Supplemental figures

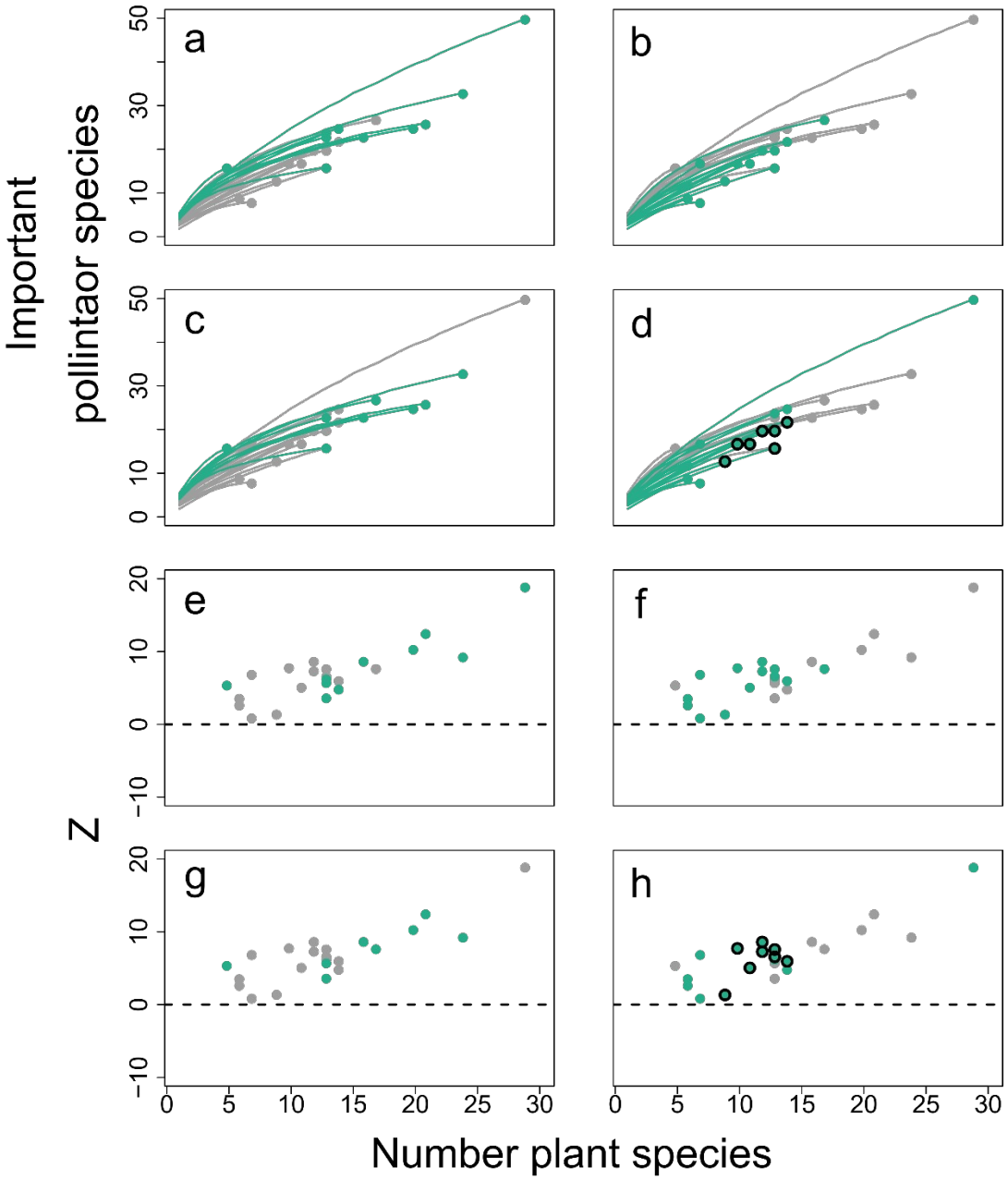

Figure S1. Results for Question 1 divided by survey design and taxonomic scope. In each, the focal group is in color, and remaining datasets are shown in grey. Within each row, highlights are reversed. (a) and (e) Studies in which sampling effort is standardized by area. (b) and (f) Studies in which sampling effort is standardized by plant species. (c) and (g) Studies focused exclusively on bees. (d) and (h) Studies focused on pollinators broadly (black circles) or all visitors (plain circles). Only the bees-only datasets were 100% identified to species. Those datasets with broader taxonomic scope also occasionally relied on coarser taxonomic resolution.

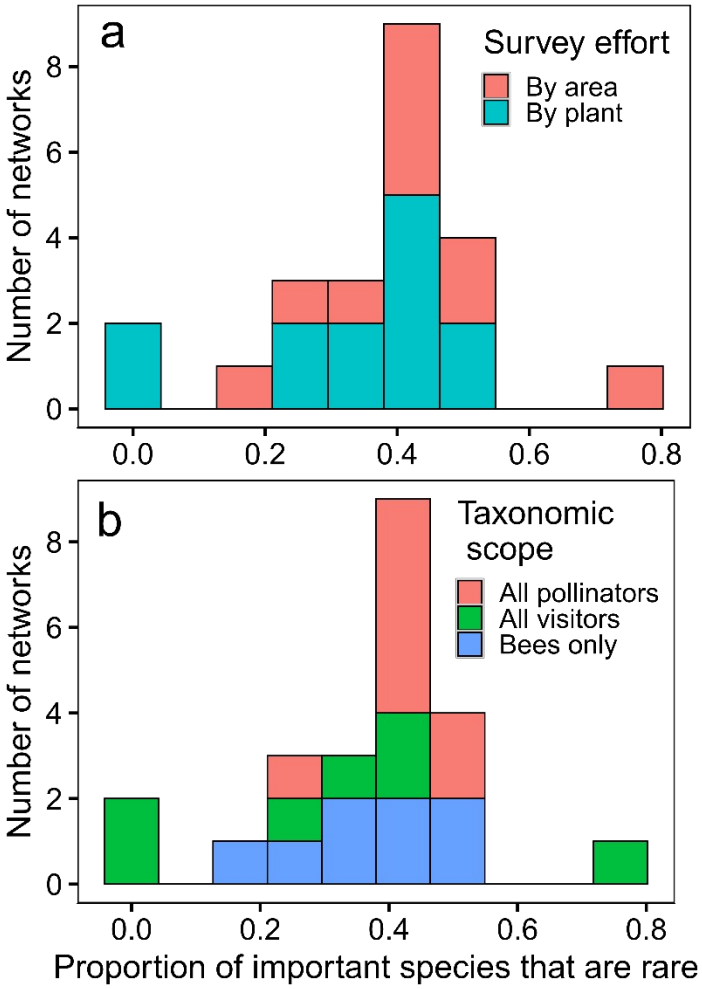

Figure S2. Results for Question 2 subdivided by (a) survey design and (b) taxonomic scope. Only the bees-only datasets were 100% identified to species. Those datasets with broader taxonomic scope also occasionally relied on coarser taxonomic resolution.

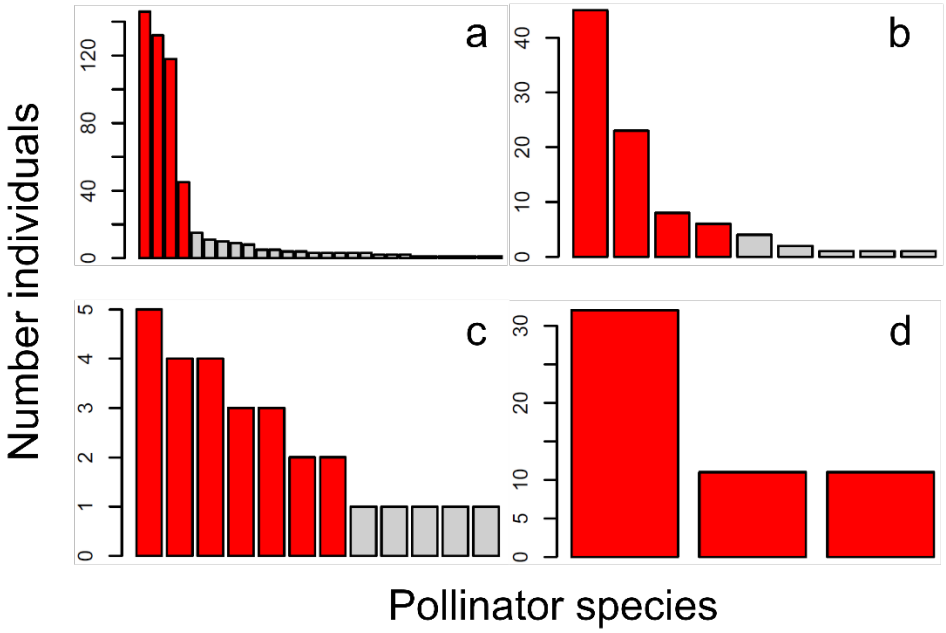

Fig S3 Example rank abundance distributions of pollinator species visiting individual plant species with important pollinators (those contributing ≥5% of visits) highlighted. These demonstrate the range of what the 5% importance thresholds look like in practice. Most plant species distributions look like (a) or (b) or somewhere in between. For plants with smaller sample sizes, in particular, pollinator abundance is more even, leading to a high proportion of important pollinator species, as in (c). When plants themselves are pollinator specialists, all pollinators may be considered important.

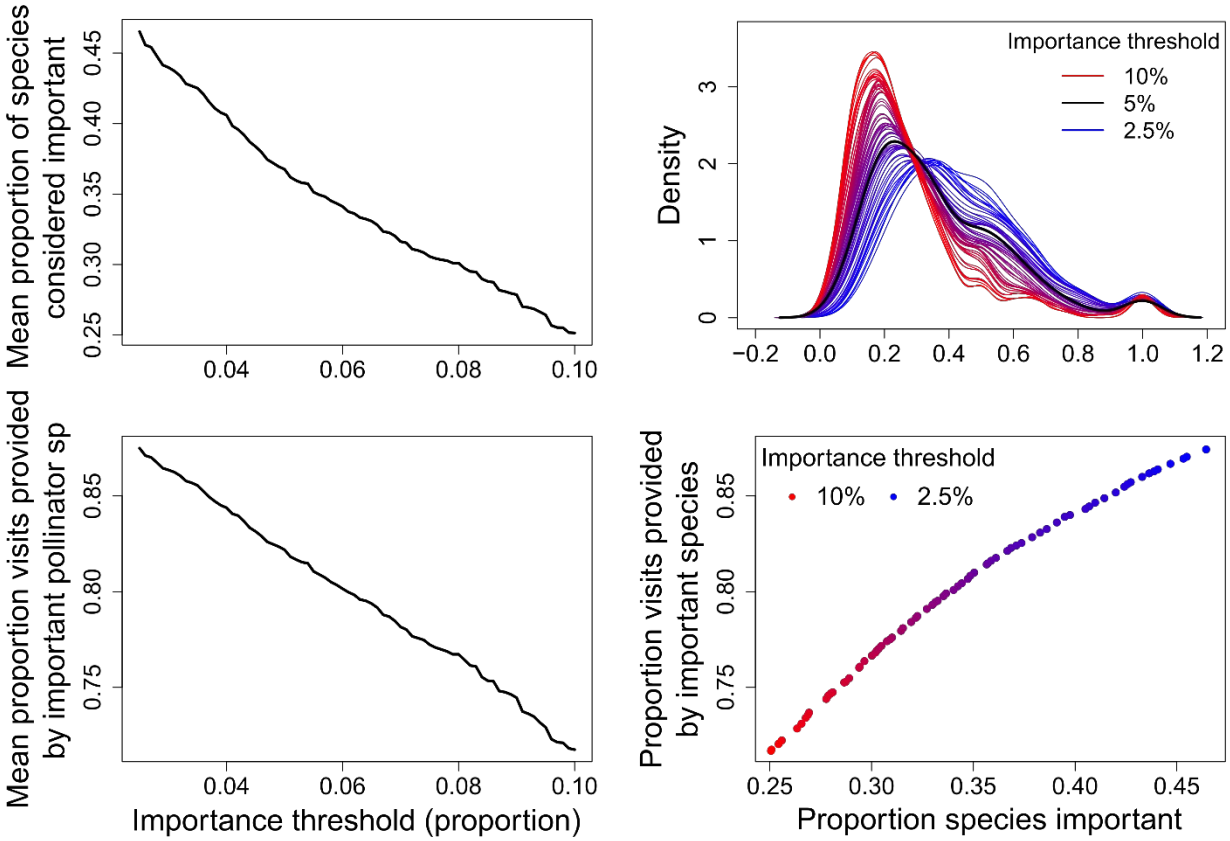

Fig. S4 Effect of the threshold used to define importance on the proportion of species considered important and the proportion of visits provided by those important species. (a-b) The proportion of species considered important declines with higher importance thresholds. (a) shows the mean, across networks, and (b) shows the distribution of values across networks. (c-d) Because fewer species are considered important with higher thresholds, the proportion of visits contributed by those species decreases.

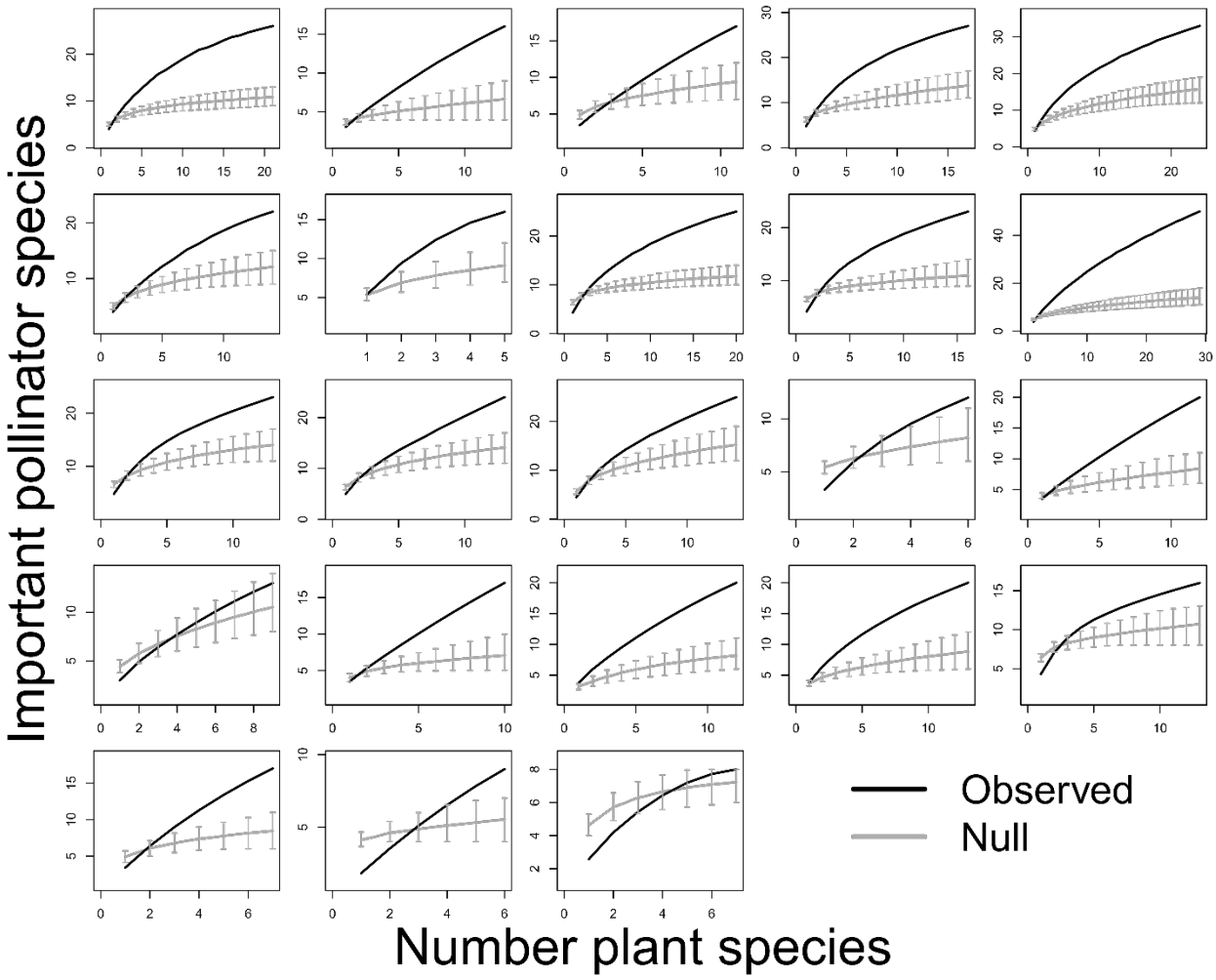

Figure S5 Observed and null accumulation curves for each network in our study. Bars on the null represent inner 95th percentile of the null.

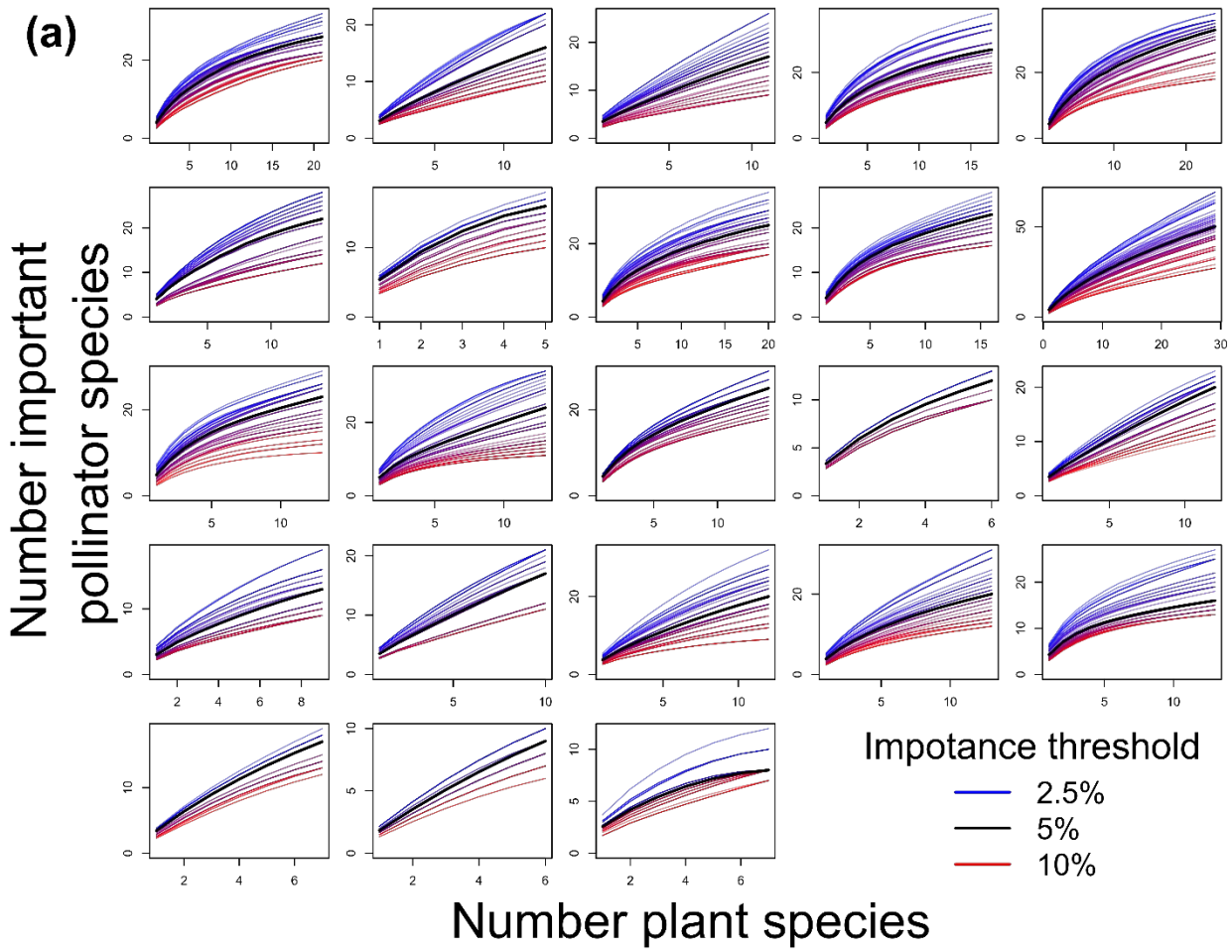

Fig S6a *(cont'd next page)*

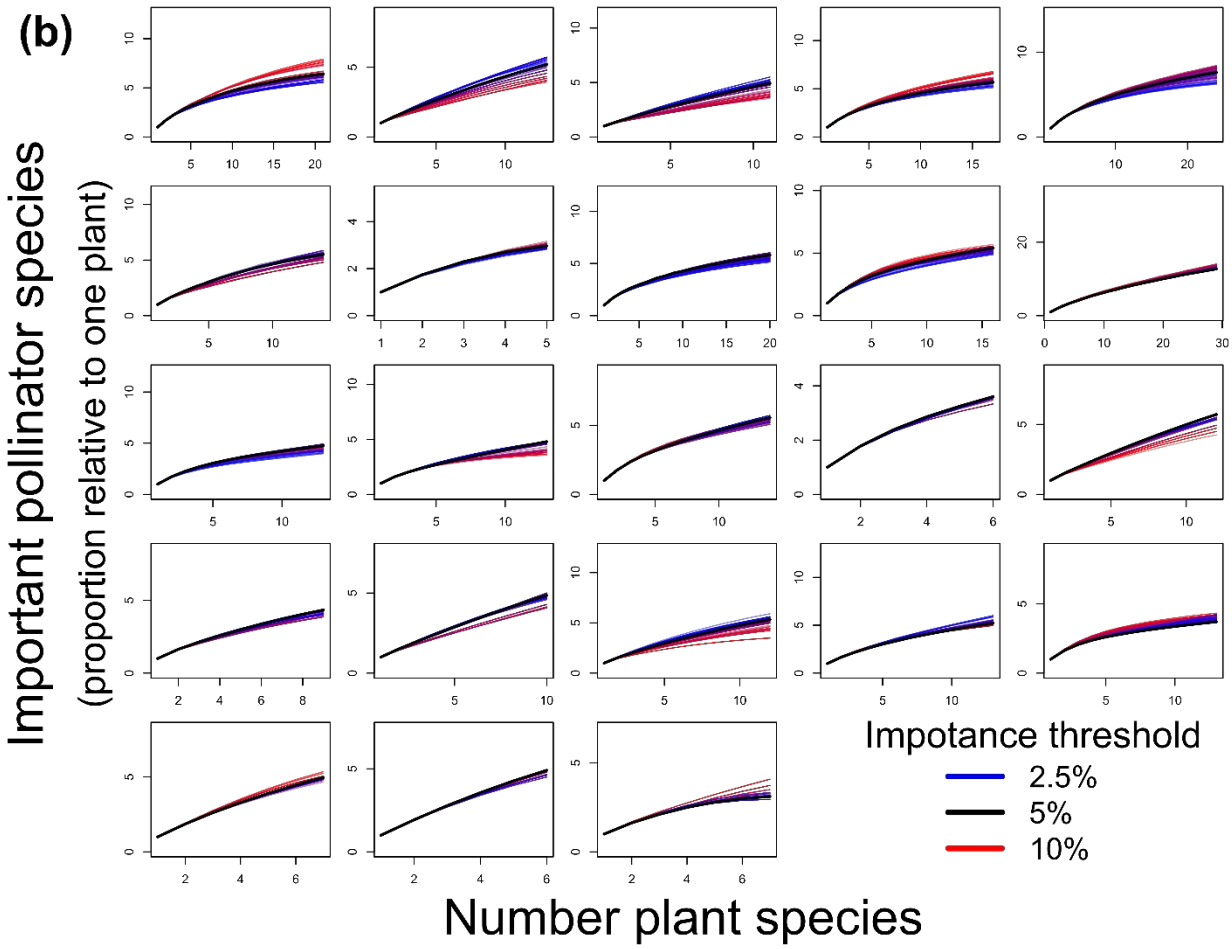

Figure S6 Sensitivity analysis showing the accumulation of important pollinator species with increasing plant species richness under varying thresholds of importance. We re-ran our analysis while defining important pollinators as those contributing 2.5% to 10% of visits to at least one plant species, using increments of 0.1%. (a) Increasing the threshold of importance lowers the absolute number of important species. (b) However, the proportional change in the number important pollinator species, relative to a single plant species, was very robust to changes in threshold definition. Moreover, when the proportional relationship did change, the slope both increased or decreased with higher thresholds, depending on the site such that the mean proportional change between a single plant species and its whole network remained nearly constant.

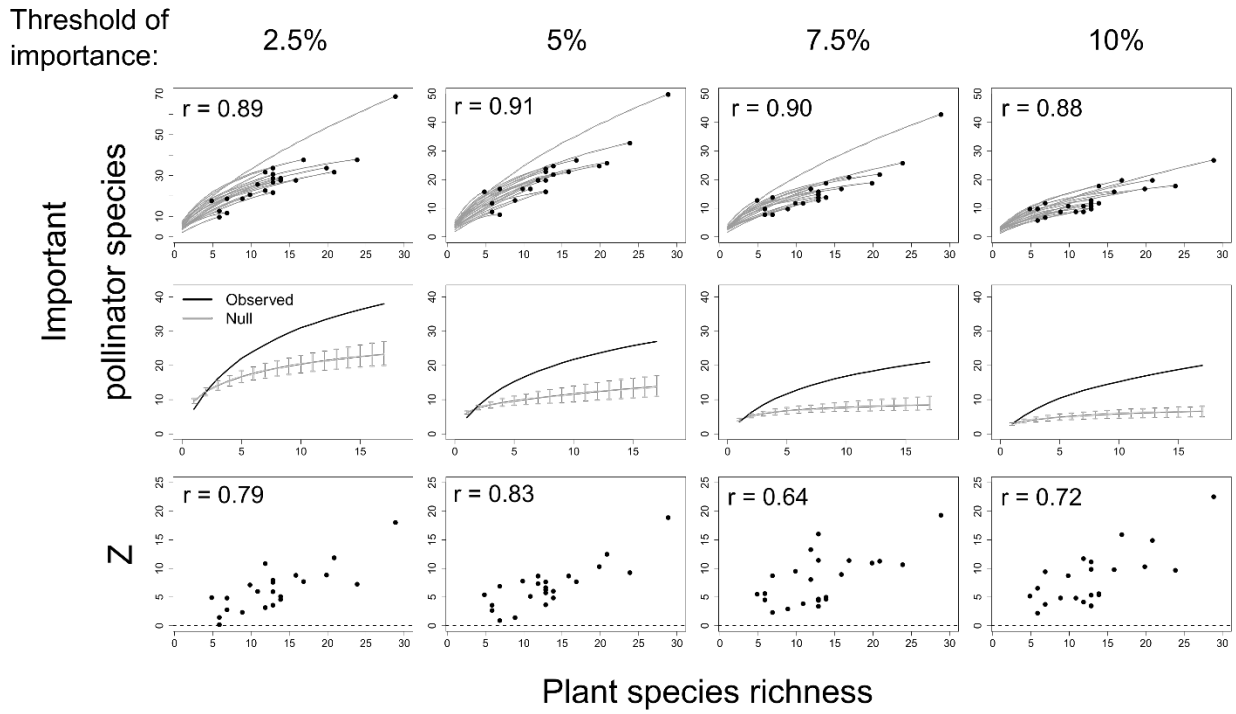

Fig S7 Effect of the threshold of importance on our main results. Each column is analogous to the main text Fig. 1. The first row shows the accumulation curves for each network. Points represent the number of pollinator species important to at least one plant species in the full community, and grey lines represent the accumulation of important species across simulated levels of plant species richness. Note that the y-axis of the top-left panel is inconsistent with the rest of its row. The r value refers to the correlation with the values for whole network. The second row shows the accumulation curve of a typical network together with its null model. The third row shows Z-scores for the number of important pollinators in each network, and r values refer to the correlation between these Z-scores and plant species richness. Although the absolute number of important pollinator species decreased with increasing thresholds, the relationship between important pollinators and plant richness remains largely unchanged. In fact, the average Z-score goes up under higher thresholds because the null models get both flatter and less variable.

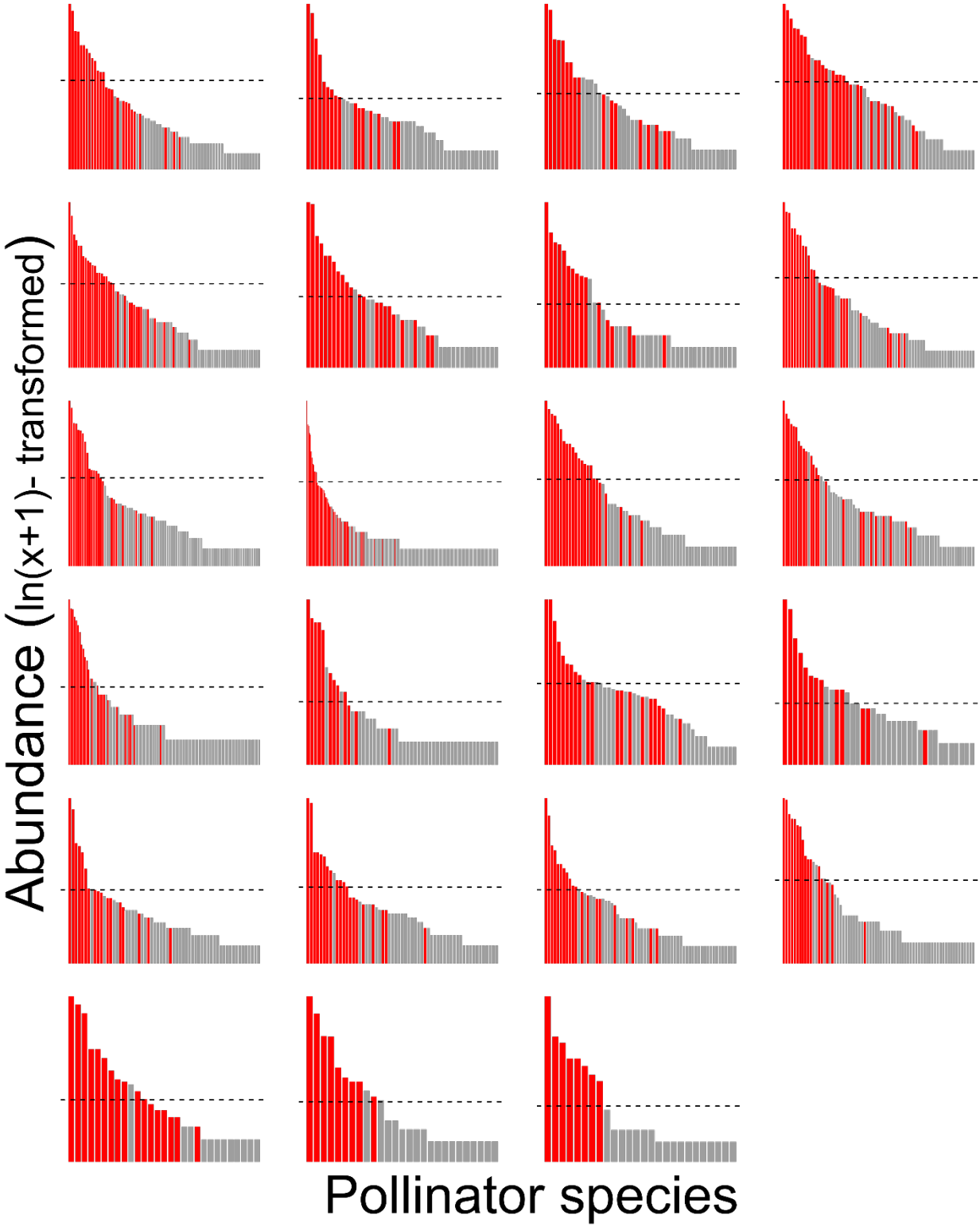

Figure S8 Rank abundance distributions for each of the networks in our analysis highlighting rare, important species. In each, pollinator species that were important to at least one plant species in its network are highlighted in red, and the horizontal dashed line represents 1% of the total pollinator community.

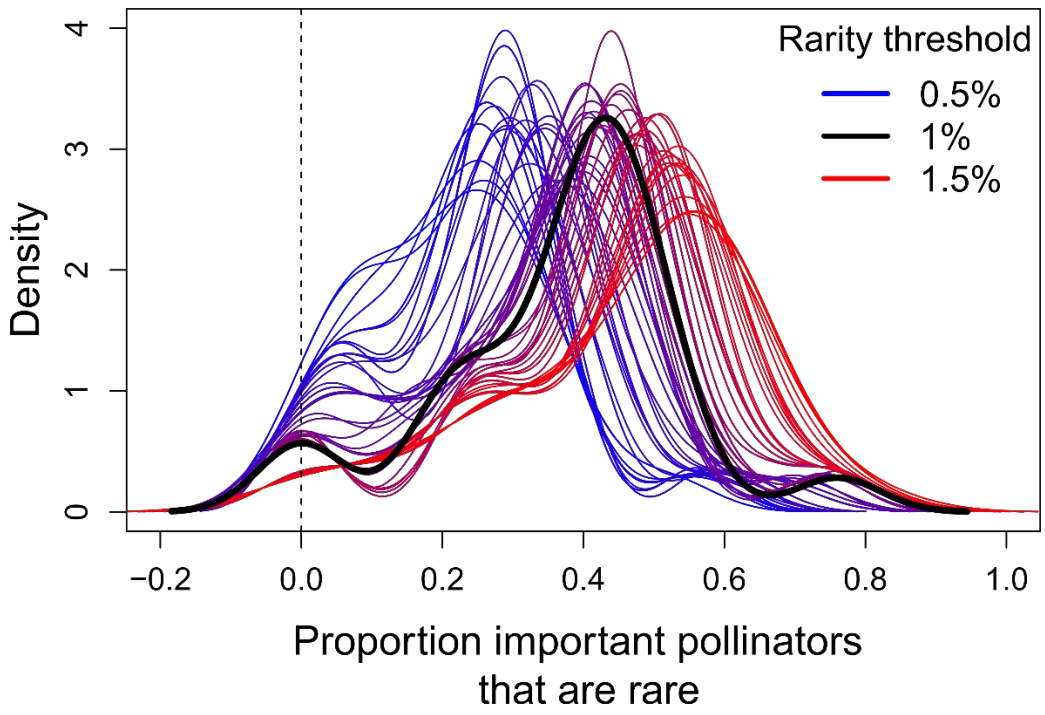

Figure S9 Sensitivity analysis showing the proportion of important pollinator species that are rare, across networks, using different rarity thresholds. In this figure, we held the threshold of importance at 5% of visits and used rarity thresholds of 0.5% to 1.5%, by increments of 0.01%. Raising the rarity threshold means more important pollinator species are considered rare, and vice versa. In the main text, we used a threshold of 1%. However, regardless of the threshold, our conclusion remains the same: across networks, a substantial proportion of important pollinator species are also locally rare.

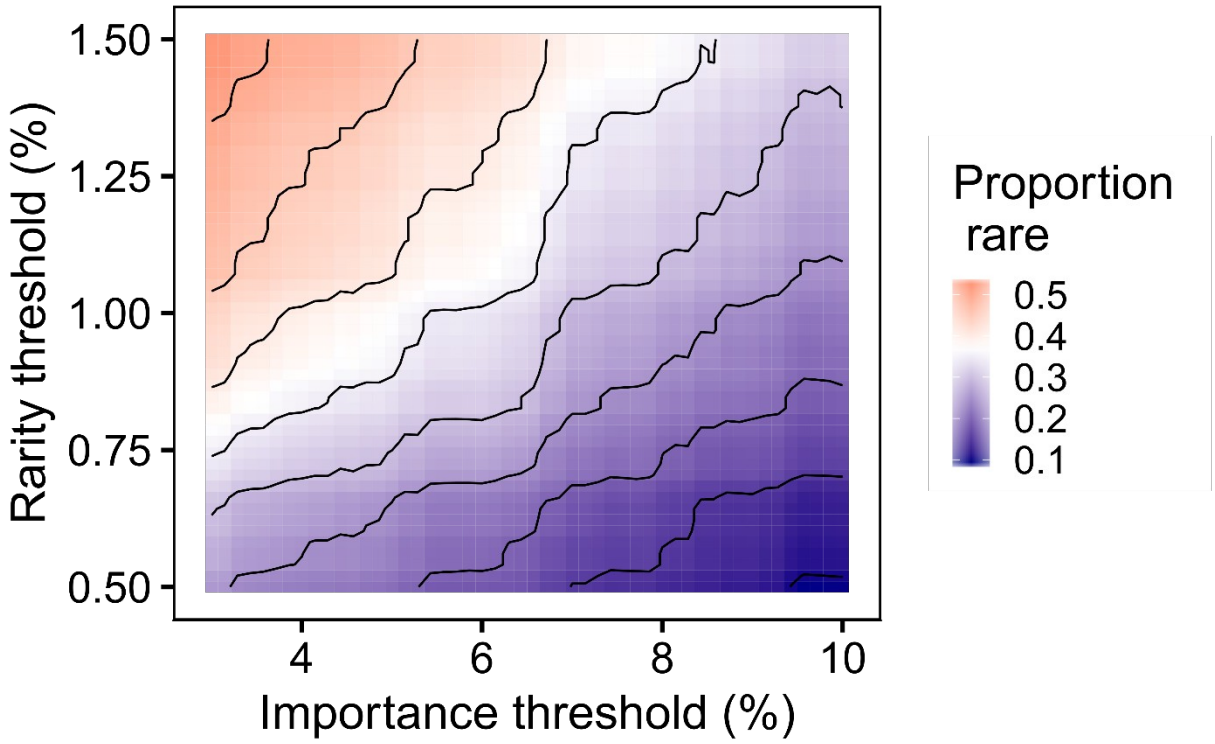

Figure S10 Sensitivity analysis showing the proportion of important pollinators that were rare using different thresholds of both pollinator importance and rarity. The value shown is the mean proportion across all 23 networks. The proportion of important pollinators that are rare increases with lower thresholds of importance and higher thresholds of rarity. Within this parameter space, the mean (across networks) proportion of important pollinators that are considered rare ranges from 9.4% in the bottom right to 56.0% in the top left. In the main text, we used thresholds of 5% for importance and 1.0% for rarity, resulting in a mean of 37% of important pollinators being considered rare (shown as white). Although this value is dependent on the thresholds used, our general conclusion holds across networks: it is common for important pollinators to also be rare, even under strict definitions of importance and rarity.

Supplemental tables

Table S1. Information on datasets included in our analysis. The sizes of specific plots were unavailable from Vázquez and Simberloff (2002).

Citation	Taxonomic scope	Taxonomic resolution	Location	Plot size (ha)	Survey method	Plant sp (original/subset)	Pollinator sp (original/subset)	Observations (original/subset)
Junker et al 2013	All visitors	Order, genus, species, or morphospecies	Würzburg, Germany	0.25	Quadrat observations	56/29	257/226	3052/2905
Kaiser-Bunbury et al 2017	All pollinators	Species or morphospecies	Mahé, Seychelles	1.7	Plant observations	16/13	53/49	1368/1339
Kaiser-Bunbury et al 2017	All pollinators	Species or morphospecies	Mahé, Seychelles	0.7	Plant observations	16/11	51/47	1474/1448
Kaiser-Bunbury et al 2017	All pollinators	Species or morphospecies	Mahé, Seychelles	1.3	Plant observations	29/14	53/45	1057/1003
Kaiser-Bunbury et al 2017	All pollinators	Species or morphospecies	Mahé, Seychelles	1.3	Plant observations	17/12	49/46	2289/2256
Kaiser-Bunbury et al 2017	All pollinators	Species or morphospecies	Mahé, Seychelles	0.7	Plant observations	18/9	47/37	670/608
Kaiser-Bunbury et al 2017	All pollinators	Species or morphospecies	Mahé, Seychelles	0.8	Plant observations	12/10	63/61	1705/1688
Kaiser-Bunbury et al 2017	All pollinators	Species or morphospecies	Mahé, Seychelles	1.4	Plant observations	13/12	59/59	1880/1865
Kaiser-Bunbury et al 2017	All pollinators	Species or morphospecies	Mahé, Seychelles	1.3	Plant observations	16/13	68/64	1792/1771
MacLeod et al 2016	Bees	Species	New Jersey, USA	0.16	Plant observations	17/17	54/54	2346/2346
Memmott 1999	All pollinators	species, morphospecies, or functional group	Bristol, UK	3.75	Transects	25/13	79/77	2183/2092
Olito and Fox 2015	All visitors	Species or morphospecies	Kananaskis Country, Alberta, Canada	1	Transects	41/14	125/109	900/768
Ollerton et al 2003	All visitors	family, genus, species, morphospecies or functional group	KwaZulu-Natal, South Africa	8	Plant observations	9/6	56/52	594/569

Roswell et al 2019	Bees	Species	New Jersey, USA	1.7	Transects	47/21	69/68	4629/4513
Roswell et al 2019	Bees	Species	New Jersey, USA	1.5	Transects	53/24	84/83	2787/2648
Roswell et al 2019	Bees	Species	New Jersey, USA	1.7	Transects	18/5	51/44	847/752
Roswell et al 2019	Bees	Species	New Jersey, USA	1.6	Transects	37/20	74/70	3714/3582
Roswell et al 2019	Bees	Species	New Jersey, USA	0.7	Transects	36/16	88/86	3342/3209
Roswell et al 2019	Bees	Species	New Jersey, USA	0.75	Transects	26/13	65/64	2098/2039
Roswell et al 2019	Bees	Species	New Jersey, USA	2.2	Transects	26/13	74/71	1594/1526
Vazquez and Simberloff 2002	All visitors	Family, genus, species, or morphospecies	Nahuel Huapi National Park, Argentina	6 - 12	Plant observations	9/7	33/29	613/586
Vazquez and Simberloff 2002	All visitors	Family, genus, species, or morphospecies	Nahuel Huapi National Park, Argentina	6 - 12	Plant observations	10/6	29/27	677/658
Vazquez and Simberloff 2002	All visitors	Family, genus, species, or morphospecies	Nahuel Huapi National Park, Argentina	6 - 12	Plant observations	8/7	27/26	592/592

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