Form Rev. 10.3.14

*Please refer to the Reporting Policy for all reporting due dates and requirements.

1. **Program Number:** *See,* Reporting Policy at III (C) (1).

15120111-C

2. **Project Title:** *See,* Reporting Policy at III (C) (2).

Data Management Support for the EVOSTC Herring Program

3. **Principal Investigator(s) Names:** *See,* Reporting Policy at III (C) (3).

Rob Bochenek, Alaska Ocean Observing System (AOOS)

4. **Time Period Covered by the Report:** *See,* Reporting Policy at III (C) (4).

February 1, 2015 – January 31, 2016

5. **Date of Report:** *See,* Reporting Policy at III (C) (5).

February 2016

6. **Project Website (if applicable):** *See,* Reporting Policy at III (C) (6).

AOOS Workspace Herring Research and Monitoring Program group: https://workspace.aoos.org/group/3503/projects

AOOS Gulf of Alaska Data Portal: http://portal.aoos.org/gulf-of-alaska.php#

7. **Summary of Work Performed:** *See,* Reporting Policy at III (C) (7).

 The core focus of the data management effort for the EVOS Herring Research and Monitoring program has been on establishing protocols for data transfer, metadata requirements and initiating the data salvage effort. The data management team (henceforth 'Axiom') has participated in several Herring Program PI meetings and coordination activities between the Herring and Gulf Watch Alaska (GWA) programs, including the November 2015 and January 2016 PI meetings.

In coordination with Herring Program management, data management project PIs determined the need for additional staff time beyond that currently funded for the effort the project that would be dedicated to Herring Program data management needs. Based on feedback acquired from the EVOSTC Science Panel and staff, the project team applied for and received funding for this new position. In FY2015 Axiom recruited and hired the data coordinator, Ms. Stacey Buckelew, who began work on the project in June 1, 2015.

In addition, the AOOS Ocean Workspace has been in use by Herring Program PIs since 2013 for staging, organizing, and sharing their datasets. Software engineers at Axiom have worked throughout FY2015 to support the Workspace, resolving bugs and implementing new functionality in response to user feedback. Datasets from the HRM program have been visualized through the AOOS Gulf of Alaska data portal to provide researchers with a streamlined visual environment for data selection, filtering, and exploration.

In this reporting period, data management support continued to be provided through the Ocean Workspace. The emphasis was on facilitating the transfer of data to the Workspace by the various projects. All prior data from the Herring Data Portal have been transferred into the AOOS Gulf of Alaska Ocean Data Explorer. Work began on reorganizing the Workspace to encourage greater use and the inclusion of more metadata. Additionally in-person meetings occurred with HRM PIs to support data submissions and metadata authoring.

Table 1. Project milestones status

Deliverable/Milestone	Status
Objective 1. GoA Data Portal showcasing Herring data sets	*Completed* ● GoA Data Portal interface and herring data updated in 2015, larger updates begun.
Objective 2. Continue to support the transfer and documentation of Herring data sets. Auditing and restructuring/reorganizing	*Ongoing* ● Data coordinator Stacey Buckelew was recruited and hired in June 2015 to support the EVOS Herring Program and GWA.
Objective 3. Continue to cultivate and support the functional capabilities of the AOOS Ocean Workspace to address Herring researcher needs	*Ongoing* ● Restructure of the HRM Workspace occurred in fall 2015. ● One-on-one PI meetings held with PIs in December 2015 and January 2016 to implement best practices for metadata record creation
Objective 4. Improved Herring Portal project profile by exposing underlying file level metadata	*Completed*

Objective 1 & 4

The Gulf of Alaska Data Portal was originally launched in September of 2013 and made available for public access. At that time, all of the data that had been in the dedicated Herring Portal was migrated to the Gulf of Alaska portal where it benefits from the additional context of more than 400 other data layers describing other observed and modeled parameters in the Gulf of Alaska. The Gulf of Alaska Data Portal leverages the cyber infrastructure behind the AOOS Ocean Data Explorer, which was developed using other funding and has these additional features: an integrated search catalog which allows users to search by category or keyword, ability to preview data before downloading files, and advanced visualization tools.

During 2015, a number of updates were made to the AOOS data system, the benefits of which are available to be shared by the EVOS Herring Program and the other research groups supported by or working with AOOS. These improvements are separated below into work completed in 2015, and work begun in 2016 and still underway.

Work Completed

The Herring Research and Monitoring program has been added to the Gulf of Alaska's data portal splash page (Fig 1). Historical data from a quarter century of monitoring studies conducted by the Herring program are available. Data and metadata records from the more recent herring investigations will be published from the Workspace to the portal when they are complete. Data published through the portal is available for public access.

In this reporting period, a new search feature was added the portal to enhance data discovery by the user. When searching data in the catalog, the user can now opt to search for content using a manifest view. This tabular list of data allows more information to be viewed on the page at one time, and it will expedite access time for users seeking specific datasets (Fig 2).

Figure 1. The overview page (e.g. splash page) to the Gulf of Alaska data portal highlights the recent and historical availability of information from both the EVOSTC-funded GWA and HRM programs.
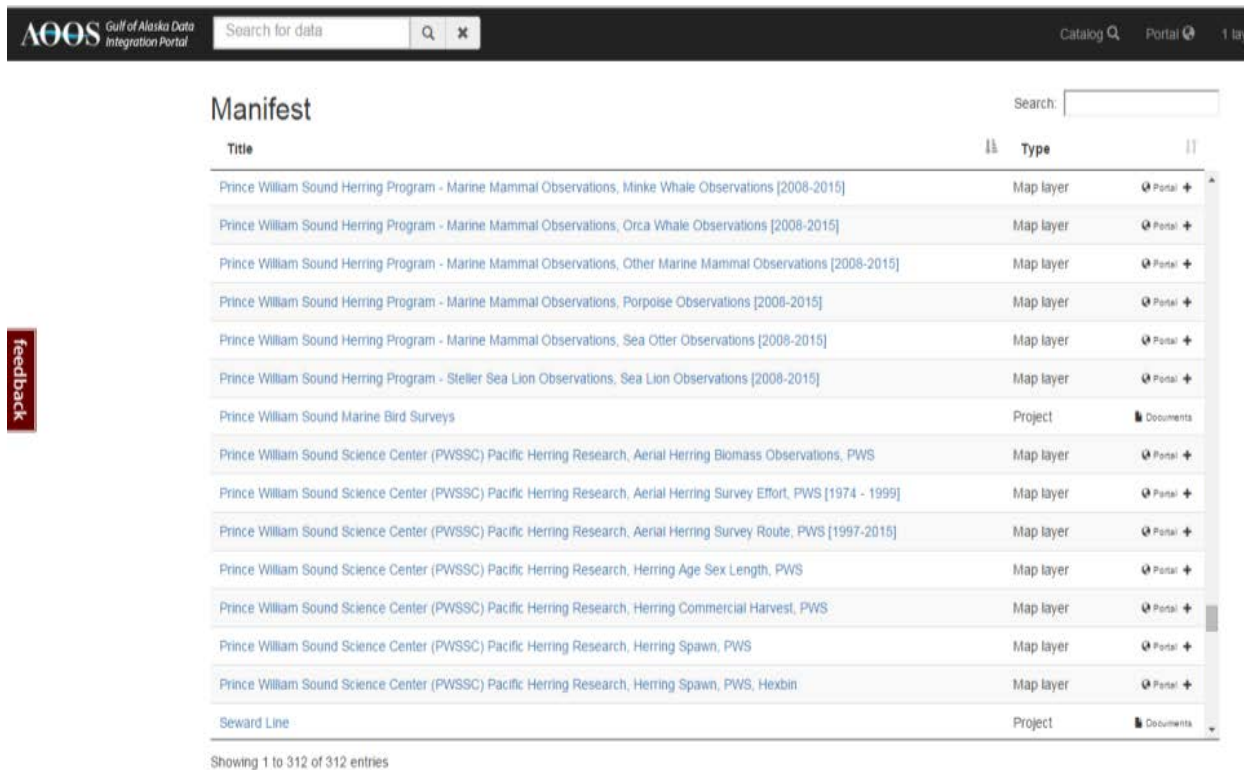
Figure 2. A manifest view of data available in the Gulf of Alaska data portal. This new search feature enhances data discovery by the user by allowing more information to be viewed on the page, thus expediting access time for users seeking specific datasets.

Axiom software engineers redesigned the display in the Gulf of Alaska Data Portal for metadata created in the Ocean Workspace and imported into the portal. Upon initial release of the portal, project metadata created in the Workspace was visible as an HTML webpage and file-level metadata from the Workspace was available in the portal as raw, unstyled JSON documents. In the time since the launch of the portal, the metadata editors in the Ocean Workspace have been harmonized to provide the same interface and fields for project and file metadata, and have expanded to provide new metadata fields. This year, Axiom's interface designer created a new style sheet to display both the project and file level metadata from the Workspace in a much more human-readable form. The design of the metadata pages in the portal underwent several design iterations based on user feedback before settling into their current form (Fig 3).

Axiom software architects and engineers have worked throughout 2015 to improve the Gulf of Alaska Data Portal's data catalog user interface and portal visualization capabilities. Improvements completed in 2015 include rebuilding the search tool to improve the precision and relevancy of search results, and to allow search results to be added to the mapping portal from the portal search bar. Additional improvements include indexing the spatial and temporal metadata associated with a dataset to allow searches to be constrained both spatially and temporally. These upgrades to the data system were motivated by feedback received from GWA managers as well as external sources. Improvements to the catalog search tool have expanded the range of material indexed for search to include file-level metadata and the text content of files imported into the Gulf of Alaska data portal from the Workspace. Indexing spatial and temporal metadata will allow users to limit the results of their searches to show only the data

in the area selected during the time span indicated. Portal users are able to set these limits by drawing a polygon on a map, inputting a spatial bounding box, and/or using a time slider to set a time range.
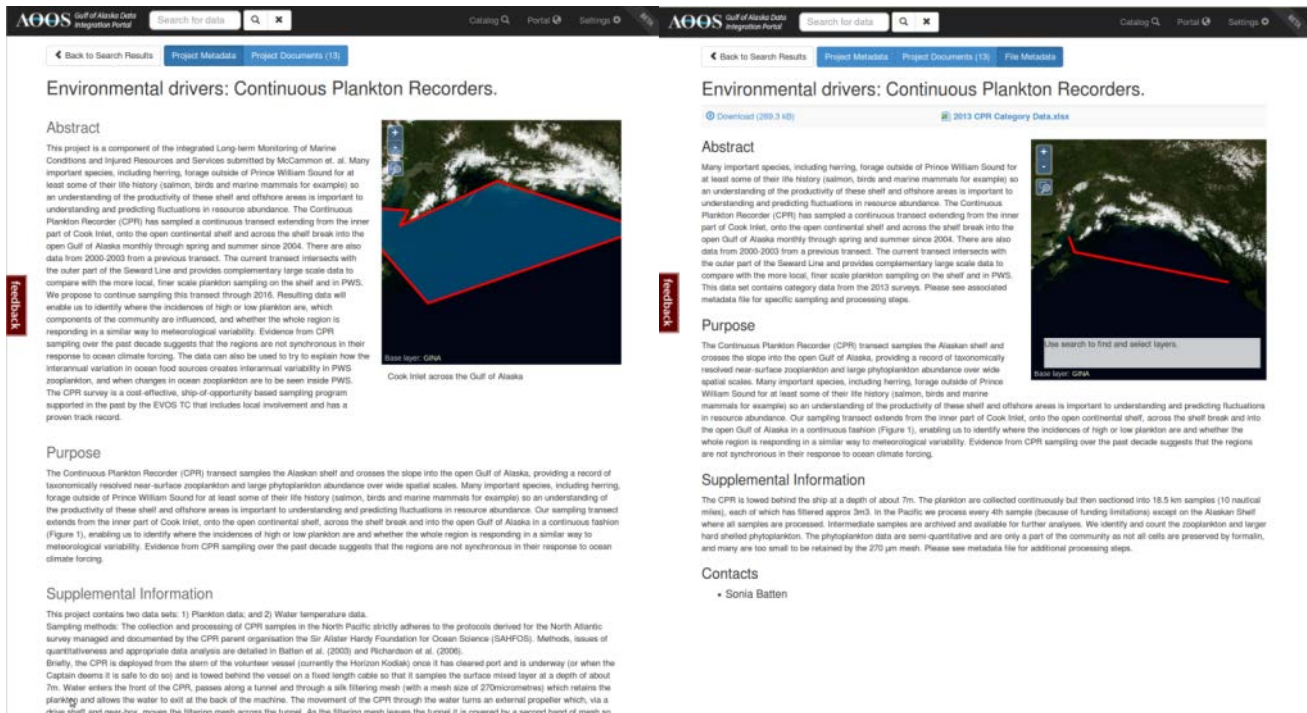

Figure 3. Screenshots of metadata imported from the Ocean Workspace into the Gulf of Alaska Data Portal. From left to right: project metadata for the Continuous Plankton Recorder (CPR) project, metadata for a single data file within the CPR project.

Work Underway

In addition to continually revising the display of project and file metadata in the portal, in FY2015 Axiom staff began work on an improved version of the metadata editor. This new editor will provide the fields and flexibility necessary to more robustly describe projects, the datasets they generate, and relationships between projects and resources. By enabling better, more precise and nuanced descriptions of data and projects, this improved editor will lead directly to better discoverability of data within the Gulf of Alaska Portal, and eventually within the DataONE system. This new web-based editor will initially create xml records for ISO 19115 metadata, with the ability to create 19115-1 and EML records developed after release. This new editor will be released in early spring 2016.

To integrate data into the Gulf of Alaska portal and enhance its use by GWA and HRM PIs and the public, data visualizations were completed for several EVOSTC long-term monitoring datasets. The goal of visualizations is to provide a clear and efficient visual communication of data by making complex or long-term information more accessible, understandable and usable. Additionally, visualizations help researchers to easily reason about data and make comparisons to other related or environmental datasets.

In this reporting period, the herring spawn survey data from the Alaska Department of Fish and Game through spring 2015 was updated in the data portal (Fig 4). The location and total length of herring spawn activity have been visualized for this entire dataset (1973 to 2015). The herring spawn data can be displayed as either as a plotted survey line or hexed heat map to represent the area when herring spawn

activity was observed. This data set can be co-visualized (or 'stacked') together with humpback whale data collected during 2006 to 2014 as part of the GWA program (refer to 14120114D 2015 annual report). These stacked data layers allow for the visual exploration of how changes in humpback whale distributions may coincide both spatially and temporarily with aggregations of spawning herring (refer to 14120114D 2015 annual report).

Additional data can be co-visualized with the herring spawn survey data to help explore possible relationships among multiple data sources. During this reporting period, the incidental marine mammal observations during aerial herring surveys conducted 2008 to 2015 were visualized. The location, time, and number of marine mammals observed by species were mapped. The view can be filtered by the user to observe all or only select groups of species. Additionally, a time slider can be applied to view the change in marine mammal distributions over time. To aid the user in generating summary statistics about these observations, a polygon tool has been integrated into the data portal. With the tool, a user can draw a polygon around a spatial area to generate a summary chart of the number of animals by species observed over time within that area (Fig 5).

To summarize data over large spatial extents, a hexed heat map is generated when the user zooms out. The heat map displays the areas where marine mammals were most frequently observed (or' hotspots') in Prince William Sound (Fig 6). Using a time slider or seasonal filter to the heat map, the change in humpback whale distribution can also be explored.
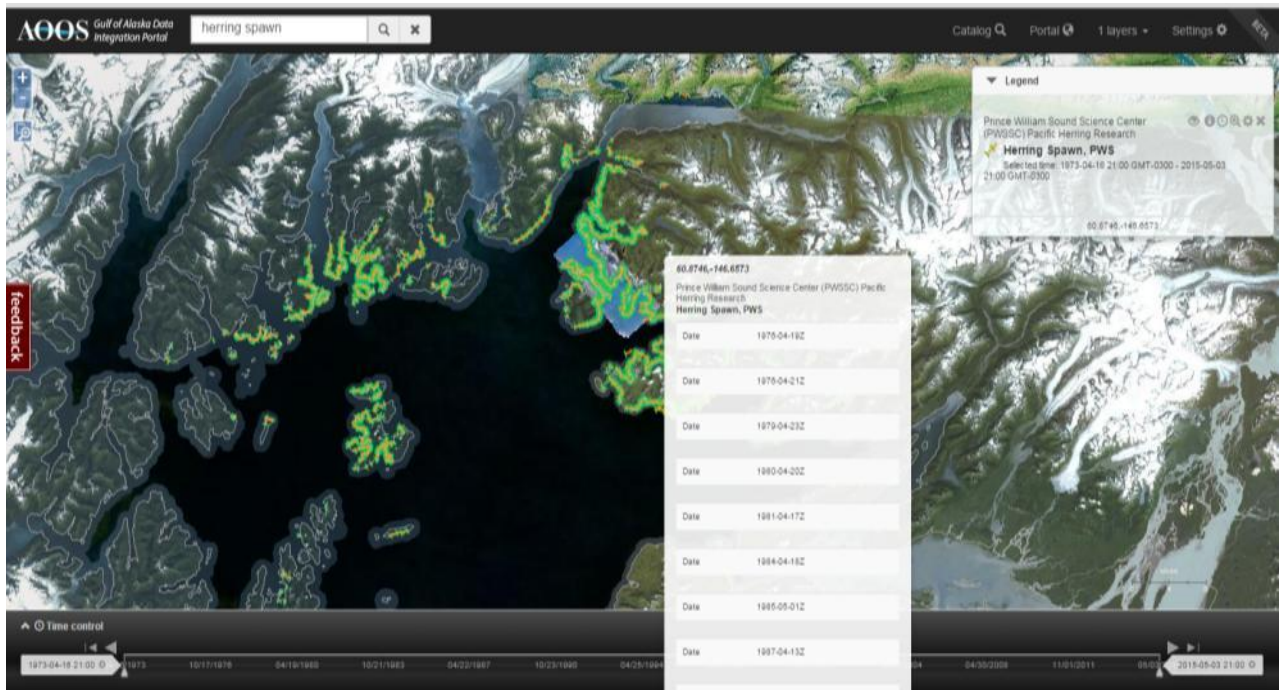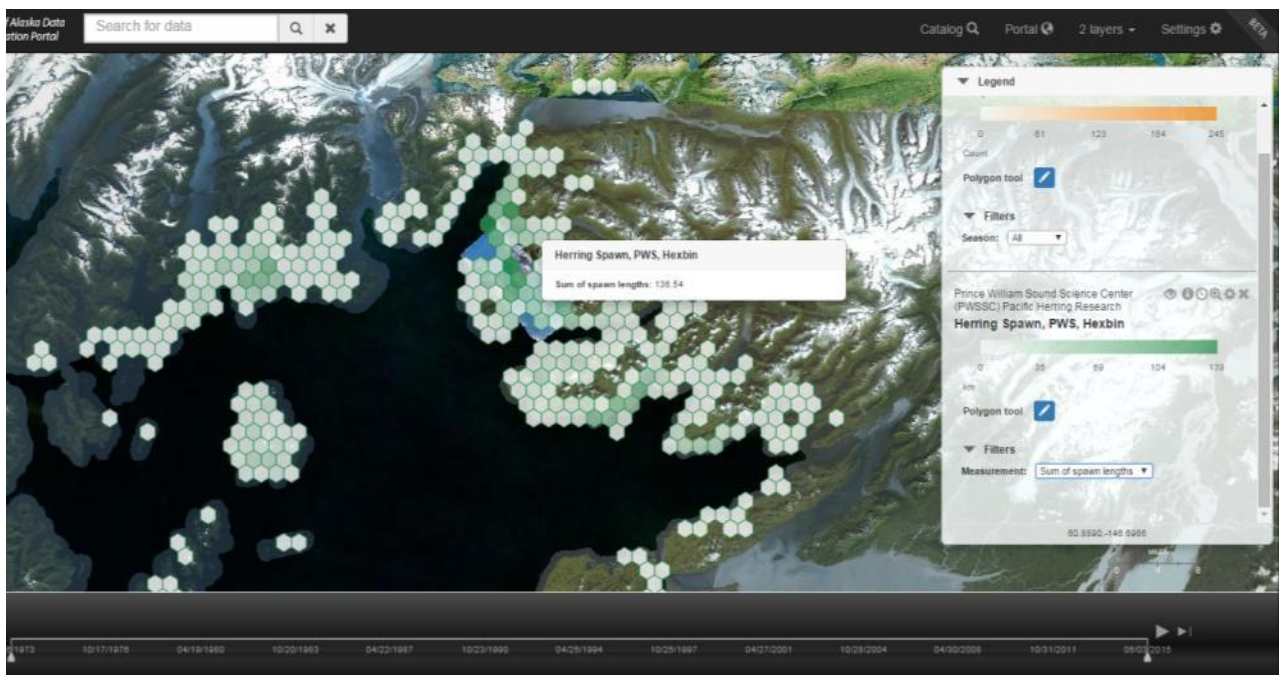
Figure 4a. Linear display of herring spawn lengths

Figure 4b. Hex heat map display of the frequency and total length of herring spawn activity.

Figures 4 a & b, above. Screenshots of AOOS Gulf of Alaska Data Portal showing two different graphical displays of herring spawn observations in Prince William Sound from surveys conducted 1973 to 2015. The upper figure shows the length (km) of observed spawning area, whereas the heat map show the sum of observed spawning lengths within a given area. The darker the color, the greater the length of total spawning activity that was observed in that area. Using the time slider (at the bottom), the change in herring spawn activity can also be explored over time.
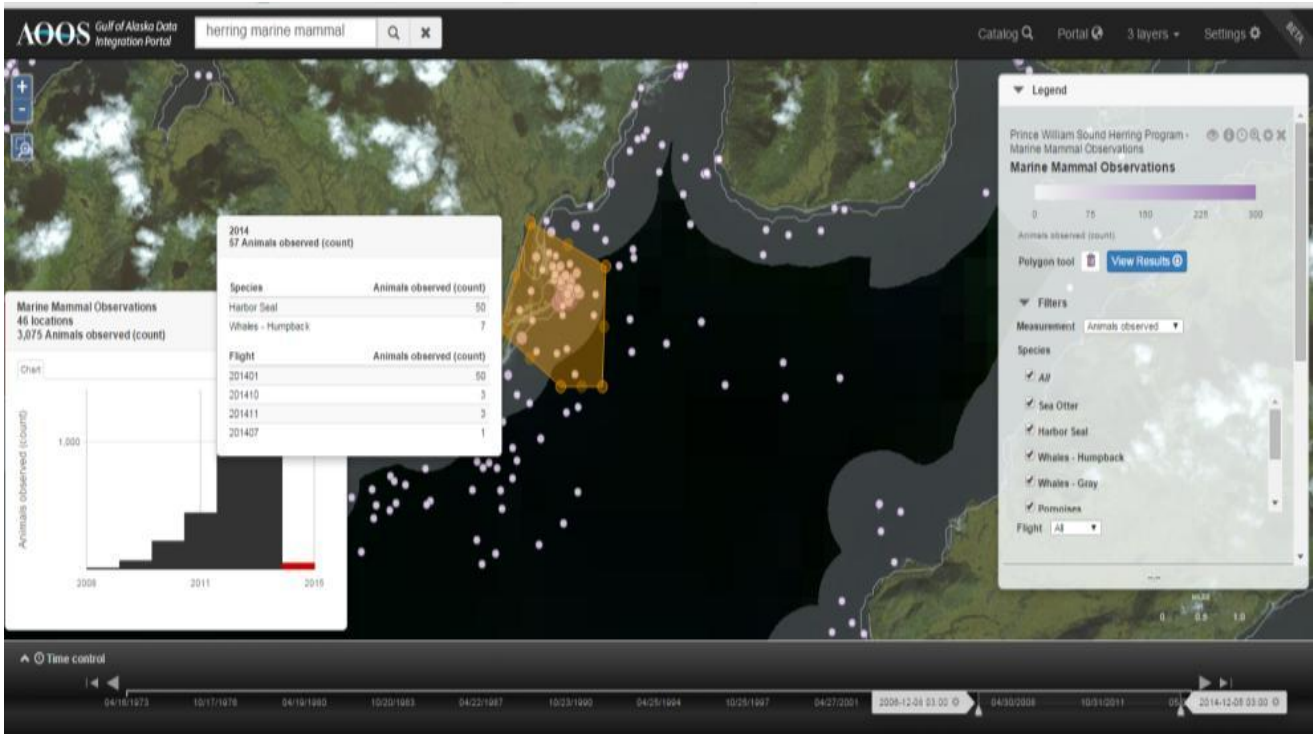
Figure 5. Screenshot of AOOS Gulf of Alaska Data Portal showing a polygon tool that automates summary statistics within user-defined spatial areas. A histogram of the number of marine mammals observed by species during aerial herring survey is shown over time from 2006 to 2015.

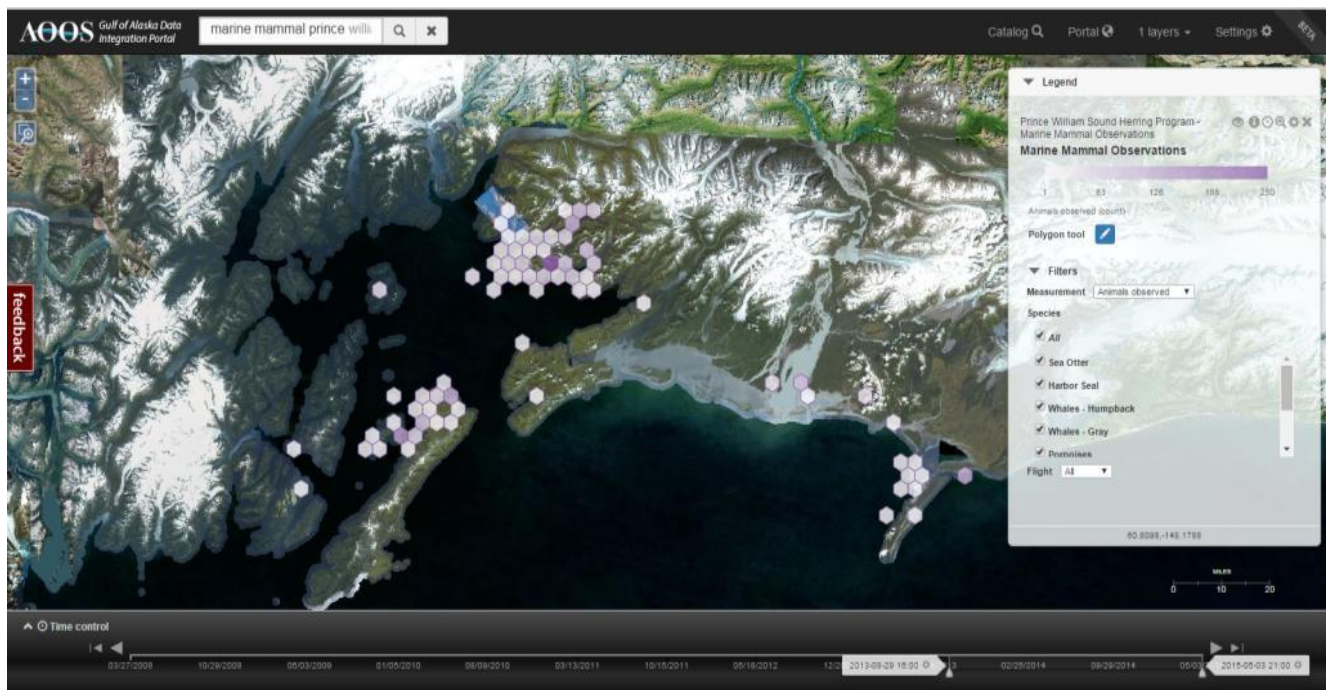*Figure 6. Screenshot of AOOS Gulf of Alaska Data Portal showing a hexed heat map of incidental marine mammal observation during aerial herring surveys conducted 2006 to 2015. The darker areas represent areas where marine mammals were most frequently observed (or' hotspots') in Prince William Sound . Using a time slider or seasonal filter to the heat map, the change in humpback whale distribution can also be explored.*

Available in the Gulf of Alaska data portal are hundreds of additional data sets that allow for simplified, visual integration. As additional data is added from the GWA and HRM programs, the portal will continue to provide researchers with a streamlined visual environment for data selection, filtering, and exploration from multiple sources (including environmental, atmospheric, and numeric models). For example, the changes in marine mammal distribution by species could be observed relative to changes in ocean temperature using NASA's Multiscale Ultrahigh Resolution (MUR) Sea Surface Temperature analysis and herring spawn activity (Fig 7). This tool allows rapid discovery of other datasets that can be used to give context to and provide comparisons study data, evaluate initial study hypotheses, inform further experimentation and experimental design, and generate additional hypotheses or notice potential "hot spots" related to drivers of environmental change in Prince William Sound.
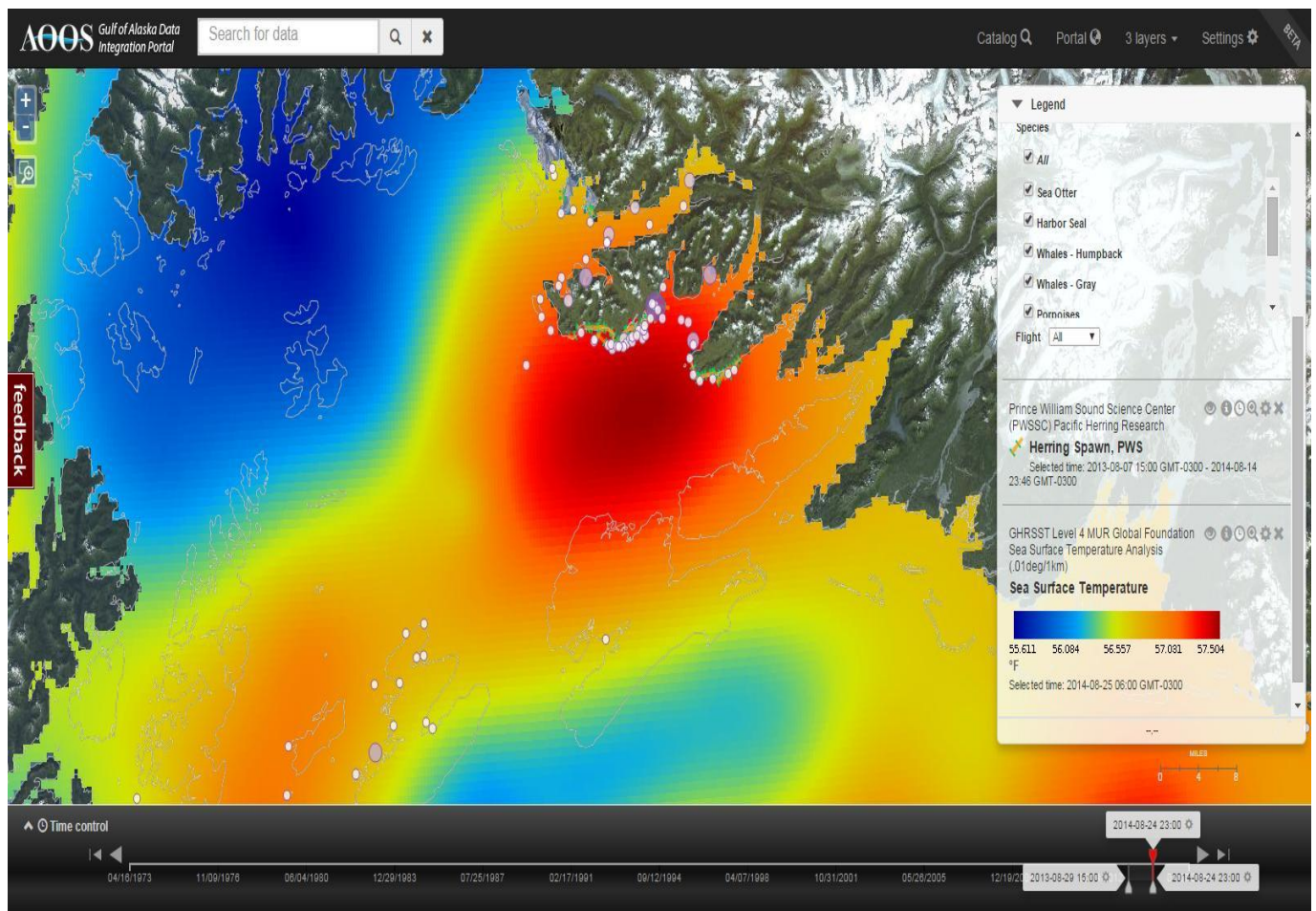
Figure 7. Screenshot of AOOS Gulf of Alaska Data Portal showing the number of marine mammal species (round circle) and herring spawning activity(green and orange lines along the coast) observed during herring survey in 2014. The underlay in the map reflects sea surface temperature from the NASA MUR Sea Surface Temperature Analysis. The change in species distribution and spawning aggregations relative to ocean temperature change can be explored across time using the time slider feature.

Objective 2 & 3

The primary results produced by this project include the acquisition and documentation of EVOS Herring Program PI-produced data sets and the aggregation of ancillary environmental data sets for integration into the AOOS Gulf of Alaska Data Portal. To facilitate the acquisition and documentation of Herring Program data, the project team provides Herring Program PIs with access to the Ocean Workspace, a web-based collaborative data management environment. The project team has supported the use of the Ocean Workspace for data ingestion and documentation through webinars, email support, and by making functional improvements to the Ocean Workspace based on user feedback.

The project team and the Herring Program management decided that the Herring Program required more active data management and facilitation than was possible using the Ocean Workspace. This would also require leveraging work done with other research groups to develop data lifecycle and management plans. In 2014, the project team applied for additional funding from the EVOSTC to partially fund a full time data coordinator position at the Axiom Data Science office to provide dedicated one-on-one work with EVOS Herring Program and GWA PIs. In June 2015, AOOS, through its technical arm at Axiom, responded to this need by hiring Ms. Stacey Buckelew as the data coordinator to lead the PWS Herring program data ingestion effort.

The data coordinator responsibilities have targeted improving metadata quality and best practices. As such, the AOOS Herring Research and Monitoring Program Workspace group was reorganized in fall 2015 to create a cohesive organizational structure to the GWA Workspace group. Additionally, one-on-one meetings were scheduled with individual PIs from the LTM and PWS Herring programs during fall 2016 and winter 2016 to provide guidance and support on data submission and metadata authoring. From December 2015 to February 2016, 24 meetings were held with over 30 program PIs or researchers to discuss data submissions and metadata authoring. PIs also received individual instruction in the use of the AOOS Workspace and exploration of data available in the Gulf of Alaska data portal. A metadata process was established to ease the authoring process by PIs and to help standardize the metadata formats across programs. For full details on these activities refer to the 2015 Supplemental Data Management project annual report.

Investigators continue to improve the Ocean Workspace in response to user feedback. The AOOS Herring Research and Monitoring Program Workspace group was reorganized in fall 2015 to create a cohesive organizational structure to the GWA Workspace group. Several meetings were held with Scott Pegau to discuss an agreed-to organizational structure. Workspace folders were then reorganized and retitled according to individuals projects in order to clearly establish the association of PIs to project and enhance their sense of 'ownership'. Additionally, data sets were reorganized by projects and tags added by current status, herring age class, and survey type to ease Workspace access by all PIs.

In concert with the Workspace restructure, a data file and metadata inventory by project was completed. The inventory was cross-referenced with project proposals and progress reports to determine which data files had not been submitted to the Workspace (Fig 1). At the PI meeting in November, the data coordinator presented the inventory and discussed a process for meeting the submission benchmarks with the PIs. The process was agreed-to by all PIs present at the meeting to include the PIs collecting content for the metadata record followed by one-on-one meetings to provide guidance and support on data submission and metadata authoring.

As a result, the Ocean Workspace has become more useful and easier to use by PIs. The increase in use by Herring Program PIs is represented in the Figures 8-10 below, followed by a description of the Ocean Workspace.
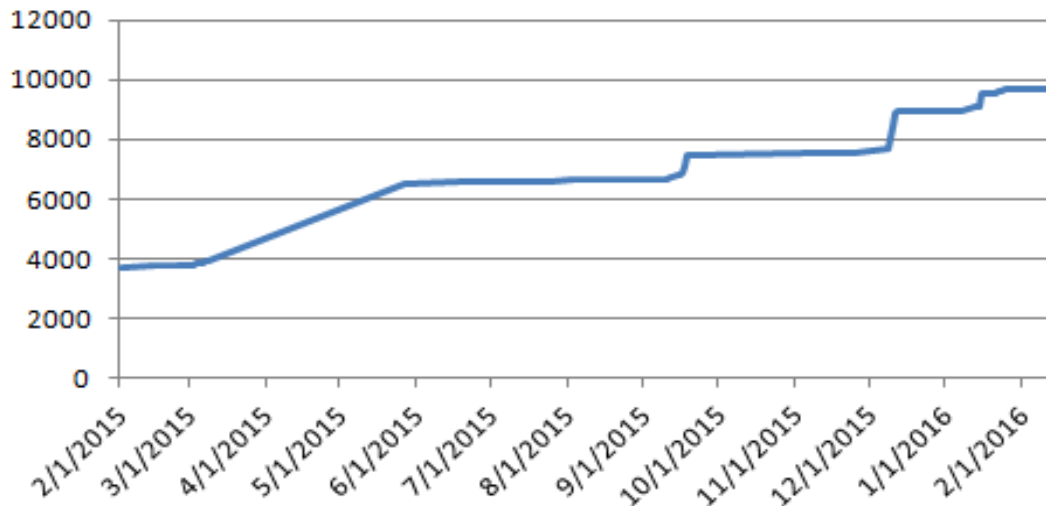

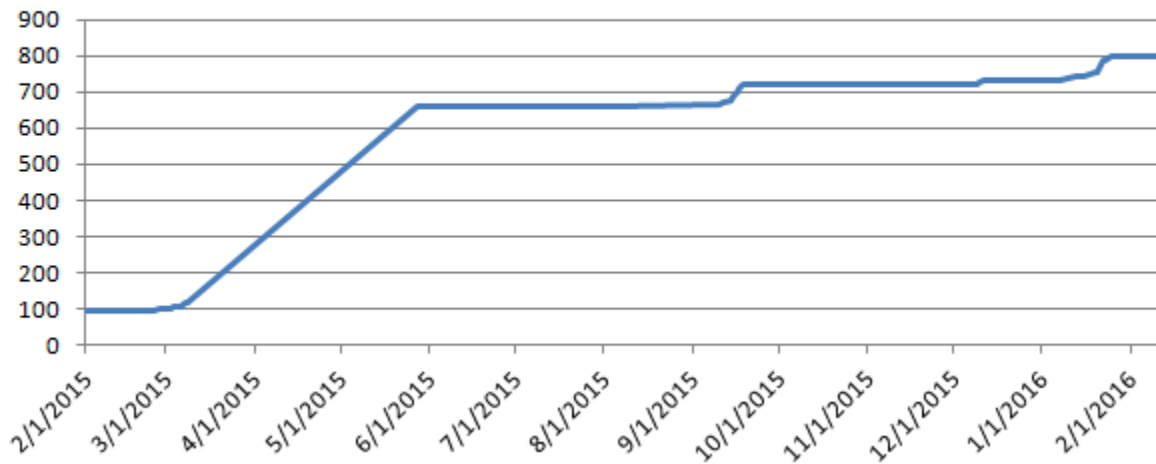Figure 8. The number of files uploaded by HRM team members in FY 2015.

Figure 9. The amount of total storage in Gb used by HRM team members in FY 2015.

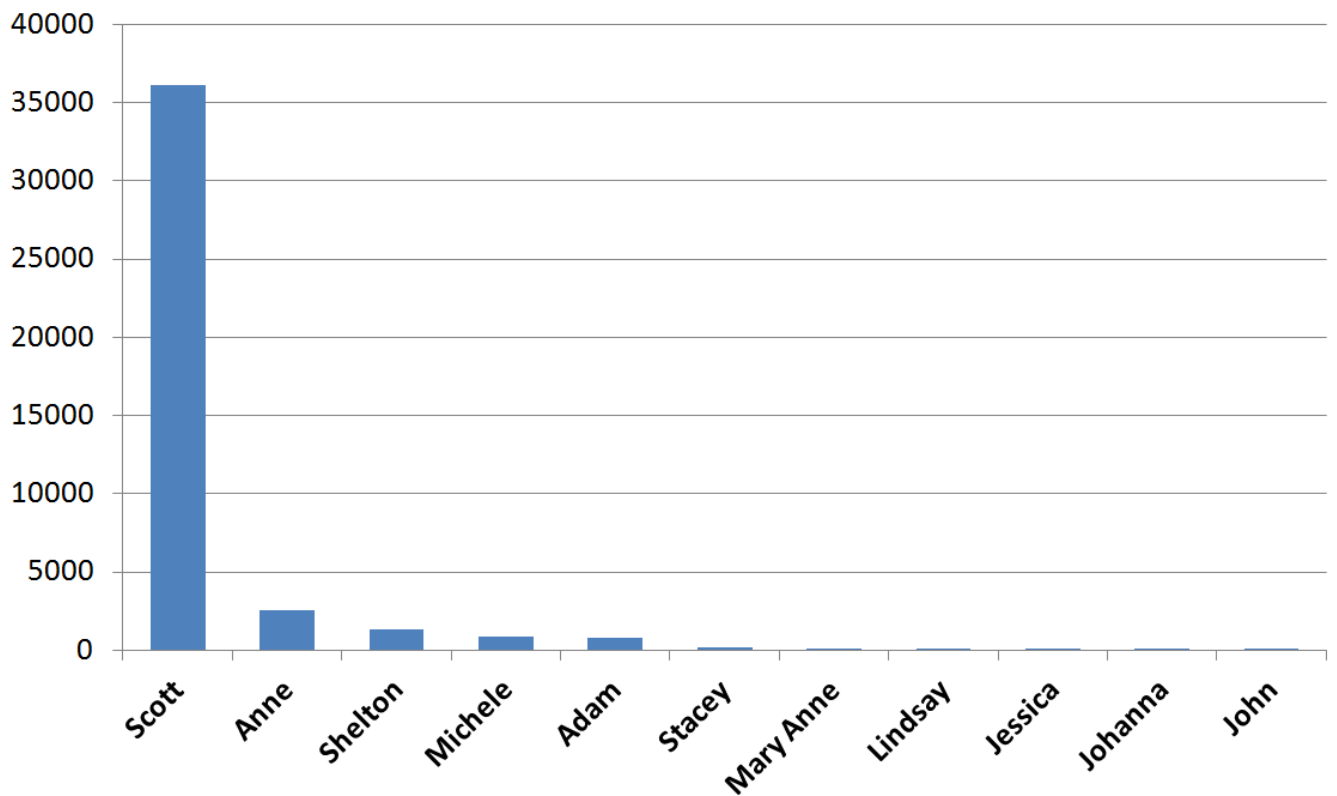**File Uploads for HRM Workspace Users through FY2015**

Figure 10. The distribution of file upload effort across individual HRM users through FY2015

The Ocean Workspace

The Ocean Workspace is a web-based data management application built specifically for storing and sharing data among members of scientific communities. GWA PIs and their teams use the Workspace as an internal staging area prior to public release of data through the AOOS Gulf of Alaska Data Portal. In addition to the GWA program, 36 other distinct regional, national, and private research efforts currently use the Workspace, which has more than 480 active individuals sharing more than 800,000 digital files across more than 1300 distinct projects. The Workspace provides users with an intuitive, web-based interface that allows scientists to create projects, which may represent scientific studies or particular focuses of research within a larger effort. Within each project, users create topical groupings of data using folders and upload data and contextual resources (e.g., documents, images and any other type of digital resource) to their project by simply dragging and dropping files from their desktop into their web-browser. Standard, ISO 19115-2 compliant metadata can be generated for both projects and individual files. Users of the Workspace are organized into campaigns, and everyone within a campaign can view the projects, folders and files accessible to that campaign. This allows preliminary results and interpretations to be shared by geographically or scientifically diverse individuals working together on a project or program before the data is shared with the public. It also gives program managers, research coordinators and others a transparent and front-row view of how users have structured and described projects and how their programs are progressing through time. The Workspace has the following capabilities:

Secure group, user, and project profiles — Users of the Workspace have a password protected user profile that is associated with one or more disciplinary groups or research programs. The interface allows users to navigate between groups in which they are involved through a simple drop down control. Transfer of data and information occur over Secure Socket Layer (SSL) encryption for all interactions with the Workspace. The Workspace supports authentication through Google accounts, so if users are already logged into their Google account (e.g., Gmail, Google Docs, etc.), they can use the Workspace without creating a separate username and password.

Metadata authoring — Because the Workspace is a cloud-based service, researchers can move between computers during the metadata generation process in addition to allowing team members and administrators to simultaneously review and edit metadata in real time.

Metadata elements currently available to researchers in the Workspace are common to the Federal Geographic Data Committee (FGDC) designed Content Standard for Digital Geospatial Metadata (CSDGM) and the ISO 19115 standards for geospatial metadata, extended with the biological profiles of those standards. Axiom also developed an integrated FGDC biological profile extension editor that allows users to search the ~625,000 taxonomic entities of the Integrated Taxonomic Information System (ITIS) and rapidly generate taxonomic metadata.

To support the multidisciplinary approach of many projects in the Gulf Watch Alaska program, PIs can author metadata records at both a project and individual file level (Fig 11-12). File level allows the PI to provide metadata fields that define the attributes of the data file in a standards-compliant format.

Figure 11. A screenshot of the Workspace project-level metadata interface. The interface allows the authoring of standards-compliant metadata content, including basic descriptive and citation metadata fields, description of the project's geographic extent, keywords, taxonomic information and data constraints. The suggested minimum metadata content for usefully descriptive metadata is included as a reference.
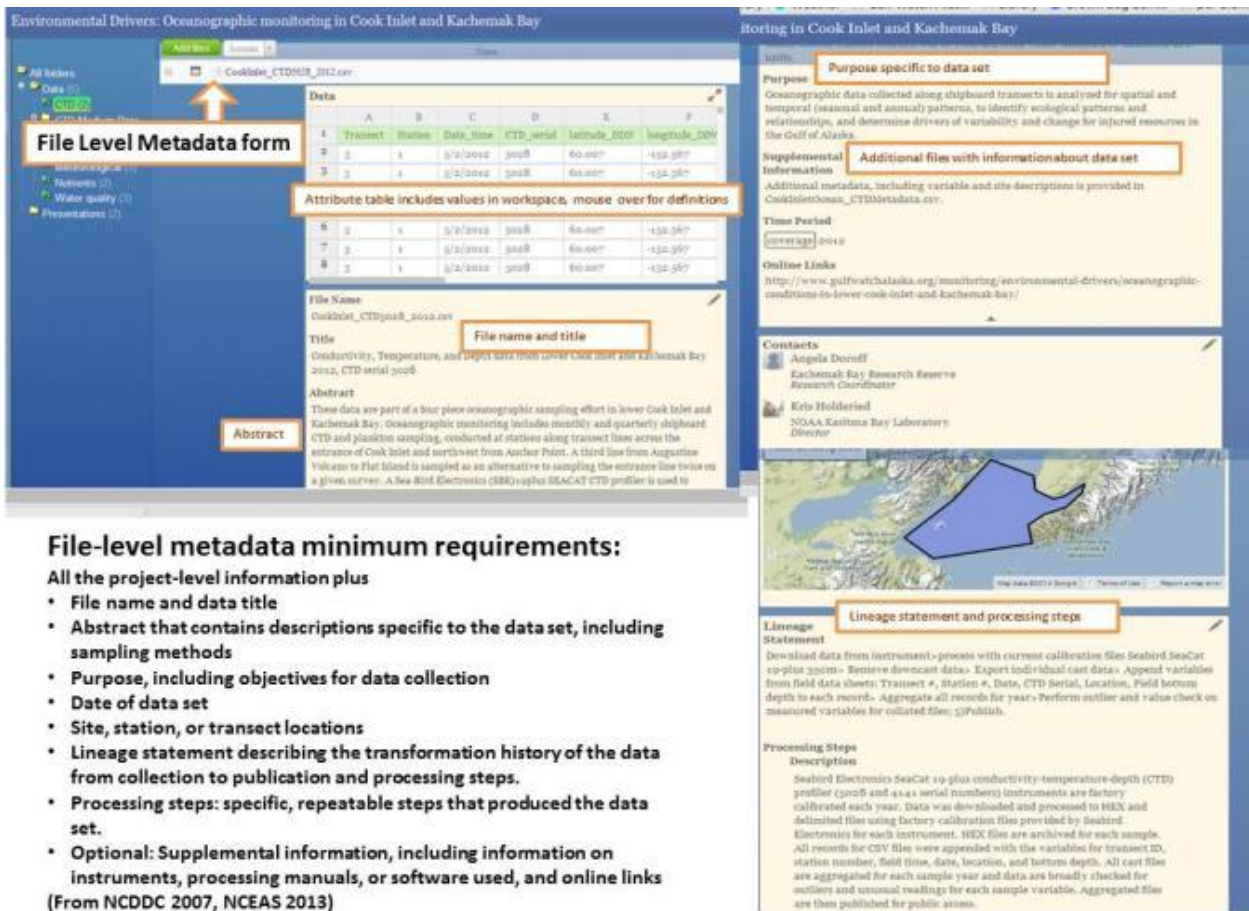
File-level metadata minimum requirements:

All the project-level information plus
- File name and data title
- Abstract that contains descriptions specific to the data set, including sampling methods
- Purpose, including objectives for data collection
- Date of data set
- Site, station, or transect locations
- Lineage statement describing the transformation history of the data from collection to publication and processing steps.
- Processing steps: specific, repeatable steps that produced the data set.
- Optional: Supplemental information, including information on instruments, processing manuals, or software used, and online links

(From NCDDC 2007, NCEAS 2013)
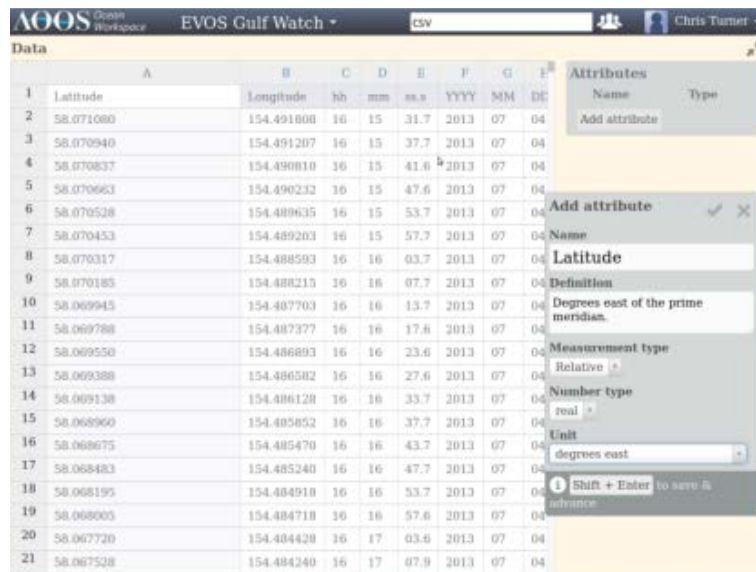
Figure 12. Screenshots of the Workspace interface for file-level metadata. The interface allows the authoring of standards-compliant metadata content, including basic descriptive and citation metadata fields, description of the project's geographic extent, keywords, taxonomic information, data constraints, and descriptive information about the attributes of the data set. The suggested minimum metadata content for usefully descriptive metadata is included as a reference. Additionally, included in the lower figure is a screenshot of the interface for editing attributes in tabular data files.

Advanced and secure file management — A core functionality of the Workspace is the ability to securely manage and share project-level digital resources in real-time with version control among researchers and study teams. Users of the Workspace are provided with tools that allow them to bulk upload files, organize those documents into folders or collections, create, contextualize, and sort projects with predefined and user-created tags, and control read and write permissions on files within projects (Fig 13). The Workspace also has the ability to track file versions: if a user re-uploads a file of the same name, the most current version of the file is displayed, but access is provided to past versions as well.

Figure 13. Screenshots of project and file management in the Workspace. The first screenshot shows a list of projects to which the example user has access rights. The second screenshot displays the interface a researcher would use to organize independent files into folders, and the way two versions of the same file are tracked by the Workspace.

Work Underway

As is described in a prior section of this report, Axiom began with in FY2015 on an improved web-based metadata editor. In FY2016, this new editor will entirely replace current Workspace metadata editor shown in the Figures 11 & 12, above.

The data management process will continue through the end of 2016 as additional data sets are submitted. The data coordinator, together with the data management team, will review submitted metadata records for completeness and accuracy. Once metadata records have been validated, they will be published to the portal. Metadata disseminated through the portal will improve the discoverability, access, and reuse of the data by a broader audience. One-on-one meetings with PIs will be scheduled again in fall 2016 to revise the metadata records by reviewing them for clarity and omissions. This quality control of the metadata from PIs will ensure records are both understandable and meet standards requirements. Validation will also involve comparing the metadata output to the FGDC/ISO standard for the DataOne portal to ensure the record conforms with the standardized format structure.

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8. **Coordination/Collaboration:** *See,* Reporting Policy at III (C) (8).

Collaboration and coordination both within your program and between the two programs: This project is focused on increasing the data management support for both LTM and PWS Herring programs by establishing a data coordinator position to improve metadata quality and best practices. Furthermore, this project also develops a mechanism to transfer and integrate LTM and PWS

Herring program data products into DataONE. As such, the data management tools and services provided to the EVOSTC LTM and Herring programs are coordinated and collaborative by their very nature. As users of a central data management system, both programs provide useful feedback that informs the features Axiom develops and implements for the Ocean Workspace and the Gulf of Alaska Data Portal. A data management and metadata authoring process are being implemented uniformly across both programs to create a clear organizational structure and standard format. Additionally, by ingesting, synthesizing, and prioritizing feedback and feature requests from both programs, the project team coordinates the needs of each program into a set of tools useful to both. Similarly, by making data from each program available in the Gulf of Alaska Data Portal, the project team helps the two programs collaborate to provide a comprehensive, holistic portrait of the conditions monitored in the Gulf of Alaska by both programs.

Coordination with other EVOSTC funded projects:
Based on feedback acquired from the EVOSTC Science Panel and staff, this project was implemented as a supplemental data management effort to execute on major tasks that have been deemed of high importance but are not being addressed by existing data management projects supporting EVOSTC programs (Projects 1412011D and 1412011C). Therefore, all tasks associated with this project are by nature aligned with tasks from the coordinated projects.

Coordination with our trust agencies:
The project team provides data management visualization, and preservation services, including providing access to and facilitating the use of the Ocean Workspace, to a number of other programs that receive funding from or are administered or are overseen by representatives from the trustee agencies. Some of these programs and their associated trustee agencies are given in Table 2 below.

Table 2. Collaborating projects and trust agencies

Arctic Marine Biological Observation Network (AMBON)	BOEM
Arctic Ecosystem Integrated Synthesis (Arctic EIS)	BOEM
Marine Arctic Ecosystem Study (MARES)	BOEM
IOOS Systems Integration	NOAA
Beluga Sightings Database Visualization	NMFS
Alaska Ocean Observing System (AOOS) Data Management	NOAA
Central and Northern California Ocean Observing System (CeNCOOS) Data Management	NOAA

Gulf of Alaska Integrated Ecological Research Program (GOAIERP)	NMFS
Russian-American Long-term Census of the Arctic (RUSALCA)	NOAA
Spatial Tools for Arctic Mapping and Planning (STAMP)	NOAA
Alaska Data Integration working group (ADIwg)	USGS

9. Information and Data Transfer: *See,* Reporting Policy at III (C) (9).

A. **Publications produced during the reporting period**: None completed.

B. **Conference and workshop presentations and attendance during the reporting period**:

The AOOS data team at Axiom Data Science attended the GWA and HRM PI meetings in November 2015, and the team meetings in January 2016 at the Alaska Marine Science Symposium (AMSS). Presentations were given to PIs at both meeting regarding use of the Workspace, Workspace reorganization, data submission, and metadata authoring process. Additionally, the data coordinator team met with individual PIs of the GWA and HRM programs in Anchorage, Homer, Cordova, and Juneau during December and January 2016. Hands-on demonstrations of the AOOS Workspace and Gulf of Alaska data portal were given at this time. Throughout the year, the project team keeps in contact with the GWA program management team with regular email and phone calls.

10. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (C) (10).

Science Panel Comments, September 2014

It was encouraging for the Science Panel to hear via a conference call with Program Science Leads that the standardized forms for metadata submission had been recently modified, and a more refined version is now available to investigators. However, it was discouraging to learn that not all investigators were compliant on submission of both metadata and data in a timely manner (within one year of collection) as agreed upon when accepting funding from EVOSTC. In the future we see submission of required data and metadata as a condition of funding renewal.

Data Management Team Response

With the award for Supplemental Data Management Support and the addition of Ms. Stacey Buckelew to the data management team, these concerns have been addressed. One-on-one meetings have been been held with each PI funded through the HRM program to assess which expected data had not been uploaded into the Workspace, the existence and quality of metadata, and to identify responsibilities for uploading and documenting other data. For the majority of projects, data submissions are complete through 2014 and project metadata has been created. The exception is for projects that are experimental in nature and laboratory studies are underway. For these projects, a clear process for data submission and metadata creation has been created and will be tracked by the Data Coordinator. For the acoustic projects with data amounting to hundreds of gigabytes (Gb), these files have been manually transferred to Axiom on a hard drive at the Jan 2016 AMSS meeting. Processing to the Workspace is underway and these files should be updated in March 2016.

11. Budget: *See,* Reporting Policy at III (C) (11).

Budget Category:		Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel		$94,400.0	$93,700.0	$16,700.0	$17,300.0	$17,900.0	$240,000.0	$ 225,726
Travel		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Contractual		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Commodities		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Equipment		$3,900.0	$4,800.0	$0.0	$0.0	$0.0	$8,700.0	
Indirect Costs (23%)		$21,700	$21,500	$3,800	$4,000	$4,100	$55,100.0	$ 48,728
	SUBTOTAL	$120,000.0	$120,000.0	$20,500.0	$21,300.0	$22,000.0	$303,800.0	$274,454.0
General Administration (9% of		$10,800.0	$10,800.0	$1,845.0	$1,917.0	$1,980.0	$27,342.0	
	PROJECT TOTAL	$130,800.0	$130,800.0	$22,345.0	$23,217.0	$23,980.0	$331,142.0	
Other Resources (Cost Share Funds)		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	

Spending is in line with the budget.

We appreciate your prompt submission
and thank you for your participation.