

# Digitization of the entomological collections of Naturalis Biodiversity Center

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## KEYWORDS

Central database, Natural History Collections, registration

**Naturalis Biodiversity Center received substantial funding in 2009 for the digitization of seven million of the estimated 37 million objects in its collection. Objects at Naturalis are digitized in production lines called digi-streets. The Entomology digi-street has been assigned to register 850,000 insects, one by one, until 1 July 2015. In addition to the Entomology digi-street, Naturalis initiated the '100,000 Drawer' project, which records the contents of each insect drawer, along with the location of that drawer.**

## Introduction

A growing number of Dutch heritage institutions have been digitizing their cultural-historical collections in recent years. This involves storing as much object data from the collections as possible in digital files, often accompanied by images. Digitization prevents our national heritage from deterioration, also making it easier for a wider audience to gain access to the information contained in the collections. Organizations such as the National Archives, the Netherlands Institute for Sound and Vision, the National Library of the Netherlands and the Rijksmuseum have all made great strides in this area. Naturalis has also been working hard for some time to build a digitized collection.

In 2009, the institute still to be established at that time, Naturalis Dutch Centre for Biodiversity (Naturalis Biodiversity Center), was granted funding from the Ministry of Education, Culture and Science (OCW), out of the Fund for Economic Structural Reform (FES). This fund manages excess funds generated by natural gas proceeds and, among other things, financing projects aimed at growth in the Dutch knowledge-based economy. A portion of the FES funding was allocated for the integration of the Amsterdam Zoological Museum (ZMA), the Herbariums of Wageningen and Leiden, and Naturalis into a single institute known as Naturalis Biodiversity Center. This integration has resulted in a unique collection containing an estimated 37 million objects (see Figure 1), placing Naturalis among the top five natural history collections in the world. Through the integration, the entomological collections of Wageningen, the Amsterdam Zoological Museum and Naturalis are now housed in the same building in Leiden. Another part of the funding will be allocated to the FES Collection Digitization (FCD) project. It has been agreed with the Ministry of Education, Culture and Science that a total of seven million relevant objects from the collection will be available in digital form by 30 June

2015. In addition, Naturalis is also investing in a permanent infrastructure for digitization so that it will also continue after completion of the project. In terms of the entomological collections, this project means that the data of approximately 850,000 insects will be recorded in digital form and that as many insect drawers as possible will be registered and inventoried.

## Digitization

The digitization process consists mainly of the digital registration of the data relating to the objects from the collections, including taking photographs of the objects, if necessary. These activities are performed in the so-called 'digi-streets', which are production lines within Naturalis where objects with a similar type of handling are digitized. By organizing the activities in the digi-street as one production process, Naturalis facilitates specialization and optimization in order to digitize large numbers of objects. In addition to the entomology digi-street, there are also others where alcohol jars, microscopic slides, wood samples, vertebrates and invertebrates dry preserved, and herbarium sheets are digitized. The museum's Live Science room houses the mollusks digi-street, where visitors of the museum can observe the work in a digi-street and find out what is involved in the process of digitizing objects item by item.

## What groups of insects are to be digitized?

Since 850,000 insects form only a small part of the estimated 17 million insects found at Naturalis, the sub-collections most significant to Naturalis will be digitized first. In order to be able to determine this significance as objectively as possible, all stakeholders compiled a wish list specifying the groups of insects to be digitized. A number of objective criteria were subsequently added to this list, including relevance to current research, after which a wide group of stakeholders voted on the list. This voting resulted in a ranking that was

submitted for decision to the project's Steering Committee. In addition to the groups of insects selected, an ample margin of around 20 percent was reserved for scheduling any unexpected additional priorities. Prioritization is subject to change and will be reviewed regularly in order to be able to consider new developments. The first sub-collection to be digitized is the bumblebee collection, which contains roughly 175,000 specimens. The groups of species currently being digitized are Dutch water beetles, Dutch butterflies, the Everts collection (beetles) and the type specimens.

### Entomology digi-street

A specific space was created within Naturalis premises on the Darwinweg in Leiden to accommodate the digitization work performed on the entomological collections (see Figure 2). The information to be digitized for each insect is available on labels that are attached to the pins used to secure the specimens, or in the drawer with the insects. There is enormous variety in the labels found at Naturalis (see Figure 3). The number of labels varies per insect; each collector has his/her own handwriting; handwriting varies per time period, and the written information is in different languages. Five days a week, a dedicated team of (temporary) employees, together with the curators and researchers, enters the basic information printed on the labels into a central database. The project team members are all seated at large lab tables with their own tools (i.e., tweezers, magnifier and a lamp), an insect drawer, a barcode reader and a computer. Each insect from the drawer is provided with a new label containing a unique number, by which the specimen will then be henceforth identified in the system. Data related to the specimen is subsequently added to this number. This data is recorded in an application, developed by the project team for temporary purposes, known as the Basic Registration Digitization (BRD). The number on the new label is also represented by a datamatrix code that can be read with a barcode scanner. A major difference with previous digitization projects within Naturalis is that the drawer in which the insect is located is now also registered. Each drawer has been given a label containing a unique number and barcode. If a specimen is moved later, the relocation can be tracked in the system by scanning the barcode of the insect and drawer.

Figure 4 shows part of the screen in which the team members register the data. Part of this data is required for managing the insects at the object level, while another part is important for research purposes. Registering *all* the data available for each object, for example, the information recorded in field books, is outside the project scope. The information available for each specimen is grouped into categories: General, Warehouse, Taxonomy, Location and Collector.

Once the data has been recorded for all the insects in a drawer, a photograph is made of the

drawer (see Figure 5), consisting of a large number of smaller photographs. The depth of field and detailing in the composite picture allow users to zoom in on the individual insects and be able to see a wealth of details. In many cases, it is also possible to scan the barcode from the screen in order to retrieve information relating to individual specimens.

### '100,000 Drawers' project

In addition to recording data for individual insects in the entomology digi-street, as many drawers as possible in the entomology collection will be registered in the so-called '100,000 Drawers' project. A mobile team has been set up for this purpose, equipped with trolleys, laptops and barcode scanners. Each drawer will be identified with a label containing a unique number, also displayed through a barcode. A separate module has been designed within the BRD for the purpose of recording each individual drawer's information. The record of the drawer can be retrieved by scanning the code with a barcode scanner. Next, the species present and their numbers are entered in the system, and the drawer's location is recorded. Approximately 65,000 drawers were processed using this method between October 2011 and July 2012. Upon completion of this project, Naturalis will have a single, central database that curators and researchers can consult for information about the entomological materials available at Naturalis and where they can be found.

### Basic Registration Digitization possibilities following digitization

The procedures for curators will change in a number of ways. They will no longer be able to simply transfer insects from one drawer to the next, but will have to track each change and relocation in the BRD. As a result, it will be possible in the future for a wide variety of users to check one system for the presence of a particular species at Naturalis, and to find out how many specimens there are and where they are located. In the example below (see also Figure 6), the search term *cryptarum* was entered. This name is listed in the BRD under 'Bumblebees' and under 'Hoverflies'. By selecting 'Bumblebees', the user discovers that there are ten drawers in Naturalis containing this species of bumblebee, distributed among the collections of the Amsterdam Zoological Museum and Wageningen and Leiden universities, with a total of 1,717 specimens. If the various bumblebee collections, for example, are combined in the future, the BRD will be a key tool in the planning, preparation and execution of the integration.

The BRD also includes several search screens designed to facilitate the management of the enormous insect collection and to be able to perform checks. This also includes a new feature to display taxonomy trees (see Figure 7). If a user wants to see what Athericidae genera and species Naturalis has in its collection, the results are shown at different levels (i.e., the user must keep clicking to access more information). The taxonomic

categorization is displayed on the left-hand side of the image; the list on the right shows the drawers containing *Atherix ibis* Fabricius. This also makes it easy to check whether the various taxonomic levels and their relationships have been accurately registered.

Once the 850,000 insects have been digitized, there will still be many remaining. The entomology digi-street will also continue to exist after the FCD project so that more groups can be digitized. The FES funding has ensured that the entomological collection will soon be easily accessible for management and research, with both internal and external users having access to a valuable tool for conducting large-scale biodiversity research.

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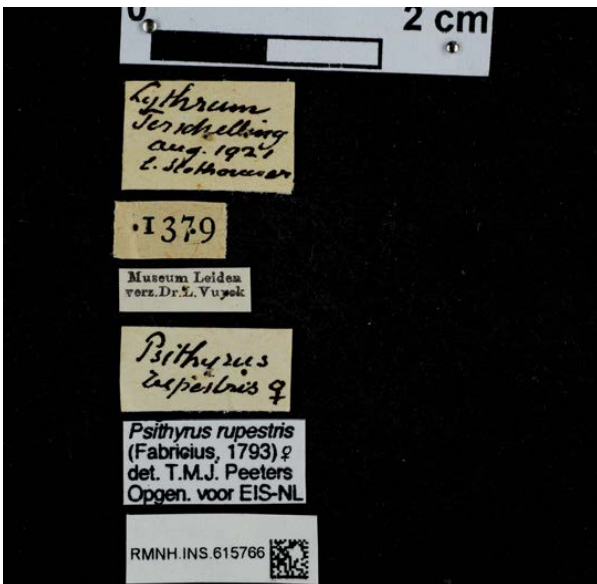
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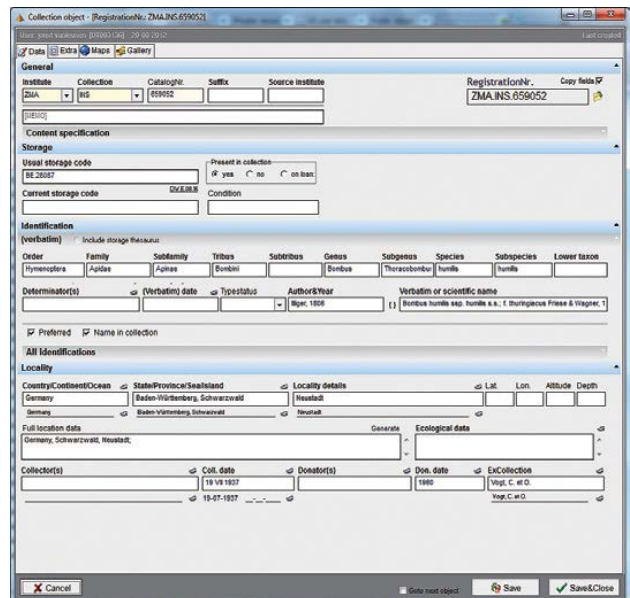
1. Naturalis' collection is one of the largest in the world.



2. Registrar at work in the Entomology digi-street, where the insect collection is being digitized.



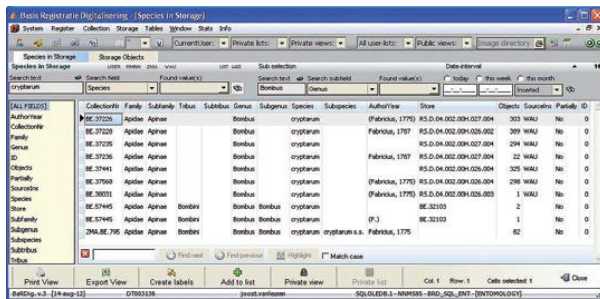
3. Variety of labels at a pin.



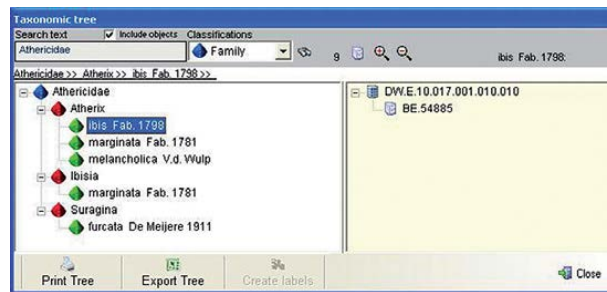
4. Screen for registering insect information.



5. For every collection drawer that is digitized, an image is created, like this one for bumblebees.



6. Search screen of the registration application of all digitized collection specimens. Here the database has been searched for the term 'cryptarum'.



7. Search screen showing the taxonomic relationships of a particular species.