to activate a pop-up for data entry verification (e.g. “Do you really want to enter 200 Common Terns?”). Could have different thresholds depending on species, and an on/off switch that turns itself back on after a given amount of time elapses.
- 4) When data check is enabled and user specifies that yes, they saw 200 Common Terns, entry will be labeled with GOOD notification.

5.3.2.6 Data Storage

We anticipate providing data in several formats for end-users when each dataset is stored and emailed at the end of the survey. Furthermore, a conversion tool should be available to convert to several other frequently used data types upon request.

- 1) Data storage in a format such as XML or JSON that can be easily loaded to geospatial database or mapped directly.
- 2) Data output to common table formats such as CSV and Excel and other formats as requested during the exploration task.
- 3) Data file name standardizations to include survey name, dates, and other info that may help identify the dataset from the name.
- 4) Export finished dataset through email when internet is available. Apple devices make file removal difficult and setting up auto-email transfer capabilities will help ensure that data are being backed up appropriately and also sent to other users for additional QA/QC as needed or analysis.

5.4 Development

5.4.1 SeaScribe development environment

SeaScribe is an HTML5/CSS3/JavaScript application written using Apache Cordova 5.0.0 (<https://cordova.apache.org/>) to target multiple mobile operating systems with a single code base. It was developed using the JetBrains WebStorm IDE (Integrated Development Environment), v10.0.2 (<https://www.jetbrains.com/webstorm/>).

Cordova requires the developer to have an environment set up for each target operating system. For SeaScribe, the following environments were used (Table 1):

Table 1. OS-specific development environment.

OS	Development environment
Android	Windows 7 Professional, 64-bit
iOS	Apple MacBook Pro, OS X (Yosemite) 10.10.5, with Xcode 7.2

SeaScribe also relies on the following open-source projects (Table 2):

Table 2. Open-source projects used to develop SeaScribe.

Project	Version	Purpose	Link
AngularJS	1.3.6	JS application framework	https://angularjs.org/
Ionic	1.0.0-rc.5	JS UI SDK	http://ionicframework.com/
SQLite	n/a	SQL database engine	https://www.sqlite.org/
jQuery	1.11.2	JS library	https://jquery.com/
jQuery UI Layout	1.4.4	JS UI layout library	http://layout.jquery-dev.com/
Leaflet	0.7.3	JS library for interactive maps	http://leafletjs.com/
L.TileLayer.Cordova	n/a	Leaflet extension for caching maps	https://github.com/gregallensworth/L.TileLayer.Cordova
esri-leaflet	1.0.0-rc.8	Leaflet extension for ArcGIS maps	https://github.com/Esri/esri-leaflet
MomentJS	2.8.4	JS datetime library	http://momentjs.com/
Mustache	n/a	JS templating engine	https://github.com/janl/mustache.js/
Papa Parse	4.1.1	JS CSV parser	http://papaparse.com/
SlickGrid	2.2	JS spreadsheet component	https://github.com/mleibman/SlickGrid/wiki
Spectrum	1.6	JS color picker	https://bgrins.github.io/spectrum/
Typeahead.js	0.11.1	JS typeahead component	https://twitter.github.io/typeahead.js/
Cordova-sqlite-storage	0.7.10	Cordova plugin to use SQLite on devices	https://github.com/litehelpers/Cordova-sqlite-storage
Cordova Email Plugin	0.8.2	Cordova plugin to compose and send emails	https://github.com/katzer/cordova-plugin-email-composer
Cordova Background Mode Plugin	0.6.4	Cordova plugin to keep app running in background	https://github.com/katzer/cordova-plugin-background-mode
Cordova Whitelist Plugin	1.1.1-dev	Cordova plugin to implement whitelist policy	https://github.com/apache/cordova-plugin-legacy-whitelist

SeaScribe makes use of the following Cordova plugins (Table 3; those marked with an asterisk are open-source projects that are listed in the table above; the others are “standard” plugins that are available via the Cordova command-line utility).

Table 3. Cordova plugins and version number used in developing SeaScribe.

Plugin	Version
PowerManagement	1.1.0
Keyboard	1.0.4
Whitelist (*)	1.1.1-dev
BackgroundMode (*)	0.6.4
EmailComposer (*)	0.8.2
Cordova sqlite storage plugin (*)	0.7.10
Camera	0.3.6
Console	0.2.13
Device	0.3.0
File	1.3.3
File Transfer	0.5.0
Geolocation	0.3.12
InAppBrowser	0.6.0
Media	0.2.16
Network Information	0.2.15
Splashscreen	1.0.0

5.4.2 Application wireframe development

We began the app development by creating a wireframe mockup of the app, setting up process flow within the app, and designing the look and feel of the major app components. We used two Android tablets, a 7” Nexus and 10” Samsung tablet to initially deploy to for wireframe development. The Android environment was easier to develop for because of the ease of deployment vs. the iOS environment for the iPad/iPhone. In the initial stages, we defined and created draft screen layouts and the flow of data entry from one data entry screen to the next. This process was critical for creating a usable product which feels natural and intuitive to work with while not putting a lot of effort initially into code development. Once completed, the wireframe mockup was submitted to BOEM for approval.

5.4.3 Alpha-level application development

Once BOEM approved the wireframe mockup, work began on the background development to support the functionality of the app including input forms, connections to tables, mapping and tools, followed by all of the detailed coding to support data entry, screen transitions, error checking, geo-referencing, exporting, reporting, and all of the other major and minor components of the app. Throughout the development, BRI and Tilson were in close contact, meeting every 1-2 weeks to test and refine the app internally prior to alpha application release. This was the most efficient process for early development as it allowed us to be able to comment on changes made

during development and head off any issues before too much work was done. This resulted in a more polished product at the end of alpha development than might have otherwise been possible.

5.4.4 Alpha testing

Once the alpha release was created, it was submitted to BOEM for internal alpha testing. BRI and Tilson met with BOEM staff (Josh Wadlington, Mary Boatman, and David Bigger) to have a mid-project meeting and get feedback on the alpha version of the application. This was an important meeting to guide the direction of SeaScribe to its final form.

5.4.5 Beta-level application development

Work began in earnest on the beta version of the application once the alpha release was approved by BOEM. Key work included improving usability of the data entry screens, tying in background data processes, and improving overall workflow, with continued internal testing and feedback on interim releases. This process of development and testing was critical for identifying early on areas that needed to be improved which greatly improved the final product and sped up the overall development process. Development continued until the application was at a point where all of the major design elements were in place and all of the planned functionality was in place resulting in the beta version. At this point it was important to send the application out for real-world beta testing to get feedback on the usability of the application as well as identify any bugs in the program.

5.5 Beta testing

We enlisted beta testers by emailing or speaking with both personal contacts and referrals for testers. We were able to get biologists that have conducted and were conducting seabird surveys to test the application in more rigorous “real world” scenarios. BRI also conducted several at-sea beta tests on local ferries to trial the device and application and provide direct feedback to developers. This was critical to be able to adequately test the application’s ability to capture data in real time and provide direct feedback on the usability of the product and identify bugs.

5.5.1 Testing protocol

We provided users with one of two Android devices with SeaScribe pre-loaded for testing. Along with the device, we sent them a testing guidance document with instructions on testing and suggested features to test (5.5.1.1), an evaluation form, and an overview of the beta release which contained basic documentation to enable them to use the application for testing purposes.

5.5.1.1 Suggested testing of features in SeaScribe

We requested beta testers: take SeaScribe into the field and make real observations either from a moving platform (preferred) or a fixed location to test all aspects of the data collection program from initial set up to editing and exporting of data.

Test the app for at least an hour can provide enough variability in observations to test the working features of data entry. Use the app on multiple occasions to allow you to test some of the other functions built into the app. If possible, make multiple trips to test.

- 1) Familiarize yourself with the home screen and make sure you can navigate to each of the main menu items (Start New Survey, Existing Surveys, Settings, and Tools).
- 2) Look through the various tools available to the user such as the Beaufort chart and calculating measurements for distance estimation.
- 3) Cache map tiles for offline (no internet) surveys.
- 4) Setup a survey with all of the survey methods and survey info.
- 5) Start a transect.
- 6) Collect observations.
 - a. Collect multiple records.
 - b. Edit records in the table.
 - c. Take a photo to associate with a record.
 - d. Record audio observations.
 - e. Flag records in the observation table.
 - f. Adjust the observation screen layout.
 - g. Change the sticky fields (sea state, observer, visibility).
- 7) Stop a survey.
- 8) Re-open a survey and start a new transect.
- 9) Edit data outside of the observation window.
- 10) Generate a report for a survey.
- 11) Export data to email and also Dropbox.
- 12) Look at data and map it if possible to check for accuracy of spatial data.

5.5.1.2 Survey App Evaluation Questions

We provided the following to testers to be able to provide structured feedback about SeaScribe:

Please fill in as much detail as you are able, once you have tested SeaScribe. We want opinion, good and bad, to make sure we produce the best possible product for end-users. Please report any bugs you find as soon as possible so we can make sure to fix these as soon as we can.

1. What device did you test on (Model and screen size)?
2. Were you able to conduct a trial survey with the app?
3. Did the app perform the task well in your opinion?
4. Did you find any bugs while using the app?
5. What were the major strengths of the app?
6. What were the major weaknesses?
7. Comment on the overall look and feel of SeaScribe.

8. Font sizes ok?
9. Button sizes ok?
10. Survey screen layout?
11. Transect screen layout?
12. Observation screen layout?
13. Does the app have a natural flow to work progression?
14. Ease of entering observations?
15. Speed to enter observations?
16. Is the ESRI map type a good one, or do you prefer another base map type?
17. What do you think of the app tools?
18. Are there additional tools you would like to see here?
19. Was the data easy to edit?
20. Was data output in a good format and correct?
21. Would you want data outputted in additional formats?
22. If you mapped the data, was it correctly mapped?
23. Did you like the data report? Was it useful and would you add to it?
24. Are there additional settings you would like to request for the app?
25. Do you have any other comments?

5.5.2 Beta testing results

We received feedback from 12 of 16 testers. Four testers did not provide feedback in time for this report, despite multiple attempts to elicit feedback. We will pass along any additional feedback we receive to BOEM when and if we get it.

5.5.2.1 *Positive feedback/major strengths*

Testers generally found SeaScribe to be intuitive, with good screen layout and work flow. Specific comments included:

- Overall look and feel is great.
- Option to select species and behaviors as a picklist is good.
- Moveable map great.
- Customizability of the app was very good.
- Good integration of photo and recording tools.
- Tool selection was useful.
- Simplicity of menu very nice.

5.5.2.2 Beta testing negative feedback and response

We summarized feedback from beta testers, as well as how we addressed those comments, either in updates to SeaScribe or clarifying information on why we chose not to (or could not) make those changes (Table 4).

Table 4. Beta testing feedback and response.

Suggested improvements	Result
Enlarge observation screen layout.	Able to adjust observation panes.
Move distance and angle up in observation data entry pane.	Moved up to just below count to increase data entry speed.
Make editing screen larger.	Able to adjust editing pane on obs. Screen.
CSV (text) output with integrated effort data and observations.	Designed to output this way – no improvement needed.
Integrate with physical keyboard.	Should be possible with Bluetooth- enabled keyboards.
Add an “outzone” field.	You can add ancillary fields to SeaScribe; this is not one of the core fields.
Stopping transect and returning to it was cumbersome.	We decided to not allow restarting of transects because it could lead to misinterpretation of data.
Speed of data entry, especially record saving.	We optimized order of fields as well as adding quick pick fields. Changing when GPS positions are grabbed greatly sped up record saving.
Found confusing to use at first, but with natural flow, documentation needed.	Documentation included.
Speed of data entry with typing is a problem. Using voice dictation would improve speed.	Voice dictation is possible natively through apps through the keyboard so it possible in a limited way and can really help with long comments and descriptions, but more development would be needed to get beyond basic dictation to voice control over the app.
White horses to describe sea state was not known, instead of white caps.	Illustrations of Beaufort sea state was taken from somewhere and no attempt was made to change the terminology use in it. We think the pictures and general text convey the meaning well.
Snapshot applies to both flying and swimming birds.	The app is meant to be broadly applicable and users must have a good understanding of the methodology in use.
Built in snapshot timer would be nice.	Not implemented here as a watch or other device could be used, possibly could be implemented in future updates. You can change the persistent field timer to whatever you want and could use this instead as a snapshot timer.
Pop-up keyboard was obscuring species list.	Modified how lists are filtered to help with this.

Suggested improvements	Result
Be able to add choices to pre-existing fields.	You can add to the species list but not to some of the other fields which we thought were comprehensive. You can add that field as an ancillary field to add these data, but this could be a future refinement.
Prefer to see visibility as an exact number.	Visibility is represented as a range vs. a code. The user could add a visibility field themselves and use codes.
Necessary to clear fields between observations.	This is not the case in the release version except for the persistent fields which are designed to be persistent. This was a design philosophy. Those fields can be ignored by the user.
GPS problems with frozen app.	GPS signal issues can lead to timeouts which the user can adjust and you can connect to and use external GPS if they can communicate with your device to improve signal.
Have the app be able to set the screen not to turn off.	Since this can be done in settings, it was not implemented in the app.
Exiting data editor screen returns you to the main menu and should return you to the list of transects.	Added to the future enhancements.
Species box disappears off the screen when moving to sticky (persistent) fields which takes too long to scroll back up to.	You can turn off the scroll to persistent if you want in settings. Screen space is limited so there are always trade-offs.
Using “linked with”: it would be nice to show the time in the drop-down with the observations and other info to differentiate between rows.	The list of possibly associated animals is in order from newest to oldest. We could add more data to the list, but it would likely get longer and messier. It is assumed that the linked objects are associated with the nearest one or two object records.
Meaning of popup icons – not clear enough to determine what they are.	Changed icons to be more indicative of what they do.
Generate report bug on one user’s device.	Fixed reporting function.
Continuing a transect resets the sticky data fields to empty status.	We removed the ability to continue a transect, so this is not applicable.
Update database button should be changed to something else to better reflect what it does.	Probably should change to Reset database or something else.
GPS connectivity must be considered as well as battery life.	Both issues are hardware specific but should be considered when purchasing and operating a device.
Protection of device from the elements.	Also hardware specific, but one good thing about tablets is that they are easier to protect from elements compared with a laptop.

Suggested improvements	Result
Screen will get slippery in the field, use an external keyboard.	We have tested one Bluetooth keyboard which does work with the Samsung device so we know it is possible to connect some external keyboards to some devices. Again, important to choose devices carefully. The better the device, the more likely it will work with other devices readily.
GPS timeout issues. The program should record time if GPS cords unavailable.	We have the user check the system time before the survey starts for just this reason. We record system time additional to GPS time to guard against this issue.
Software takes too much time to save audio records which sometime can be over 5 seconds.	The location is being captured as soon as the audio stops, we probably need to try to begin to capture the location on entry into the audio only section to improve performance as the getting location piece takes time. This may or may not be possible.
A trigger system (e.g., a mouse) would be more effective for finding and clicking icons on the screen.	We have not explored, but it is probably possible to connect external mouse-type devices to tablets or phones. This would be device-specific and currently beyond the scope of this work.
Use mouse buttons to click and save records.	Future updates could look at aircraft-specific modifications that would improve usability with tactile devices so one does not have to take their eyes away from viewing.
Observer info field not easy to scroll down.	Made as easy as possible the ability to scroll.
Age and maturity fields need a quick select.	Age and plumage fields have hotkeys that can be set in Settings-Hotkeys. Click on values to add as a quick-pick.
Plumage/maturity codes for Gannets not understood.	These are standard codes that need to be learned or translated as needed.
End transect comment unnecessary?	There is a need for this to add comments about survey conditions and any other comments about the survey.
User did not need the map and could have used more space for quick fill fields.	The observation form data entry pane can be expanded to fill the screen.
Maps take longer to load on zoom-out.	This is probably an artifact of loading tiles, more on zoom-out and none or less on zoom-in. This is partly dependent on device speed as well.
Is there a way to display all of the completed transects on a map?	We added this feature.
Add GPS test button.	Added to start transect.
It would be good to have a “?” next to various settings and objects to know what these were referring to.	We have created a manual that will be available with the app and can be referred to. We could consider adding in-line help in the future.

Suggested improvements	Result
Screen saving and shutdown mode were difficult to change.	This is device specific and can be changed. Future updates may be able to have a setting available for this, but it may depend on the device and OS.
Difficulty seeing menu with screen glare.	You may be able to get an anti-glare stick on screen to help and also we may be able to have different color palettes as a setting in future updates to help with glare.
When transects begins but no birds are recorded, is the start and end locations of the transect recorded?	Beginning and end positions are captured.
Be able to add top 5 species in quick pick list before survey.	This is one option, but we think our method works well and gets you there without having to change settings. May be possible to set as option top 5-10 species you expect to encounter as future update.
Add compass heading to map.	Likely possible based on internal three axis sensors. Future enhancement.
Add some tools such as sea state to observation form for quick access.	We add a couple of these tools here.
Inconsistent error with number and keypads on one device when moving from “distance” to “degree”.	Unable to reproduce this error. Could be an OS bug.

5.6 Internal OS version testing

SeaScribe was tested on the following operating systems:

Table 5. OS versions tested.

OS	Version
Android	4.4, 5.0, 5.1
iOS	8.3, 9.0, 9.1

Testing was an iterative process to identify and correct any bugs found in the process for each OS version tested. A script was followed (see APPENDIX 3: TESTING SCRIPT USED FOR INTERNAL TESTING OF SEASCRIBE) by the internal tester to make sure all aspects of the program were tested similarly across platforms and OS versions. All bugs were identified and corrected. This process was repeated until testing turned up no new errors for each OS version and platform (Android, iOS).

6 DOCUMENTATION

We provide a full set of documentation for SeaScribe detailing all aspects of using the application in a separate document. We expect this documentation to be available in Adobe PDF format for packaging with the application as reference.

7 APPLICATION RELEASE

7.1 Android

SeaScribe was released as version 1.0.1 for Android versions 4.4 (KitKat), 5.0 (Lollipop), and 5.1(Lollipop). SeaScribe for Android is available at <http://www.boem.gov/Renewable-Energy-Program-Mapping-and-Data/> at <http://www.briloon.org/SeaScribe> and at the Google Play store.

7.2 iOS

SeaScribe was released as version 1.0.1 for Apple iOS versions 8.3, 9.0, and 9.1. SeaScribe for iOS is only available through the iTunes app store.

8 FUTURE SEASCRIBE UPDATES AND ENHANCEMENTS

8.1 SeaScribe updates

It was not possible to address every concern/request from all testers as many of these either came in too late in development or we believed the change would be counter to what we felt was in the best interest of the app. However, some requested changes/additions we felt warranted listing for future enhancements.

- 1) Cache library – ask the user for a name to save the current cache request as; that name would then be the only thing displayed in the Offline Map Cache, making it very easy to navigate.
- 2) Add ability to add to/customize existing fields such as age and plumage in settings.
- 3) Suggest returning from data editor to the list of transects instead of the main menu.
- 4) Change “Update database” to “Reset database” or something that better reflects this function in Manage Data.
- 5) Add the ability to upload the database from another tablet.
- 6) In audio-only observations, saving takes too long possibly because the location is captured at the end of recording. Move this to start capturing the position at the beginning of recording, if that will help at all.
- 7) Future updates could look at aircraft specific modifications that would improve usability with tactile devices so one does not have to take their eyes away from viewing such as what is used with USFWS aircraft and a recording device they use.
- 8) Add in-line help for settings and options.
- 9) Have different color palettes as a setting to help with glare or color-blindness issues.

- 10) Add a snapshot tool that has a snapshot indicator based on the ship's speed.
- 11) Add compass heading to map to show direction of travel.

9 RECOMMENDATIONS

Android and iOS environments are in constant development. With the pace of development of devices and operating systems, it is recommended that a plan be put in place for updating SeaScribe to stay current with OS environments and devices. Furthermore, despite our best effort to test SeaScribe in real-world scenarios, it is inevitable that further bugs will be encountered that were not reported and addressed in this release of SeaScribe. We would recommend that, at least annually, SeaScribe be tested against the latest versions of the OS for Android and iOS and updated as needed to comply with these latest versions. It may be necessary to maintain historical versions for use on devices that can only support the older OS versions. During these updates, any enhancements can be decided upon and implemented and any bugs addressed. Documentation would then be updated to reflect these changes. We realize this is a commitment of time and money, but it will ensure that SeaScribe will be relevant and usable, and continue to provide standardized data for years to come.

A dedicated website should be set up to host SeaScribe and its documentation for ease of finding the app and deploying it. The Android version can be distributed as an Android .apk installer package, but a link will have to be made to the Apple iTunes app store for accessing and installing the iOS version for iPad or iPhone.

10 TECHNICAL SUPPORT

Requests for technical support for SeaScribe should be made through BOEM to boemseascribe@boem.gov. All bugs and suggestions for future enhancements should be sent here. This email address should be a group distribution list so that several people can monitor the use of SeaScribe.

REFERENCES

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- Ford, R.G. 1999. dLOG: data entry and real-time mapping program. Software and documentation for integration of GPS location and observer data. Portland, OR: RG Ford Consulting Company.
- Gjerdrum, C., D.A. Fifield, and S.I. Wilhelm. 2012. Eastern Canada Seabirds at Sea (ECSAS) standardized protocol for pelagic seabird surveys from moving and stationary platforms. Canadian Wildlife Service Technical Report Series No. 515. Atlantic Region. vi + 37 pp.

APPENDIX 1: AVIAN SURVEY APPLICATION END-USER FEATURES QUESTIONNAIRE

This questionnaire is intended to gather end-user suggestions for an avian survey application for tablet and smart-phone devices using the Android and iOS operating systems.

Name

Affiliation

Best contact phone number

If amenable, please include your phone number so that we can reach you for any follow up questions.

What type of surveys do you currently conduct, or are likely to conduct with this app?

- Boat-based marine surveys
- Aerial marine surveys
- Avian point counts
- Sea-watch surveys
- Beached-birds (carcass) surveys
- Oiling rate surveys
- Other:

What type(s) of entities do you intend to perform this work for?

- Federal
- State
- NGO
- Commercial
- International

Currently, what application(s) do you use to gather survey data?

List all that apply

- DLog
- Seebird
- Eastern Canada Seabirds at Sea database (ECSAS)
- SURVEY - USFWS voice recording program
- Other:

Currently what type of device for data collection do you use?

List all that apply

- Laptop computer
- Android tablet
- iPad
- Microsoft Tablet
- Smart Phone
- Paper data records
- Other:

What do you think would be the optimal platform for entering survey data?

- Apple iPad - 10"
- Apple iPad - 7"
- Android Tablet - 10"
- Android Tablet - 7"
- iPhone
- Android Phone

What would be the core fields you would include to describe the TRANSECT-level data beyond the following (transect ID, observation platform, weather conditions, visibility, observation height ASL)?

What ancillary data fields would you like to include at the TRANSECT level?

Ancillary data fields will be optional fields that can be added to the app when needed, but are not default fields.



What would be the core fields that you would include for species OBSERVATIONS beyond the following (date, time, observer, species, behavior, movement direction, distance to object, angle to object, comments)?



What ancillary observation data fields would you like to include?

Ancillary data fields will be optional fields that can be added to the app when needed, but are not default fields.



While surveys are underway, would you like to see a map of current location and track on the application?

- yes
- no
- I don't care

Where would you like to see a map in the app?

- At the bottom of the screen
- On the side of the screen
- As a tab on the screen
- I don't care
- Other:

Would you like to see a table of recorded observations?

- yes
- no
- I don't care

Where would you like to see a table of recorded observations in the app?

- At the bottom of the screen
- On the side of the screen
- As a tab on the screen
- I don't care
- Other:

Would you like to use audio capture for recording data?

- yes
- no
- I don't care

Would you like to use text to speech for recording data?

- yes
- no
- I don't care

Would you like to capture images using the device's on-board camera?

- yes
- no
- I don't care

What kinds of data quality checks should the application be doing?



What data storage/output type(s) would you ideally like to see?

- Comma separated value (CSV) file
- Excel
- KML
- GML
- GeoJSON
- ESRI file geodatabase
- ESRI personal geodatabase
- Shapefile
- Map Info TAB format
- TIGER
- Well-known text (WKT)
- Other:

Is there any near-real-time data analysis that would be beneficial for this app to produce?



Please comment on any additional functionality that you think would be useful for including in such an application:

Please add any additional comments here:

Would you be willing to beta test this application?

A tablet and/or iPad would be provided to you for testing purposes.

- yes
- no

Who else should take this survey?

Please recommend additional contact's email(s) and phone number if available.

Never submit passwords through Google Forms.

APPENDIX 2: RESPONSES TO THE END-USER QUESTIONNAIRE

1. What type of surveys do you currently conduct, or are likely to conduct with this app?
 - a. Boat-based marine surveys 9
 - b. Avian point counts 4
 - c. Aerial marine surveys 5
 - d. Sea-watch surveys 2
 - e. Beached-birds (carcass) surveys 1
 - f. Oiling rate surveys 0
 - g. Other
 - i. Seabird interactions with powerlines
2. What type(s) of entities do you intend to perform this work for?
 - a. Federal 8
 - b. State 6
 - c. NGO 3
 - d. Commercial 1
 - e. International 0
3. Currently, what applications(s) do you use to gather survey data?
 - a. DLOG 6
 - b. Seebird 2
 - c. Eastern Canadian Seabirds at Sea database 1
 - d. SURVEY – USFWS voice recording program 1
 - e. Other
 - i. Simple voice recorder
 - ii. Transcribe – USFWS transcription program
 - iii. I designed ship based and seawatch surveys using Cybertracker loaded onto a Trimble PDA
 - iv. Special DLOG Mobile App version
 - v. Digital recorder
4. Currently, what type of device for data collection do you use?
 - a. Laptop Computer 9
 - b. Android tablet 0
 - c. iPad 0
 - d. Microsoft Tablet 0
 - e. Smart Phone 0
 - f. Paper data records 2
 - g. Other
 - i. Voice recorder
 - ii. Trimble PDA
 - iii. Voice recorder for aerial surveys
 - iv. RECON rugged handhelds
5. What do you think would be the optimal platform for entering survey data?
 - a. Apple iPad – 10” 5
 - b. Apple iPad – 7” 0
 - c. Android Tablet – 10” 2
 - d. Android Tablet – 7” 2

- e. iPhone 0
 - f. Android Phone 0
6. What would be the core fields you would include to describe the transect-level data beyond the following (transect ID, observation platform, weather conditions, visibility, observation height ASL).
 - a. I'm not sure how to divide the list below into core versus ancillary, since for ECSAS we need them all. I guess the lowest common denominator from all your respondents would be the "core" set and all others would be ancillary? At any rate, other things we have in ECSAS include position at beginning and end of transect (automatically filled in via GPS), vessel activity (fishing, steaming, etc.), sea state, glare, wind speed and direction, ice conditions, vessel speed and direction, indication of whether observer was indoors or outdoors, distance sampling methodology (radial versus perpendicular distances recorded).
 - b. Latitude, longitude, Beaufort, ship's course, ship's speed, sun angle (glare position), side of ship if conducting a 90° quadrant survey, observations conditions.
 - c. Transect Width, Glare Conditions (forward/side glare), Sea State (wave height, swell height), Ship Speed, Note how survey protocols deal with flying birds (scans/continuous counts/other?). Also for some surveys we need to collect information on ice: ice type and concentration of ice.
 - d. Transect width (Editable Field, EF), Visibility for EACH OBSERVER (otherwise useless for culling data) EF, Counting to one Port or Starboard only? Distance? EF, Counting to Both sides? Distances? EF, Counting how far forward? EF
 - e. location (UTM or other)
 7. What Ancillary data fields would you like to include at the transect level?
 - a. Observations on transect and a field/column for observations off/between transect
 - b. Light present (such as Near Infra-red lights, moonlights, street lights, car lights, city lights)
 - c. SST, Air temp
 - d. Sea state (which could be separate from weather conditions or not); Perspective (starboard/port); Sample (In/out of viewing quadrant/transect); Transiting (vs. Stopped)
 - e. observer position (left back/right back; port/starboard)
 - f. Yes/No to following: Fixed width Tx method? Line Tx method? Combined Tx method? (i.e., strip fixed width tx, but some species more precisely surveyed using line tx methods). Flying birds counted continuously? Flying birds counted on scan? Flying birds counted by vector method?
 8. What would be the core fields that you would include for species OBSERVATIONS beyond the following (date, time, observer, species, behavior, movement direction, distance to object, angle to object, comments)?
 - a. Assuming you are implementing a relational database model (which I hope is true), then if observer is already in the transect level info, it is redundant to have it here (and breaks the rules for normal forms). However, if you want to allow for multiple observers then you might want to differentiate which observer saw which bird and having observer here makes sense (you would also need to provide for multiple observers at the transect level.). Other fields that we have found useful in ECSAS include: Latitude longitude of observation, Association code (what the bird was associated with including cetaceans, marine debris, garbage, oil, etc.), indication of whether animal was flying or on the water, count, age, plumage (e.g. molting?), sex.
 - b. Flight height, plumage, moult state, age, sex, association. Observer should be at the transect level.
 - c. Plumage, Age (immature, hatch year, 2nd year, etc). Also, we have found it very useful to have a "hotkey" (in Dlog) that designates that an observation has been correctly entered. We call it "GOOD #" and this entry goes into a comment field. The hotkey is used often when we have an "odd" sighting of birds that can seem like a data entry error. Typically this would involve species that you do not normally see concentrated in high numbers. For example we had an observation of 44 PIGU. The observer can quickly enter the comment "GOOD #" and we can confirm that this was a correct entry, and not a keystroke error that was not recognized right away. We have found

the "GOOD #" comment very useful later down the line when proofing data and it can be difficult to remember the specifics of one entry weeks ago.

- d. flight height, flight direction
 - e. observer #1 ID, Obs#1 obs conditions, (editable field EF), observer #2 ID, obs #2 obs conditions, (EF), latitude and longitude, exact distance to animal (as in your list), approx strip distance bin (0-50, 50-100, 100-200, 200-300, >300) (EF)
 - f. bird height, number of birds in a group, station location with respect to canopy openings, distance to edge
9. What ancillary observation data fields would you like to include?
- a. Presence/absence of fishing vessels, fishing activity, presence and behaviour of any associated marine mammals, feeding flocks are important (whether on fish or marine mammals). Perhaps include fields for angle and reticle if 25x150 ship-mounted binoculars are being used, such as when seabird observers are on board a marine mammal survey that are using bigeyes (used for flock surveys).
 - b. Fields to designate the name of the survey, vessel name, and observer ID.
 - c. age, plumage (breeding/nonbreeding); these can get very observer defined, so it would be nice to have pre-set entries. (1st year, 2nd year, etc.)
 - d. species association
 - e. Plumage (editable field, to distinguish Ad/Juv, or age 1,2,3 etc.), Comments field
 - f. predators present
10. While surveys are underway, would you like to see a map of current location and track on the application?
- a. Yes 7
 - b. No 1
 - c. I don't care 2
11. Where would you like to see a map in the app?
- a. As a tab on the screen 4
 - b. At the bottom of the screen 0
 - c. On the side of the screen 2
 - d. I don't care 3
 - e. Other
 - i. I think sometimes a map biases species ID
12. Would you like to see a table of recorded observations?
- a. Yes 9
 - b. No 0
 - c. I don't care 1
13. Where would you like to see a table of recorded observations in the app?
- a. At the bottom of the screen 0
 - b. On the side of the screen 0
 - c. As a tab on the screen 4
 - d. I don't care 4
 - e. Other
 - i. Top of the screen
 - ii. Either bottom or a tab
14. Would you like to use audio capture for recording data?
- a. Yes 5
 - b. No 3
 - c. I don't care 1
15. Would you like to use text to speech for recording data?
- a. Yes 4

- b. No 2
 - c. I don't care 4
16. Would you like to capture images using the device's on-board camera?
- a. Yes 3
 - b. No 2
 - c. I don't care 5
17. What kinds of data quality checks should the application be doing?
- a. Accuracy of transect, species alpha code
 - b. I think this will be difficult to do in a general way since the kinds of checks will depend upon the observation protocol being used. For example, in ECSAS the database checks for a whole variety of input errors that are specific to the ECSAS protocol. Perhaps you would need to provide some sort of "validation rule" facility similar to the validation rules available in Microsoft Access?
 - c. auto-validation of species codes upon entry, as well as auto-validation of the acceptable range of values for each field.
 - d. Have a specific set of species codes, behavior codes that are accepted. Prompt the observer if an incorrect code is entered.
 - e. It should make sure that the count, degree, and distance field is a number only, and it would be helpful if it gave options to select from a pre-set range of cardinal directions, visibility (1-10 or 1-5), beaufort (1-10), behaviors (with options to add details in the comments). It would be helpful to quality check that the species code is less than 5 letters.
 - f. GPS voice warning -- useful to hear on aerial surveys if GPS suddenly fails. GPS visual warning - Red icon = GPS NOT detected by software - Green icon = GPS detected by software - perhaps this can be a colored window with GPS with a real-time GPS stream.
 - g. Checking range of possible values, flag when outside range.
 - h. For murrelet surveys we need to check the height of the birds to the behavior and number of vocalizations to the behavior, etc.
18. What data storage/output type(s) would you ideally like to see?
- a. Comma separated value (CSV) file 7
 - b. Excel 5
 - c. Map Info TAB format 1
 - d. KML 2
 - e. ESRI file geodatabase 4
 - f. Shapefile 5
 - g. Other
 - i. Formatted for input to program Distance
 - ii. Most compatible is ASCII csv
 - iii. Access
19. Is there any near-real-time data analysis that would be beneficial for this app to produce?
- a. Perhaps a (potentially species specific) histogram of detection distances to give observers an idea of whether they are meeting distance sampling assumptions. Not really analysis, but fields showing current position, speed, heading, windspeed, etc. would be nice.
 - b. A running list of birds seen that day.
 - c. Yes. Densities. Perhaps if you have the user input the effective strip width, and the program uses distance traveled to calculate densities by species. Alternatively, if it could calculate effective strip width or densities using distance sampling with the inputted distances/degrees, that would be a bonus!
 - d. GPS stream on screen. Time on screen. Location and track on map
 - e. maybe, but not essential
 - f. Not sure at this point since I have never used this type of system for data collection

20. Please comment on any additional functionality that you think would be useful for including in such an application.
- a. One important point to keep in mind is the conditions in which some work is conducted. You don't want to use a platform that is difficult to use in rough weather (can it be secured so it's not tossed across deck), is fairly resistant to salt water spray, big enough screen to be useful, a screen that is resistant to sun glare)
 - b. In ECSAS, we found it necessary to have a third level in the hierarchy (besides Transect and Observation) that we call "Cruise" but could equally be described as something like "Survey". This contains information about the entire survey trip including vessel (or aircraft) name and type, start and end (air)port, start and end dates of the trip, etc
 - i. I'm presuming that you will be using either a built in (or connected) GPS to automatically give position speed and direction information?
 - ii. The ability to accept an external NMEA stream would be very useful. In ECSAS, we connect to Coast Guard ship data streams to not only get vessel position and speed but also wind speed and direction data from vessel sensors. Likewise, real-time sea surface temperature can sometimes be available in this way.
 - iii. I think voice recognition is essential (not sure if this is what you meant by "Text-to-speech"). I have provided this facility in the ECSAS database and it has revolutionized the way we collect data. No more wasting valuable observation time clicking on computer or tablet screens...
 - c. Some sort of data integrity check, or a program that can be run to check for data consistency and data entry errors in real time and/or at the end of the day. The end of the day data check should not be manual. There also needs to be a fully standardised set of 4-letter codes for bird names, and perhaps for other values and parameters as well.
 - d. I find it very useful for the program to be flexible in how species and number of birds are entered. It is nice to be able to either enter the species code first and then the number, or number of birds and then the species code. For our surveys we use the scan method to record flying birds. We have installed a 3rd party timer onto our survey laptops to chime when it is time to do a "scan". It would be nice to have this timer program built into the survey software.
 - e. I doubt that an on-board camera would have enough zoom to identify birds at-sea, but if so, it would be helpful.
 - f. 1) Transcription software similar to USFWS TRANSCRIBE program 2) A software tool that will spatially bin observations to transects at any spatial scale. Suggested output columns similar to BRI seabird tool: P/A, summed number, #/km², optional linear densities (#/km; #/NM ...), also option to sum taxa, i.e., storm petrels/ km²; storm petrels/ NM)
 - g. 1) should be a specific, NON EDITABLE approved species list in a drop down menu. 2) expected common species can be listed in dropdown, to include 20 or so species. all the rest can be retrieved from longer drop down
21. Please add any additional comments here:
- a. This is a great idea and I'm delighted to see that you're taking it on! I'm (Dave Fifield) the co-designer and sole programmer of the ECSAS database. I would be happy to share any lessons we've learned during development or be involved in further design discussions if that would be helpful. I suspect my co-designer, Carina Gjerdrum, would also be interested. I think the optimal type of device will depend on the particular survey conditions. I'm confused by your use of "text-to-speech" for recording data. Are you referring to voice recognition to automatically record data? This I believe is absolutely essential. However, "text-to-speech" usually refers to the computer reading information back to you and I'm not sure how this might be useful for "recording data" other than having the computer dictate what you have entered back to you? You're probably

already aware of CyberTracker but if not you might look at it for design ideas:

<http://www.cybertracker.org/>

- b. It is vitally important that data entry not compromise data collection. Data entry should not be so kludgy and burdensome that one is unable to conduct the survey. It should be designed so that a single observer can both collect and enter the data. Often there are personnel restraints that prohibit more than one or two bird observers on a research ship, and usually only one observer is available to stand watch. The data collection program's data entry should be lean and fast, yet comprehensive. Minimise keystrokes/tapping!
- c. I would like to have the survey data stored in a separate folder from the program system files to prevent files being damaged or mistakenly deleted by the user. From my experience it has been extremely useful to have a window at the top of the screen to catch data entry errors. On our version of dLOG we can move that screen around, but overwhelmingly our observers (and myself) prefer to have the review screen at the top.
- d. I can chat on the phone. I don't feel like writing 5 essays. You don't want aerial observers looking away from the water to record data.
- e. Critical that the output be compatible with majority of existing data from Alaska and North Pacific, and easily pulled into the North Pacific Pelagic Seabird Database, which currently houses 371,000+ transects.

APPENDIX 3: TESTING SCRIPT USED FOR INTERNAL TESTING OF SEASCRIBE

Use Keyboard "enter" button wherever possible.

Record default settings.

Create new Ancillary Field: Shiny; each; sort:8; select choices:2(true/Shiny; false/Normal)

Set GPS heartbeat to 60 seconds.

Create new Survey: Summer 1 Li\n/n//\\near Survey.

Create new Methodology: Default Linear.

Create new Observer: Minion 1.

Set number of Observers to 2, and attempt to add Minion 1 twice. (should fail)

Set number of observers to 5.

Create new Observers: Minion 1-5.

Create new Platform: HMS Number as aircraft.

Start transect: t1

Confirm time.

Set observer as new: "=A1"

Observe 10 Atlantic Puffins diving 100m to the North.

Observe 1 Harlequin Duck milling 0m away.

End Transect: Comment: 1 end to transect 1.

Turn on developer mode.

Turn on GPS spoofing.

Start transect: t2

Confirm time.

Observe 2 adult male Common Terns Flying North, 9m away at 90deg, with Breeding plumage. Comment: "They're going so fast." Picture: the inside of the tablet case.

Full-left-to-right swipe, as in the ios 'back' gesture.

End Transect: Comment: 1 end to transect 2: ";SELECT * FROM tableDoesntExist;--

Attempt to submit previous survey.

By email as JSON.

By email as CSV.

By Dropbox as JSON.

By Dropbox as CSV.

Configure Dropbox and GMail.

Attempt to submit previous survey.

By email as JSON.

By email as CSV.

By Dropbox as JSON.

By Dropbox as CSV.

Confirm 13 birds, and other survey data in submissions.

Cache local area from z8 to z9.

Cache local area from z10 to z12.

Scroll somewhat to the side and cache from z9 to z11.

Without moving, cash from z10 to z10.

Disable GPS heartbeat from settings.

Create new Survey: Summer 2 Linear Survey.

Create new Methodology: Phrenology.

Create new Observer: Jack the Ripper.

Create new Survey Platform: The Hindenburg.

Create new Ancillary Field: Knobs (count), creates Phrenology duplicate.

Start Transect: t3

End Transect.

Attempt to delete setup data.

Delete previous Survey.

Delete both Phrenology(s), Jack The Ripper, The Hindenburg, Knobs.

Create new Survey: Summer 3 Standing Survey.

Create new Methodology: Default idle.

Select existing Observers: Minion 1-2.

Create new Platform: The Cutler VLF Array.

Start transect: t4

Confirm time.

Toggle offline maps.

Check zoom levels of offline maps.

Observe 1 Harlequin Duck milling 0m away.

Add a new observer: Minion Prime.

Observe 1 Harlequin Duck, kleptoparasitizing 0m away.

Observe 0 Harlequin Ducks; should fail.

Switch sticky fields.

Observe 4 Rhinoceros Auklets, swimming, with audio "Auklet" and photo of Commercial Street

End Transect: Comment: 1 end to transect 4.

Re-enable GPS heartbeat.

Disable system GPS.

Create new Survey: Summer 4 Standing Survey.

Select existing Methodology: Default idle.

Select existing Observer: Minion 1.

Select existing Platform: The Cutler VLF Array.

Start transect: t5

Confirm time.

Observe 1 Harlequin Duck milling 0m away.

Observe 1 Harlequin Duck milling 0m away. Take three photos.

Fill in all fields for both prior observations.

Take an audio-only observation.

Switch sticky fields.

Attempt to create new observer Minion 3. when that fails, just add Minion 3 to the survey.

Take note of species shortcuts with order:

Observe 4 Rhinoceros Auklets with audio "Auklet" and photo of Commercial Street

Observe 2 Rhinoceros Auklets.

Observe 2 Rhinoceros Auklets.

Observe 2 Rhinoceros Auklets.

End Transect: Comment: 1 end to transect 5.

Start transect: delete Transect.

Toggle observation of old transect.

Observe distance estimation guide.

Observe Beaufort scale.

End Transect.

Delete previous transect.

Enable system GPS.

Edit existing data:

Ancillary Fields: add option to Shiny: Dire

Attempt to edit options for a non-editable ancillary field.

Attempt to create a new Ancillary Field: Shiny.

Survey Platforms: HMS Number is a boat.

Observers: Minion 1 is named Minion 2. (should fail)

Observers: Minion 1 is named Minion Bob.

Methodologies: Add shiny field to Default Linear.

Change field type of Shiny (not allowed)

Check how the changes appear.

View system info and export it via email.

Change Setting:

Change Mapping settings to 10, false, green, green, green, 100, 10, 20, 1000, false, true, 5, false, 60, false.

Change Hotkeys to {Juv, Imm, Ad}, None, {B, NB}.

Change a siting of a Harlequin Duck to a UNDU, and change its quantity to 88.

Test invalid data entry in a text field and a number field in Data Editor.

Start transect: j1.

Observe absence of persistent field checks.

Activate persistent field checks.

Start transect: j2.

Observe persistent field check behavior.

Set Alert settings to true, 900, true.

Observe the Beaufort Scale.

Check extreme values in Distance Estimation Guide.

Check 1,10,20=>500 in Distance Estimation Guide. (499?)

Observe the About page and visit one of the linked pages.

Create new Audio-only Survey.

Select existing Methodology: Default idle.

Select existing Observers: Minion 1-2.

Add ancillary field: new: Number of babies. Attempt to set max value less than min value. Use the clear button to start over.

Start Transect: A-T.

Start recording.

Stop recording.

Start recording.

Cancel recording.

Start recording.

Stop recording.

Edit observations inline: Set Number of babies to 5, 0.

Create new Survey: Summer 5 Standing Survey.

Select existing Methodology: Default idle.

Select existing Observers: Minion 1-2.

Select existing Platform: The Cutler VLF Array.

Start transect: t6

Confirm time.

Turn off GPS heartbeat.

Observe new hotkey configuration.

Wait 30 minutes.

Observe 1 Harlequin Duck milling 12m away.

Flag previous observation for deletion.

Immediately end the Transect: Comment: 1 end to transect 6.

Check data editor to see that observation was flagged.

Exit developer mode.

Delete previous Survey.

View a report of a previous survey.

Submit as HTML by email and by Dropbox.

Confirm that report is viewable as html.

Confirm that device prefix on file names is consistent.

Set GPS heartbeat to max time.

Create a new Survey: Summer 6 Standing Survey; Default title; Minion Bob; The Cutler VLF Array.

Start Transect: t7

Observe 1 XXXX; create new species named xxxxxxxx.

Observe 2 yyyyyyyy; create new species with code YYYY.

Observe 1 CORV.

Switch to email app.

Leave device overnight.

Switch back to SeaScribe.

Observe the persistent field flag and the auto-scroll to the persistent fields.

Observe 1 CORV with 3 photos and 3 audio recordings.

Observe 1 CORV with 1 photo and 1 audio recording.

Edit two CORV observations to be observations of 90 DUNL each.

Flag one DUNL and the CORV observation for deletion: "Just a note in my eye."

End Transect.

Go to Data Editor for previous transect.

Delete one audio and one photo from the triplet observation.

Delete the audio and video from the singleton observation.

Change one of the 90 DUNL observations to be 85.

Process only one of the deletes.

Attempt to set the species of the remaining observation to "false".

Submit previous survey as JSON by email from Data Editor.

Confirm overnight data collection in JSON.

Export the database to Dropbox.

Confirm some of the contents.

Reset all settings.

Check that settings have been reset to defaults.

Reset database.

Observe the absence of data in Data editor and Data Manager.

Clear the map cache.

Observe the persistent logs.

Export the persistent logs by email.



The Department of the Interior Mission

As the Nation’s principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the sound use of our land and water resources, protecting our fish, wildlife and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island communities.

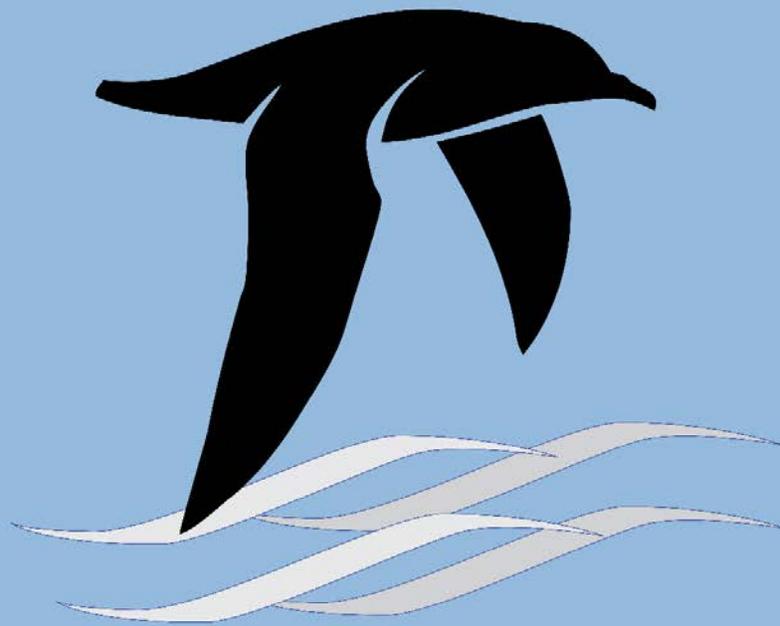


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The Bureau of Ocean Energy Management (BOEM) works to manage the exploration and development of the nation's offshore resources in a way that appropriately balances economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development and environmental reviews and studies.

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SeaScribe



USER'S GUIDE

10 March 2016



Avian Survey Application (SeaScribe) Manual

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1 Purpose

The seabird survey application for Android and iOS devices, hereafter referred to as SeaScribe, was developed to fill a need for a modern data collection application for seabird survey efforts. The challenge was to create an intuitive, flexible application that would be cross-platform for Android and iOS environments and usable on both phones and tablets. This application will be freely available and hopefully gain wide acceptance and use. It is specifically designed to greatly increase data standardization and allow more thorough data recording, as well as increase the speed of post-survey processing while reducing data errors. We also expect that this program will make digital marine surveys collected by citizen-scientists more accessible.

2 System requirements

SeaScribe runs on smartphones or tablets running Android version 4.4-5.1 and iOS version 8.3-9.1. While future OS versions may be compatible with SeaScribe, we make no guarantee that it will do so.

There is no minimum size allowed for use, however, we suggest use of a screen size no smaller than 7". The application was optimized for a 10" screen and we recommend this size tablet for optimal usability of the application.

Devices must have a built-in GPS or be able to obtain location services through attached GPS via Bluetooth or some other method. Location services must be enabled for the position information to be recorded in the survey app. A testing tool is provided in SeaScribe to test whether the GPS is operational. More information about this tool is provided later (see 6.2).

The device must be able to communicate via Wi-Fi or other data connection to the internet and must have a valid email account and/or Dropbox account to be able to export data. It is best if these accounts are set up prior to using SeaScribe.

We have done only limited testing of wireless keyboards and pointing devices (e.g., mice, trackballs) but they should be able to be used with SeaScribe as long as they work with the device itself. Use of wireless keyboards and pointing devices may assist with data entry.

3 Installing SeaScribe

3.1 Android

Installing the app to an Android device is very easy. You can visit the Google Play store and search for SeaScribe. Tap “INSTALL” to install the app. You may need to provide a password. Accept the special permissions to continue to install. The application will be downloaded and installed.

Alternatively, download the installer file (SeaScribe.apk) from <http://www.briloon.org/seascribe> or <http://www.boem.gov/Renewable-Energy-Program-Mapping-and-Data/> or otherwise obtain a copy of the installer. Browse to the file on your device and click on the installer file. You must agree to allow the app to use certain functions such as the microphone and location services, etc. You must also change security settings to allow installation of third party applications. You must have installation rights on your device as well, which may be controlled by your organization. Seek IT support if you cannot install this app successfully

3.2 Apple

To install the Apple iOS version on an iPhone or iPad, open the App Store on your device and search for SeaScribe. Click “install” to install the application. The application will be downloaded and installed. You may be asked to provide a password for your account. Once successfully installed, you can click open or tap on the application on the device window.

4 Removing SeaScribe

4.1 Android

Go to the device's settings, select Apps or Application Manager, touch the app you want to uninstall and touch uninstall. You may also be able to drag the app to the trash in the application folder. Deleting the app will also remove all of the data. Make sure you have removed whatever data you would like prior to uninstalling.

4.2 Apple

Long-press the icon for the app and click the "X" on the upper corner of the app. Agree to delete the app and all of its data. You can also remove an app by going to Settings – General – Storage & iCloud Usage – Storage – Manage Storage – SeaScribe – Delete App. Agree to delete the app and all of its contents. Deleting the app will also remove all of the data. Make sure you have removed whatever data you would like prior to uninstalling.

5 Standard Survey Methods

There are two major survey methods in use today: the line transect method (distance sampling) and strip transect method. Some also use a hybrid method, but in our opinion there is no real benefit to such a method as it makes analysis more complicated with limited benefits. We generally advocate use of the line transect method as estimates of true abundance are of greatest accuracy because they account for differences in detectability and can include effects of observer bias and other environmental effects (e.g., sea state or light conditions) on abundance estimates (Buckland et al., 2001; Ronconi and Burger, 2009).

Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., Thomas, L., 2001. Introduction to distance sampling: estimating abundance of biological populations, New York New York USA. doi:10.1007/s00531-004-0408-5

Ronconi, R., Burger, A., 2009. Estimating seabird densities from vessel transects: distance sampling and implications for strip transects. *Aquat. Biol.* 4, 297–309. doi:10.3354/ab00112

5.1 Line transect method (distance sampling)

Conduct surveys looking forward from one side of the vessel (plane or ship) in a bow-to-beam arc extending to 90° on one side (0-90° or 270-360° depending on what side you are on). Observations should be made on the side of the vessel that provides the best visibility (e.g., the least glare), changing sides throughout the survey as necessary to maintain good viewing conditions, but recording the change of sides in SeaScribe. Scan continuously using the naked eye or binoculars to identify birds, marine mammals, sea turtles, and other fauna or objects in the distance. Regularly scan ahead for diving birds, or for sitting birds that may flush off of the water. Record distance to the object or group in meters and angle to the object in degrees from the front (bow 0°) of the vessel, 90° being the starboard (or right) side and 270° being the port (or left) side relative to the bow (front) of the vessel. Record the number observed in the group (being 1 or more objects). The distance and angle must be recorded for the center of the group when it is first sighted. When densities are high and the observer struggles to keep up with entry, record as many distances and angles as possible without missing objects to record. Modeling methods can correct detections without distance measurements, but DO NOT change monitoring protocols under these conditions (e.g., switch from a line transect to a strip transect to reduce the number of objects for observers to count). At the beginning of the survey, and every 15-30 minutes throughout the observation period, record Beaufort sea state, visibility code, and the side the observer is viewing from. SeaScribe will prompt you for this information at a user-defined time (15 minutes default). Record this information whenever the observer changes or conditions visibly change.

The most difficult aspect of this method is the estimation of distance. Observers should practice estimating distance for objects of different sizes at different known distances prior to starting surveys. There are methods that can be used as well to assist with distance estimation such as creating a distance ruler, for which a tool is provided in SeaScribe (see 6.9.2).

5.2 Strip transect method

Conduct the strip transect method from one side of the vessel or the other, whichever has the best visibility (e.g., the least glare), changing sides throughout the survey as necessary to maintain good viewing conditions. In the strip method, all objects are counted within an area 300 m from the centerline of the vessel (300 m distance and 90° arc). Primarily the observer should watch the forward 90 degree quadrant, but occasionally look behind to determine if birds are following the vessel. Use a reliable estimate of the strip boundary from the observation position such that the observer can quickly determine if an object is within the strip or not. Scan continuously using the naked eye or binoculars to identify birds, marine mammals, sea turtles, and other fauna or objects in the distance. Regularly scan ahead for diving birds, or for sitting birds that may flush off of the water. At the beginning of the survey, and every 15-30 minutes throughout the observation period, record Beaufort sea state, visibility code, and the side the observer is viewing from. SeaScribe will prompt you for this information at a user-defined time (15 minutes default). In addition, record this information whenever the observer changes or conditions visibly change. If you record any incidental observations outside of the 300 m strip, such as for rare animals or marine mammals, make sure to record the distance (>300 m) or that these are out-zone (outside 300 m zone) birds somehow so they can be removed from analysis of relative density.

6 Using SeaScribe

SeaScribe was designed to be as intuitive as possible considering the complexity of the task. The main entry to the application is the main menu when you first bring up the app. Start here to access all areas of the application.

6.1 Main menu

When you start SeaScribe you will see a main window with four menu buttons (Figure 1):

1. “Start New Survey” – the entry point for starting a new survey.
2. “Existing Surveys” – access existing survey data.
3. “Settings” – application settings.
4. “Tools” – ancillary tools available to assist with surveying.

Click one of the blue buttons to advance to the next screen. Each will be explained below.

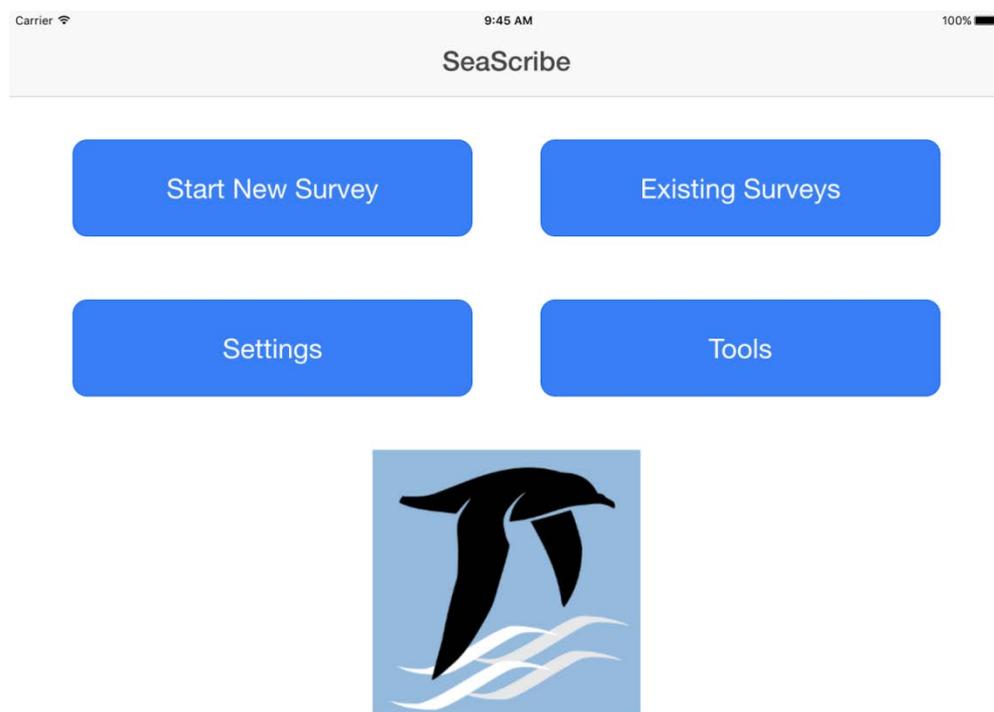


Figure 1. Main menu.

6.2 Start New Survey

This is the primary screen for beginning a new survey, where a survey is considered a collection of one or more transects – a transect being an un-interrupted period of observation during a survey. It is up to the user to determine how they want to define a survey rather than a new transect period under an existing survey. This screen asks the user to provide information about the survey itself, including the survey name, methodology, observers taking part and their experience, survey platform, survey region and sub-region, species list, and ancillary fields (Figure 2).

The screenshot shows the 'Start New Survey' screen in the SeaScribe app. The screen is titled 'Start New Survey' and has a back arrow and 'SeaScribe' logo. The form contains the following fields:

- Survey Name: Text input field, highlighted with a red outline and labeled '* Required'.
- Mode: Dropdown menu with 'Standard' selected.
- Methodology: Dropdown menu with a plus sign, highlighted with a red outline and labeled '* Required'.
- # Observers: Dropdown menu with '1' selected.
- Observer 1 section:
 - Observer: Dropdown menu with a plus sign, highlighted with a red outline and labeled '* Required'.
 - Experience: Dropdown menu, highlighted with a red outline and labeled '* Required'.
 - Notes: Text input field.
- Survey Platform: Dropdown menu with a plus sign, highlighted with a red outline and labeled '* Required'.
- Region: Dropdown menu, highlighted with a red outline and labeled '* Required'.
- Sub-region: Dropdown menu.
- Species List: Dropdown menu, highlighted with a red outline and labeled '* Required'.
- Ancillary Fields: Text input field with a blue circle containing '0'.

At the bottom of the screen, there is a yellow 'Check GPS' button, a blue 'Start Transect' button, and a grey 'Clear' button.

Figure 2. Start new survey screen

Filling out the form:

Note that for all fields, a red outline here indicates a problem with data entry, in most cases a field that is required but not yet filled in.

1. Enter the survey name (required) – this can be any alphanumeric entry up to 100 characters in length.

2. Enter the mode – either “standard” or “audio only”. This provides a fork for the application for data entry later on, either as full data entry capabilities and including audio and photos or “Audio Observations Only” which provides a data entry window with audio recording buttons only to simplify this type of data entry. Standard is default.
3. Methodology – select the stored methodology or click “+” to add a new methodology (Figure 3). This allows the user to define the survey methodology and stores it for later selection. Once this is entered, you can simply select it in the drop down, speeding up data entry in the future.
 - a. Enter a methodology name in alphanumeric format up to 100 characters (required). This is a name you will select later if using this methodology again when setting up a new survey.
 - b. Select the survey type (required): fixed width (strip), line transect (distance sampling), or combined.
 - c. Select the counting methodology: continuous, snapshot, or vector (required).
 - d. Select if one or both sides of the vessel are being used to count (required) – this is important as it helps determine the primary viewing area of the observer.
 - e. Ancillary fields – here you can add or modify any additional fields to the observation form. Use this subform to add ancillary fields, remove or create and add new ancillary fields to the observation form. Ancillary fields are beyond the core set of default fields and are meant to allow observers to record additional information for specific research needs (see 6.3). These fields added here with a methodology are always added when this methodology is selected, saving time in the future once set up.
 - f. Click “Save” to accept the “New Methodology” and return to the “Start New Survey” form. Click “Clear” to start over. Click the “< Start New Survey” at top left to return to the “Start New Survey” form.

Carrier 10:07 AM 100%

< Start New Survey **New Methodology**

Methodology Name Test Methodology

Transect Type Fixed Width ▼

Counting Methodology Continuous ▼

Counting Performed On Both Sides ▼

Ancillary Fields 6
 Association, Flying, Flight Height (m), Oiled, Fishing, Test Ancillary Field

Save Clear

Figure 3. New methodology subform.

4. Enter the number of observers and add observer(s) contact information. This will automatically create the number of observer fields (observer 1, observer 2, etc.). If you have not already done so, you must populate this list of observers by going to the “New Observer” subform (Figure 4).

Once you add the observer, you can select them from the dropdown box and then enter their experience level and any notes about their experience such as years of experience, whether they have good knowledge of marine mammals, turtles, or other taxa, etc. Continue to do this for each observer that is observing during the survey. You will be able to select each observer in the observations form later on and have the opportunity to add observers then as well if they are not entered here.

The image shows a web form titled "New Observer" with a blue header bar containing the title and a "Cancel" button. The form contains the following fields:

- First Name (Required)
- Last Name (Required)
- Affiliation
- Address Line 1
- Address Line 2
- City
- State
- Zip
- Contact Phone
- Email (Required)

At the bottom of the form are two buttons: "Save" and "Clear".

Figure 4. New observer subform.

5. Select the survey platform or add a new survey platform if necessary. Click the "+" to go to the "New Survey Platform" subform (Figure 5). Entering the platform name and type (watercraft, aircraft, or point location). Click "Save" to accept or "Clear" to clear the form to start over. "Cancel" (top right) exits without saving.

Figure 5. New survey platform subform.

6. Select the Region from the list: North Atlantic Ocean, North Pacific Ocean, or Arctic Ocean (required).
7. Select the sub-region if desired.
8. Select the species list that will be used to populate and validate the species selected in the observation form. Currently, SeaScribe provides lists that support the Atlantic Seabird Catalog database (formerly the Northwest Atlantic Seabird Compendium¹) and the North Pacific Pelagic Database². The species lists have different codes for different species, species groups, and objects so it is important to select the correct species list to support the geographic area you are observing in.
9. The ancillary fields added in the methodology will be displayed, check for accuracy. If you want to modify the ancillary fields, you can do so by clicking here, but any changes to the ancillary fields will create a new methodology.
10. Click the Check GPS bar to test the GPS for operation. If the GPS is able to return a location, the bar will turn green. If the bar does not turn green (see Figure 6), you may need to improve your view of the sky to allow for better GPS signal. Also, check to make sure that Location Services are enabled which allows the device to access GPS and provide locations to the app. On Android devices, you may be able to use an external Bluetooth GPS receiver by connecting to the external GPS and enabling “Allow mock locations” under the Debugging section of Developer options in settings. Install a third party GPS app to test the external GPS before using.
11. Click “Start Transect” once all required fields are entered and the Start Transect button is not grayed out. Click “Clear” if you want to clear the fields and start again.

¹ O’Connell, A. F., B. Gardner, A. T. Gilbert, and K. Laurent, 2009, Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States, Final Report (Database Section - Seabirds). Prepared by the USGS Patuxent Wildlife Research Center, Beltsville, MD. U.S. Department of the Interior, Geological Survey, and Bureau of Ocean Energy Management Headquarters, OCS Study BOEM 2012-076.

² Drew, G.S., Piatt, J.F., and Renner, M., 2015, User’s guide to the North Pacific Pelagic Seabird Database 2.0: U.S. Geological Survey Open-File Report 2015-1123, 52 p., doi: 10.3133/ofr20151123 (report) doi:10.5066/F7WQ01T3 (database)

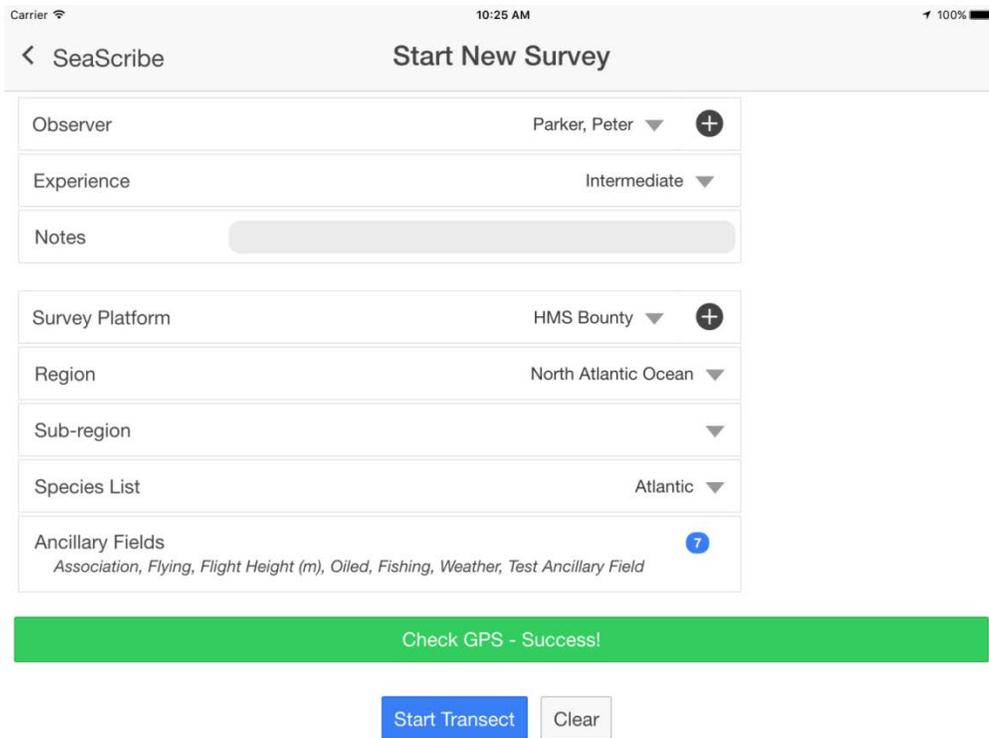


Figure 6. Check GPS success.

6.3 Adding ancillary fields to the observation form

Adding and removing ancillary fields is easy. When you select the Ancillary Fields field, you are brought to the “Select Ancillary Fields” form (Figure 7). In this form, you can add available fields to the selected fields list on the right of the form using the right arrow (>), remove it with left arrow (<), add all (>>), or remove all (<<). If you need to create and add a new ancillary field, click the “+” button and the “New Ancillary Field” subform will pop up. Click “Save” to save the ancillary field list to the methodology.

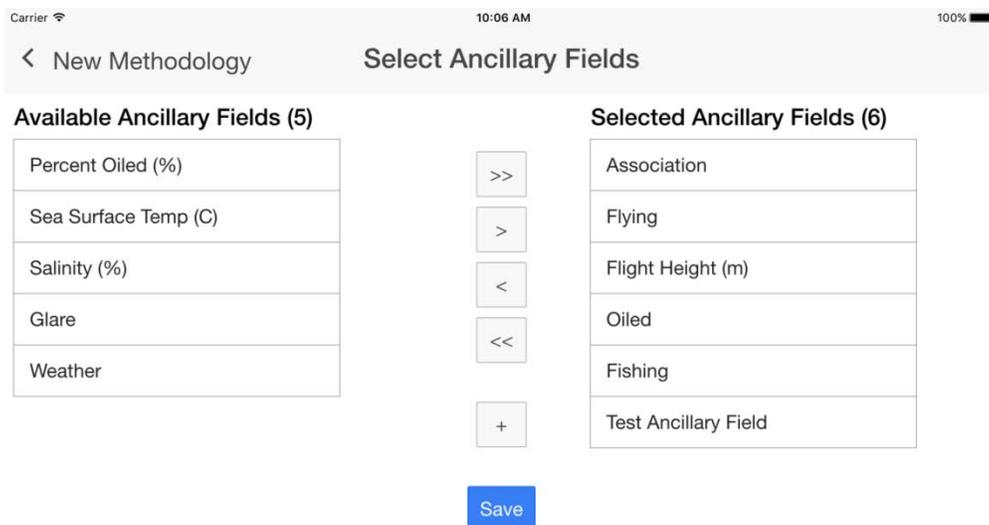


Figure 7. Add and remove ancillary fields form.

To create a new ancillary field (Figure 8):

1. Give the field a unique name.
2. Tell it how frequently the observation should be recorded – every observation or only periodically change.
3. Determine the sort order; where it shows in the observation form.
4. Choose the input control (numeric, text, select from a list).
 - a. When using select from a list, you tell the application how many selections you would like and then enter the selections to create the dropdown list in the observation field.
 - b. Scroll down the form to complete and enter “Save” to save, “Clear” to clear the form and start over or “Cancel” to exit without saving the new ancillary field.

The screenshot shows a form titled "New Ancillary Field" with a blue header bar containing the title and a "Cancel" button. The form contains the following fields:

- Field Name: Test Ancillary Field
- Frequency: Each Observation (dropdown)
- Sort Order: 12
- Input Control: Select (from a list of choice (dropdown))
- # Select Options: 3 (dropdown)

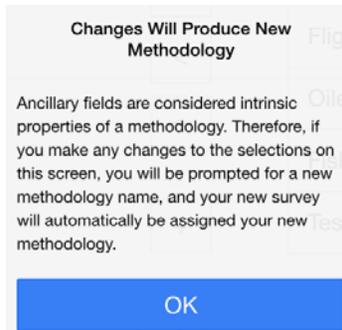
Below these fields are three sections for defining select options:

- Select Option 1: ID 1, Text Value for ID 1
- Select Option 2: ID 2, Text Value for ID 2
- Select Option 3: ID 3, Text Value for ID 3

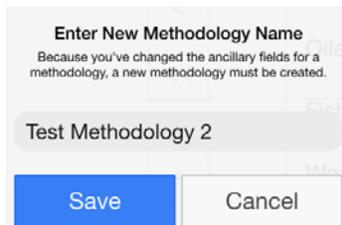
At the bottom of the form are two buttons: "Save" (blue) and "Clear" (white).

Figure 8. Create new ancillary field.

However, ancillary fields are considered intrinsic to the methodology, for which you will be warned.



That is, if you change ancillary fields for a methodology that has already been created, you must then change the name of the methodology and this pop up box will prompt for a new name.



6.4 Starting a transect

Once you have clicked “Start Transect” at the end of the “Start New Survey Form” you will enter the Start Transect form. Here you will enter the initial conditions for the start of the survey and confirm the system date/time are correct. This is important as it provides a backup date/time for observations if the GPS fails to provide it.

A screenshot of a mobile application interface. At the top, the status bar shows "Carrier", "10:26 AM", and "100%". The main title is "Start Transect". Below the title is a form with several fields: "Transect Name" (text input), "Observer" (dropdown), "Position" (dropdown), "Beaufort" (dropdown), and "Visibility" (dropdown). Below these fields is a section for date and time: "Current Date and Time is:" followed by a radio button, "Friday, 12/18/2015, 10:26, -0500", and a refresh/info icon. Below this is the text "Is this correct?" and a red asterisk with the word "Required". At the bottom of the form are two buttons: "Start Recording Observations" (blue) and "Cancel" (white).

Figure 9. Blank start transect form.

1. Enter the Transect Name if one is used.
2. Select the Observer from the list you entered initially (required).
3. Enter the observation Position (port or starboard) (required).
4. Enter the Beaufort sea state (0-12, required, see 6.9.1).
5. Enter the Visibility category: 0-300m, 300-500m, 500m-1km, 1-3km, 3-5km, unlimited (required).
6. Check that the date is correct. If it is not, you must correct it with the device's date/time settings since this date/time used here is pulled from the system clock. If it is correct, click the radio button to confirm.
7. Once you are finished and all required fields have been filled in, click the "Start Recording Observations" button (Figure 10) to proceed to the observation form or "Cancel" to exit.

Figure 10. Filled in start transect form.

6.5 Recording Standard Observations

You will see on entry to the observation form that it is split into a header bar and four viewing panes (Figure 11):

- 1) Data entry – main part of the form for recording all observation related data.
- 2) Map – the map of the survey area including survey track(s) and observation points.
- 3) Spreadsheet – data records are shown here and can be edited.
- 4) Action pane – pane for holding various buttons including the save observation, clear data, take picture, record audio, and stop transect buttons.

Viewing panes can be manipulated in size to maximize or minimize one pane over another by dragging the grey bars left or right or up and down.

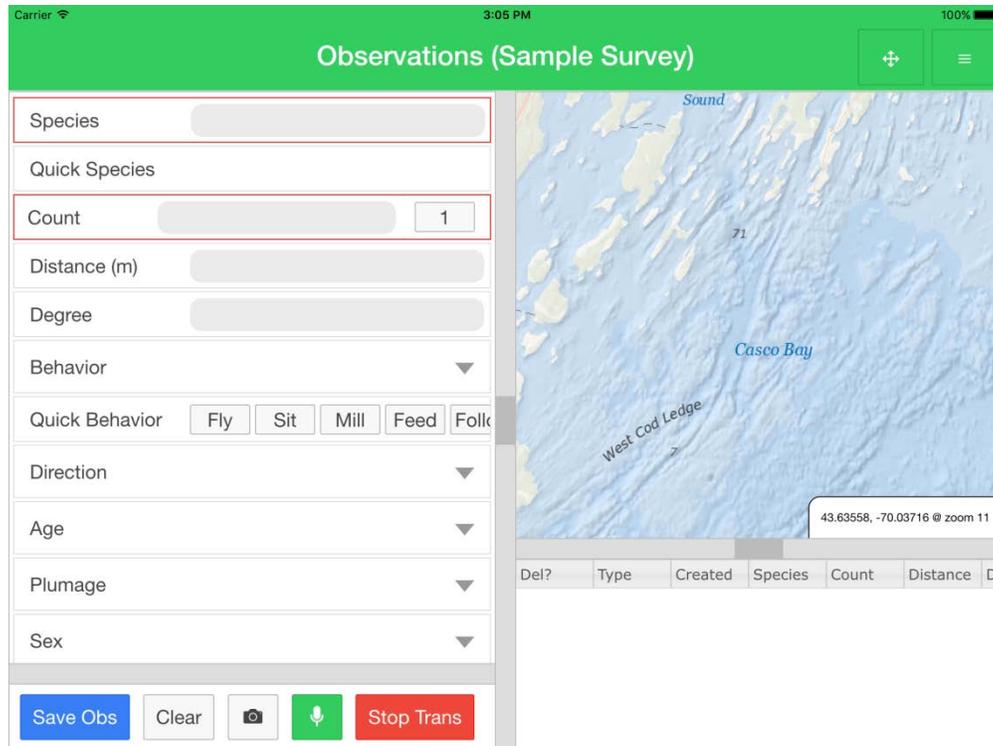


Figure 11. The observation form window with four panes.

6.5.1 Observation form header bar

The bar will be green when SeaScribe is successfully acquiring a location and turns red when GPS signal is lost. While SeaScribe will continue to function and observations can be saved, no positional information will be recorded, only the system date-time stamp will be recorded for that observation which can be used to estimate position in post-processing if speed and direction are known.

There are two buttons at the right hand side of the bar:  and  for layout and options.

6.5.1.1 Layout observation form button

 allows the user to select a pre-defined layout. Click this button to access it.

The following options are available:

- 1) Maximize data-entry area.

Carrier 3:16 PM 100%

Observations (Sample Survey)

Species

Quick Species BAEA DEJU

Count

Distance (m)

Degree

Behavior

Quick Behavior Fly Sit Mill Feed Follow Swim

Direction

Age

Plumage

Sex

Figure 12. Maximized data entry in observation form.

2) Maximize map area (Figure 13).

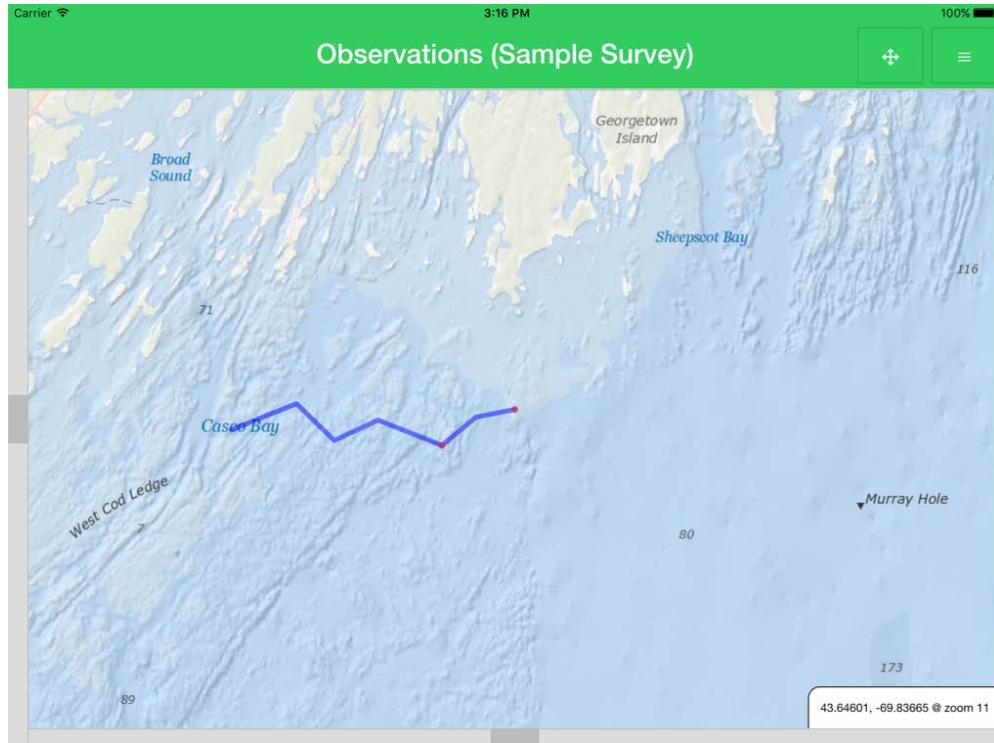


Figure 13. Maximized map area in observation form.

- 3) Maximize spreadsheet area (Figure 14).

Del?	Type	Created	Species	Count	Distance	Degree	Behavior	Direction	Age	Plumage	Sex	Linke
<input type="radio"/>	USER	2015-1...	DEJU	1								
<input type="radio"/>	USER	2015-1...	BAEA	1	100	45	Flying - ...	NE	Ad - Ad...	B - Bree...	U - Unk...	

Figure 14. Maximize the spreadsheet area in observation form.

- 4) Reset layout.

6.5.1.2 Options and tools button in the observation form



gives access to various tools and options for the observation form (Figure 15):

- 1) Center Map – center map on current location.
- 2) Reset Map Zoom to Default.
- 3) Show Offline Map Cache – if maps were cached while online (see 6.9.10), you can switch to the map cache that is stored on the device.
- 4) View Online Map – switch to online map display if internet is available for viewing.
- 5) Disable GPS Heartbeat – turn off the GPS heartbeat which records the current position every X seconds as designated in the settings (see 6.8.1).
- 6) Disable Center Map on Latest GPS – do not move map to center on latest GPS position.
- 7) Show all Transects on Map – map all of the transects recorded from the survey to show prior transects.
- 8) Show Illustrated Beaufort Scale – show Beaufort sea state chart for reference (see 6.9.1).
- 9) Show Distance Estimation Guide – show the distance estimation tool for calculating measurements to put on a guide for distance references (see 6.9.2).
- 10) Stop Transect.

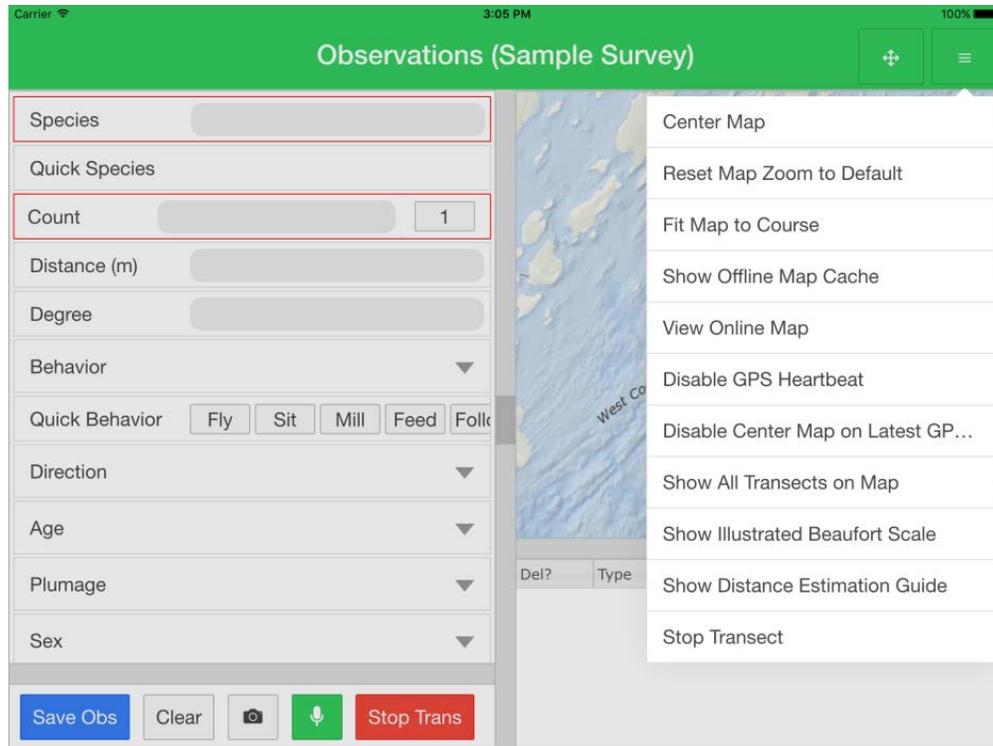


Figure 15. Observation form tools and options.

6.5.2 Entering observations into the observation form

Entering observations can be as simple as entering the species and count, but can include many other observation fields and as recommended should include the distance and angle to every observed animal, for which the layout of the fields was optimized. The default fields are described below, but the app can be customized to include ancillary fields as well. The observation fields are broken into two categories: non-persistent (entered every record as needed) and persistent fields (are carried from one record to the next until the user changes the values).

6.5.2.1 Non-persistent fields

- Species – enter the four letter species or species group code or starting typing in the name and SeaScribe will return a list of matches that you can select (Figure 16). In order to speed up data entry, SeaScribe keeps a record of the most recorded codes and adds them to the quick species selector below the species entry field. The program will continue to update this list so that you have an up to date list of species codes to choose from. This can greatly speed up data entry.

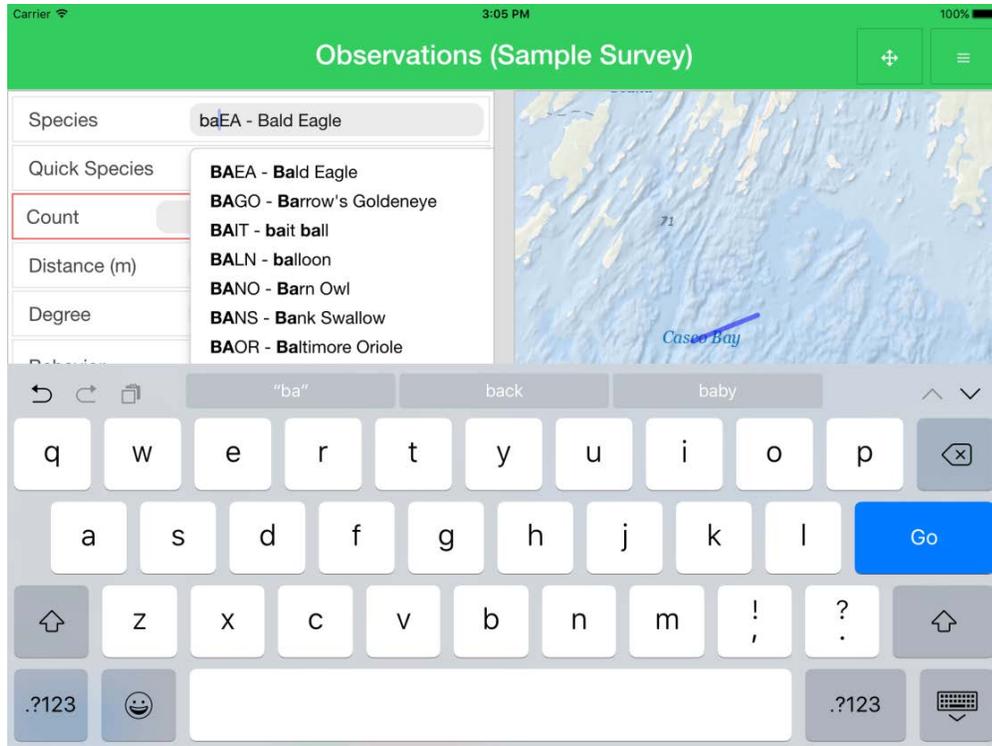


Figure 16. Example of species typeahead for filtering species codes.

If a species code is entered that is not in the application database, SeaScribe prompts for additional information about this code when you go to save the observation (Figure 17). Please enter the common name for the object and type (bird, marine mammal, sea turtle, fish, or other). If this was an error in data entry, you may cancel and change the species code.

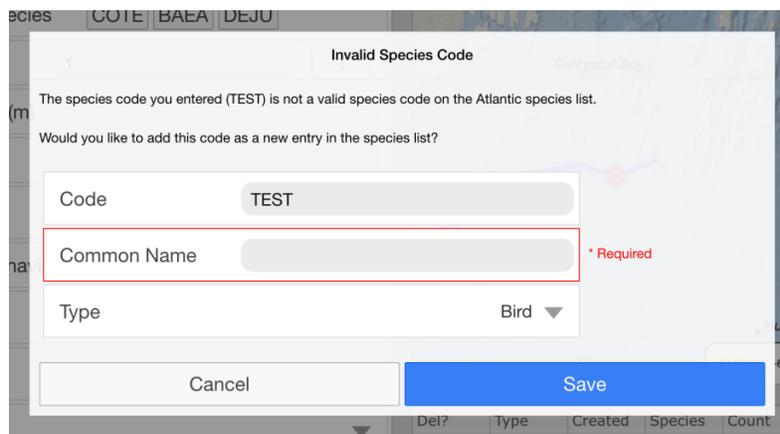


Figure 17. Entering additional information about a new species code.

- Count – counts can be entered as any whole number or use the quick pick “1” value.
- Distance – distance to object in meters.
- Degree – bearing to object with the front of the vessel equal to 0 degree, right side 90 degrees, left side 270 degrees, etc.
- Behavior – select the behavior of the animal from the list.

- Quick Behavior – press the quick behavior button to speed up behavioral code entry. These can be changed in the settings of the app.
- Direction – cardinal movement of the object.
- Age – age code of the animal.
- Plumage – plumage code of the animal.
- Sex – male, female, or unknown.
- Linked With – is a unique identifier that allows the observer to link species observations records together so that one can associate species that have been observed together.
- Comment – any additional comments about the observation.

Carrier 3:06 PM 100%

Observations (Sample Survey)

Species: BAEA - Bald Eagle

Quick Species:

Count: 1

Distance (m): 100

Degree: 90

Behavior: Sitting - Bird sitting on water or

Quick Behavior: Fly Sit Mill Feed Folk

Direction: NE

Age: Ad - Adult

Plumage: B - Breeding/Alternate spring ar

Sex: U - Unknown

Save Obs Clear Camera Microphone Stop Trans

Map: Casco Bay, 43.63036, -69.96437 @ zoom 11

Del?	Type	Created	Species	Count	Distance	De

Figure 18. Example of filled in fields in the observation form.

Ancillary fields are typically found below these such as “Flight height” and “Oiled” fields below (Figure 19), but sort order can be set when adding these fields (see 6.3).

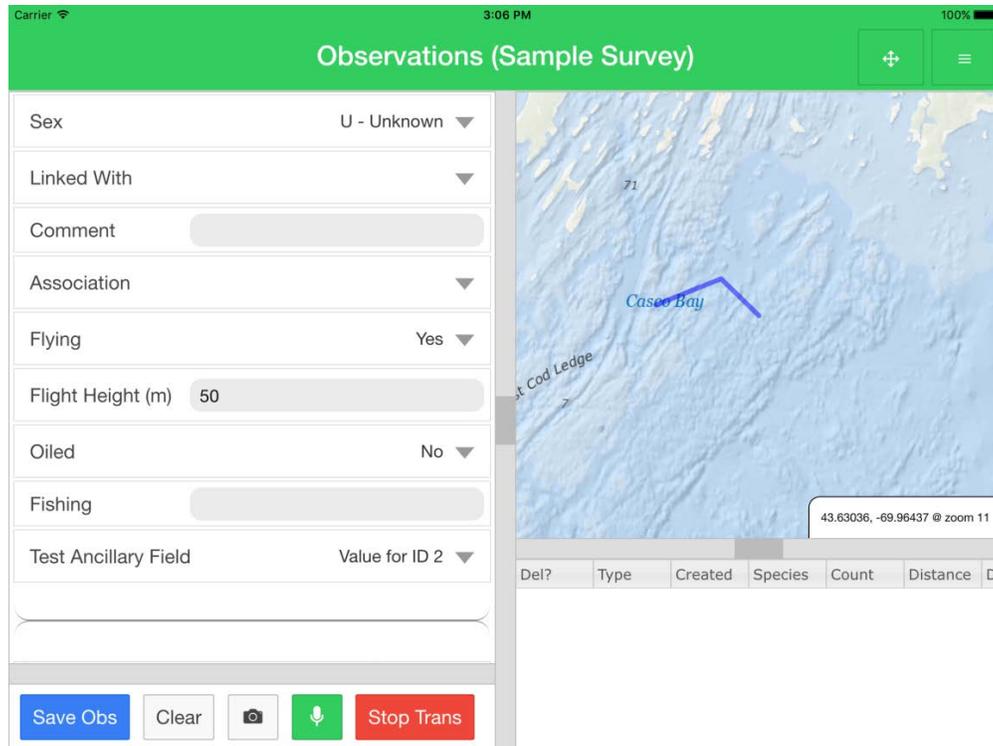
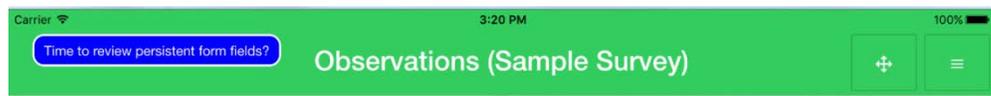


Figure 19. Example ancillary fields in the observation form.

6.5.2.2 Persistent fields

Persistent fields are ones that normally do not change, or change infrequently and are recorded in each record until the user changes them. SeaScribe will prompt for the user in the header bar with a blue “Time to review persistent form fields” alert. You can change the alert schedule in the settings. Other persistent fields can be added as a customization by the user, such as the weather code below in Figure 20.



- Observer – select the observer or add an observer using the “+” button if not already entered during initial survey setup.
- Position – side of the vessel observations are being made on.
- Beaufort – the sea state code.
- Visibility – the visibility category.

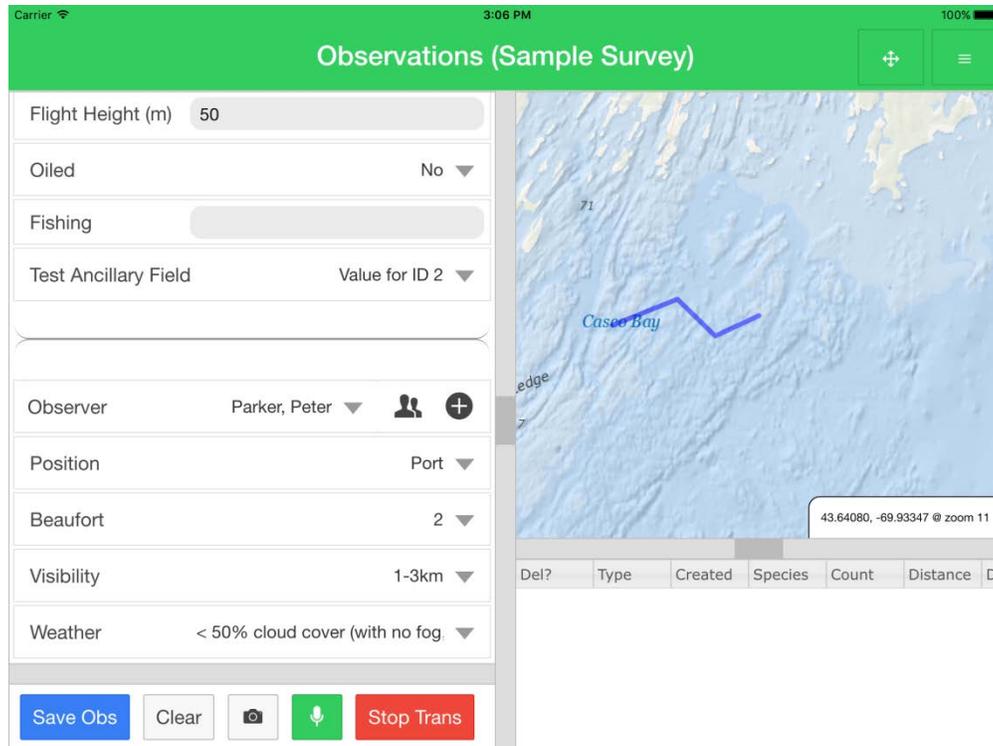


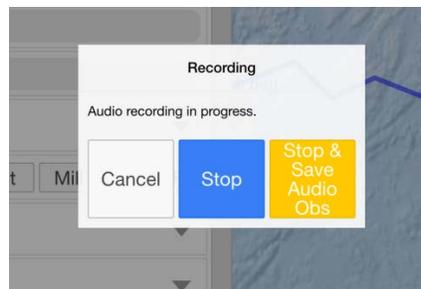
Figure 20. Example of persistent fields in the observation form.

6.5.2.3 Associating audio and pictures with records

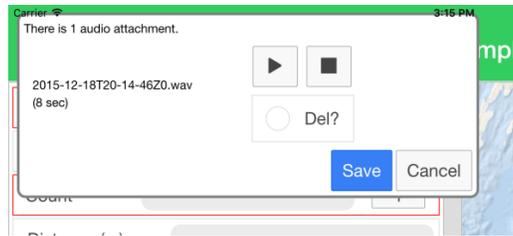
Using the   buttons, the user can take photos using the onboard camera and/or record audio and associate these image and audio files with an observation record. These files are also exported and associated with the record for ease of reviewing and archiving later.

Selecting the camera button gives you access to the camera device and its functionality, allowing you to “retry” or “ok” the picture for saving.

Selecting the green audio recording (microphone) button allows the user to record a segment of audio and save it to the observation.



The audio file can later be played and deleted or saved if necessary by clicking on the audio field in the record for that observation in the spreadsheet view.



6.5.3 Mapping pane

The map pane allows the user to track the progress of the survey as well as shows the observations in increasing size markers with larger counts (Figure 21). The observation circle marker has a number of settings including color, radius multiplier, radius minimum and radius maximum allowing the user to customize these markers. The blue line below shows the track of the survey and can be customized for color in settings (see 6.8.2). If you would like to display all the tracks from transects for the survey go to the observation options and click “Show All Transects on Map.”

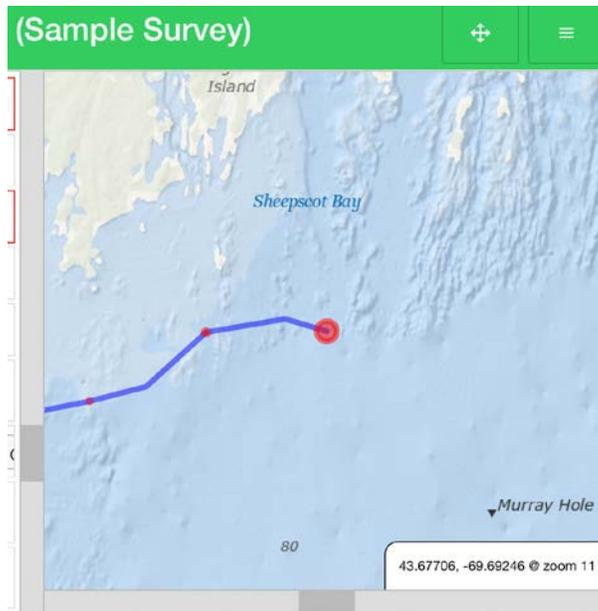
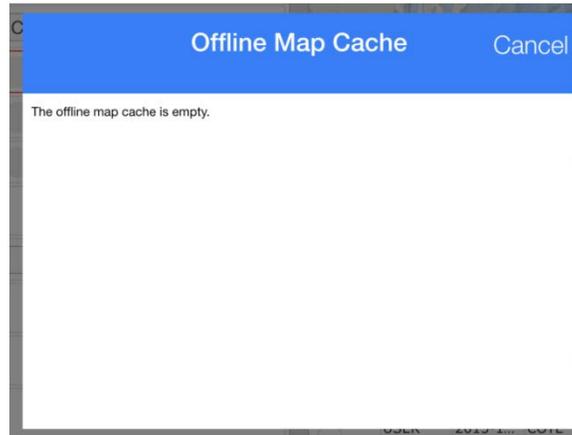


Figure 21. Observations with increasing size marker depending on count and survey track line.

The map displays the current map center location and zoom level of the map in the lower right of the map window. The default is for the map view to shift to keep the last position centered in the window, but this can be disabled by going to the observations form options (see 6.5.1.2). The map is dynamic and can be manipulated by touching the map and dragging it and can be zoomed out or in by using two fingers to pinch or spread fingers apart. You can always re-center the map by going to the options for the form in the header bar (see 6.5.1.2).

The map defaults to online streaming of map content. If you do not have internet access, the map will show no content in the background, though the track and observation points will continue to display. If you anticipate not having internet connection while conducting the survey, it is advised that you download a map cache for the anticipated survey area at multiple zoom levels (see 6.9.10). Doing so will allow the map background to display properly once the “Show Offline Map Cache” button is clicked in

the options button of the header bar (see 6.5.1.2). If no maps are available in the map cache, the following will be shown:



Download map content prior to beginning the survey when internet is available.

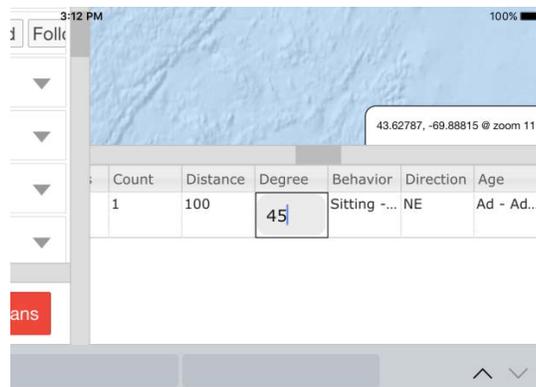
Other options are available for the map including resetting the map zoom to default, fit the map to course, and disable center map on latest GPS.

6.5.4 Spreadsheet pane

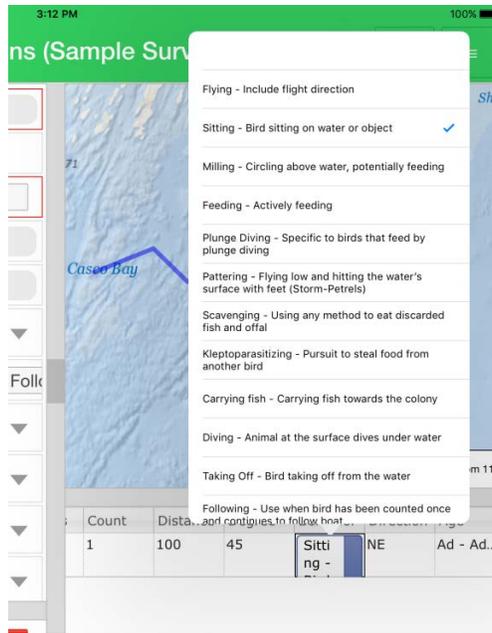
The spreadsheet pane shows the observation records as they are entered and allows the user to make edits to these observations while still collecting data. The user can maximize this pane for easier viewing and editing if necessary by clicking the layout options button in the header (see 6.5.1.1).

6.5.4.1 Editing records in the spreadsheet pane

To edit records, simply scroll to the desired record to edit and click in the cell for editing. Clicking on a cell will bring up the appropriate keyboard or dropdown list. If it's a text or number field simply type in the field.

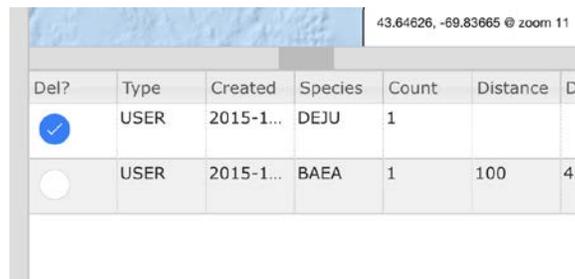


If it's a dropdown list, click the cell and then click the list shown again and it will expand to allow selection of the correct entry.



6.5.4.2 Marking a record for deletion in the spreadsheet pane

The first column of the spreadsheet view allows you to mark the record for deletion.



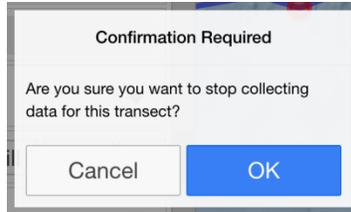
We do not include the ability to make deletions during the survey to prevent accidental deletion, so we provide a way to flag a record for deletion later, after which they can be processed for deletion in the data editor once the transect is complete (6.7.2.1). When a record is flagged for deletion, a reason must be entered in the popup box.



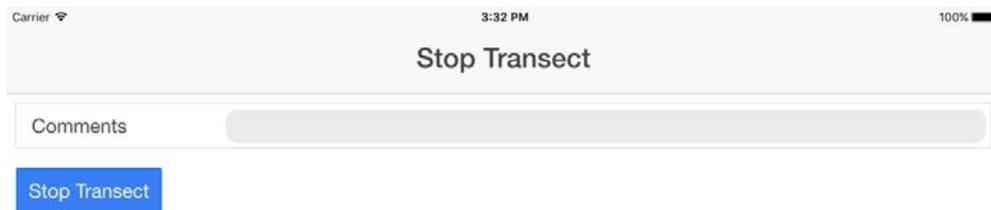
6.5.5 Finishing the transect

When you have finished the transect, you may click the “Stop Trans” button in the button pane or in the options button list. Once you have clicked this button it confirms that you want to stop collecting data

for this transect. Click “OK” to accept or click “Cancel” to return to the observation form and continue the transect. Caution, once you click “OK”, there is no way to continue, you must start a new transect and then merge the two transects later in post-processing if they need to be continuous for analysis purposes.



Once you have confirmed that you want to end the transect, you will be given the opportunity to add comments about the transect if you want. Click “Stop Transect” to exit.



6.6 Recording Audio-Only Observations

In some surveys, it may be necessary to perform audio-only data entry during the survey. This is common when performing aerial surveys where animals are passing by at high rates of speed and entering data in the standard data entry form could result in missed animals. We have provided an audio-only data entry form with simple, large buttons for recording audio observations and saving records. Each audio file is geo-referenced and the record of which can be seen in the spreadsheet view. Click “Record” to start recording an observation and “Save obs” to stop recording and save the observation audio file. Clicking “Cancel” will cancel the current audio recording. Click “Stop Trans” to exit the current transect.

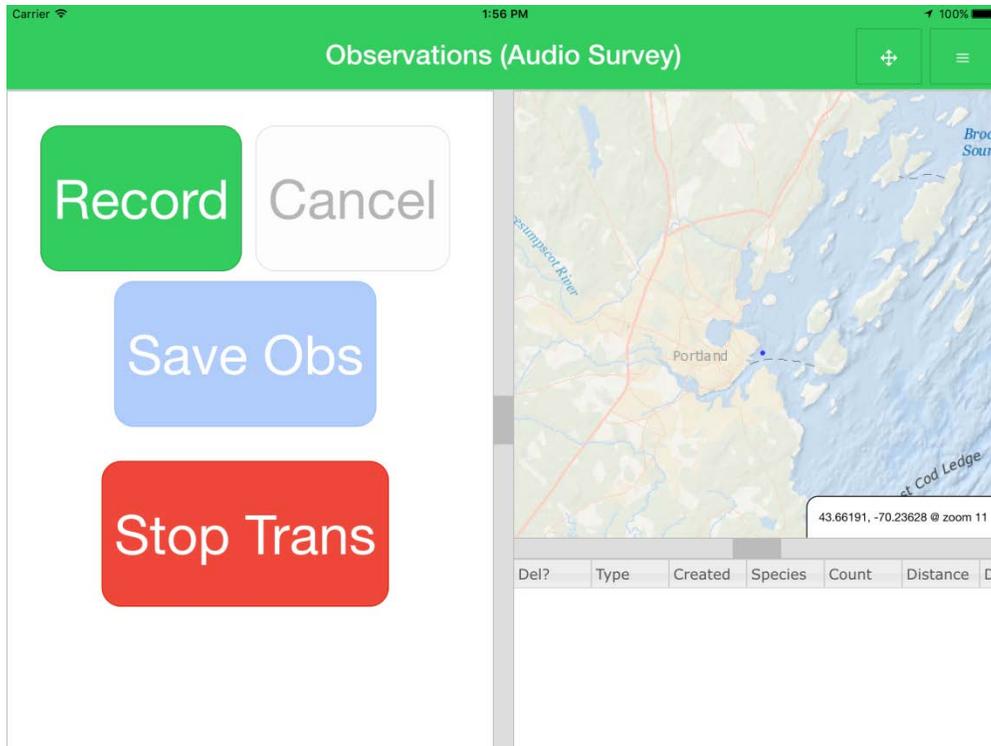


Figure 22. Audio-only data entry form.

6.7 Existing Surveys

Within “Existing Surveys”, the user can see the list of existing surveys, most recent first, and corresponding transects, also most recent first (Figure 23). There are different operations that can be performed when selecting surveys or transects of chosen surveys.

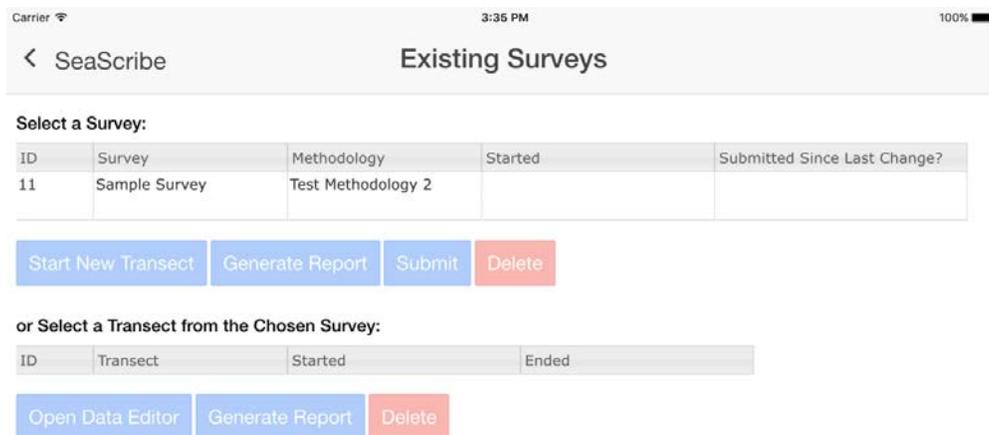


Figure 23. Existing surveys screen.

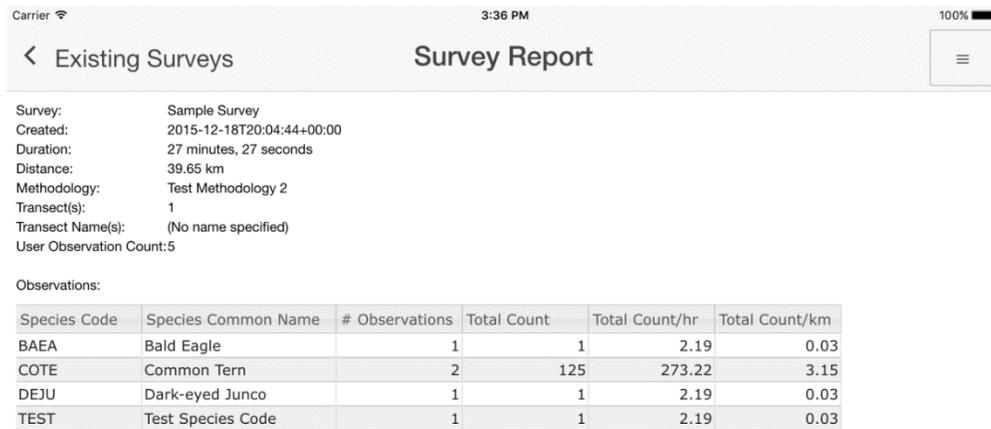
6.7.1 Operations on surveys

6.7.1.1 Start new transect

This button allows you to start a new transect within an existing survey. This brings you back to the “Start Transect” form (see 6.4) where you can continue to add data to the survey.

6.7.1.2 Generate survey report

You can generate a summary report for the survey by selecting the survey of interest and pressing “Generate Report”. An on-screen report will be created with information about the survey including survey name, duration, distance traveled, methodology, number of transects, transect name(s), and number of users along with a summary table of observations to included observed species, number observed, total count, counts/hour, and counts/km (Figure 24).



Carrier 3:36 PM 100%

< Existing Surveys Survey Report

Survey: Sample Survey
Created: 2015-12-18T20:04:44+00:00
Duration: 27 minutes, 27 seconds
Distance: 39.65 km
Methodology: Test Methodology 2
Transect(s): 1
Transect Name(s): (No name specified)
User Observation Count: 5

Observations:

Species Code	Species Common Name	# Observations	Total Count	Total Count/hr	Total Count/km
BAEA	Bald Eagle	1	1	2.19	0.03
COTE	Common Tern	2	125	273.22	3.15
DEJU	Dark-eyed Junco	1	1	2.19	0.03
TEST	Test Species Code	1	1	2.19	0.03

Figure 24. The survey report tabulating a survey.

Within the survey report screen, if you click the upper right button on the screen , you are given the option to “Submit Report” via email or Dropbox in HTML format. This report can be read in any web browser and will show up in email content as well.

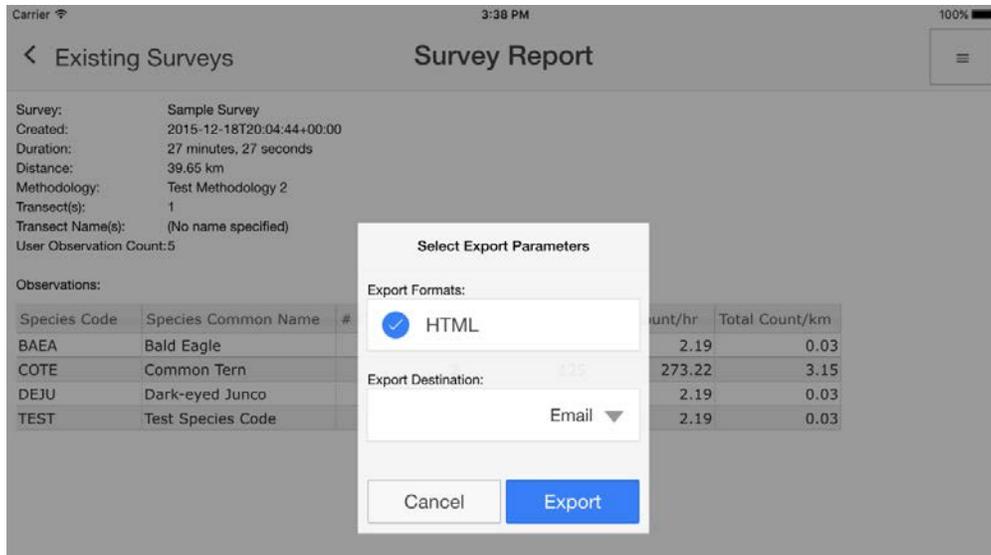


Figure 25. Survey report exporting parameters.

Select the export destination (Email or Dropbox) and select “Export” or “Cancel” (Figure 25). If you choose email and an email client is set up then the html report will be attached to a generated email in the email client on the device. Enter a recipient to send. If you choose to export via Dropbox and no Dropbox account is linked to SeaScribe, the program will request an email and password to link (Figure 26).

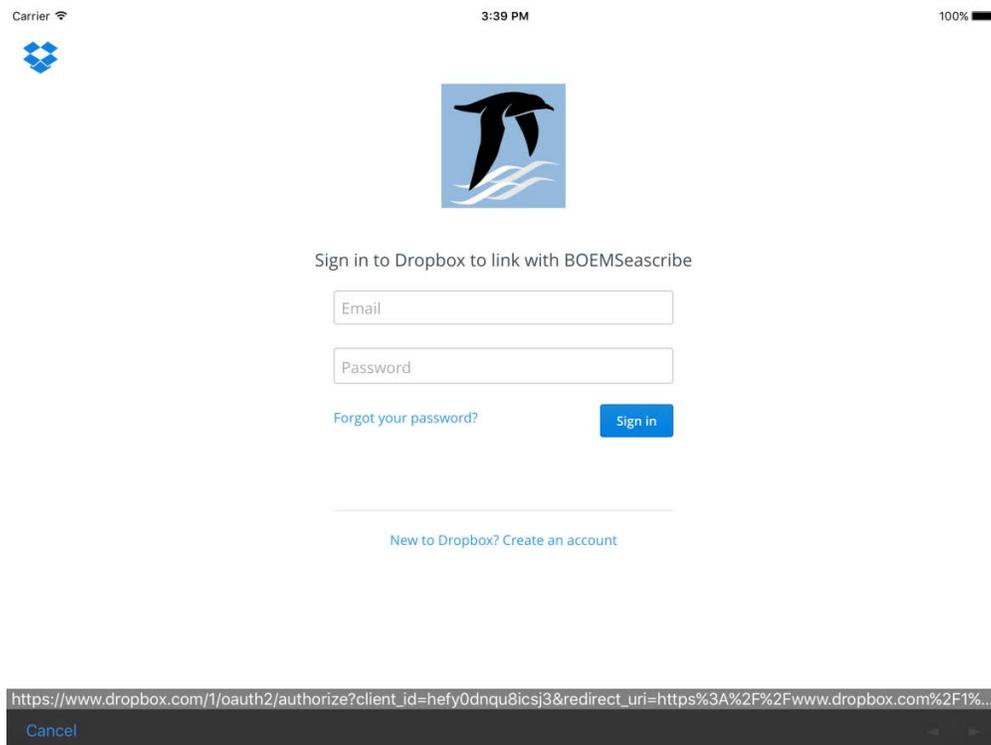


Figure 26. Dropbox sign in form for linking Dropbox to SeaScribe.

6.7.1.3 Submit survey data

To submit data by email or Dropbox, select one or more surveys. Selected surveys will be highlighted in blue and can be unselected by clicking the selected (blue) row. Click “Submit” for selected survey(s) to submit all of the data collected for the survey(s) including all transects. Like report submission, data submission gives you options for the export destination, email or Dropbox, as well as export format options: JSON (JavaScript object notation) and CSV (comma-separated value). JSON is a lightweight data-interchange format popular for programming and the web (<http://www.json.org/>). Using JSON, all fields and metadata are stored in this text-based format and only a single file is exported per survey. CSV data is presented in tabular format, ready to be loaded into statistical software or GIS programs for example. When selecting CSV, in addition to the data, metadata about the survey is provided separately as a JSON file, and the trip report in HTML (total of three files).

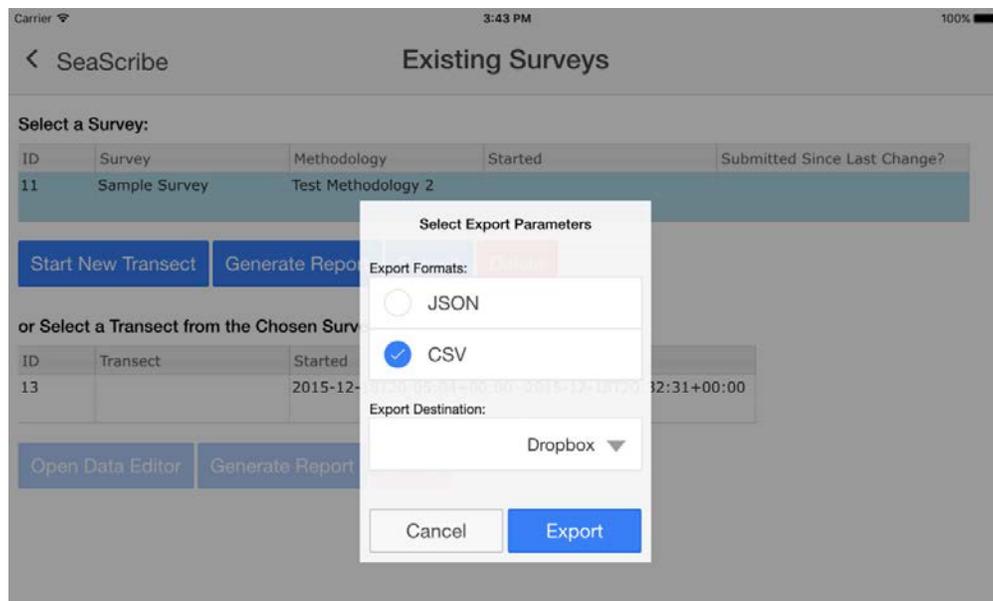
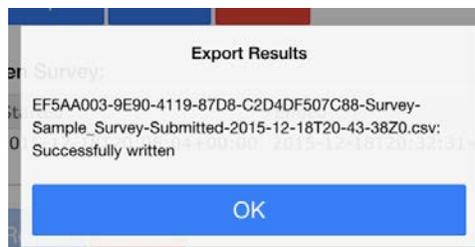


Figure 27. Submitting data for existing surveys.

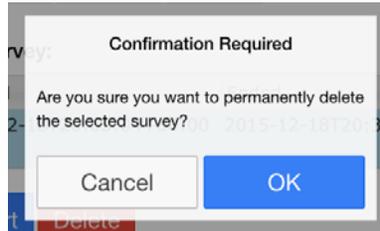
You will see that once data are submitted that the column “Submitted since Last Change?” will be filled in with either Email and/or Dropbox. Successful export will generate an email with attachment(s) when submitting by email, but note that SeaScribe can’t verify whether or not the email has been sent. Check your sent email box for confirmation of submission. If results have been successfully written to Dropbox, an “Export Results” dialog box will be shown.



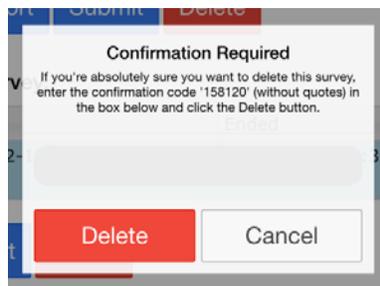
If submitting data directly to BOEM, the address 'boemseascribe@boem.gov' can be used to submit data. This address is monitored by personnel at BOEM.

6.7.1.4 Delete a survey

To delete survey level data, select one or more surveys. Selected surveys will be highlighted in blue and can be unselected by clicking the selected (blue) row. Click "Delete" for selected survey(s) to delete all of the data collected for the survey(s) including all transects. Confirmation is required.



Click "OK" to confirm and proceed to the next confirmation step or "Cancel" to exit. In the next step, you will be provided a confirmation code to enter to execute the deletion. This is a safety mechanism to protect the user from accidental deletion. Enter the code and click "Delete" to delete or "Cancel" to exit.



After deletion, the survey and associated transect(s) will be removed from the list (Figure 28).

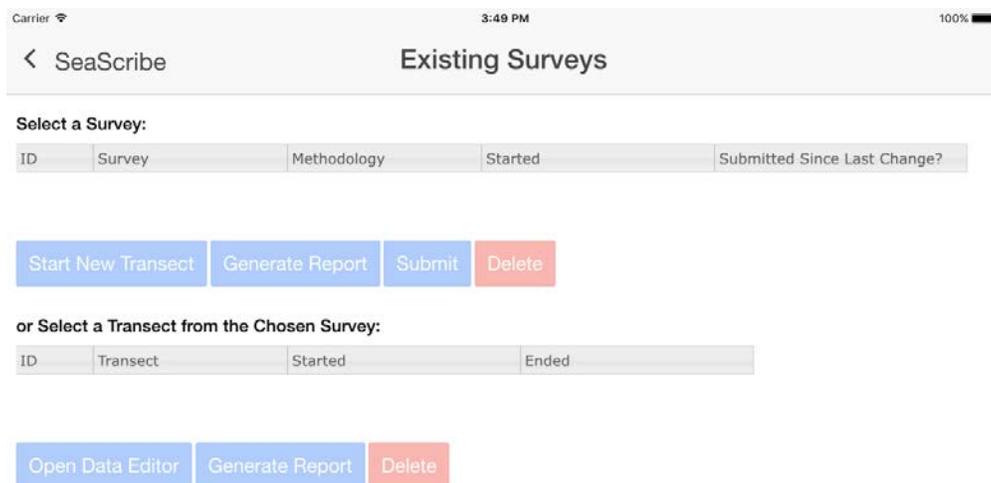


Figure 28. Transect removed after deletion from list of transects.

6.7.2 Operations on transects

When a transect is selected after selecting a survey, you can “Open Data Editor”, “Generate Report”, and “Delete”.

6.7.2.1 Data editor

You can edit observations for a particular transect by selecting the transect and clicking the “Open Data Editor” button which takes you to the editor screen.

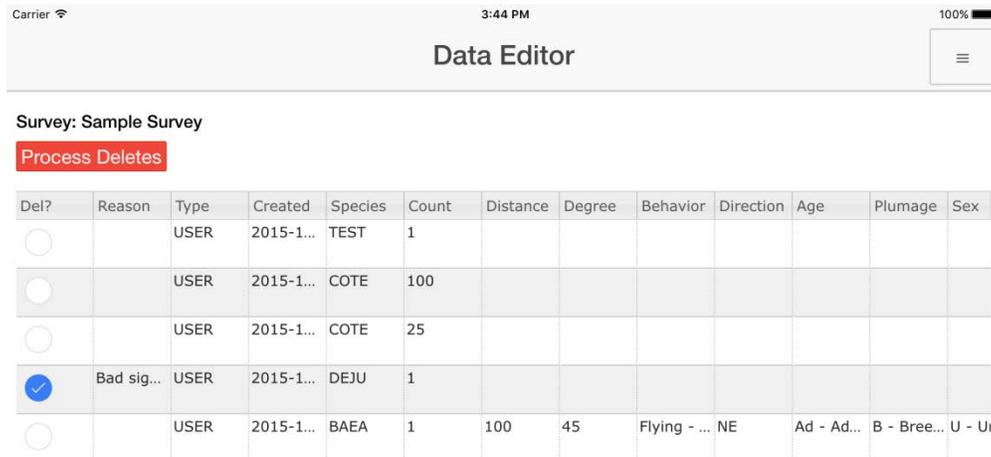


Figure 29. The data editor screen.

If you click on the options button at the top right  you have access to three options: “Start New Transect for this Survey”, “Submit Survey”, and “Exit”.

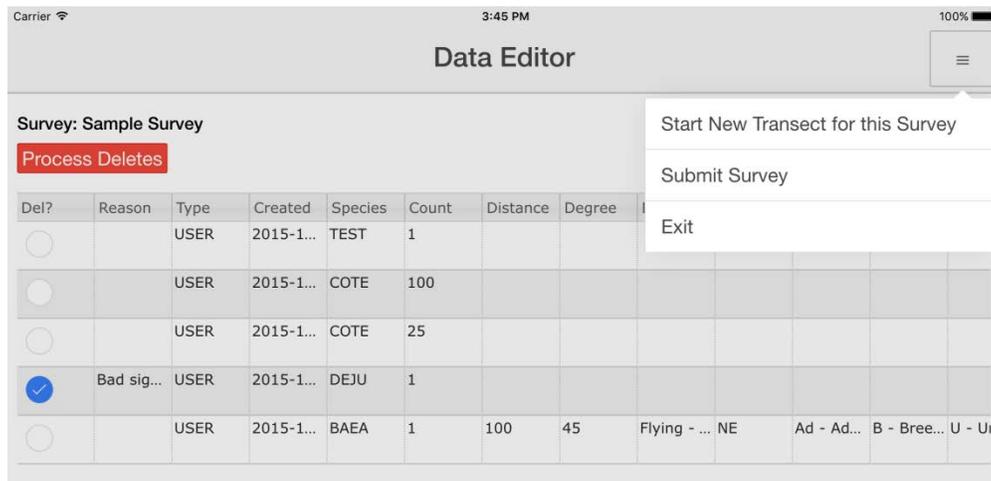


Figure 30. Options in the data editor.

In the data editor, like on the real-time spreadsheet view of the observations form (see 6.5.4), you can edit data fields (Figure 31, Figure 32).

Del?	Reason	Type	Created	Species	Count	Distance	Degree	Behavior	Direction	Age	Plumage	Sex
<input type="radio"/>		USER	2015-1...	TEST	1							
<input type="radio"/>		USER	2015-1...	COTE	100							
<input type="radio"/>		USER	2015-1...	COTE	25	80						
<input type="radio"/>		USER	2015-1...	BAEA	1	100	45	Flying - ...	NE	Ad - Ad...	B - Bree...	U - Ur



Figure 31. Editing text fields in the data editor.

Carrier 3:47 PM 100%

Data Editor

Survey: Sample Survey

Process Deletes

Del?	Reason	Type	Created	Species	Count	Distance	Degree	Behavior	Direction	Age	Plumage	Sex
<input type="radio"/>		USER	2015-1...	TEST	1							
<input type="radio"/>		USER	2015-1...	COTE	100							
<input type="radio"/>		USER	2015-1...	COTE	25	80						
<input type="radio"/>		USER	2015-1...	BAEA	1	100				Ad...	B - Bree...	U - Ur

- Flying - Include flight direction
- Sitting - Bird sitting on water or object
- Milling - Circling above water, potentially feeding
- Feeding - Actively feeding
- Plunge Diving - Specific to birds that feed by plunge diving
- Pattering - Flying low and hitting the water's surface with feet (Storm-Petrels)
- Scavenging - Using any method to eat discarded fish and offal
- Kleptoparasitizing - Pursuit to steal food from another bird

Figure 32. Editing dropdown fields in the data editor.

You can also process records for deletion here that you marked while recording data or marked here in data editing. Mark any additional records you may wish to delete and click the  button.

6.7.2.2 *Generate transect-level report*

You can generate a summary report for a transect by selecting the transect of interest and pressing “Generate Report”. An on-screen report will be created with information about the transect including survey name, duration, distance traveled, methodology, number of transects, transect name(s), and number of users along with a summary table of observations to included observed species, number observed, total count, counts/hour, and counts/km (see Figure 24 for similar report at the survey level).

Within the survey report screen, if you click the upper right button on the screen , you are given the option to “Submit Report” via email or Dropbox in HTML format. This report can be read in any web browser and will show up in email content as well.

Select the export destination (Email or Dropbox) and select Export or Cancel (Figure 25). If you choose email and an email client is set up then the html report will be attached to a generated email in the email client on the device. Enter a recipient to send. If you choose to export via Dropbox and no Dropbox account is linked to SeaScribe, the program will request an email and password to link (Figure 26).

6.7.2.3 *Delete a transect*

To delete transect level data, highlight a transect in blue by selecting it (unselected by clicking the selected blue row). Click “Delete” for the selected transect to delete all of the data collected for this transect. Confirmation is required. After deletion, the transect will be removed from the list.

6.8 Settings

SeaScribe has a number of settings that allows the user to customize many things within the program. You can access the settings from the main menu of SeaScribe (see Figure 1). The settings are grouped into the following categories: GPS, mapping, map cache navigator, user interface, hotkeys, alerts, export and system. SeaScribe comes with default settings, which can always be reset by clicking the reset button at the bottom of the form. If any settings are outside of the required bounds, SeaScribe will suggest the upper or lower limit and also prompt you with a red box around it to enter a value.



6.8.1 *GPS settings*

The first category of settings is related to GPS function (Figure 33).

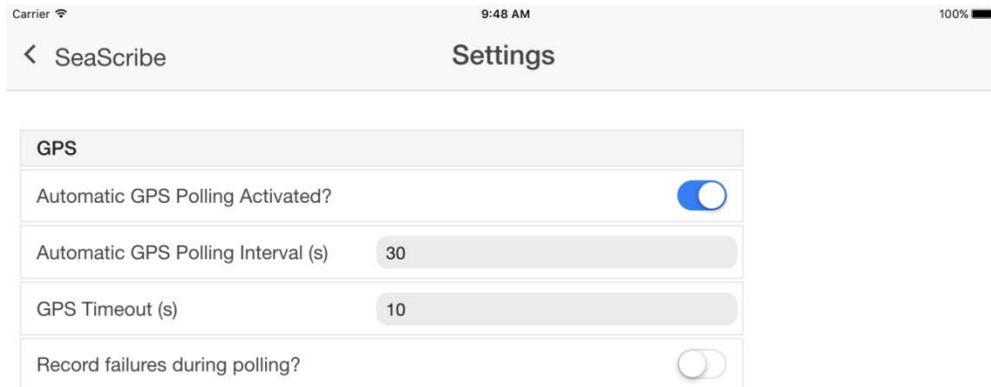


Figure 33. GPS function settings.

The following settings are available:

- 1) Automatic GPS Polling Activated – you can either enable or disable the polling function of the GPS. Automatic polling means that SeaScribe will request a location from the GPS and record this location along with the persistent field data at the set polling interval. Having polling on allows the user to record the track and thus effort for the survey. If the survey is a fixed survey effort, however, such as a seawatch, you may not want the location information being constantly recorded since it is of the same position (enabled or disabled, default = enabled).
- 2) Automatic GPS Polling Interval (s) – the polling interval in seconds (see above) (5-3600 s, default = 30 s).
- 3) GPS Timeout (s) – when GPS signal is poor, the GPS can “timeout” causing no location to be returned to SeaScribe. This timeout issues a warning in SeaScribe. The timeout interval can be lengthened if signal is poor and timeout occur regularly or shortened as necessary (1-60 s, default = 10 s).
- 4) Record failures during polling – when a request for GPS coordinates fails, do you want to record the error message to the database (enabled or disabled, default = disabled).

6.8.2 Mapping settings

Here you can adjust settings related to mapping in the observation form (Figure 34).

Mapping	
Initial Zoom	11 <input type="range"/>
Follow Latest GPS Logged?	<input checked="" type="checkbox"/>
Course Line Color	<input type="color" value="#0000FF"/>
Circle Rim Color	<input type="color" value="#FF0000"/>
Circle Fill Color	<input type="color" value="#FF0000"/>
Circle Fill Opacity	50 <input type="range"/>
Circle Radius Multiplier	5 <input type="range"/>
Circle Radius Minimum	10 <input type="range"/>
Circle Radius Maximum	500 <input type="range"/>

Figure 34. Mapping function settings.

Mapping options include:

- 1) Initial zoom level (1-15, default = 11).
- 2) Follow Latest GPS Logged – move the map to follow the latest GPS position logged (enabled or disabled, default = enabled).
- 3) Course Line Color – select one of fifteen colors (default = blue).
- 4) Circle Rim Color – select one of fifteen colors (default = red).
- 5) Circle Fill Color – select one of fifteen colors (default = red).
- 6) Circle Fill Opacity – set the opacity of the circle fill from transparent (0) to opaque (100) (default = 50).
- 7) Circle Radius Multiplier – this sets the multiplier of the observation point circle radius; this factor is responsible for the circle size increasing as the observation count increases (1-20, default = 5).
- 8) Circle Radius Minimum – this sets the minimum of the observation point circle radius (10-100, default = 10).
- 9) Circle Radius Maximum – this sets the maximum of the observation point circle radius (100-1000, default = 500).

6.8.3 Map cache navigator settings

These settings define options in the map cache navigator (Figure 35).

Map Cache Navigator	
Show Lowest Zoom Only	<input checked="" type="checkbox"/>
Show Label Tiles	<input type="checkbox"/>

Figure 35. Map cache navigator settings.

Settings include:

- 1) Show the Lowest Zoom Only – you can end up with a lot of tiles in the map cache, especially if you cache multiple zoom levels. This makes the Offline Map Cache display difficult to navigate, due to the sheer number of tiles. When Show Lowest Zoom Only is enabled, only tiles from the lowest zoom level will be displayed in the Offline Map Cache display. For example, if you cache zoom levels 10 to 12, only tiles from the level 10 set are shown (enabled or disabled, default = enabled).
- 2) Show Label Tiles – the ArcGIS ocean maps are split into two sets of tiles; terrain and labels, both are downloaded when the user requests to cache a map. In the Offline Map Cache display, the label tiles are small enough to be largely illegible, making their usefulness in that display minimal. This setting exists to once again reduce the number of tiles in the Offline Map Cache display (enabled or disabled, default = disabled).

6.8.4 User interface settings

Settings related to the user interface (Figure 36).

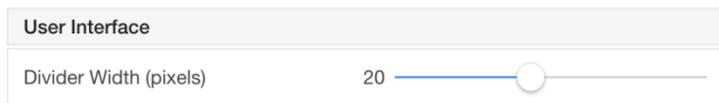


Figure 36. User interface settings.

- 1) Set the divider width between panes in the observation data entry form. A wider divider is easier to touch in the UI, but takes up valuable screen real estate.

6.8.5 Hotkeys settings

These are settings to control hotkeys (Figure 37). By default, only behavior has a hotkey field. If the user adds any hotkeys to age or plumage, the “Quick Age” and “Quick Plumage” fields are added to the observation form. The user can change the listed order if you click the blue “Show Reorder” button. Drag the values using the three lined symbol at right to the desired order. Click “Save” to save the hotkey settings or “Cancel” or click outside of the popup form to cancel and exit.

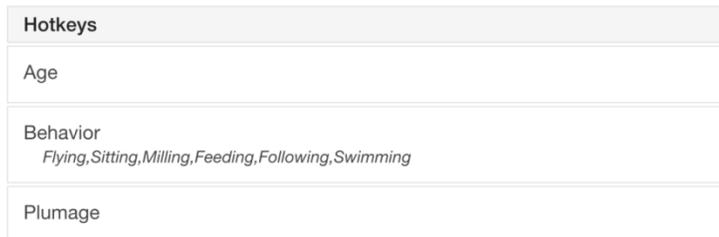


Figure 37. Hotkey settings.

- 1) Age – assign the ages as hotkeys to speed up data entry.
- 2) Behavior – assign the behavior hotkeys which have defaults as shown in the settings.
- 3) Plumage – assign the plumages as hotkeys to speed up data entry.

6.8.6 Alerts settings

Here the user can modify settings related to the persistent check alert (Figure 38).

Alerts	
Persistent Check Activated?	<input checked="" type="checkbox"/>
Persistent Check Interval (s)	900
Scroll to Persistent?	<input checked="" type="checkbox"/>

Figure 38. Alerts settings.

- 1) Persistent Check Activated – will the blue persistent check alert appear in the observation form (see 6.5.2.2) or not (enabled to appear or disabled, default = enabled).
- 2) Persistent Check Interval – the interval at which the persistent check flag will appear in seconds (60-7200 s, default = 900 s).
- 3) Scroll to Persistent – set whether clicking the “Time to review persistent form fields” button (see 6.5.2.2) in the header of the observation form scrolls to the persistent fields or not (enabled to scroll or disabled, default = enabled).

6.8.7 Export settings

Settings related to data export.

Export
Detach from Dropbox Account

Figure 39. Export settings.

- 1) Detach from Dropbox Account – this setting allows the user to detach the device from Dropbox. This is a 3-step process including signing out of Dropbox, disassociating the application from the Dropbox account via a web browser, and restarting the app. You will be asked to click next to continue after explaining this process in a dialog box.

6.8.8 System settings

System settings can be changed here. Except for “About”, all of these options are designed to assist with debugging any issues that may arise. As such, we recommend leaving the default settings unless directed otherwise by a technical support representative.

System	
Debugging Mode?	<input type="checkbox"/>
Logging Level	Info ▼
Persistent Log Threshold	Info ▼
About	>

Figure 40. System settings.

- 1) Debugging Mode – if enabled, extra options are shown in the Manage Data page. These extra options are Export Database, View Persistent Logs, and View Device Info (enabled or disabled, default = disabled).
- 2) Logging Level – sets the transient logging level. Levels, in order from most voluminous to least, are Debug, Info, Warn, Error, and Fatal. This is of no practical use unless the device is directly connected to a developer workstation for debugging purposes; we recommend leaving the setting at Info (Trace, Debug, Info, Warn, Error, or Fatal; default = Info).
- 3) Persistent Log Threshold – sets persistent logging level. Levels, in order from most voluminous to least, are Debug, Info, Warn, Error, and Fatal. We recommend never setting this threshold below Info unless so directed by a technical support representative (Debug, Info, Warn, Error, or Fatal; default = Info).
- 4) About – this is not a setting at all, but provides details about SeaScribe (Figure 41): version, funders (BOEM) and creators (BRI and Tilson), mapping data and open source attributions as well as links to further information (press “Go” to open a web browser for more info and click the X to return to SeaScribe).

SeaScribe v1.0.0



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Mapping Data Attributions

Layer Name	Provider	Attribution	Further Information
World Ocean Base	ArcGIS	Eri, DeLorme, GEBCO, NOAA NGDC, and other contributors	Go
World Ocean Reference	ArcGIS	Eri, GEBCO, NOAA, National Geographic, DeLorme, HERE, Geonames.org, and other contributors	Go

Open Source Attributions

Package	Further Information
Apache Cordova	Go
AngularJS	Go
Ionic	Go
jQuery	Go
jQuery UI Layout	Go
Leaflet	Go
L.TileLayer.Cordova	Go
esri-leaflet	Go
MomentJS	Go
Mustache	Go
Papa Parse	Go
SlickGrid	Go
Spectrum	Go
Typeahead.js	Go
Cordova-sqlite-storage	Go
Cordova Email Plugin	Go
Cordova Background Mode Plugin	Go

Figure 41. The about screen.

6.9 Tools

SeaScribe provides a few tools accessed from the “Tools” menu: illustrated Beaufort scale, distance estimation guide, manage data, and offline maps, each of which will be described below (Figure 42).

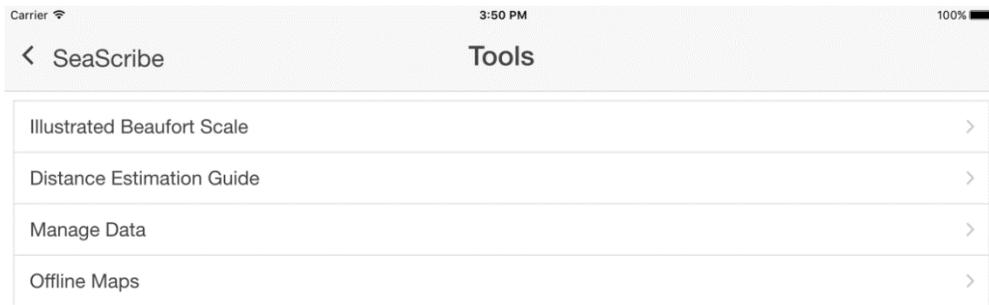


Figure 42. Tools menu.

6.9.1 Illustrate Beaufort Scale

This tool provides an illustrated guide to assessing Beaufort Scale (sea state)³. The conditions and an image are provided to assist the observer in correctly identifying Beaufort condition (Figure 43) which has an important effect on object detection. This scale is also accessible from the observation form options and tools button  in the Observation Form.

³ https://en.wikipedia.org/wiki/Beaufort_scale

0 - Calm

Wind Speed < 1 kmh / < 1 mph / < 1 knots / < 0.3 mps

Wave Height 0 m / 0 ft

Sea Flat.

Conditions

Land Conditions Calm. Smoke rises vertically.



BEAUFORT FORCE 0
WIND SPEED: LESS THAN 1 KNOT
SEA: SEA LIKE A MIRROR

1 - Light Air

Wind Speed 1.1-5.5 kmh / 1-3 mph / 1-3 knots / 0.3-1.5 mps

Wave Height 0-0.2 m / 0-1 ft

Sea Ripples without crests.

Conditions

Land Conditions Smoke drift indicates wind direction. Leaves and wind vanes are stationary.



BEAUFORT FORCE 1
WIND SPEED: 1-3 KNOTS
SEA: WAVE HEIGHT .1M (.25FT), RIPPLES WITH THE APPEARANCE OF SCALES, BUT WITHOUT FOAM CRESTS

2 - Light Breeze

Wind Speed 5.6-11 kmh / 4-7 mph / 4-6 knots / 1.6-3.3 mps

Wave Height 0.2-0.5 m / 1-2 ft

Sea Small wavelets. Crests of glassy appearance, not breaking.

Conditions

Land Conditions Wind felt on exposed skin. Leaves rustle. Wind vanes begin to move.



BEAUFORT FORCE 2
WIND SPEED: 4-6 KNOTS
SEA: WAVE HEIGHT .2-.3M (.5-1FT), SMALL WAVELETS, CRESTS HAVE A GLASSY APPEARANCE AND DO NOT BREAK

3 - Gentle Breeze

Wind Speed 12-19 kmh / 8-12 mph / 7-10 knots / 3.4-5.4 mps

Wave Height 0.5-1 m / 2-3.5 ft

Sea Conditions Large wavelets. Crests begin to break; scattered whitecaps.

Land Conditions Leaves and small twigs constantly moving, light flags extended.



BEAUFORT FORCE 3
WIND SPEED: 7-10 KNOTS

SEA: WAVE HEIGHT 0.5-1M (2-3FT), LARGE WAVELETS, CRESTS BEGIN TO BREAK, ANY FOAM HAS GLASSY APPEARANCE, SCATTERED WHITECAPS

4 - Moderate Breeze

Wind Speed 20-28 kmh / 13-17 mph / 11-16 knots / 5.5-7.9 mps

Wave Height 1-2 m / 3.5-6 ft

Sea Conditions Small waves with breaking crests. Fairly frequent whitecaps.

Land Conditions Dust and loose paper raised. Small branches begin to move.



BEAUFORT FORCE 4
WIND SPEED: 11-16 KNOTS

SEA: WAVE HEIGHT 1-1.5M (3.5-5FT), SMALL WAVES BECOMING LONGER. FAIRLY FREQUENT WHITE HORSES

5 - Fresh Breeze

Wind Speed 29-38 kmh / 18-24 mph / 17-21 knots / 8.0-10.7 mps

Wave Height 2-3 m / 6-9 ft

Sea Conditions Moderate waves of some length. Fairly frequent whitecaps.

Land Conditions Branches of a moderate size move. Small trees in leaf begin to sway.



BEAUFORT FORCE 5
WIND SPEED: 17-21 KNOTS

SEA: WAVE HEIGHT 2-2.5M (6-8FT), MODERATE WAVES TAKING MORE PRONOUNCED LONG FORM, MANY WHITE HORSES, CHANCE OF SOME SPRAY

5 - Fresh Breeze

Wind Speed 29-38 kmh / 18-24 mph / 17-21 knots / 8.0-10.7 mps

Wave Height 2-3 m / 6-9 ft

Sea Conditions Moderate waves of some length. Fairly frequent whitecaps.

Land Conditions Branches of a moderate size move. Small trees in leaf begin to sway.



BEAUFORT FORCE 5
WIND SPEED: 17-21 KNOTS

SEA: WAVE HEIGHT 2-2.5M (6-8FT), MODERATE WAVES TAKING MORE PRONOUNCED LONG FORM, MANY WHITE HORSES, CHANCE OF SOME SPRAY

6 - Strong Breeze

Wind Speed 39-49 kmh / 25-30 mph / 22-27 knots / 10.8-13.8 mps

Wave Height 3-4 m / 9-13 ft

Sea Conditions Long waves begin to form. White foam crests are very frequent. Some airborne spray is present.

Land Conditions Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic bins tip over.



BEAUFORT FORCE 6
WIND SPEED: 22-27 KNOTS

SEA: WAVE HEIGHT 3-4M (9.5-13 FT), LARGER WAVES BEGIN TO FORM, SPRAY IS PRESENT, WHITE FOAM CRESTS ARE EVERYWHERE

7 - High Wind, Moderate Gale, Near Gale

Wind Speed 50-61 kmh / 31-38 mph / 28-33 knots / 13.9-17.1 mps

Wave Height 4-5.5 m / 13-19 ft

Sea Conditions Sea heaps up. Some foam from breaking waves is blown into streaks along wind direction. Moderate amounts of airborne spray.

Land Conditions Whole trees in motion. Effort needed to walk against the wind.



BEAUFORT FORCE 7
WIND SPEED: 28-33 KNOTS

SEA: WAVE HEIGHT 4-5.5M (13.5-19 FT), SEA HEAPS UP, WHITE FOAM FROM BREAKING WAVES BEGINS TO BE BLOWN IN STREAKS ALONG THE WIND DIRECTION

8 - Gale, Fresh Gale

Wind Speed 62-74 kmh / 39-46 mph / 34-40 knots / 17.2-20.7 mps

Wave Height 5.5-7.5 m / 18-25 ft

Sea Conditions Moderately high waves with breaking crests forming spindrift. Well-marked streaks of foam are blown along wind direction. Considerable airborne spray.

Land Conditions Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.



BEAUFORT FORCE 8
WIND SPEED: 34-40 KNOTS

SEA: WAVE HEIGHT 5.5-7.5M (18-25FT). MODERATELY HIGH WAVES OF GREATER LENGTH. EDGES OF CREST BEGIN TO BREAK INTO THE SPINDRIFT. FOAM BLOWN IN WELL MARKED STREAKS ALONG WIND DIRECTION.

9 - Strong Gale

Wind Speed 75-88 kmh / 47-54 mph / 41-47 knots / 20.8-24.4 mps

Wave Height 7-10 m / 23-32 ft

Sea Conditions High waves whose crests sometimes roll over. Dense foam is blown along wind direction. Large amounts of airborne spray may begin to reduce visibility.

Land Conditions Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over.



10 - Storm, Whole Gale

Wind Speed 89-102 kmh / 55-63 mph / 48-55 knots / 24.5-28.4 mps

Wave Height 9-12.5 m / 29-41 ft

Sea Conditions Very high waves with overhanging crests. Large patches of foam from wave crests give the sea a white appearance. Considerable tumbling of waves with heavy impact. Large amounts of airborne spray reduce visibility.

Land Conditions Trees are broken off or uprooted, structural damage likely.



BEAUFORT FORCE 10
WIND SPEED: 48-55 KNOTS

SEA: WAVE HEIGHT 9-12.5M (29-41FT). VERY HIGH WAVES WITH LONG OVERHANGING CRESTS. THE RESULTING FOAM, IN GREAT PATCHES, IS BLOWN IN DENSE WHITE STREAKS ALONG WIND DIRECTION. ON THE WHOLE, SEA SURFACE TAKES A WHITE APPEARANCE, TUMBLING OF THE SEA IS HEAVY AND SHOCK-LIKE, VISIBILITY AFFECTED.

11 - Violent Storm

Wind Speed 103-117 kmh / 64-73 mph / 56-63 knots / 28.5-32.6 mps

Wave Height 11.5-16 m / 37-52 ft

Sea Conditions Exceptionally high waves. Very large patches of foam, driven before the wind, cover much of the sea surface. Very large amounts of airborne spray severely reduce visibility.

Land Conditions Widespread vegetation and structural damage likely.



BEAUFORT FORCE 11
WIND SPEED: 56-63 KNOTS

SEA: WAVE HEIGHT 11.5-16M (37-52FT), EXCEPTIONALLY HIGH WAVES, SMALL-MEDIUM SIZED SHIPS MAY BE LOST TO VIEW BEHIND THE WAVES. SEA COMPLETELY COVERED WITH LONG WHITE PATCHES OF FOAM LYING ALONG WIND DIRECTION. EVERYWHERE, THE EDGES OF WAVE CRESTS ARE BLOWN INTO FROTH.

12 - Hurricane Force

Wind Speed ≥ 118 kmh / ≥ 74 mph / ≥ 64 knots / ≥ 32.7 mps

Wave Height ≥ 14 m / ≥ 46 ft

Sea Conditions Huge waves. Sea is completely white with foam and spray. Air is filled with driving spray, greatly reducing visibility.

Land Conditions Severe widespread damage to vegetation and structures. Debris and unsecured objects are hurled about.



BEAUFORT FORCE 12
WIND SPEED: 64 KNOTS

SEA: SEA COMPLETELY WHITE WITH DRIVING SPRAY, VISIBILITY VERY SERIOUSLY AFFECTED. THE AIR IS FILLED WITH FOAM AND SPRAY

Figure 43. Beaufort sea state scale descriptions.

6.9.2 Distance Estimation Guide

The distance estimation guide is a tool for calculating the measurements on a ruler necessary to estimate distance of the object using the horizon and markings on a ruler or window as a guide (Figure 44). Enter the distance between the observer and ruler (or window) when the observer's arm is fully outstretched (holding the ruler) or distance of the eye to the window which will have markings. Enter the distance above water in meters. Enter distances you would like estimated in a comma-separated list. Click "Calculate" and the list of distances (in meters) and distance below horizon in millimeters is given to be marked on the ruler or window⁴.

⁴ Gjerdrum, C., D.A. Fifield, and S.I. Wilhelm. 2012. Eastern Canada Seabirds at Sea (ECSAS) standardized protocol for pelagic seabird surveys from moving and stationary platforms. Canadian Wildlife Service Technical Report Series No. 515. Atlantic Region. Vi, 37 pp.

Distance Estimation Guide
Cancel

Distance between observer's eye and ruler when observer's arm is fully outstretched (m)

Height of observer's eye above water at observation point (m)

Distance to be estimated (m, can be comma-delimited list)

Distance to be Estimated (m)	Distance Below Horizon (mm)
300	30
200	45
100	91
50	182

Figure 44. Distance estimation tool.

6.9.3 Manage Data

The “Manage Data” subform gives access to the database which stores the data behind the scenes for the application. Within this form you can select to: edit ancillary fields, edit survey platforms, edit observers, edit methodologies, reset all settings to defaults, and update the database.

Carrier
4:03 PM
100%

< Tools
Manage Data

Edit Ancillary Fields
Edit Survey Platforms
Edit Observers
Edit Methodologies
Reset All Settings to Defaults
Update Database

Figure 45. Manage data tools.

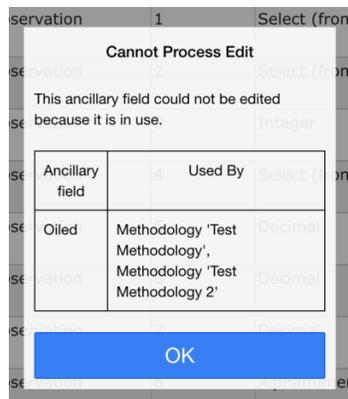
6.9.4 Edit ancillary fields

You will see in the edit ancillary fields table a list of all of the ancillary fields that have been added and the information about those fields (Figure 46). Here you can edit fields that are not in use, delete fields that have not been used, and add new fields.

Del?	Name	Frequency	Sort Order	Input Control	Input Control Chc
In Use	Association	Each Observation	1	Select (from a list of choices)	Associated with fi
In Use	Flying	Each Observation	2	Select (from a list of choices)	Yes, No, Taking Ot
In Use	Flight Height (m)	Each Observation	3	Integer	
In Use	Oiled	Each Observation	4	Select (from a list of choices)	Yes, No, Unknown
<input type="radio"/>	Percent Oiled (%)	Each Observation	5	Decimal	
<input type="radio"/>	Sea Surface Temp (C)	Each Observation	6	Decimal	
<input type="radio"/>	Salinity (%)	Each Observation	7	Decimal	
In Use	Fishing	Each Observation	8	Alphanumeric	
<input type="radio"/>	Glare	Changed at Intervals	9	Select (from a list of choices)	None, Slight/grey,
In Use	Weather	Changed at Intervals	10	Select (from a list of choices)	< 50% cloud cove
In Use	Test Ancillary Field	Each Observation	12	Select (from a list of choices)	Value for ID 1, Va

Figure 46. Edit ancillary fields table.

To edit a field click the cell in a row you want to change that does not have the “*In Use*” designator. If the field is already in use and you try to edit it, a warning is given that the field can’t be edited because it is in-use by the listed methodologies. Once the ancillary field has been used in survey, that field is locked from editing or deletion to preserve the information for that survey. You will need to add another ancillary field with the changes you desire.



To delete an unused ancillary field, click the open circle in the “Del?” column in the field of choice. Only those ancillary fields with rows that do not say “In Use” are able to be deleted. Click the red “Process Deletes” button to execute the ancillary field delete.

To add a new ancillary field, click the blue “New” button; doing so will open the “New Ancillary Field” dialog box where you can enter values for the new field. Click “Save” to save the new field or “Clear” to start over and “Cancel” to exit without creating a field (Figure 47).

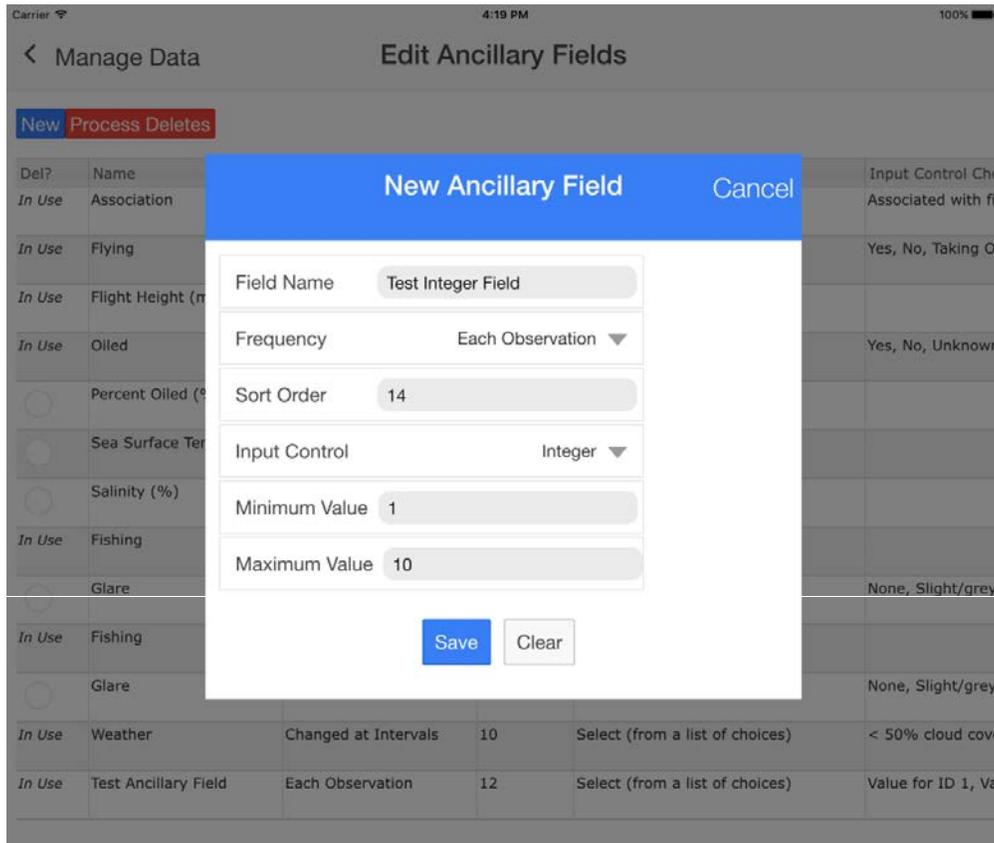


Figure 47. Enter a new ancillary field from the edit ancillary field form.

Once created, the new ancillary field gets listed in the table and is available for use in surveys (Figure 48).

Del?	Name	Frequency	Sort Order	Input Control	Input Control Chk
In Use	Association	Each Observation	1	Select (from a list of choices)	Associated with fi
In Use	Flying	Each Observation	2	Select (from a list of choices)	Yes, No, Taking OI
In Use	Flight Height (m)	Each Observation	3	Integer	
In Use	Oiled	Each Observation	4	Select (from a list of choices)	Yes, No, Unknown
<input type="radio"/>	Percent Oiled (%)	Each Observation	5	Decimal	
<input type="radio"/>	Sea Surface Temp (C)	Each Observation	6	Decimal	
<input type="radio"/>	Salinity (%)	Each Observation	7	Decimal	
In Use	Fishing	Each Observation	8	Alphanumeric	
<input type="radio"/>	Glare	Changed at Intervals	9	Select (from a list of choices)	None, Slight/grey,
In Use	Weather	Changed at Intervals	10	Select (from a list of choices)	< 50% cloud cove
In Use	Test Ancillary Field	Each Observation	12	Select (from a list of choices)	Value for ID 1, Va
<input type="radio"/>	Test Integer Field	Each Observation	14		

Figure 48. Addition of a new ancillary field.

6.9.5 Edit survey platforms

The user can edit survey platform information or delete survey platform(s) from the database (Figure 49). Select the cell in the platform of interest to edit or click the “Del?” cell and click “Process Deletes” to delete.

Del?	Name	Type
<input type="radio"/>	HMS Bounty	Watercraft

Figure 49. Edit survey platforms.

To edit a text field simply click in the field and make the edits in the cell (Figure 50).

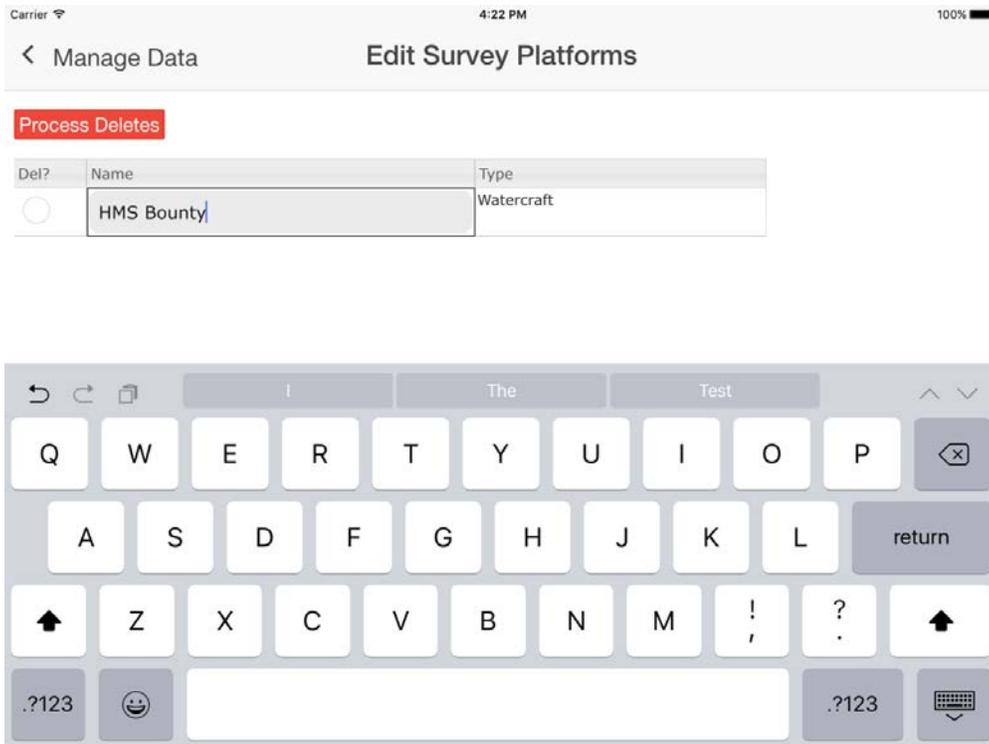


Figure 50. Edit a text field for a survey platform.

To change a dropdown click the dropdown box and select the desired entry (Figure 51).

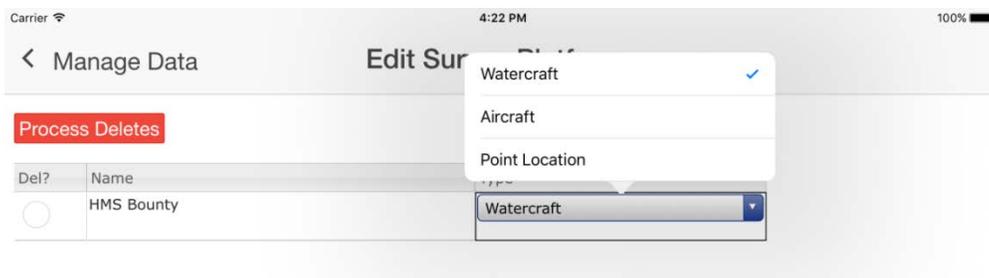


Figure 51. Changing a dropdown box for a survey platform.

6.9.6 Edit observers

The user can edit observer information or delete observer(s) from the database (Figure 52). Select the cell in the observer record to edit or click the “Del?” cell and click “Process Deletes” to delete. Editing observer fields follows in the same way as for survey platforms.



Figure 52. Edit observers data.

6.9.7 Edit methodologies

The user can edit methodologies or delete them from the database (Figure 53). Select the cell in the platform of interest to edit or click the “Del?” cell and click “Process Deletes” to delete.

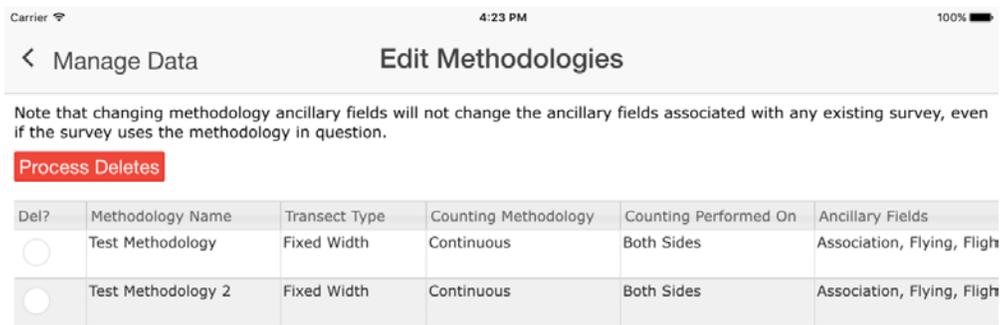


Figure 53. Edit methodologies.

To edit a text field simply click in the field and make the edits in the cell (Figure 54).

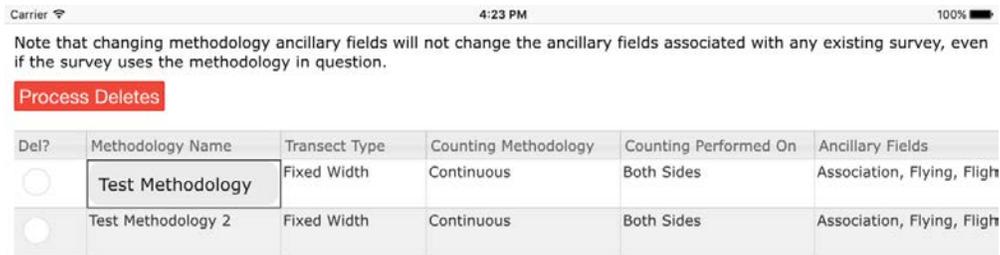


Figure 54. Edit a text field for a methodology.

To change a dropdown click the dropdown box and select the desired entry (Figure 55).

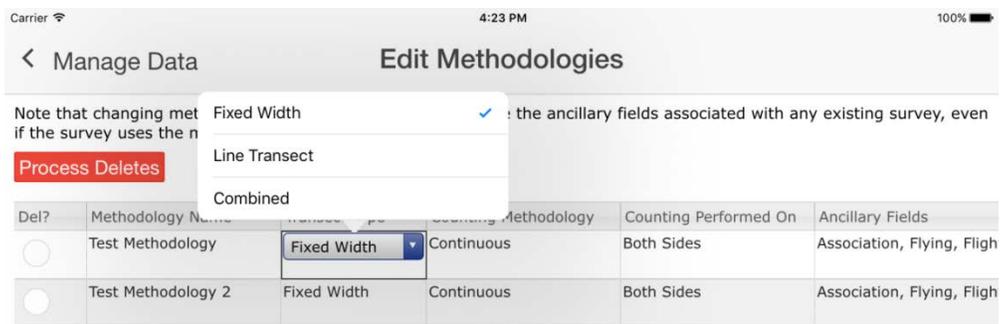


Figure 55. Changing a dropdown box for a methodology.

You can also modify the ancillary fields for a methodology using the select ancillary field dialog box (Figure 56).

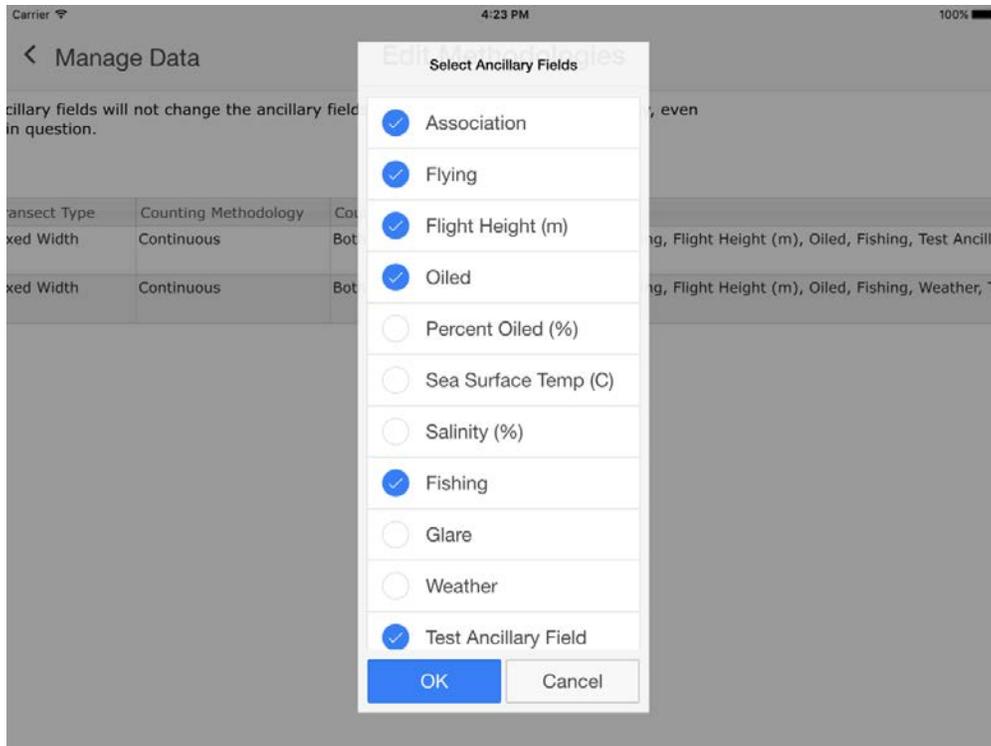
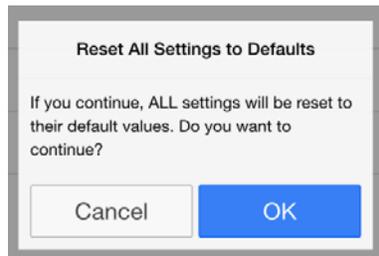


Figure 56. Modify ancillary fields dialog box in the edit methodologies window.

6.9.8 Reset all settings to defaults

You can perform a “factory reset” on the settings by clicking on the “Reset All Settings to Default” button which will bring up the following dialog box.



Click “Cancel” to exit or “OK” to accept the factory reset.

6.9.9 Update the database

The database can be reset as well which will delete all data and reset to the base database. Caution should be taken as this will irreversibly delete **ALL DATA**. You will be asked to confirm deletion and enter a confirmation code to complete the database update.

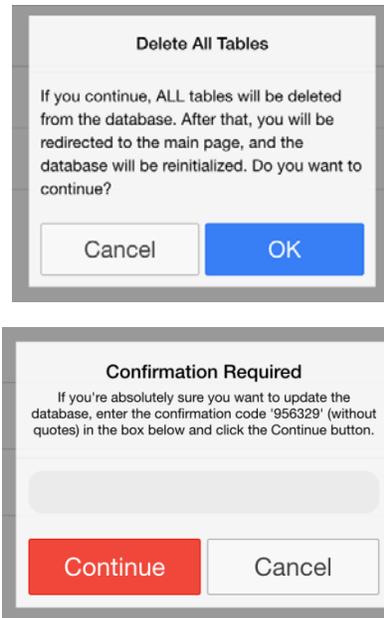


Figure 57. Update the database

6.9.10 Offline Maps

Because access to the internet is typically unavailable during surveys, SeaScribe has a utility for caching maps while internet is available and using these maps while offline (Figure 58). This utility requires the user to move around the map and cache maps at various zoom levels. Pan to the area of the map that you think will be most useful for your survey efforts. By default the map centers on your current location, if known.

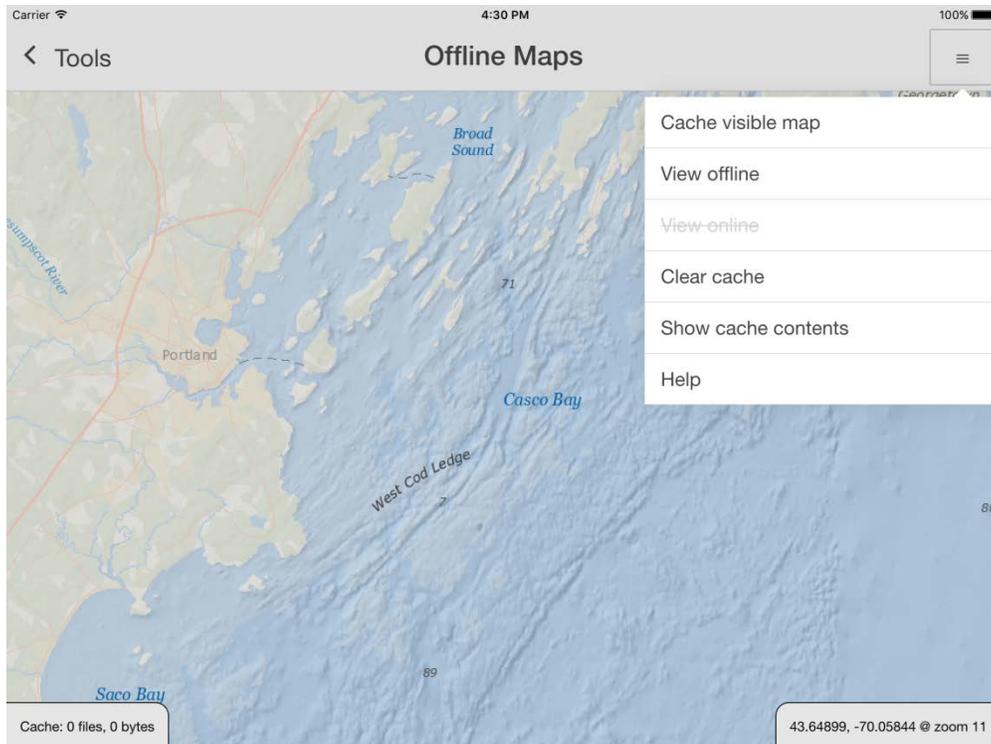
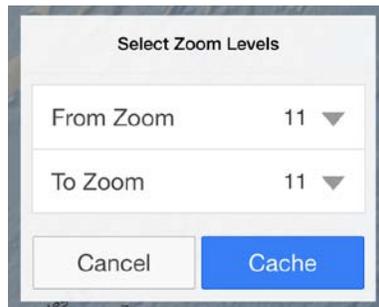


Figure 58. Offline map caching utility.

When you click on the menu button  at the top right of the screen a suite of available options drop down including: cache visible map, view offline, view online, clear cache, show cache contents and help.

When you cache the visible map, you are asked to set zoom levels to the upper and lower bounds you wish to cache. SeaScribe allows multiple zoom levels of caching to speed up the process of caching maps. When you open the Cache maps dialog (below) it sets the “From Zoom” and “To Zoom” to the current zoom level.



You can cache three levels of zoom at a time. Select “From Zoom” and “To Zoom” and click “Cache” to begin downloading and caching map tiles or “Cancel” to exit. When you click “Cache” you will be asked to confirm the request for the specified number of tiles. As tiles are downloaded and cached, the progress will be followed at the lower left corner of the screen. SeaScribe uses the ESRI World Ocean Base and Reference maps which currently only have tiles up to zoom level 13; no tiles are available at zoom levels 14 or 15. If you zoom into level 14 or 15, the tiles are replaced by a blue warning tile that

says “Map data not yet available”. Future versions of this base map may have more detailed map data at finer zoom levels (14-15).



A dialog box will show when the cache request is complete and the number of tiles and size of the cached tiles will be shown in the lower left hand corner of the screen (Figure 59).

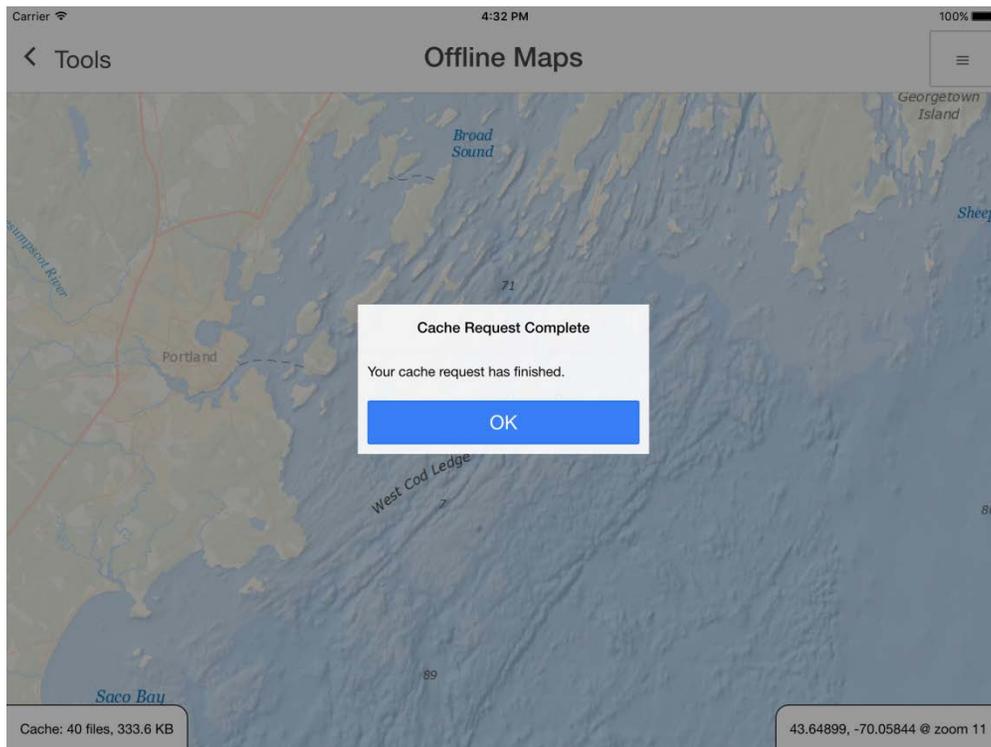


Figure 59. A completed map cache request.

By switching to offline mode, you can check to see if the needed map tiles have been cached for use later. Wherever map tiles are missing the map screen will show gray background (Figure 60). Switching back to online mode will allow you to download any additional tiles needed.

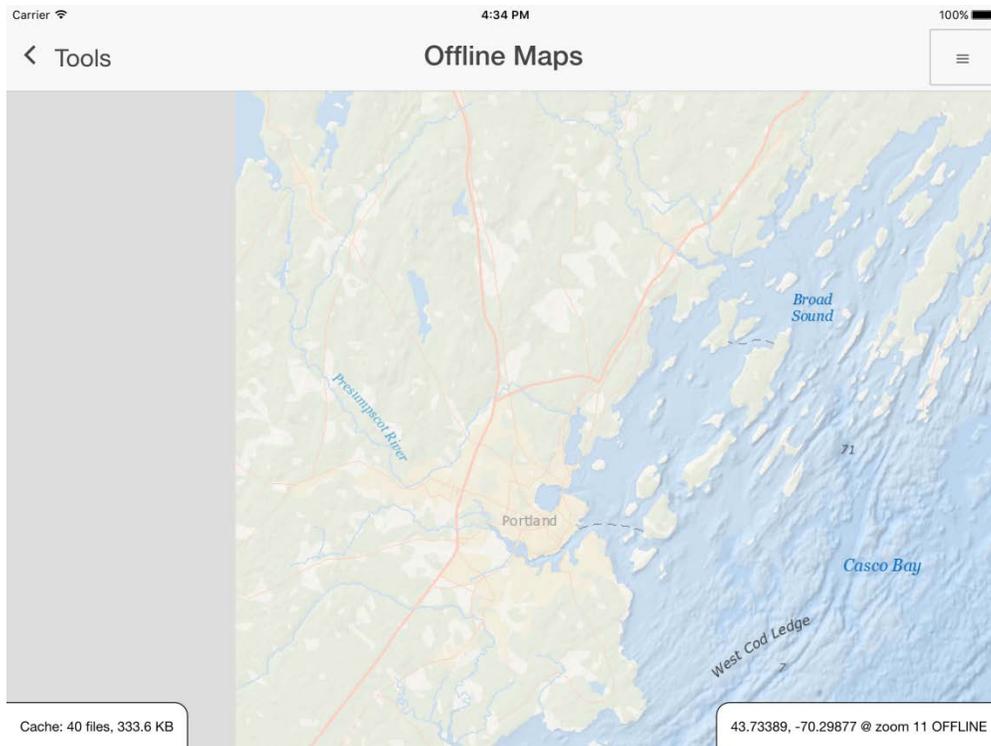


Figure 60. Offline map viewing with missing (gray) map tiles.

By selecting “Show cache contents” you can see the list of cached map tiles and go to a cached map tile by clicking the blue “Go” button next to the tile you want to pan to (Figure 61).

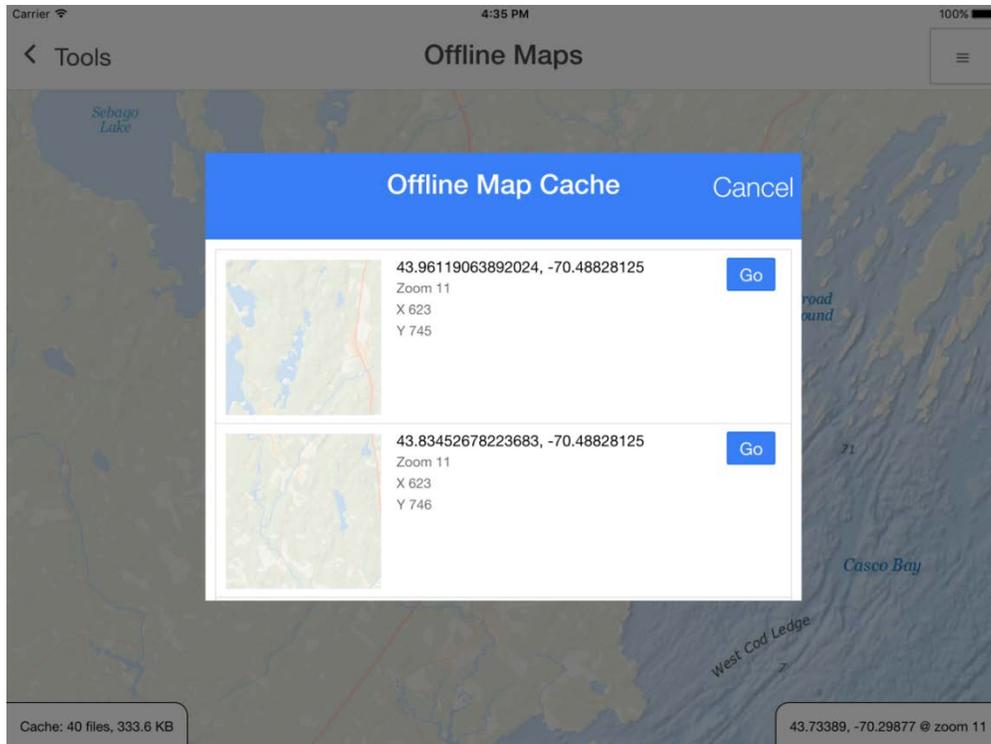
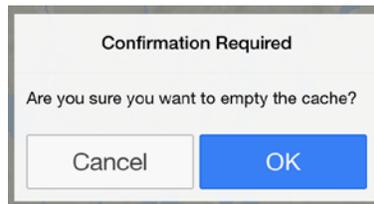
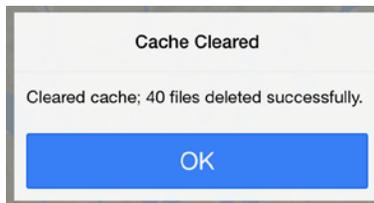


Figure 61. Offline map cache list.

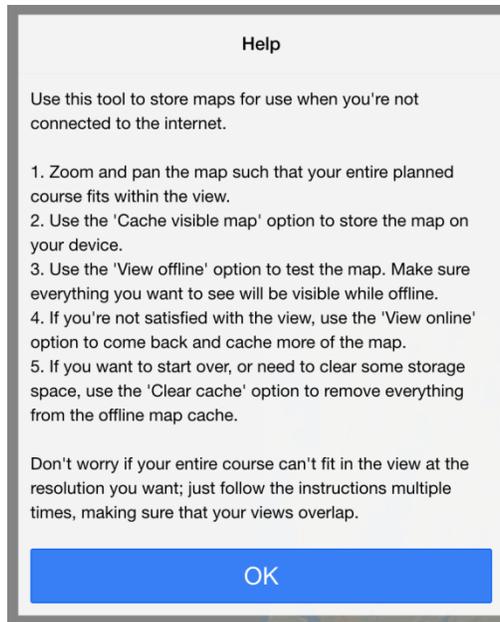
Map tiles will be available until you clear the cache. Note that continuing to cache map tiles uses up storage on the device which will only be released when the map cache is cleared. You will be asked to confirm cache clearing.



Once confirmed the cache cleared dialog box will display.



Clicking help will give guidance about the processing of caching tiles.



6.10 Application errors and enhancement requests

Note that this application does not have planned ongoing maintenance; however, it is possible that the user will encounter errors (bugs) in the software or want to make enhancement requests. All errors and enhancement requests should be directed to BOEM at boemseascribe@boem.gov. It is hoped that annually all bugs and enhancement requests will be considered and addressed. Feel free to direct all comments positive and negative to this address as well. We hope that SeaScribe will benefit the marine survey community for years to come.