The pilot project has been a collaborative effort among the Northeast Regional Planning Body, SeaPlan, the Atlantic Coastal Cooperative Statistics Program, state and federal fisheries managers, George Lapointe Consulting, Harbor Light Software, and the for-hire fishing industry in the Northeast.
Introduction
The past year represents the beginning of a new era of planning and management in U.S. oceans. The Northeast Ocean Plan and the Mid-Atlantic Ocean Action Plan have been submitted to the National Ocean Council1. Construction of the Block Island Wind Farm, the Nation’s first offshore wind farm, was completed2. By the end of 2016, the Bureau of Ocean Energy Management will have leased over 1.2 million acres off of the Atlantic coast for commercial wind development3. These events underscore the need for accurate, up-to-date data on ocean uses to help identify potential use conflicts between existing and emerging uses and support natural resource management, including fisheries management.

Over the past three years, SeaPlan has been working in a collaborative partnership with the for-hire fishing industry, state and federal fisheries managers, the Northeast Regional Planning Body, the Atlantic Coastal Cooperative Statistics Program, George Lapointe Consulting, and Harbor Light Software. With this team, SeaPlan worked on a pilot project aimed to satisfy both planning and management objectives: develop a preliminary understanding of important areas of the ocean for the for-hire fishing industry at the project’s scale, embed the capability for spatial data collection into existing institutional functions, and improve electronic reporting for fisheries management. The Northeast Ocean Plan identifies this work as an important stepping stone to the potential development of a regional scale spatial representation of for-hire fishing activity. The growth in electronic reporting means higher quality, more timely catch and effort data for resource managers.

This report presents the overall results of the spatial data collection in 2015 & 2016 and the methods and results of participatory mapping workshops conducted in 2016. The 2015 Pilot Party and Charter Vessel Mapping Study Final Report (Figure 1) provides additional details on the project, including the context, purpose, and goals; the collaboration with fisheries management officials and entities; and development and management of the technical infrastructure, including data management and processing. Figure 2 presents a timeline of the spatial data collection pilot project.

---

1 The Northeast Ocean Plan as submitted to the NOC is available on the Northeast Regional Planning Body’s website. The Mid-Atlantic Ocean Action Plan as submitted to the NOC is available on the Mid-Atlantic Regional Planning Body’s website, which is hosted by BOEM.
2 Construction on the BIWF was completed in August 2016.
3 Eleven commercial wind leases have been issued by BOEM (summaries are available on their renewable energy fact sheet) with another slated to occur in mid-December for an area off the coast of New York (see the press release for the lease sale).
Approach
The team used a mixed methods approach that depended on close collaboration with project partners (Figure 3). The project focused on the collection of spatial data on vessel movement and fishing activity empirically through a tablet based application: SAFIS eTRIPS Mobile. In the final year of the project, SeaPlan used participatory mapping workshops to augment data collected through the tablet application.

Empirical Data Collection
The backbone of the pilot project was the capability to collect vessel tracking data and catch location data directly from captains. We provide a summary of methods below for reference through the remainder of the report.

<table>
<thead>
<tr>
<th>Year</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013 - 2014</td>
<td>• Rhode Island Party and Charter Boat Association initiated project</td>
</tr>
<tr>
<td></td>
<td>• Pilot project planning &amp; partnership building</td>
</tr>
<tr>
<td>2015</td>
<td>• Spring - Application development &amp; industry outreach</td>
</tr>
<tr>
<td></td>
<td>• Summer - Deploy tablets, begin data collection, &amp; troubleshoot issues</td>
</tr>
<tr>
<td></td>
<td>• Fall &amp; Winter - Continue data collection, process data, meet with captains, &amp; report initial results</td>
</tr>
<tr>
<td>2016</td>
<td>• Spring - Reengage captains &amp; recruit additional participants</td>
</tr>
<tr>
<td></td>
<td>• Summer - Collect data, troubleshoot application performance, &amp; provide data to captains</td>
</tr>
<tr>
<td></td>
<td>• Fall - Conduct participatory mapping workshops, plan for future work, &amp; report</td>
</tr>
<tr>
<td>2017 &amp; Beyond</td>
<td>• Possible continuation of data collection &amp; integration into institutional function</td>
</tr>
</tbody>
</table>

Figure 2. Timeline of Spatial Data Collection Pilot Project
Methods Review

In collaboration with state and federal fisheries managers, partners developed the SAFIS eTRIPS Mobile tablet application\(^4\), which is primarily focused on the collection of catch and effort information\(^5\) required for fisheries management. In early 2016, the application was certified by the National Marine Fisheries Service as an acceptable means for captains to submit federal vessel trip reports. During the 2015 project, individual participants in the location data collection program were identified in the code of the application and their locations were collected using the tablet’s GPS functionality. In 2016, this capability was generalized and the application now features an opt-in setting for any user to supply their location data if their tablet has the technical capability (located within the internal settings menu of the application).

SeaPlan provided participating captains with location-enabled iPads, protective cases, and mounting hardware for their vessels. SeaPlan and Harbor Light Software staff trained captains on the use of the application. During the 2016 season, tutorial videos supported training and provided a reference for captains\(^6\). Partners provided troubleshooting support throughout the project, though some issues remain with the application’s capability to collect location data (see the Results & Discussion Section below for more details).

Throughout the fishing season, captains brought the tablets onboard their vessels and tracked their trips using the SAFIS eTRIPS Mobile application. Captains uploaded trips periodically when they had access to the internet and all data were collected and stored by ACCSP. SeaPlan was granted access to location data through the online SAFIS interface. We periodically downloaded spatial data, processed those data, and provided maps back to participating captains.

---

\(^4\) SAFIS eTRIPS Mobile was developed by Harbor Light Software for ACCSP. The application was developed in close coordination with fishing industry members and fisheries managers, in order to both satisfy mandated reporting requirements and ensure ease of use.

\(^5\) Catch information collected for reporting can include species, number, and/or weight of fish landed and the disposition of fish caught (e.g. released alive, used for bait, kept for sale, etc.). Effort information collected can include the number and type of gear used, the duration of the trip, and limited information on location.

\(^6\) Available on the ACCSP website
Results & Discussion

Between 2015 and 2016, a total of 16 captains participated from Rhode Island, Connecticut, and New York. The level of participation varied by captain and by year. Over the duration of the project, we collected over 500 trips with associated location data. Most data were submitted by captains in Rhode Island and Connecticut. Figures 4 and 5 show a density map of the data we collected from Rhode Island captains between 2015 & 2016. Figure 6 shows a similar map of the data we collected from Connecticut captains. We urge caution in the interpretation of these maps, as our participants and their trips we collected are not representative of all for-hire activity in the area. We suggest that these maps can be used to identify areas that are used by the for-hire industry, however these maps cannot be used to argue that a given area is not important to the industry.

Due to technical hurdles and varied geographical representation, we collected more information from Rhode Island participants than from participants in other states. Data from captains hailing from Rhode Island ports included a few trips to the submarine canyons at the edge of the continental shelf (Figure 4). Additional data collected during the 2016 season bolsters the data collected in 2015 and show that areas surrounding Block Island, particularly off its south-western corner, are frequently visited by the for-hire captains that participated in the study (Figure 5). These additional data also expand the footprint of use that we captured in 2015.

In 2016, we captured few trips from captains sailing from New London, CT, thus our results look quite similar to those we captured in 2015 (Figure 6). There is one exception; in 2016 we recruited one participant that sailed from Clinton, CT. We experienced numerous technical issues during collection of his data but were able to collect a small number of his trips. These are reflected in the separate set of activity notable in the western portion of the extent of Figure 6.

Overall, captains were very receptive to use of the application and the convenience of electronic reporting. However, spatial data collection in 2016 was characterized by challenges with performance of the eTRIPS Mobile application. By the end of the 2015 data collection season, the application was performing well with only a few remaining bugs that had a minor impact on data collection. Early in the 2016 data collection season, there was an abrupt shift in performance when multiple captains, who had previously submitted trips with high quality spatial data, began submitting trips with very little or no associated spatial data. Unfortunately, this issue was not resolved by the end of the 2016 season, thus much of our empirical results rely on data collected in 2015.

7 SeaPlan inspected all location data during the troubleshooting process and during analysis. Trips that only contained data collected while at port or others that were apparent in their inaccuracy were not included in the analysis.
8 We do not present additional data from New York captains in this report. Unresolved issues with the application resulted in poor quality data from those participants. Data collected from the 2015 season is provided in the report from that year’s work.
Figure 4. Overview of Rhode Island Captains’ Activity from 2015-2016. Density grids were computed using a 1km² hexagonal analysis grid.
Figure 5. Rhode Island Captains’ Nearshore Activity from 2015-2016. Density grids were computed using a 1km² hexagonal analysis grid.
Figure 6. Overview of Connecticut Captains' Activity from 2015-2016. Density grids were computed using a 1km² hexagonal analysis grid.
Participatory Mapping Workshops

During the fall of 2016, SeaPlan conducted two participatory mapping workshops, one in each of Rhode Island and Connecticut. The purpose of these workshops was to both collect supplementary spatial data on important fishing areas for the for-hire industry and vet the data we collected through the tablet application.

Methods

Learning from our experience conducting participatory mapping workshops during the collection of recreational use data,9 and drawing from the NOAA guide to participatory mapping, SeaPlan designed workshops to gather general use information on the fishing spots important to captains. We worked with industry partners to coordinate a time and place for each workshop. We met at industry operated or associated venues to help coordinate around captains highly variable schedules. This provided us flexibility in our scheduling and ensured that we could discuss sensitive information in confidence.

We used a particular type of participatory mapping where participants interact directly with a geographic information system (GIS) and provide digital data. For this process, one staff member controlled the GIS software on a laptop, which was projected onto a wall or other rigid smooth surface, while another facilitated discussion and data collection. We used Esri’s ArcMap as our GIS to provide a dynamic basemap and collect and manage data during the workshops. Participants used an eBeam Edge pen, essentially as a remote mouse, to interact with the projected map and draw important fishing areas. The staffer at the laptop was able to zoom, pan, change the layers visible on the basemap, and otherwise manage the GIS to satisfy the needs of the participant. Both groups that we worked with preferred to use the NOAA Nautical Charts as the basemap to orient their input, as this is what they use during normal operations on their vessels.

For each workshop, participants were seated around the table and directed towards the map. We had six participants in Rhode Island and four participants in Connecticut. Staff provided a demonstration on how to use the eBeam pen and then asked participants to circle the areas they depended on for fishing. Participants were not asked to indicate areas used for transit and generally did not offer contextual information on the fishing areas (e.g. time of year used, species targeted, frequency of use, etc.). Participants in Rhode Island were interested in using the empirical data collected (Figures 4 & 5) to help guide their data entry. The size of the hexagonal grid seemed to guide the specificity of their entries on the map. Captains in Connecticut found additional empirical data (Figure 6) on the screen to be distracting but did compare it to their entries once they had finished. Throughout the process, notes were taken on additional attributes of specific areas, including, when offered, usage details or notes on any necessary modifications to the data (e.g. merge two areas together).

9 During work to characterize important recreational uses of the ocean in the Northeastern US, SeaPlan collected data on commercial whale watching and SCUBA activities using participatory mapping techniques. For details on this project, please refer to the Characterization of Coastal and Marine Recreational Activity in the U.S. Northeast available on our website.
There was one captain who was unable to attend the workshop as he had planned. After the workshops concluded, we provided him maps of the data we had collected through the application and the relevant workshop. He contributed additional data by printing out the applicable map, drawing additional areas on it with a pencil, and sending a scan back to us. We digitized those data and integrated them into the larger dataset for that state.

Results & Discussion
Data collected from the two workshops are summarized in Figures 7 & 8. For the most part, participants indicated areas of a relatively consistent size within nearshore areas. Areas that they indicated offshore tended to be larger and less specific. One result of note is the number of overlapping areas indicated by participants from the two states (e.g. around Block Island). This may suggest that we captured relatively contiguous information, with few gaps in the geographical space between the two groups. That being said, it is particularly important that these results are properly contextualized during interpretation.

In general, participatory mapping is a powerful technique because it allows participants to share information in as general a format as they are comfortable and edit results on-the-fly. Participants can also retain information they are not comfortable sharing. The quality of results from the process can vary among workshops and between different stakeholder groups. We found that the presence of the empirical data helped to keep many of the entries to the size of a few square kilometers. Throughout data collection, participants indicated that there are a multitude of additional small fishing sites that may be targeted beyond those provided. Captains also noted that some larger trolling areas are not captured. The specific bounds of a given area should not be taken to have a high level of precision. Rather, areas should be interpreted to represent general areas of use, with the possibility of supplemental use in areas that are not indicated.

Participants indicated that areas are used with varying frequency, and some are not used at all during some years. Much of the reason why a particular spot is used depends on if fish are found there in a given season. If a particular spot does not seem to have fish on it one season, they may come back the next. Decisions on which area to use are also dependent on the species the captain is targeting.

Participatory mapping workshops are powerful tools not only to collect data, but also to substantively engage with stakeholder groups. They offer an opportunity to discuss the overarching objectives of ocean planning initiatives and provide specific details on relevant efforts. We were fortunate to have a person knowledgeable and involved with the Connecticut Blue Plan process at the workshop in that state, who was able to answer a great deal of questions the participants had and gather his own insights from the conversation.

10 More information on the Blue Plan can be found on the Connecticut Department of Energy & Environmental Protection website.
Figure 7. Participatory mapping results, overview.
Figure 8. Participatory mapping results, nearshore detail.
Integrated Results

Figures 9 & 10 show the results of the participatory mapping workshop in Rhode Island overlaid on the empirical data collected over both seasons from captains there. Figures 11 & 12 show analogous information for Connecticut captains. One limitation of the empirical data is that it does not differentiate between fishing and transit areas. Vessel speed is roughly correlated with these activities, and more nuanced analysis may allow derivation of these two activity types. However, participants were not comfortable sharing preliminary results of this type that we developed during the 2015 season because the distinction between the two modes was not sufficiently accurate. The results from the participatory mapping sessions address this limitation.

As noted above, participatory mapping results captured additional fishing areas not recorded in the empirical data. These gaps are attributable to two factors: 1) issues with the application or user error, and 2) areas not indicated due to their lack of use during the study period. Still, our results demonstrate the advantages of using the mixed methods approach. While the empirical data can provide some indication of the relative intensity of use of particular areas, the participatory process allows empirical data to be contextualized and provides an opportunity to collect rich supporting information about industry activity.

Next Steps

With the movement towards electronic reporting in for-hire fisheries management, the integration of spatial data collection provides the opportunity to supply updated, high quality data to inform ocean planning and benefit industry participants. By developing and testing tablet-based technology that can serve both fisheries reporting and ocean planning needs, and by fostering necessary capacity and relationships among key partners, this pilot project established a promising foundation to be scaled and incorporated into normal institutional operations. Summarized below are key next steps identified through discussions with project partners to move the effort forward toward a regional scale implementation.

- **Improve the SAFIS eTRIPS Mobile application location data collection capabilities.** Performance of the application and its susceptibility to user error varied over the course of the pilot program, with the 2016 collection season posing particular challenges for consistent collection of quality spatial data. A successful regional roll out can be advanced by ensuring the functionality of the application’s spatial component and incorporating lessons from the pilot project to improve user instructions\(^1\) and troubleshooting\(^2\).

---
\(^1\) The tutorial videos hosted by ACCSP greatly improved the efficiency of training in 2016; further development of similar training materials and consistent updates to existing videos will facilitate the growth in use of the application.
\(^2\) Developing relationships with participating captains facilitates troubleshooting, as a participant having difficulties with the application is more likely to call early on and willing to work through challenging issues. Additionally, the capability for detailed technical logging was integrated into the application in 2016. This type of logging should improve future technical troubleshooting and help reveal bugs in the software.
Figure 9. Integrated empirical (2015-2016) and participatory mapping results for Rhode Island participants.
Figure 10. Integrated empirical (2015-2016) and participatory mapping results for Rhode Island participants, nearshore detail.
Figure 11. Integrated empirical (2015-2016) and participatory mapping results for Connecticut participants.
Figure 12. Integrated empirical (2015-2016) and participatory mapping results for Connecticut participants, nearshore detail
• **Develop additional application features that benefit industry while improving spatial data management and distribution.** Industry partners have indicated throughout the project that additional features to improve the application’s function as an electronic logbook would be advantageous for their businesses. Beyond giving them valuable information, providing captains access to their own trip maps directly through the application would also allow them to act as a first line of quality control by detecting data collection issues during or shortly after their trips. This capability would also alleviate any need to process and return data to captains, as it would be available immediately to them.

• **Formalize framework for determining access to and consent for use of spatial data.** During the pilot project, data collection, vetting, and distribution was conducted through a fairly informal trust-based system. SeaPlan’s role as a data expert and neutral third party helped insulate sensitive industry location data from potential uses inconsistent with industry interest. With SeaPlan’s exit from the project, remaining questions about access to and use of location data must be addressed in a more systematic fashion. We suggest two avenues through which these concerns can be addressed: 1) adding new features to the application through which the user can indicate consent, and 2) developing a user agreement for the tablet application that integrates basic provisions for any data sharing processes.

• **Integrate spatial data delivery and processing into current ocean planning data management and update systems.** Continued communication and collaboration between ocean planning and fisheries management entities will be paramount for a successful transition to the full automation of data collection, processing, vetting, and distribution. If data from a regional scale effort are to be presented on the Northeast Ocean Data Portal (or other regional or state data portal), communication during the development or modification of technical systems will facilitate smooth data transfer protocols. Although we anticipate potential challenges finding sufficient numbers of participants throughout the region to create a representative study, the outcomes of any data collection program should be aligned with the needs of the planning authority.

Continuation of the effort beyond 2016 and potential expansion of the project toward a regional scale will depend on project partners’ sufficient organizational capacities and respective institutional priorities. With industry generally supportive of the project, at a minimum enhancing the application’s functionality and clarifying the terms of data accessibility and use would facilitate a path forward for regional scale (or larger) for-hire sector spatial data collection in the future. Potential funding opportunities also offer promise for the effort to move ahead, including the Fisheries Innovation Fund from the National Fish and Wildlife Foundation13. Summarized below are possible avenues for continued partner roles, as identified through discussions with project partners:

• The NERPB identified the need for spatial data collection to inform its ocean planning efforts and will continue to play an important role as the region’s marine planning authority. This project is

---

13 This past year, electronic reporting was specified as a focus of Fisheries Innovation Fund grants and a similar focus is likely to persist over the next few years.
specified in the Northeast Regional Ocean Plan as submitted to the National Ocean Council as a way to address spatial data gaps on the for-hire fleet. Consultation and engagement of RPB staff will ensure that as application capabilities and data access terms are developed, resulting products will be able to be integrated into the planning process.

- **ACCSP**, a critical partner throughout the project, foresees its ongoing support for maintaining the application given the anticipated expansion of electronic fisheries reporting, which remains their priority focus. ACCSP may also be in a position to handle updates to the location aspects of the application recognizing that analysis and storage of spatial data is compatible with its priorities, while also of considerable interest to the for-hire sector, and that the capability to collect those data is piggybacked on the reporting aspect of the application.

- **Industry members** are the crux of this project’s path forward. Their participation and support are critical for a successful transition to a full scale project.

Expanding this kind of effort from pilot to regional scale presents both opportunities and challenges. This pilot project has created a foundation that we hope will enable an effective full scale roll out in the future as circumstances allow, including broad scale industry recruitment, training, and support.