Marine Recreational Information Program
FY-2013

Ocean Recreational Boat Survey (ORBS) Database Improvements

Project: ORBS Database Improvements

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1. Acknowledgement

We thank Suzanne Bauer for her initial work on the SQL Server ORBS database definition and the migration of the Access database to SQL Server. Without her hours of individual and collaborative effort, the goals for the latter stages of the migration would have been impossible in the time frame needed. We'd also like to thank Suzanne for her assistance during the transition between the initial stages of the project and the closing stage. We'd like to acknowledge the work done by Jessica Moll for her work on the ORBS database migration from Access to the SQL Server. Her abundant knowledge of the processes and data used with ORBS project ensured that the final product would not only work but also be a good replacement to the original Access version of ORBS. Finally, we received much needed support from ODFW Information Systems Division (ISD) and contract staff including Rebecca VanderMalle, Noel Magee, Andrew Boes, Debora Nearman, Darren Boss, Brian Friesen, and Praveen Batchu. Their assistance and guidance was crucial in making the successful migration of Access ORBS to SQL Server.

2. Background

The Marine Resources Program (MRP) of the Oregon Department of Fish and Wildlife (ODFW) monitors boat traffic at major ports and other ocean access points and conducts interviews with recreational fishermen as they return to the dock. These data are collected by the **O**cean **R**ecreational **B**oat **S**urvey (ORBS) program and are used to estimate the total fishing effort and catch of unique species by the recreational fleet and is crucial to fishery managers for the maintenance of healthy stocks.

Collection and storage of **ORBS** data relies on two principal components – a handheld device with a custom application for collecting data during interviews of recreational fishermen and a back-end Microsoft Windows based PC with an Access database and an associated application (the Desktop Application) to process and store interview data. Prior to 2010, Dell Axim X30s were used for data collection, and as these began to fail, alternative handheld computers were evaluated and tried. With the 2010 season, the Trimble Nomad with a Microsoft 6.1 mobile operating system was employed as the new standard mobile device. An updated mobile application (**OrbsInterview**) was developed to run on the new device, and largely automated the interview process. The updated software solution accommodated refined collection protocols, additional data fields, and a new mobile database.

OrbsInterview utilizes a Microsoft SQL Server 3.5 Compact database to store field data locally during sampler interviews with returning fishermen. Key components of the backend system that stored and processed **ORBS** data remained largely unchanged for the 2010 release. The desktop software that generates catch and effort estimates is a legacy Visual Basic 6 application that has not been updated in over 5 years. In fact, MRP staff would have significant difficulty assembling a system with the appropriate environment to rebuild the application.

The legacy Visual Basic 6 system does not support data fields introduced since 2010, and it cannot process the type of database file that is generated by the **OrbsInterview** mobile application. Data is pre-processed by an application developed by MRP staff to transform these database files into a format appropriate for the legacy application, which can then process the information to append interview data to the master database. This "Data Transformer" application also retrieves the data fields added since 2010 and stores them in a separate, mirrored database. Considerable effort is expended to maintain the two

separate databases and ensure that they are synchronized.

Migration of the ORBS data from the Microsoft Access database to an agency-wide SQL Server platform is necessary to provide improved stability, flexibility, and reporting requirements. Objectives that need to be satisfied in order to complete this migration include:

- Duplicate the existing ORBS database in SQL Server.
- Make changes as needed to improve flexibility, accommodate additional data elements, etc.
- Import existing ORBS data in the new database.
- Develop exports and custom reports to meet current and anticipated needs for ORBS data.

Numerous project goals were defined to achieve the objectives. Those project goals are:

- Replace the two Access databases in Newport with a single SQL Server Database hosted in a managed database server environment at ODFW headquarters in Salem.
- Eliminate the Legacy Desktop Application, and the need for the "Data Transformer".
- Move the back-end out of a desktop environment, and re-invent it as Web-based application; (known as **OrbsWeb**) that can be used anywhere there is network connectivity.
- Provide an open, contemporary platform (C#/.Net) for redefining data collection, validation, editing, implementing expansion computations, and providing better reporting capabilities.
- Automating manual processes, while maintaining data integrity and increasing data flow efficiency.

3. Executive Summary

This final report describes work conducted by Oregon Department of Fish and Wildlife (ODFW) to migrate data collected through its **O**cean **R**ecreational **B**oat **S**urvey (ORBS) from a customized Microsoft Access database to an agency-wide SQL Server platform. The purpose of this migration to the SQL Server is to provide improved stability, flexibility, and reporting capabilities. Objectives of this project are: (a) duplicate the existing ORBS database in SQL Server, (b) accommodate additional data elements, (c) import existing ORBS data into the new database, and (d) develop exports and custom reports to meet current and anticipated needs for ORBS data. Most objectives and goals of this project were successfully completed. Additional work is needed to complete two tasks: OrbsWeb Expansion calculator and two reports. These final tasks will be completed by December 31, 2015 using other funds.

4. Methods

ODFW staff and a contract database developer worked together to migrate ORBS database and associated functions to a SQL server platform, and to design and develop custom reports required to meet the needs of ODFW ORBS data users.

5. Results

Key Components of OrbsWeb

The initial phase of development involved analyzing and diagramming the flow of data through the legacy system from field collection to final storage and processing. Inefficiencies and redundancies were identified. Redundancies were primarily the result of splitting the data storage into two separate databases

so that MRP could continue to use the Desktop App. A new diagram was constructed that took advantage of efficiency improvements and removed redundancies. This diagram charted the flow of data through an updated back-end system and identified most of its high level components (Figure 1). A major design goal for **OrbsWeb** was to avoid any change to **OrbsInterview** and CWTF (**C**oded **W**ire **T**ag **F**ish) web application that collects all salmonid recovery and catch sample summary data for subsequent processing and reporting to PSMFC and other agencies.

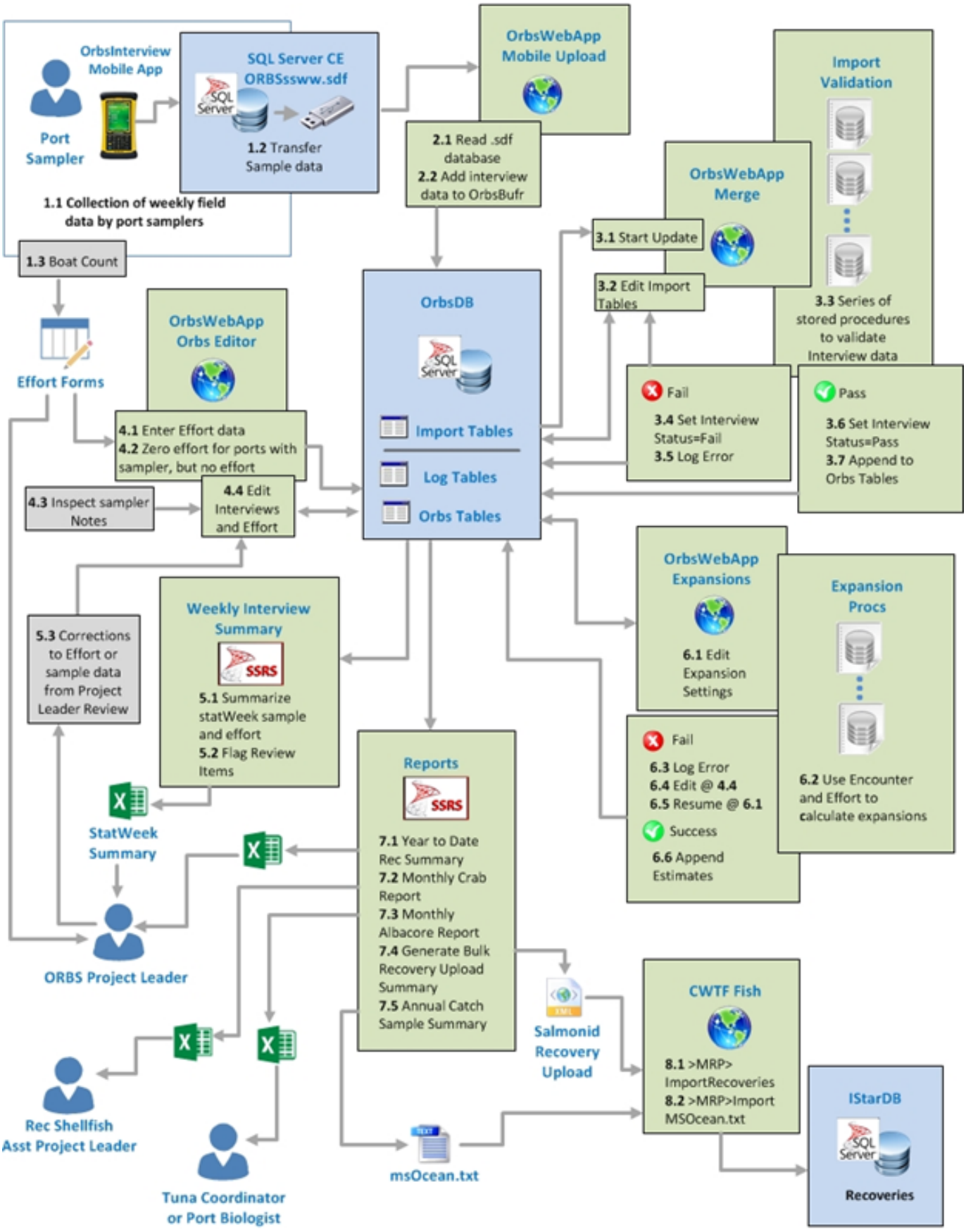

Figure 1. Key components and Data Flow in OrbsWeb.

OrbsDB and ORBS Migration

Central to the new **ORBS** back-end system is a newly designed database, **OrbsDB**, a Microsoft SQL Server 2008 R2 database. The database has three main schemas:

- **OrbsLookup** contains data tables that generally remain static, such as a table of Oregon Ports, Species Table, Reef Locations, Boat Types, Trip types, and so forth.
- **ImptBufr** contains data that has been uploaded from mobile devices. It is a staging area where the data for a statistical week is temporarily stored so that it can be inspected for errors, validated, and corrected before it is added the database used to produce results.
- **OrbsData**, sometimes referred to as the master or live database, contains the tables that store validated data that can be accessed for management purposes.

A migration application was developed that transfers data from the existing Access databases into the live database schema of **OrbsDB**. It operates on **ORBS** data collected since 2001. The migration application combines the interview data that is stored in OrbsData.mdb with the additional interview fields that are stored separately (in OSMData). In addition, it “unpacks” the fields that were added as temporary solutions to store additional interview data as the need arose.

Data Collection

The data acquisition component of the **ORBS** system consists of the electronic interview data collected by port samplers and the effort forms submitted each week that tally the recreational boat count. Most boat counts are obtained from a video monitoring system at each port, though some ports still obtain boat counts by manning an observation location and manually tallying outgoing and incoming recreational vessels. No changes were initially required to **OrbsInterview** or the mobile database as a consequence of developing **OrbsWeb**. However, the port of Astoria is in the process of installing video monitoring cameras at each of the five docks that recreational fisherman use to access the ocean and estuary fishery. In order to effectively calculate total effort in Astoria, samplers must now indicate the dock (sub-port) in the interview data. This required changing the databases to store the sub-port for each interview and **OrbsInterview** to allow port samplers to enter sub-port information.

Mobile Data Upload

Interview data from the port samplers is collected each Monday; the individual database files (Sql Server CE .sdf files) are stored centrally on a PC in Newport. In order to append this data to **OrbsDB**, **OrbsWeb** provides the capability to select and upload .sdf files. Data for the statistical week is first stored in a staging area, the import buffer, where it can be evaluated for accuracy before appending to the live data area of **OrbsDB**.

Merging Imported Data

After uploading the sampler data files for a statistical week, the **ORBS** technician uses **OrbsWeb** to

merge the statistical week of interviews with the live database. There are three major processes associated with merging interview data: Data Validation; Interview Editing; Appending to OrbsData.

Validation is the first step that must be performed before data is appended to the live database. **OrbsWeb** cannot append interview data to the live database until it has successfully passed validation. The **OrbsInterview** mobile application also performs validations during the interview process, adding an extra layer of protection before data is added to **OrbsDB**. Data can also be edited after it has been uploaded, which may be required after a full suite of validations is performed. **OrbsWeb** validates interview data by inspecting a variety of properties in the imported data. Specific validation procedures examine the uploaded interviews to ensure the data is consistent. Validations performed include:

- The number of tagged and scanned fish should not exceed the reported catch;
- The number of bio records should not exceed the catch;
- Non-fishing trips must not land fish;
- Each tagged Chinook, Coho and Steelhead caught must report a snout Id (SNID) regardless of whether the snout was collected
- Fishing trips must report the number of anglers actively fishing;
- Trips that land tuna should not indicate that fishing took place in the estuary;
- Trips that have both an estuary and ocean component should have two separate interviews;
- Snout IDs must be unique in the interview and not be a duplicate of any other recorded already.

Additional validations will be added to address any error conditions that are discovered subsequent to the initial rollout of **OrbsWeb**; the design of the back-end validation provides a clear path to extending these validations.

An import status log is created to record errors that are detected during validation. After the validation procedures are completed, **OrbsWeb** displays the validation log on the screen so that it can be reviewed by the ORBS fishery technician. Each reported error displays a code, the interview location where it was found, a full description and a hotlink that will launch the buffer editor and navigate the technician to the offending interview. This allows the technician to quickly repair the problem or determine the identification of the sampler for follow-up clarification.

OrbsWeb Editor Effort Entry and Interview Editor

OrbsWeb allows interview data that has been previously merged (or appended) to **OrbsData** to be edited. In addition to the interview data that the port samplers collect, the other key data item collected is fishing effort. Port samplers interview a subset of the total fishing trips recorded by the boat counts. Effort data is used in subsequent calculations to expand sample data so that total catch can be estimated. Raw effort is submitted to Newport on paper forms each Monday. The effort data and a summary of the interviews for a statistical week are reviewed by the ORBS Project Leader. After the project leader completes the review, the ORBS technician enters boat effort data directly into the live database using the effort editing feature of **OrbsWeb**.

As previously stated, effort data combined with the catch and release data recorded in the interviews are used to expand (see section **2.6**) the sample data to estimate total fishing effort and catch. Errors are occasionally encountered during this expansion which requires the ORBS technician to edit the interview

or the effort data for the statistical week. The interview editor feature of **OrbsWeb** is used to edit the interview and all associated catch, tag information or biodata that is part of the interview.

Weekly Interview Report

The weekly summary is an initial report generated that the ORBS Project leader uses when assessing the effort data as described in section **2.4**. It uses **S**QL **S**erver **R**eporting **S**ervices (SSRS) to generate a report that summarize the interviews conducted for a statistical sampling week. This report may be expanded in the future to include a summary of the effort associated with each statistical week.

OrbsWeb Expansion calculator

The expansion calculator allows the ORBS technician to generate an expansion of the catch, release and trip type data from the interviewed trips to account for the total fishing effort. There are two steps to generating the expansion. First, the ORBS technician must identify the expansion periods that apply to each day of a statistical week. Expansions are identified as weekly if the entire statistical week of interview and effort data is used to generate the catch estimates. Daily expansions group one or more days together and calculate a separate expansion for the grouped days. When daily expansions are used, the remaining ungrouped days are considered weekly even though they will no longer consist of an entire week. The weekly and daily expansions are summed after the separate calculations. The terms weekly and daily are historical and not fully descriptive. Rather, it is a technique to combine the days during the week into two separate groups of days. For the majority of statistical weeks, the expansions group all seven days into a single (weekly) group. However, if there is a seasonal change to a fishery, such as a halibut opener, those days are grouped together to account for the change in fishing and effort unique to those days. This allows for a more accurate overall estimation.

On rare occasions during a statistical week, halibut openers and salmon openers may occur on a different series of days. The ORBS technician can specify the fishery management type (salmon or halibut) to use to generate the expansion. Each management type can group a different set of days.

During the expansion calculations, the trip types are also expanded. This data represents the expanded effort, and allows for an estimate of the total effort and catch by trip type (salmon, combo, halibut, bottom, etc) to be calculated.

Three additional features are present in the **OrbsWeb** expansion procedures that are not currently available in the legacy ORBS application:

- The expansion periods will be saved in the database for each statistical week. This allows the expansion periods to be reviewed and amended at a later date, if necessary, so that the expansion calculations can be rerun. Currently, this information is frequently lost if it is not recorded in a separate spreadsheet. Without a record of the expansion periods it is difficult to quickly reproduce the expansion calculations and verify results.
- Release data will be expanded that take into account depth related survival and mortality. This allows for a released live and released dead expansion based on depth-mortality tables by species and the

reported fishing depth.

- The expansion calculations will include the statistical variance. This feature is not yet implemented. Although R code has been created to accomplish this feature, the best way to apply it is being developed.

Reports

In order for the data in **OrbsDB** to be effectively used by fishery managers, it must be presented in a summarized and clear format. Using SSRS, a series of reports have been defined that are frequently used by fisheries managers or the ORBS technician. Reporting services are integrated with **OrbsWeb** so that the user can quickly generate and distribute reports.

Recreation Summary

As the name implies, this report contains a summary of the recreational fishery. The report can be a summary of the year or a summary of a selected statistical week.

Monthly Crab Report

The shellfish group includes the recreational crab take when reporting total crab harvest. Unlike the finfish reports, the crab report is based on a calendar month rather than statistical weeks.

Monthly Tuna Report

A report of the tuna harvest for a calendar month.

Bulk Recovery Upload

Salmon tag data for each statistical week is uploaded to IStar. The bulk recovery file is generated in two steps. First, the ORBS technician runs the recovery report to generate a list of all salmonids sampled that scanned positive for a coded wire tag (CWT). The export feature of reporting services is used to export the recovery report as an Excel file. Next, the excel file is copied to the bulk recovery upload template and saved as an XML file.

After the bulk upload recovery XML file is generated it is added to the database used by the CWTF web application, using the current import method required by that application.

Catch Sample Summary (MSOcean.txt)

The CWTF application generates a catch sample summary that reports sampled and expanded

salmonid catch data for tagged and untagged fish. Salmonid recoveries from ORBS are included in this report. OrbsWeb includes a report that generates the **MSOcean.txt** file that is imported using the CWTF application. It is an annual report, but is also used to report year-to-date data for salmonids.

CWTF Import

The Coded Wire Tag Fish web application is used to import the bulk recovery upload file and the MSOcean.txt file as described in sections **2.74** and **2.76.** There have been no changes made to CWTF to accommodate **OrbsWeb**.

Completion Status

The following table shows tasks completed to date.

Feature	Status
Analyze legacy data flow, redesign for OrbsWeb	Done
OrbsDB and ORBS Migration	Done
Data Collection	Done
Mobile Data Upload	Done
Merging imported data	Done
ORBS Web Editor – Import Buffer and Live Data	Done
Weekly Interview Report	Done
OrbsWeb Expansion calculator	**In Progress**
Reports	
Recreation Summary	To Do
Monthly Crab Report	To Do
Monthly Tuna Report	To Do
Bulk Recovery Upload	Done
Catch Sample Summary (MSOcean.txt)	Done

6. Limitations

7. Discussion/Conclusions/Recommendations

This project successfully completed most objectives and goals. Additional work is needed to complete the OrbsWeb Expansion calculator as well as two reports (see Completion Status). These tasks will be completed by December 31, 2015 using other funds.

8. References

None