ACTIVATING THE PALEONTOLOGICAL RESEARCH POTENTIAL OF LIFE HISTORY DATA IN LIVING COLLECTIONS: A CASE STUDY AT THE DUKE LEMUR CENTER

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BACKGROUND

How do we contextualize and interpret fossil vertebrate anatomy?

Comparative anatomy data from neontological collections and life history data from living animals.

What kind of metadata do neontological natural history collections typically have associated with them?

Mass at collection, sex, and collection locality.

What kind of data are collected at living (non-invasive) research colonies like the Duke Lemur Center?

Breeding records, veterinary care, husbandry data, locomotor behaviors, mass throughout life, and diet.

Wouldn't it be useful to paleontological research if osteological specimens had more life history metadata associated with them?

Yes it would! But such data are often disaggregated making them difficult to explore, and transferring these data from zoos or colonies to natural history collections is not always prioritized, nor is it standardized.

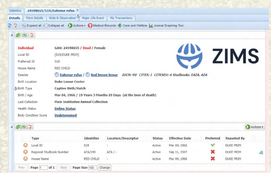
How can we aggregate these data and make the data more accessible to researchers?

Create a database where all the data live together!

Skeleton of Red Child, a female *Eulemur rufus* in our collection who died in 1985 with a cancerous tumor on her foot.

A descendant of Red Child, Cardinal, in the living colony.

The microCT scan of Red Child could reveal how cancer affected her bone growth.



We can associate the life history data of Red Child from ZIMS, Zoological Information Management System, with the skeleton we have in our osteology collection.

SCAN STORAGE

The DLC Data Team started by generating microCT scans of the osteology and frozen cadaver collections to make morphological data available on MorphoSource.

MorphoSource has persistent identifiers so scans can be cited in peer reviewed research and used by educators. Other 3D storage sites (like Sketchfab) do not guarantee data storage so they are less useful for long-term uses such as research and building curriculum guides.

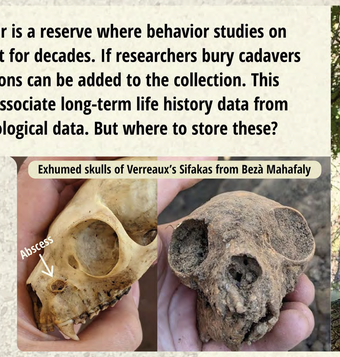
DATABASE SOFTWARE

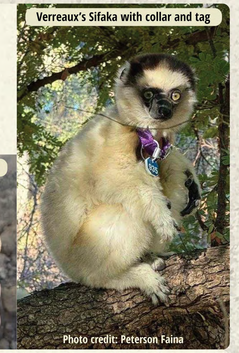
We had hoped to utilize Specify for our database needs, but network incapatibility meant a change of plans. We went with a free software that is already integrated into Duke systems: REDCap, developed at Vanderbilt originally for clinical research uses – which often include longitudinal data – to network scans with life-history records. We also store fossil metadata like field notes and specimen preparation records in REDCap.

Our goal is to make these database tools available to other living colonies and natural history collections, so life-history data can be shared and standardized across institutions. This effort – in collaboration with the ZooMu consortium – will ultimately make life histories accessible to researchers including paleontologists exploring the fossil record.

FOR WILD ANIMAL DATA TOO?

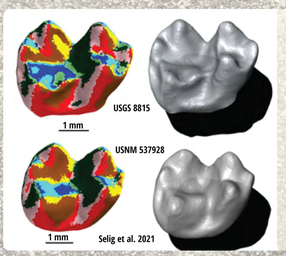
Bezà Mahafaly in Madagascar is a reserve where behavior studies on lemurs have been carried out for decades. If researchers bury cadavers they come across, the skeletons can be added to the collection. This presents an opportunity to associate long-term life history data from wild specimens with morphological data. But where to store these?





Karie Whitman and Duke undergrad Erika Kraabel joined Laurie Godfrey and Malagasy colleagues Manjaka Rasolonjatovo and Peterson Faina this summer at Bezà Mahafaly to work with the staff there on exhuming skeletons and organizing the collection and catalogue. The DLCMNH hopes to continue support of Malagasy data collections in this way.

PALEONTOLOGICAL APPLICATIONS OF THESE DATA



Left: High-res data on diet and genetics could augment this study on intraspecific variation in the dentition of *Microsyops latidens*.

Right: Life history data from living relatives helps in this study of the giant lemur *Megaladapis madagascariensis*.