Disease Emergence and Richness in Primates

Jenny Huang, Jingjing Shi, Andrew Patterson, Melanie Wang,
Courtney Werner, Marie C. Chelini, Jim Moody, Charles L. Nunn

1 Introduction

We are interested in the drivers of parasitism in primates...

Fig. 1 bipartite network linking host to parasite.

2 Data

Global Primate Parasite Database (GPPD)

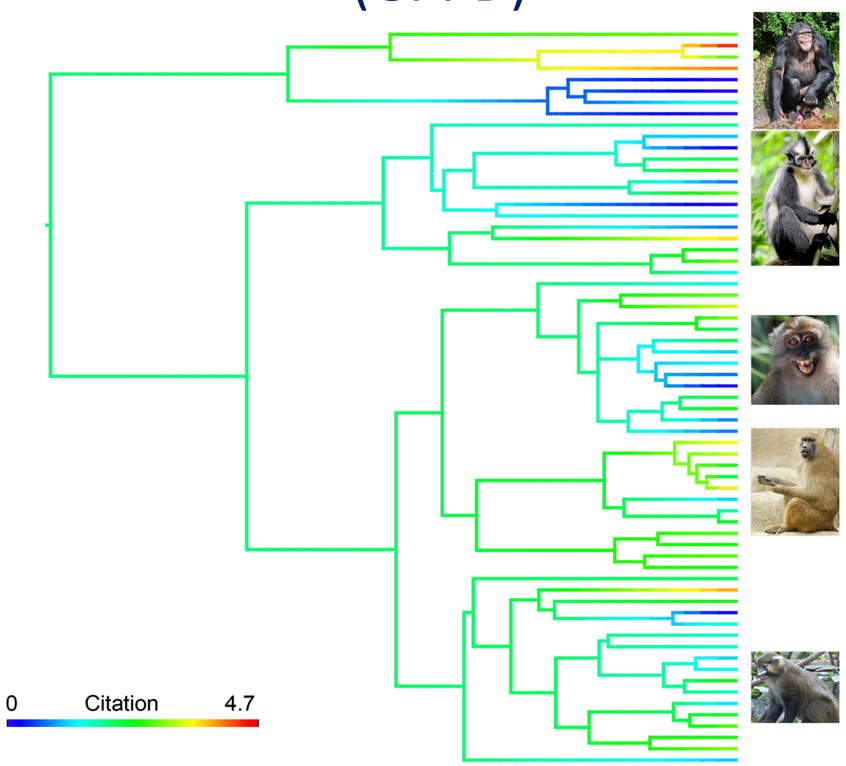


Fig. 2 Phylogenetic tree colored by sampling effort.

3 Network and Prediction

Phylogeny-based prediction methods identified undocumented host-parasite interactions.

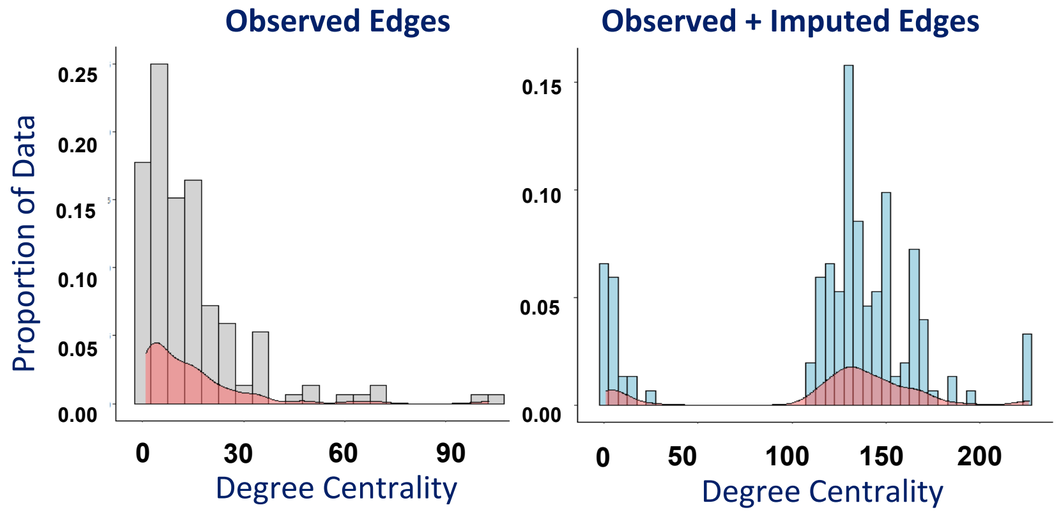


Fig. 3
Degree centrality before and after adding predicted edges.

4 PGLS

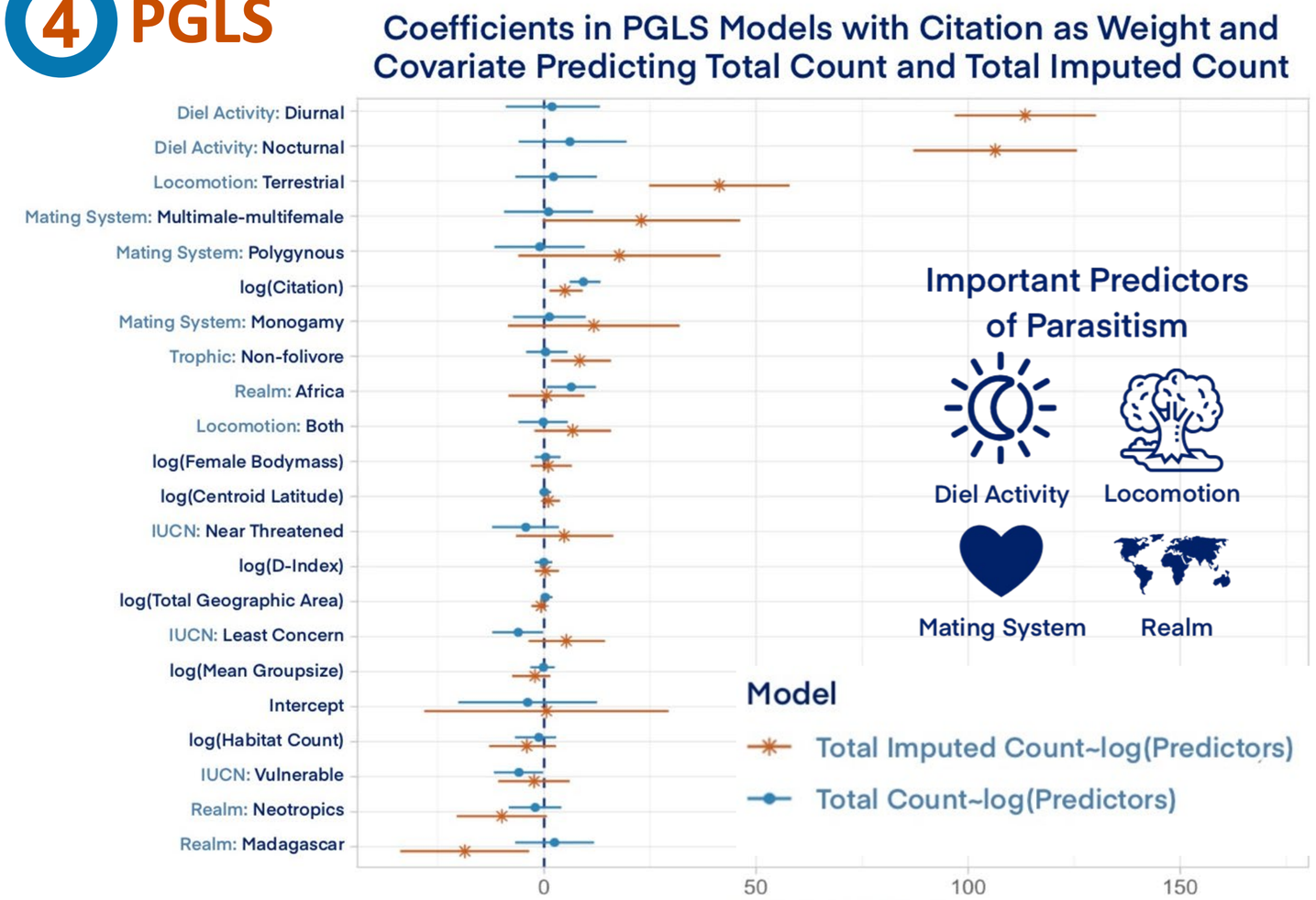
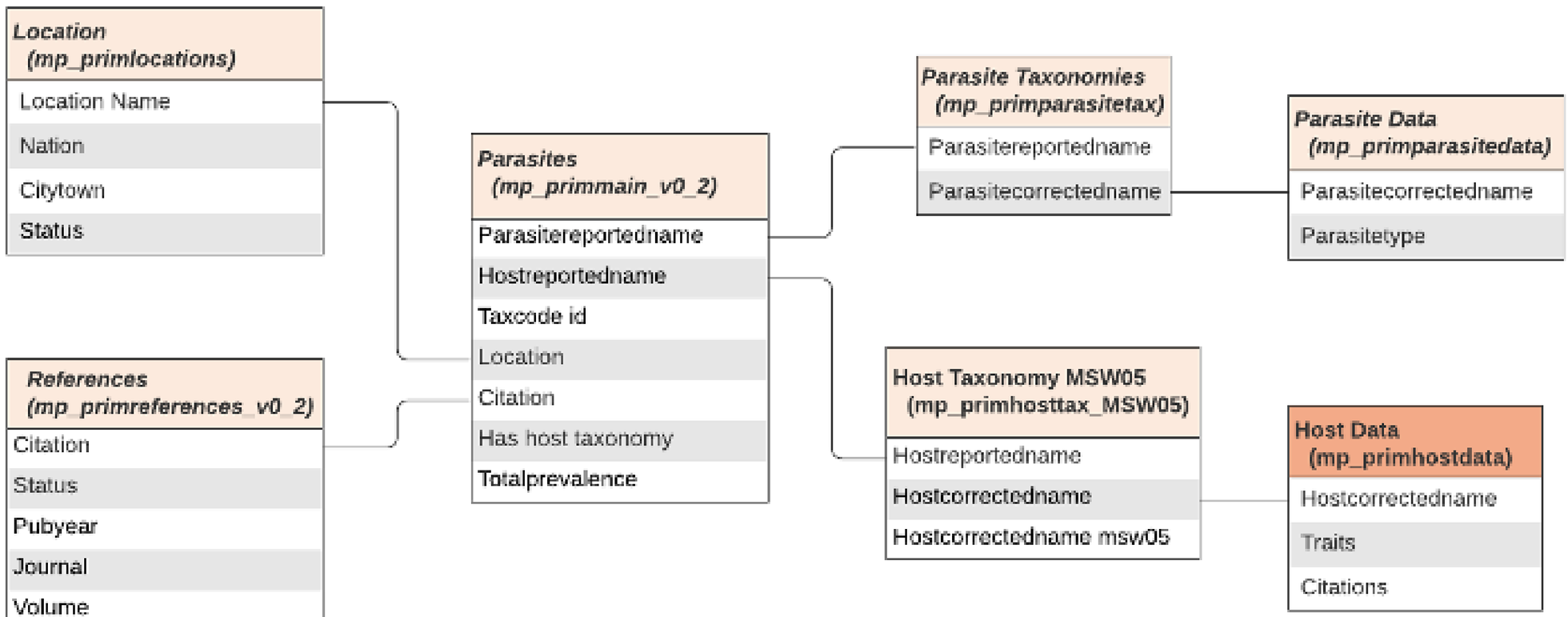


Fig. 4 Models predicting parasite counts show certain predictors have larger influences on count.

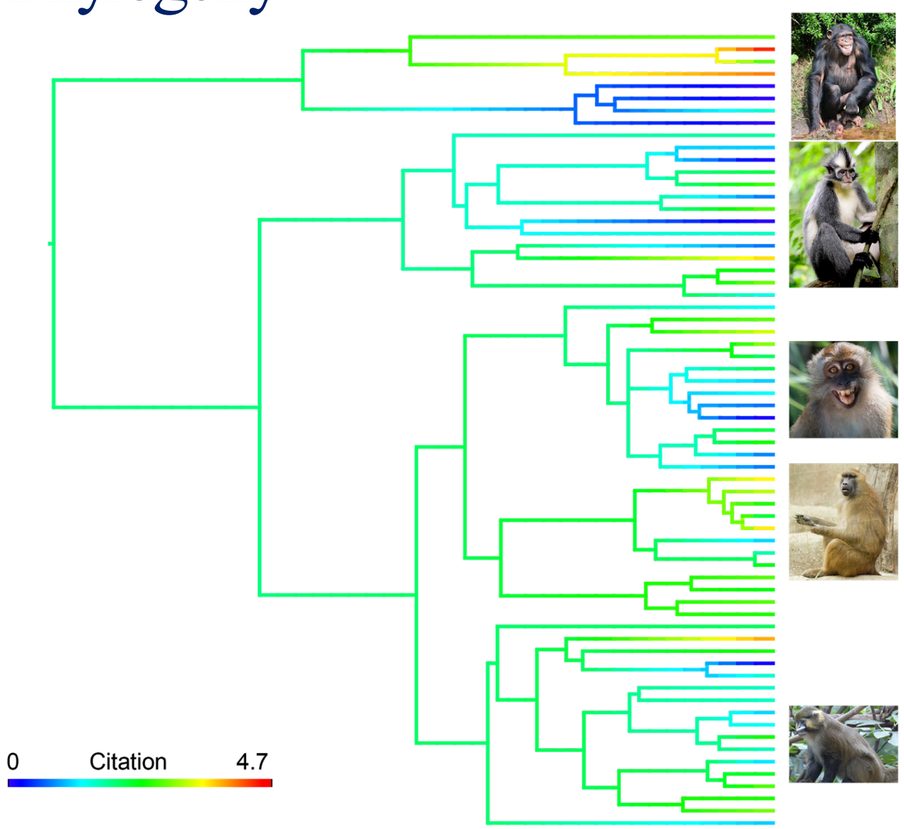
Data

Global Primate Parasite Database (GPPD)



A compilation of parasites+pathogens from wild primate hosts

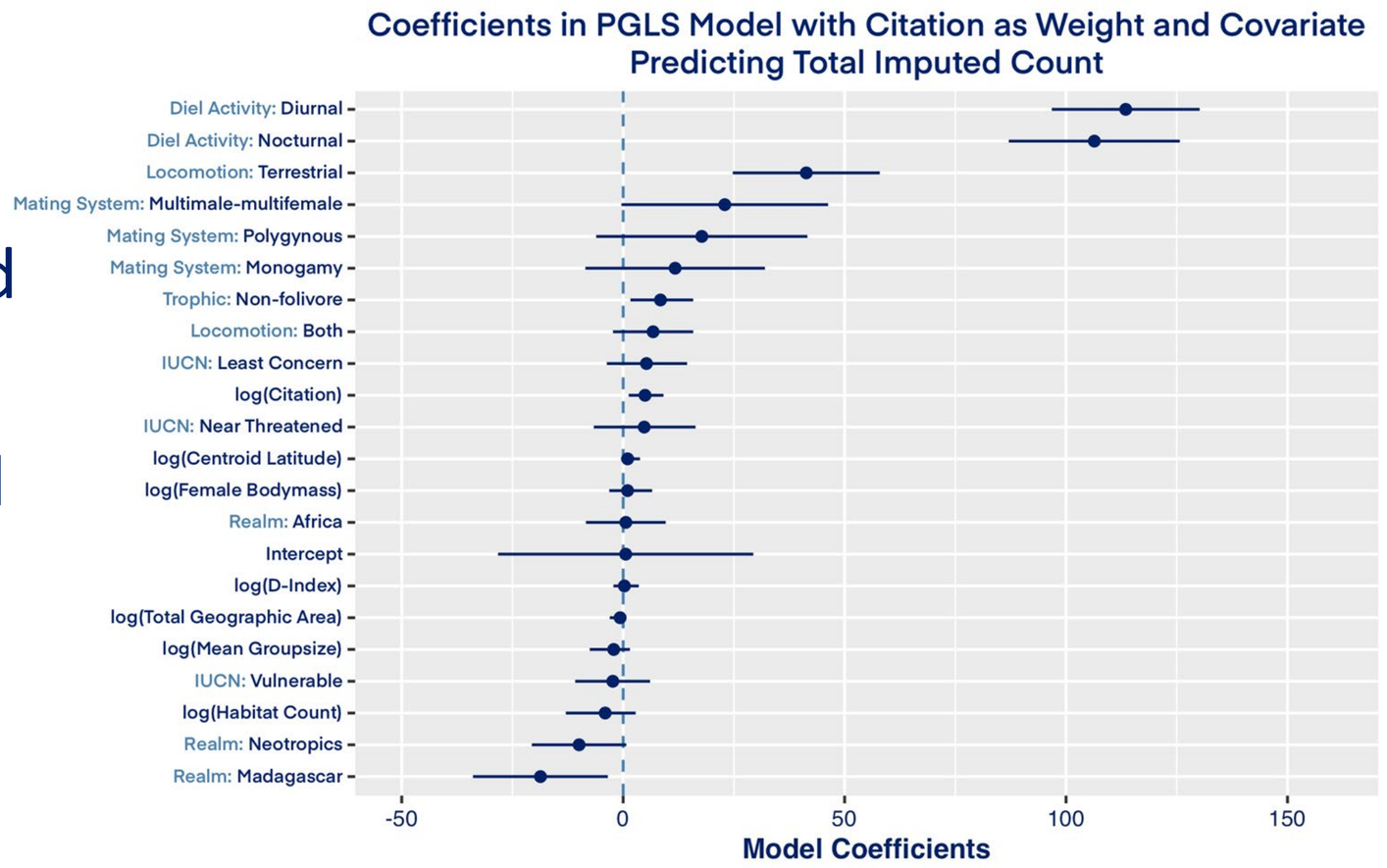
Phylogeny

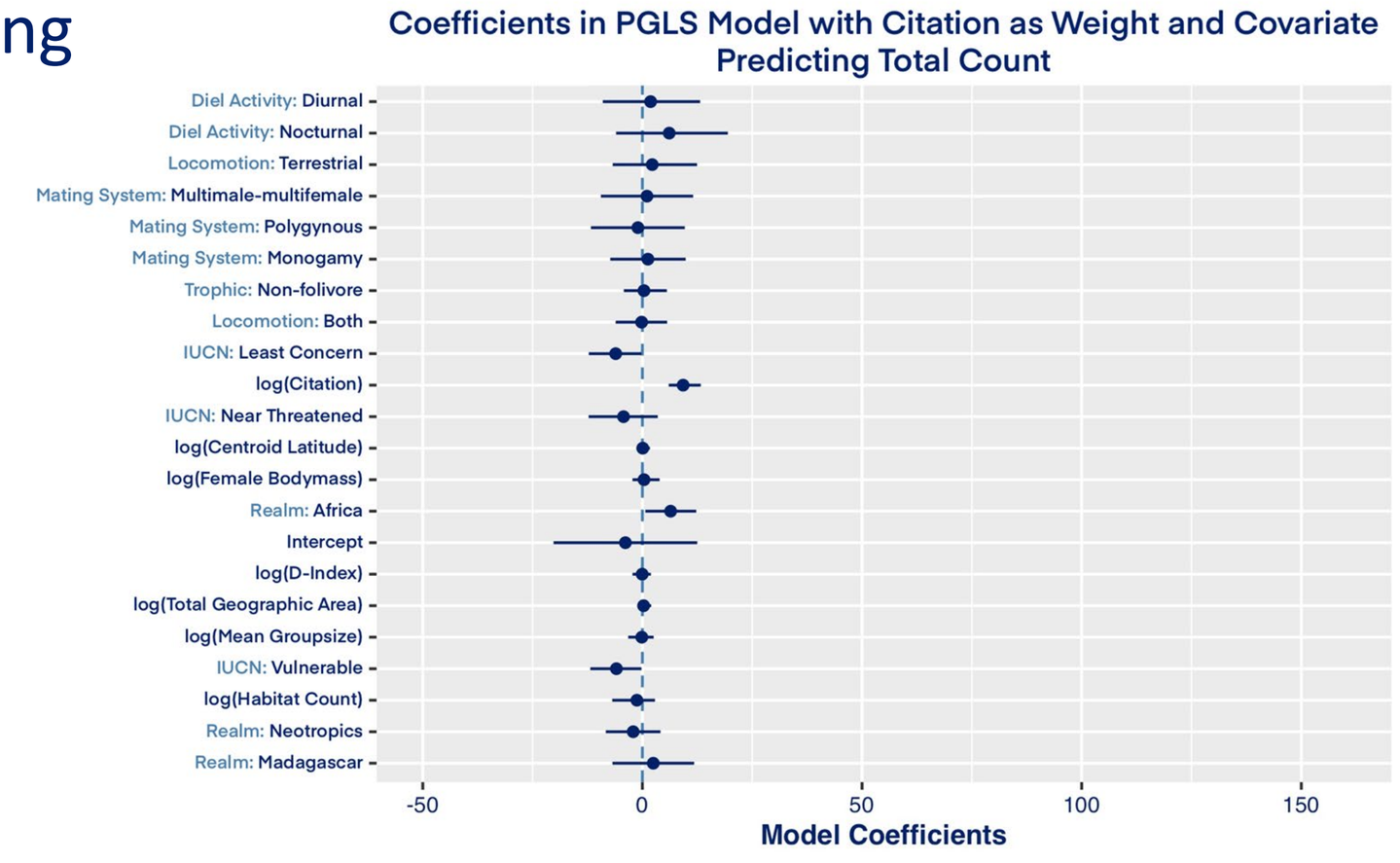


Some species are studied much more than other species

Phylogenetic Generalized Least Squares (PGLS) models

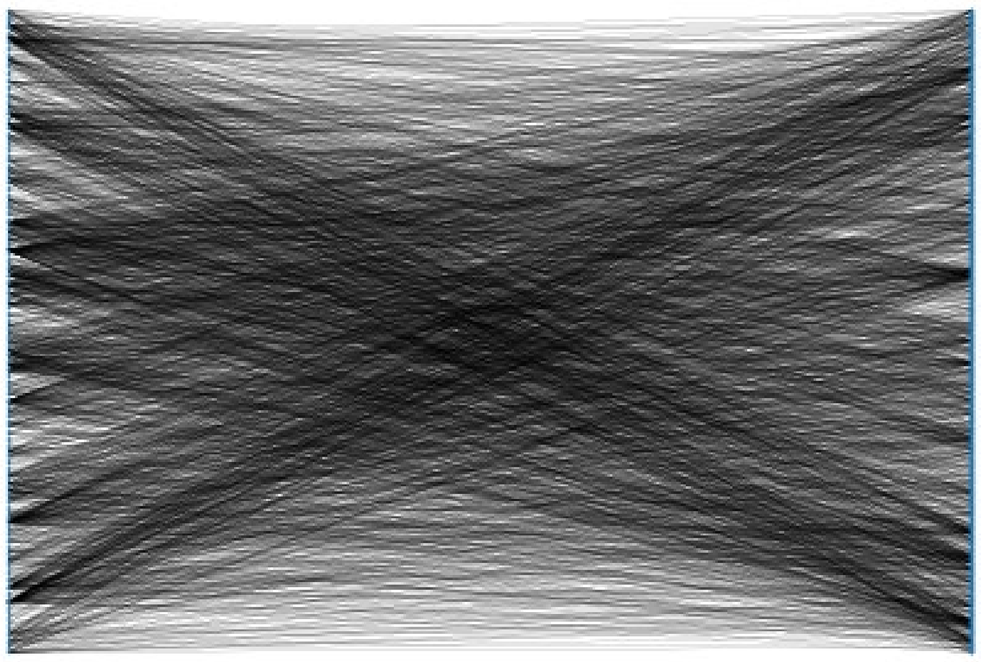
- A consensus chronogram was obtained from 10K tree, and used in phylogenetic regression
- log(Citation) used as weights and included as covariate to control for sampling efforts
- Possible models were ranked by AIC values, and coefficients were obtained through model averaging



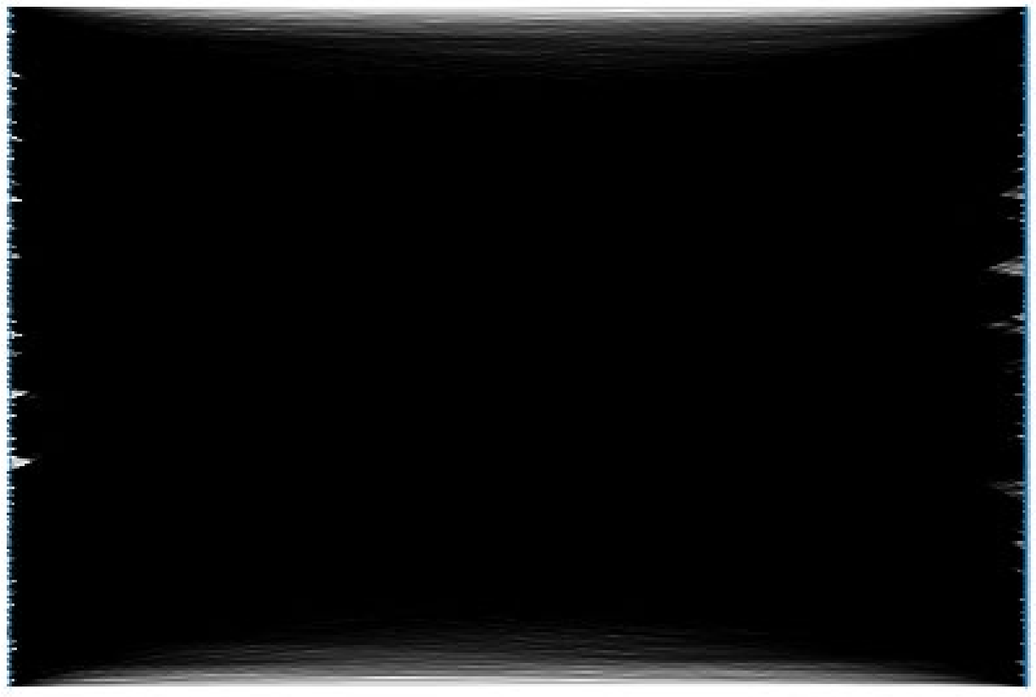


Predicting Undocumented Host-Parasite Interactions

- Evolutionary relationships encoded as weighted network.
- Top edges were ranked by relative probabilities of existing (p).
- Citation count variable decreased in importance (eased sampling effort problem)
- 5-Fold Cross Validation to test predictive accuracy.



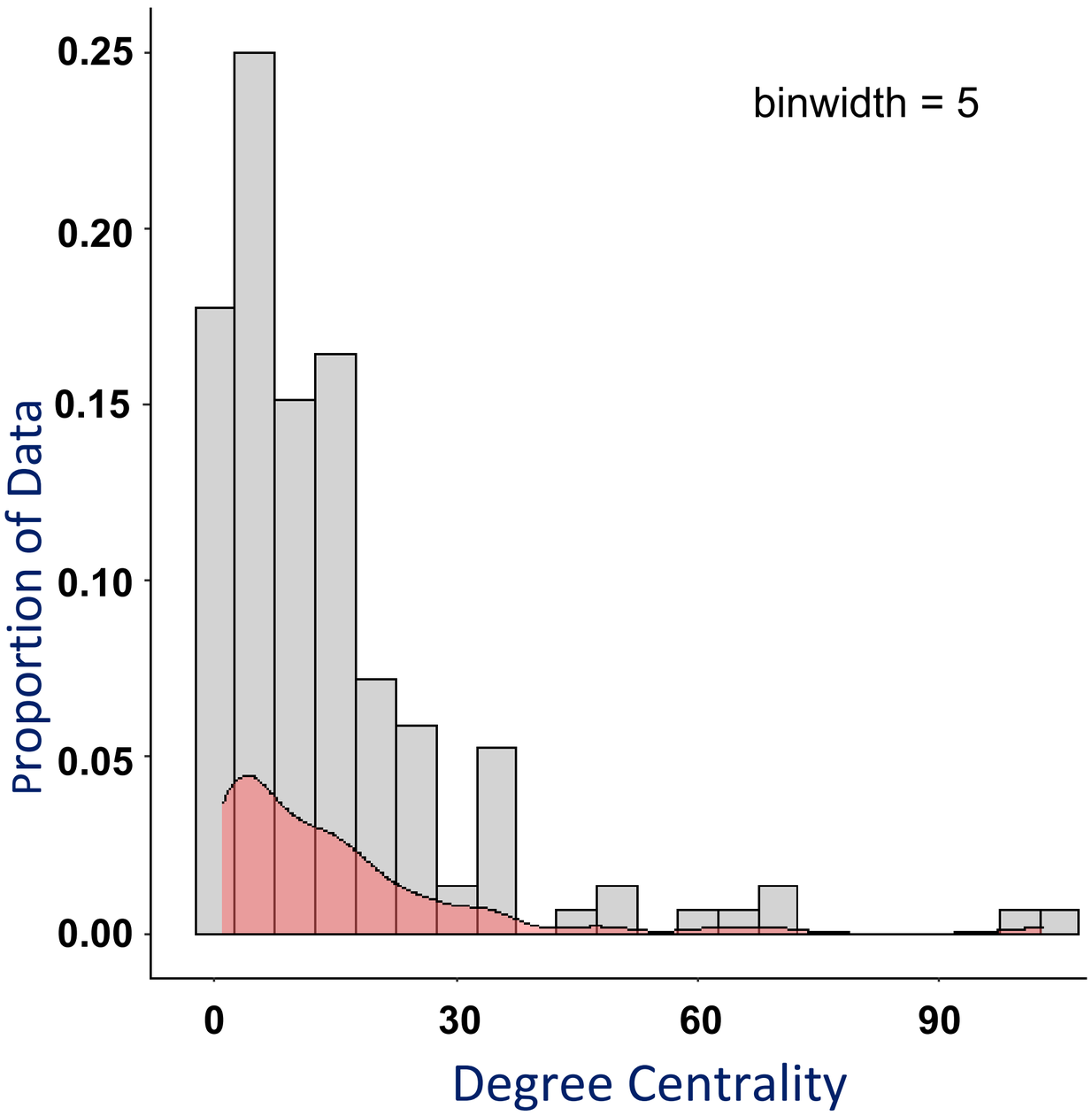
Only Original Data (2415 Edges)



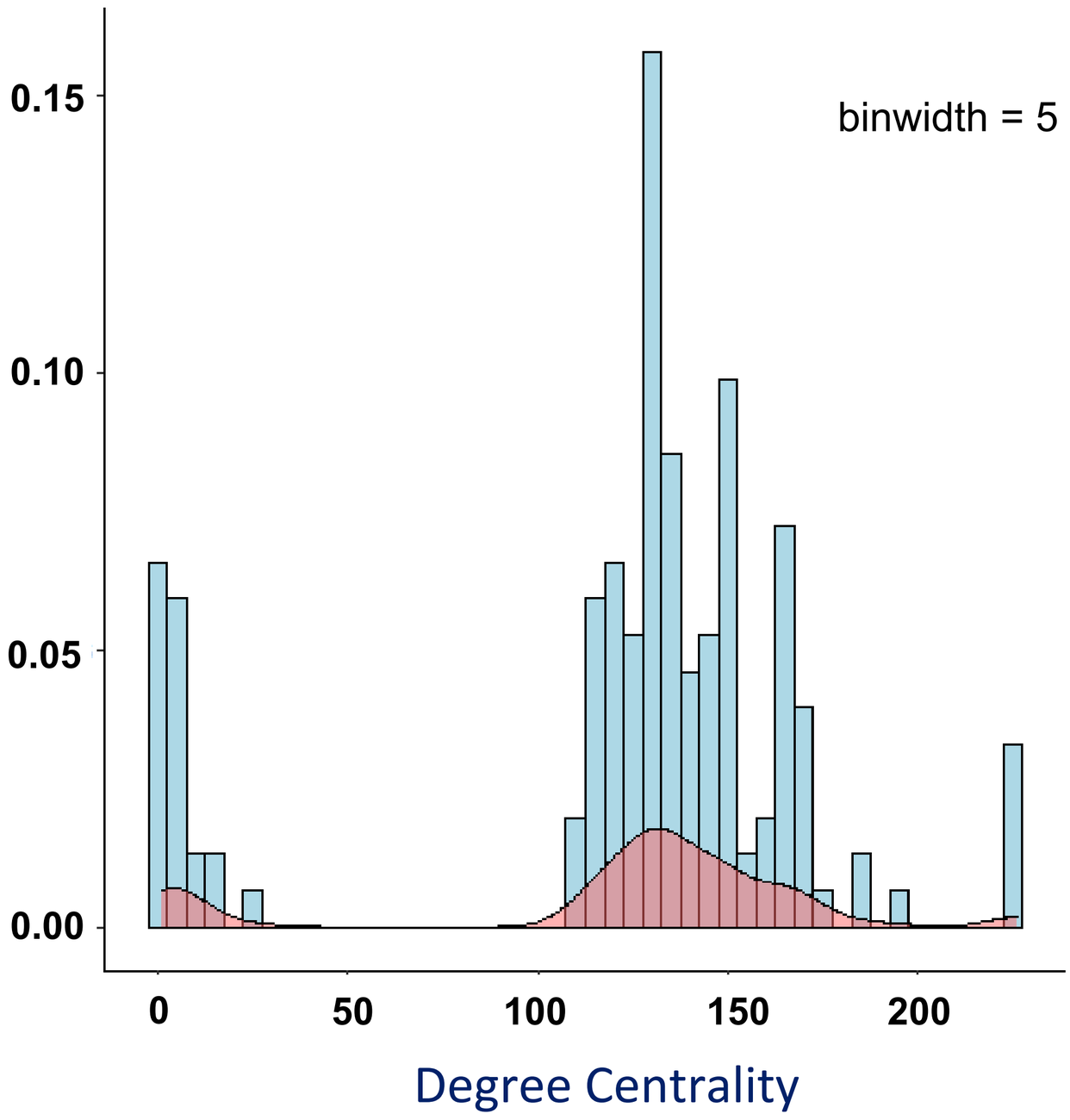
Network With Predicted Edges (16262 Edges)

Distribution of Host Degree Centrality

Observed Edges



Observed + Predicted edges



Degree Centrality: the number of edges connected to a node.

i.e. the number of parasites connected to a host.