SUMMARY OF DATA NEEDS

Below is a summary of data needs as identified by participants of the Seed Dispersal Workshop (May 2016). While many of these data are collected independently, we lack comprehensive data on dispersal and demography in the same system and for the same taxa. We also highlight existing available data that need to be combined with dispersal data. This is not a comprehensive list of data needs but were those identified as important gaps to be filled.

Movement of Seeds

Animal-dispersed species

Adhesion rates
Disperser residence times in different habitats
Handling times
Gut passage time - more of a continuous evaluation
Animal Movement across different habitats
- mark-release-recapture
- telemetry data
- *Existing*: Global data archive of animal tracking data with 811 taxa, 1 billion locations, 1.4 billion non-location events in Movebank (Kranstauber *et al.* 2011, Wikelski and Kays 2018)

Animal movement linked to gut passage
Animal Traits
- *Existing*:
    o Traits for 214 extant mammal and 242 bird species of Madagascar (Razafindratsima *et al.* 2018)
    o Global database of species-level foraging attributes for 9993 and 5400 extant bird and mammal species (Wilman *et al.* 2014)
    o Global database of diet preferences of 5364 mammals (Kissling *et al.* 2014)
    o Global database of traits, phylogeny, and range maps for 5831 known mammal species extant since the last interglacial, including current ranges and present natural ranges predicted in the absence of anthropogenic pressures (Faurby *et al.* 2018)
    o Global database of bird and mammal traits (volancy, diurnal/nocturnal, clutch size, body mass, habitat breadth) for all bird and mammal species,

with values derived (and missing values phylogenetically imputed) from other existing databases (Cooke *et al.* 2019)

- o Global database of bird bill morphology from 3D scans of museum specimens, including landmark data. Initial dataset (roughly 1 species per genus) available at http://data.nhm.ac.uk/dataset/markmybird and species-level coverage expected soon (Cooney *et al.* 2017)

Time/space budgets of animal

Animal foraging, including seasonality of animal foraging

Demography

- *Existing:* 1927 matrix population models from 405 species in COMADRE (Salguero-Gómez *et al.* 2016, COMADRE Animal Matrix Database 2018)

Interaction Networks

Multi-year interaction networks

Interchangeability of dispersers and interactions between them

Beta diversity of interaction networks

Abundance of organisms out there (so we can understand opportunism vs. trait-based drivers of network structure)

Existing:

- Web resources and interfaces with seed dispersal interactions and other interaction types:
  - Interaction Web Database (https://www.nceas.ucsb.edu/interactionweb/)
  - Web of Life (http://www.web-of-life.es/)
  - Globi (Global Biotic Interactions; https://www.globalbioticinteractions.org/)
    - o Most current and largest database of interactions. Although data from network studies are presented in this database, they are not presented as adjacency matrices as in the other resources. R package to access the data (Poelen *et al.* 2018), and an active platform to incorporate additional data via github (https://github.com/ropensci/rglobi), are also available.
- Studies that develop databases of seed dispersal network interactions compiled from multiple studies and that make these databases available in supplementary materials:
  - A database of networks involving fruit-eating neotropical bats (Mello *et al.* 2011a, b)

- A database of plant-frugivore interactions, including bird-plant interactions only, with substantial overlap with the Web of Life networks (Pigot *et al.* 2016).

Wind-dispersed species

Settling velocities
Wind speeds
Turbulence
Variances
Directions with seeds
Existing: Micrometeorological data available from the FLUXNET Network (http://fluxnet.ornl.gov/; http://fluxnet.fluxdata.org; Baldocchi *et al.* 2001)

Water-dispersed species

Flow speeds
Turbulence

Plant data

Presence/absence data
- *Existing:*
  - 206,241,288 observations from 485, 902 species Botanical Information and Ecology Network (Enquist *et al.* 2016, Enquist *et al.* 2018)
  - 1,038,689,568 occurrence data from over 1,000,000 species from the Global Biodiversity Information Facility (GBIF: The Global Biodiversity Information Facility 2018)

Fitted dispersal kernels
- *Existing*: Data available for 144 vascular plant species from 63 families (Bullock *et al.* 2017)

Spatial patterns of plants - subsample at smaller scales (more continuous)
- *Existing*: Forest Global Earth Observatory (ForestGEO; Anderson-Teixeira *et al.* 2015)

Seed rain relative to distance from conspecifics
Long distance dispersal
- *Existing*: Maximum dispersal distances available for 576 plant species from 102 families (Tamme *et al.* 2014)

Landscape genetics

Fruit/seed production (variability and environmental drivers of)

Plant Demography

Seed dispersal effectiveness
- quality of the microsite
- distance-dependent and density-dependent mortality

Demographic transition probability matrices for use in matrix models
- at low and high densities for population spread questions
- along climatic gradient
- *Existing*: 7024 matrix population models from 695 species (Salguero-Gómez *et al.* 2015, COMPADRE Plant Matrix Database 2018)

Fitted integral projection model (IPM) for population modeling

Datasets for IPM's over time

Plant traits

Fruit/seed trait information
- *Existing*:
  - KEW Royal Botanical Gardens Seed Information Database (Royal Botanic Gardens Kew 2016): Dispersal syndromes (25,050spp), seed weights (25,050spp), germination rates (12,424 spp)
  - LEDA Traitbase: 26 plant traits from *ca*. 3000 species of the Northwest European flora (https://uol.de/en/biology/landeco/research/projects/leda/; Kleyer *et al.* 2008)
  - TRY Plant Trait Database (148,000 plant taxa; Kattge *et al.* 2011)
  - FRUBASE: Fleshy fruit traits for more than 1000 plant species (Jordano 1995a, b)
  - Global database of fruit traits for 13,178 fleshy fruited plant species (Sinnott-Armstrong *et al.* 2018)
  - eFloras (online flora; Brach and Song 2006)
  - USDA PLANTS Database (http://plants.usda.gov)
  - Useful Tropical Plants Database contains information on the uses of thousands of plants grown in tropical regions (http://tropical.theferns.info)

Source plant traits

Changes in traits with climate

Population-level data

Population densities and spread over time

Environmental data

Weather conditions
Soil conditions (e.g. nutrient availability, moisture content)
Light availability

Existing: Environmental data from 81 field sites (47 terrestrial and 34 aquatic) in the United States from the National Ecological Observatory Network (National Ecological Observatory Network 2018)

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