SPECIES 360

Global information serving conservation.

# Species360 Research Request Instructions

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## The Species360 Conservation Science Alliance (CSA)

Data sharing is central to Species360's mission, and for over 50 years, Species360 members have contributed to the world's largest database of animals in human care, known as the Zoological Information Management System (ZIMS). The Species360 Conservation Science Alliance (CSA) serves as a platform for data science collaborations, aiming to maximize the positive impact of ZIMS data to improve animal care and welfare, support conservation efforts, and advance scientific research, all while ensuring the privacy of Species360 member data.

The CSA also offers expertise and consultation services related to ZIMS data to promote its responsible use in research applications. As part of the CSA, the Species360 Science Team, who have a deep understanding of the data in ZIMS, can help you understand the complexity and biases of ZIMS data.

Community members interested in accessing ZIMS data can submit a Research Request, which involves approval by the Species360 Board of Trustees. There is no cost associated with Research Requests applications submitted by Species360 members. **For non-members, a non-refundable application fee of $100.00 USD is required at the time of Research Request submission and will not be refunded if the request is rejected.** Regardless of membership status, additional fees may be required for complex data queries.

In addition to data services, we offer you the opportunity to be affiliated with the Species360 Conservation Science Alliance and to use the CSA as one of your affiliations when publishing your manuscript. By being affiliated with the CSA, you will gain access to its global professional network, which includes academic researchers and experts from the zoo, aquarium, and conservation communities.

In collaboration with the Population Biology Team of the Department of Biology, and the Department of Mathematics (IMADA) at the University of Southern Denmark, the Species360 Science Team has developed tools to extract, clean, aggregate, and anonymize data from ZIMS for Husbandry. This allows Species360 to provide data in an accessible format while ensuring the anonymity of our members.

The following instructions are designed to inform researchers on how to obtain ZIMS data, either data that is openly available, data available through a membership/subscription, or data available through a Research Request.

For further information on any topics discussed here, please contact Species360 support via support@species360.org, indicating “Research Request: *title of your project*” in the subject line.

## How to access ZIMS data

As a Species360 member, you have unlimited access to your data in ZIMS. To obtain data in ZIMS that is not owned by your institution, you will need permission from the owning institution, i.e., the institution that entered the data, or request the data through the Research Request process if you are seeking multiple institutional datasets.

Some specific data can be obtained by Species360 members and non-members, such as aggregated data sets like the *Species360 Global Resources*. These are outlined below.

You can also submit a Research Request for data that is unavailable through membership, Species360 Insights Program subscriptions, or Global Resources.

## Species Holdings

*Species Holdings* data includes the number of living individuals per member institution at the time of extraction. The *Species Holdings* data includes information on each individual's sex (female, male, or unknown), whether it is kept in a group, and the geographic information, along with the member association for the institution.

You will need a formal Research Request to access this data. To request the *Species Holdings* data, please complete the form below. ***Please note: Publishing species holdings at the institutional level violates Species360 terms and conditions. The institution information must be anonymized for publication.***

## Research Request Form

## Species360 Insights Program Subscription

Species360 offers an Insights Program subscription, allowing your institution to access a variety of data in ZIMS without submitting a Research Request. Get more information on Species360's *Insights subscription* benefits here. This program provides veterinarians, medical labs, colleges, universities, research centers, students, and others with access to aggregated ZIMS data and analytics for a low annual fee. The data is anonymous to the individual animal, group, enclosure, and institution, and reflects global collections for over 25,000 species.

For information on how to become an Insights Program subscriber or on which types of data you can access through it, visit our website or send inquiries to support@species360.org, including the phrase *Insights Program* in the subject line.

## Husbandry data (Research Request data)

This data is extracted from ZIMS Husbandry and corresponds to anonymized data from the ZIMS Animals Module. Animals in private collections are not included in the husbandry extract. All data is fully anonymized, includes data from 1 January 1980, and has been filtered to remove entry errors in the database (such as incorrect dates) to ensure data quality. Thus, this extract does not reflect exactly species holdings over time. Data before January 1, 1980, can be requested but requires special approval. This extraction does not include any medical data or any studbook data; see separate sections. To apply for the husbandry data, please refer to the **Research Request Instructions** section.

## Medical data

Species360 members have access to aggregated Global Medical Resources in ZIMS as part of their membership. These reports provide important aggregated data and analysis on areas such as anesthesia dosages, physiological norms, and expected test results. These reports are also available through the Species360 Insights Program subscription; see the Species360 *Insights* section for more information.

We are currently unable to support Research Requests for most ZIMS medical data. Although we have an established extraction process for husbandry data, we lack a corresponding cleaning process for medical data, which means that medical data requests require additional preparation. However, we will consider your request and do our best to accommodate it; please note that additional fees may apply. The development of extraction and cleaning tools required for medical data is part of our plan; however, we currently have no funding or timeline for developing this resource. If you are interested in helping us fund plans for extracting ZIMS for Medical data, please contact the Species360 Support team at support@species360.org.

### Studbook data

Studbooks are overseen by national, regional, and international associations (e.g., WAZA, EAZA, AZA, ZAA), and as such, we cannot grant access to this data without the approval of the relevant regional association. We encourage you to contact the association directly.

## Research Request Instructions

### Husbandry data access

To obtain extracted and cleaned data from ZIMS for Husbandry, please complete a Research Request form following the guidelines below. Every Research Request is submitted to the Species360 Research Committee and then to the Species360 Board of Trustees for approval. For any other inquiries regarding data, please contact support@species360.org and include the phrase *Data Question* in the subject line.

**Research Request Form**

### How to complete a research request

To complete a research request, you will need a clear research question and methodology that you will have to explain in detail in the application. A lack of explanation can lead to the rejection of the research request.

To specify the data required for your project, you must identify the necessary data and the target species. The online submission form requires details of the data needed, including the following information:

- Sex
- Time frame
- Minimum sample size per species
- Minimum age of individuals
- Maximum age of individuals
- Geographic scope
- Specify if you are requesting data only on captive- or wild-born individuals
- Specify the uncertainty allowed around the dates

## Husbandry data description

The following section describes the raw structure of the data for researchers to better understand how the received data table was created.

The raw data is extracted by a query from a cleaned ZIMS database. All data are then fully anonymized and only include data from 1 January 1980, to ensure data quality. Data prior to 1 January 1980 is only available upon special request and requires approval. Animals in private collections are excluded from the husbandry extract.

The Species360 teams have developed a standardized cleaning process that is consistently performed on the 'core' and 'weight' data before distribution to researchers. We aim to develop this for the other data resources as well. Following the data cleaning, the different data tables (see Table 1) will be merged by the Species360 Science team. Therefore, you will only receive one data file. For more information on how this is done, refer to the data structure section below.

**Table 1**: Overview of the different datasets used to create the requested data table through the Research Request process.

| Data table name | Variables included | Limitations / Cleaning |
|---|---|---|
| Core (Basic information) | Basic information about an animal includes: Anonymized animal ID, taxonomy, birth and death dates, sex, and birth type (wild/captive) | Has gone through the standardized cleaning process. Outliers are detected and marked for individuals' lifespans. |
| Contraception | Anonymized animal ID, Contraception method, Date of contraception, and status | Has ***not*** gone through a standardized cleaning process. Data only from husbandry, only high-level data, no specific methods, not from medical |
| Institutions | Anonymized Institution ID, Latitudes, and Country | Has ***not*** gone through a standardized cleaning process. Raw data with a lot of missing data, especially for non-ZIMS members. Only latitudes or countries can be provided to guarantee anonymity. |
| Lengths | Anonymized animal ID, Measurement type, measurement value, and Date of measurement | Has ***not*** gone through a standardized cleaning process. Raw data as recorded in ZIMS, non-standardized units, and measurement types |
| Institutional Animal Transfers | Anonymized animal ID, Physical holder history, Date of transport, Sending and receiving institution | Has ***not*** gone through a standardized cleaning process. Raw data as recorded in ZIMS, non-matching duplicates in the data due to incongruencies between entries of sender versus receiver |
| Parents | Anonymized animal ID, Parent ID, Parent Sex, and Parent Probability | Has ***not*** gone through a standardized cleaning process. Raw data as recorded in ZIMS |
| Weights | Standardized body weights per age and Date of measurement | Has gone through the standardized cleaning process. Outliers are detected and marked |

### 1. Core Data

The Core Data Table contains essential information on individuals within Species360 member institutions. It includes each individual's anonymized ID, taxonomic information (Latin binomial species name, Family, Order, Class), the animal's birth and death dates (if available) and uncertainty around these dates, sex (female, male, unknown), and birth type (zoo-born, wild-born, unknown).

The Core Data has been cleaned and standardized through a process developed and maintained by Species360's Science team.

*Limitations:* The data has been thoroughly cleaned by the Species360 Team; however, potential data limitations persist due to varying record-keeping quality across institutions. Detailed documentation on the data cleaning protocol is available upon request. For example, birth and death dates may be highly uncertain for wild-born, confiscated, or individuals born at institutions that are not Species360 members.

### 2. Contraception Data

The Contraception Data Table provides essential details on an individual's contraception status, encompassing the contraception date, method (e.g., surgical or hormonal), and status (active or inactive).

*Limitations*: This data is raw, unprocessed, and uncleaned, directly extracted from ZIMS. As a result, data entry errors, duplicate entries, and incongruencies may occur. Moreover, this data is extracted from Husbandry records only, rendering it incomplete as contraception can also be recorded in the ZIMS for Medical module or may not be recorded at all. However, most medical data is currently unavailable for research requests (see above: Medical data).

### 3. Institutions

The Institutions Data Table contains geographic information for both Species360 members and non-members, encompassing many (but not all) institution's country and latitude. However, the institutions remained anonymous. The Institution Data can be linked to the Core Data Table to obtain latitude and country information of each animal's first and last holding institution, as well as to the Institutional Animal Transfers Data Table to obtain an animal's physical holder history.

*Limitations:* This data is raw, unprocessed, and uncleaned, directly extracted from ZIMS. As a result, data entry errors, duplicate entries, and incongruencies may occur. Data is restricted to high-level geographic resolution (latitude, country) to ensure member anonymity (refer to Data Privacy Policy here). Please note that data may be incomplete, especially for non-ZIMS member institutions or smaller institutions where geographical information might not be available.

### 4. Lengths

The Lengths Data Table contains information regarding animal length measurements. It includes the animal's anonymized ID, the date of measurement, the type of measurement, and the measurement unit.

*Limitations*: This data is raw, unprocessed, and uncleaned, directly extracted from ZIMS. As a result, data entry errors, duplicate entries, and incongruencies may occur. Moreover, length data measurements are raw non-standardized data. They include a large number of different measurements (e.g. tail length, head length, snout-vent length, etc.), as well as different units of measurement (centimetres, inches, meters, etc.). Outliers may be an issue in the dataset due to data entry errors (e.g. entries with incorrect units).

### 5. Institutional Animal Transfers

The Institutional Animal Transfers Data Table contains information regarding an animal's physical movement history, detailing its transfers across institutions. It includes the animal's ID, as well as anonymized institution IDs of the sending and receiving institutions and the transaction date. Besides including physical moves across institutions, it also includes major life events, such as birth and death. By linking this data to the institution table through anonymized IDs, additional information on the latitude and the destination country of the animal can be obtained.

*Limitations*: This data is raw, unprocessed, and uncleaned, directly extracted from ZIMS. As a result, data entry errors, duplicate entries (since both births and deaths are considered transfers), and incongruencies in transaction dates or sending/receiving institutions may occur. Such errors may occur when transactions are entered with conflicting dates and times by both the recipient and sender, which can be common with long-distance animal moves.

### 6. Parent Data

The Parent Data Table contains essential details about an individual's parentage, including the individual's anonymized ID, the anonymized IDs of their parents, their sexes (dam/sire), and the parent probability expressed as a percentage. Further offspring and parent information, such as the parents' age at offspring birth, can be obtained by linking this table to the core data table using corresponding animal IDs.

*Limitations*: This data is raw, unprocessed, and uncleaned, directly extracted from ZIMS. As a result, data entry errors, duplicate entries, and incongruencies may occur.

### 7. Weights

The Weights Data Table comprises standardized live weight measurements (in kg), measurement dates, and corresponding animal ages at measurement. The Weights Data has been cleaned and standardized through a process developed and maintained by the Science Team of Species360.

*Limitations:* To ensure data accuracy, statistical outliers have been removed using a moving window and interquartile ranges across ages. Analyses were performed on records available after 1 January 1980. In addition, all weight measures are taken from individuals in ZIMS; thus these results may not represent weight values in the natural habitat of the species.

## Data Structure

The following section describes the structure of the data, enabling researchers to better understand how the received data table was created.

The husbandry data consists of several data tables. One of these tables consists of the ‘core’ data, which provides the data backbone and contains one row for each animal registered in ZIMS alongside basic information, such as the species taxonomy. Separate data tables provide additional information, such as weight measurements or parentage data. Data tables are relational, which means they can be linked via unique identifiers (IDs) (see Figure 2). As previously mentioned, this linkage between data tables will be performed by the Species360 Science team. Therefore, you will only receive one data file.

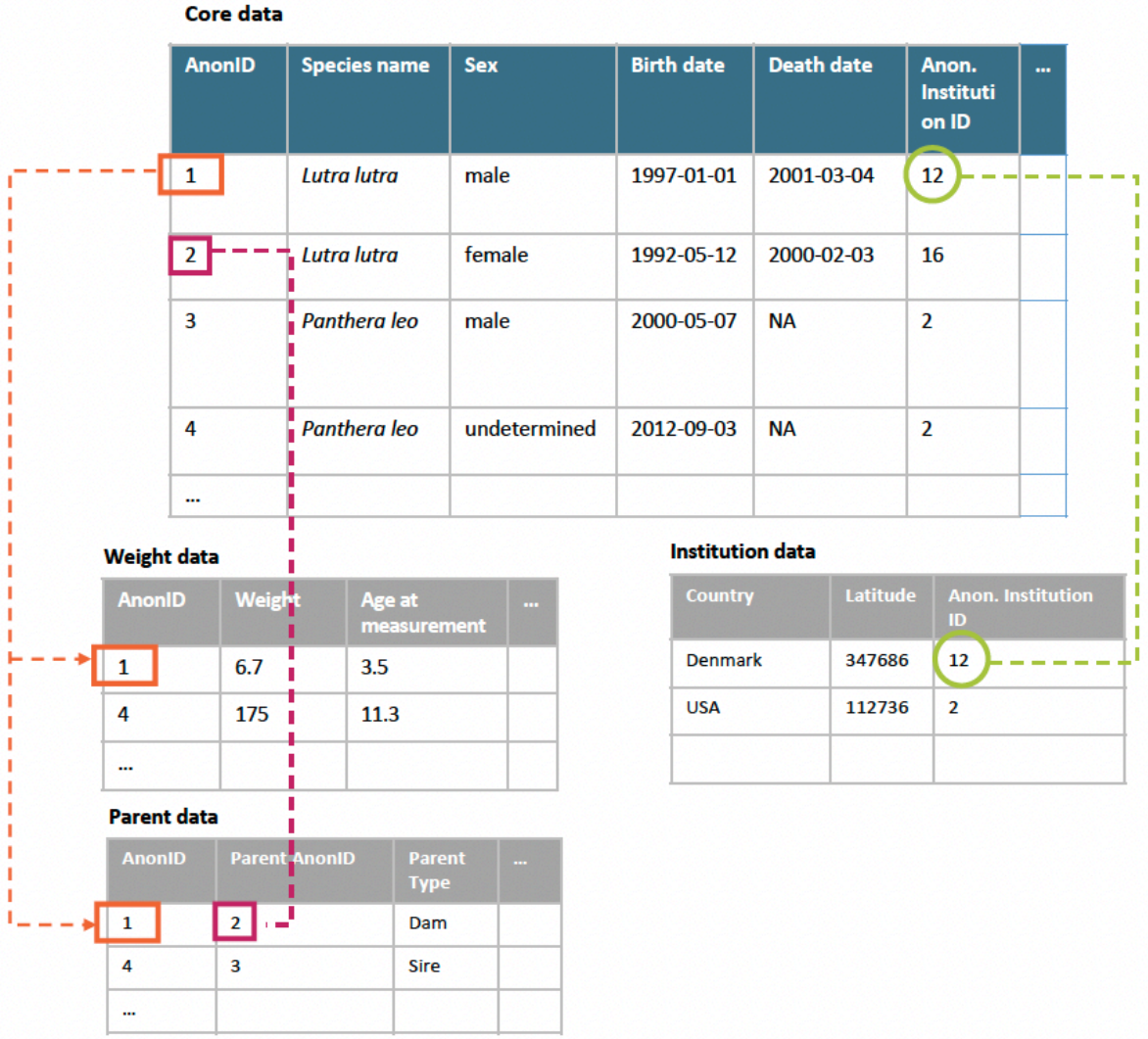


**Figure 2.** The core data table (top) contains basic information for all animals in ZIMS, with each row corresponding to a unique individual identified by an anonymized ID (AnonID). Additional data tables, such as weight measurements and parent information, are linked to the core table via AnonIDs (**orange**). Parent data can also be linked back to the core through ParentAnonID (**pink**). Latitudes and country information of animal first and last holding institutions are obtained from the institution's data table and linked to the core via anonymized institution IDs (**green**).

# Research Request Review Process

## Timeline

Research Requests are reviewed by the Species360 Research Committee and the Species360 Board of Trustees through an asynchronous process. This comprehensive review process ensures responsible use of the data and measures to protect Species360 member privacy. Consequently, **it typically takes between three to six months** to process the request and prepare the data, provided the request has been approved.

## Data Use Agreement and Data Publication

When your Research Request has been accepted, you will receive a Data Use Agreement that you will have to sign before receiving any data. This agreement confirms that you and your collaborators will use the data sent to you solely for the scientific study specified in your request. The aggregated dataset can be published as part of a manuscript, **but the raw dataset cannot be made publicly available**. **You must agree not to share the raw data anywhere**, implying that you will not be able to submit the raw data along with your manuscript, even if it is required by the journal where you submit your study for publication. Species360 will serve as the data repository for your publication using the last version you will return to us. For manuscript submission, you can use our personalised Statement on the Non-Public Availability of Species360 Member Data, which outlines the process for obtaining a copy of the dataset. We can provide you with this letter to attach to your submission if necessary. Contact us if you require a personalised copy for journal requirements. Finally, we require that you acknowledge and credit the Species360 members (see the *How to acknowledge* section).

# Disclaimer

The Core Data and Weights Data have undergone cleaning and standardization by the Science Team at Species360, but may still contain some input errors. The other datasets mentioned in this document are in their unprocessed form, extracted directly from ZIMS. All datasets may contain more errors, repetitions, and inconsistencies in data entry.

All data originates from individuals recorded in ZIMS, which may not reflect the natural habitat conditions of the species.

The data, which is exclusively derived from individuals managed under human care, may have inherent biases due to variations in husbandry and management practices across different species, time periods, countries, and institutions. These biases are discussed in the Research Committee meetings for each research request. To better understand the data, we recommend consulting with the Species360 Science Team and/or Support Team via support@species360.org indicating "Research Request: *title of your project*" in the subject line.

The data provided through the Research Request process cannot be made publicly available or published anywhere else, despite it potentially being required by the journals; see the Acknowledgements section.

# How to acknowledge

## How to cite ZIMS

In publications, please state the Research Request number in the methods section, such as "Data were obtained from Species360's Zoological Information Management System (ZIMS) via data request #[request number]."

Species360 Zoological Information Management System (ZIMS) (2023), zims.Species360.org. [Date of download: 2023-12-04]

## Acknowledgments

We require acknowledgement of the Species360 Conservation Science Alliance, which manages and supports the Research Request process to ensure ZIMS data access to the research community.

Here is a suggested text you can use in the Acknowledgments section of your manuscript:

“This research was made possible by the worldwide information network of zoo and aquarium members of Species360. Access to the data has been made possible thanks to the support of the Species360 Science Team serving the Conservation Science Alliance, which ensures a process for the research community to explore the data recorded by more than 1,300 zoological institutions globally to advance knowledge and research on animals. The raw data that support the findings of this study were provided by Species360 via the Research Request #[request number]. Restrictions apply to the availability of these data, which were used under license for this study. It is possible to obtain the data used for this study for replication purposes from Species360 following a successful research request, quoting #[request number].”

## Data Privacy Policy

If you would like to learn more about Species360’s data privacy policy, please click here.