Bat Eco-Interactions Working Group

Nate Upham and Aja Sherman
Co-Leads

WG members: *Cullen Geiselman, Nancy Simmons, DeeAnn Reeder, Kendra Phelps, Anna Willoughby, Quentin Groom, Donat Agosti, Jorrit Poelen*

21 May 2024 | GBatNet meeting, Houston

Bat Eco-Interactions Working Group

Aja Sherman
Bat Eco-Interaction Project

Cullen Geiselman
Bat Eco-Interaction Project

Nancy Simmons
American Museum of Natural History

Jorrit Poelen
UC Santa Barbara

Quentin Groom
Meise Botanical

DeeAnn Reeder
Bucknell University

Nathan Upham
Arizona State University

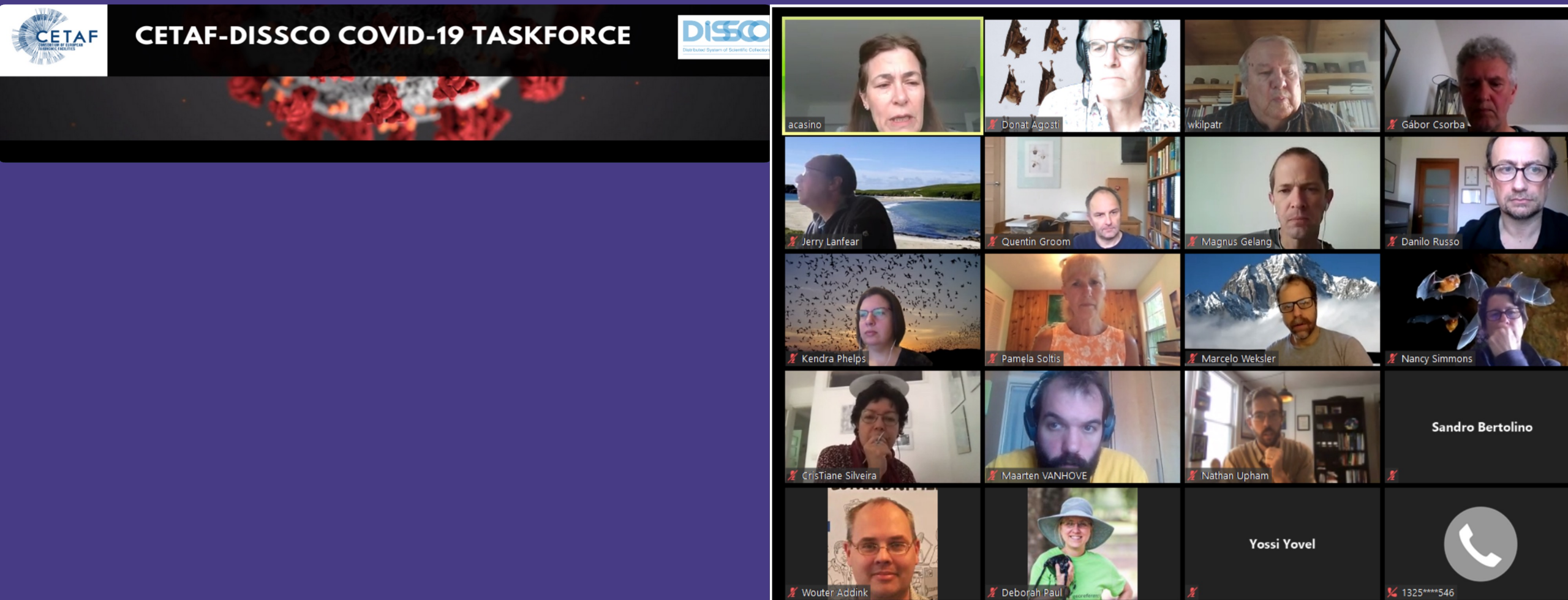
Kendra Phelps
EcoHealth Alliance

Donat Agosti
Plazi

Anna Willoughby
Univ Georgia

April 2020… **Goal:** liberate bat-virus data

- **Novel coronavirus**: SARS-CoV-2
- **Likely host reservoirs**: mammals ➤ bats ➤ horseshoe bats (*Rhinolophus* sp.)



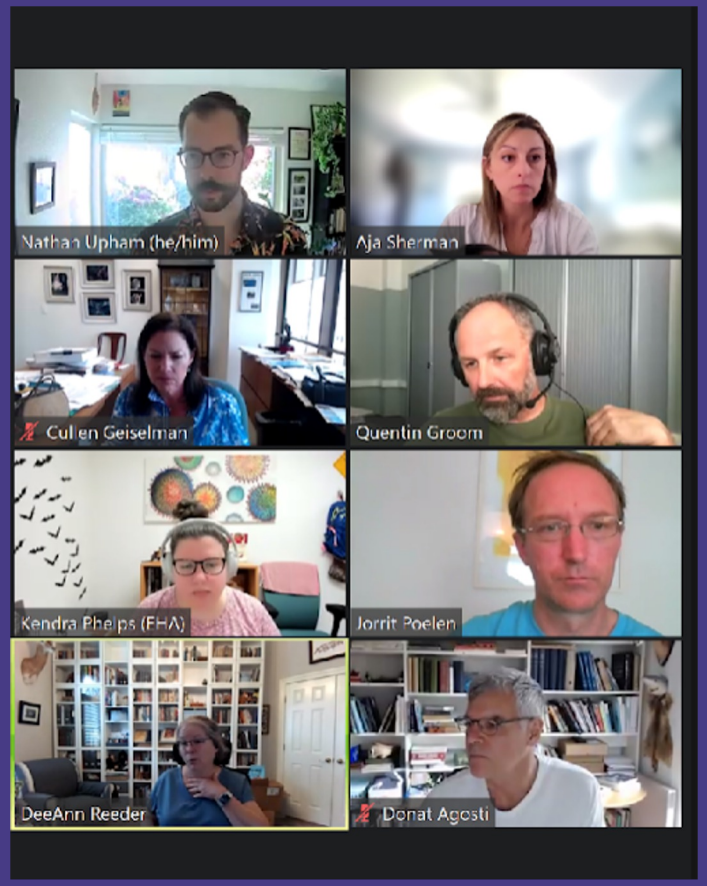
April 2020… **Goal:** liberate bat-virus data

…Now May 2024 and still meeting weekly!

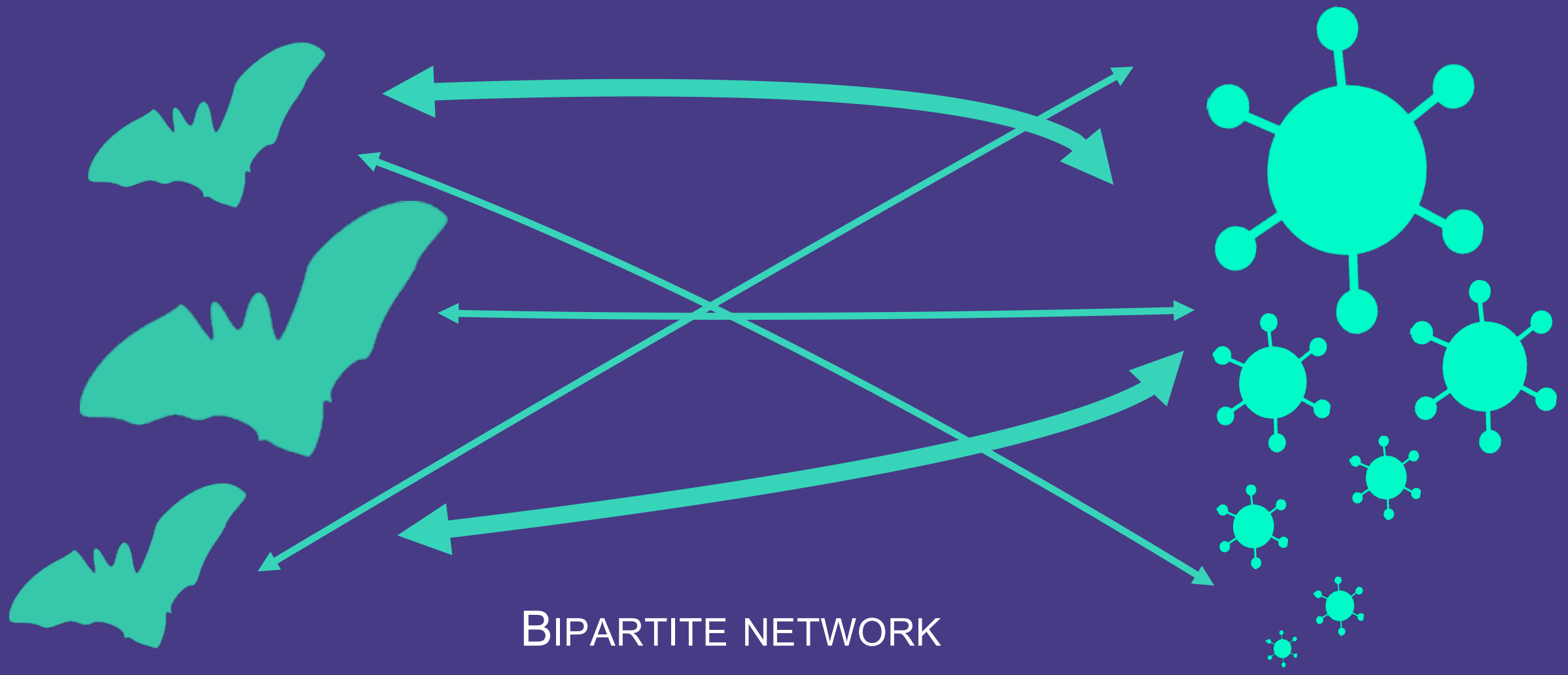
Weekly Notes - Bat Eco-Interactions Working Group

Meeting zoom: https://deic.zoom.us/j/7588563077
Meeting time: 5pm CET / 11am ET / 8am PT
Whimsical board for brainstorming:
https://whimsical.com/biodiversity-knowledge-hub-WyqgfhD1V4rMg5W7d6CnYY

10 May 2024
8 May 2024
1 May 2024
24 April 2024
17 April 2024
3 April 2024
27 March 2024
20 March 2024

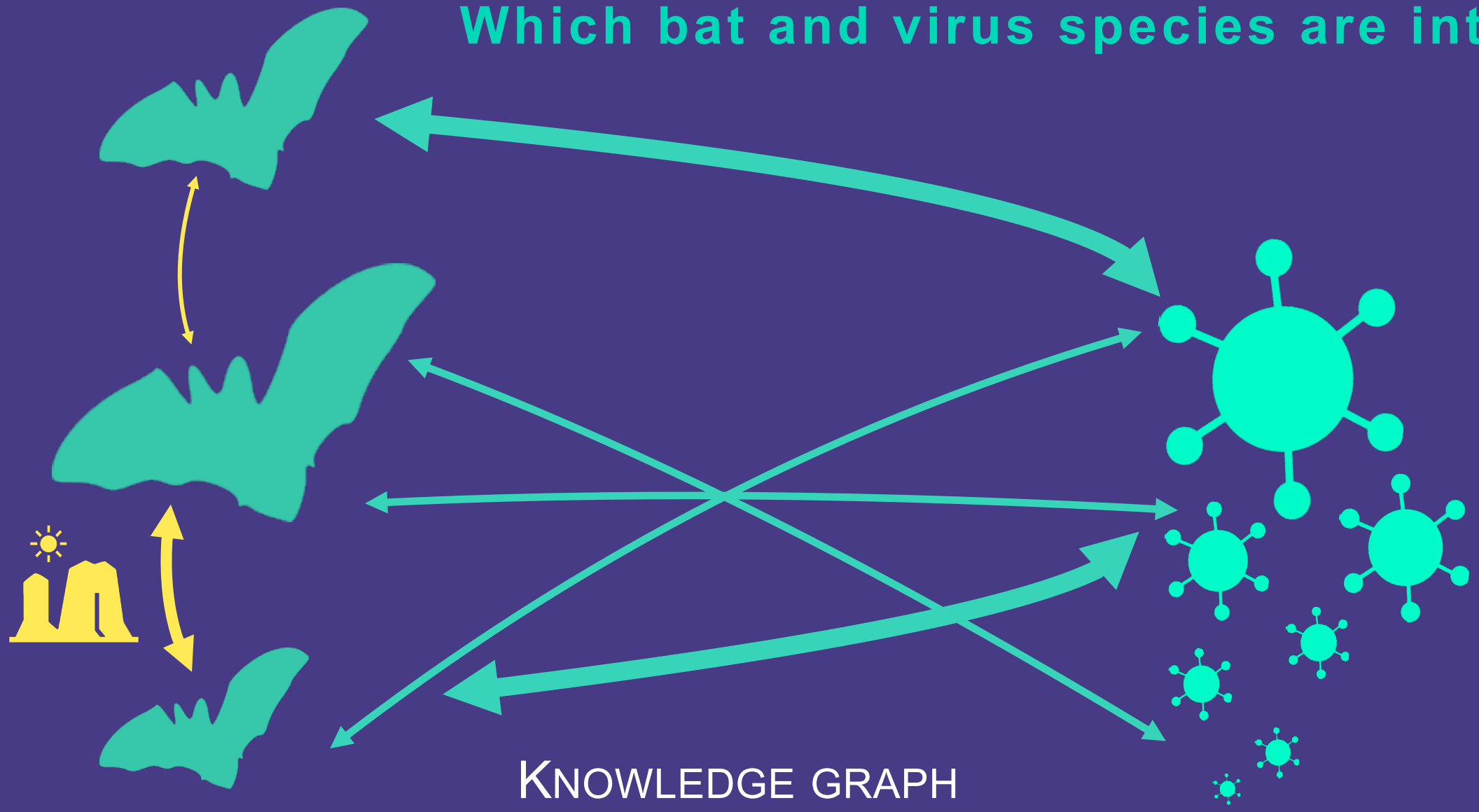


Which bat and virus species are interacting?



Which bat species are interacting?

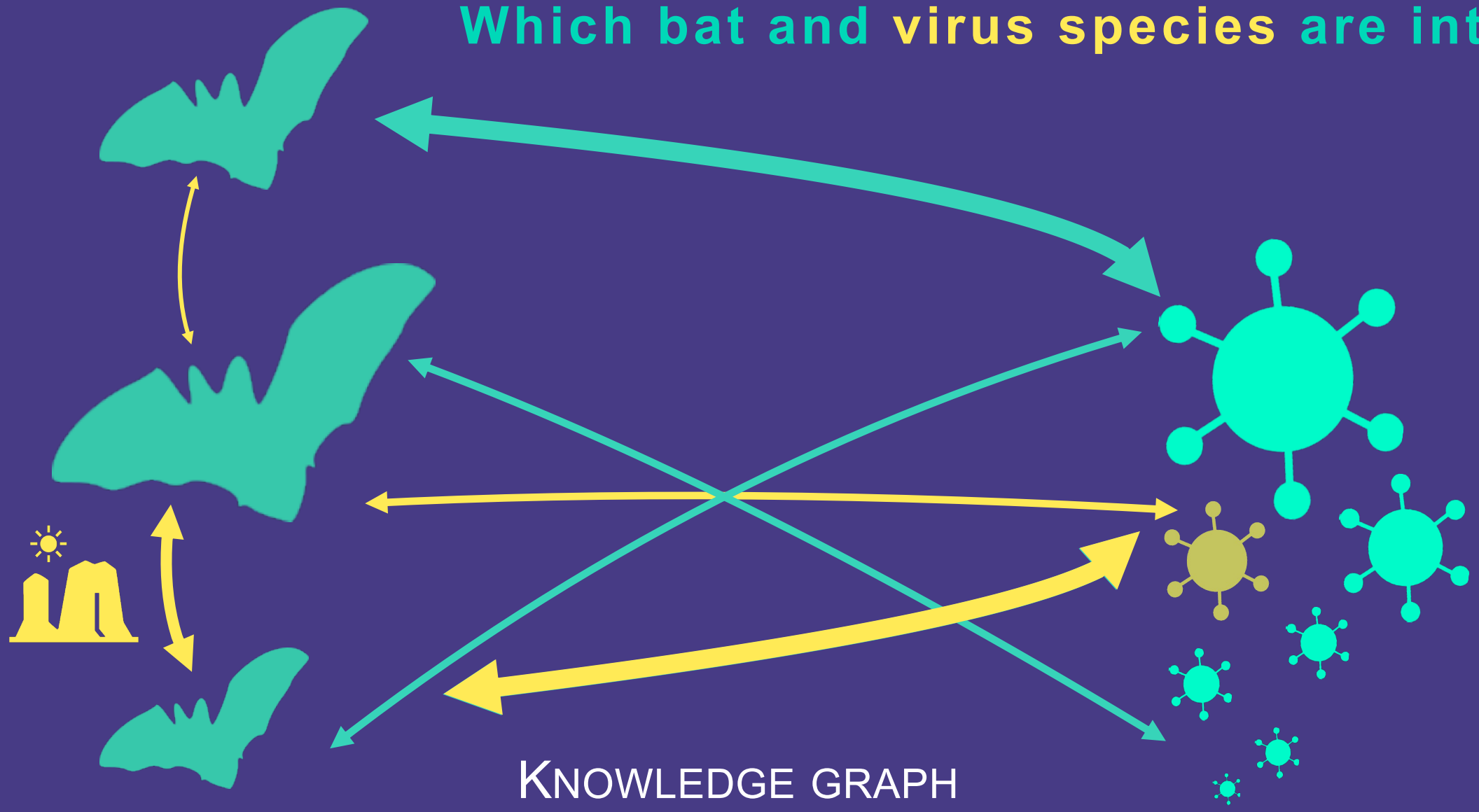
Which bat and virus species are interacting?



KNOWLEDGE GRAPH

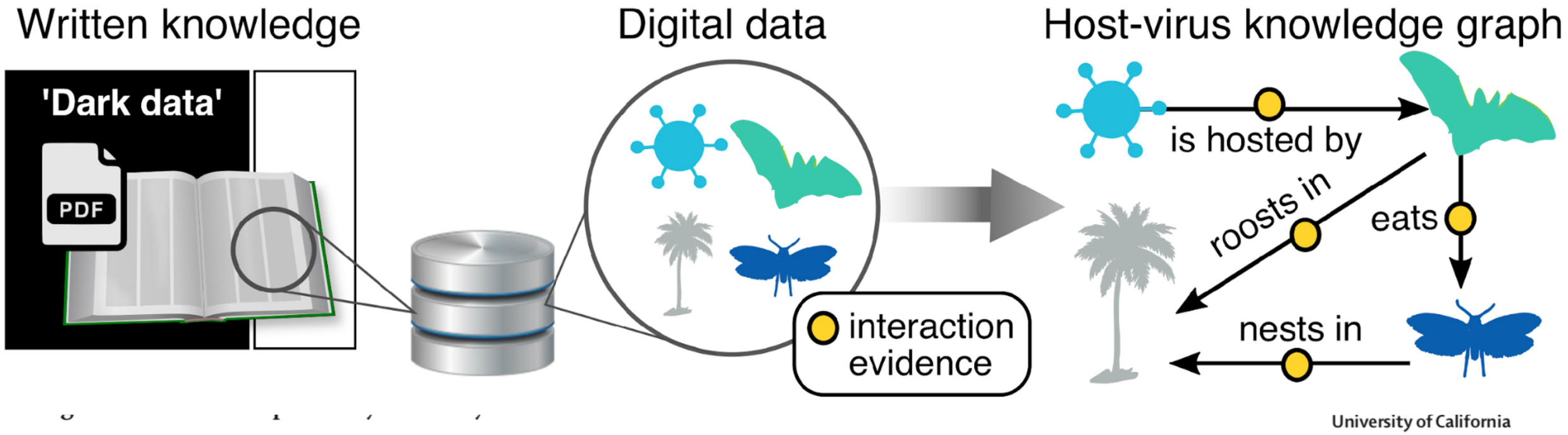
Which bat species are interacting?

Which bat and virus species are interacting?

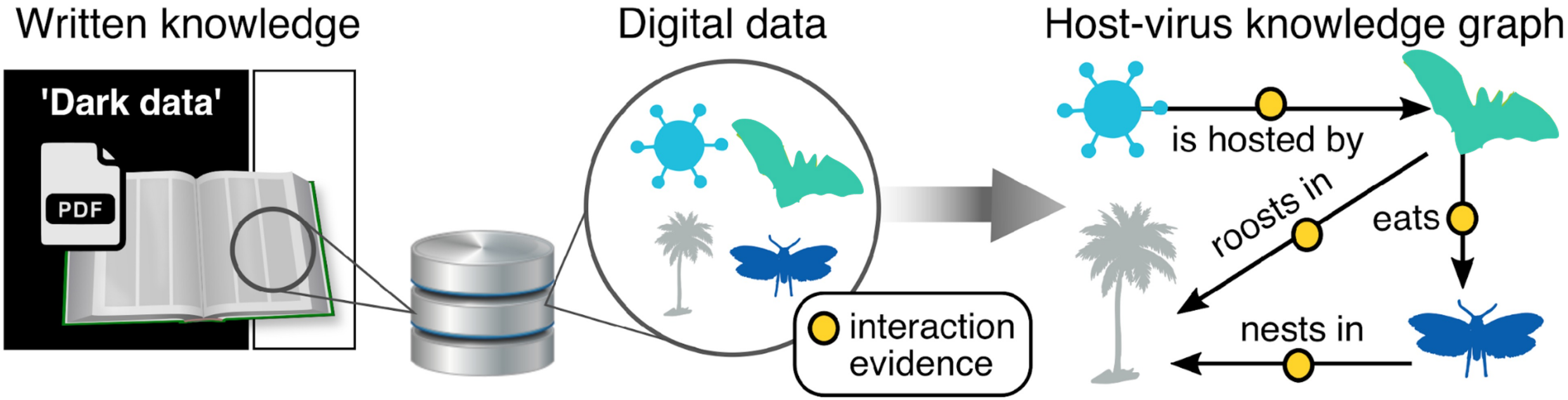


Liberating host–virus knowledge from biological dark data

Nathan S Upham, Jorrit H Poelen, Deborah Paul, Quentin J Groom, Nancy B Simmons, Maarten P M Vanhove, Sandro Bertolino, DeeAnn M Reeder, Cristiane Bastos-Silveira, Atriya Sen, Beckett Sterner, Nico M Franz, Marcus Guidoti, Lyubomir Penev, Donat Agosti

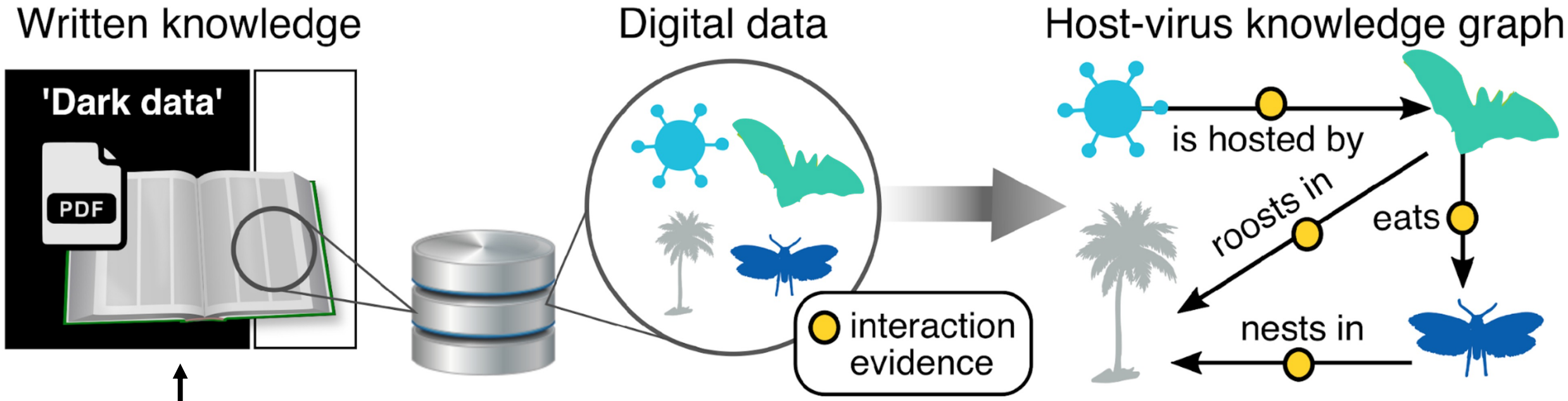


Upham et al. (2021) *The Lancet Planetary Health*



Objectives:

(1) Dark data: most eco-interactions are digitally unknown



Species interactions

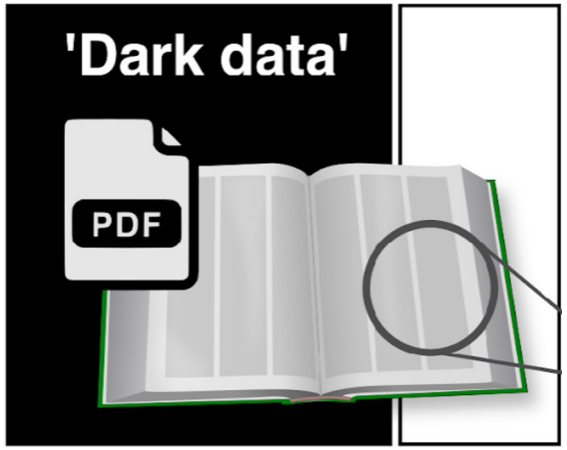
Observations, collections

Objectives:

(1) Dark data: most eco-interactions are digitally unknown

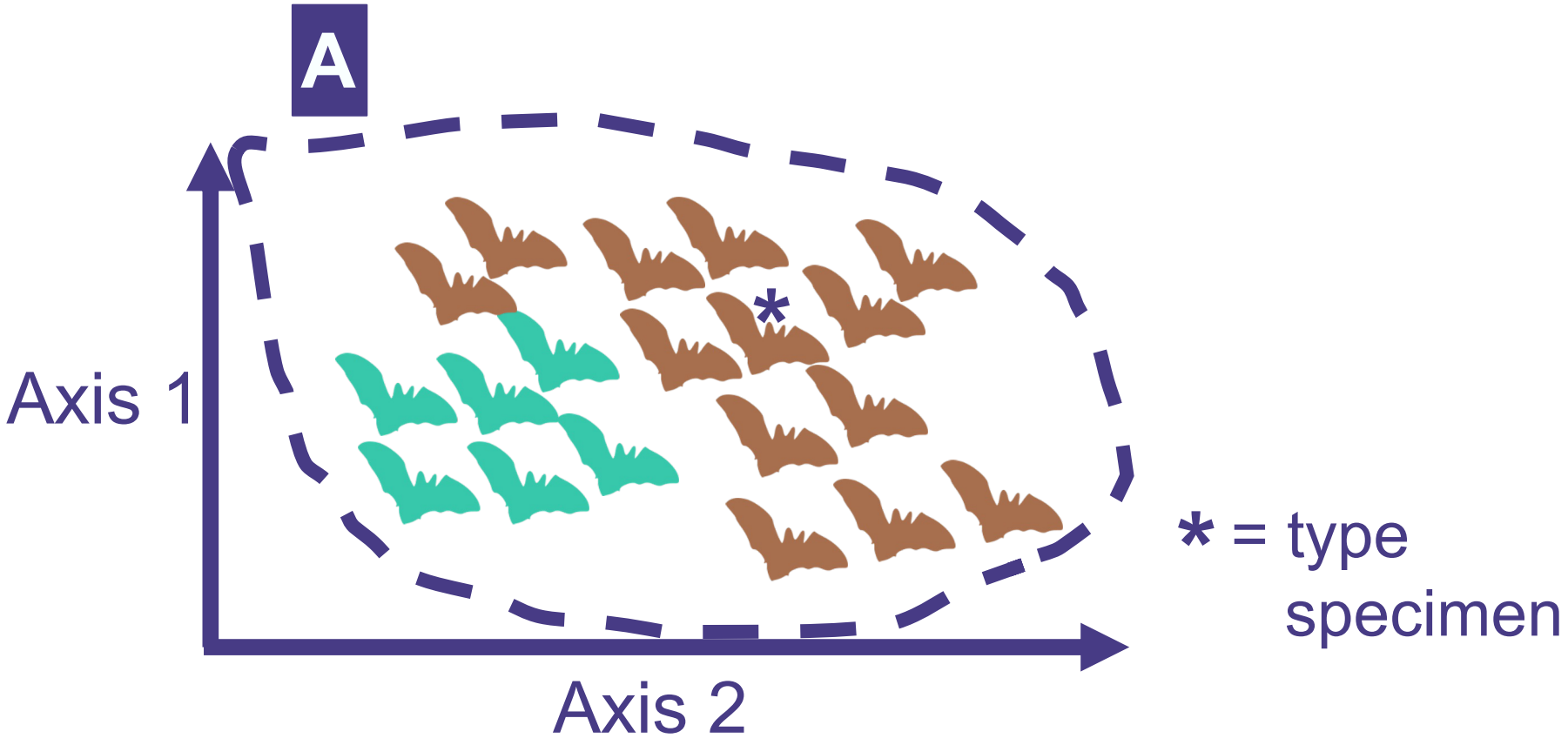
(2) Taxonomy: species name-to-meaning changes over time

Written knowledge



Species interactions

Observations, collections

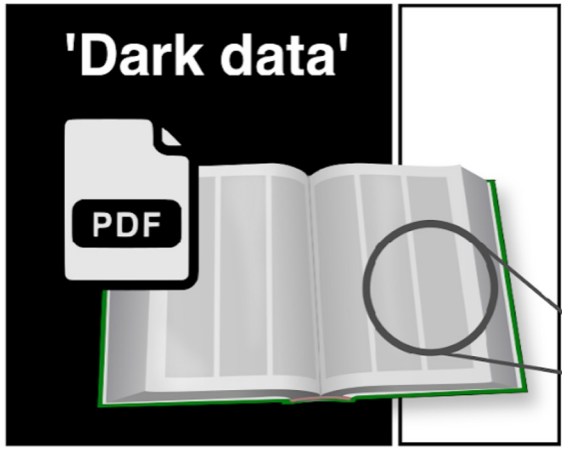


Objectives:

(1) Dark data: most eco-interactions are digitally unknown

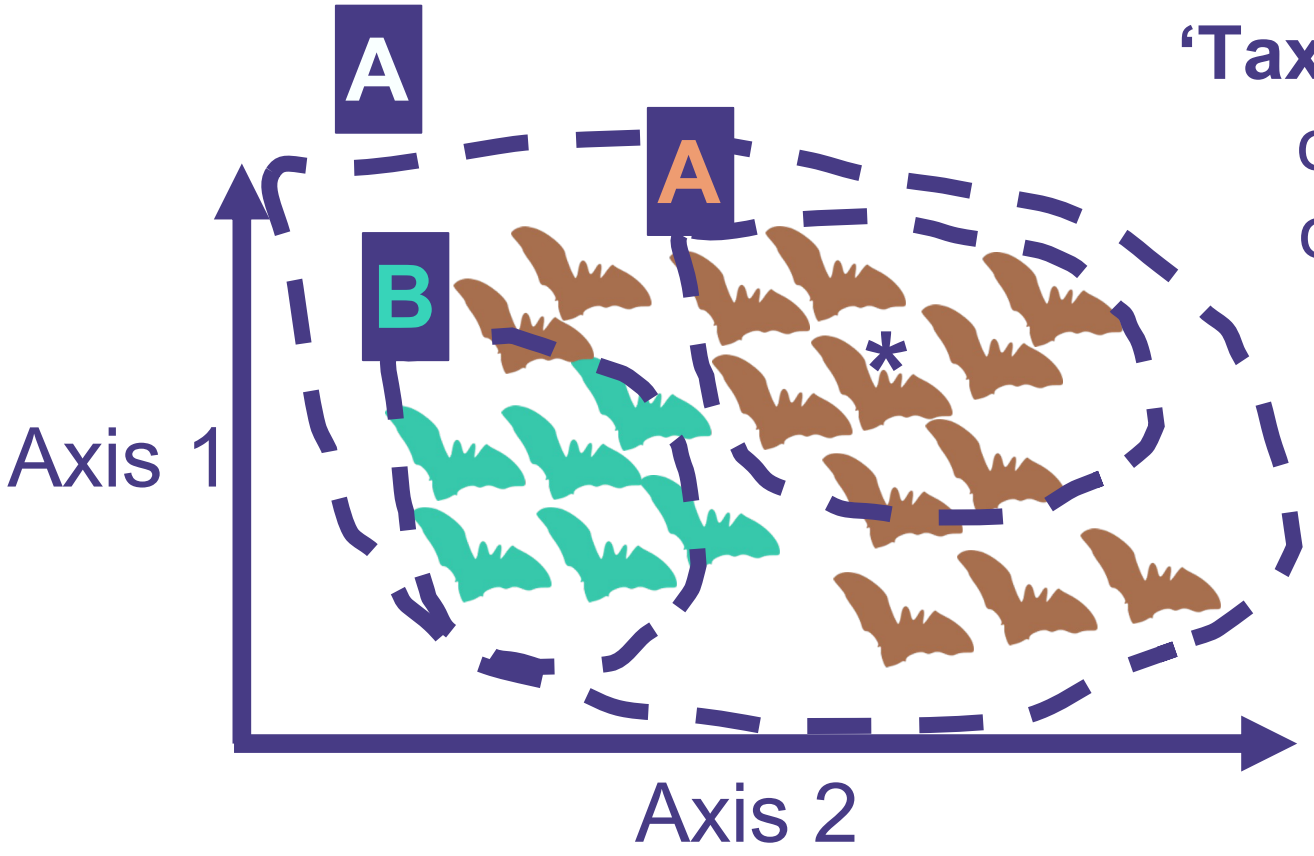
(2) Taxonomy: species name-to-meaning changes over time

Written knowledge



Species interactions

Observations, collections



'Taxonomic decay' of interaction observations over time

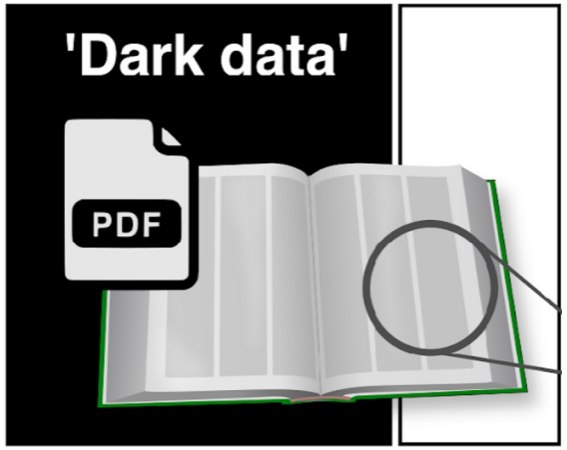
* = type specimen

Objectives:

(1) Dark data: most eco-interactions are digitally unknown

(2) Taxonomy: species name-to-meaning changes over time

Written knowledge



Species interactions

Observations, collections

Objectives:

(1) Dark data: most eco-interactions are digitally unknown

(2) Taxonomy: species name-to-meaning changes over time

(3) Publications: lack of open-access FAIR availability

1- TO 3-YEAR GOALS:

(1) Dark data: most eco-interactions are digitally unknown

→ Bat Co-roosting Project

(2) Taxonomy: species name-to-meaning changes over time

→ Bat Taxonomic Alignment Project

(3) Publications: lack of open-access FAIR availability

→ Bat Literature Project

(1) Bat Co-roosting Project

17,238 interactions

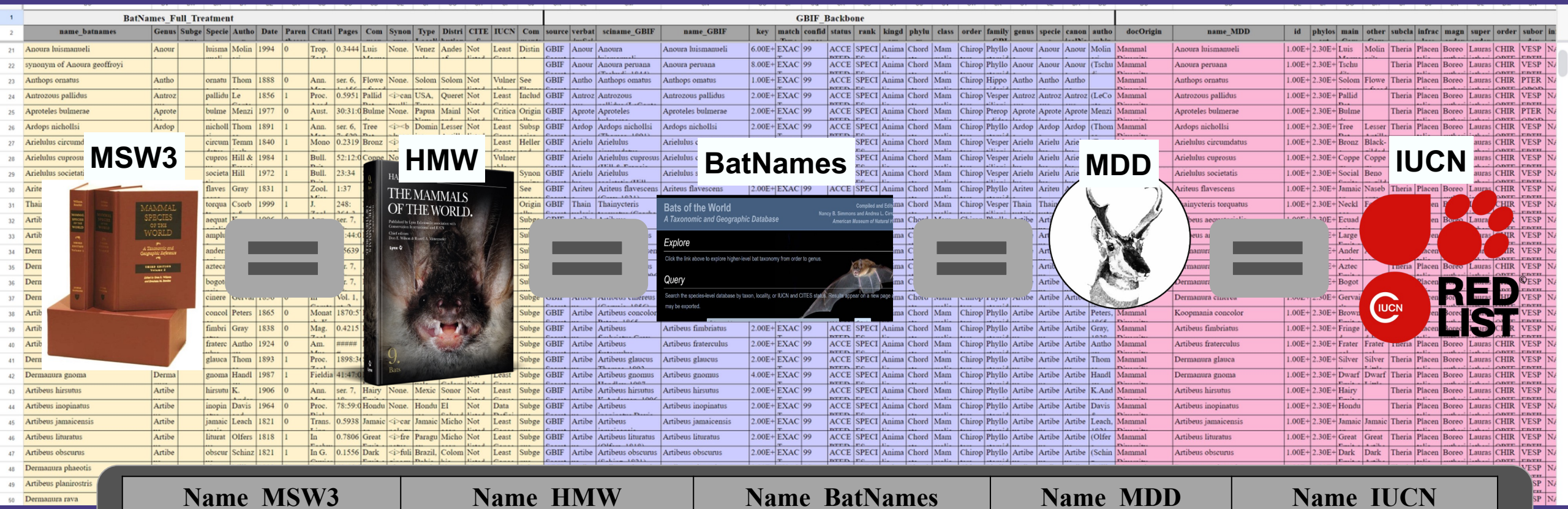
644 bat species

333 publications

1860-2020 span

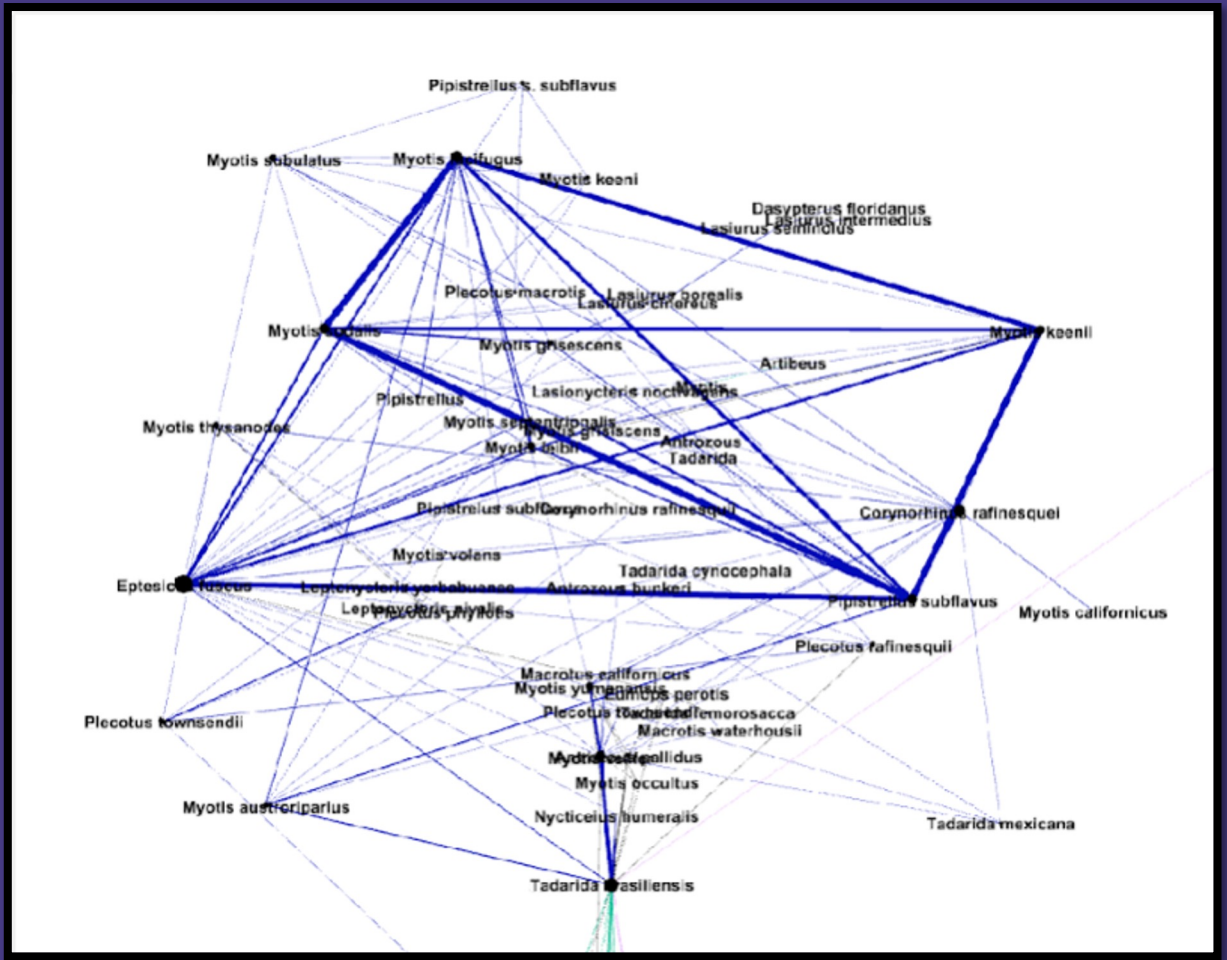
Machine Learning Training Dataset

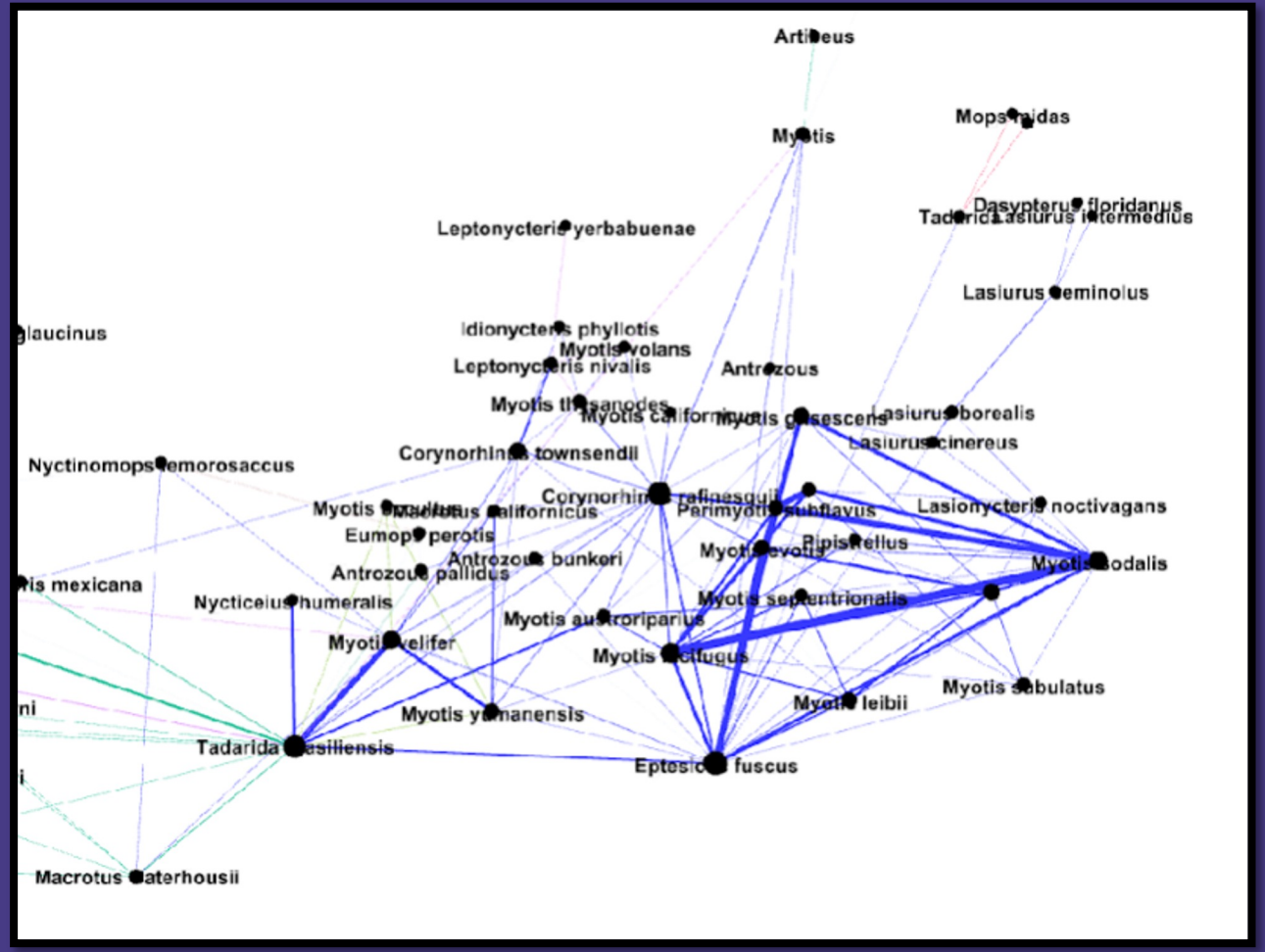
(2) Bat Taxonomic Alignment (BTA)



Name_MSW3	Name_HMW	Name_BatNames	Name_MDD	Name_IUCN
synonym of Artibeus lituratus palmarum	synonym of Artibeus lituratus palmarum	Artibeus intermedius	synonym of Artibeus lituratus	

Example of Resolved Taxonomy





Before **After**

Tadarida cynocephala now considered a subspecies of *Tadarida brasiliensis*

(3) Bat Literature Project

Goal: To create a global public repository of bat literature in Zenodo

- Eliminate common obstacles, liberating resources for FAIR access to existing knowledge for the broader scientific community
- Make each publication citable and digitally represented
- Enhance the metadata

What we need help with

- **Collecting PDFs!**
  - Send us your bat biodiversity libraries for digitization
- **Collecting co-roosting data!**
  - Point us to additional sources of ecological interactions
  - Automate data mining workflow
- **Broader applications of the Bat Taxonomic Alignment**
  - Translating ecological or genetic data for taxonomically complex groups like *Myotis* or *Pteronotus*

Acknowledgments — Thank you!

NIH NIAID

BAT ECO-INTERACTIONS
BATBASE.ORG

GLoBI

American Museum of Natural History

PLAZI
TAKING CARE OF FREEDOM

ARCADIA

Meise Botanic Garden

EcoHealth Alliance

zenodo

ASU Biodiversity Knowledge Integration Center
Arizona State University

Biodiversity Literature Repository

Bucknell University

Center for the Ecology of Infectious Diseases
UNIVERSITY OF GEORGIA