Documentation Sphenotron

Introduction

Sphenotron is a program written in the Python programming language, which serves as an interacting interface with RFID (Radio Frequency IDentification) database. Originally developed to work with penguin databases, Sphenotron requires a MySQL server and a compatible database to function.

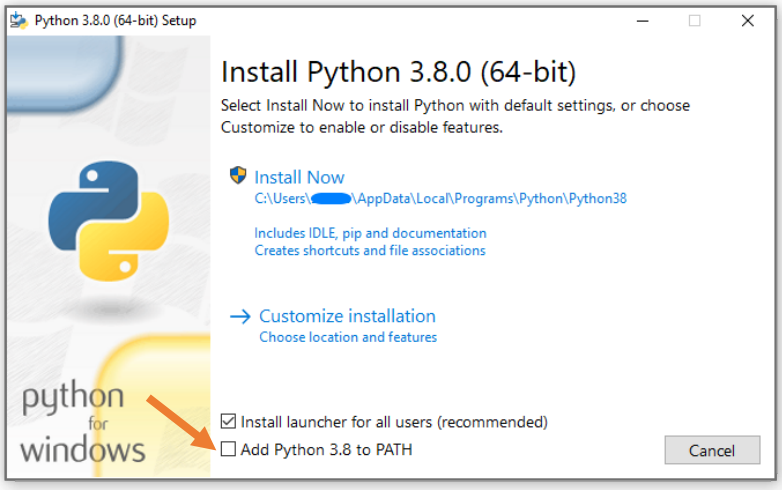
Installation

Sphenotron doesn't require an installation process, but you do need a compatible version of Python and packages used by the program. Sphenotron has been tested with Python versions 3.7 to 3.9.

1) Python installation

Windows:

To install Python, download the Windows Installer X86 from the files section of the Python website (e.g. https://www.python.org/downloads/release/python-3913/). During installation, make sure to check 'Add Python X.X to PATH' to register Python location with your OS.



Mac or Linux:

For Mac users, Python is pre-installed on your machines. However, if you need to install a different version of Python, you can download and install it from the official Python website:

https://www.python.org/downloads/mac-osx/

For Linux users, you can install Python from your distribution's package manager. For example, on Ubuntu, you can use the following command in the terminal to install Python 3: **sudo apt-get install python3**

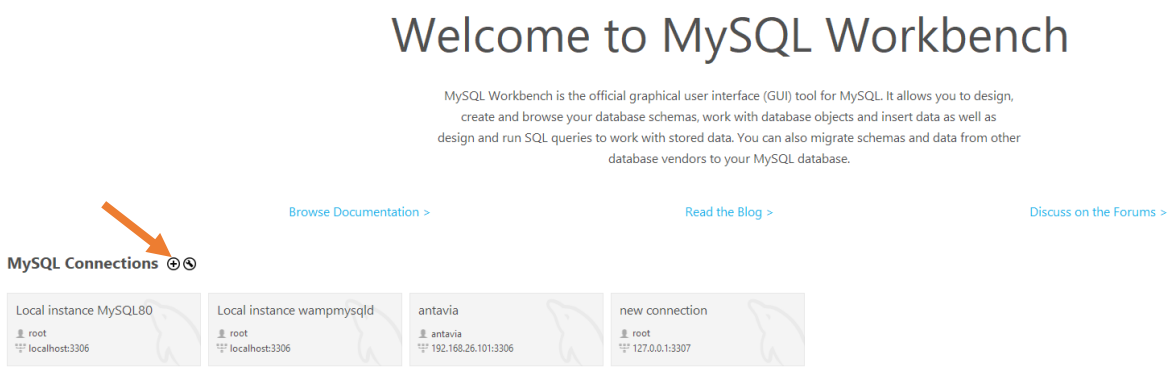
2) Installation of Sphenotron

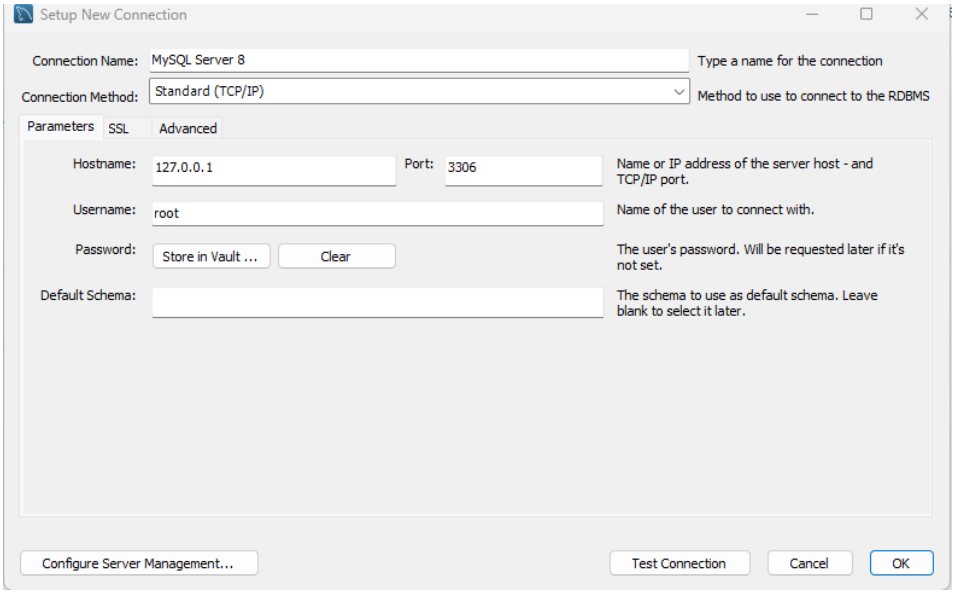
- Clone the GitHub directory of Sphenotron and unzip the folder where you want to store Sphenotron.
- Open the command prompt in Sphenotron location (on Windows, right-click in the folder and select 'open command prompt').
- Execute the following command to install packages: **python –m pip install –r requirements.txt**
- Wait for the installation to complete. Once all the packages are installed, you can run Sphenotron by executing the following command in the terminal: **python sphenotron_main.py**
- The software should open but an error information may appear as the connection with the database is not set up.

3) Installation of a MySQL server

If you do not already have a MySQL 8 server on your computer, download MYSQL 8 server from https://dev.mysql.com/downloads/mysql/ and follow the installer's steps. Choose the latest version of the MySQL 8 server. Change the port if you already have a MySQL server installed on your computer (e.g., use 3307).

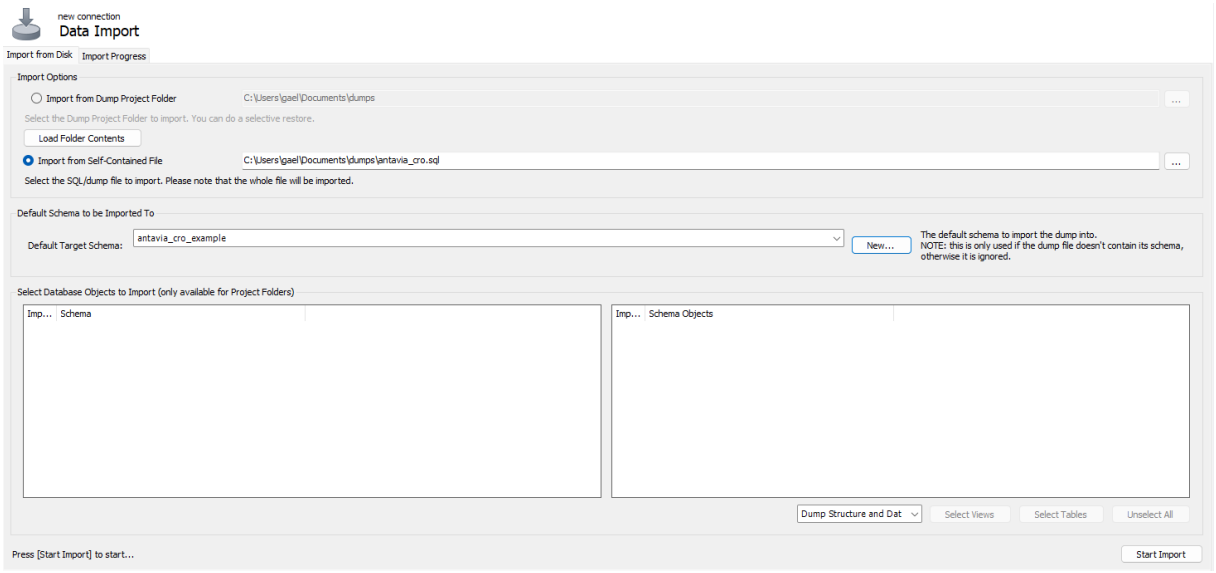
To simplify database importing and navigation, we recommend installing MySQL Workbench from https://dev.mysql.com/downloads/workbench/. After installing MySQL Workbench, add a connection by clicking the '+' button next to MySQL connections. Use the information you provided during the MySQL server installation (change the port if necessary).





4) Import of database

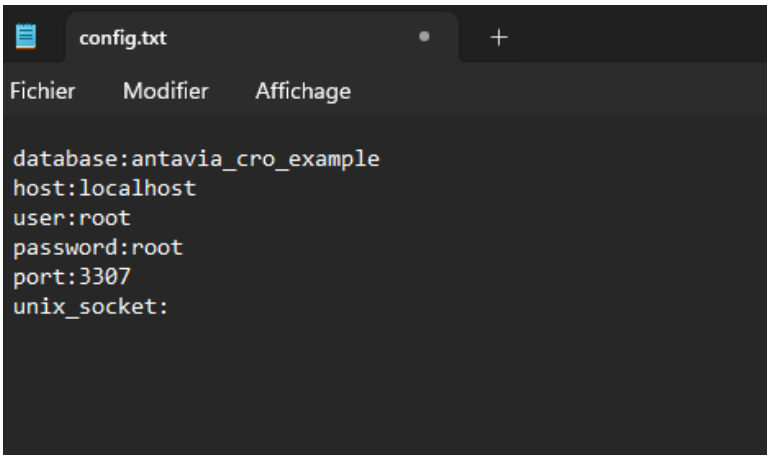
- Open MySQL Workbench and the MySQL server 8.
- Open the import tool (server > data import).
- Select ‘Import from Self-Contained File’ and select the .sql dump of the database that you want to import.
- Click on ‘New’ to create a new target schema and named it. For our penguin databases, the name must contain ‘cro’ or ‘ddu’ to be recognized as a database containing Crozet or Dumont d’Urville penguin data.
- Click on ‘Start Import’.



Note: If you decided not to use MySQL workbench, you must manually create the database with MySQL commands and import the SQL file using ‘source’ command.

5) Configuration of database connection

You must configure the database connection by setting up the mysql_connection/config.txt file in Sphenotron folder with your MySQL Server information and the name of the database you used as a new target schema. Save and quit the config.txt file.



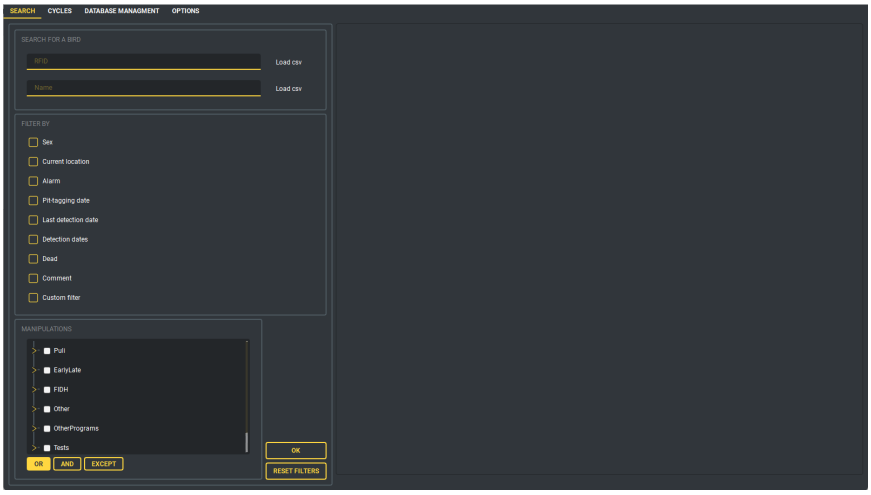
6) Run Sphenotron

To run Sphenotron, execute the command '**python sphenotron_main.py'** in your command prompt or run the run.bat file on Windows.

General

Once installed, the software can be started from Sphenotron folder, and you can create a shortcut on your desktop to execute run.bat. MySQL server must be running for Sphenotron to work; you can turn it on by opening it in MySQL Workbench.

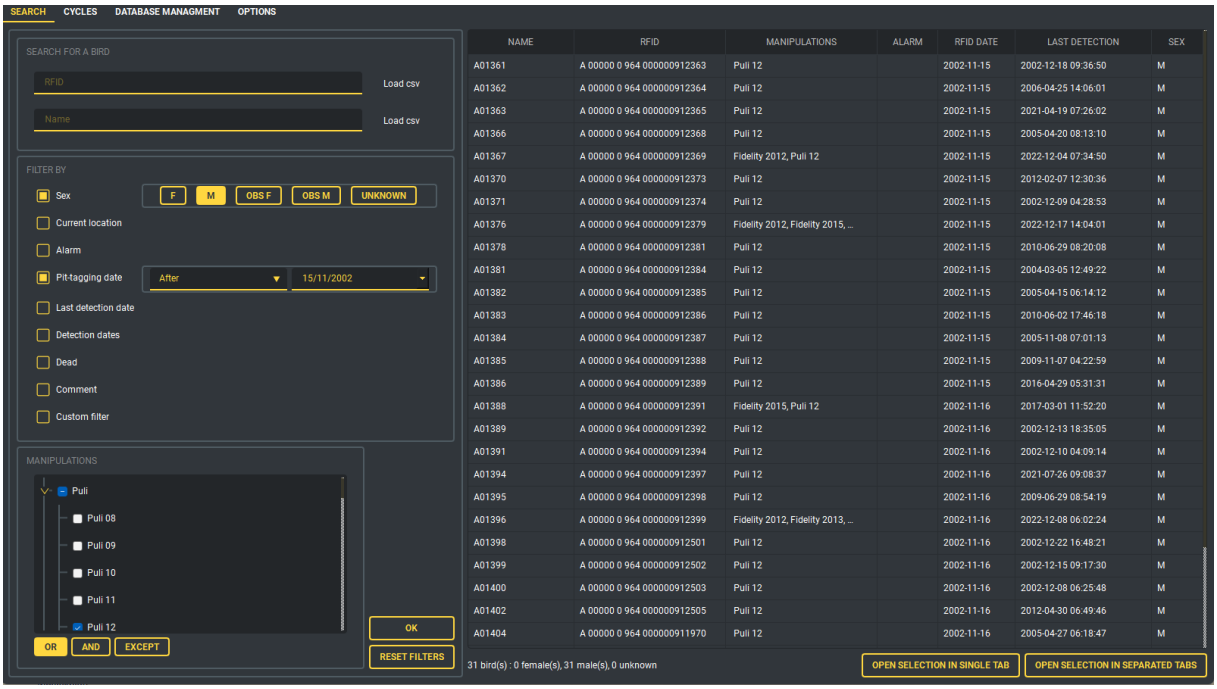
1) Search



When opening Sphenotron, you should be directed to the Search Window. This window is divided into two sections. It allows to execute queries on the database and displays a filtered list of individuals.

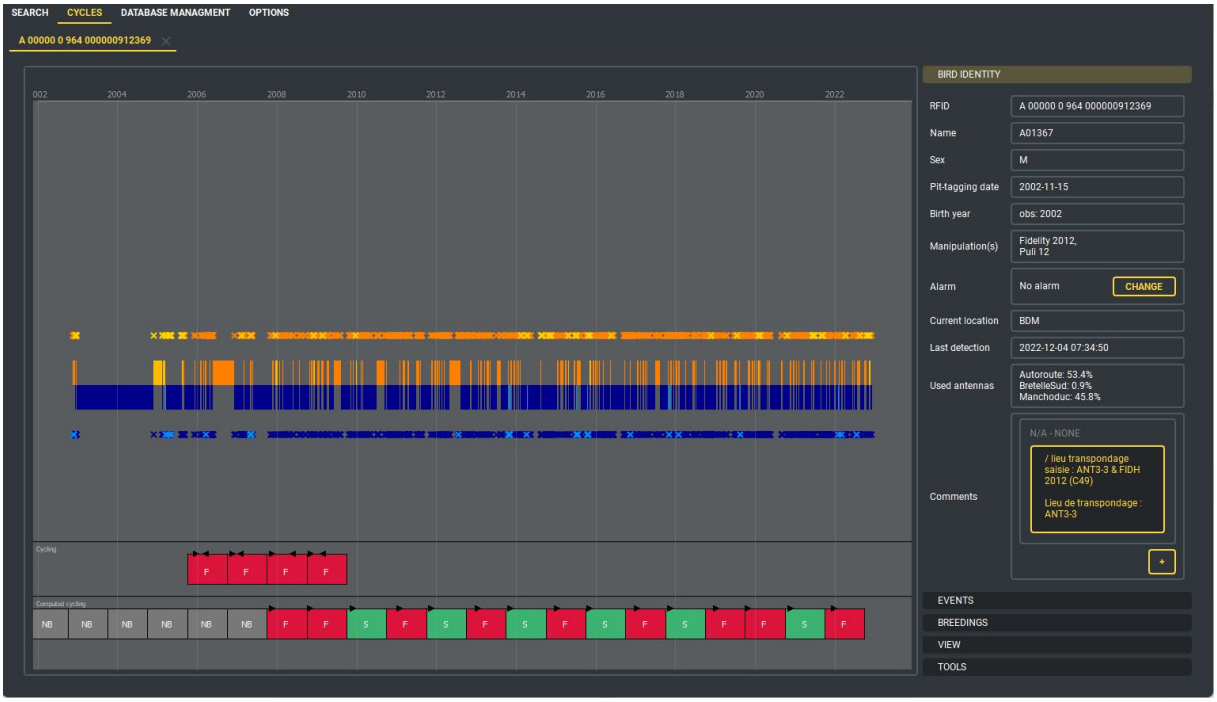
- In the left section, filters can be used to select a chosen list of individuals.
- RFID and name filters can contain several elements that must be separated by commas. The 'load CSV' button allows the user to import a list of RFID or names into the filters, taking the first column of the loaded CSV. The header of the loaded CSV should be either none, 'rfid' or 'name' for RFID and name, respectively.
- The ‘Manipulation’ section allows you to select birds from one or multiple chosen manipulation(s). Clicking on the right arrow (on the left of combobox) will display the different manipulations of each class.

To execute the query and display the list of individuals in the right section, you can click on 'OK' button or press Enter key. The filters can be reset by clicking on the 'Reset filters' button.

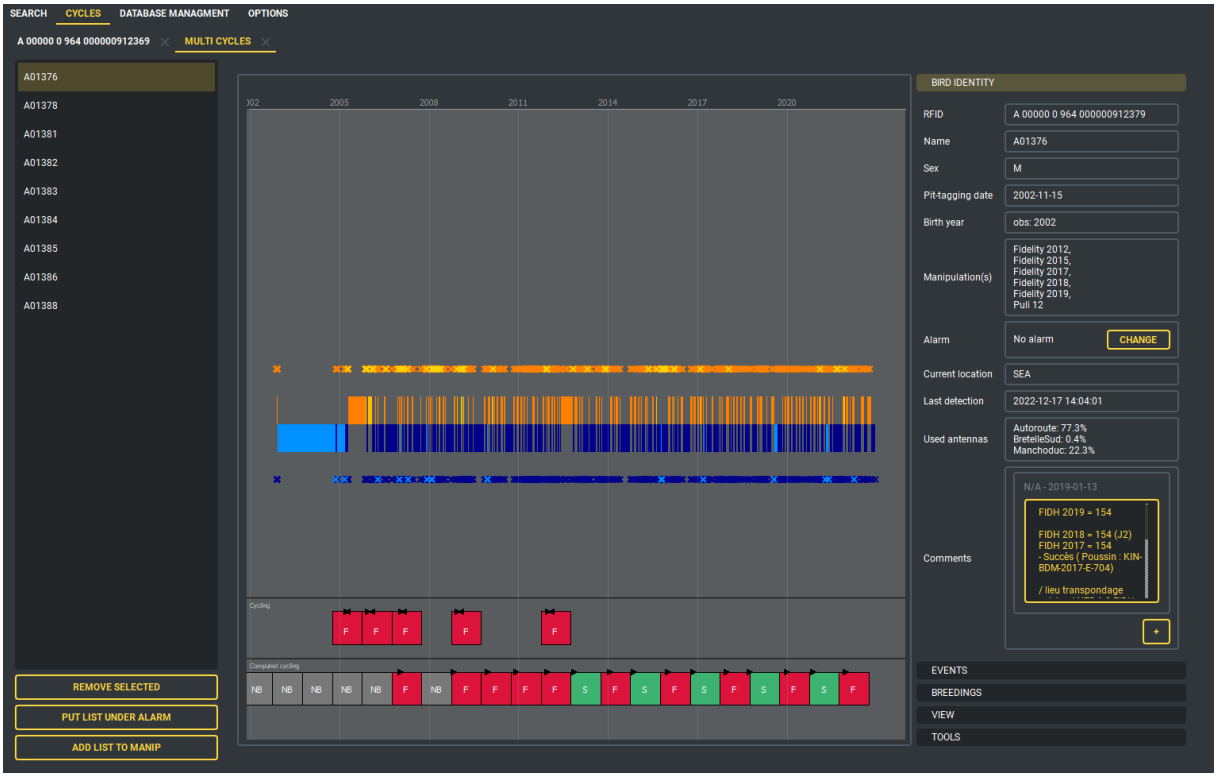


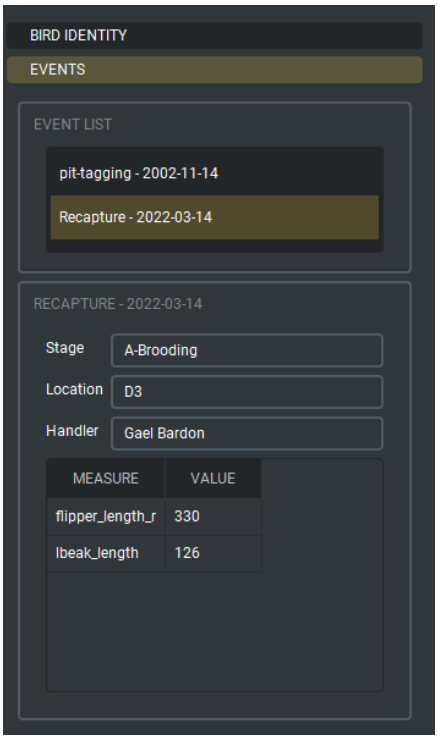
- Columns can be sorted by clicking on headers.
- Individual data can be accessed by double-clicking on the rows, and multiple rows can be selected by dragging the mouse or using Ctrl+click. To select all individuals, use the Ctrl+A shortcut.
- The list of individuals can be opened in several tabs or in a single tab by clicking on the bottom right buttons (see ‘Cycles’ section).

2) Cycles



'Cycles' window showing presence/absence pattern (in and out) of an individual (here A01367). The right panel displays the individual's information. The central chart displays the lifetime locations of the individual: inside the colony in orange, and outside the colony in blue. Yellow and light blue correspond respectively to inside corrected location and outside corrected location (with the algorithm of missing detection correction). Each cross corresponds to one detection (with the same colour scheme). The bottom panel displays the breeding cycles analysed by human experts (top) and by RFIDeep function (bottom): Success in green, Failure in red, and Non-Breeding in grey. Black triangles correspond to the Breeding dates. In the right panel, alarm associated with the individual can be modified with the 'Change' button and new comments can be added with the '+' button.


SEARCH
CYCLES
DATABASE MANAGMENT
OPTIONS
A 00000 0 964 000000912369
MULTI CYCLES
A01376
A01378
A01381
A01382
A01383
A01384
A01385
A01386
A01388
REMOVE SELECTED
PUT LIST UNDER ALARM
ADD LIST TO MANIP
BIRD IDENTITY
RFID
A 00000 0 964 000000912379
Name
A01376
Sex
M
Pit-tagging date
2002-11-15
Birth year
obs: 2002
Manipulation(s)
Fidelity 2012,
Fidelity 2015,
Fidelity 2017,
Fidelity 2018,
Fidelity 2019,
Puli 12
Alarm
No alarm
CHANGE
Current location
SEA
Last detection
2022-12-17 14:04:01
Used antennas
Autoroute: 77.3%
BretelleSud: 0.4%
Manchoduc: 22.3%
Comments
N/A - 2019-01-13
FIDH 2019 = 154
FIDH 2018 = 154 (J2)
FIDH 2017 = 154
- Succès (Poussin : KIN-BDM-2017-E-704)
/ lieu transpondage
EVENTS
BREEDINGS
VIEW
TOOLS


BIRD IDENTITY
EVENTS
EVENT LIST
pit-tagging - 2002-11-14
Recapture - 2022-03-14
RECAPTURE - 2022-03-14
Stage
A-Brooding
Location
D3
Handler
Gael Bardon
MEASURE
VALUE
flipper_length_r
330
lbeak_length
126

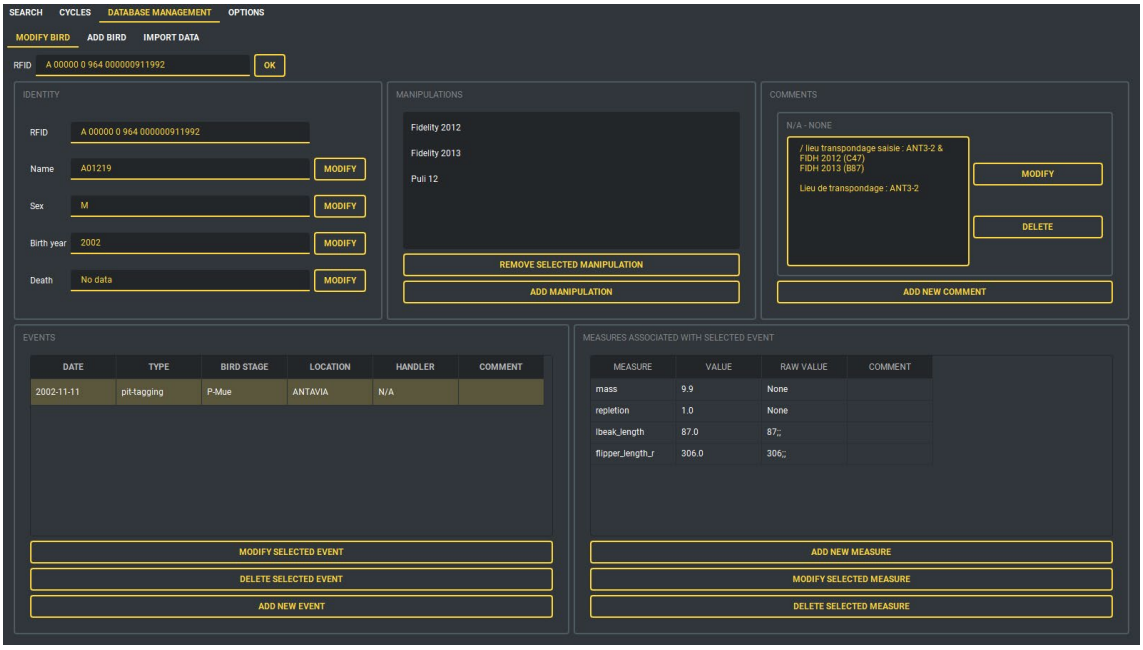
In the right panel, ‘View’ tab displays the options for the 'Cycles’ view. The different types of cycling data can be displayed or not, as well as the two types of corrected detections.

There is an option to compare the cycle of two individuals to identify if they are partners for a breeding season. Write the name or the RFID of the birds to compare. In the center of the graph, the colors indicate if at least one of the two individuals is at the colony (green) or if both are at sea (blue). Synchronous partners should have long continuous green periods, especially at the beginning of the breeding cycle when the stereotyped presence/absence patterns are constrained by the incubation and brooding duties and very synchronous between partners.

Tools tab allows to directly open the window to modify individual data (see next ‘Database management’ section).

3) Database management

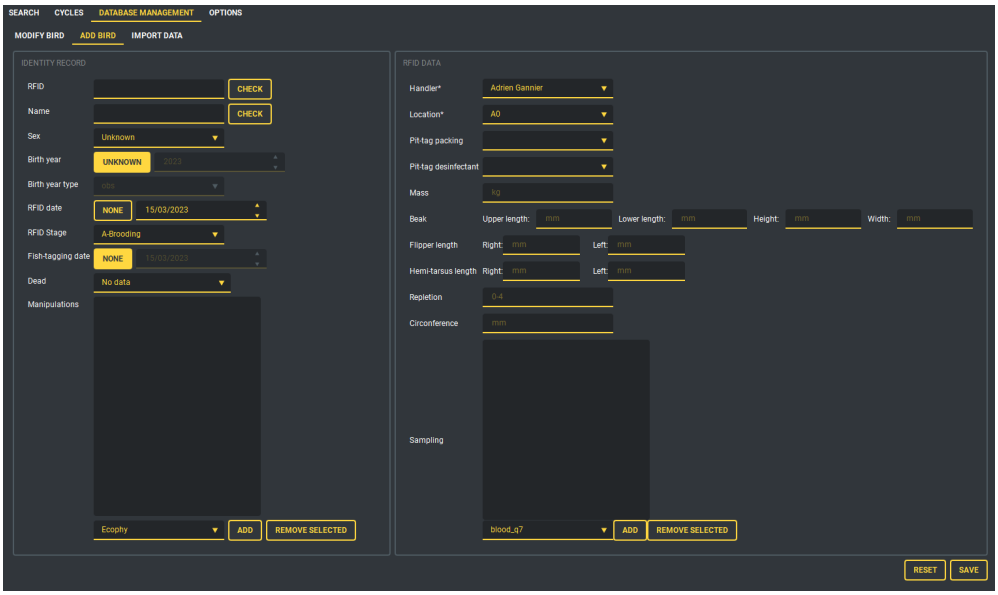
'Database management' section can be used to modify individual data, add new individuals to the database, or import data in the database from CSV file.



a) Modify bird

The 'Modify bird' tab gives tools to modify individual data. This page is enabled when a valid RFID is entered. It can also be directly enabled when using the 'Modify bird's data' button in the 'Cycles' tab.

All the modifications (except in 'Manipulation') are associated with a 'handler' name to track who (and when) the modifications were done. The RFID cannot be changed as it is the unique identifier of each individual. In the bottom section, the measure data in the right section correspond to those associated with the selected event in the left section.

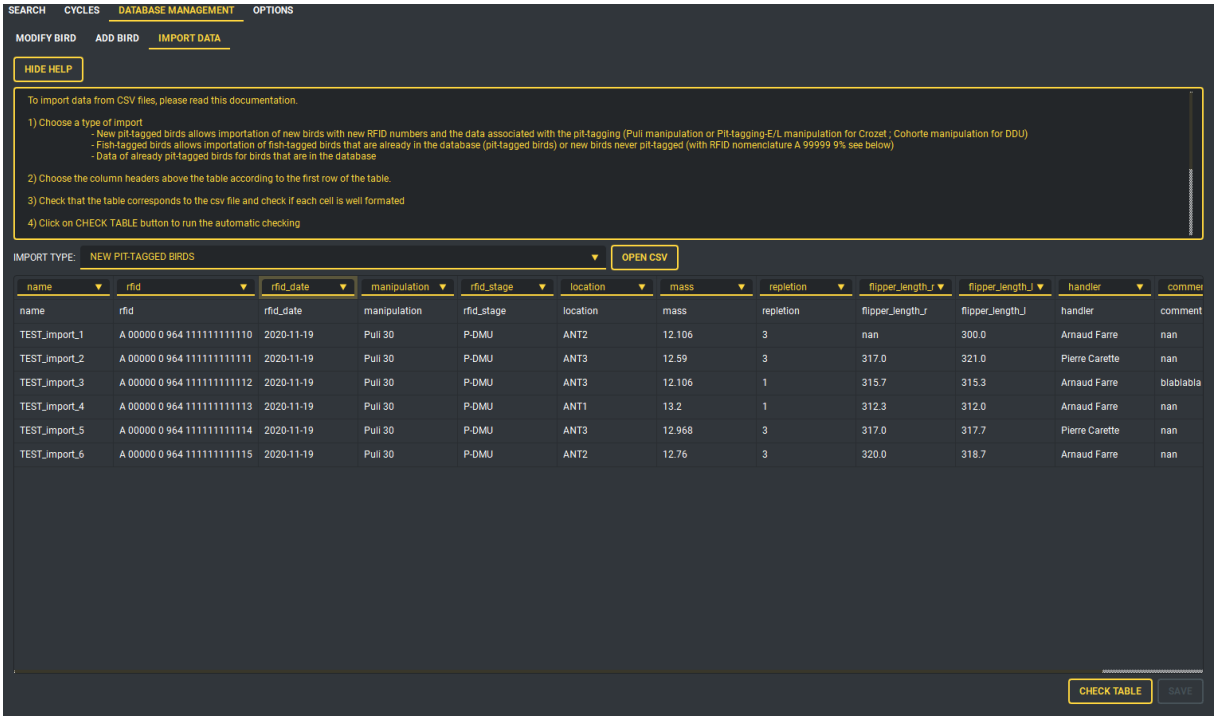


b) Add bird

The 'Add bird' tab allows to add individuals to the database, one by one, by entering their known information. The 'RFID' and 'Name' fields must be filled in and validated with the CHECK button. If these fields are not validated, the individual cannot be added to the database. This validation allows to check if the RFID or the name is not a duplicate, if the RFID is of the right format (according to the templates stored in the text file: "accepted_values.txt").

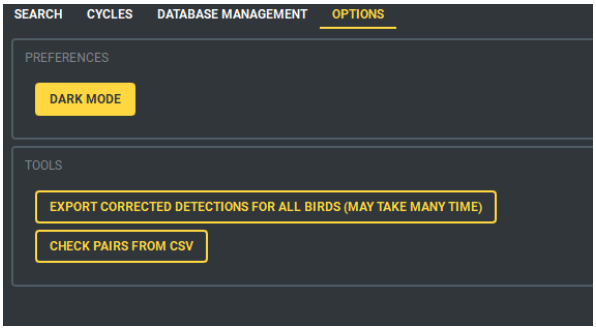
When all known data are filled in, click on ‘Save’ button to import the individual and the data in the database. Many checks are carried out before the data are integrated into the database. If something is not valid, information message pops up and the integration is canceled.

c) Import data



The 'Import data' tab allows to import data from a CSV. Help is available directly in the window. Three types of imports are available and allow the integration of most of the data collected in the field. When a CSV file is imported, it is displayed, and you have to choose what each column corresponds to from the drop-down list. If the name of the column already corresponds to a field in the list, it is selected automatically. Once all the columns have been associated with a field in the drop-down list, click on 'Check table’ to import the data. This validation function checks that the columns are all associated with an existing field and that they are unique. Then, for each type of column, validations are performed for each cell. For measurements, warnings are given when the value is in the lowest or highest 5% of those existing in the database to avoid importing outliers or data in the wrong unit.

4) Options



The ‘Options’ tab offers additional features like it is possible to change the theme of Sphenotron by enabling or disabling the Dark Mode, or tools like the export of corrected detections allows to calculate the missing detections of all the individuals in the database and to export the result in CSV format (an interesting option to include the corrections of the detection data in other analyses). The option to check pairs of individuals is used to check a list of pairs of individuals from a CSV file (put your mouse on the button to display a help): this check option opens the ‘Cycles’ tab with comparison tool and allows the pair list to be loaded automatically, plus it automatically zooms to the given year.