



D1.5 Implementation scenarios v1

WP1 – Wildlife scenarios

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EO4wildlife Project Overview

EO4wildlife main objective is to bring large number of multidisciplinary scientists such as biologists, ecologists and ornithologists around the world to collaborate closely together while using European Sentinel Copernicus Earth Observation more heavily and efficiently.

In order to reach such important objective, an open service platform and interoperable toolbox will be designed and developed. It will offer high level services that can be accessed by scientists to perform their respective research. The platform front end will be easy-to-use, access and offer dedicated services that will enable them process their geospatial environmental stimulations using Sentinel Earth Observation data that are intelligently combined with other observation sources.

Specifically, the EO4wildlife platform will enable the integration of Sentinel data, ARGOS archive databases and real time thematic databank portals, including Wildlifetracking.org, Seabirdtracking.org, and other Earth Observation and MetOcean databases; locally or remotely, and simultaneously.

EO4wildlife research specialises in the intelligent management big data, processing, advanced analytics and a Knowledge Base for wildlife migratory behaviour and trends forecast. The research will lead to the development of web-enabled open services using OGC standards for sensor observation and measurements and data processing of heterogeneous geospatial observation data and uncertainties.

EO4wildlife will design, implement and validate various scenarios based on real operational use case requirements in the field of wildlife migrations, habitats and behaviour. These include:

- Management tools for regulatory authorities to achieve real-time advanced decision-making on the protection of protect seabird species;
- Enhancing scientific knowledge of pelagic fish migrations routes, reproduction and feeding behaviours for better species management;
- Enable researchers better understand the movement behaviour of sea turtle populations; and
- Setting up tools to assist marine protected areas and management.

Abbreviations and Glossary

A common glossary of terms for all EO4wildlife deliverables, as well as a list of abbreviations, can be found in the public document “EO4wildlife Glossary” available at EO4wildlife.eu.

Executive Summary

The goal of this document is to describe the implementation of the Use Case Scenarios in the EO4wildlife platform at this intermediate stage of the project lifetime.

It takes into consideration the scenarios requirements described in D1.1 [1] and merges the results of the deliverables D2.7 [3], D3.5 [5] and D3.7 [6] to provide a view of the EO4wildlife services available from the end-user point of view.

This document gives a status on the data and services availability and accessibility and describes the scenarios implementation according to their level of development and the level of integration of the required services in the platform. It describes the steps for running the Use Case Scenarios through the platform according to the different components and services deployed.

The V2 platform offers several general functionalities to the end-user and allows the implementation of the early versions of two of the scenarios: the Seabirds scenario described by Birdlife and the Fish scenario described by CLS. The implementation of more elaborated Fish and Seabirds scenarios as well as the implementation of the Sea turtles (described by the University of Exeter) and the Marine mammals (described by the AAMP/AFB) scenarios will be allowed in the future version of the platform (V3) to be delivered in December 2017. The second version of this document due in early 2018 will reflect the functionalities of the V3 platform.

1 Introduction

1.1 Purpose

This document describes the first implementation of the Use Case Scenarios in the EO4wildlife platform.

It describes the data availability and accessibility through the platform web portal access, gives a status on the thematic analytics web services implemented and their configuration, and provides guidelines to test the easiness of the platform for the end user.

This document is end-user scenarios-oriented. It describes the implementation of the use case scenarios in the version V2 of the platform to be delivered in February 2017. It does not describe the platform implementation with regard to the service provider, product provider or administrator profiles, since these roles are out of the scope of this release.

The objective of this document is to describe how to run the scenarios in the V2 platform so as to enrich the validation plan for each scenario.

1.2 Related Documents

This document is based on the use case scenarios described in the D1.1 [1] deliverable and on their translation in thematic analytics services described in the D3.5 [5] and D3.7 [6]. It is based on the platform components deployment described in D2.7 [3].

2 Status of EO4wildlife Platform V2 for the Purpose of Scenario

Implementation

This paragraph gives a status on the functionalities available in the EO4wildlife platform. In the present version of the platform, general functionalities have been implemented. The auxiliary data and user data has to be uploaded manually.

In the next version:

- The Argos data and other type of tracking data (GPS and GLS) will be directly uploaded from the existing platforms of seaturtle.org and seabirdtracking.org.
- The auxiliary data needed to process the specific workflows will be downloaded through data connectors.

The objective of this section is to provide a complete picture of the services and functionalities offered by the platform V2 to the end-user in order to run the Use Case Scenarios.

2.1 EO4wildlife Platform Major Components

The following table gives the list of the major components and data to be included in the EO4wildlife platform and their implementation status in the actual version of the V2 version of the platform.

Component	Implemented in V2	Accessibility in V2	Access through front-end
Auxiliary Data connectors			
Bathymetry	manual import	Common data folder	Yes
Sea surface temperature	manual import	Common data folder	Yes
CMEMS connector	Yes	Yes	yes but not linked to WPS services
PEPS connector	partially, PEPS product are imported without description metadata	no, as no service uses this data yet, and displaying the products without description does not add much value	no
AVISO connector	No		
CLS Datastore connector	No		
Platform interoperability			
Seabirdtracking.org interoperability	No		
Seaturtle.org interoperability	No		
Platform configuration			
Front-end	Yes	Yes	Yes
User registration	Yes	Yes	No
User authentication	Yes	Yes	Yes
Web Services			
Front End	Yes	Yes	Yes
Catalogue	Partially (no workflow for metadata edition)	Yes	Yes
WPS Pelagic Fish V1	Yes	Yes	Yes

WPS Seabird V1	Partially	Yes	Yes
File manager (upload, download, browse)	Yes	Yes	Yes
WPS execution	Yes	Yes	Yes
WPS status	Yes	Yes	Yes
WPS Sea turtle	No	No	No
WPS AAMP	No	No	No

Table 1: List of Major Platform Components

The following table provides the exhaustive list of the services needed for the Use Case Scenarios and their implantation status in the platform V2. The details of the services are described in D3.5 [5] and D3.7 [6].

Service id	Implemented	WPS name	Access through front-end
Data pre-processing services			
speed_filter	No	No	No
turning filter	No	No	No
discard (on land or near land location)	No	No	No
position_quality_filter (related to the quality of argos loc)	No	No	No
regular_locations (averaging or linear interpolation)	No	No	No
redundancy_filter	No	No	No
Data aggregation services			
track_reprojection	yes	Package R sp/ WPS Seabird	
track_splitting	yes	WPS Seabird	
track_gridding: counting animal presence in a grid cell (input: horizontal + vertical cell resolution)	No	No	No
track_sampling (raster data interpolated at the position?!)	No	No	No
track_circular_sampling	No	No	No
polygon count	yes	(WPS Seabird)	No
distribution grid_sampling	No	No	No
Data mining/ home range estimation			
min_convex_polygon	No	No	No
ars_scale	yes	WPS Seabird	No
Kernel_density Kernel Density estimator	yes	WPS Seabird	No
variance_test (Birdlife)	Yes	WPS Seabird	No
brown_bridge	No	No	No
alpha_hulls	No	No	No
Data mining/ identification of foraging grounds			
foraging_FPT	No	No	No
foraging_RTA	No	No	No
bootstrap	Yes	(WPS Seabird)	No

Data mining/ relevant environmental parameters discovery			
data_mining/rank_corr	No	No	No
Shapiro_wilk_test	No	No	No
Mann_Whitney_test	No	No	No
Kruskal-Wallis_test	No	No	No
High Level Fusion services			
track_and_loc	Yes	WPS PelagicFish	Yes
changepoint	No	No	No
habitat modelling:fusion/Ecological niche modelling ENM (R?)	No	No	No
ENM_ensemble	No	No	No
ENM_enveloppe	No	No	No
GAMM	No	No	No
null_model	No	No	No
chesson_preference_index	No	No	No

Table 2: List of Services Required for the Use Case Scenarios and Implementation Status

3 Implementation of Common Functionalities

This section describes the general functionalities common to all scenarios with respect to their availability and accessibility through the web portal. It gives a status on the implementation of the general services for the end-user.

3.1 User Registration and Authentication

The user can register to the EO4wildlife application. In the present version, an admin manually manages the user base (for next versions, a user will be able to register by filling a form).

For V3, once registered, the user will be able to log in: the user fills his login id and his password to enter the application.

The user workspace is directly available, no additional authentication is required.

3.2 User Private Workspace

The user private directory is composed of 2 subdirectories:

- the input subdirectory where the user uploads its data,
- the process sub-directory where the user can find the time tagged execution results, folders of the processing services he has launched.

The user is able to remove files in his private workspace.

In V3, the user workspace is strictly private, the platform ensures the security of the users' personal data.

3.3 Product and Services Discovery

The "Products" panel allows browsing the data products available in the catalogue

- The CMEMS catalogue is harvested in the EO4wildlife catalogue
- The available products are displayed with a thumbnail and quick description. Clicking on a product results on displaying a more detailed description.
- The products are sorted with various and configurable criteria (release data and usage ratio)
- A search field is available with various criteria: resource type, data provider, release date, updating frequency.

The "Workflows" panel allows browsing the available services. In V2, we can see the current service catalogue, including the SeaBird and the PelagicFish scenarios. In V3, this panel will be enriched with the possibility to generate new workflows by a service provider.

3.4 Data Uploading

In the platform V2 release, the uploading of input data has to be done manually in the private workspace using the front-end menu. The auxiliary data has to be uploaded previously manually by a platform administrator under the *common_data* directory.

In the V3 version, there will be a connection between the external platforms and the private workspace of a user for input data. Via this connection, the auxiliary data will be downloaded by the process through the data connectors during the process execution.

3.5 Services Processing

The services browsed through the catalogue of services can then be selected and run through the front-end. The appropriate inputs are selected through the front –end.

For the selection of the input tracking data, the application only shows the input files available in the user workspace that fits with the selected workflow (.csv files, zip files,...).

For the selection of the auxiliary data, the application shows as an option the products available in the *common_data* folder.

The ‘Execute’ button will only be enabled when all the necessary inputs are selected for a specific workflow.

The execution status of the process can be checked under the ‘Execution’ table.

3.6 Products Downloading

In the platform V2 release, the user is able to download the results of the processing services. The user can download individually files or multiple files as a .zip archive.

3.7 Products Display

The platform does not allow the display of tracking data, auxiliary data or results from the processing services.

4 Template of Implementation of Use Case Scenario

The objective is to describe the functional implementation of each scenario in the EO4wildlife platform V2, taking into account the easiness of use of the web portal for the end-user, the availability and accessibility of the tracking data and auxiliary data through the data connectors, and the display of results. This document should be a guideline for the future validation tasks on how to run the scenarios in the EO4wildlife platform.

This paragraph gives a guideline on the necessary information that should be described in the scenario implementation deliverable.

4.1 Input Data

4.1.1 Animal Location Data

- Origin of animal location data (Argos, GPS, GLS, high resolution images...)
- Format of the animal location data
- Parameters / variables of the animal data (location, additional measurements,...)
- Description of the uploading process: manual upload/ automatic upload in the user private workspace/ data already located in folder.
- Description of the discovery and display functionalities

4.1.2 Auxiliary Data

- Summary of auxiliary data needed for the scenario and format
- Description of the uploading process: manual upload/automatic upload in the *common_data* folder/ already accessible in folder

The list of auxiliary data selected for each scenario is summarized in Table 1 of D3.5 deliverable [5].

4.2 WPS Services Related to Use Case Scenario

4.2.1 WPS Service id (implemented in the platform)

4.2.1.1 Metadata Short Description

What does this service allow the user to obtain from what inputs. This section could be used as a short description of the WPS in the catalogue of services. This content is displayed to the user.

4.2.1.2 Sub-processes Included in WPS

- sub-processes included in the WPS (service id: see list in **Table 2**)
- language
- docker image name

4.2.1.3 Input Parameters

- actions in the web portal to launch the service: input form for parameters, selection of input files through the front-end

4.2.1.4 Interfaces with EO4wildlife Platform

- how to launch the service: manual/ through front-end
- provide a schema of the service within the EO4wildlife platform

4.3 Results

- Nature of results (maps, tables...)
- Description of products (density maps, statistics...)
- Display of results

5 Implementation of the Fish Scenario

5.1 Input Data

5.1.1 Argos Data

For the first implementation of the Fish scenario in the EO4wildlife platform V2, the Argos data are manually uploaded in the user/input_dir directory.

The format of the animal data is presented as a list of zip archives. Each archive follows the project structure described in D3.5 [5] (a folder named by tag id containing a tag.config.xml and 3 subdirectories named “argos”, “manufacturer” and “output”).

The animal data recorded by the tag is daily observation data of observed light level, temperature data and depth. The observation data is presented in a list of csv files.

The raw Argos data cannot be displayed in the platform EO4wildlife.

5.1.2 Auxiliary Data

The following auxiliary datasets are needed for the fish scenario:

- global grids of daily sea surface temperature from OSTIA aggregated in hdf5 format
- global grid of high resolution bathymetry in nectdf format (ETOPO1)

Auxiliary data are manually uploaded by a platform administrator and available for the users in the *common_data* folder.

The list of auxiliary data to be used is summarized in Table 1 of D3.5 deliverable [5].

5.2 WPS Services

5.2.1 WPS PelagicFish

5.2.1.1 Metadata Short Description

This WPS service proposes the reconstruction of fish tracks based on the daily measurements of light level, temperature and depth recorded by a tag attached to the fish. It takes as inputs the measurements data recovered from the tag, satellite sea surface temperature and bathymetry data and it provides as results an estimation of the fish track positions.

The metadata description of this web service is summarized to the following for the end-user:

‘Estimate submarine trajectories based on measurements obtained from the tags along with environmental data such as sea surface temperature and bathymetric models’

5.2.1.2 Sub-processes Included in WPS

The PelagicFish WPS is available on the docker image ‘trackloc:latest’ and includes the following sub-processes:

- fusion/track_and_lock (python code)

5.2.1.3 Input Parameters

No specific input parameters are needed when launching the WPS. The parameters are self-calculated by the algorithm.

5.2.1.4 Interfaces with the EO4wildlife Platform

The service is launched through the front-end. Through the Workflows Catalogue, the user can select the PelagicFish WPS service.

The user selects the input file which is stored under the private workspace/input folder, selects the auxiliary stored under common_data and executes the service.

The outputs files are generated and stored under the user/process/output directory.

Figure 1 presents the schematic implementation of the Fish scenario in the EO4wildlife platform V2.

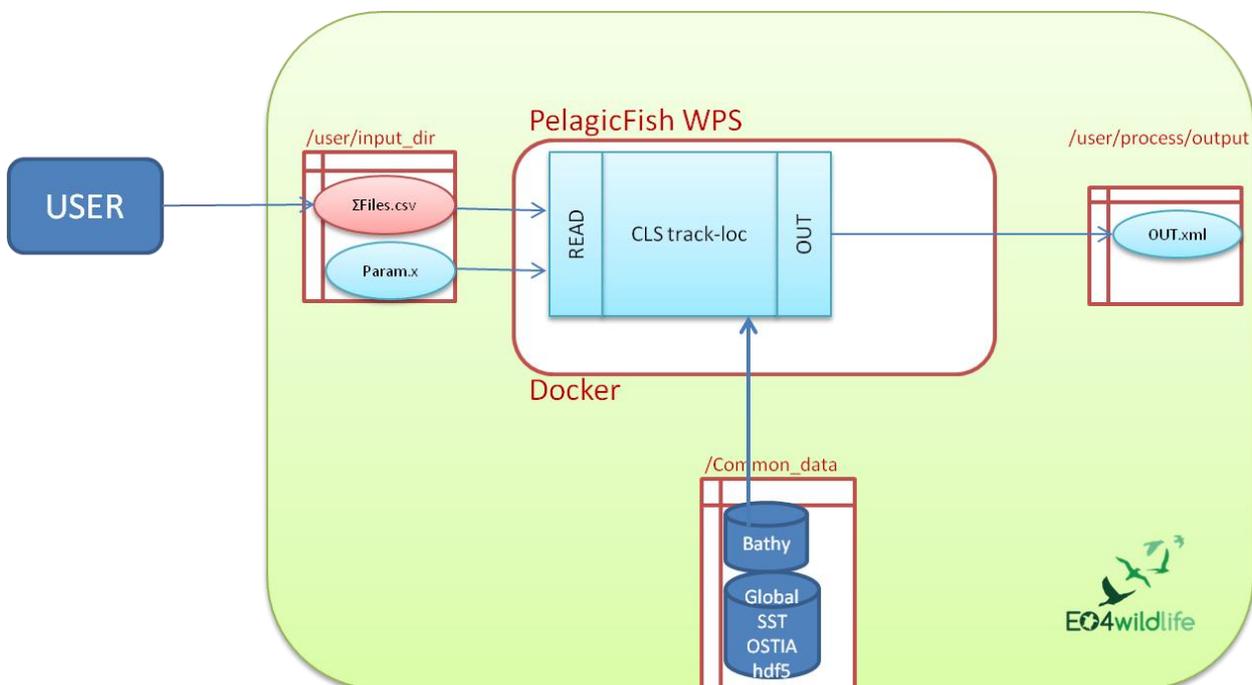


Figure 1: Implementation of the PelagicFish Scenario

5.3 Results

The outputs of the PelagicFish WPS are a list of files:

- xml file corresponding to the estimated trajectory
- zip archive containing the project with all generated results (plots of the trajectory and physical value along the track)

The files are generated and stored in the directory user/process/output.

The files can be downloaded individually or in one action but cannot be opened or display on the platform.

6 Implementation of the SeaBird Scenario

6.1 Input Data

6.1.1 Argos, GPS and GLS data

The tracking data are in a csv format and have to be uploaded by the user under user/input_dir following the template provided by BirdLife. In the next version of the platform, the data will be directly uploaded in the user/input-directory from the SeabirdTracking database. The SeabirdTracking database has a series of automated filtering and analysis approaches that allow inputs and outputs to be standardized, thus minimizing time required for database maintenance. The tracking data cannot be displayed in the platform EO4wildlife.

6.1.2 Auxiliary Data

No auxiliary data is need for the first implementation of the SeaBird Scenario.

6.2 WPS Services Related to Use Case Scenario

6.2.1 WPS SeaBird

6.2.1.1 Metadata Short Description

The idea of this WPS is to identify and monitor important bird areas by incorporating tracking data into habitat suitability models, linked to clear oceanographic preferences of seabird species. It takes as inputs the tracking data and it provides as results a shapefile describing the seabird core areas (i.e. areas of highly intensive use). In the next version of platform, habitat suitability models will be developed to describe ecological drivers of distribution patterns (e.g. what are the differences between those core areas from other available areas in the ocean), and to make predictions, including for data-poor areas by mapping the oceanic habitats used by seabirds.

The metadata description of this web service is summarized for the end-user to the following:

‘Compute the seabirds core use areas from input tracking data’

6.2.1.2 Sub-processes Included in WPS

The following subservices are included in this WPS:

- track_reprojection
- track_splitting
- ars_scale
- Kernel_density Kernel Density estimator
- variance_test
- polygon count

The scripts are written in R code and contained in the birdlife:latest docker.

6.2.1.3 Input Parameters

No specific input parameters are needed when launching the WPS.

6.2.1.4 Interfaces with EO4wildlife Platform

The service is launched through the front-end. Through the Services Catalogue, the user can select the SeaBird WPS service.

Figure 2 presents the schematic implementation of the SeaBird scenario in the EO4wildlife platform V2.

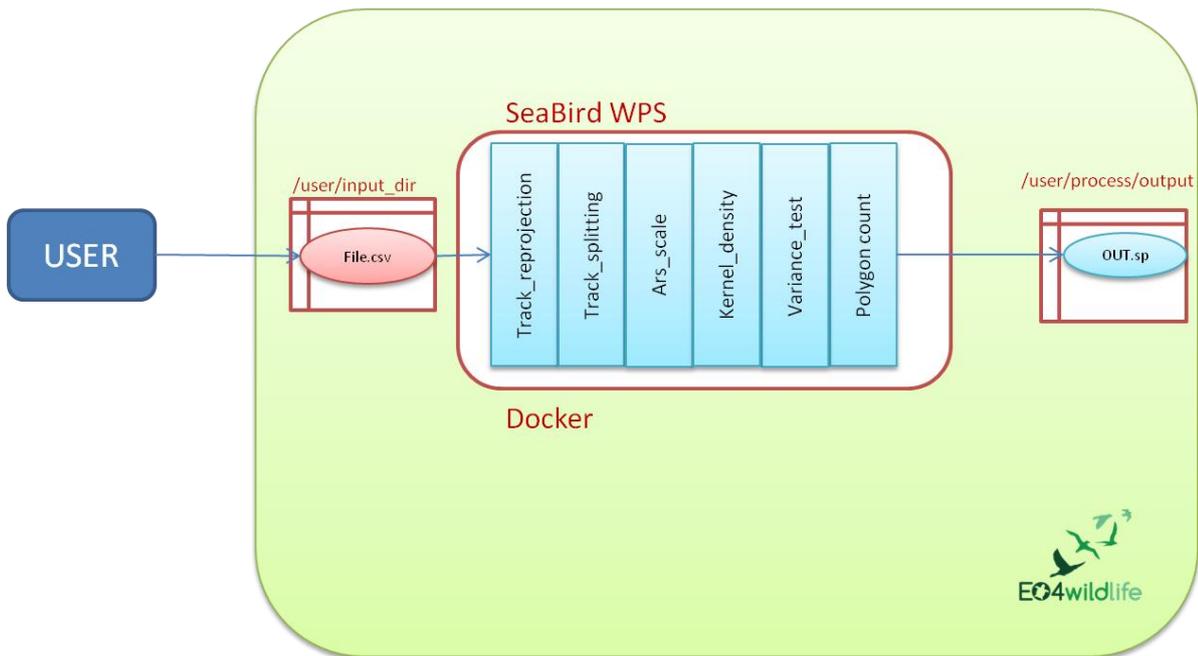


Figure 2: Implementation of the SeaBird Scenario

6.3 Results

The output of the SeaBird WPS is a shapefile resulting in the Kernel analysis representing the seabirds core use area.

The files are generated and stored in the directory `user/process/output`.

The files can be downloaded but cannot be opened or display on the platform.

7 Recommendations for the Next Implementation

This paragraph provides some recommendations in order to improve the easy-use of the platform in the next scenario implementation.

7.1 Input Data

7.1.1 Template of Tracking Data

Under the workspace, it will be helpful to have a folder named “template” on which the user will find the template of tracking data and maybe the process to upload its data into his workspace.

7.1.2 Display of Tracking Data

In the future version of the platform, the tracking data will be converted in a netcdf format for the display on the web portal.

Location data from Argos files should be displayed over auxiliary data.

7.2 WPS Services

7.2.1 Temp Folder

The temp folder is used by the process to compute the results. It is necessary to hide this folder to end users but to make its access available to the service provider for any required investigation.

7.2.2 SeaBird Scenario

CSV data is used as input to the process. The implementation will be eased when the interoperability between SeaBirdTracking.org and EO4wildlife platform will be set up.

To take into account the Advisory Board comments received during the first AB meeting held in September 2016, the platform should allow the user to run the entire process of a defined workflow, but also to run the sub-processes step by step.

7.2.3 PelagicFish Scenario

The actual version of WPS implemented uses zip files as inputs to the process, and recreate a zip file as output. In the future version of the platform, the input and output formats will be updated and the results will be made available in the standard EO4wildlife xml format described in the D3.3 [4]. This will allow the user to have access to the others tools of the platform (display, other WPS services...)

7.3 Display and On-line Tools

The platform V2 does not provide any display tools at this stage.

The major focus for the next implementation will be to offer the user some display facilities of its data and process results.

8 Conclusion

The objective of task 1.3 of the EO4wildlife project is to prepare the implementation of the Use Case Scenarios in the platform, ensuring the data availability and accessibility of data, configuring the platform for the use cases and to provide feedbacks on the scenarios implementation from the end-user point of view.

The document gives a status on the platform functionalities and tools available for the end-user, and provides a guideline on the implementation process to follow according to the availability of the different platform components.

Although the implementation is only partly done at this stage of the project for V2, some general functionalities are already implemented for testing.

Two of the Use Case Scenarios have also been implemented in their initial version. Some feedbacks are provided to ease the implementation of the use case in the future version of the platform.

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