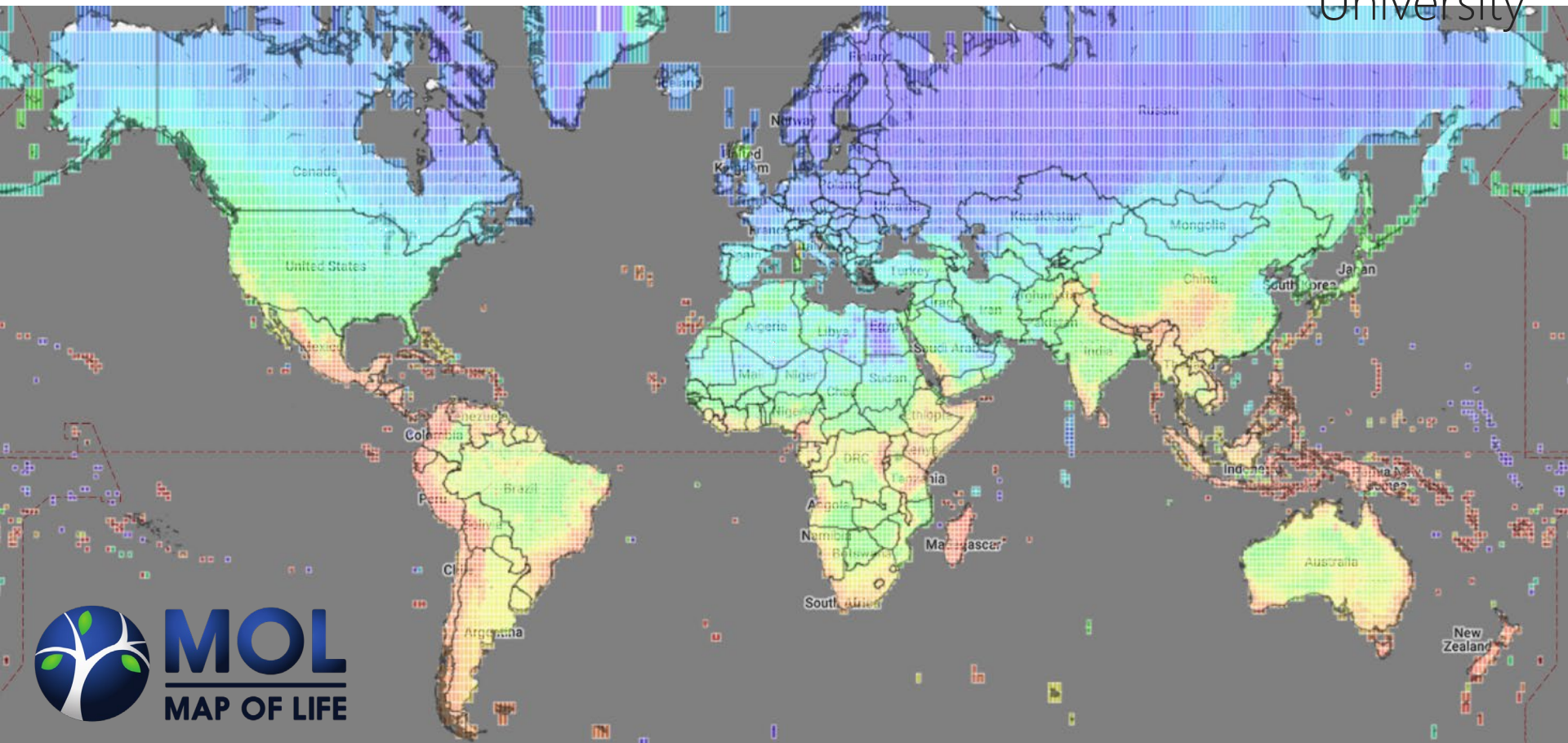


# Map of Life: A platform for synthesizing heterogeneous biodiversity data for research, education, and conservation

Michelle Duong, Ecology and Evolutionary Biology, Yale University



# What biodiversity data is already available?



# What biodiversity data is already available?



Species Locations

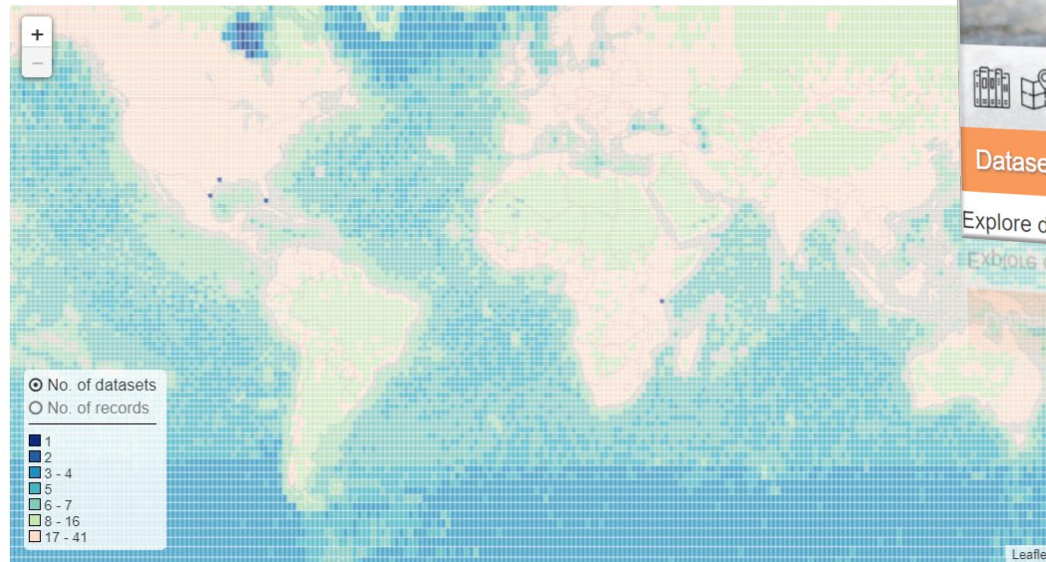
All datasets By region

View Mode Map Only List Only Both

Filters Datasets: 435  
Select items to filter below

- Data type**
  - Local inventories (264)
  - Regional checklists (85)
  - Expert range maps (63)
  - Gridded surveys (4)
  - Point observations (19)

- Taxonomic group**
  - Vertebrates** (Add all +)
    - Birds (112)
    - Mammals (99)
    - Reptiles (129)
    - Turtles (1)
    - Amphibians (109)
    - Fishes (21)
  - Invertebrates** (Add all +)
    - Butterflies (38)
    - Moths (2)
    - Bumblebees (2)
    - Dragonflies (11)
  - Plants** (Add all +)
    - Plants (19)
    - Trees (1)
    - Cacti (1)
    - Conifers (1)
    - Palms (1)



**Datasets**

Explore datasets used across MOL

Search Filter datasets via title and authors

Data type	Taxonomic group	Dataset	No. of records	No. of species
Expert range maps	Turtles	Turtles of the World	289	289
Expert range maps	Trees	North America Tree Atlas	50,182	679
Local inventories	Reptiles	Reptile checklist of Río Pilcomayo National Park, Formosa, Argentina	42	41
Regional checklists	Reptiles	The herpetofauna of the vicinity of Silifke	11	11

Listing currently publicly viewable datasets. Check back as we move more of Map of Life data that are not yet surfaced into this category or as additional datasets are contributed or mobilized by the Map of Life team.

# Different types of biodiversity data



[login/register](#)

Species Home Summary Map Detailed Map Projection **Birds** Archilochus colubris



Map species  
Views species range map, inventory, and occurrence data

## Ruby-Throated Hummingbird

*Archilochus colubris*

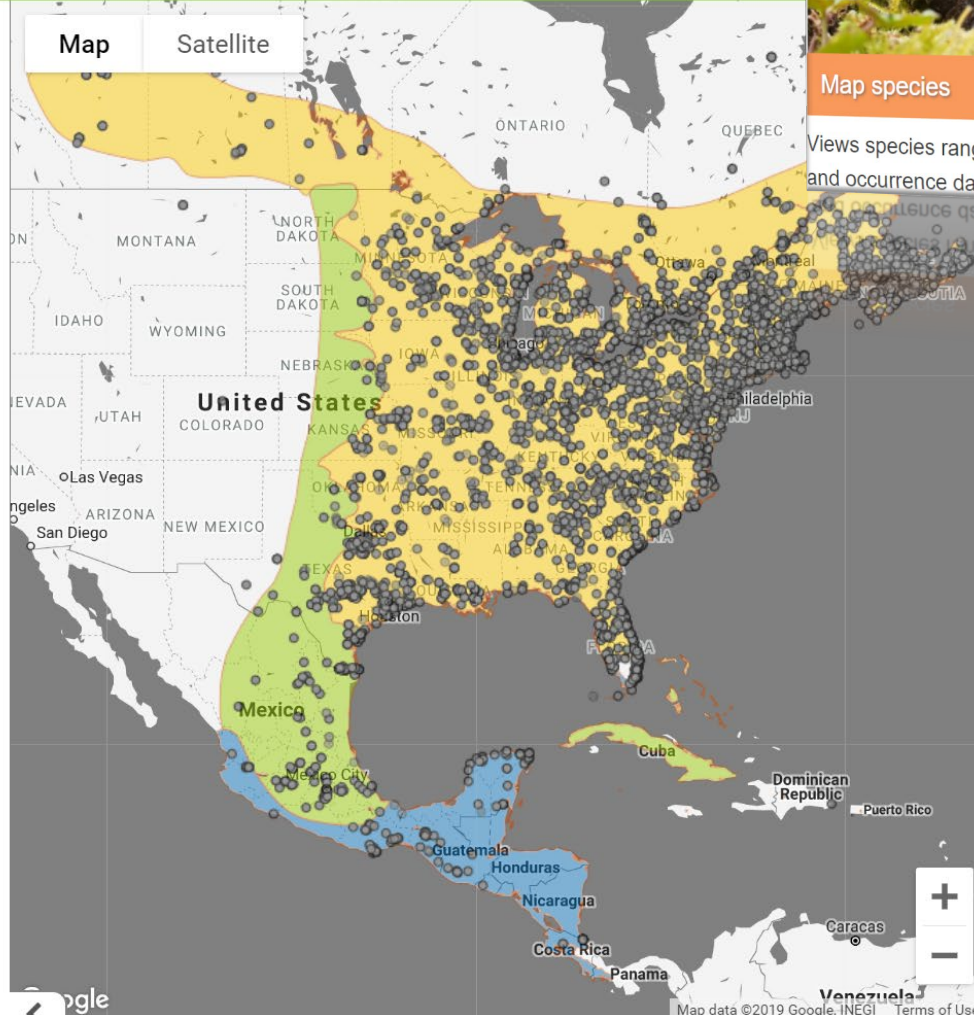
| Hummingbirds

Least Concern (IUCN 2016)



### Sources

- Local inventories 1 Q i
- Expert range maps 2 Q i
  - MOL grid of BirdLife Q i
  - Jetz et al. (2012) Q i
- Point observations 1,020,026 Q i
- Regional checklists 1,516 Q i
- Distribution models 1 Q i

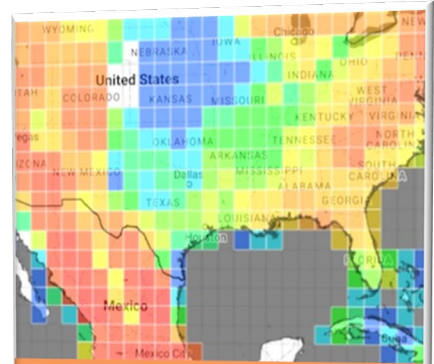


# Global patterns in biodiversity



Species

Locations



Patterns

Overview Richness and Rarity Background

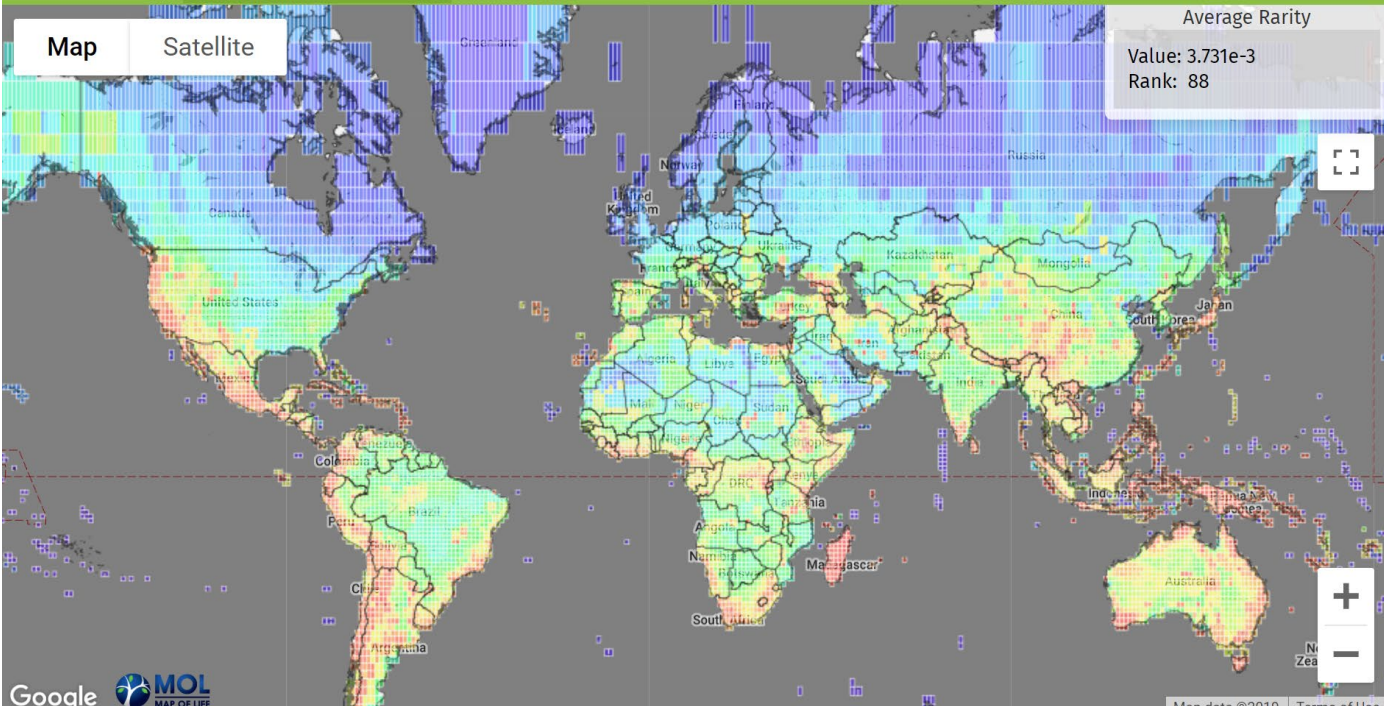
Map Satellite

Average Rarity  
Value: 3.731e-3  
Rank: 88

Explore richness patterns and biodiversity facets

Species groups: Mammals

Pattern type  
Richness Average Rarity Total Rarity

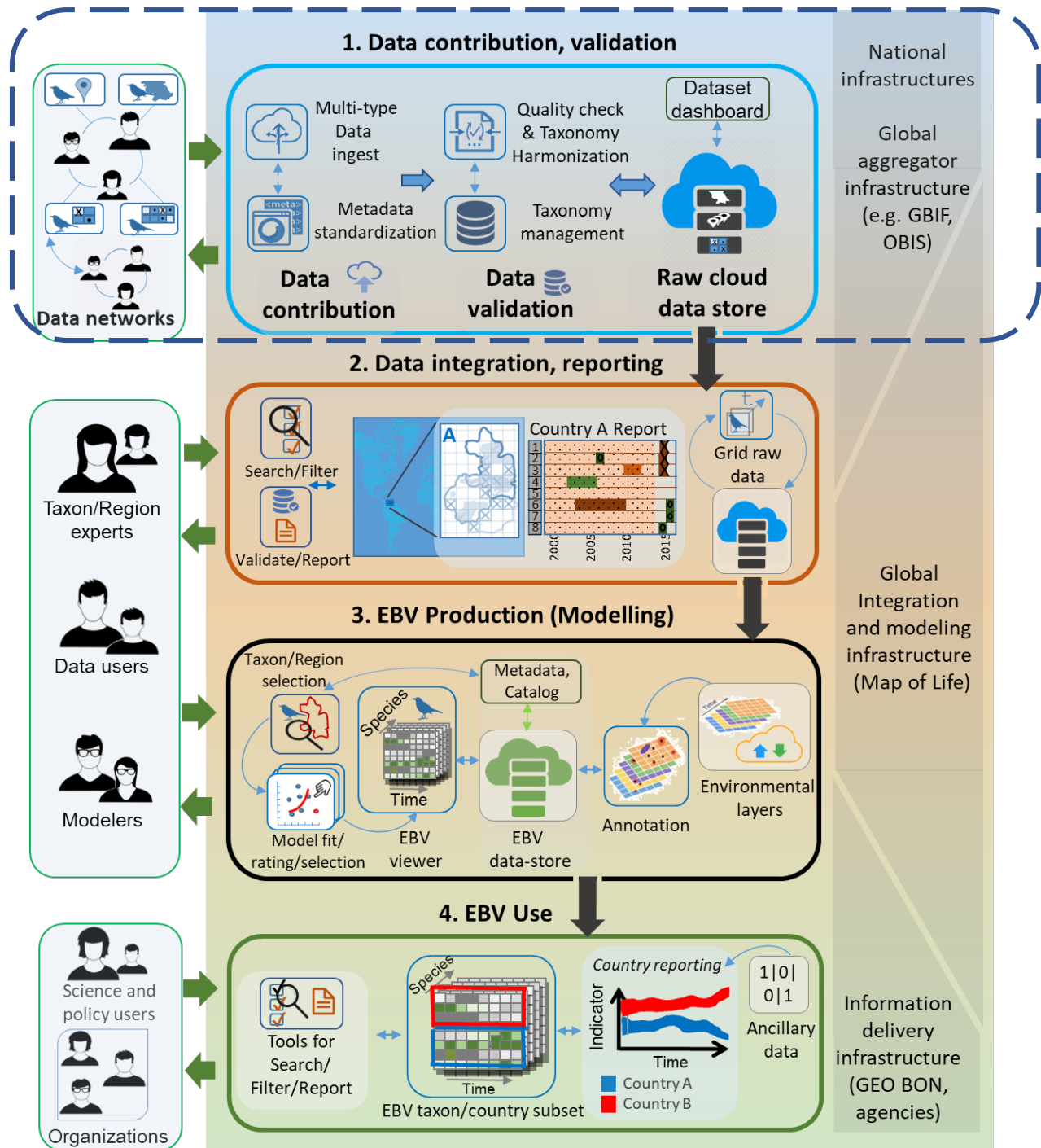


For data sources, see *Expert range maps* in MOL Datasets page.



Walter Jetz<sup>1</sup>, Melodie A. McGeoch<sup>2</sup>, Robert Guralnick<sup>3</sup>, Simon Ferrier<sup>4</sup>, Jan Beck<sup>5</sup>, Mark J. Costello<sup>6</sup>, Miguel Fernandez<sup>7,8</sup>, Gary N. Geller<sup>9</sup>, Petr Keil<sup>10</sup>, Cory Merow<sup>1</sup>, Carsten Meyer<sup>10,11</sup>, Frank E. Muller-Karger<sup>12</sup>, Henrique M. Pereira<sup>10,13,14</sup>, Eugenie C. Regan<sup>15</sup>, Dirk S. Schmeller<sup>16,17</sup>, Eren Turak<sup>18,19</sup>

Nature Ecology & Evolution 2019



# MOL Data Loader

## Uploader

1

2

3

4

5

Basic Information

Upload Files

Match Columns

Review Geometry

Metadata

### Basic Information

#### Taxonomic Group

Amphibians

Select from the list of groups currently supported by MOL

#### Dataset Type

Occurrence or Inventory

Next



Instructions

- Occurrences
- Inventories

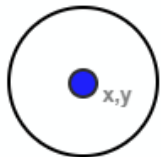
- Birds
- Mammals
- Amphibians
- Reptiles
- Fishes
- Butterflies
- Spingid Moths
- Dragonflies
- Bumblebees

## Define Study Area

Shape of study area

Circle  Square

Position of coordinate in study area



Specify size measurement

Radius  Area

Specify size

Area (meters squared)

If you don't know the size of your study area, consider uploading your data as an occurrence dataset instead.

Cancel

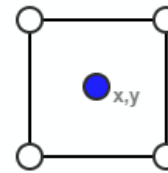
Save

## Define Study Area

Shape of study area

Circle  Square

Position of coordinate in study area



Southwest

Northwest

Northeast

Southeast

Center

Specify size measurement

Edge Length  Area

Specify size

Area (meters squared)

If you don't know the size of your study area, consider uploading your data as an occurrence dataset instead.

Cancel

Save



# Uploader

- ✓ Basic Information
- 2** Upload Files
- 3 Match Columns
- 4 Review Geometry
- 5 Metadata

## Upload Files

 Select species CSV file...

 Select shapefile...

Required: a zipped folder with .shp, .dbf, .prj, and .shx files

Back

Next

 Instructions 

# MOL Data Loader

The screenshot shows the 'MOL Data Loader' interface. At the top, there are navigation tabs for 'My Datasets' and 'Upload Data'. The main area is titled 'Uploader' and contains a 'Basic Information' section with a green checkmark. Below this is a 'Match Columns' section with a blue box containing instructions: 'Please match the columns to the following terms are n...' and a 'Matching terms' section with a green hourglass icon. A modal dialog box titled 'Match Columns' is open in the center. It contains the following text: 'We have detected columns that may match Map of Life field names. Please verify that column names were matched correctly using the drop-down menus below.' The dialog lists several fields with their corresponding column names in dropdown menus, each preceded by a green checkmark: 'scientificName' to 'scientificname', 'decimalLatitude' to 'decimal\_latitude', 'decimalLongitude' to 'decimal\_longitude', 'recordedBy' to 'recorded\_by', 'coordinateUncertaintyMeters' to 'uncertainty\_m', and 'basisOfRecord'. The 'eventDate3' field is also listed but has no dropdown menu. At the bottom of the dialog are 'Cancel' and 'Done' buttons. The background interface is dimmed, showing a 'Metadata' section with a '5' in a circle and a 'Match Columns' button.

My Datasets Upload Data

Uploader

Basic Information

Match Columns

Please match the columns to the following terms are n...

Matching terms

Match "scientificName" to:

✓ scientificname

Match "decimalLatitude" to:

✓ decimal\_latitude

Match "decimalLongitude" to:

✓ decimal\_longitude

Match "recordedBy" to:

✓ recorded\_by

Match "coordinateUncertaintyMeters" to:

✓ uncertainty\_m

Match "basisOfRecord" to:

Match "eventDate3" to:

Cancel Done

5 Metadata

Match Columns

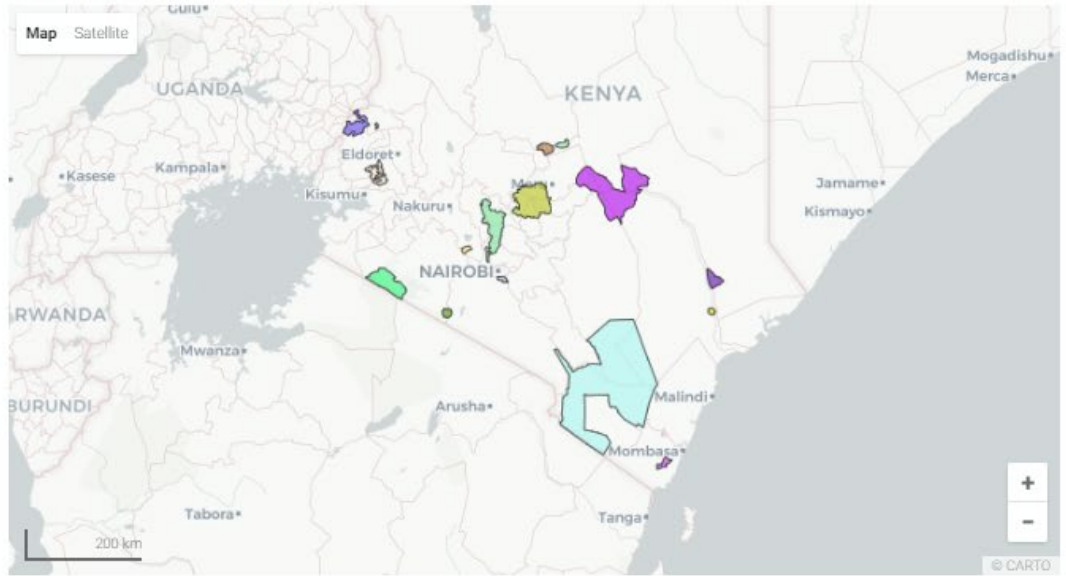
Back Next

Instructions

# Uploader

- ✓ Basic Information
- ✓ Upload Files
- ✓ Match Columns
- 4** Review Geometry
- 5 Metadata

## Review Geometry



Back

Next

## Metadata

### Required Info

**Title** \*REQUIRED  
test - Mammal transect of North America

**Description** \*REQUIRED  
test dataset

**Geographic Coverage** \*REQUIRED  
Canada and USA

### Permissions

Make available for MOL internal use in models

Make publicly visible

Publish data

You have chosen to publish your data. When you finalize your dataset, we will generate a DOI on the release date. All published occurrence datasets will be shared with the Global Biodiversity Information Facility (GBIF).

### Release Policy

 \*REQUIRED
 

Set release date

2019-02-18

Don't set release date

### License

**License** \*REQUIRED

CC-0

Licenses: CC-0 - Public domain, CC-BY, CC-BY-NC

### Citation

**Citation**

Duong, M. (2019). Mammal transect of North America.

e.g., Kitamura, S., Thong-Agree, S., Madri, S., and Poonswad, P. (2010). Mammal diversity and conservation in a small isolated forest of southern Thailand. The Raffles Bulletin of Zoology, 58(1), 145-156.

**Short Citation**

Duong (2019)

Single author: Jetz (2018)  
2 authors: Jetz & Guralnick (2018)  
More than 2 authors: Jetz et al. (2018)

### Optional Info

Back
Submit

**Instructions**

## Metadata

### Required Info

**Title** \*REQUIRED  
test - Mammals of Kenya Parks

**Description** \*REQUIRED  
Kenya National Park checklists

### Permissions

Make available for MOL internal use in models

Make publicly visible

Publish data

### Release Policy

 \*REQUIRED
 

Set release date

2019-02-18

Don't set release date

### License

**License** \*REQUIRED

CC-0

Licenses: CC-0 - Public domain, CC-BY, CC-BY-NC

### Survey Dates

**Start Date** \*REQUIRED      **End Date** \*REQUIRED

2010-02-01      2015-01-31

### Completeness

 \*REQUIRED
 

**Lower bound** \*REQUIRED      **Upper bound** \*REQUIRED

75%      100%

**Rationale used to determine completeness** \*REQUIRED

Long running survey with multiple sampling events in wet and dry season, lots of personnel, sampled day and night, detected rare species.

Opt out of specifying completeness

### Citation

**Citation**

Duong, M. (2019). Mammals of Kenya Parks

e.g., Kitamura, S., Thong-Agree, S., Madri, S., and Poonswad, P. (2010). Mammal diversity and conservation in a small isolated forest of southern Thailand. The Raffles Bulletin of Zoology, 58(1), 145-156.

**Short Citation**

Duong (2019)

Single author: Jetz (2018)  
2 authors: Jetz & Guralnick (2018)  
More than 2 authors: Jetz et al. (2018)

### Optional Info

Back
Submit

# test - Mammal transect of North America

↑ Harmonize

🗑 Delete

This dataset isn't finalized yet! This means: occurrence and inventory datasets will **not show on any MOL apps**.

Overview

Map

Metadata

Permissions


Published Data

GROUPS  
1

SPECIES  
6

RECORDS  
14







### Species Groups

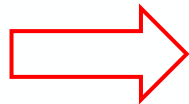
	Group	Count
	mammals	6

### Species

	Species	Count
	<b>Cougar</b> <i>Puma concolor</i>	4
	<b>Virginia Opossum</b> <i>Didelphis virginiana</i>	4
	<b>Hoary Marmot</b> <i>Marmota caligata</i>	3
	<b>American Beaver</b> <i>Castor canadensis</i>	1
	<b>Least Chipmunk</b> <i>Tamias minimus</i>	1
	<i>Gulo Gulo</i>	1

### Latest Records

	Species	Event date
	<b>American Beaver</b> <i>Castor canadensis</i>	2016-01-05
	<b>Cougar</b> <i>Puma concolor</i>	2016-01-05
	<b>Hoary Marmot</b> <i>Marmota caligata</i>	2016-01-05
	<b>Cougar</b> <i>Puma concolor</i>	2016-01-05
	<b>Cougar</b> <i>Puma concolor</i>	2016-01-05
	<b>Hoary Marmot</b> <i>Marmota caligata</i>	2016-01-05
	<b>Least Chipmunk</b>	



# test - Mammal transect of North America

[< Back to Dataset Overview](#)

[? Instructions](#)

[✔ Save](#)

[✔ Submit](#)

## Taxonomies for Mammals

6 Names in dataset

Mammal Species of the World v3 (master) [6 exact matches]

Accept This Taxonomy

### Names to Verify (0)

Select all



### Verified Names (6)

**Select all** Select All

Castor canadensis

Didelphis virginiana

Gulo Gulo → Gulo gulo

Marmota caligata

Puma concolor

Tamias minimus

# Integrating species occurrence and environmental data

## American Badger
















*Taxidea taxus*

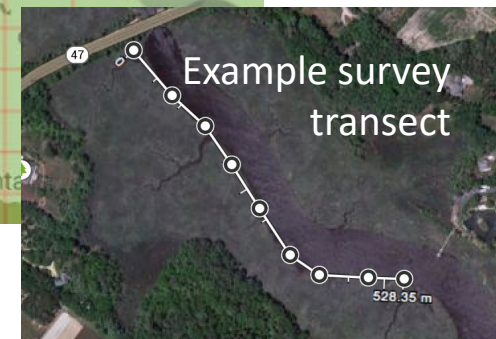
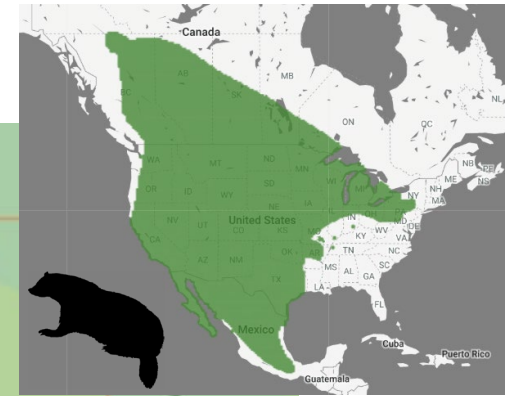
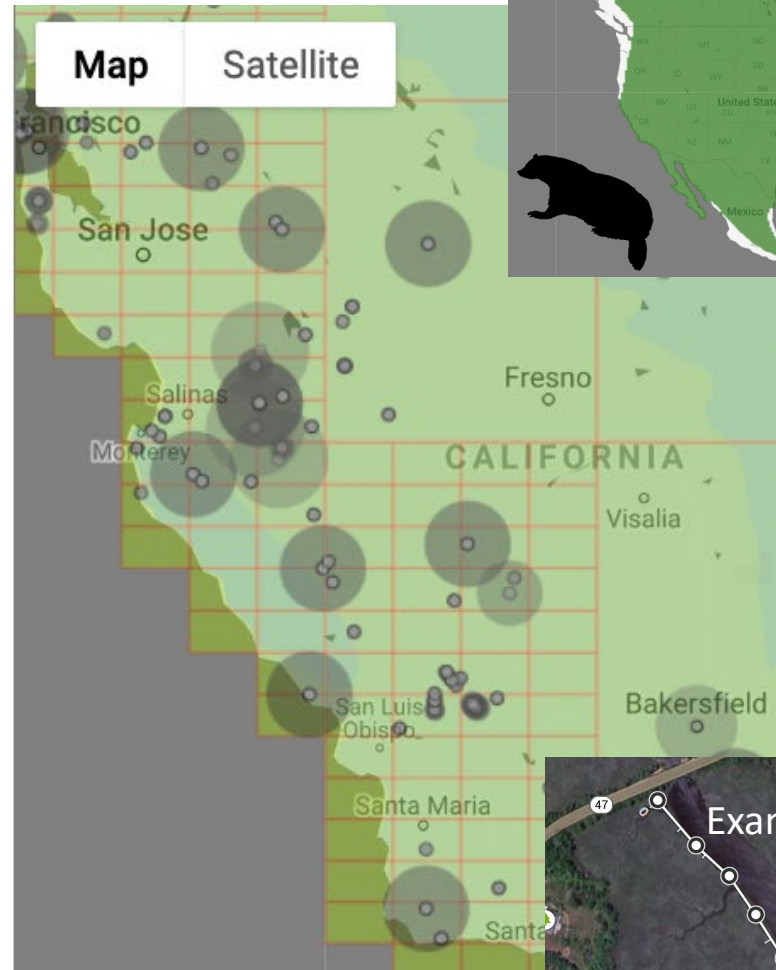
 | Mustelids

Least Concern (IUCN 2016)

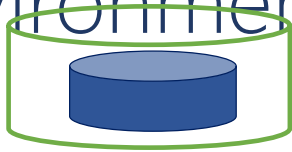


### Sources

- >  [Point observations](#)  1,279  
- ▼  [Expert range maps](#)  1  
  - [MOL grid of IUCN](#)   
- >  [Local inventories](#)  1  
- >  [Regional checklists](#)  1,197  



# Integrating species occurrence and environmental data

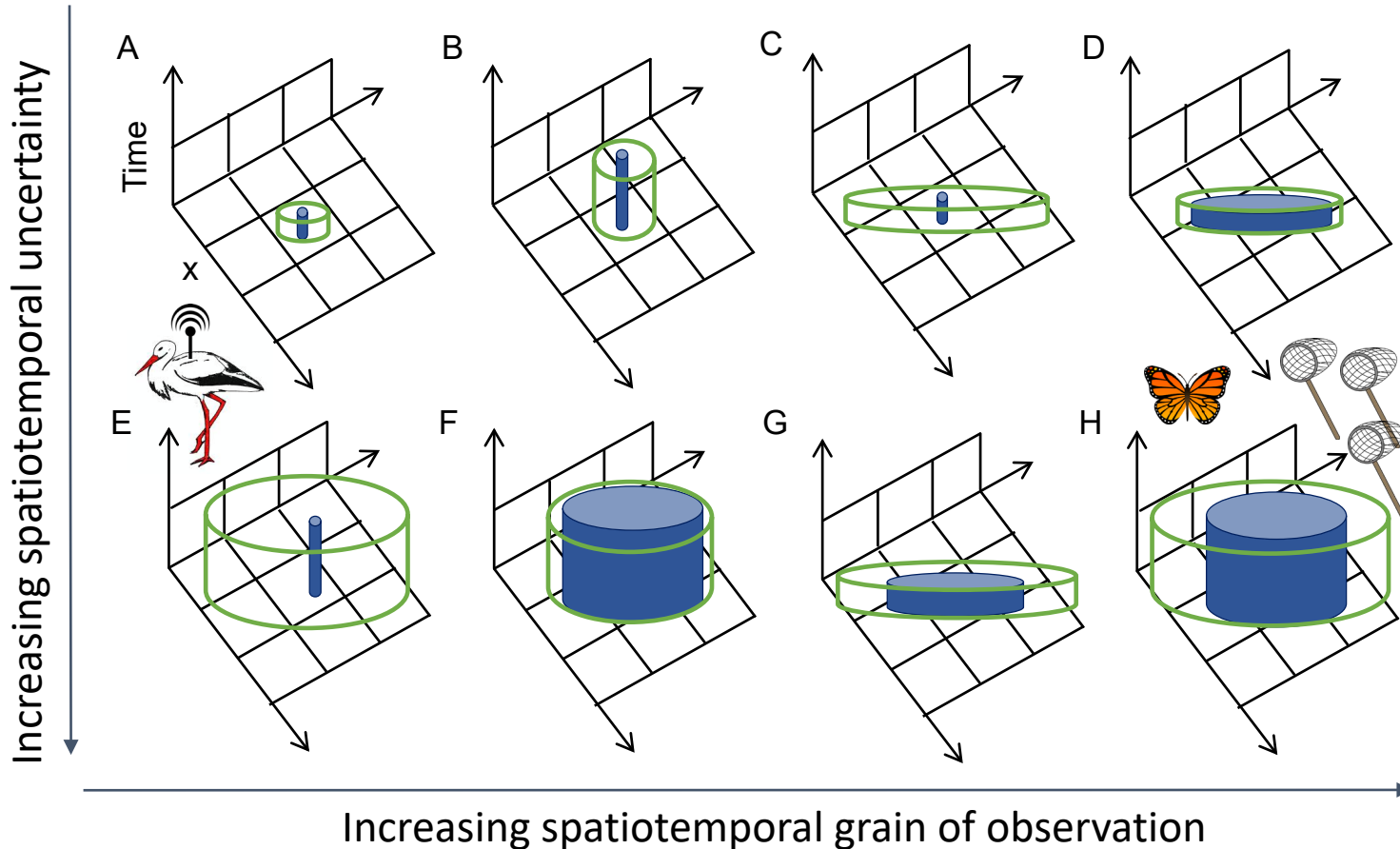


Observation Grain

Locational Uncertainty

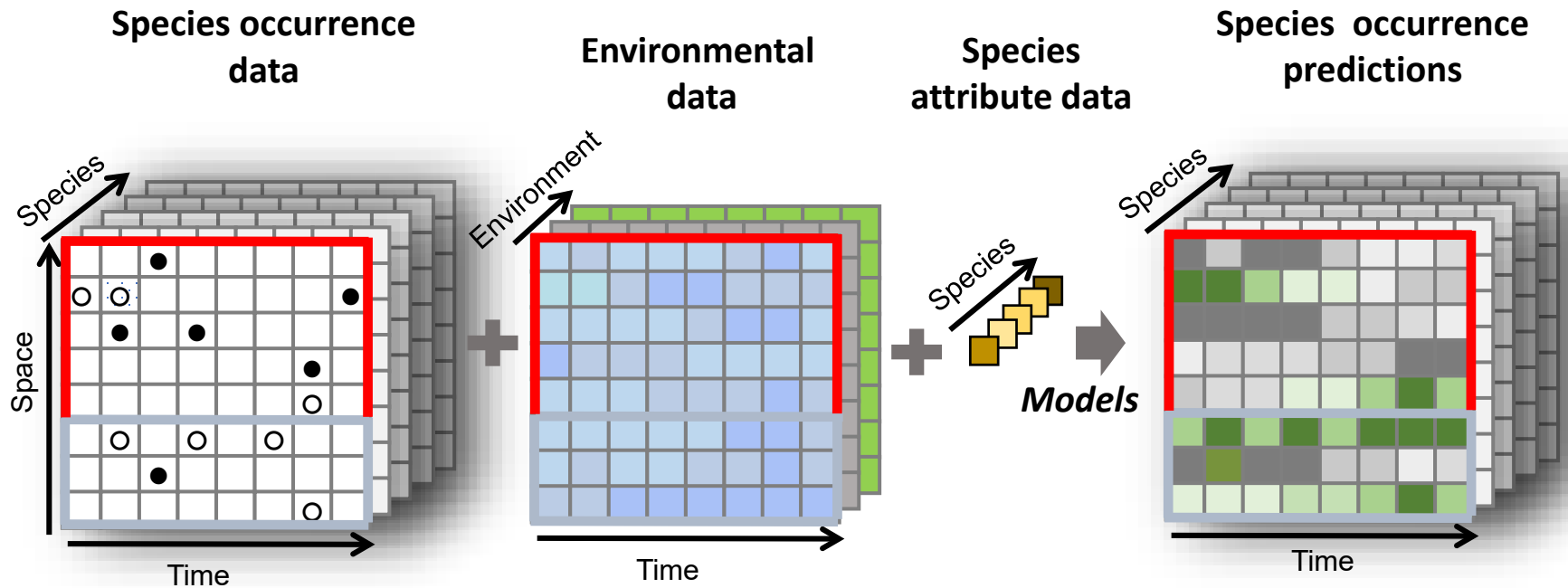
Spatio-temporal grain and uncertainties

- Occurrence record
- Environmental data





# Data integration and analysis



# Conservation & Engagement

The screenshot displays the Half-Earth Project website. At the top left is the logo with the tagline "half the earth for the rest of life". The navigation bar includes links for HOME, ABOUT, MAPS, VIDEOS, BLOG, ENEWSLETTER, PLEDGE, HALF-EARTH DAY 2018, and a DONATE button. The main content area is split into two columns. The left column features a "STORY" tab and a text block explaining the importance of the global Protected Areas network. Below the text is a bar chart showing the percentage of species for which the network provides sufficient coverage across six taxonomic groups. The right column features a "GLOBAL" tab and a large interactive map of the Earth. The map uses a color scale to represent species rarity and includes a legend for Protected Areas and Species Rarity. A "PARTNERS" section is partially visible at the bottom left of the map area.

**half-earth project**  
half the earth for the rest of life

HOME ABOUT MAPS VIDEOS BLOG ENEWSLETTER PLEDGE HALF-EARTH DAY 2018 DONATE

STORY EXPLORE

This global **Protected Areas** network plays a key role in the conservation of nature and safeguarding of species. However, by overlaying global species **richness** and **rarity** with the protected areas network, we can see that many species remain insufficiently protected.

Group	Percentage of species for which the global protected area network provides sufficient coverage
Amphibians	30
Birds	70
Cacti	20
Conifers	65
Mammals	55
Turtles	50

Percentage of species for which the global protected area network provides sufficient coverage.

GLOBAL

Protected Areas

Species Rarity

All Taxa 0 1

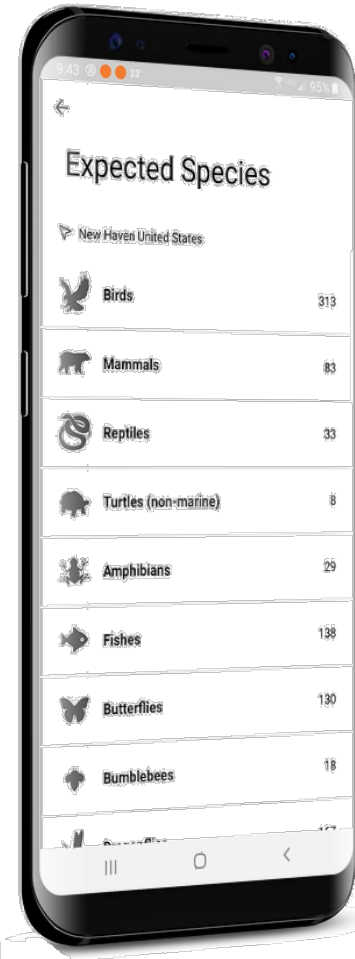
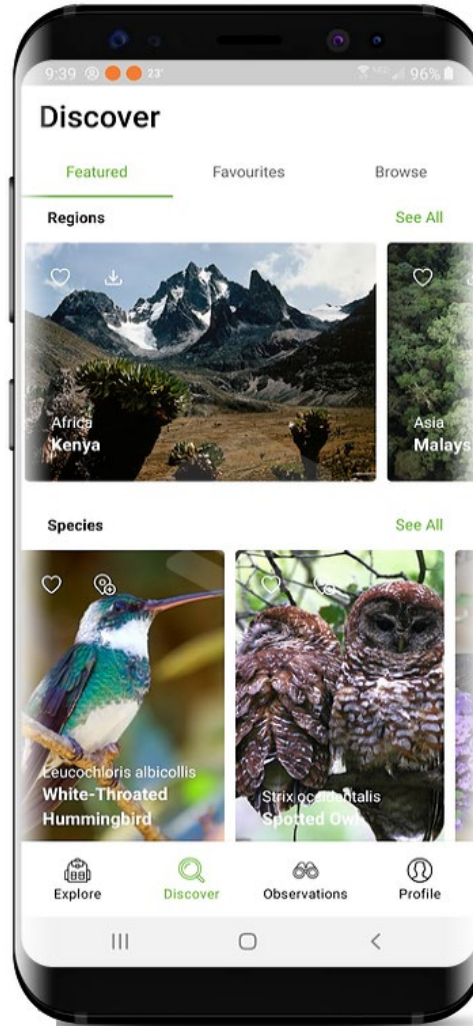
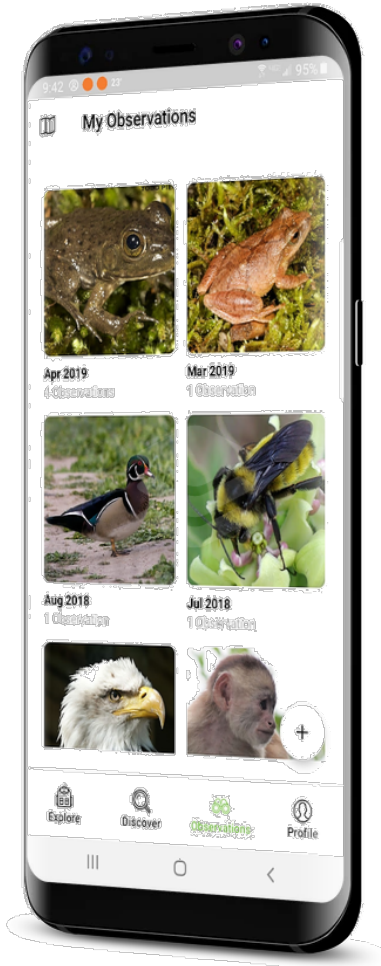
LEGEND

PARTNERS ...



**MOL**  
MAP OF LIFE

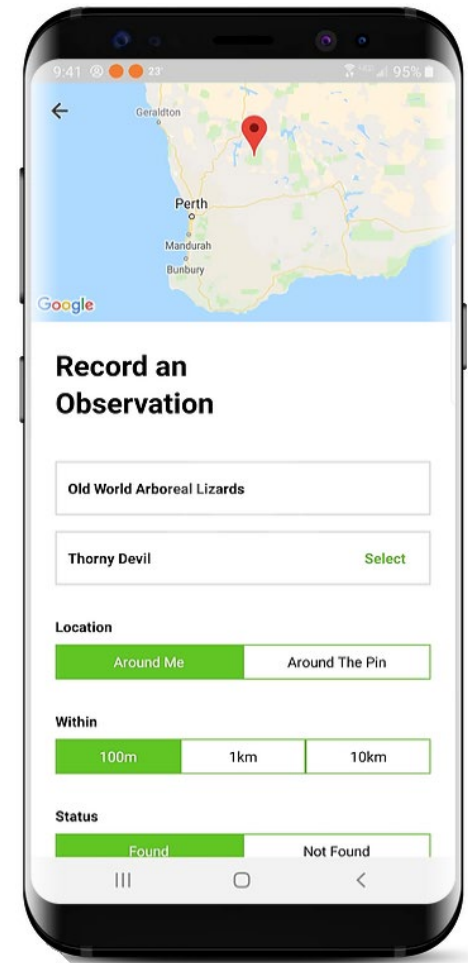
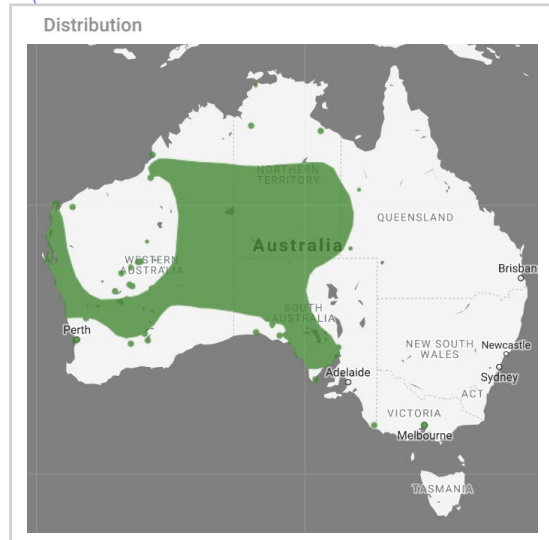
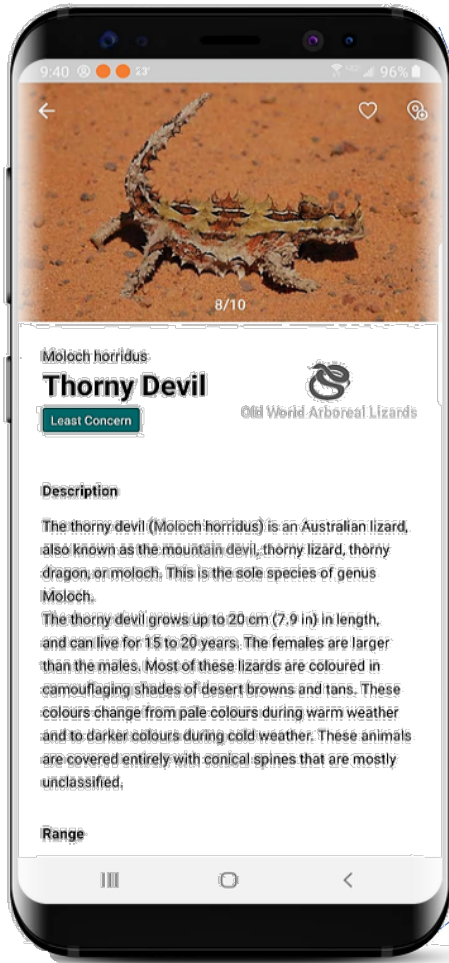
DISCOVER.





**MOL**  
MAP OF LIFE

RECORD.





**MOL**  
**MAP OF LIFE**



# Join us to celebrate E.O. Wilson's 90th Birthday on June 10, and throughout the month of June.

**GIVE THE GIFT OF SPECIES DATA.** Whether you're a scientist with data to share, a budding citizen scientist, or simply a nature lover, you are invited to join the celebration.

Go for a walk nature, head out on an adventure expedition, or share your archived data. The species observations you share with the **Half-Earth Project** in honor of E.O. Wilson will contribute to his dedication and passion for conservation Earth's biodiversity.





# TEAM

## Associated Researchers

### Faculty



Walter Jetz  
Lead PI  
Yale University



Robert Guralnick  
Associate Professor  
University of Florida



Marta Jarzyna  
Assistant Professor  
Ohio State University



Cory Merow  
Research Scientist  
Yale University



Dirk Karger  
Associate Researcher  
Yale University



Adam Wilson  
Assistant Professor  
University at Buffalo



Brett Jesmer  
Postdoctoral Associate  
Yale University



Mario Ribeiro de Moura  
Postdoctoral Associate  
Yale University



Scott Rinnan  
Postdoctoral Associate  
Yale University



Erica Stuber  
Postdoctoral Associate  
Yale University

### Staff



Ajay Ranipeta  
Lead Software Engineer  
Yale University



Raphael Lafrance  
Web Developer  
University of Florida



Nate Upham  
Postdoctoral Associate  
Yale University



Carsten Meyer  
University of Göttingen



Ruth Oliver  
Postdoctoral Associate  
Yale University



Michelle Duong  
Project Manager  
Yale University



Yanina Sica  
Research Associate  
Yale University



Wendy Dorman  
Data Curator  
Yale University

## Associated Graduate Students



Isabel del Toro Mijares  
Research Assistant  
Yale University



Krish Maypole  
Research Assistant  
Yale University



Amelia Linnett  
Research Assistant  
Yale University



Victoria Dombrowik  
Research Assistant  
Yale University



Ben Carlson  
PhD Student  
Yale University



Diego Ellis-Soto  
PhD Student  
Yale University



Muyang Lu  
PhD Student  
Yale University



Richard Li  
PhD Student  
Yale University

# Supporters

Yale



**UF** | UNIVERSITY of  
**FLORIDA**



The **Field**  
Museum

MacArthur  
Foundation

