

DISCO-NL



THE POWER OF NATURAL SCIENCE COLLECTIONS IN THE NETHERLANDS



50 MILLION
NATURAL SCIENCE
OBJECTS, AVAILABLE FOR
SCIENCE, POLICY, AND SOCIETY

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Colophon

DiSSCo-NL

Distributed System of Scientific Collections - The Netherlands

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Glossary

DiSSCo – Distributed System of Scientific Collections

DSI – Digital Sequence Information

ERIC – European Research Infrastructure Consortium

GBIF – Global Biodiversity Information Facility

NLBIF – Netherlands Biodiversity Information Facility

DiSSCo-NL

THE POWER OF NATURAL SCIENCE COLLECTIONS

For over 200 years, the Netherlands has cherished a wealth of natural science collections. Managing and preserving these collections is not only important for the protection of our cultural and scientific heritage, but also for our future.

EXCEPTIONAL VALUE

The unique collections, found at a multitude of natural history museums and research institutes in our country, represent an exceptional value—the power to contribute to the livability of our planet. To harness that potential, the collections must be accessible for scientific research, nature policy, and society. Without restrictions and in a user-friendly way. With this goal in mind, our national natural science collections are being brought together into a single common European research infrastructure: DiSSCo—more specifically, the Dutch consortium within this network: DiSSCo-NL.

ADDRESSING URGENT ISSUES

The available data can be used in all sorts of ways—from studying species in an ecosystem to the effects of climate change. Or to better understand the consequences of the current biodiversity crisis. Because digital data is freely accessible, countless other scientific disciplines can make use of it. Whether it concerns medicine, for example, or computer science. In doing so, DiSSCo opens doors to endless amounts of high-quality information for solving the pressing issues of our time.



"Digitising the collection unlocks all the information about an object, as if it were a physical specimen. Researchers can do all sorts of things with it, without the need to have the specimen in their hands. That is exactly the goal of DiSSCo. And the great thing is, such a digital collection is freely accessible to everyone."

~ Dimitris Koureas

Director DSI,
Naturalis Biodiversity Center



"Researchers gain access in a dynamic and interactive way to information that helps find solutions to one of the greatest challenges of our time: creating a future in which humans and nature are in harmony, while preserving natural resources."

~ Niels Raes

Programme manager
research infrastructures,
Naturalis Biodiversity Center

"The natural science collections of the Netherlands hold an extraordinary wealth of information for science and society. Through the DiSSCo-NL consortium, we are bringing these collections together digitally. A virtual reference collection that empowers researchers to generate new knowledge, accelerate innovation, and find solutions for society's most pressing challenges"



~ Eva Alonso

Node manager,
NLBIF & DiSSCo-NL

BIODIVERSITY under pressure

A wide variety of life forms is the basis of a healthy and resilient natural world. Without biodiversity, there can be no viable ecosystems or the things that go with them: clean air, safe drinking water, and sufficient food production. It is no coincidence that more than half of the global economy depends on these natural systems functioning well. But since the Industrial Revolution, biodiversity has been under pressure. Humans have put the world's natural environment in serious danger. Because of our actions, we are facing both a biodiversity and a climate crisis.

SEARCH FOR SOLUTIONS

Natural history collections play a vital role in the search for solutions to complex challenges surrounding climate change and biodiversity loss. They act as a time machine that allows us to look into the past, at the present, and towards the future. By accelerating the availability of natural science data, we can better map the increasing effects of climate change and biodiversity loss and address a growing number of questions.

ACCELERATING THROUGH INNOVATION

In recent decades, groundbreaking innovations have drastically changed research methods in the natural sciences. This has vastly increased the quantity, quality, and diversity of object information. Examples include the development of new methods for DNA sampling, high-quality 3D scans, and the integration of artificial intelligence. By making Dutch natural science collections accessible within a dynamic and interactive European research infrastructure, a wealth of information becomes available—faster to find than ever before and freely accessible to everyone. In this way, these collections contribute to the harmony between humans and nature, which is essential for a healthy future.



WHAT IS A NATURAL SCIENCE COLLECTION?

Natural science collections have a long history in the Netherlands. They initially began as private collections, assembled out of wonder at the richness of nature. Starting in the 18th century, collections began to emerge at the institutional level. They were established to chart the history of life on Earth: natural history.

The collections consist of both biological and geological material, such as plants, animals, DNA extracts, rocks, minerals, and fossils. Each object or specimen is accompanied by information about its name, where and when it was collected, by whom, and under what circumstances. These objects are maintained by natural history museums, botanical gardens, scientific institutions, and universities. Together, all these institutions form the Dutch natural science collections.

What is DiSSCo?

Distributed System of Scientific Collections, or DiSSCo for short, is a pan-European research infrastructure designed to digitise and interconnect all European natural science collections. The collaboration began in 2020 and includes more than 400 participants from 23 countries. DiSSCo offers a unique starting point for sharing, jointly managing, actualising, and enriching a wealth of data about the natural world around us across national borders.

RESPONSE TO SOCIETAL ISSUES

Global challenges, such as the loss of biodiversity and climate change, require a decisive approach. Natural science collections are invaluable in this regard. Every specimen contains valuable reference data applicable to a wide range of scientific disciplines that develop solutions to societal issues. That is why policy in the Netherlands—and throughout Europe—is responding to the urgent need to digitise and mobilise scientific collections for mutual exchange. DiSSCo is tangible proof of this.

DIGITISATION PACE

An increasing amount of data from natural science collections is being shared via global platforms such as GBIF. This platform plays a crucial role in collecting and publishing data on the distribution of species over time and space. This information has fundamentally changed biodiversity research and monitoring. Nevertheless, the current pace of digitisation is not fast enough. Furthermore, a large portion of the collection data remains fragmented and incomplete or inadequately linked to the full scientific context. This makes it impossible to adequately support international policy goals, such as the UN biodiversity targets for 2030 and 2050.

ONE DIGITAL EUROPEAN COLLECTION

To harness the full potential of these collections, data must be available so that both people and computers can work with it effortlessly. DiSSCo was created to address this challenge. Bringing together natural science collections into a single digital European collection—including all available information, experts, and digital tools to manage and enrich that information—creates enormous added value. DiSSCo also reduces the administrative workload of collection staff and allows for greater focus on digitisation efforts.

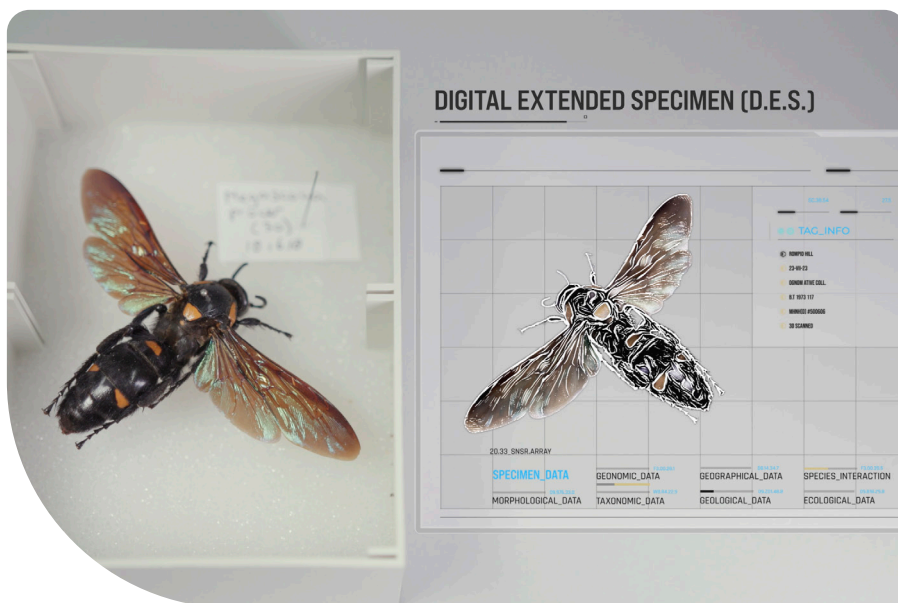
THE DIGITAL TWIN

DiSSCo works with digital specimens. These are digital twins created by digitising collections items. A digital twin is essentially a digital copy of the physical collection specimen. For example, a collection specialist might be holding a mounted butterfly while simultaneously viewing its digital twin on the screen. The image is essentially the “cover photo” for a wealth of data associated with this specific collection specimen. Data from various sources, originating from different locations, all referring to the same physical specimen. This brings together taxonomic, genetic, biochemical, and many other relevant pieces



of information in one place. Moreover, the information package is not static, unlike the information on a collection label. All data gathered through the digital specimen can be downloaded for research and

edited and supplemented online. A dynamic and interactive way to unlock information that is linked together.



DiSSCo CONVERTS STATIC AND ITEM-LEVEL DATA INTO SPECIMEN INFORMATION THAT EVOLVES WITH SCIENCE

THE ROLE OF DiSSCo-NL

Within the European DiSSCo consortium, the Dutch natural science collections affiliated with it form the DiSSCo-NL consortium. This research infrastructure makes the collections accessible and usable for all forms of research, innovation, and education both domestically and internationally.

OVER 50 MILLION SPECIMENS

The national heritage jointly managed by the consortium's members comprises a staggering number of specimens: over 50 million. The members share a common mission to digitise each of these specimens and provide them with the highest possible quality of collection data, including information about their provenance, relevance, and potential applications. Validated, high-quality, and freely accessible information, available to researchers, policymakers, and the public.

BENEFITS FOR SOCIETY AND POLICY SUPPORT

DiSSCo-NL aligns closely with national and European research agendas, including the Dutch Digital Heritage Network, the European Open Science Cloud, and the FAIR data principles

(findable, accessible, interoperable, and reusable). Collaboration with ministries, research funders, and infrastructure partners ensures that digitised natural science collections become an integral part of research, education, and policymaking.

The collections provide long-term data and support decision-making aimed at public welfare. They contribute directly to society by supporting information-driven policy development and a sustainable economy. And they strengthen healthcare by

enabling us to respond to future developments. By using our shared natural science heritage for these purposes and safeguarding it for the future, DiSSCo endorses the importance of long-term investments, sustainable infrastructure, and the inclusion of this heritage in national roadmaps and European Research Infrastructure Consortia (ERICs).

GOALS OF DiSSCo-NL

Contributing to a sustainable future

DiSSCo-NL ensures that Dutch natural science collections are accessible to scientists, policymakers, and society.

Making information from Dutch natural science collections accessible

DiSSCo-NL coordinates and provides the expertise and tools to make Dutch natural science collections accessible.

Improving the quality of biodiversity data

DiSSCo-NL provides data accompanied by clear information on origin, relevance, and potential applications.

DiSSCo ensures that access to European natural science collections is supported and improved. This is achieved by developing various digital services necessary for collection managers and researchers to do their work effectively.



What does DiSSCo do?

In this way, we create a unique gateway for editing, supplementing, organizing, and using collection data for research purposes. The possible barriers to digitisation are reduced as far as possible, so that even institutions with smaller collections can participate. With simplicity and affordability as top priorities, as many collections as possible can be made digitally accessible.

WORKING MORE EFFICIENTLY

Through DiSSCo, collection staff become part of a European and global natural sciences community. Loaning out collections and checking and supplementing each other's collection data all takes place through a single system. Administrative work is taken off their hands, giving collection staff more time to respond to changing user needs and new scientific applications of collections.

As a result of these improvements, researchers can also work more efficiently. This accelerates natural science research, which is necessary to better address current societal challenges. Moreover, this approach reduces the ecological footprint of the research, as the collection and the researchers themselves need to travel less between institutions.

EXAMPLES OF DiSSCo SERVICES

- DiSSCover - Annotation and Curation System**
 One of DiSSCo's most notable services is DiSSCover. This is a unified system for the curation and annotation of digital specimens (digital twins). With this groundbreaking application, collection staff, researchers, and citizen scientists can use their specific expertise to log in wherever they are, contribute to the digital collection, and improve the information it contains.
- ELViS - European Loans and Visits System**
 ELViS serves as a central portal for European natural science collections. In this application, collection staff and researchers can request visits, loans, and virtual access. This ensures that requests are directed immediately to the appropriate staff member and can be processed quickly, without time-consuming email correspondence. In addition, ELViS enables digitisation "on demand". This means that users can submit requests and suggestions for the digitisation of collection items. This allows institutions to carry out their digitisation work in a targeted manner, thereby directly contributing to ongoing research and addressing urgent issues.

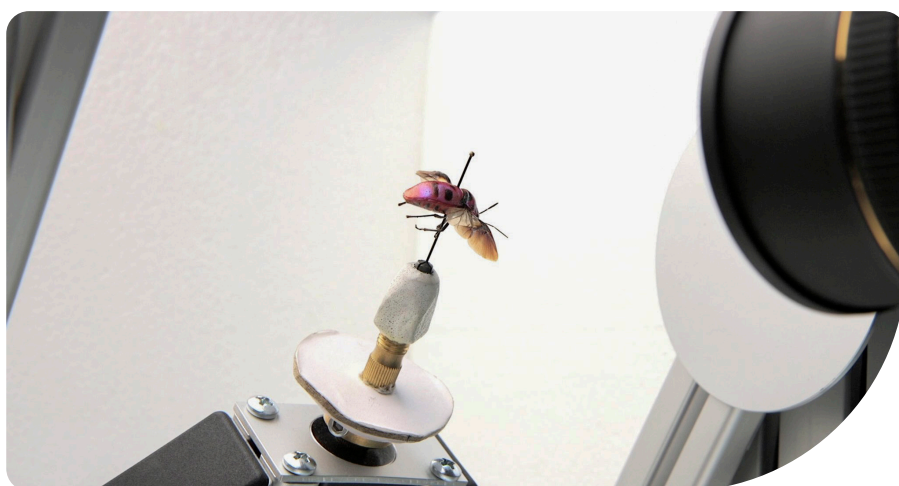
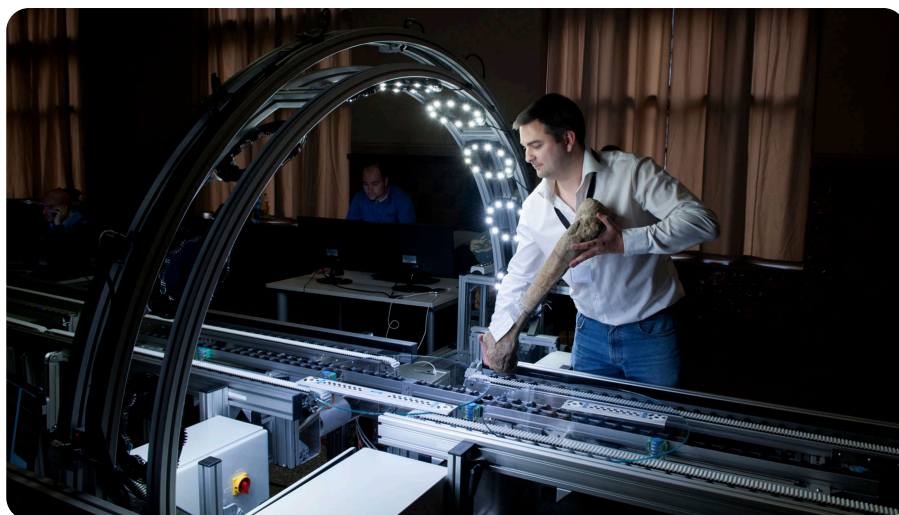


WHAT IS DIGITISATION?

It's clear: everything in DiSSCo revolves around digitised collections, including their management and use. But what exactly is digitisation? And what is the value of online discoverability?

Simply put, digitisation is the conversion of physical information into digital information. This can be done by scanning or photographing a collection item, or simply by entering label data into a database. The extensive datasets resulting from this are of great importance for supporting scientific research.

Digitisation yields different types of data for different purposes. All digitised specimens have a unique identifier that links the physical specimen to the digital record. This basic digital record is expanded with data such as the scientific name, geographic location, date, and various images of the specimen and the labels. Scientific publications, DNA sequences, chemical analyses, field notes, and other collection details are also added. In other words, a single central entry point for a wealth of information and users.



There is great enthusiasm and willingness to digitise Dutch natural science collections. However, most organisations

have insufficient resources for a structured approach or for making the data optimally accessible. That is why it is crucial to collaborate at the national level and to make all the national collections accessible together.

DIGITISATION PAYS OFF

Why are all these efforts necessary? Because digitisation pays off. Digitised collections have a much wider reach and are much easier and faster to search. This saves a tremendous amount of time in scientific research, collaboration, and innovation. And time is money.

BENEFIT	IMPACT
Global access	Researchers have direct access to collections, without travel or time consuming digital communication.
Faster research	Data can be found, searched, used, and linked more quickly.
Engine of innovation	Easily and quickly searchable collections drive breakthroughs in medicine, agriculture, and climate science.
Education and outreach	Greater reach and improved accessibility expand opportunities for citizen scientists, schools, and museums to use natural science collections for research and education.

“DiSSCo OPENS COLLECTIONS and makes them available to everyone”

Sam Leeflang is lead developer on the DiSSCo development team at Naturalis. Together with colleagues, he is developing a platform for collection data, usable by experts and citizen scientists who can improve and enrich this information. In an interview, Leeflang illustrates the importance of this platform.

RELIEVING THE BURDEN ON COLLECTION MANAGERS

Making European collection information available digitally relieves the burden on the institutions involved, says Leeflang. “To keep up with all the developments in AI, we need to build a platform with new tools for collection management. Authorized users can log in to the platform and indicate that certain information about a collection item is incorrect or incomplete. They can then supplement that information themselves, rather than having to send an email to the relevant colleague at another institution. That’s much more efficient.”

BREAKING DOWN INSTITUTIONAL BARRIERS

There are already many tools for improving data, but these often only work within the boundaries of a single institution.

The development team wants to break through this unwanted limitation, Leeflang explains. “If someone develops a specific algorithm that is also valuable to others, we can integrate it as a tool on our platform with just a few minor adjustments. Then every user can work with it.”

LINKING DNA BARCODES TO TYPE SPECIMENS

As an example of where information exchange regularly goes wrong, Leeflang cites DNA barcode databases. In the world of natural science collections, there are many such databases. There is just one problem, though. It’s not always clear which collection item the DNA in question was taken from. “We solve this by bringing all the information together,” says Leeflang. “The DNA barcode, the literature in which the collection item is mentioned, and the description of the type

specimen. This way, the DNA barcodes remain traceable and the research in which they are used is reproducible, as it should be in science.”

CONTRIBUTING TO DEEPER RESEARCH QUESTIONS

Despite all the digitisation, Leeflang believes that the knowledge and experience of collection managers are invaluable to the success of DiSSCo. “We need to deploy existing expertise in a targeted manner. By automating simple tasks, experts can focus on the cases where their knowledge is most urgently needed. Citizen scientists also possess a great deal of expertise and specific knowledge. Just like researchers and collection managers, they can search and annotate the digital collections. In doing so, DiSSCo opens up the collections and makes them available to everyone.” Finally, Leeflang expects that by making data accessible at this new level, deeper research questions can be asked. “Research questions that, for example, contribute to solving the biodiversity crisis. But the first step is and remains digitisation.”



*“By digitising intensively,
we provide insight into
our collections and
increase the accessibility
of our collections for
research, management,
and the public.”*

*~ **Daphne Niehoff**,
Head of collections*

*“Animals like the mammoth,
that are now extinct, seem
like mythical creatures.
They provide a platform
to discuss a highly topical
issue: the loss of biodiversity.
And our role in that as
humans.”*

*~ **Jimmy de Rooij**,
Curator GeoPaleo*

De Bastei

Treasury of natural and cultural historical heritage

With more than 100,000 objects, the collection of Museum De Bastei (Nijmegen) has grown into a treasure trove of natural and cultural-historical heritage. The museum collections tell the story of the Waal River, the rich history of Nijmegen, and the natural history of the region. Each object contributes to a better understanding of this connection between people, nature, and the landscape.

Although a large part of the collection originates from Nijmegen and the surrounding area, its significance extends far beyond regional borders. The collection offers valuable insights into the development of Dutch biodiversity over time and thus serves as an important reference for scientific research, nature

conservation, and education at the national level.

Approximately 70 percent of the collection has now been digitised: a solid foundation for further access and development of knowledge. Work is currently being done on photographing and digitising no fewer than

40,000 insects. Thanks to the digital recording and access to the collection, scientists gain access to this valuable data on species and their distribution. This aids research into changes in biodiversity, climate change, and the conservation of endangered species.

Collection in the spotlight

Woolly mammoth the 'Bergharen skull'

Scientific name:

Mammuthus primigenius

Age:

38,900 years

Registration number:

NMN_1994_25

In the early 1990s, divers made a spectacular discovery at the bottom of the Groene Heuvels recreational lake near Bergharen: an almost complete mammoth skull. The fossil belongs to an adult male woolly mammoth, between 45 and 50 years old. This Ice Age giant has since become a symbol of the richness of the regional collection at Museum De Bastei. The skull is a remarkable object as it is one of the five most complete skulls found in the Netherlands to date. The Bergharen mammoth skull is

not only an eye-catcher within the museum's natural history collection but also a tangible reminder of the Pleistocene fauna that once lived in our river region. "Together with thousands of other objects from our collection, the mammoth tells the story of a landscape in motion," says Head of Collections Daphne Niehoff. "By digitising these collections, we are making this story accessible to new generations, from researchers to nature enthusiasts."

"We receive many donations of private collections, from a generation of enthusiasts that is now dying out. How many of those unknown finds are still waiting to be discovered? And how do we preserve them for science?"

~ Jos Lankamp,
Volunteer, Geology
Department



De Museumfabriek

The family museum of Twente

De Museumfabriek (Enschede) is not a natural history or art museum, but a combination of all kinds of museums. It houses a large natural history collection, originating from the former Natuurmuseum Enschede. The Muschelkalk Winterswijk collection is an important sub-collection for scientific research, containing several type specimens.

The Museumfabriek team is working hard on the collection. In a special lab, staff carefully extract fossils from the surrounding rock, making them available for exhibitions and scientific research. Butterflies and beetles from sometimes old collections are studied in detail to determine the species and subspecies. By transcribing the small labels, this

data is entered into the collection database.

The Muschelkalk Winterswijk collection contains approximately 5,000 fossils, ranging from complete skeletons, skeletal parts, and individual bones to footprints. Some species are entirely unique and known exclusively from Winterswijk. The collection has

been partially digitised and is proactively made available for scientific research. This has resulted in various publications, and descriptions of new species. The digitisation process is still in full swing.

Collection in the spotlight

Partial skeleton of an anarosaurus

Scientific name:

Anarosaurus heterodontis

Age:

244 million years

Registration number:

DMF.480000622

The quarry in Winterswijk is one of the most important sites for Early Triassic fossils. This period, which follows the largest mass extinction event in history, demonstrates how nature can recover. About 244 million years ago, many new species of reptiles evolved here, most of which quickly went extinct again. Studying the fossils of these animals provides insight into the consequences of a mass extinction, such as the one currently being caused by mankind.

A good example is the fossil of an anarosaurus, found in the 1980s by a collector. "This lady never worked on the fossil herself," says Jos Lankamp, a volunteer in the Geology Department. He works with passion at preparing the extinct reptile. "She donated it to the museum for further study." By cataloguing the fossil and eventually making it digitally accessible, it becomes widely available for scientific research decades after it was excavated.

"There is still the most to discover about the small creatures. You don't see their unique characteristics in the field, but you do in museum collections."

~ **Arno van Berge**

Henegouwen,

Volunteer (formerly Principal curator Biology)



Museon-Omniversum

A global collection as a compass for a liveable Earth

Museon-Omniversum (The Hague) has a collection of over 316,000 objects in the fields of nature, culture, and technology. The focus is on major global themes such as biodiversity, globalisation, energy, climate, food security, and a sustainable living environment. Despite this global character, the collection has a strong connection to the city of The Hague.

The natural history collection of Museon-Omniversum connects science with current affairs. The collection includes a wide variety of taxidermied animals, replicas, and models; scientifically valuable European fossil collections; entomological type specimens from, for example, the Netherlands and Indonesia; and local biodiversity such as vascular plants from The Hague. With a focus on

species adapting to changing conditions, the collection bridges the gap between humans and nature, and between the past, the present, and the future.

Object information is recorded in the TMS collection registration system. Objects are photographed where possible, and access to these images is provided via the museum's own collection website

and partly via GBIF. Significant progress still needs to be made in this area, particularly in the botany and insect collections. In 2026, the registration of type specimens of diving beetles and water bugs will begin. This will make these collections discoverable via GBIF and DiSSCo, maximizing their impact on international research.

Collection in the spotlight

Type specimen of a water beetle

Scientific name: *Hydrochus megaphallus*

Location:
floodplain of the Waal River near Neerijnen, Gelderland, Netherlands

Collection date:
September 19, 1987

In the late 1980s, Arno van Berge Henegouwen—then principal curator Biology, now a volunteer at Museon-Omniversum—noticed a previously unknown species of water beetle in museum collections. Among the drawers full of beetles of the species *Hydrochus brevis*, he discovered unusual specimens. “In those specimens, the male genitalia—the phallus—protruded, whereas in the others it did not,” he explains. “When I took a closer look, there turned out to be two species. Based on other characteristics as well.”

Van Berge Henegouwen published this new species in 1988 under the apt name *Hydrochus megaphallus*. A playful press release generated a lot of media attention. The type specimens are preserved in the collections of Museon-Omniversum and Naturalis Biodiversity Center. After publication, the species turned out not to be rare, with a wide distribution ranging from Ireland to well beyond the Ural Mountains in Russia. Partly based on Van Berge Henegouwen's discovery, the beetle genus *Hydrochus* is now being revised.



"We have so many wonderful things here that people don't know about yet. I think it's wonderful to showcase that collection and make it available to science!"

~ **Hannco Bakker,**
Senior collection manager

Naturalis Biodiversity Center

The national research institute for biodiversity

Naturalis Biodiversity Center (Leiden) aims to understand and conserve biodiversity and connect it with society. Part of this mission is the management and preservation of all natural history objects that have been described and included in the national collection over the past centuries. The Naturalis collection now contains more than 43 million objects, of which an estimated 180,000 are type specimens.

Since 2010, Naturalis has been systematically digitising its collection and has now digitised more than 10 million specimens and nearly half a million species records, making them freely accessible via GBIF. This data forms the basis for thousands of scientific publications.

The type specimens hold a special place within the collection: they are the 'gold standard' for taxonomic research. The type specimen is the specimen on the basis of which a new scientific name was published and thus serves as the eternal and international reference point. Naturalis therefore strives to make

all information about these crucial specimens fully available; a substantial challenge.

Collection in the spotlight

Barnacles and duck mussels on a piece of skin from a humpback whale

Scientific names:

Coronula diadema,
Conchoderma auritum and
Megaptera novaeangliae

Barnacles of the genus *Coronula* attach themselves to the skin of baleen whales such as the humpback. This is how they travel around the world. In natural history collections, barnacles are often preserved in alcohol. Along with the piece of whale skin, without identifying the specific whale. By digitizing the collection and making it accessible via DiSSCo, experts can identify and record such symbiotic relationships. According to senior collection manager Hannco Bakker, this helps scientists search a specific collection. "You don't just pop a whale into a jar of alcohol. So for whale skin, you actually have to look in other collections."

According to Bakker, the Naturalis collection contains 24 such alcohol jars with barnacles on whale skin. "They form a time series from 1824 to 1956." A highly valuable collection that scientists at Wageningen Marine Research use in their research into industrial chemicals such as DDT, PCBs, and PFAS. These substances were first produced between 1930 and 1950. Today, there is hardly an animal left without these contaminants in its body. Samples from the pieces of whale skin provide a unique insight into the speed and extent of human impacts on the global environment.

"The best part of my profession is that I can observe all kinds of creatures up close. All that beauty, those colours and shapes ... Nature is fantastic!"

*~ **Nadine Müller,**
Coordinator Collection
and Science*



Natuurmuseum Brabant

We let people discover the beauty of nature

Discover nature at the Natuurmuseum Brabant (Tilburg). The largest natural history museum in the southern Netherlands aims to inspire and move every single visitor, so that they cherish and protect nature. The museum boasts a diverse collection of some 700,000 objects, including birds and mammals, plants, mosses, and fossils.

The collection of Natuurmuseum Brabant (Natural History Museum Brabant) consists of a large number of objects. About 30 percent of these have been digitally catalogued. Photographing the specimens is a very time-consuming but essential part of the collection registration process. The goal is to create

digital images of all the specimens that can be shared safely and responsibly with researchers, institutions, and the public.

Among the special collections are the arthropods, featuring a unique and extensive series of insects from the nature reserve and research area “De Kaaistoep,” southwest

of Tilburg. Fossils are also found in the collection, including the skull of the holotype of an extinct baleen whale (*Balaenella brachyrhynus*). The bird collection includes a mounted specimen of the monkey-eating eagle (*Pithecophaga jefferyi*), one of the largest birds of prey in the world.

◀ Collection in the spotlight

Subcollection of approximately 253,000 European butterflies (Cox collection)

The donation from Anton Cox is a special part of the Natuurmuseum Brabant's butterfly collection. As a passionate biology enthusiast, he built up a unique collection

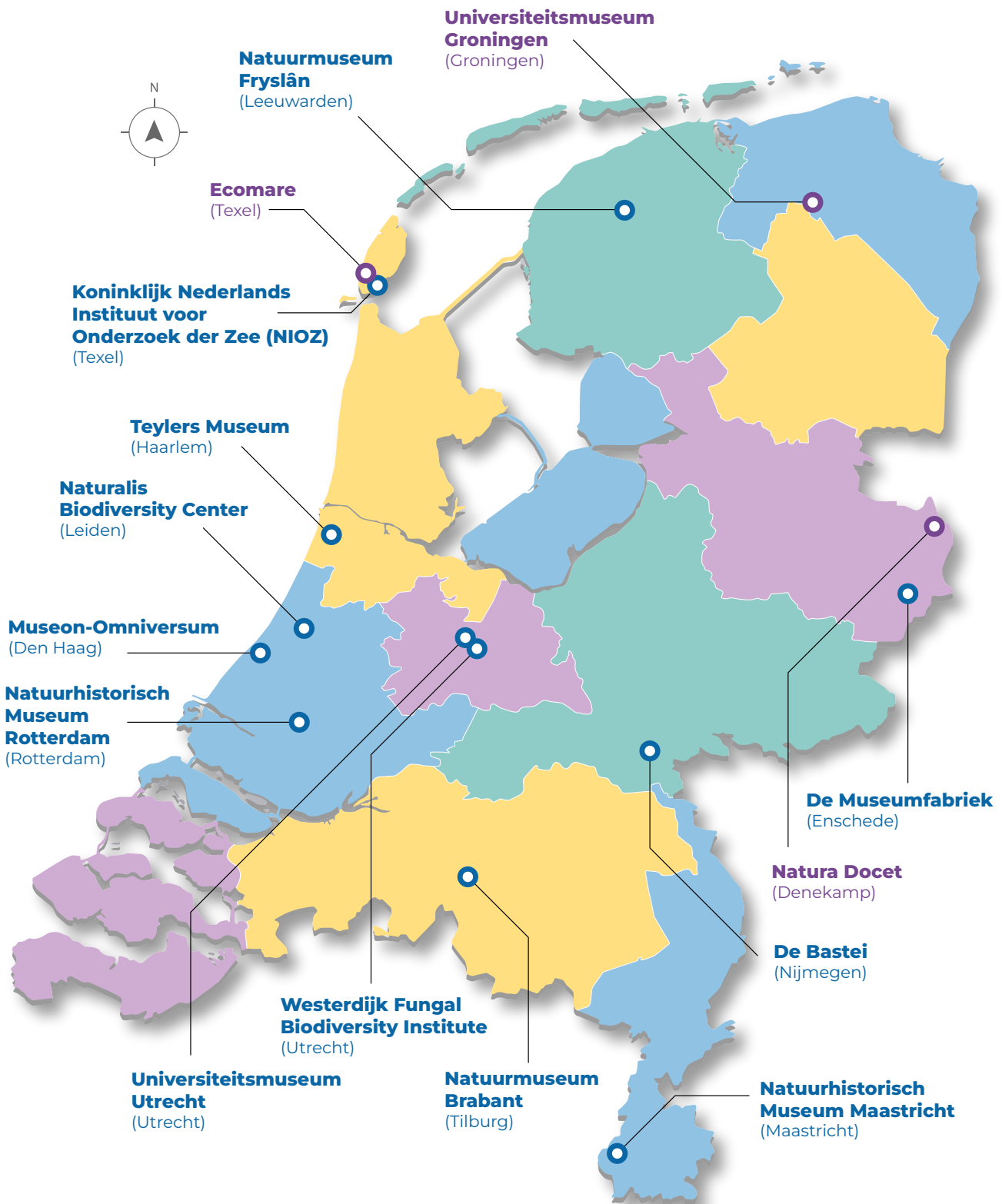
between 1960 and 2016 consisting mainly of European butterflies (Lepidoptera). Cox discovered 12 new butterfly species, including *Coleophora coxi*, which is named after him. Due to its size, geographic coverage, and long collection period, this butterfly collection is a valuable resource for taxonomic and genetic research, as well as for studies of phenology (periodic events in life cycles).

The butterflies form a unique time series for research into changes in biodiversity, distribution patterns, and population trends spanning more than half a century. This

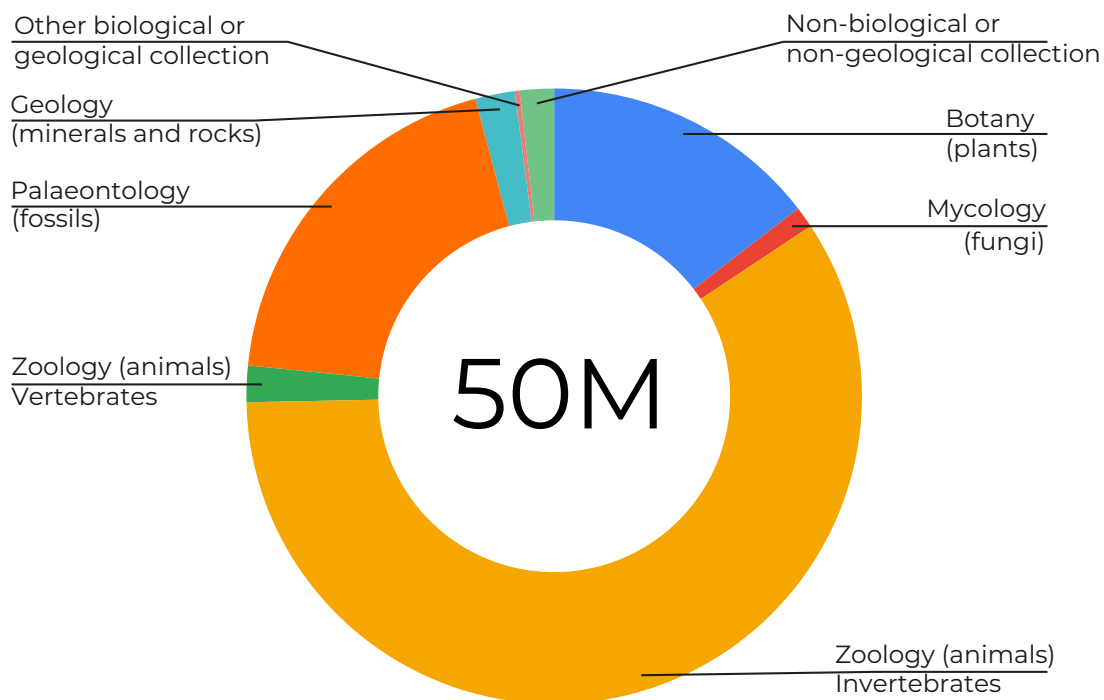
data is crucial, for example, for mapping the consequences of climate change. An important reference for biodiversity research, now and in the future. “The butterflies that Cox initially found at a single location only, have now been found further north as well and have been added to the collection,” explains Coordinator Collection and Science Nadine Müller. “Digitising the collection allows you to discover connections and patterns that you wouldn't otherwise see. But for that to happen, all the data must be entered very neatly and precisely.”

Natural science collections in the Netherlands

The current DiSSCo-NL consortium has **12 participating members** and **3 associate members**. Together, they manage more than **50 million objects**: the natural science heritage of the Netherlands.



National Natural Science Collection Overview



The value of regional collections

All Dutch natural science museums and institutions have their own identity. Because they are well distributed throughout the country and their collections often focus on the surrounding natural environment, they are regional specialists of particular value. Just like the national research institute Naturalis, regional museums and collections are affiliated with universities and research institutes. These institutions

manage unique collections and are often involved in scientific research. Through their various activities, they reach more than one million visitors per year.

Dutch natural science collections are well-managed, organised, and generally well-documented. Because the institutions have been collaborating for a long time, they are ideally suited to make a strong contribution to DiSSCo-NL. The strength

of regional collections lies in the unique specimens and subcollections with a specific focus on a single area or taxonomic group. Thanks to their compact size, these collections are accessible and easier for hobbyists to search. They form a source of personal connections from which unique citizen science networks emerge: a starting point for new discoveries and better-documented collection data.

The natural science collections of the Netherlands are more vibrant than ever before. New discoveries are made in them every day, and they deepen our understanding of life on Earth, the functioning of ecosystems, and how these have evolved over time. The multitude of objects collected over the past 250 years contains a wealth of data and serves as a source of answers to contemporary issues such as climate change, health, food supply, and the biodiversity crisis.

In conversation with four scientists—experts in diverse research fields—we explore how this works and how digitizing collections helps accelerate their work and amplify its impact.



SOURCE OF A

Kasper Hendriks Postdoctoral researcher, Naturalis Biodiversity Center

“As a researcher at Naturalis Biodiversity Center, I study the evolution of crucifers, a flavourful plant family that includes mustard, cabbage, garden cress, and rocket. Within this family, many species have evolved from herbaceous plants to species with woody stems. In our research group, we believe this is an adaptation to drought, and we’d like to better understand this. That knowledge could be crucial now that extreme drought is occurring more often.

I have created an evolutionary family tree for this plant family. This allows others to search specifically for wild plant species that are resistant to a pathogen or more drought-tolerant. Such traits can be introduced into agricultural crops through crossbreeding to strengthen them.

In recent years, I have collected DNA samples from more than 75 collections worldwide. Through GBIF, I can efficiently find data on collection locations and identifications. A high-resolution photo is also very useful for verifying the identification, if available. And information about a DNA extract prevents you from

resampling a collection specimen. But this information is still hard to find. Better linking of databases enables more comprehensive research, saves time and money, and helps us find solutions faster to major challenges such as food shortages.”



Renske Onstein

Group leader, Biodiversity Hotspots, Naturalis Biodiversity Center

“The term ‘hotspots’ in our research group’s name refers to areas with many unique and endangered species. These are places on Earth that are indispensable for our food supply and for regulating the global climate. We investigate how the enormous diversity in these areas came about and how we can protect it.

Natural history collections give us a glimpse into ecosystems that are no longer intact. They help us discover species and determine the role that plants and animals play in the ecosystem. Because the collections are hundreds of years old, we can study changes in biodiversity over time. To do this, we need to be able to measure the shape and size of collected specimens, for example, but also determine the context through a description of the habitat and collection site. The collections

also serve as a DNA database for evolutionary research, helping us explain how hotspots became so diverse.

It is inevitable that we will lose biodiversity, and with it, unique ecosystems. That is why it is extremely important to study these ecosystems while they still exist in this form. To do this efficiently, collection data must be standardized and openly shared. At Naturalis, we’re already well on our way.”

ANSWERS

Chris Hecker & Arjan Dijkstra

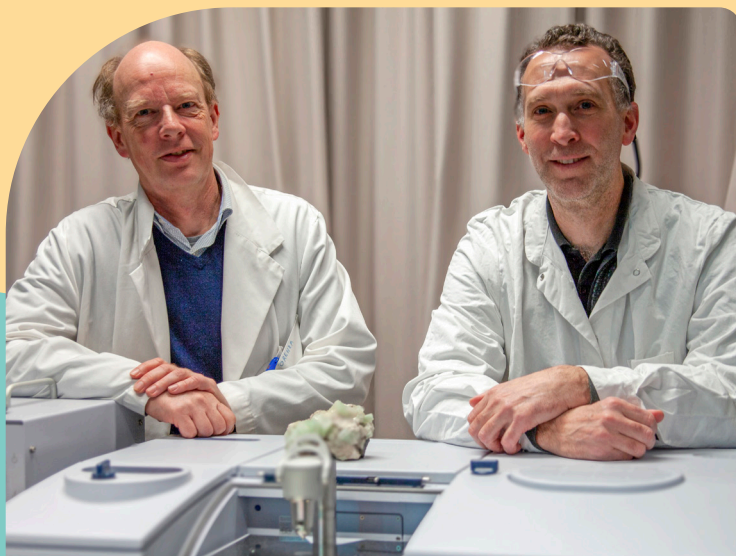
Associate professor Geological Remote Sensing & Assistant professor Earth Materials, University of Twente

“In the Department of Applied Earth Sciences at the University of Twente, we research raw materials for the energy transition and geothermal energy. We are funded through development partnerships and are tasked with training many students from outside Europe.

In Kenya and Indonesia, we study high-temperature geothermal systems from which steam can provide sustainable electricity. By identifying the gravel-sized fragments of mineral that come up during drilling—with the naked eye, hand lens, or microscope—you can determine whether the drilling is close to the depth where the temperature is right for production. But these minerals can be identified much more accurately by analysing how they absorb or reflect infrared light.

For geothermal companies, this reduces risks, costs, and environmental damage.

To train this method, we borrowed zeolites from the collection of Naturalis Biodiversity Center, including the rare wairakite; an indicator of high temperature. If you find wairakite, you’re “in business” and can start producing there. Good photos and contextual data are crucial, but currently take a lot of time. A database containing X-ray diffraction data and infrared spectra—the “gold standard” for crystal structures—and insight into available samples for (slightly) destructive analysis would accelerate renewable energy projects worldwide and strengthen local expertise.”



SOCIETAL importance

Gain access to digitised bee data across Europe to help track the decline of these pollinators, with just a few clicks of your mouse. Or formulate policies that provide new grants for modelling large-scale ecological changes. Search through regional Dutch collections alongside those from other European countries to map the spread of a new species from the south over the next hundred years, or compare current trends in a species' decline with its historical range.

These are a few of the many visions for the future, built on the ambitions of DiSSCo. A future in which natural science collections are no longer locked away in inaccessible, dark cabinets. But are living, accessible knowledge systems that drive discoveries and innovation. Searchable from anywhere, to find answers to the urgent questions of our time.

"We must be wary of the shifting baseline syndrome—forgetting just how rich nature used to be. Consequently, we are slower to notice what is disappearing, even though biodiversity is indispensable for clean water, healthy soil, and crop pollination. Natural science collections allow us to trace how many species of plants and animals used to live in the Netherlands. Armed with this knowledge, we can make better policy choices and strengthen nature for the future."

~ Paul van der Eerden
Programme Manager Base
Quality Nature at the Ministry
of Agriculture, Fisheries, Food
Security, and Nature



"We are very excited about the integration of Dutch natural science collections into a single digital collection. Biodiversity-related analyses are extremely complex, and the data quality often still lacks detail. Therefore ASN Bank will always promote the introduction of new, interesting data that can potentially help us better analyse the negative impacts and positive contributions of our investments on nature. We are very curious to see what DiSSCo has to offer us in the future."

~ Bas Smeets
Nature Lead
at ASN Bank





Ecomare is a nature museum and seal rescue centre on Texel, with the nature of the Wadden

Ecomare

Sea and the North Sea as its central theme. The natural history collection focuses on the island, the surrounding marine life, and geological finds, featuring a large bone collection consisting of hundreds of whale bones and approximately 850 remains of Pleistocene land mammals. Highlights are on display in the museum, including the 23-meter-long skeleton of a fin whale—the

largest natural history object on display in the Netherlands.

The collection is housed in a future-proof central repository of the governing body, the Texels Museum Foundation, completed in 2025. The digital cataloguing of all objects is still in full swing and progressing steadily.



Natura Docet (Denekamp, Overijssel) is the oldest regional natural history museum in the Netherlands. The museum

Natura Docet

garden can be experienced as a 'snapshot' of the landscape of Twente. The biological collection includes mollusks, specimens preserved in alcohol, and mounted birds and mammals. Exceptional specimens are displayed in cabinets of curiosities to reflect current biodiversity. The exhibit Buitengewone Beesten (Extraordinary Animals) displays unusual animals, including calves with two or even three heads.

With objects from the paleontological collection, Natura Docet offers a window into the biodiversity of prehistoric times.

The geological collection contains crystalline erratic boulders and erratic boulder-fossils, originating from the Northern Netherlands, Scandinavia, and Central Europe. However, objects from this geological collection are not on display.



Universiteitsmuseum Groningen (University Museum Groningen) has a diverse collection that provides insight into the

Universiteitsmuseum Groningen

development of the natural sciences in the Netherlands. The 100,000 objects reflect the close connection between nature, culture, and science. In addition to the collection of the University of Groningen, the collections of the defunct Ethnographic Museum Gerardus van der Leeuw and Natural History Museum Groningen are also housed here. An extensive collection of medical objects and instruments includes the medical heritage of the UMCG (University Medical Center

Groningen), which accounts for about a quarter of the total collection.

In preparation for barcoding the collection, the museum is working on a comprehensive inventory check. Barcoding enables future relocations and provides real-time insight into locations and access: the foundation for making the collection fully searchable and more accessible to the public and researchers.

“The slender-billed curlew is extinct because humans have chosen to alter the landscape”

~ **Dennis Voeten**,
Curator



Natuurmuseum Fryslân

Nature's memory of the Northern Netherlands



Natuurmuseum Fryslân (Leeuwarden) manages a natural history collection that reflects the natural diversity of the Northern Netherlands. The collection of nearly 400,000 objects has been assembled over more than 100 years through donations, acquisitions, and the museum's own additions, and is continuously enriched with reference material acquired regionally.

The rich collections of Natuurmuseum Fryslân (Frisian Museum of Natural History) form a constantly growing record of the natural history of the Northern Netherlands in general and that of Fryslân in particular. They document more than a century of changes in landscape, biodiversity, and human influence. The well-documented reference collection is representative of local

natural diversity and is used for scientific research, education, and exhibitions.

The collection houses thousands of bird and mammal skins and subcollections including, for example, butterflies, herbaria, and erratic boulders. Due to the Northern Dutch tradition of collecting shells, the museum has an extensive reference

collection of species from around the world. The collection also features objects documenting the relationship between people and nature through time, such as Frisian decoy birds and mouse traps. Natuurmuseum Fryslân has been digitising its museum records since the 1990s and aims to make important subcollections accessible online within a few years.

Collection in the spotlight

Mounted Slender-billed Curlew

Scientific name:

Numenius tenuirostris

Registration number:

1980-20916/R

The slender-billed curlew was once a rare migrant along the Dutch coasts, including those of Fryslân.

Vast salt marshes, mudflats, and brackish water marshes served as important stopover sites for migratory birds. This bird species is now extinct. "This Frisian museum specimen is therefore not only a unique biological archive item, but also a tangible reminder of nature's fragility," says Dennis Voeten, curator at Natuurmuseum Fryslân.

The disappearance and fragmentation of coastal and marshland areas throughout Europe played a major role in the decline of the slender-billed curlew. In the Netherlands, this process was accelerated by

interventions such as the closure of the Zuiderzee and large-scale dyking and drainage. Habitats on which this and other migratory birds depend were lost. "Digitising and providing access to collection specimens like this mounted slender-billed curlew is essential for nature research," says Voeten. "Not only to preserve our natural heritage for future generations of researchers, but also to learn from the past so that the extinction of more species can be prevented."

"Mosasaurs were the first animals in the world to be officially declared extinct. People simply couldn't imagine that such an animal still existed."

*~ **Dylan Bastiaans**,
Senior collection manager*



Natuurhistorisch Museum Maastricht

Museum of the past and present
nature of Limburg

Limburg is a unique part of the Netherlands. It is home to species that cannot be found anywhere else in the country. The fossils from the Cretaceous rock have permanently changed our view of the world. The collections of Natuurhistorisch Museum Maastricht comprise over 75,000 highly diverse species, ranging from mosasaur bones to flowering plants in the museum garden. And the museum manages over 1,000 type specimens.

Natuurhistorisch Museum Maastricht (Natural History Museum of Maastricht) builds on hundreds of years of local history and the work of local collectors. From books about the siege of Maastricht in 1794 to the life's work of a local pharmacist who discovered fossils that were new to the Netherlands. The museum manages more than half a million

objects from the Netherlands and, in part, from Belgium. These collections focus on palaeontology, geology, and the region's flora and fauna.

The museum still collaborates extensively with citizen scientists. They are often co-authors of scientific articles and occasionally even have species named after

them. The most impactful discoveries are often made by these hobbyists. They are the experts on certain plants and animal groups. Thanks to the digitisation methods the museum employs, the barrier to the collection is further lowered for anyone interested in collecting and research.

Collection in the spotlight

Fossil skeleton of the mosasaur "Bèr"

Scientific name:

Prognathodon saturator

Location:

ENCI quarry, Sint-Pietersberg, south of Maastricht

Collection date:

1998

Registration number:

NHMM 1998141

Mosasaurians have played an important role in the development of palaeontology as a science. The original discoveries in the second half of the 18th century, in the vicinity of Maastricht, contributed to the widespread acceptance of the concept of extinction. Since then, they have remained fascinating, both to scientists and to the general public.

One of the most impressive species in the world was *Prognathodon saturator* from Limburg. The skull and partial skeleton, discovered in 1998, have provided significant insight into the diversity of mosasaur species.

Now the remains are being re-examined using the latest 3D techniques to answer questions such as: how powerful was its bite and what did it eat? "By studying these kinds of giants, we discover what is possible in nature and what we can learn from this," says Dylan Bastiaans, senior collection manager. The museum is conducting the mosasaur research in collaboration with Utrecht University and Naturalis Biodiversity Center. The results will be prominently featured in the renovated Natuurhistorisch Museum Maastricht when the exhibition halls open in 2028/2029.

"The bulk of digitisation work involves keeping track of incoming collections. I never say 'no' to well-documented collections from our region. I'd prefer to make them all digitally accessible. But that does take time."

~ **Bram Langeveld,**
Curator



Natuurhistorisch Museum Rotterdam

A dead serious museum

Natuurhistorisch Museum Rotterdam (Natural History Museum Rotterdam)—or simply “Het Natuurhistorisch”—has a collection of approximately 430,000 natural history objects. This collection forms the foundation of exhibitions, museum lessons, research, and publications. Eighty-five percent of the collection consists of arthropods and molluscs. In addition, virtually all other groups of the animal and plant kingdoms are well represented. Collection items are primarily of regional, but partly global, origin.

Urban nature is a key focus of Het Natuurhistorisch. Although “urban” and “nature” may sound contradictory, nothing could be further from the truth. Nature is everywhere, and that includes the city. In fact, biodiversity in urban areas is often higher than in the surrounding agricultural areas. All these species of plants, animals, and fungi live in the city

alongside a dominant inhabitant: humans. By actively researching and collecting urban nature, Het Natuurhistorisch documents changes and interrelationships within it.

Approximately 90 percent of the collection of Het Natuurhistorisch has been digitised and is available for research. Registration takes

place in ‘CB 4.0’, a database for natural history specimens, developed in-house by the museum. To date, over 380,000 records have been entered and are available via the museum’s own web database and the GBIF portal.

Collection in the spotlight

Atlantic rangia

Scientific name:

Rangia cuneata

Registration number:

NMR993000221603

Urban aquatic nature is largely invisible, but is changing rapidly. For example, through the introduction of exotic species.

This sometimes happens due to direct human influence, but also indirectly, due to climate change. The Atlantic rangia, a species of clam, was not previously found on our side of the Atlantic Ocean. The larvae were transported to Antwerp in ships’ ballast water and have spread throughout Europe. “These specimens were smashed by herring gulls on a bike path to get to the clam meat,” says curator Bram Langeveld.

According to Langeveld, urban nature helps people realise how close by nature is. “You just have to learn to look, see, understand,

and appreciate. The Atlantic rangia is new to the Netherlands; we didn’t have many molluscs here that can survive in brackish water.” Whether the species poses a threat to native species is not yet clear. That is why it is important to document Atlantic rangia and other exotic species. Where are they found? How do these species behave? And how do they become part of the ecological web? With the answers to these questions, it is possible to map the consequences of human impact on nature.

"Our collection spans from the Mississippi Delta to the Black Sea, the Baltic Sea, Iceland, and Indonesia. You could say that the whole world is represented here."

~ Rick Hennekam,
Senior scientist



Koninklijk Nederlands Instituut voor Onderzoek der Zee (NIOZ)

Sea research from climate to biodiversity

The Royal Netherlands Institute for Sea Research, known as NIOZ (Koninklijk Nederlands Instituut voor Onderzoek der Zee), on Texel is the national institute for fundamental and applied oceanographic research. Scientific knowledge about coasts, seas, and oceans is essential for a better understanding of, and a sustainable future for, our planet. The institute manages geological collections and a variety of water samples from the sea.

The NIOZ collections range from water samples to sediment cores. They are used for multidisciplinary research into marine processes, climate change, changes in biodiversity, and the history of the ocean. The NIOZ's unique and extensive collection of geological samples places a strong emphasis on sediment cores. This collection has a global scope but also

contains a significant amount of material from the North Sea.

The NIOZ aims to make the majority of its sediment core collection publicly available in the near future via the Dutch Marine Science Portal. Through this online platform, information about the NIOZ's types of specimens is shared and linked to the archiving

system for research and metadata. This access allows end-users—including those outside the institute—to gain insight into the sediment cores, including their seafloor origins.

Collection in the spotlight

Sediment core with oxygen-depleted layers

Location:

Mediterranean Sea, north of Egypt

Registration number:

64PE406-E1#6

Sediment cores like this one provide a glimpse into the climate of the past. Senior scientist Rick Hennekam explains how they can also help us look into the future. "Using the cores, we can map out the consequences of our human actions. For example, we've only been measuring carbon dioxide concentrations since humans began to have a significant impact. We can infer the situation prior to that from the cores." The dark lines in this core come from periods lasting thousands of years during which the Mediterranean Sea was oxygen-deprived. Due to global warming, such a situation

could occur again in the future in various seas around the world.

According to Hennekam, it is very important that researchers outside the institute have access to the collection and associated data. "This prevents others from having to incur the high costs of collecting sediment cores. Moreover, the NIOZ has material from areas that are no longer easily accessible." Digitization also ensures that the cores, along with all associated data, are archived so that their scientific value is preserved.

"The diversity of our collection and the museum's rich history make Teylers special. I keep discovering new stories—that's what makes working here so fascinating."

*~ **Laura Egginton,**
Collections officer, Science*



Teylers Museum

The oldest museum in the Netherlands

Teylers Museum (Haarlem) is the oldest museum in the Netherlands. After its founding in 1784, the museum quickly became a public space for art and science. The natural science collection consists of collections of fossils, rocks and minerals, and a library with an emphasis on illustrated natural history works.

Teylers Museum's natural history collection was formed in the late 18th century with materials acquired to investigate the scientific questions of the time. These included, for example, the age of the Earth, the arrangement of crystals, the origin of life, and humanity's place within it. These collections provide insight into the biodiversity of the past and

are indispensable for research into the development of biodiversity, including the factors that influence it.

Thanks to its historical nature, the fossil collection of 75,000 objects contains a great deal of type material. Some of these come from sites that are no longer accessible or are only accessible

to a very limited extent. Digitising and providing access to this collection is therefore invaluable to researchers worldwide. More than 5,000 fossils, including important type specimens, have already been made accessible and available online on GBIF since 2023.

Collection in the spotlight

Fossil of a primitive bird 'The Haarlem specimen'

Scientific name:
Ostromia crassipes

Collection date:
1855

Registration number:
TM 6928 & TM 6929

In 1855, this rare fossil of a primitive bird was found in the Solnhofen limestone formation in Bavaria. It is the oldest bird-like dinosaur outside of Asia. This is the only known fossil of the species *Ostromia crassipes* and is known as "the Haarlem specimen". To this day, this remarkable specimen continues to capture the attention of palaeontologists.

The fossil of the primitive bird illustrates the development of the natural sciences. New knowledge and techniques led to ever-changing insights. At first, the animal was thought to be a flying reptile, a *Pterodactylus*. In 1970,

the American palaeontologist John Ostrom determined that it was an *Archaeopteryx*, and in 2016, the German researchers Oliver Foth and Christian Rahut demonstrated that it is an even more primitive species of bird. The researchers described the fossil as a new species of feathered dinosaur and named it *Ostromia crassipes*. By making Teylers Museum's historical collection digitally accessible, the primitive bird—and lesser-known collection items—can continue to enable new scientific insights.



*"Historical collections
can provide insight
into contemporary
problems, such as the
consequences of rising
temperatures and sea-
level rise."*

*~ **Paul Lambers,**
Curator*

Universiteitsmuseum Utrecht

The academic heritage of Utrecht University

Universiteitsmuseum Utrecht makes heritage and science accessible to a broad audience. The collection of approximately 200,000 objects, all of which have been used for scientific research and education, spans all the disciplines at Utrecht University.

The collection of historical scientific instruments forms the foundation of Universiteitsmuseum Utrecht. The medical collections are also of great value. For example, the dental and veterinary collections are the only ones of their kind in the Netherlands. With, among other things, a historical zoological collection, a large number of fossils, and a collection of Pleistocene soil samples,

the natural history collection covers biology, geology, and palaeontology. The museum also manages collections related to the humanities and the history of the university.

The collection in the museum depot is currently being photographed and catalogued. Part of the collection of scientific instruments is already available on

the website, and half of the fossil collection (over 9,000 objects) has been available on GBIF since 2021. Ultimately, the museum aims to have the entire collection digitised and made searchable for everyone.

Collection in the spotlight

Fossil shells, from drill cores from Amsterdam and Amersfoort and the surrounding area

Age:

126,000–116,000 years (Eemian)

A special subcollection of Universiteitsmuseum Utrecht includes fossil shells from the

Eemian. They come from drill cores, and curator Paul Lambers is fascinated by their historical context. “Professor Pieter Harting collected and studied the material at a time when the concept of an ‘ice age’ didn’t even exist yet,” he says. Based on these shells and other objects, Harting described the Eemian: a warm period between the last two ice ages, when sea levels were much higher than they are today and large parts of the present-day Netherlands were part of the North Sea.

The collection consists of core samples collected over several years. “Everything that came up with the drill cores has been preserved,” says Lambers. Only the fossil shells are in the Utrecht collection. The sediment, such as sand and clay, is stored in the collection of the Geological Survey of the Netherlands (GDN). Through DiSSCo, these kinds of historical collections can be digitally reunited, allowing them to reinforce one another.

"The fungi we manage have an enormous variety of characteristics. The microscopic structure, in particular, can be quite beautiful. You see so much biodiversity every day. It's just a joy!"

*~ **Gerard Verkleij**,
Group leader Collection*



Westerdijk Fungal Biodiversity Institute

Study Center and Biobank for Fungi

The Westerdijk Institute in Utrecht manages the CBS Biobank. With 100,000 strains, this is the world's largest public biodiversity collection of living fungi and yeasts. In addition, the institute also manages the NCCB Biobank for bacteria and phages, which contains 10,000 strains. Every year, thousands of strains are requested by researchers and sent to more than 50 countries.

The CBS Biobank (Centraalbureau voor Schimmelcultures) was founded in 1904 and contains strains originating from all continents. Approximately 15,000 of these are type specimens. Recent additions primarily come from citizen science projects. The strains are preserved in a metabolically inactive state. To this end, they are frozen and

permanently stored at -190 °C in liquid nitrogen (cryopreservation) or freeze-dried. Some strains are also preserved in an active form on agar media in glass tubes.

All strains and their stocks are registered in a BioloMICS database (BioAware). This database contains metadata, as well as images and scientific data from publications

and our own research. Through Mycobank—the Westerdijk Institute's online database—and various websites for specific fungal groups, the data is made accessible and available for research, policy, and innovation, for example.

Collection in the spotlight

A strain from the *Penicillium* genus

Scientific name:

Penicillium rubens

Registration number:

CBS 205.57

The strain of this living culture was discovered in the 1920s by the famous English microbiologist Alexander Fleming (1881–1955) in one of his bacterial cultures.

Bacteria would not grow around the area where the mold was active. This led to his discovery of the most important broad-spectrum antibiotic in history: penicillin.

Strains that form the basis of the best production strains for this antibiotic are preserved in the CBS collection at the Westerdijk Institute. This reference collection is of great value for research and policy in the fields of health and nutrition, biotechnology, and sustainable development. "It's evident in every respect that this collection is used extensively

and has a significant impact," says Collection Group Leader Gerard Verkleij. The collection also includes fungi that can pose a threat as pathogens or that are, on the other hand, useful in biotechnology. "For example, research is being conducted on fungi that produce enzymes that can help break down waste streams," explains Verkleij. "Because we have such a large collection, we can look for alternatives from the same evolutionary line that perform better."



DiSSCo-NL

Distributed System of Scientific Collections - The Netherlands

Distributed System of Scientific Collections

(DiSSCo) unifies all European natural science collections into a single digital collection. This makes them easier to navigate and more accessible for research, policy, and innovation. In this way, this treasure trove of information contributes optimally to finding solutions to major global challenges such as the biodiversity and climate crises.

Key priorities of DiSSCo-NL:

- Full integration of Dutch collections into the European DiSSCo infrastructure.
- Completing the digitisation of millions of specimens and thereby unlocking a wealth of crucial data.
- Supporting artificial intelligence and machine learning tools that analyse specimen data for research, conservation, and innovation.
- Providing open access to high-quality biodiversity data for science, education, and society.