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Dataflows in support of cross-border management of muskrat (*Ondatra zibethicus*) and coypu (*Myocastor coypu*)

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Introduction

Effective data sharing is crucial for managers involved in cross-border species management. The Life MICA (Management of Invasive Coypu and muskrat in Europe) project which ran from 2019 till 2023 aimed to improve data exchange between its 11 partners located in three different countries (Belgium, the Netherlands and Germany) to facilitate management of invasive coypu and muskrat.

At the start of the project all partners had different methods for recording catches and/or presence of muskrat and coypu. These ranged from a dedicated national field app in the Netherlands to scattered and incomplete recording in Germany. There was also no mechanism to centralise invasive alien rodent occurrence and management data across larger geographic scales and there was no tool to effectively exchange these data between different actors. Below you will find the step-by-step approach we took to remedy this.



Muskrat



Coypu

Recommendations

Governments should define and communicate clear management goals and set explicit reporting obligations.

We recommend that for each observation or for each intervention at least the number of animals, the date, the location in coordinates, the management method (e.g. trapping, hunting) and effort spent be recorded, ideally this happens digitally.

Invest enough resources in the technical aspects of this process such as apps used for collecting data, support of the data publication process and development of visualisation tools.

Step 1: improve raw data collection

For Germany, no digital tools were available to register catches of muskrats or coypus before the start of the LIFE MICA project. Therefore, a simple app was made using Google AppSheet, which allowed data from the project areas to be digitally recorded. However, a long-term solution for German data still needs to be found.

During the project we also developed novel methods for monitoring muskrat and coypu such as camera trapping with image recognition and eDNA.

Step 2: transform raw data to Darwin Core

Data in the Life MICA project originated from different sources. We actively mobilised trapping data from different LIFE MICA partners either active in management or research. This also included data derived from camera trap deployments in the framework of the MICA project, as well as historic data on muskrat management from Belgium (Flanders, since 1991) and the Netherlands (since 1987). Additionally, we mobilised data from organisations not in the consortium. All these datasets came in different formats and needed to be standardized. We choose the Darwin Core standard since this is used by GBIF. This transformation process was performed in consultation with project partners, which also increased their knowledge on the data publication process and empowered them to curate and publish their own data. This made the dataflows more sustainable and less dependent on project funding. The source code for the Darwin Core transformation is available as a git repository:

<https://github.com/inbo/mica-occurrences>

Step 3: publish data to GBIF

We chose to publish all data to GBIF (the Global Biodiversity Information Facility) which is an open data aggregator. Due to the standardized data format of GBIF, data mobilisation and data publication could be tackled separately from dashboard development, allowing simultaneous work on both aspects. GBIF requires datasets to be properly documented with metadata, ensuring that they follow the FAIR principles of findability, accessibility, interoperability and reusability. A Creative Commons zero 1.0 license (no rights reserved) was attributed to the datasets to maximise their use. By publishing the MICA datasets openly on GBIF, data on occurrence and management of muskrat and coypu become available to the wider community and can be used for various applications. Through dataset citation and the use of a digital object identifier (DOI), further use of the data can be tracked.

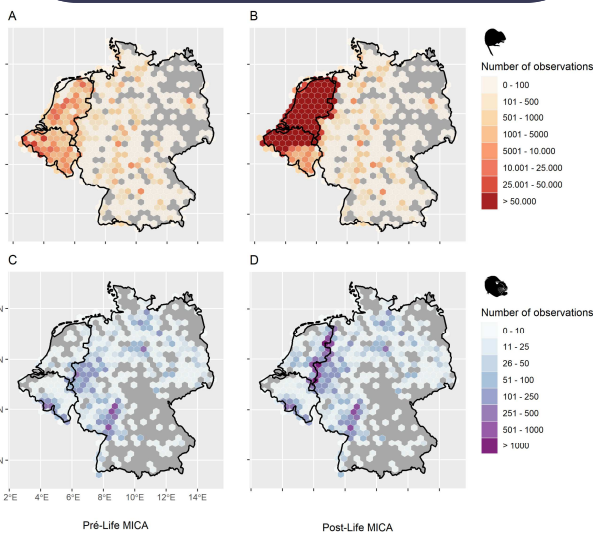
Overall, we published almost a million new observations of muskrat and coypu to GBIF, with observations ranging from 1987 up until the present day. Flemish data are updated weekly, providing the different management actors with a timely update on catches made by all actors in an area, not just themselves. Dutch data are updated every three months. Combined with the Flemish data, they support ongoing cross border management of muskrats and coypus.

Step 4: harvest data through API

Once published, the data can be harvested by the dashboard without any delay using APIs.

Step 5: create a dashboard for visualisation of the data

Using GBIF as its source, a dashboard (<https://mica.inbo.be/>) was developed to visualise muskrat and coypu observations and catches across borders. All available data sets that contain muskrat and/or coypu in Belgium, the Netherlands, and Germany were included. The dashboard allows users to filter for a specific species or dataset. Users can distinguish between catches and observations, filter for a specific MICA project area, a specific date range, and map data as either absolute number of animals or the number of animals per kilometre waterway. In addition, users can zoom in and click on specific observations. A unique link then provides access to the original observation in GBIF. This system automatically downloads new observations from GBIF on a nightly basis. The source code is available under the open-source MIT license, which puts very few restrictions on reuse: <https://github.com/inbo/mica-dashboard>



Records of muskrat (upper panels A, B) and coypu (lower panels C, D) for the period 1987–2023 in GBIF without (left panels A, C) and with (right panels B, D) inclusion of the LIFE MICA data in Belgium, Germany and the Netherlands.

