Functional traits contribute in opposite directions to taxonomic turnover in northeastern US forests over time

María Natalia Umaña, Jenny Zambrano, Natalia Norden

Journal of Vegetation Science

APPENDIX S1. Supplementary results

TABLES

Table S1.1. Seed mass classification using *bin-2* and *bin-3* classification methods described in the main text.

Species	Seed mass (mg)	Sees size classification	
		Bin-3	Bin-2
Betula populifolia	0.1	Small	Small
Populus grandidentata	0.13	Small	Small
Populus tremuloides	0.13	Small	Small
Betula papyrifera	0.31	Small	Small
Betula lenta	0.7	Small	Small
Betula alleghaniensis	0.95	Small	Small
Tsuga canadensis	1.18	Small	Small
Picea rubens	3.3	Small	Small
Abies balsamea	7.6	Small	Small
Sorbus americana	15.3	Medium	Small
Pinus strobus	20.1	Medium	Small
Acer spicatum	23.2	Medium	Small
Acer rubrum	23.7	Medium	Large
Acer pensylvanicum	37.3	Medium	Large
Fraxinus americana	37.3	Medium	Large
Prunus pensylvanica	43.5	Medium	Large
Fraxinus nigra	55.3	Medium	Large
Prunus serotina	83.9	Medium	Large
Acer saccharum	201.5	Large	Large
Fagus grandifolia	222.22	Large	Large
Quercus velutina	1852	Large	Large
Quercus alba	2997	Large	Large
Quercus rubra	3143	Large	Large
Castanea dentata	3467.3	Large	Large

Carya tomentosa	5529	Large	Large

Table S1.2. Wood density classification using *bin-2* and *bin-3* classification methods described in the main text.

Species	Wood density (g/cm^3)	Sees size classification	
		Bin-3	**Bin-2**
Abies balsamea	0.33	Low	Low
Pinus strobus	0.34	Low	Low
Populus tremuloides	0.35	Low	Low
Populus grandidentata	0.36	Low	Low
Prunus pensylvanica	0.36	Low	Low
Picea rubens	0.37	Low	Low
Tsuga canadensis	0.38	Low	Low
Castanea dentata	0.4	Medium	Low
Acer pensylvanicum	0.44	Medium	Low
Betula populifolia	0.45	Medium	Low
Fraxinus nigra	0.45	Medium	Low
Nyssa sylvatica	0.46	Medium	Low
Prunus serotina	0.47	Medium	High
Betula papyrifera	0.48	Medium	High
Acer rubrum	0.49	Medium	High
Betula alleghaniensis	0.55	High	High
Fraxinus americana	0.55	High	High
Acer saccharum	0.56	High	High
Fagus grandifolia	0.56	High	High
Quercus rubra	0.56	High	High
Quercus velutina	0.56	High	High
Betula lenta	0.6	High	High
Quercus alba	0.6	High	High
Carya tomentosa	0.64	High	High

Table S1.3. Kruskal-Wallis test results examining differences in *E* between the trajectory that included all species (ALL) and each of the trajectories obtained when removing subsets of species based on wood density and seed mass groups (e.g., ALL vs. $ALL_{w/o\ SSM}$, ALL vs. $ALL_{w/o\ LSM}$) for Sørensen, Morisita-Horn and Horn dissimilarity metrics. The letters (SML) in the Dunn's test column indicate significant differences among median *E* values across the three (S: small, M: medium, L: large) or two groups (*bin-3* or *bin-2*). The column *Year* indicates the subset of data that was used: the subset that used year 2001 as a reference and the subset that used the year 2002 as a reference.

Trait	Metric	Year	Binning	X2	df	P-value	SML
Seed mass	Sørensen	2002	2	2.00	1	0.1	
Seed mass	Sørensen	2001	2	12.23	1	<0.001	AB
Seed mass	Sørensen	2002	3	50.59	2	<0.001	ABC
Seed mass	Sørensen	2001	3	60.93	2	<0.001	ABC
Seed mass	Horn	2002	2	0.98	1	0.31	
Seed mass	Horn	2001	2	0.25	1	0.61	
Seed mass	Horn	2002	3	169.67	2	<0.001	ABC
Seed mass	Horn	2001	3	166.11	2	<0.001	ABC
Seed mass	Morisita-Horn	2002	2	0.91	1	0.3	
Seed mass	Morisita-Horn	2001	2	0.28	1	0.6	
Seed mass	Morisita-Horn	2002	3	182.38	2	<0.001	ABC
Seed mass	Morisita-Horn	2001	3	210.35	2	<0.001	ABC
Wood density	Sørensen	2002	2	16.77	1	<0.001	AB
Wood density	Sørensen	2001	2	27.74	1	<0.001	AB
Wood density	Sørensen	2002	3	24.08	2	<0.001	ABC
Wood density	Sørensen	2001	3	14.16	2	<0.001	ABA
Wood density	Horn	2002	2	10.15	1	<0.001	AB
Wood density	Horn	2001	2	29.10	1	<0.001	AB
Wood density	Horn	2002	3	140.96	2	<0.001	ABC
Wood density	Horn	2001	3	147.99	2	<0.001	ABC
Wood density	Morisita-Horn	2002	2	7.13	1	<0.001	AB
Wood density	Morisita-Horn	2001	2	9.08	1	<0.001	AB
Wood density	Morisita-Horn	2002	3	171.72	2	<0.001	ABC
Wood density	Morisita-Horn	2001	3	194.80	2	<0.001	ABC

FIGURES

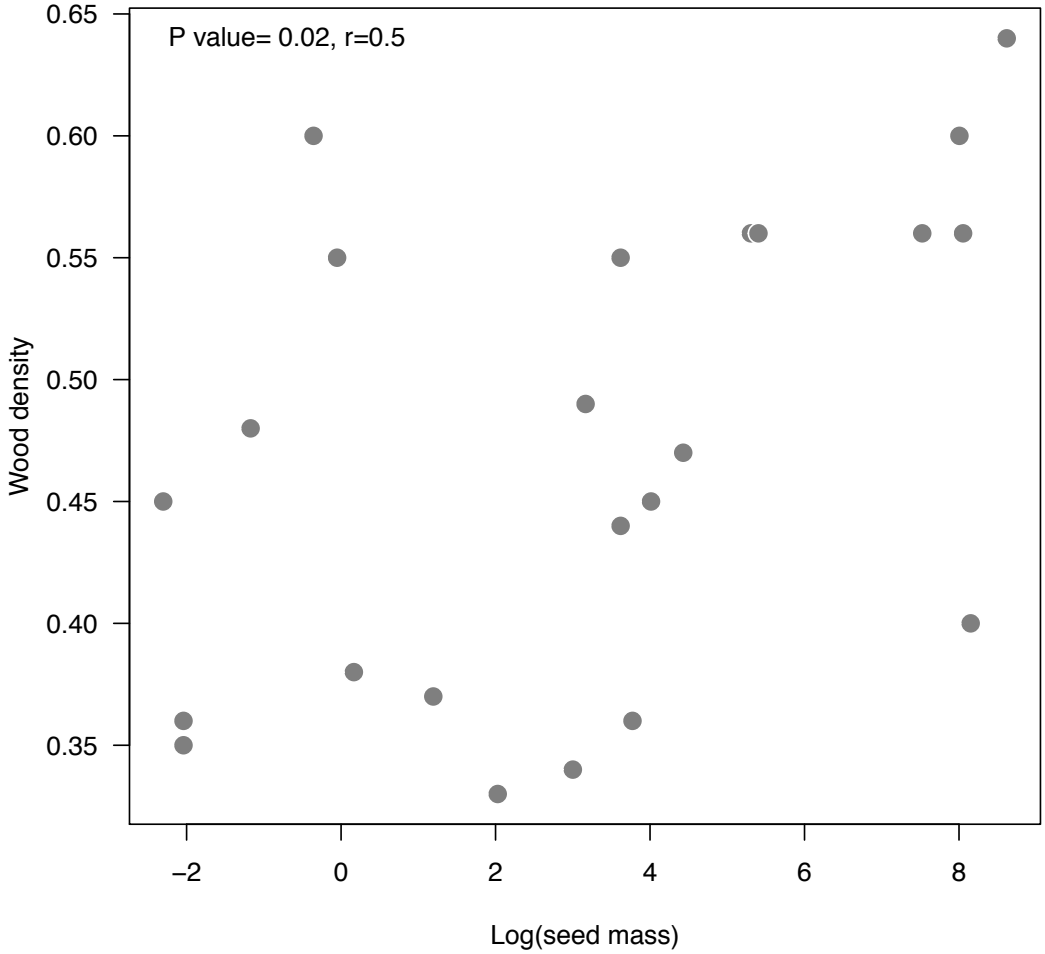

Figure S1.1. Correlation between log-transformed seed mass and wood density for all species studied.

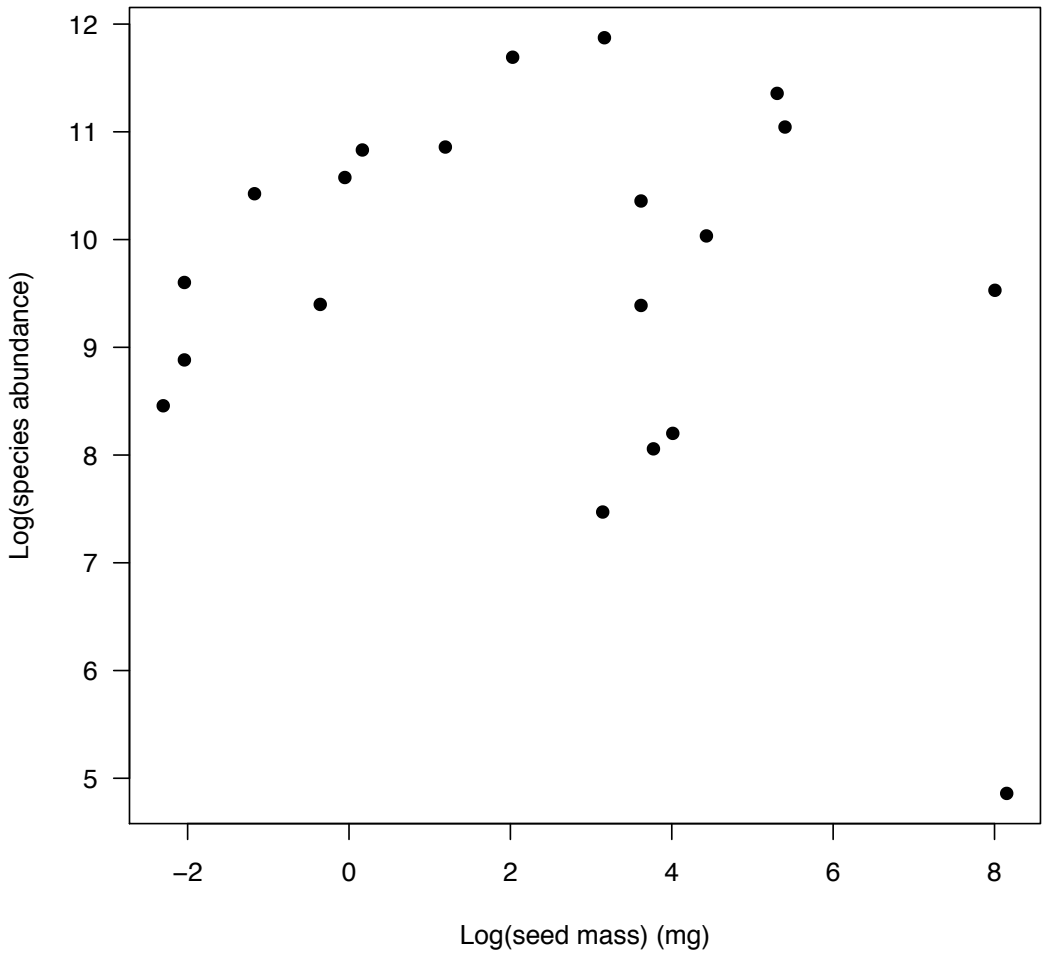

Fig. S1.2. Relationship between species abundance and seed mass.

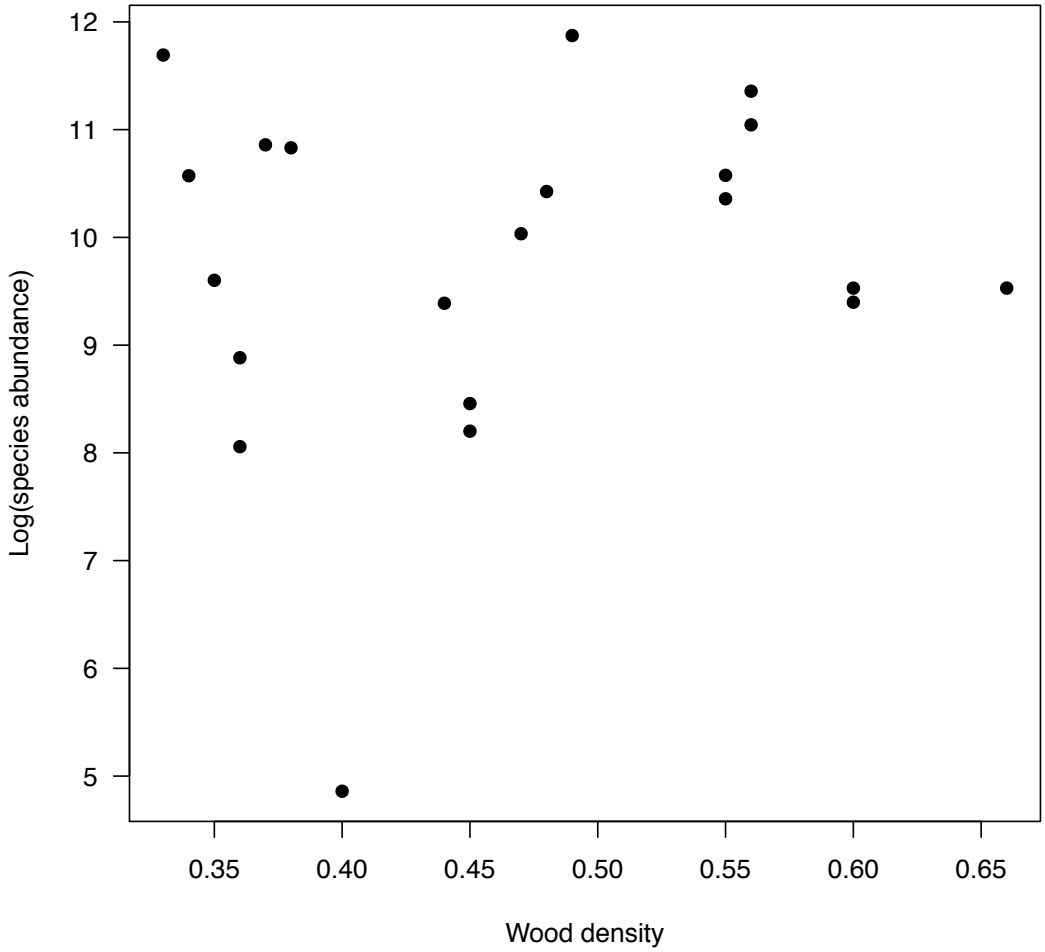

Fig. A1.3. Relationship between species abundance and wood density (g/cm^3).

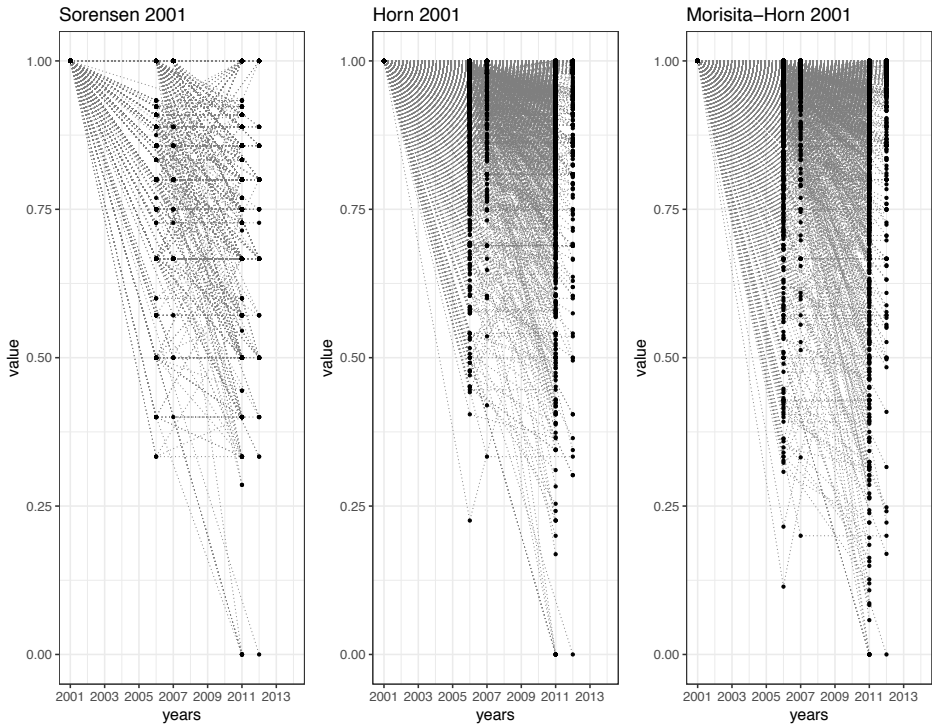

Figure S1.4. Taxonomic similarity over time using Sørensen, Horn and Morisita-Horn indices. Each line represents the trajectory for different plots. Values equal to 1 indicate same species composition or similarity per subplots at the onset of the study period. Overall, the plots show a declining trend in taxonomic similarity over time (linear mixed model with plot as a random effect; alpha=0.05).

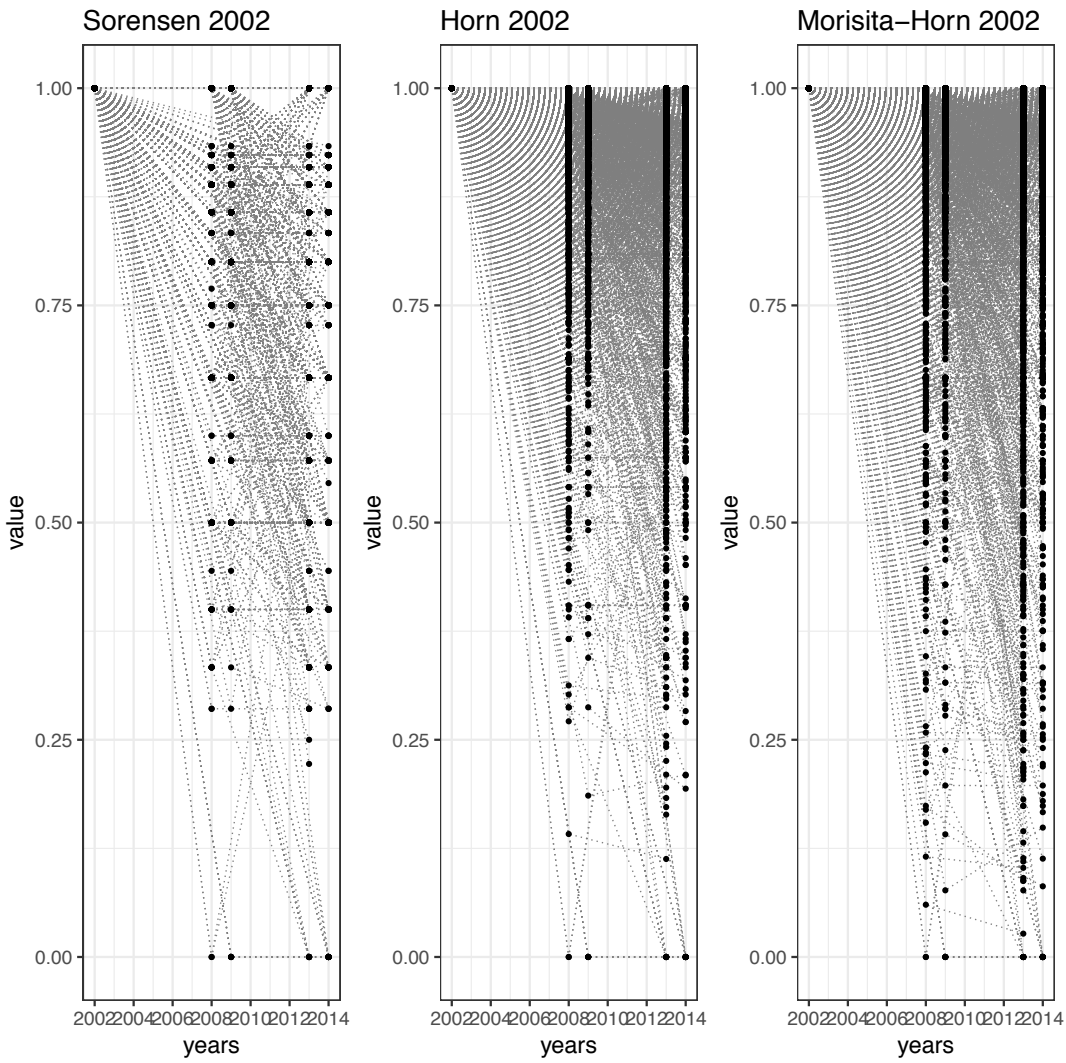

Figure S1.5. Taxonomic similarity over time for censuses starting in 2002 using Sørensen, Horn and Morisita-Horn indices. Each line represents the trajectory for different plots. Values equal to 1 indicate same species composition or similarity per subplots at the onset of the study period. Overall, the plots show a declining trend in taxonomic similarity over time (linear mixed model with plot as a random effect; alpha=0.05).

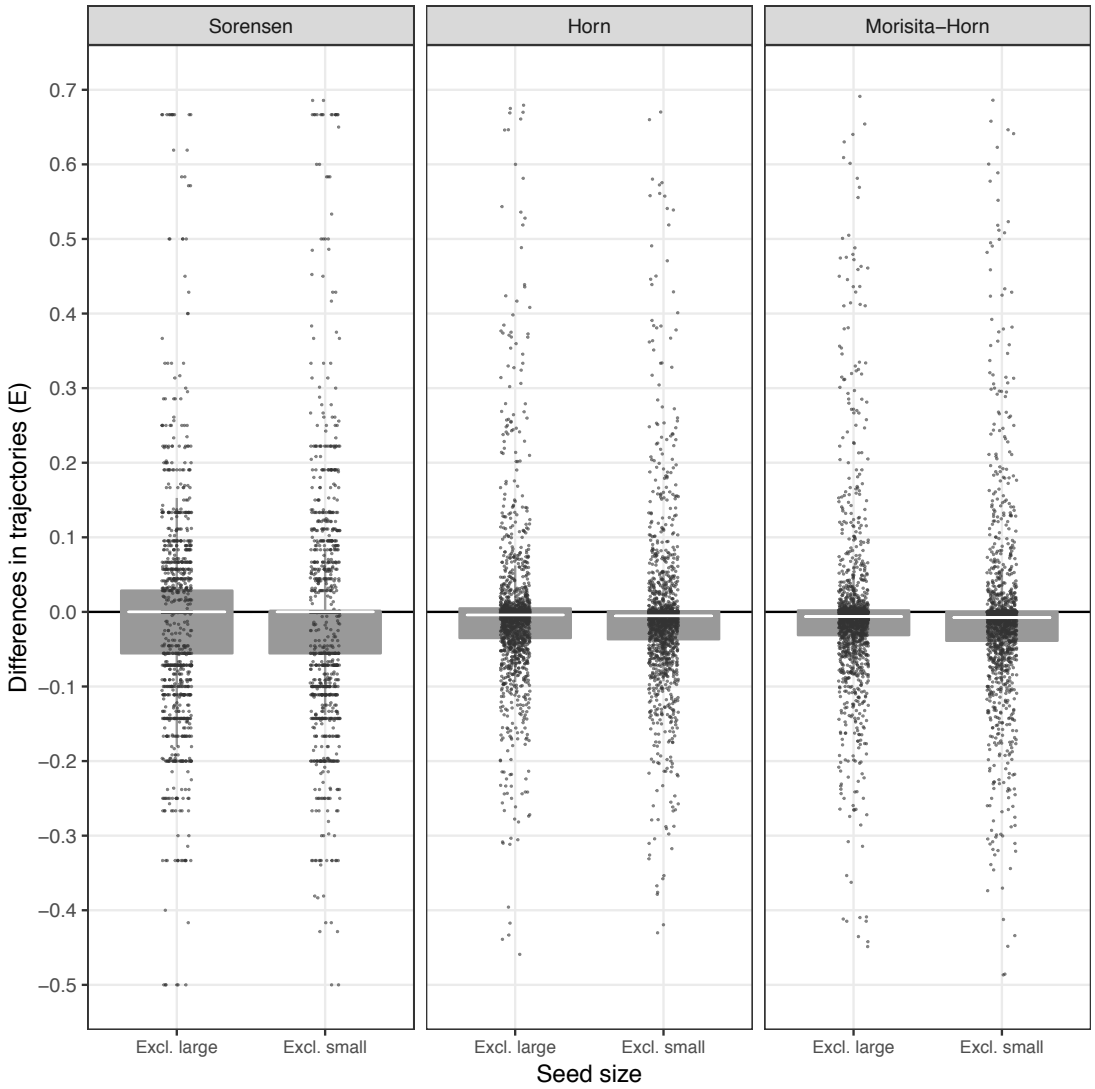

Figure S1.6. Boxplot showing the differences in trajectories (*E*) between communities including all species (ALL) and communities excluding species based on differences in seed mass ($ALL_{w/o\ LSM}$ and $ALL_{w/o\ SSM}$). Positive *E* values indicate that the species removed contribute to maintain the taxonomic similarity over time. Negative *E* values indicate that the species removed contribute to taxonomic divergence. For Morisita-Horn and Horn metrics the median differences in trajectories were not significant ($P < 0.05$, Kruskal-Wallis test, and null model approach).

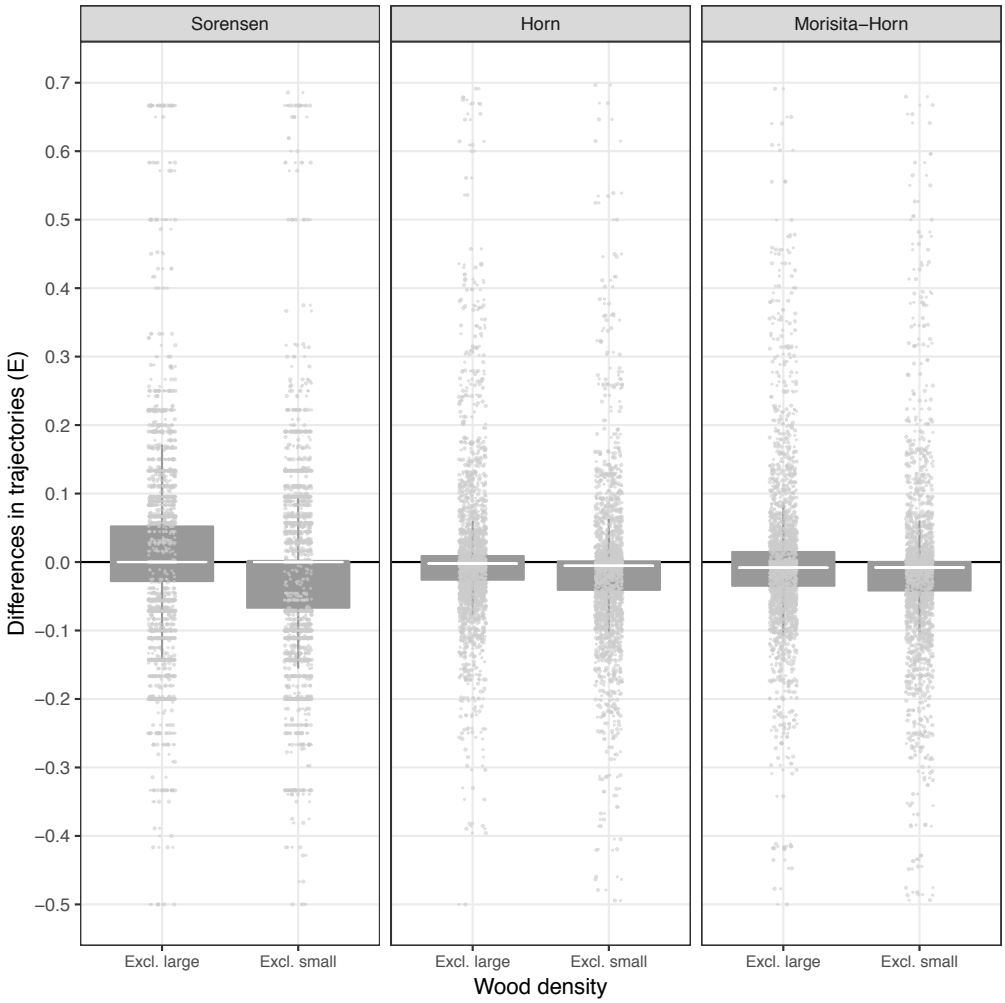

Fig. S1.7. Boxplot showing the differences in trajectories (*E*) between communities including all species and communities excluding species based on differences in wood density ($ALL_{w/o\ HWD}$ and $ALL_{\ w/o\ LWD}$). Positive *E* values indicate that the species removed contribute to maintain the taxonomic similarity over time. Negative *E* values indicate that the species removed contribute to taxonomic divergence. For all three metrics the median differences in trajectories were significantly different ($P < 0.05$, Kruskal-Wallis test) but not different when using the null model approach (Appendix 1).

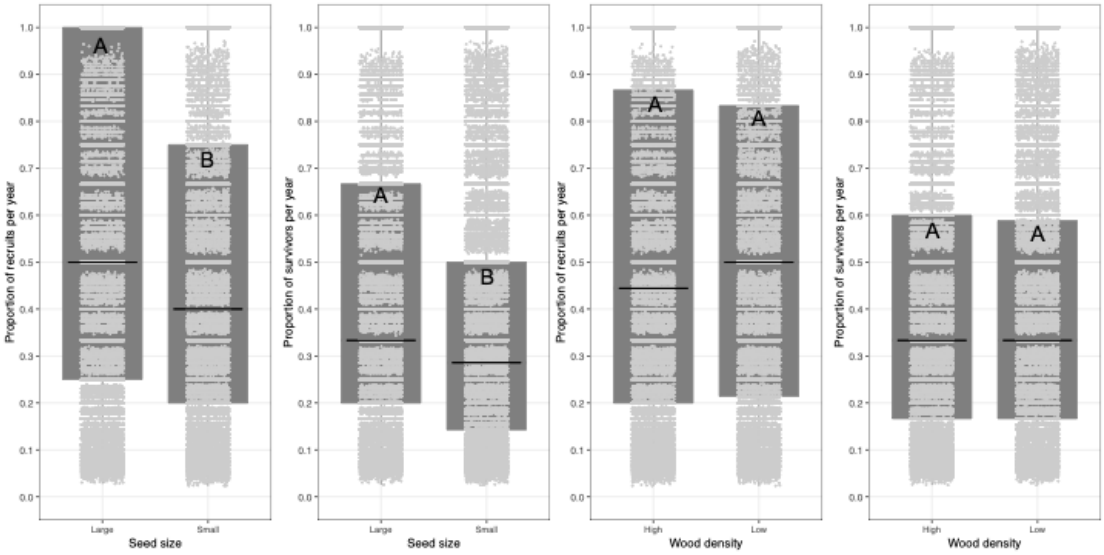

Fig. S1.8. Differences in proportion of recruits and survivors per plot per census across groups of different seed masses and wood densities (*bin-2*). The different letters indicate significant differences ($P < 0.05$, Kruskal-Wallis test).