Separating nestedness from species replacement in measures of beta diversity in montane meadows of the Western Cascades

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Abstract

Beta diversity quantifies differences in species composition across sites. However, alone, measures of beta diversity do not distinguish which processes are driving dissimilarity. Partitioning beta diversity into dissimilarity resulting from nestedness and species replacement has relevance to the understanding of fragmented habitats. I separated nestedness and species replacement in measures of beta diversity of plant and pollinator communities of montane meadows of the Western Cascades. Pollinator communities showed a higher amount of dissimilarity than plant communities between meadows. Species replacement contributed more to beta diversity than nestedness. Meadow soil moisture exhibited more influence on dissimilarity of plant and pollinator species compositions than difference in meadow size and distance between meadows. The ratio of species replacement to dissimilarity increased with difference in meadow soil moisture for plants. These results highlight the contribution of heterogeneity in meadow soil characteristics to diversity of plant and pollinator species in the landscape.

Introduction

While the idea that different places tend to have different species compositions is simple, the method of quantifying dissimilarity across sites has been in development and debated for decades. Just one of the many dissimilarity indices, the Jaccard index, was proposed in 1912, but it was not until 1960 that the term beta diversity was coined by R.H. Whittaker. He defined it as "the extent of change in community composition, or degree of community differentiation, in relation to a complex-gradient of environment, or a pattern of environments" (Whittaker 1960). Most simply, beta diversity describes the amount that gamma diversity exceeds the average diversity of sites within the landscape (Whittaker 1960). This means that alpha and gamma diversity will only differ if sites within the landscape have different species compositions (Baselga 2012). This makes beta diversity a valuable measure of dissimilarity in species composition between sites and explains why popular dissimilarity indices, including Jaccard and Sørensen, are monotonic transformations of beta diversity (Baselga 2012) (Jost 2007).

Since the term was coined, the concept of beta diversity has developed. In 1943, Simpson discovered that dissimilarity could exist between sites without the presence of species replacement, hinting at a second component to beta diversity. In conjunction, in 2007, Baselga et

al. found that two separate and even opposite phenomenon could produce the same amount of dissimilarity between sites: nestedness and species replacement. In 2010, Baselga produced the first unified method to partition beta diversity.

Partitioning beta diversity is important because nestedness and species replacement reflect two opposite types of dissimilarity. In the case of nestedness, a species-poor site has a nested subset of the species in a richer site (Fig 1). On the other hand, species replacement describes when the species composition of a species-poor site is completely different from a species-rich site (Fig 2). Both nestedness and species replacement can occur between the same plots (Fig 3). Separating nestedness and species replacement reveals historic and present effects of environmental factors on diversity. If nestedness is present, this points to selective extinction, selective colonization, and habitat nestedness (Si et al. 2015). In contrast, species replacement reflects effects of niche and dispersal constraints on the landscape (Si et al. 2015).

Because they reflect contrasting historical and present ecosystem processes, nestedness and species replacement call for different conservation measures to be taken. In the case of nestedness, the most species-rich sites should be conserved. If species replacement is dominant, both species-rich and species-poor sites should be conserved because both types of sites are adding to diversity across the landscape. Fragmentation is just one of the threats facing meadows worldwide. Studies that partition beta diversity of multiple taxa in meadows are needed in order to inform conservation decisions affecting these habitats. This study fills this need, focusing on plants and pollinators in Western Cascade montane meadows that have experienced habitat loss and connectivity over the previous centuries.

Using data on plant and pollinator diversity in montane meadows in the HJ Andrew's Experimental Forest, I addressed the following questions: (1) Which component of beta diversity, species replacement or nestedness, dominates for plants and pollinators? (2) Does beta diversity, species replacement, or nestedness differ between plants and pollinators? (3) Do beta diversity, species replacement, or nestedness of plants or pollinators relate to difference in meadow size, distance between meadows, or difference in meadow soil moisture? I hypothesized that nestedness would dominate for both plants and pollinators because meadow size and isolation would have a stronger impact on species composition of a meadow than soil moisture. I also expected that overall beta diversity and beta diversity resulting from nestedness would be higher in pollinators because their shorter life-cycles and better dispersal abilities would cause them to disappear from contracting meadows more quickly than plants. I hypothesized that beta diversity and nestednesss would increase with difference in meadow size and distance between meadows.

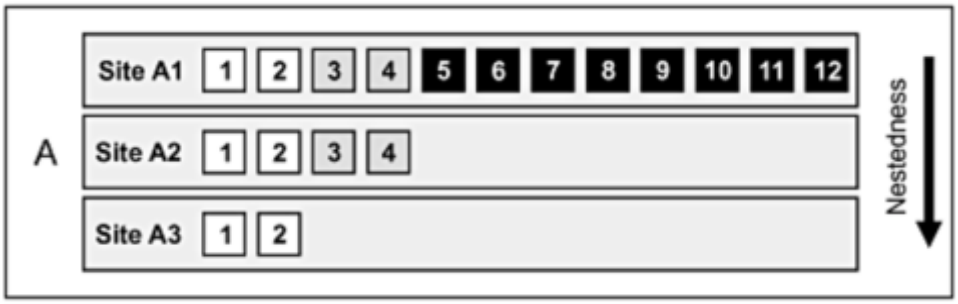

Fig 1. Diagram showing nestedness. Site A2 is a has a nested subset of the species composition of Site A1. Site A3 has a nested species composition of both site A2 and Site A1. Figure has been adapted from Baselga 2010.

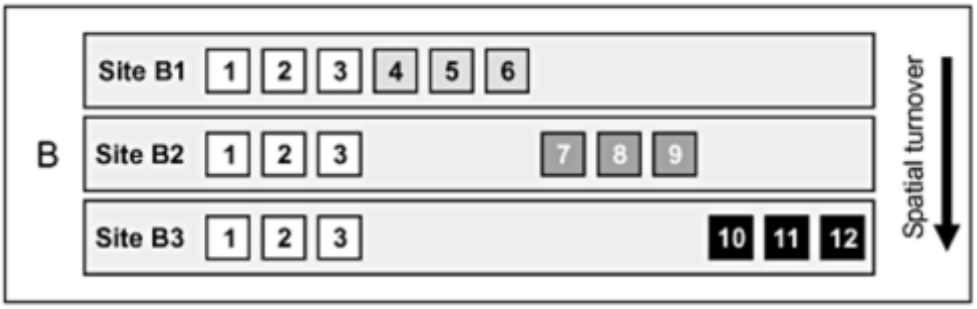

Fig 2. Diagram showing species replacement. Between Sites B1 and B2, species 4, 5, and 6 have been replaced by 7, 8, and 9. Between Sites B2 and B3, species 7, 8, 9 have been replaced by 10, 11, 12. Figure has been adapted from Baselga 2010.

Fig 3. Diagram showing nestedness and species replacement. Only nestedness exists between Site C1 and Site C2: species 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 are found in Site C1 but Site C2 only has species 1, 2, 3, 4, 5, 6. Only species replacement occurs between Site C2 and Site C3 because species 1, 2, 3 are present in both sites and species 4, 5, 6 are replaced by 13, 14, 15 between the sites. Between Site C1 and Site C3, there exists both nestedness and species replacement because 3 species are replaced between sites and species 1, 2, 3 in Site C3 are a nested subset of the species in Site C1. Figure has been adapted from Baselga 2010.

Methods

Study site

The HJ Andrews Experimental Forest is located in the Western Cascades of Oregon. The landscape has been dissected and sloped by rivers, glaciers, and mass movement (Vera Pfeiffer 2013). The climate is maritime: the summers are warm and dry while the winters are mild and experience most of the precipitation (Vera Pfeiffer 2013). Mean annual precipitation is 2,221 mm and mean annual temperature is 6.7°C. Above 1000m, there is a seasonal snowpack (Vera Pfeiffer 2013). At the Vanmet station (1,273 m), the mean annual water equivalent of the snow pack is 370 mm. The habitat is forest dominated with patches of non-forest habitat, including meadows which are predominantly xeric and mesic (Swanson and James 1975). The meadows have shallow soil and exposed bedrock is common, especially in the xeric meadows. The meadows were established and maintained for the last 6000 years by Native Americans burning the landscape (Highland 2011). Since the 1700s, fire has been suppressed due to the decimation of Native Americans and the arrival of Europeans (Miller and Halpern 1998). With the suppression of this disturbance, the meadows have contracted due to woody encroachment. Between 1946 and 2000, non-forest habitat in the landscape decreased from 5.5% to 2.5% (Takaoka and Swanson 2008).

Experimental design, difference in meadow size, distance between meadows, difference in meadow soil moisture

For this study, I used data from three montane meadow complexes in the HJA Experimental Forest that have been surveyed since 2011. These complexes are Carpenter Mountain, Lookout Mountain, and Frissell Ridge (Fig 4.). In 2011, four meadows in the Carpenter Complex, two meadows in the Lookout Complex, and three meadows in the Frissell Complex were sampled. In Carpenter and Frissell, one large and two small meadows were chosen. In 2012, a third meadow was added to the meadows sampled in the Lookout Complex. In 2013, a fourth meadow in the Frissell Complex began to be sampled. The complexes are found at elevations between 1343 and 1533 m and their slopes range from 0 to 55 percent. The size of the 12 meadows found in these complexes ranges from .26 to 4.44 ha as of 2005 (Table 1, Table 2). Of these complexes, Carpenter has experienced the highest proportion of habitat loss followed by Lookout and then Frissell (Highland 2011). The distances between meadows were calculated by Eddie Helderop using gps locations of meadow centroids (Table 3). In 2011 and 2013, during multiple watches, soil samples were collected from areas adjacent to plots. Soil moisture was calculated gravimetrically: after the removal of large organic material, samples were sieved to less than two mm fraction, weighed, and then air-dried for weeks. Soil moisture percent was calculated as (the original weight of the sieved sample – the weight of the sieved sample after being air-dried)/the original weight of the sieved sample (Table 4, Table 5). In 2011, the soil moisture of meadows was calculated using the Topographic Convergence Index (Table 4). Because both soil moisture estimates from 2011 covered only nine of the 12 meadows and because there were no estimates of soil moisture after 2013 available, I also used a ranking of the 12 meadows from wettest to driest that was made by EISI participants in 2017. This

ranking was based on the abundances of flowers across the entire flowering season in each meadow, the amount of erosion, and observations of soil moisture. To compile the multiple calculations of soil moisture into one measure, the meadows were ranked from wettest to driest using each measure (Table 6). The normalized rankings available for each meadow were then averaged (Table 7, Table 8). Since 2013, four meadows in each of the three complexes have been sampled every year. Each meadow has two transects near the center of the meadow, each with five 3 x 3 m plots. The transects are 20 meters apart and the plots are separated by 15 meters.

Fig 4. The locations of the three complexes and the four meadows in each complex. The black line denotes the boundary of the HJA Experimental Forest. For an interactive map with each meadow's coordinates, elevation, slope, and aspect, see: http://andlter.forestry.oregonstate.edu/data/map.aspx?dbcode=SA026.

Table 1. The size (ha) of the 12 meadows found in Carpenter Mountain Complex, Frissell Ridge Complex, and Lookout Mountain Complex in the HJA Experimental Forest as of 2005.

CPB	CPM	CPR	CPS	LB	LM	LO	LS	M2	NE	RP1	RP2
0.72	2.52	0.26	0.39	0.29	3.89	1.95	1.68	4.44	0.43	0.61	0.63

Table 2. The difference in size (ha) of each pairwise comparison of the 12 meadows found in Carpenter Mountain Complex, Frissell Ridge Complex, and Lookout Mountain Complex in the HJA Experimental Forest as of 2005.

	CPB	CPM	CPR	CPS	LB	LM	LO	LS	M2	NE	RP1	RP2
CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CPM	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CPR	0.46	2.26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

CPS	0.33	2.13	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA
LB	0.43	2.23	0.03	0.1	NA	NA	NA	NA	NA	NA	NA	NA
LM	3.17	1.37	3.63	3.5	3.6	NA	NA	NA	NA	NA	NA	NA
LO	1.23	0.57	1.69	1.56	1.66	1.94	NA	NA	NA	NA	NA	NA
LS	0.96	0.84	1.42	1.29	1.39	2.21	0.27	NA	NA	NA	NA	NA
M2	3.72	1.92	4.18	4.05	4.15	0.55	2.49	2.76	NA	NA	NA	NA
NE	0.29	2.09	0.17	0.04	0.14	3.46	1.52	1.25	4.01	NA	NA	NA
RP1	0.11	1.91	0.35	0.22	0.32	3.28	1.34	1.07	3.83	0.18	NA	NA
RP2	0.09	1.89	0.37	0.24	0.34	3.26	1.32	1.05	3.81	0.2	0.02	NA

Table 3. The distance (km) between each meadow found in Carpenter Mountain Complex, Frissell Ridge Complex, and Lookout Mountain Complex in the HJA Experimental Forest.

	CPB	CPM	CPR	CPS	LB	LM	LO	LS	M2	NE	RP1	RP2
CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CPM	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CPR	0.2	0.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CPS	1.4	0.9	1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
LB	8.2	8.1	8.1	7.6	NA	NA	NA	NA	NA	NA	NA	NA
LM	7.8	7.7	7.7	7.2	0.6	NA	NA	NA	NA	NA	NA	NA
LO	8.7	8.6	8.6	8.1	0.3	0.9	NA	NA	NA	NA	NA	NA
LS	8.5	8.4	8.4	7.9	0.3	0.9	0.3	NA	NA	NA	NA	NA
M2	4	3.7	4	3.1	4.5	4.2	5.1	4.8	NA	NA	NA	NA
NE	4.1	3.8	4.1	3.2	4.6	4.3	5.2	4.9	0.1	NA	NA	NA
RP1	4.5	4.3	4.5	3.8	3.8	3.5	4.4	4.1	0.7	0.8	NA	NA
RP2	4.4	4.3	4.4	3.7	3.9	3.5	4.4	4.2	0.7	0.8	0.1	NA

Table 4. Average moisture (grams of H_2O per grams of oven dried soil) of five soil samples collected from each meadow during two different weeks of the 9-week sampling period, average Topographic Convergence Index (TCI) values of the plots in each meadow, and the TCI standard deviation within each meadow for Carpenter Mountain Complex, Frissell Ridge Complex, and Lookout Mountain Complex in the HJA Experimental Forest. Data was collected in 2011 by Vera Pfeiffer (Pfeiffer 2013).

	Week 3 (g H_20/g Soil)	Week 5 (g H_20/g Soil)	Avg TCI	St dev TCI
CPB	0.29	0.17	5.53	1.11
CPM	0.32	0.12	2.83	1.06
CPR	0.39	0.13	2.06	0.68
CPS	0.09	0.07	2.29	0.85
M2	0.38	0.1	2.37	0.88

RP1	0.13	0.09	1.55	0.77
RP2	0.09	0.01	1.93	0.62
LM	0.41	0.03	2.91	1.22
LO	0.02	0	1.74	0.27

Table 5. The average soil moisture (grams of H_2O per grams of oven dried soil) of the plots in each meadow and the standard deviation within each meadow measured during three different watches in Carpenter Mountain Complex, Frissell Ridge Complex, and Lookout Mountain Complex in the HJA Experimental Forest. Data was collected in 2013 by Amanda Reinhard.

	Avg			St dev		
	Watch 1	Watch 4	Watch 6	Watch 1	Watch 4	Watch 6
CPS	10.35	1.90	1.41	5.76	2.75	1.57
CPR	24.54	5.51	2.05	10.27	7.57	3.85
CPM	18.71	4.96	4.25	4.36	3.12	3.43
CPB	18.50	6.16	5.33	7.43	7.81	6.86
LM	28.27	4.55	1.59	4.93	1.80	1.41
LB	71.33	71.68	69.75	10.53	9.84	11.12
LO	9.96	1.16	0.77	6.55	0.97	1.12
LS	18.97	3.98	1.32	8.79	3.18	0.93
M2	14.81	5.88	1.38	4.59	3.14	1.26
NE	11.97	5.44	3.63	7.80	3.75	3.38
RP1	9.68	1.66	1.19	4.97	1.12	0.93
RP2	9.36	1.68	1.34	6.32	1.31	1.30

Table 6. The soil moisture rankings of the meadows found in Carpenter Mountain Complex, Frissell Ridge Complex, and Lookout Mountain Complex in the HJA Experimental Forest based on average soil moisture collected by Vera Pfeiffer in 2011 (Pfeiffer 2013), average TCI measured by Vera Pfeiffer in 2011 (Pfeiffer 2013), and average soil moisture collected by Amanda Reinhard in 2013 as well as the ranking by EISI participants in 2017 based on the abundances of flowers across the entire flowering season, the amount of erosion, and observations of soil moisture.

	Avg soil moisture collected by Pfeiffer in 2011	Avg TCI collected by Pfeiffer in 2011	Avg soil moisture collected by Reinhard in 2013	EISI participants in 2017
Wettest			LB	LB
			LM	CPB
	M2	CPB	CPR	LM
	CPR	LM	CPB	M2
	CPB	CPM	CPM	CPM

	CPM	M2	LS	RP2
	LM	CPS	M2	RP1
	RP1	CPR	NE	NE
	CPS	RP2	CPS	LS
	RP2	LO	RP1	CPR
	LO	RP1	RP2	CPS
Driest			LO	LO

Table 7. The soil moisture ranking of the 12 meadows found in Carpenter Mountain Complex, Frissell Ridge Complex, and Lookout Mountain Complex in the HJA Experimental Forest compiled from the four different rankings.

CPB	CPM	CPR	CPS	LB	LM	LO	LS	M2	NE	RP1	RP2
1.04	0.27	-0.12	-0.65	2.48	0.43	-1.03	-0.48	0.33	-0.39	-0.52	-0.54

Table 8. The difference in soil moisture ranking of each pairwise comparison of the 12 meadows found in Carpenter Mountain Complex, Frissell Ridge Complex, and Lookout Mountain Complex in the HJA Experimental Forest as of 2005.

	CPB	CPM	CPR	CPS	LB	LM	LO	LS	M2	NE	RP1	RP2
CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CPM	0.77	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CPR	1.15	0.38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CPS	1.68	0.91	0.53	NA	NA	NA	NA	NA	NA	NA	NA	NA
LB	1.44	2.21	2.6	3.13	NA	NA	NA	NA	NA	NA	NA	NA
LM	0.61	0.16	0.54	1.07	2.05	NA	NA	NA	NA	NA	NA	NA
LO	2.07	1.3	0.91	0.39	3.51	1.46	NA	NA	NA	NA	NA	NA
LS	1.51	0.74	0.36	0.17	2.96	0.9	0.55	NA	NA	NA	NA	NA
M2	0.71	0.06	0.45	0.97	2.15	0.1	1.36	0.81	NA	NA	NA	NA
NE	1.43	0.66	0.27	0.26	2.87	0.82	0.64	0.09	0.72	NA	NA	NA
RP1	1.56	0.79	0.41	0.12	3	0.95	0.51	0.05	0.85	0.13	NA	NA
RP2	1.58	0.81	0.42	0.1	3.02	0.97	0.49	0.07	0.87	0.15	0.02	NA

Recording plant and pollinator interactions

In a given year, each of the 12 meadows was surveyed five times (five watches). These watches occurred about a week apart during the mid-June to mid-August season. During a watch, all of the plots in the meadow were surveyed for plant-pollinator interactions. Because of the nature of pollinators, surveying is limited to 0900 to 1700 hours and days in which the weather is sunny or partly cloudy, non-windy, and precipitation-free. During the watch, for each plot, the flowers in anthesis were identified to species and the number of stalks of each species containing at least one flower in bloom were counted. Then the number of flowers per stalk (for up to 10 stalks) of

each species was counted. This allowed for the total or an estimate of the total number of flowers of each species in the plot to be determined. For the pollinator portion of the watch, each of the plots in the meadow were observed for 15 minutes. At the beginning of the 15 minutes, the presence of any clouds, shade, and breeze were recorded. The temperature in the meadows at the time of the watches was taken from Vanmet and Uplmet. The minute, pollinator species, flower species, and number of interactions by pollinator were recorded for every instance a pollinator made contact with a flower in the plot during the 15 minutes. During any pause to identify an insect or record data, the stopwatch was stopped. Interactions were classified as P, W, or U if the pollination seemed to occur, if the pollinator waited on the flower, or seemed unsuccessful in pollinating, respecitively. A pollinator visiting multiple flowers of the same species in a minute was recorded as one interaction. A pollinator visiting multiple species of flowers in a minute was separated into multiple interactions by species of flower visited. If one pollinator was involved in multiple interactions whether it visited several flower species in a minute or pollinated flowers in the plot in different minutes, this was noted. Pollinators that could not be easily identified were caught in a net or vial after they had left the plot. If the pollinators could still not be identified from this closer range, they were euthanized in jars of ammonium carbonate and then brought out of the field for identification by Andy Moldenke, an expert entomologist.

Partitioning beta diversity

To calculate the amount of dissimilarity due to species replacement and nestedness from pair-wise beta diversity, I followed the method proposed by Baselga (Baselga 2010). While the Sørensen dissimilarity index is just one of many dissimilarity indices, it is one of the indices most often used to partition beta diversity. This is because the Sørensen dissimilarity index relies on the proportion of species shared between two sites and follows a linear relationship with Whittaker's beta (Diserud and Ødegaard 2007). Sørensen dissimilarity incorporates both true spatial turnover and differences in richness (Koleff et al. 2003). The equations for pairwise Sørensen dissimilarity (βsor) (Eq 1), species replacement (βsim) (Eq 2), and nestedness (βsne) (Eq 3) are:

(Eq 1) $$\beta sor = \frac{(b + c)}{2a + b + c}$$

(Eq 2) $$\beta sim = \frac{\min(b, c)}{a + \min(b, c)}$$

(Eq 3) $$\beta sne = \beta sor - \beta sim$$

where a is the number of species common to both sites, b is the number of species unique to the first site, and c is the number of species unique to the second site. The numerator of Eq 1 represents the number of unique species among the two sites while the denominator is the total

number of species found in the two sites. Eq 1 therefore quantifies dissimilarity because it measures the number of unique species per site (Baselga 2012). The numerator of Eq 2 measures the number of replaced species in a site because the site with fewer unique species sets a limit on the number that are replaced (Baselga 2012). For example, if one site has three unique species and another has four unique species, only three species are replaced in either of the two sites. The denominator of Eq 2 measures the total number of species that can be replaced within a site (Baselga 2012). The number of species in the less rich site sets a limit on the number of species that can be replaced (Baselga 2012). Eq 2 therefore comes to measure the number of replaced species over the number that could be replaced in that site. Species replacement and nestedness are the only components that determine dissimilarity. Therefore, species replacement and nestedness sum to Sørensen dissimilarity which allows the amount of nestedness to be found from the difference of Sørensen dissimilarity and species replacement.

Applying Eq 1, Eq 2, and Eq 3 to the sites shown in Figure 3 can help illustrate the concept of beta diversity partitioning. If Site C1 and Site C2 are paired, a = 6 (species in common), b = 6 (species unique to Site C1), and c = 0 (Species unique to Site C2). This makes βsor = (b + c)/(2a + b + c) = (6 + 0)/(2*6 + 6 + 0) = 6/18 = 0.33. This makes sense because 6 of the 18 species represented in the 2 sites are unique. βsim = min(b, c)/(a + min(b, c)) = 0/(6 + 0) = 0, demonstrating what can be seen from Figure 3: there is no species replacement between Site C1 and Site C2. βsne = βsor - βsim = 0.33 - 0 = 0.33; all of the dissimilarity between Site C1 and Site C2 is explained by nestedness. If Site C2 and C3 are paired, a = 3, b = 3, and c = 3. Therefore, βsor = (b + c)/(2a + b + c) = (3 + 3)/(2*3 + 3 + 3) = 6/12 = 0.5; this demonstrates that half of the species represented between the pair of sites are unique to one of the sites. βsim = min(b, c)/(a + min(b, c)) = 3/(3 + 3) = 3/6 = 0.5; half of the species that could be replaced in each site are replaced. βsne = βsor - βsim = 0.5 - 0.5 = 0; neither site has a nested subset of the species found in the other site. If Site C1 and Site C3 are paired, a = 3, b = 9, and c = 3. βsor = (b + c)/(2a + b + c) = (9 + 3)/(2*3 + 9 + 3) = 12/18 = 0.66; this makes sense because dissimilarity can be measured as the number of unique species found in Site C1 and Site C3 over the total number of species found in both sites. βsim = min(b, c)/(a + min(b, c)) = 3/(3 + 3) = 3/6 = 0.5; in each site, there are 6 species that can be replaced but just 3 are. βsne = βsor – βsim = 0.66 – 0.5 = 0.16; Site C3 has a nested subset of the species found in Site C1.

To calculate beta diversity, species replacement, and nestedness between all of the meadows in a given year, I used the Baselga method of calculating multiple-site Sørensen dissimilarity and its components (Baselga 2010). Within this method, the equations for multiple-site Sørensen dissimilarity (β_{SOR}) (Eq 4), species replacement (β_{SIM}) (Eq 5), and nestedness (β_{SNE}) (Eq 6) are:

(Eq 4) $$\beta_{SOR} = \frac{[\sum_{i<j} \min(b_{ij}, b_{ji})] + [\sum_{i<j} \max(b_{ij}, b_{ji})]}{2[\sum_i S_i - S_T] + [\sum_{i<j} \min(b_{ij}, b_{ji})] + [\sum_{i<j} \max(b_{ij}, b_{ji})]}$$

(Eq 5) $$\beta_{SIM} = \frac{[\sum_{i<j} \min(b_{ij}, b_{ji})]}{[\sum_i S_i - S_T] + [\sum_{i<j} \min(b_{ij}, b_{ji})]}$$

(Eq 6) $$\beta_{SNE} = \beta_{SOR} - \beta_{SIM}$$

where S_i is the number of species in site i, S_T is the number of species in all of the sites aggregated, and b_{ij} and b_{ji} are the number of species only found in sites i and j when compared in pairs. To apply this set of equations to my data, I used the betapart package in R (Baselga and Orme 2012).

To calculate the percentage of dissimilarity resulting from nestedness, I found the pair-wise nestedness ratio (β_{ratio}) (Eq 7) and the multiple-site nestedness ratio (β_{RATIO}) (Eq 8):

(Eq 7): $$\beta_{ratio} = \frac{\beta_{sne}}{\beta_{sim}}$$

(Eq 8): $$\beta_{RATIO} = \frac{\beta_{SNE}}{\beta_{SIM}}$$

Data analysis

I tested whether difference in meadow size, distance between meadows, and difference in soil moisture were significantly related to pairwise dissimilarity and ratio of nestedness of plant and pollinator communities using linear regressions in R. I found the Pearson correlation coefficients, p-values, intercepts, and slopes associated with each linear regression.

Results

Multiple-site beta diversity and its components

The mean yearly multiple-site Sørensen dissimilarity of plant communities was 0.71 and was 0.75 for pollinator communities. The Sørensen index ranges from 0 to 1 where a Sørensen dissimilarity of 0 represents identical species composition between sites and 1 means that there is no overlap of species between sites. Therefore, the multiple-site Sørensen dissimilarities of plant and pollinator communities both show a high mean degree of dissimilarity between all of the meadows in the three complexes in the six-year period. These results also show that the multiple-site dissimilarities were similar between plant and pollinator communities.

While each year shows a high degree of dissimilarity for plants and pollinators, there was still variation in multiple-site Sørensen dissimilarity of plant and pollinator communities across years (low of 0.74 in 2011 and high of 0.82 in 2015 for plant communities, low of 0.75 in 2011 and high of 0.85 in 2015 for pollinator communities) (Fig 5 and Fig 6). The minimum and maximum values of multiple-site dissimilarity occurred in the same years for plant and pollinator communities. In 2011 and 2015, the multiple-site species replacement components of plant communities were 0.69 to 0.74 and the nestedness components were 0.046 and 0.077, respectively. This shows that the greatest variation in multiple-site dissimilarity of plant communities which occurred between 2011 and 2015 was driven by both an increase in species replacement and nestedness. While species replacement increased more in absolute terms, nestedness increased by almost 170% between these two years. For pollinator communities, in 2011, the multiple-site species replacement component was 0.68 while in 2015, it was 0.79. In 2011, the multiple-site nestedness component of pollinator communities was 0.069 while in 2015, it was 0.055. In contrast to plants, the greatest variation in multiple-site dissimilarity of pollinators which manifested as an increase in dissimilarity between 2011 and 2015 was driven solely by species replacement.

Plant and pollinator communities showed similar mean multiple-site species replacement components of beta diversity (0.78 and 0.81). The mean nestedness components of the multiple-site beta diversities of plant and pollinator communities were similar (0.068 and 0.059). In conjunction with the similar values of multiple-site Sørensen dissimilarity and nestedness components between the two taxa, the mean ratios of multiple-site nestedness to Sørensen dissimilarities of plants and pollinators were similar (0.089 and 0.074).

Species replacement made up the largest portion of dissimilarity of plant communities as well as pollinator communities in each year (Fig 5 and Fig 6).

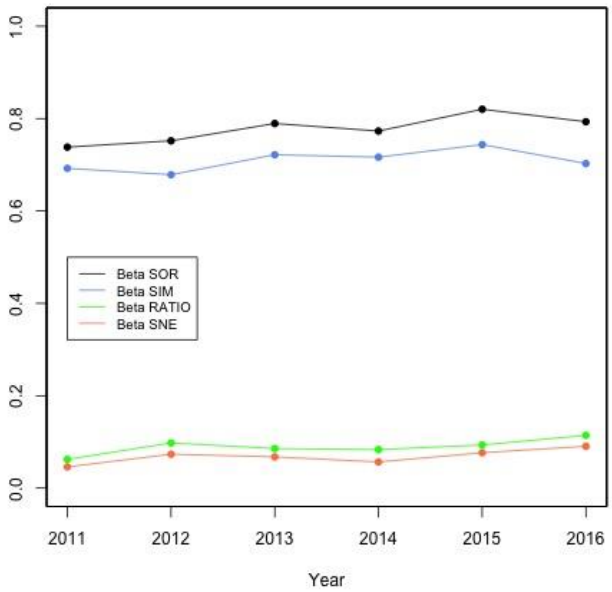

Fig 5. The multiple-site Sørensen dissimilarity (β_{SOR}) and its components of turnover (β_{SIM}) and nestedness (β_{SNE}) as well as the ratio of nestedness to dissimilarity (β_{RATIO}) of plant communities in the HJA Experimental Forest over 2011 to 2016.

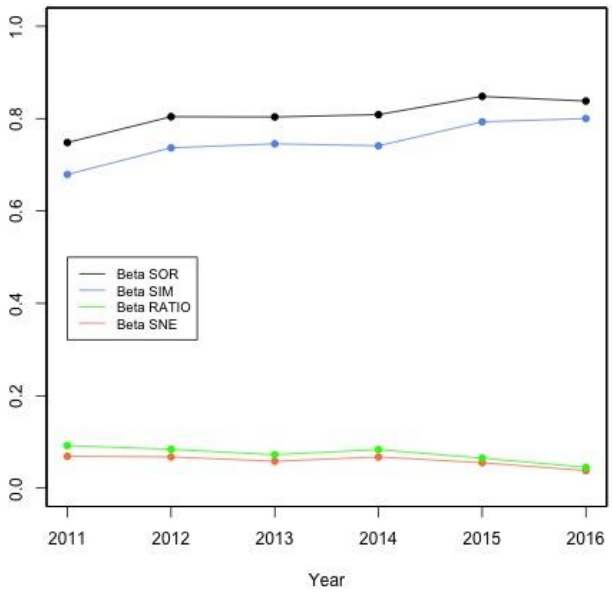

Fig 6. The multiple-site Sørensen dissimilarity (β_{SOR}) and its components of turnover (β_{SIM}) and nestedness (β_{SNE}) as well as the ratio of nestedness to dissimilarity (β_{RATIO}) of pollinator communities in the HJA Experimental Forest over 2011 to 2016.

Pairwise beta diversity and its components

Pairwise dissimilarity of pollinators increased significantly with dissimilarity of plants (r = 0.381, p < 2.2e-16) (Fig 7). The y-intercept and slope of the linear regression were 0.381 and 0.386. The pairwise dissimilarity of pollinator communities is higher than that of plants because according to this model, if two plant communities were completely similar, the pollinator communities in the same pair of sites would have a dissimilarity of 0.381 so they would not be identical. Across the full range of values, according to the linear regression, pollinator dissimilarity was 0.381 higher than plant dissimilarity. Pollinator dissimilarity increased by 0.386 as plant dissimilarity increased by one.

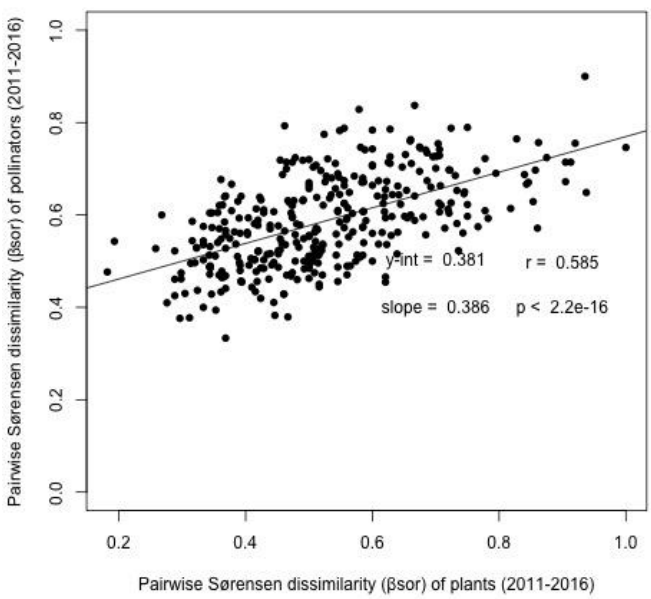

Fig 7. The relationship of Sørensen dissimilarity (β_{sor}) of plant and pollinator communities in the HJA Experimental Forest over 2011 to 2016.

Pairwise ratio of nestedness of pollinators increased significantly with pairwise ratio of nestedness of plants (r = 0.243, p = 5e-06) (Fig 8). The y-intercept and slope of the linear regression were 0.122 and 0.213. The y-intercept of 0.122 indicates that two meadows that show no nestedness of plant communities will still show some nestedness of pollinator communities. According to the model, the two meadows with the maximum ratio of nestedness for plants (0.842) will have a ratio of nestedness of 0.179 for pollinators which is only 0.057 higher than the ratio of nestedness of pollinator communities for the meadows with no ratio of nestedness of plant communities. Therefore, the relationship between the pairwise ratios of nestedness of plant and pollinator communities is not practically significant.

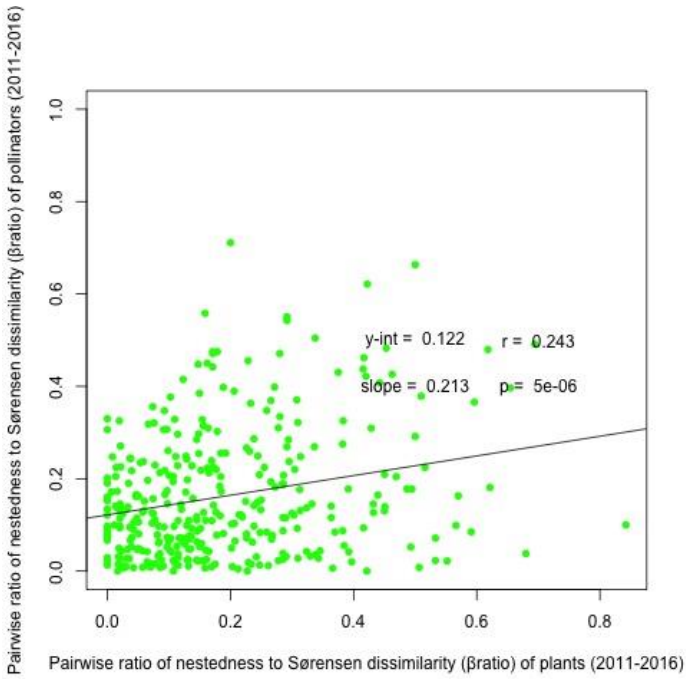

Fig 8. The relationship of the ratio of nestedness to Sørensen dissimilarity (β_{ratio}) of plant and pollinator communities in the HJA Experimental Forest over 2011 to 2016.

Pairwise dissimilarity of plant species composition between meadows significantly decreased with difference in meadow size (r = -0.129, p = 1.37e-02) (Fig 9). However, the linear regression provided a y-intercept of 0.552 and a small slope of -0.015 which suggests that this result is not practically significant. The model predicts that meadows that are the same size have plant compositions with a dissimilarity of 0.552 while the plant species in meadows that are four ha different in size show a dissimilarity of 0.492. In response to the large increase in the difference in meadow size, there was a relatively small decrease in dissimilarity. No significant relationship was found between difference in meadow size and pairwise Sørensen dissimilarity for pollinators (Fig 10).

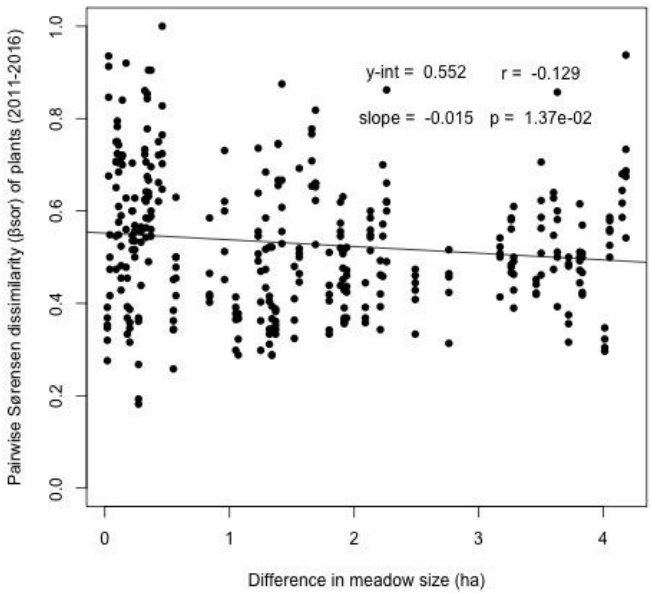

Fig 9. The relationship of pairwise Sørensen dissimilarity (β_{sor}) of plant communities with difference in meadow size in the HJA Experimental Forest surveyed from 2011 to 2016.

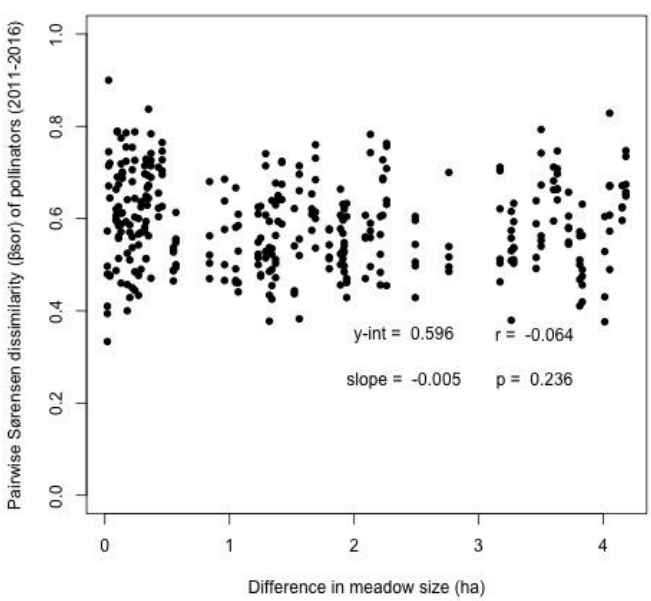

Fig 10. The relationship of pairwise Sørensen dissimilarity (β_{sor}) of pollinator communities with difference in meadow size in the HJA Experimental Forest surveyed from 2011 to 2016.

No significant relationship existed between difference in meadow size and the pairwise ratio of nestedness of either plant or pollinator communities (Fig 11 and Fig 12).

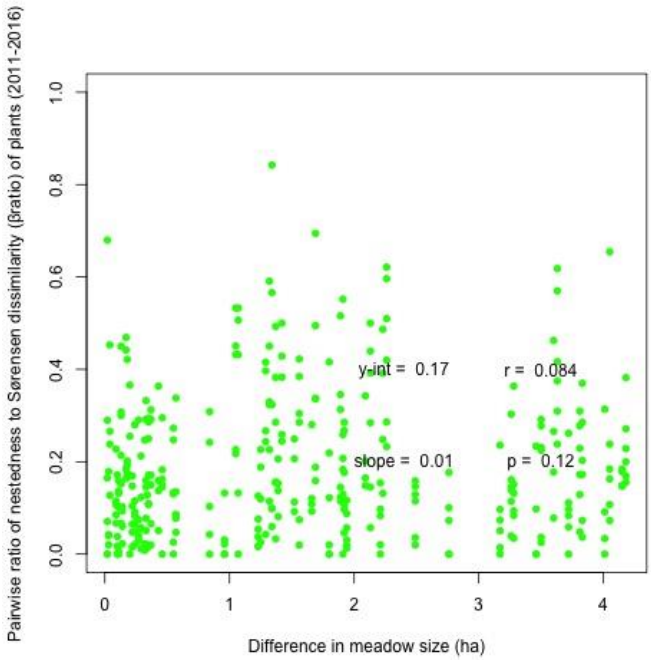

Fig 11. The relationship of the ratio of pairwise nestedness to Sørensen dissimilarity (β_{ratio}) of plant communities with difference in meadow size in the HJA Experimental Forest surveyed from 2011 to 2016.

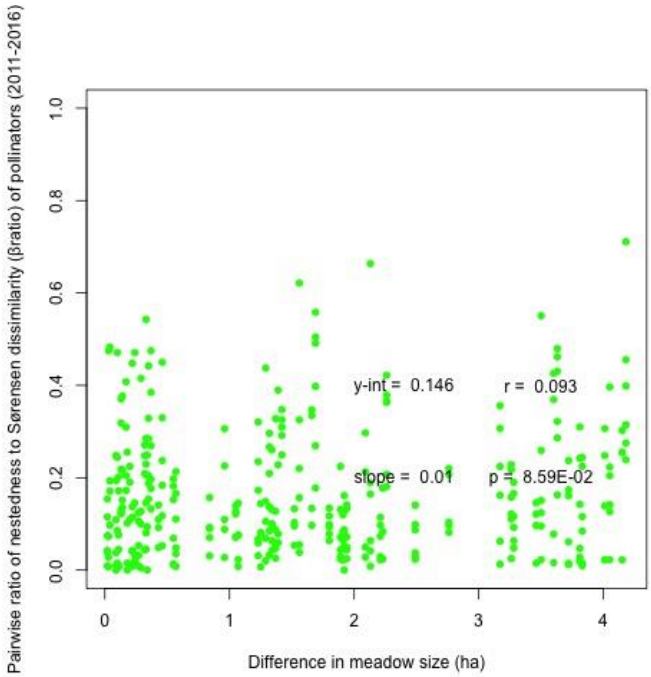

Fig 12. The relationship of the ratio of pairwise nestedness to Sørensen dissimilarity (β_{ratio}) of pollinator communities with difference in meadow size in the HJA Experimental Forest surveyed from 2011 to 2016.

Pairwise Sørensen dissimilarity of plant communities increased significantly with distance between meadows (r = 0.16, p = 2.8e-03) (Fig 13). The linear regression provided a y-intercept of 0.492 and slope of 0.009 for this relationship. The small slope of this relationship suggests that while this relationship is statistically significant, it is not practically significant. The plant species compositions of two meadows that are very close together would show a dissimilarity value of around 0.492 while meadows two km apart would show a similar dissimilarity of 0.51.

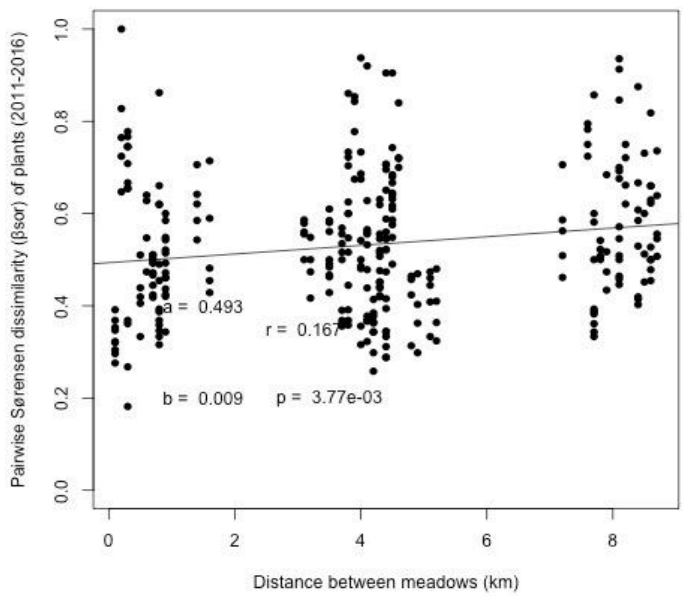

Fig 13. The relationship of pairwise Sørensen dissimilarity (β_{sor}) of plant communities with distance between meadows in the HJA Experimental Forest surveyed from 2011 to 2016.

Pairwise dissimilarity of pollinator composition significantly increased with distance between meadows (r = 0.181, p = 7.43e-04). In similar fashion to the relationship between distance between meadows and dissimilarity of plant communities, this relationship is not practically significant. The y-intercept and slope of the relationship are 0.56 and 0.007. The slope is small so meadows that are close together and far apart have similar dissimilarity values.

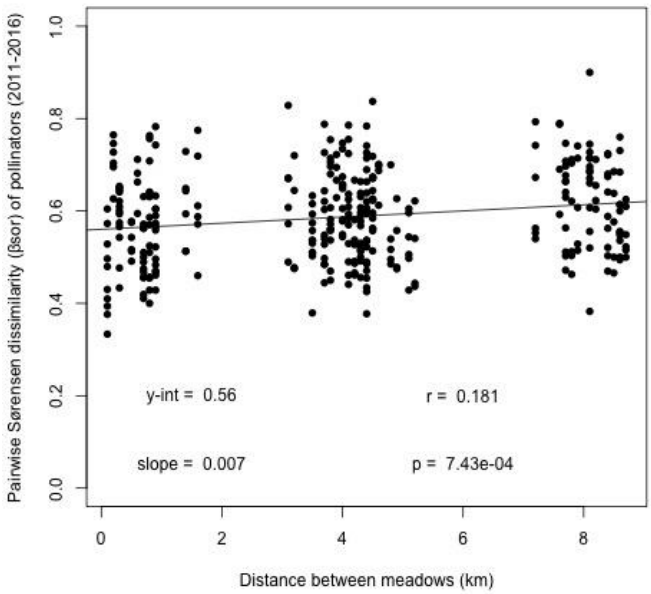

Fig 14. The relationship of pairwise Sørensen dissimilarity (β_{sor}) of pollinator communities with distance between meadows in the HJA Experimental Forest surveyed from 2011 to 2016.

No significant relationship between distance between meadows and ratio of nestedness of plants was found (Fig 15). Similarly, no significant relationship between distance between meadows and ratio of nestedness of pollinators existed (Fig 16).

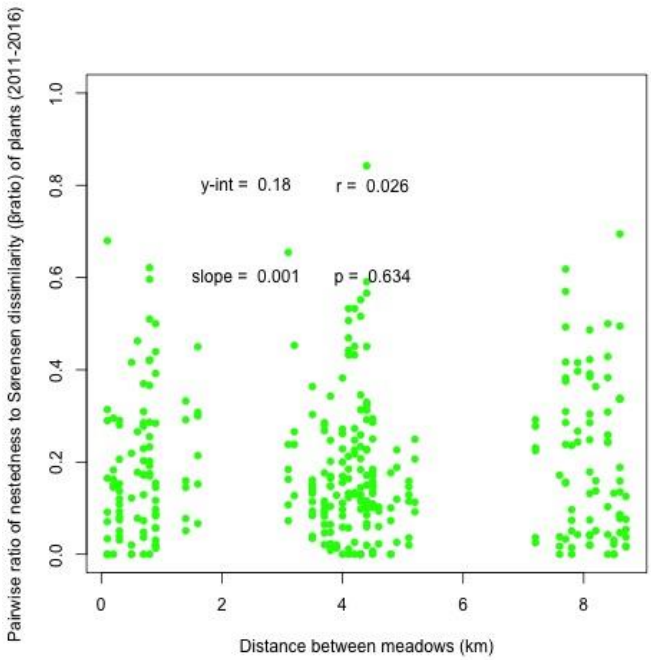

Fig 15. The relationship of the ratio of pairwise nestedness to Sørensen dissimilarity (β_{ratio}) of plant communities with distance between meadows in the HJA Experimental Forest surveyed from 2011 to 2016.

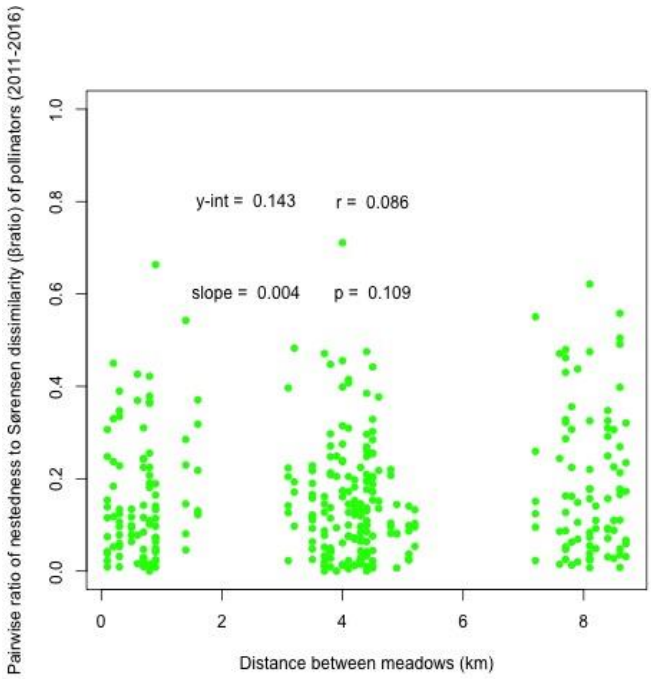

Fig 16. The relationship of the ratio of pairwise nestedness to Sørensen dissimilarity (β_{ratio}) of pollinator communities with distance between meadows in the HJA Experimental Forest surveyed from 2011 to 2016.

Pairwise dissimilarity of plant communities increased significantly with difference in meadow soil moisture ($r = 0.524$, $p < 2e\text{-}16$) (Fig 17). The linear regression provided a y-intercept of 0.441 and a slope of 0.094 for this relationship. The provided soil moisture of each meadow is a ranking. The maximum difference in rankings between the meadows is 3.51. According to the model, a meadow pair with this difference in soil moisture would have a dissimilarity value of 0.771 which is 0.330 greater than the dissimilarity of two meadows with the same soil moisture ranking. Therefore, the statistically significant relationship between meadow soil moisture and dissimilarity of plant species composition is also practically significant.

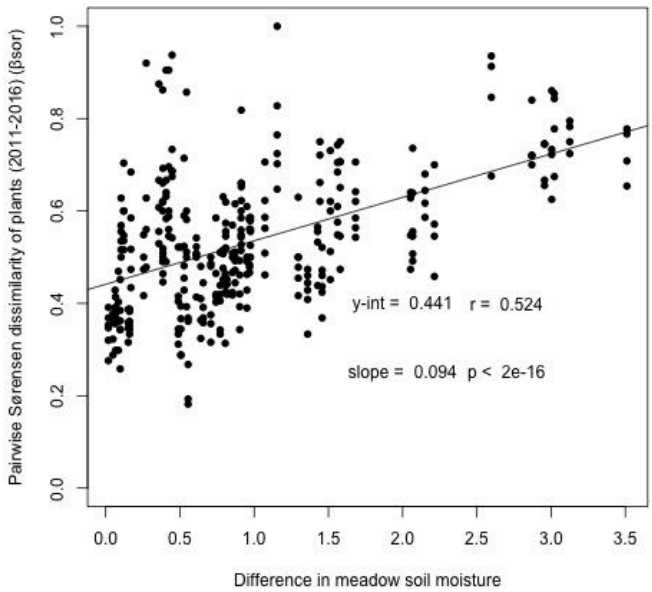

Fig 17. The relationship of pairwise Sørensen dissimilarity (β_{sor}) of plant communities with difference in meadow soil moisture in the HJA Experimental Forest surveyed from 2011 to 2016.

There was also a positive significant relationship between difference in meadow moisture and dissimilarity of pollinator communities (r = 0.237, p = 1.06e-05) (Fig 18). The y-intercept and slope of this relationship were 0.563 and 0.028 according to the linear regression. Following this model, meadows with the same soil moisture ranking will show a dissimilarity of 0.563 while meadows that have the greatest difference in meadow soil moisture ranking: 3.51 will have a dissimilarity of 0.661. The meadows which differ the most in soil moisture have a dissimilarity of pollinator composition 0.098 greater than the meadows with the most similar soil moisture ranking. There is a relationship between meadow soil moisture and dissimilarity of pollinator communities but it is neither as statistically nor practically significant as the relationship between difference in meadow soil moisture and dissimilarity of plant communities.

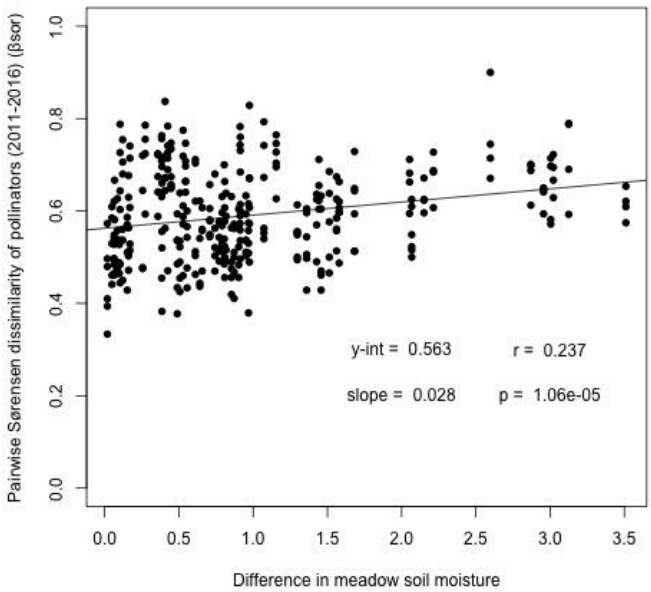

Fig 18. The relationship of pairwise Sørensen dissimilarity (β_{sor}) of pollinator communities with difference in meadow soil moisture in the HJA Experimental Forest surveyed from 2011 to 2016.

There existed a significant negative relationship between difference in meadow soil moisture and ratio of nestedness of plant communities (r = -0.273, p = 3.51e-07) (Fig 19). The model predicts that meadows with the same soil moisture will have a ratio of nestedness of plant communities of 0.237. Also according to the model, for plant communities in the driest and wettest meadow, the ratio of nestedness will be 0.054. Therefore, the linear regression predicts that the ratio of nestedness will decrease (ratio of species replacement will increase) by 0.183 in the meadows that differ the most in soil moisture compared to the meadows that have the same soil moisture ranking. Therefore, the relationship between difference in meadow soil moisture and the ratio of dissimilarity of plant communities explained by nestedness is practically as well as statistically significant. No significant relationship was found between difference in meadow soil moisture and ratio of nestedness of pollinator communities (Fig 20).

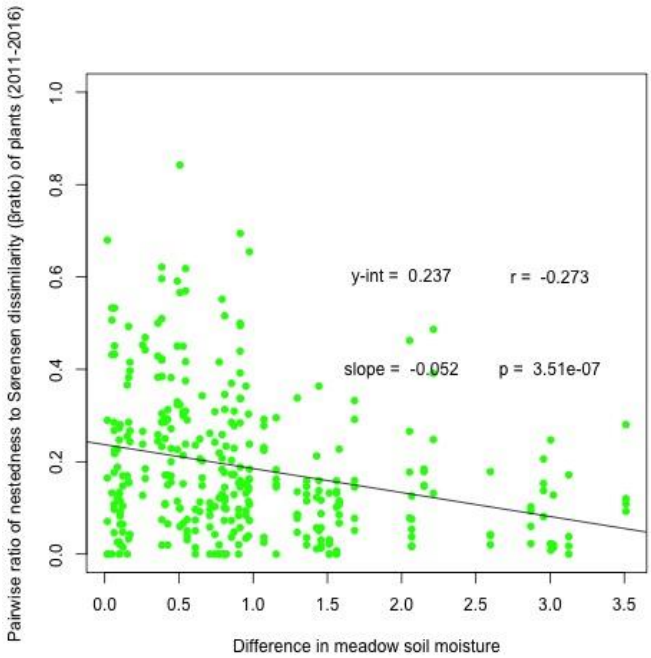

Fig 19. The relationship of the ratio of pairwise nestedness to Sørensen dissimilarity (β_{ratio}) of plant communities with difference in meadow soil moisture in the HJA Experimental Forest surveyed from 2011 to 2016.

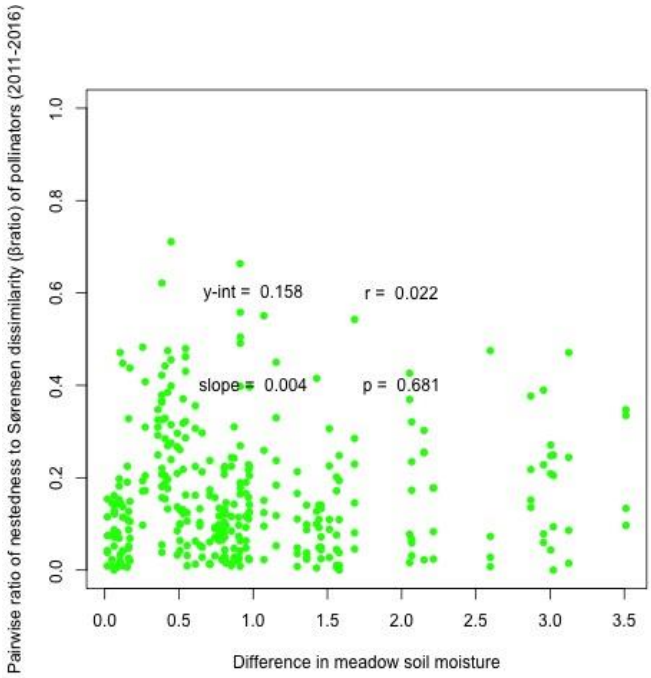

Fig 20. The relationship of the ratio of pairwise nestedness to Sørensen dissimilarity (β_{ratio}) of pollinator communities with difference in meadow soil moisture in the HJA Experimental Forest surveyed from 2011 to 2016.

Table 9. The relationships between plant and pollinator pairwise Sørensen dissimilarity (β_{sor}), plant and pollinator ratio of pairwise nestedness to Sørensen dissimilarity (β_{ratio}), and the relationships between difference in meadow size, distance between meadows, and difference in meadow soil moisture and plant and pollinator pairwise Sørensen dissimilarity (β_{sor}) and ratio of pairwise nestedness to Sørensen dissimilarity (β_{ratio}). The Pearson correlation coefficients and p-values are included for the data from each year from 2011 to 2016 and for the data aggregated across years. All data was collected in the HJA Experimental Forest.

βsor of plants x βsor of pollinators	correlation coefficient	p-value
βsor of plants x βsor of pollinators (2011-2016)	0.585	<2.2E-16****
βsor of plants x βsor of pollinators (2011)	0.464	4.38E-03**
βsor of plants x βsor of pollinators (2012)	0.548	9.82E-05****
βsor of plants x βsor of pollinators (2013)	0.78	1.13E-14****
βsor of plants x βsor of pollinators (2014)	0.636	9.24E-09****
βsor of plants x βsor of pollinators (2015)	0.51	1.23E-05****
βsor of plants x βsor of pollinators (2016)	0.534	3.88E-06****
βratio of plants x βratio of pollinators		
βratio of plants x βratio of pollinators (2011-2016)	0.243	5.00E-06****
βratio of plants x βratio of pollinators (2011)	0.327	5.17E-02
βratio of plants x βratio of pollinators (2012)	0.13	0.396
βratio of plants x βratio of pollinators (2013)	0.195	0.118
βratio of plants x βratio of pollinators (2014)	0.242	5.03E-02
βratio of plants x βratio of pollinators (2015)	0.503	1.71E-05****
βratio of plants x βratio of pollinators (2016)	0.23	6.37E-02
Meadow size x βsor		
Plants		
Meadow size x βsor of plants (2011-2016)	-0.129	1.37E-02*
Meadow size x βsor of plants (2011)	0.062	0.717
Meadow size x βsor of plants (2012)	-0.001	0.995
Meadow size x βsor of plants (2013)	-0.208	9.33E-02
Meadow size x βsor of plants (2014)	-0.087	0.49
Meadow size x βsor of plants (2015)	-0.151	0.225
Meadow size x βsor of plants (2016)	-0.207	9.47E-02
Pollinators		
Meadow size x βsor of pollinators (2011-2016)	-0.064	0.236
Meadow size x βsor of pollinators (2011)	0.31	6.54E-02
Meadow size x βsor of pollinators (2012)	-0.076	0.621
Meadow size x βsor of pollinators (2013)	-0.017	0.893
Meadow size x βsor of pollinators (2014)	-0.161	0.196
Meadow size x βsor of pollinators (2015)	-0.011	0.93

Meadow size x βsor of pollinators (2016)	-0.156	0.212
Meadow size x βratio		
Plants		
Meadow size x βratio of plants (2011-2016)	0.084	0.12
Meadow size x βratio of plants (2011)	-0.009	0.959
Meadow size x βratio of plants (2012)	-0.052	0.735
Meadow size x βratio of plants (2013)	0.083	5.08E-01
Meadow size x βratio of plants (2014)	0.179	0.15
Meadow size x βratio of plants (2015)	0.179	0.15
Meadow size x βratio of plants (2016)	0.089	0.475
Pollinators		
Meadow size x βratio of pollinators (2011-2016)	0.093	8.59E-02
Meadow size x βratio of pollinators (2011)	0.167	0.331
Meadow size x βratio of pollinators (2012)	0.195	0.2
Meadow size x βratio of pollinators (2013)	0.32	8.82E-03**
Meadow size x βratio of pollinators (2014)	0.031	0.803
Meadow size x βratio of pollinators (2015)	-0.021	0.865
Meadow size x βratio of pollinators (2016)	0.001	0.995
Meadow distance x βsor		
Plants		
Meadow distance x βsor of plants (2011-2016)	0.16	2.80E-03**
Meadow distance x βsor of plants (2011)	-0.007	0.967
Meadow distance x βsor of plants (2012)	0.128	0.401
Meadow distance x βsor of plants (2013)	0.18	0.148
Meadow distance x βsor of plants (2014)	0.153	0.22
Meadow distance x βsor of plants (2015)	0.28	2.28E-02*
Meadow distance x βsor of plants (2016)	0.138	0.268
Pollinators		
Meadow distance x βsor of pollinators (2011-2016)	0.181	7.34E-04***
Meadow distance x βsor of pollinators (2011)	0.14	0.415
Meadow distance x βsor of pollinators (2012)	0.026	0.867
Meadow distance x βsor of pollinators (2013)	0.173	0.166
Meadow distance x βsor of pollinators (2014)	0.309	1.15E-02*
Meadow distance x βsor of pollinators (2015)	0.159	0.202
Meadow distance x βsor of pollinators (2016)	0.303	1.33E-02*
Meadow distance x βratio		
Plants		
Meadow distance x βratio of plants (2011-2016)	0.026	6.34E-01
Meadow distance x βratio of plants (2011)	0.022	0.896
Meadow distance x βratio of plants (2012)	-0.129	3.99E-01
Meadow distance x βratio of plants (2013)	-0.016	0.898

Meadow distance x βratio of plants (2014)	0.104	0.405
Meadow distance x βratio of plants (2015)	0.024	0.846
Meadow distance x βratio of plants (2016)	0.116	0.355
Pollinators		
Meadow distance x βratio of pollinators (2011-2016)	0.086	1.09E-01
Meadow distance x βratio of pollinators (2011)	0.378	2.32E-02*
Meadow distance x βratio of pollinators (2012)	-0.064	0.678
Meadow distance x βratio of pollinators (2013)	0.033	0.79
Meadow distance x βratio of pollinators (2014)	0.062	0.622
Meadow distance x βratio of pollinators (2015)	0.118	0.345
Meadow distance x βratio of pollinators (2016)	0.076	0.545
Difference in meadow soil moisture x βsor		
Plants		
Difference in meadow soil moisture x βsor of plants (2011-2016)	0.524	<2E-16****
Difference in meadow soil moisture x βsor of plants (2011)	0.285	9.18E-02
Difference in meadow soil moisture x βsor of plants (2012)	0.285	5.81E-02
Difference in meadow soil moisture x βsor of plants (2013)	0.676	4.6E-10****
Difference in meadow soil moisture x βsor of plants (2014)	0.693	1.15E-10****
Difference in meadow soil moisture x βsor of plants (2015)	0.339	5.43E-03**
Difference in meadow soil moisture x βsor of plants (2016)	0.677	4.37E-10****
Pollinators		
Difference in meadow soil moisture x βsor of pollinators (2011-2016)	0.237	1.06E-05****
Difference in meadow soil moisture x βsor of pollinators (2011)	0.108	5.31E-01
Difference in meadow soil moisture x βsor of pollinators (2012)	-0.069	6.53E-01
Difference in meadow soil moisture x βsor of pollinators (2013)	0.388	1.3E-03**
Difference in meadow soil moisture x βsor of pollinators (2014)	0.501	1.8E-05****
Difference in meadow soil moisture x βsor of pollinators (2015)	0.165	0.184
Difference in meadow soil moisture x βsor of pollinators (2016)	0.154	0.216
Difference in meadow soil moisture x βratio		
Plants		
Difference in meadow soil moisture x βratio of plants (2011-2016)	-0.273	3.51E-07****
Difference in meadow soil moisture x βratio of plants (2011)	-0.173	3.12E-01
Difference in meadow soil moisture x βratio of plants (2012)	-0.371	1.21E-02*
Difference in meadow soil moisture x βratio of plants (2013)	-0.356	3.31E-03**
Difference in meadow soil moisture x βratio of plants (2014)	-0.001	0.995
Difference in meadow soil moisture x βratio of plants (2015)	-0.36	2.98E-03**
Difference in meadow soil moisture x βratio of plants (2016)	-0.428	4.22E-04***
Pollinators		
Difference in meadow soil moisture x βratio of pollinators (2011-2016)	0.022	0.681
Difference in meadow soil moisture x βratio of pollinators (2011)	-0.094	0.586
Difference in meadow soil moisture x βratio of pollinators (2012)	0.057	0.709
Difference in meadow soil moisture x βratio of pollinators (2013)	0.091	0.467
Difference in meadow soil moisture x βratio of pollinators (2014)	0.364	2.69E-03**
Difference in meadow soil moisture x βratio of pollinators (2015)	-0.164	0.188
Difference in meadow soil moisture x βratio of pollinators (2016)	0.032	0.797

Discussion

The mean yearly multiple-site Sørensen dissimilarity of plant and pollinator communities was relatively high (0.71 and 0.75). This shows that the meadows surveyed show large differences in their composition of plant and pollinator species. The heterogeneous species composition across the HJA Experimental Forest is likely a result of the heterogeneous nature of the landscape. The meadows vary in size, isolation, and edaphic qualities. While each year showed a high degree of dissimilarity for plants and pollinators, there was still variation across years (Fig 5 and Fig 6). The largest fluctuations in multiple-site dissimilarity occurred for both plants and pollinators in 2011 and 2015. Possibly, the same factors drive plant and pollinator community dissimilarity. Other possible explanations are that species composition affects pollinator species composition, vice versa, or the species composition of each taxa affects the other. However, these scenarios seem unlikely given that the variation in multiple-site dissimilarity of plants was caused by both in increase in species replacement and nestedness while the variation for pollinators was solely driven by an increase in species replacement.

Plant and pollinator communities exhibited a similar amount of multiple-site dissimilarity. However, when the pairwise dissimilarity of plant and pollinator communities is compared, a more developed conclusion can be made. There is a significant relationship between the dissimilarity of plant and pollinator communities and the linear regression provides a y-intercept of 0.381 for this relationship (Fig 7). Across the full range of data, pollinator communities showed dissimilarities around 0.381 higher than plant communities. This fits with my hypothesis that pollinator species composition would show higher dissimilarity between meadows because pollinators react more quickly to habitat change than plants. However, it is evident that species replacement contributed more to the multiple-site beta diversity of plant and pollinator communities than nestedness because the multiple-site ratio of nestedness to Sørensen dissimilarity was low for both groups (0.089 and 0.074). Therefore, pollinator communities do not seem to show more dissimilarity because of increased nestedness. Further research should be conducted to determine why the composition of pollinator species varies more across the meadows than does plant species composition. Pollinator communities might show greater dissimilarity because they are a trophic level above plants. Another possibility is that pollinator communities show higher dissimilarity because some of the pollinators surveyed are forest dwelling. Additionally, communities of herbaceous and predacious insects might show different amounts of dissimilarity.

I had hypothesized that nestedness would dominate based on my idea that meadow size and distance between meadows would affect species composition more than meadow soil moisture. My finding that species replacement actually dominated disagreed with this hypothesis, suggesting that meadow soil moisture is actually a larger influence on species composition. This alternative hypothesis is further supported by the linear regressions I ran on meadow characteristics and pairwise dissimilarity of plant and pollinator communities. The relationship between difference in meadow size and dissimilarity of

plant communities was statistically significant but not practically significant (Fig 9). No significant relationship was found between difference in meadow size and dissimilarity for pollinators (Fig 10). Both of these findings demonstrate that meadow size is not a determinant of plant or pollinator species composition. The same conclusion can be made for distance between meadows because the relationships between this factor and dissimilarity of plant and pollinator communities were both statistically significant but neither were practically significant. The relationships between difference in meadow soil moisture and dissimilarity for plants and pollinators were more statistically significant than the previous relationships and in contrast, were practically significant. Meadow soil moisture is a more dominant driver of plant and pollinator species composition in the meadows than meadow size or distance between meadows. The ratio of species replacement to Sørensen dissimilarity increased significantly with difference in meadow soil moisture for plants. The variation in meadow soil moisture across the landscape creates new niches, allowing for species replacement of plants. The meadows vary in soil moisture dramatically even within the same complex which allows unique species to be found in meadows close together. Additionally, variation in soil moisture across the meadows allows small meadows to have species not found in larger meadows. Dissimilarity and the ratio of species replacement to dissimilarity might increase more with difference in meadow soil moisture for plants than for pollinators because plants receive nutrients and water from the ground. Because difference in meadow soil moisture did not explain all of the variation in either plant or pollinator community dissimilarity, other factors are driving differences in species composition between meadows. These might include soil type, slope, aspect, altitude, and other factors that are associated with species replacement given the small contribution of nestedness to beta diversity.

Edaphic factors appear to be a more dominant driver of the plant and pollinator species composition of the meadows found in the HJA Experimental Forest than fragmentation. While the primary goal of the HJA Experimental Forest is research, if conservation of the meadows were ever to be considered, it would be advised against to solely protect the largest meadows. Instead, meadows of different sizes and more importantly, different soil characteristics should be conserved because the diversity of plant and pollinator species in the landscape is partly due to species replacement resulting from variation in the soil of meadows.

Conclusion

Partitioning beta diversity in montane meadows of the Western Cascades demonstrated that species replacement is the dominant driver of dissimilarity of both plant and pollinator communities across meadows. Furthermore, this work showed that there is greater dissimilarity of pollinator communities than plant communities. There were weak relationships between difference in meadow size and pairwise dissimilarity of plants and pollinators. This was true for distance between meadows as well. Difference in soil moisture between meadows was the strongest driver of dissimilarity of plant and pollinator communities. Because dissimilarity for both taxa increased with difference in meadow soil moisture, species replacement dominated, and the ratio of species replacement to dissimilarity of plant communities increased with difference in meadow soil moisture, it can be inferred that variation in edaphic factors across the meadows allows for greater diversity in the landscape.

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Appendices

Pairwise Sørensen dissimilarity (βsor) of plants

	2011 CPB	2011 CPM	2011 CPR	2011 CPS	2011 LM	2011 LO	2011 M2	2011 RP1	2011 RP2
2011 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPM	0.405	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPR	0.724	0.621	NA	NA	NA	NA	NA	NA	NA
2011 CPS	0.543	0.514	0.481	NA	NA	NA	NA	NA	NA
2011 LM	0.500	0.382	0.500	0.563	NA	NA	NA	NA	NA
2011 LO	0.507	0.478	0.623	0.446	0.460	NA	NA	NA	NA
2011 M2	0.316	0.368	0.733	0.556	0.343	0.408	NA	NA	NA
2011 RP1	0.576	0.515	0.640	0.516	0.500	0.344	0.500	NA	NA
2011 RP2	0.545	0.545	0.560	0.516	0.467	0.311	0.500	0.276	NA

	2012 CPB	2012 CPM	2012 CPR	2012 CPS	2012 LM	2012 LO	2012 LS	2012 M2	2012 RP1	2012 RP2
2012 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPM	0.342	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPR	0.702	0.600	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPS	0.564	0.559	0.524	NA	NA	NA	NA	NA	NA	NA
2012 LM	0.414	0.352	0.511	0.623	NA	NA	NA	NA	NA	NA
2012 LO	0.492	0.417	0.652	0.519	0.368	NA	NA	NA	NA	NA
2012 LS	0.621	0.465	0.556	0.585	0.393	0.193	NA	NA	NA	NA
2012 M2	0.375	0.429	0.686	0.525	0.452	0.429	0.516	NA	NA	NA
2012 RP1	0.705	0.514	0.583	0.536	0.390	0.367	0.288	0.569	NA	NA
2012 RP2	0.750	0.574	0.600	0.628	0.478	0.404	0.391	0.615	0.347	NA

	2013 CPB	2013 CPM	2013 CPR	2013 CPS	2013 LB	2013 LM	2013 LO	2013 LS	2013 M2	2013 NE	2013 RP1	2013 RP2
2013 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPM	0.439	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPR	0.765	0.619	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPS	0.621	0.543	0.590	NA	NA	NA	NA	NA	NA	NA	NA	NA

2013 LB	0.621	0.571	0.846	0.783	NA	NA	NA	NA	NA	NA	NA	NA
2013 LM	0.507	0.333	0.600	0.509	0.474	NA	NA	NA	NA	NA	NA	NA
2013 LO	0.639	0.500	0.660	0.500	0.767	0.437	NA	NA	NA	NA	NA	NA
2013 LS	0.600	0.415	0.608	0.517	0.655	0.420	0.361	NA	NA	NA	NA	NA
2013 M2	0.486	0.390	0.686	0.586	0.586	0.362	0.444	0.457	NA	NA	NA	NA
2013 NE	0.565	0.358	0.560	0.474	0.719	0.441	0.324	0.362	0.304	NA	NA	NA
2013 RP1	0.684	0.507	0.632	0.600	0.733	0.429	0.288	0.368	0.509	0.393	NA	NA
2013 RP2	0.651	0.520	0.545	0.569	0.843	0.484	0.415	0.365	0.492	0.387	0.320	NA

	2014 CPB	2014 CPM	2014 CPR	2014 CPS	2014 LB	2014 LM	2014 LO	2014 LS	2014 M2	2014 NE	2014 RP1	2014 RP2
2014 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPM	0.419	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPR	0.647	0.490	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPS	0.585	0.585	0.429	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 LB	0.750	0.458	0.676	0.795	NA	NA	NA	NA	NA	NA	NA	NA
2014 LM	0.522	0.343	0.393	0.586	0.547	NA	NA	NA	NA	NA	NA	NA
2014 LO	0.545	0.455	0.527	0.509	0.654	0.521	NA	NA	NA	NA	NA	NA
2014 LS	0.452	0.419	0.529	0.434	0.667	0.493	0.182	NA	NA	NA	NA	NA
2014 M2	0.356	0.356	0.542	0.560	0.644	0.344	0.460	0.424	NA	NA	NA	NA
2014 NE	0.439	0.368	0.478	0.417	0.721	0.452	0.410	0.298	0.296	NA	NA	NA
2014 RP1	0.548	0.452	0.490	0.547	0.625	0.463	0.394	0.323	0.424	0.333	NA	NA
2014 RP2	0.474	0.439	0.696	0.500	0.674	0.581	0.344	0.298	0.444	0.346	0.368	NA

	2015 CPB	2015 CPM	2015 CPR	2015 CPS	2015 LB	2015 LM	2015 LO	2015 LS	2015 M2	2015 NE	2015 RP1	2015 RP2
2015 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPM	0.510	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPR	1.000	0.862	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPS	0.706	0.600	0.714	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 LB	0.721	0.545	0.913	0.724	NA	NA	NA	NA	NA	NA	NA	NA
2015 LM	0.542	0.388	0.857	0.706	0.628	NA	NA	NA	NA	NA	NA	NA
2015 LO	0.736	0.630	0.818	0.692	0.708	0.472	NA	NA	NA	NA	NA	NA
2015 LS	0.731	0.585	0.875	0.684	0.745	0.462	0.368	NA	NA	NA	NA	NA
2015 M2	0.500	0.358	0.938	0.579	0.617	0.385	0.474	0.464	NA	NA	NA	NA
2015 NE	0.556	0.391	0.920	0.548	0.700	0.422	0.480	0.469	0.347	NA	NA	NA
2015 RP1	0.610	0.476	0.905	0.704	0.722	0.610	0.522	0.378	0.467	0.368	NA	NA
2015 RP2	0.707	0.619	0.905	0.556	0.778	0.561	0.522	0.378	0.511	0.316	0.353	NA

	2016 CPB	2016 CPM	2016 CPR	2016 CPS	2016 LB	2016 LM	2016 LO	2016 LS	2016 M2	2016 NE	2016 RP1	2016 RP2
2016 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPM	0.333	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPR	0.828	0.660	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2016 CPS	0.642	0.548	0.455	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 LB	0.662	0.700	0.935	0.750	NA	NA	NA	NA	NA	NA	NA	NA
2016 LM	0.506	0.361	0.581	0.462	0.640	NA	NA	NA	NA	NA	NA	NA
2016 LO	0.556	0.500	0.660	0.464	0.778	0.424	NA	NA	NA	NA	NA	NA
2016 LS	0.512	0.403	0.667	0.474	0.745	0.343	0.268	NA	NA	NA	NA	NA
2016 M2	0.481	0.361	0.674	0.500	0.680	0.258	0.333	0.313	NA	NA	NA	NA
2016 NE	0.532	0.444	0.628	0.500	0.840	0.419	0.364	0.403	0.323	NA	NA	NA
2016 RP1	0.743	0.631	0.667	0.600	0.860	0.491	0.288	0.367	0.418	0.455	NA	NA
2016 RP2	0.706	0.556	0.588	0.535	0.854	0.585	0.333	0.414	0.472	0.358	0.391	NA

Pairwise Sørensen dissimilarity (βsor) of pollinators

	2011 CPB	2011 CPM	2011 CPR	2011 CPS	2011 LM	2011 LO	2011 M2	2011 RP1	2011 RP2
2011 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPM	0.491	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPR	0.626	0.455	NA	NA	NA	NA	NA	NA	NA
2011 CPS	0.513	0.496	0.460	NA	NA	NA	NA	NA	NA
2011 LM	0.463	0.563	0.664	0.552	NA	NA	NA	NA	NA
2011 LO	0.500	0.500	0.536	0.383	0.429	NA	NA	NA	NA
2011 M2	0.544	0.528	0.653	0.572	0.488	0.506	NA	NA	NA
2011 RP1	0.514	0.513	0.563	0.450	0.511	0.490	0.489	NA	NA
2011 RP2	0.487	0.456	0.471	0.444	0.379	0.377	0.510	0.410	NA

	2012 CPB	2012 CPM	2012 CPR	2012 CPS	2012 LM	2012 LO	2012 LS	2012 M2	2012 RP1	2012 RP2
2012 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPM	0.513	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPR	0.727	0.708	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPS	0.649	0.590	0.775	NA	NA	NA	NA	NA	NA	NA
2012 LM	0.503	0.511	0.708	0.673	NA	NA	NA	NA	NA	NA
2012 LO	0.549	0.613	0.731	0.696	0.469	NA	NA	NA	NA	NA
2012 LS	0.466	0.470	0.674	0.607	0.456	0.543	NA	NA	NA	NA
2012 M2	0.549	0.484	0.735	0.672	0.487	0.605	0.517	NA	NA	NA
2012 RP1	0.626	0.568	0.671	0.680	0.593	0.639	0.461	0.563	NA	NA
2012 RP2	0.597	0.500	0.784	0.726	0.558	0.594	0.491	0.562	0.573	NA

	2013 CPB	2013 CPM	2013 CPR	2013 CPS	2013 LB	2013 LM	2013 LO	2013 LS	2013 M2	2013 NE	2013 RP1	2013 RP2
2013 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPM	0.516	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPR	0.695	0.639	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPS	0.594	0.559	0.588	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 LB	0.655	0.684	0.671	0.593	NA	NA	NA	NA	NA	NA	NA	NA

2013 LM	0.512	0.503	0.664	0.563	0.595	NA	NA	NA	NA	NA	NA	NA
2013 LO	0.516	0.494	0.600	0.556	0.574	0.461	NA	NA	NA	NA	NA	NA
2013 LS	0.500	0.503	0.641	0.529	0.594	0.522	0.434	NA	NA	NA	NA	NA
2013 M2	0.578	0.497	0.674	0.608	0.671	0.465	0.497	0.539	NA	NA	NA	NA
2013 NE	0.490	0.470	0.593	0.475	0.612	0.492	0.437	0.478	0.430	NA	NA	NA
2013 RP1	0.557	0.530	0.644	0.560	0.581	0.503	0.425	0.441	0.475	0.457	NA	NA
2013 RP2	0.597	0.523	0.689	0.603	0.667	0.530	0.434	0.466	0.500	0.510	0.497	NA

	2014 CPB	2014 CPM	2014 CPR	2014 CPS	2014 LB	2014 LM	2014 LO	2014 LS	2014 M2	2014 NE	2014 RP1	2014 RP2
2014 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPM	0.577	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPR	0.704	0.631	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPS	0.513	0.573	0.611	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 LB	0.623	0.688	0.745	0.690	NA	NA	NA	NA	NA	NA	NA	NA
2014 LM	0.621	0.472	0.640	0.540	0.682	NA	NA	NA	NA	NA	NA	NA
2014 LO	0.610	0.548	0.684	0.520	0.653	0.470	NA	NA	NA	NA	NA	NA
2014 LS	0.576	0.521	0.722	0.515	0.641	0.483	0.477	NA	NA	NA	NA	NA
2014 M2	0.605	0.540	0.657	0.489	0.623	0.532	0.429	0.485	NA	NA	NA	NA
2014 NE	0.570	0.558	0.724	0.477	0.698	0.516	0.443	0.475	0.376	NA	NA	NA
2014 RP1	0.584	0.523	0.718	0.537	0.714	0.536	0.455	0.529	0.419	0.400	NA	NA
2014 RP2	0.620	0.578	0.726	0.485	0.694	0.509	0.485	0.462	0.411	0.429	0.333	NA

	2015 CPB	2015 CPM	2015 CPR	2015 CPS	2015 LB	2015 LM	2015 LO	2015 LS	2015 M2	2015 NE	2015 RP1	2015 RP2
2015 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPM	0.543	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPR	0.746	0.757	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPS	0.729	0.743	0.571	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 LB	0.604	0.607	0.714	0.788	NA	NA	NA	NA	NA	NA	NA	NA
2015 LM	0.711	0.630	0.697	0.742	0.712	NA	NA	NA	NA	NA	NA	NA
2015 LO	0.523	0.556	0.614	0.660	0.621	0.604	NA	NA	NA	NA	NA	NA
2015 LS	0.685	0.680	0.724	0.741	0.646	0.565	0.566	NA	NA	NA	NA	NA
2015 M2	0.657	0.621	0.649	0.829	0.625	0.537	0.596	0.700	NA	NA	NA	NA
2015 NE	0.625	0.560	0.755	0.644	0.701	0.639	0.541	0.627	0.604	NA	NA	NA
2015 RP1	0.674	0.631	0.672	0.754	0.697	0.537	0.535	0.609	0.631	0.641	NA	NA
2015 RP2	0.663	0.607	0.714	0.788	0.722	0.615	0.537	0.667	0.571	0.586	0.394	NA

	2016 CPB	2016 CPM	2016 CPR	2016 CPS	2016 LB	2016 LM	2016 LO	2016 LS	2016 M2	2016 NE	2016 RP1	2016 RP2
2016 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPM	0.575	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPR	0.765	0.763	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPS	0.644	0.783	0.719	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 LB	0.711	0.727	0.900	0.789	NA	NA	NA	NA	NA	NA	NA	NA
2016 LM	0.704	0.677	0.746	0.793	0.663	NA	NA	NA	NA	NA	NA	NA
2016 LO	0.625	0.553	0.760	0.714	0.609	0.633	NA	NA	NA	NA	NA	NA

2016 LS	0.638	0.563	0.588	0.714	0.650	0.604	0.600	NA	NA	NA	NA	NA
2016 M2	0.581	0.548	0.747	0.670	0.596	0.527	0.544	0.495	NA	NA	NA	NA
2016 NE	0.636	0.607	0.786	0.720	0.688	0.589	0.622	0.558	0.528	NA	NA	NA
2016 RP1	0.561	0.596	0.837	0.706	0.571	0.633	0.522	0.585	0.456	0.525	NA	NA
2016 RP2	0.607	0.664	0.741	0.644	0.629	0.574	0.536	0.581	0.468	0.570	0.480	NA

Pairwise species replacement (βsim) of plants

	2011 CPB	2011 CPM	2011 CPR	2011 CPS	2011 LM	2011 LO	2011 M2	2011 RP1	2011 RP2
2011 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPM	0.405	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPR	0.619	0.476	NA	NA	NA	NA	NA	NA	NA
2011 CPS	0.515	0.485	0.333	NA	NA	NA	NA	NA	NA
2011 LM	0.452	0.323	0.381	0.548	NA	NA	NA	NA	NA
2011 LO	0.469	0.438	0.524	0.438	0.452	NA	NA	NA	NA
2011 M2	0.297	0.351	0.619	0.515	0.258	0.344	NA	NA	NA
2011 RP1	0.517	0.448	0.571	0.483	0.483	0.310	0.414	NA	NA
2011 RP2	0.483	0.483	0.476	0.483	0.448	0.276	0.414	0.276	NA

	2012 CPB	2012 CPM	2012 CPR	2012 CPS	2012 LM	2012 LO	2012 LS	2012 M2	2012 RP1	2012 RP2
2012 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPM	0.200	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPR	0.588	0.294	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPS	0.520	0.400	0.412	NA	NA	NA	NA	NA	NA	NA
2012 LM	0.393	0.179	0.353	0.600	NA	NA	NA	NA	NA	NA
2012 LO	0.483	0.276	0.529	0.480	0.357	NA	NA	NA	NA	NA
2012 LS	0.607	0.321	0.412	0.560	0.393	0.179	NA	NA	NA	NA
2012 M2	0.333	0.353	0.529	0.440	0.393	0.379	0.464	NA	NA	NA
2012 RP1	0.700	0.419	0.412	0.480	0.357	0.345	0.250	0.548	NA	NA
2012 RP2	0.667	0.278	0.588	0.556	0.333	0.222	0.222	0.444	0.111	NA

	2013 CPB	2013 CPM	2013 CPR	2013 CPS	2013 LB	2013 LM	2013 LO	2013 LS	2013 M2	2013 NE	2013 RP1	2013 RP2
2013 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPM	0.343	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPR	0.625	0.250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPS	0.522	0.304	0.500	NA	NA	NA	NA	NA	NA	NA	NA	NA

2013 LB	0.522	0.348	0.813	0.783	NA	NA	NA	NA	NA	NA	NA	NA
2013 LM	0.500	0.206	0.375	0.391	0.348	NA	NA	NA	NA	NA	NA	NA
2013 LO	0.629	0.432	0.438	0.348	0.696	0.412	NA	NA	NA	NA	NA	NA
2013 LS	0.600	0.314	0.375	0.391	0.565	0.412	0.343	NA	NA	NA	NA	NA
2013 M2	0.486	0.286	0.500	0.478	0.478	0.353	0.429	0.457	NA	NA	NA	NA
2013 NE	0.559	0.235	0.313	0.348	0.652	0.441	0.294	0.353	0.294	NA	NA	NA
2013 RP1	0.591	0.227	0.563	0.591	0.727	0.273	0.045	0.182	0.364	0.227	NA	NA
2013 RP2	0.607	0.357	0.375	0.522	0.826	0.429	0.321	0.286	0.429	0.321	0.227	NA

	2014 CPB	2014 CPM	2014 CPR	2014 CPS	2014 LB	2014 LM	2014 LO	2014 LS	2014 M2	2014 NE	2014 RP1	2014 RP2
2014 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPM	0.419	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPR	0.550	0.350	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPS	0.500	0.500	0.400	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 LB	0.647	0.235	0.647	0.765	NA	NA	NA	NA	NA	NA	NA	NA
2014 LM	0.484	0.290	0.150	0.455	0.294	NA	NA	NA	NA	NA	NA	NA
2014 LO	0.516	0.419	0.350	0.364	0.471	0.514	NA	NA	NA	NA	NA	NA
2014 LS	0.452	0.419	0.400	0.318	0.529	0.452	0.129	NA	NA	NA	NA	NA
2014 M2	0.321	0.321	0.450	0.500	0.529	0.250	0.393	0.393	NA	NA	NA	NA
2014 NE	0.385	0.308	0.400	0.364	0.647	0.346	0.308	0.231	0.269	NA	NA	NA
2014 RP1	0.548	0.452	0.350	0.455	0.471	0.419	0.355	0.323	0.393	0.269	NA	NA
2014 RP2	0.423	0.385	0.650	0.455	0.588	0.500	0.231	0.231	0.423	0.346	0.308	NA

	2015 CPB	2015 CPM	2015 CPR	2015 CPS	2015 LB	2015 LM	2015 LO	2015 LS	2015 M2	2015 NE	2015 RP1	2015 RP2
2015 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPM	0.500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPR	1.000	0.500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPS	0.500	0.300	0.500	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 LB	0.684	0.474	0.750	0.600	NA	NA	NA	NA	NA	NA	NA	NA
2015 LM	0.542	0.375	0.500	0.500	0.579	NA	NA	NA	NA	NA	NA	NA
2015 LO	0.708	0.600	0.250	0.400	0.632	0.417	NA	NA	NA	NA	NA	NA
2015 LS	0.708	0.560	0.500	0.400	0.684	0.417	0.357	NA	NA	NA	NA	NA
2015 M2	0.458	0.320	0.750	0.200	0.526	0.333	0.464	0.464	NA	NA	NA	NA
2015 NE	0.524	0.333	0.750	0.300	0.684	0.381	0.381	0.381	0.238	NA	NA	NA
2015 RP1	0.529	0.353	0.750	0.600	0.706	0.529	0.353	0.176	0.294	0.294	NA	NA
2015 RP2	0.647	0.529	0.750	0.400	0.765	0.471	0.353	0.176	0.353	0.235	0.353	NA

	2016 CPB	2016 CPM	2016 CPR	2016 CPS	2016 LB	2016 LM	2016 LO	2016 LS	2016 M2	2016 NE	2016 RP1	2016 RP2
2016 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPM	0.293	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPR	0.583	0.250	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPS	0.429	0.333	0.250	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 LB	0.421	0.526	0.917	0.737	NA	NA	NA	NA	NA	NA	NA	NA

2016 LM	0.387	0.258	0.250	0.333	0.526	NA	NA	NA	NA	NA	NA	NA
2016 LO	0.486	0.457	0.333	0.286	0.684	0.387	NA	NA	NA	NA	NA	NA
2016 LS	0.444	0.361	0.333	0.286	0.632	0.290	0.257	NA	NA	NA	NA	NA
2016 M2	0.355	0.258	0.417	0.381	0.579	0.258	0.290	0.258	NA	NA	NA	NA
2016 NE	0.419	0.355	0.333	0.381	0.789	0.419	0.323	0.355	0.323	NA	NA	NA
2016 RP1	0.625	0.500	0.500	0.571	0.842	0.417	0.125	0.208	0.333	0.375	NA	NA
2016 RP2	0.545	0.364	0.417	0.524	0.842	0.500	0.136	0.227	0.364	0.227	0.364	NA

Pairwise species replacement (βsim) of pollinators

	2011 CPB	2011 CPM	2011 CPR	2011 CPS	2011 LM	2011 LO	2011 M2	2011 RP1	2011 RP2
2011 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPM	0.453	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPR	0.553	0.289	NA	NA	NA	NA	NA	NA	NA
2011 CPS	0.472	0.492	0.289	NA	NA	NA	NA	NA	NA
2011 LM	0.321	0.492	0.474	0.484	NA	NA	NA	NA	NA
2011 LO	0.340	0.393	0.237	0.258	0.407	NA	NA	NA	NA
2011 M2	0.415	0.443	0.447	0.500	0.481	0.494	NA	NA	NA
2011 RP1	0.491	0.500	0.447	0.431	0.414	0.362	0.379	NA	NA
2011 RP2	0.434	0.443	0.289	0.435	0.297	0.266	0.438	0.379	NA

	2012 CPB	2012 CPM	2012 CPR	2012 CPS	2012 LM	2012 LO	2012 LS	2012 M2	2012 RP1	2012 RP2
2012 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPM	0.465	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPR	0.400	0.440	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPS	0.500	0.478	0.680	NA	NA	NA	NA	NA	NA	NA
2012 LM	0.422	0.484	0.480	0.609	NA	NA	NA	NA	NA	NA
2012 LO	0.532	0.592	0.440	0.587	0.406	NA	NA	NA	NA	NA
2012 LS	0.361	0.426	0.440	0.543	0.443	0.475	NA	NA	NA	NA
2012 M2	0.541	0.423	0.400	0.522	0.391	0.582	0.410	NA	NA	NA
2012 RP1	0.519	0.500	0.480	0.652	0.556	0.556	0.426	0.426	NA	NA
2012 RP2	0.449	0.388	0.680	0.717	0.490	0.469	0.429	0.388	0.551	NA

	2013 CPB	2013 CPM	2013 CPR	2013 CPS	2013 LB	2013 LM	2013 LO	2013 LS	2013 M2	2013 NE	2013 RP1	2013 RP2
2013 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPM	0.456	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPR	0.568	0.405	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPS	0.567	0.467	0.459	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 LB	0.583	0.563	0.622	0.542	NA	NA	NA	NA	NA	NA	NA	NA
2013 LM	0.397	0.459	0.378	0.417	0.375	NA	NA	NA	NA	NA	NA	NA

2013 LO	0.426	0.471	0.297	0.433	0.375	0.441	NA	NA	NA	NA	NA	NA
2013 LS	0.456	0.488	0.432	0.450	0.458	0.463	0.388	NA	NA	NA	NA	NA
2013 M2	0.485	0.459	0.405	0.483	0.500	0.459	0.484	0.488	NA	NA	NA	NA
2013 NE	0.441	0.457	0.351	0.383	0.479	0.432	0.395	0.475	0.370	NA	NA	NA
2013 RP1	0.515	0.519	0.432	0.483	0.438	0.444	0.383	0.438	0.420	0.457	NA	NA
2013 RP2	0.591	0.455	0.568	0.583	0.604	0.409	0.318	0.409	0.379	0.455	0.439	NA

	2014 CPB	2014 CPM	2014 CPR	2014 CPS	2014 LB	2014 LM	2014 LO	2014 LS	2014 M2	2014 NE	2014 RP1	2014 RP2
2014 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPM	0.500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPR	0.667	0.500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPS	0.367	0.537	0.417	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 LB	0.565	0.565	0.739	0.522	NA	NA	NA	NA	NA	NA	NA	NA
2014 LM	0.400	0.317	0.333	0.458	0.391	NA	NA	NA	NA	NA	NA	NA
2014 LO	0.467	0.488	0.500	0.500	0.435	0.404	NA	NA	NA	NA	NA	NA
2014 LS	0.400	0.439	0.542	0.479	0.391	0.436	0.462	NA	NA	NA	NA	NA
2014 M2	0.500	0.512	0.500	0.478	0.435	0.435	0.391	0.435	NA	NA	NA	NA
2014 NE	0.333	0.439	0.500	0.396	0.435	0.508	0.385	0.436	0.261	NA	NA	NA
2014 RP1	0.467	0.488	0.583	0.532	0.565	0.447	0.426	0.489	0.413	0.298	NA	NA
2014 RP2	0.500	0.537	0.583	0.479	0.522	0.429	0.469	0.429	0.391	0.347	0.319	NA

	2015 CPB	2015 CPM	2015 CPR	2015 CPS	2015 LB	2015 LM	2015 LO	2015 LS	2015 M2	2015 NE	2015 RP1	2015 RP2
2015 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPM	0.489	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPR	0.500	0.438	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPS	0.333	0.250	0.500	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 LB	0.574	0.593	0.375	0.417	NA	NA	NA	NA	NA	NA	NA	NA
2015 LM	0.702	0.600	0.375	0.333	0.700	NA	NA	NA	NA	NA	NA	NA
2015 LO	0.488	0.463	0.313	0.250	0.561	0.561	NA	NA	NA	NA	NA	NA
2015 LS	0.667	0.619	0.500	0.417	0.595	0.524	0.561	NA	NA	NA	NA	NA
2015 M2	0.617	0.621	0.188	0.500	0.611	0.500	0.512	0.643	NA	NA	NA	NA
2015 NE	0.545	0.394	0.625	0.333	0.606	0.545	0.485	0.576	0.455	NA	NA	NA
2015 RP1	0.667	0.578	0.375	0.417	0.667	0.511	0.512	0.595	0.578	0.576	NA	NA
2015 RP2	0.638	0.593	0.375	0.417	0.722	0.600	0.463	0.619	0.556	0.455	0.333	NA

	2016 CPB	2016 CPM	2016 CPR	2016 CPS	2016 LB	2016 LM	2016 LO	2016 LS	2016 M2	2016 NE	2016 RP1	2016 RP2
2016 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPM	0.538	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPR	0.583	0.625	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPS	0.550	0.750	0.625	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 LB	0.611	0.667	0.875	0.778	NA	NA	NA	NA	NA	NA	NA	NA

2016 LM	0.660	0.660	0.625	0.775	0.611	NA	NA	NA	NA	NA	NA	NA
2016 LO	0.588	0.549	0.625	0.675	0.528	0.617	NA	NA	NA	NA	NA	NA
2016 LS	0.568	0.523	0.417	0.700	0.611	0.591	0.568	NA	NA	NA	NA	NA
2016 M2	0.574	0.500	0.542	0.575	0.444	0.447	0.490	0.386	NA	NA	NA	NA
2016 NE	0.633	0.577	0.625	0.650	0.583	0.532	0.588	0.477	0.517	NA	NA	NA
2016 RP1	0.557	0.558	0.708	0.625	0.417	0.574	0.471	0.500	0.452	0.517	NA	NA
2016 RP2	0.607	0.635	0.542	0.550	0.500	0.511	0.490	0.500	0.459	0.567	0.475	NA

Pairwise nestedness (βsne) of plants

	2011 CPB	2011 CPM	2011 CPR	2011 CPS	2011 LM	2011 LO	2011 M2	2011 RP1	2011 RP2
2011 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPM	0.000	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPR	0.105	0.144	NA	NA	NA	NA	NA	NA	NA
2011 CPS	0.028	0.029	0.148	NA	NA	NA	NA	NA	NA
2011 LM	0.048	0.060	0.119	0.014	NA	NA	NA	NA	NA
2011 LO	0.038	0.041	0.099	0.009	0.009	NA	NA	NA	NA
2011 M2	0.018	0.017	0.114	0.040	0.085	0.065	NA	NA	NA
2011 RP1	0.059	0.067	0.069	0.033	0.017	0.034	0.086	NA	NA
2011 RP2	0.063	0.063	0.084	0.033	0.018	0.036	0.086	0.000	NA

	2012 CPB	2012 CPM	2012 CPR	2012 CPS	2012 LM	2012 LO	2012 LS	2012 M2	2012 RP1	2012 RP2
2012 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPM	0.142	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPR	0.114	0.306	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPS	0.044	0.159	0.112	NA	NA	NA	NA	NA	NA	NA
2012 LM	0.021	0.174	0.158	0.023	NA	NA	NA	NA	NA	NA
2012 LO	0.009	0.141	0.123	0.039	0.011	NA	NA	NA	NA	NA
2012 LS	0.014	0.143	0.144	0.025	0.000	0.014	NA	NA	NA	NA
2012 M2	0.042	0.076	0.157	0.085	0.059	0.049	0.052	NA	NA	NA
2012 RP1	0.005	0.094	0.172	0.056	0.033	0.022	0.038	0.021	NA	NA
2012 RP2	0.083	0.296	0.012	0.072	0.145	0.182	0.169	0.171	0.236	NA

	2013 CPB	2013 CPM	2013 CPR	2013 CPS	2013 LB	2013 LM	2013 LO	2013 LS	2013 M2	2013 NE	2013 RP1	2013 RP2
2013 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPM	0.096	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPR	0.140	0.369	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPS	0.099	0.239	0.090	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 LB	0.099	0.224	0.034	0.000	NA	NA	NA	NA	NA	NA	NA	NA

2013 LM	0.007	0.127	0.225	0.117	0.126	NA	NA	NA	NA	NA	NA	NA
2013 LO	0.010	0.068	0.223	0.152	0.071	0.025	NA	NA	NA	NA	NA	NA
2013 LS	0.000	0.100	0.233	0.126	0.090	0.009	0.018	NA	NA	NA	NA	NA
2013 M2	0.000	0.105	0.186	0.108	0.108	0.009	0.016	0.000	NA	NA	NA	NA
2013 NE	0.006	0.123	0.248	0.126	0.067	0.000	0.030	0.009	0.010	NA	NA	NA
2013 RP1	0.093	0.280	0.069	0.009	0.006	0.156	0.243	0.187	0.145	0.166	NA	NA
2013 RP2	0.044	0.163	0.170	0.047	0.017	0.055	0.094	0.079	0.063	0.066	0.093	NA

	2014 CPB	2014 CPM	2014 CPR	2014 CPS	2014 LB	2014 LM	2014 LO	2014 LS	2014 M2	2014 NE	2014 RP1	2014 RP2
2014 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPM	0.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPR	0.097	0.140	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPS	0.085	0.085	0.029	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 LB	0.103	0.223	0.029	0.030	NA	NA	NA	NA	NA	NA	NA	NA
2014 LM	0.039	0.053	0.243	0.132	0.253	NA	NA	NA	NA	NA	NA	NA
2014 LO	0.029	0.035	0.177	0.145	0.183	0.007	NA	NA	NA	NA	NA	NA
2014 LS	0.000	0.000	0.129	0.116	0.137	0.041	0.053	NA	NA	NA	NA	NA
2014 M2	0.035	0.035	0.092	0.060	0.115	0.094	0.067	0.031	NA	NA	NA	NA
2014 NE	0.054	0.061	0.078	0.053	0.074	0.105	0.102	0.067	0.027	NA	NA	NA
2014 RP1	0.000	0.000	0.140	0.093	0.154	0.043	0.039	0.000	0.031	0.064	NA	NA
2014 RP2	0.051	0.054	0.046	0.045	0.086	0.081	0.113	0.067	0.021	0.000	0.061	NA

	2015 CPB	2015 CPM	2015 CPR	2015 CPS	2015 LB	2015 LM	2015 LO	2015 LS	2015 M2	2015 NE	2015 RP1	2015 RP2
2015 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPM	0.010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPR	0.000	0.362	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPS	0.206	0.300	0.214	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 LB	0.037	0.072	0.163	0.124	NA	NA	NA	NA	NA	NA	NA	NA
2015 LM	0.000	0.013	0.357	0.206	0.049	NA	NA	NA	NA	NA	NA	NA
2015 LO	0.028	0.030	0.568	0.292	0.077	0.055	NA	NA	NA	NA	NA	NA
2015 LS	0.022	0.025	0.375	0.284	0.060	0.045	0.011	NA	NA	NA	NA	NA
2015 M2	0.042	0.038	0.188	0.379	0.091	0.051	0.009	0.000	NA	NA	NA	NA
2015 NE	0.032	0.058	0.170	0.248	0.016	0.041	0.099	0.088	0.109	NA	NA	NA
2015 RP1	0.080	0.123	0.155	0.104	0.016	0.080	0.169	0.201	0.173	0.074	NA	NA
2015 RP2	0.060	0.090	0.155	0.156	0.013	0.090	0.169	0.201	0.158	0.080	0.000	NA

	2016 CPB	2016 CPM	2016 CPR	2016 CPS	2016 LB	2016 LM	2016 LO	2016 LS	2016 M2	2016 NE	2016 RP1	2016 RP2
2016 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPM	0.041	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2016 CPR	0.244	0.410	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPS	0.213	0.215	0.205	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 LB	0.240	0.174	0.019	0.013	NA	NA	NA	NA	NA	NA	NA	NA
2016 LM	0.119	0.103	0.331	0.128	0.114	NA	NA	NA	NA	NA	NA	NA
2016 LO	0.070	0.043	0.326	0.179	0.094	0.037	NA	NA	NA	NA	NA	NA
2016 LS	0.068	0.041	0.333	0.188	0.114	0.053	0.010	NA	NA	NA	NA	NA
2016 M2	0.126	0.103	0.258	0.119	0.101	0.000	0.043	0.055	NA	NA	NA	NA
2016 NE	0.113	0.090	0.295	0.119	0.051	0.000	0.041	0.048	0.000	NA	NA	NA
2016 RP1	0.118	0.131	0.167	0.029	0.018	0.074	0.163	0.158	0.085	0.080	NA	NA
2016 RP2	0.160	0.192	0.172	0.011	0.012	0.085	0.197	0.187	0.108	0.131	0.028	NA

Pairwise nestedness (βsne) of pollinators

	2011 CPB	2011 CPM	2011 CPR	2011 CPS	2011 LM	2011 LO	2011 M2	2011 RP1	2011 RP2
2011 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPM	0.038	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPR	0.074	0.165	NA	NA	NA	NA	NA	NA	NA
2011 CPS	0.041	0.004	0.171	NA	NA	NA	NA	NA	NA
2011 LM	0.142	0.072	0.190	0.069	NA	NA	NA	NA	NA
2011 LO	0.160	0.107	0.299	0.124	0.021	NA	NA	NA	NA
2011 M2	0.129	0.085	0.206	0.072	0.006	0.012	NA	NA	NA
2011 RP1	0.023	0.013	0.115	0.019	0.097	0.128	0.110	NA	NA
2011 RP2	0.053	0.013	0.181	0.009	0.082	0.112	0.073	0.031	NA

	2012 CPB	2012 CPM	2012 CPR	2012 CPS	2012 LM	2012 LO	2012 LS	2012 M2	2012 RP1	2012 RP2
2012 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPM	0.048	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPR	0.327	0.268	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPS	0.149	0.111	0.095	NA	NA	NA	NA	NA	NA	NA
2012 LM	0.081	0.027	0.228	0.064	NA	NA	NA	NA	NA	NA
2012 LO	0.017	0.022	0.291	0.109	0.062	NA	NA	NA	NA	NA
2012 LS	0.105	0.043	0.234	0.064	0.013	0.067	NA	NA	NA	NA
2012 M2	0.008	0.062	0.335	0.150	0.096	0.023	0.107	NA	NA	NA
2012 RP1	0.107	0.068	0.191	0.028	0.038	0.084	0.035	0.137	NA	NA
2012 RP2	0.148	0.112	0.104	0.009	0.068	0.124	0.062	0.174	0.022	NA

	2013 CPB	2013 CPM	2013 CPR	2013 CPS	2013 LB	2013 LM	2013 LO	2013 LS	2013 M2	2013 NE	2013 RP1	2013 RP2
2013 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPM	0.060	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2013 CPR	0.128	0.234	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPS	0.027	0.092	0.128	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 LB	0.072	0.122	0.049	0.051	NA	NA	NA	NA	NA	NA	NA	NA
2013 LM	0.115	0.044	0.286	0.146	0.220	NA	NA	NA	NA	NA	NA	NA
2013 LO	0.089	0.024	0.303	0.122	0.199	0.020	NA	NA	NA	NA	NA	NA
2013 LS	0.044	0.016	0.209	0.079	0.135	0.060	0.046	NA	NA	NA	NA	NA
2013 M2	0.093	0.038	0.269	0.124	0.171	0.005	0.014	0.052	NA	NA	NA	NA
2013 NE	0.049	0.013	0.242	0.092	0.133	0.060	0.042	0.003	0.060	NA	NA	NA
2013 RP1	0.042	0.012	0.212	0.077	0.144	0.058	0.043	0.003	0.055	0.000	NA	NA
2013 RP2	0.006	0.069	0.122	0.020	0.063	0.121	0.116	0.057	0.121	0.056	0.057	NA

	2014 CPB	2014 CPM	2014 CPR	2014 CPS	2014 LB	2014 LM	2014 LO	2014 LS	2014 M2	2014 NE	2014 RP1	2014 RP2
2014 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPM	0.077	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPR	0.037	0.131	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPS	0.146	0.036	0.194	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 LB	0.057	0.122	0.006	0.168	NA	NA	NA	NA	NA	NA	NA	NA
2014 LM	0.221	0.155	0.307	0.081	0.291	NA	NA	NA	NA	NA	NA	NA
2014 LO	0.143	0.061	0.184	0.020	0.219	0.066	NA	NA	NA	NA	NA	NA
2014 LS	0.176	0.082	0.180	0.035	0.250	0.047	0.015	NA	NA	NA	NA	NA
2014 M2	0.105	0.028	0.157	0.011	0.188	0.097	0.037	0.050	NA	NA	NA	NA
2014 NE	0.237	0.119	0.224	0.082	0.263	0.008	0.059	0.038	0.115	NA	NA	NA
2014 RP1	0.118	0.035	0.135	0.005	0.149	0.089	0.029	0.040	0.006	0.102	NA	NA
2014 RP2	0.120	0.041	0.143	0.005	0.173	0.080	0.016	0.033	0.019	0.082	0.014	NA

	2015 CPB	2015 CPM	2015 CPR	2015 CPS	2015 LB	2015 LM	2015 LO	2015 LS	2015 M2	2015 NE	2015 RP1	2015 RP2
2015 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPM	0.053	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPR	0.246	0.319	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPS	0.395	0.493	0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 LB	0.029	0.015	0.339	0.371	NA	NA	NA	NA	NA	NA	NA	NA
2015 LM	0.009	0.030	0.322	0.409	0.012	NA	NA	NA	NA	NA	NA	NA
2015 LO	0.035	0.092	0.302	0.410	0.060	0.043	NA	NA	NA	NA	NA	NA
2015 LS	0.019	0.061	0.224	0.324	0.051	0.041	0.005	NA	NA	NA	NA	NA
2015 M2	0.040	0.000	0.461	0.329	0.014	0.037	0.084	0.057	NA	NA	NA	NA
2015 NE	0.080	0.167	0.130	0.311	0.095	0.093	0.056	0.051	0.150	NA	NA	NA
2015 RP1	0.007	0.053	0.297	0.338	0.030	0.026	0.023	0.014	0.053	0.065	NA	NA
2015 RP2	0.025	0.015	0.339	0.371	0.000	0.015	0.073	0.048	0.016	0.132	0.061	NA

	2016 CPB	2016 CPM	2016 CPR	2016 CPS	2016 LB	2016 LM	2016 LO	2016 LS	2016 M2	2016 NE	2016 RP1	2016 RP2
2016 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPM	0.037	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPR	0.181	0.138	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPS	0.094	0.033	0.094	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 LB	0.100	0.061	0.025	0.012	NA	NA	NA	NA	NA	NA	NA	NA
2016 LM	0.044	0.017	0.121	0.018	0.052	NA	NA	NA	NA	NA	NA	NA
2016 LO	0.037	0.004	0.135	0.039	0.081	0.016	NA	NA	NA	NA	NA	NA
2016 LS	0.070	0.040	0.172	0.014	0.039	0.013	0.032	NA	NA	NA	NA	NA
2016 M2	0.007	0.048	0.205	0.095	0.152	0.080	0.054	0.109	NA	NA	NA	NA
2016 NE	0.003	0.030	0.161	0.070	0.104	0.057	0.033	0.080	0.012	NA	NA	NA
2016 RP1	0.004	0.039	0.129	0.081	0.155	0.059	0.052	0.085	0.004	0.008	NA	NA
2016 RP2	0.000	0.029	0.200	0.094	0.129	0.063	0.046	0.081	0.009	0.004	0.004	NA

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants

	2011 CPB	2011 CPM	2011 CPR	2011 CPS	2011 LM	2011 LO	2011 M2	2011 RP1	2011 RP2
2011 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPM	0.000	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPR	0.145	0.233	NA	NA	NA	NA	NA	NA	NA
2011 CPS	0.051	0.057	0.308	NA	NA	NA	NA	NA	NA
2011 LM	0.097	0.156	0.238	0.025	NA	NA	NA	NA	NA
2011 LO	0.076	0.085	0.159	0.019	0.019	NA	NA	NA	NA
2011 M2	0.059	0.046	0.156	0.073	0.247	0.158	NA	NA	NA
2011 RP1	0.102	0.130	0.107	0.065	0.034	0.099	0.172	NA	NA
2011 RP2	0.115	0.115	0.150	0.065	0.039	0.114	0.172	0.000	NA

	2012 CPB	2012 CPM	2012 CPR	2012 CPS	2012 LM	2012 LO	2012 LS	2012 M2	2012 RP1	2012 RP2
2012 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPM	0.416	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPR	0.162	0.510	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPS	0.077	0.284	0.214	NA	NA	NA	NA	NA	NA	NA
2012 LM	0.051	0.493	0.309	0.036	NA	NA	NA	NA	NA	NA
2012 LO	0.018	0.338	0.188	0.074	0.031	NA	NA	NA	NA	NA
2012 LS	0.022	0.308	0.259	0.043	0.000	0.075	NA	NA	NA	NA
2012 M2	0.111	0.176	0.229	0.163	0.130	0.115	0.100	NA	NA	NA
2012 RP1	0.007	0.183	0.294	0.104	0.084	0.060	0.132	0.037	NA	NA
2012 RP2	0.111	0.516	0.020	0.115	0.303	0.450	0.432	0.278	0.680	NA

	2013 CPB	2013 CPM	2013 CPR	2013 CPS	2013 LB	2013 LM	2013 LO	2013 LS	2013 M2	2013 NE	2013 RP1	2013 RP2
2013 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPM	0.219	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPR	0.183	0.596	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPS	0.159	0.439	0.152	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 LB	0.159	0.391	0.040	0.000	NA	NA	NA	NA	NA	NA	NA	NA
2013 LM	0.014	0.382	0.375	0.231	0.266	NA	NA	NA	NA	NA	NA	NA
2013 LO	0.016	0.135	0.338	0.304	0.093	0.057	NA	NA	NA	NA	NA	NA
2013 LS	0.000	0.242	0.383	0.243	0.137	0.020	0.051	NA	NA	NA	NA	NA
2013 M2	0.000	0.268	0.271	0.184	0.184	0.026	0.036	0.000	NA	NA	NA	NA
2013 NE	0.011	0.343	0.442	0.266	0.093	0.000	0.092	0.026	0.034	NA	NA	NA
2013 RP1	0.136	0.552	0.109	0.015	0.008	0.364	0.842	0.506	0.285	0.421	NA	NA
2013 RP2	0.067	0.313	0.313	0.082	0.020	0.114	0.226	0.217	0.129	0.170	0.290	NA

	2014 CPB	2014 CPM	2014 CPR	2014 CPS	2014 LB	2014 LM	2014 LO	2014 LS	2014 M2	2014 NE	2014 RP1	2014 RP2
2014 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPM	0.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPR	0.150	0.286	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPS	0.145	0.145	0.067	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 LB	0.137	0.487	0.042	0.038	NA	NA	NA	NA	NA	NA	NA	NA
2014 LM	0.074	0.154	0.618	0.225	0.462	NA	NA	NA	NA	NA	NA	NA
2014 LO	0.054	0.077	0.336	0.285	0.280	0.013	NA	NA	NA	NA	NA	NA
2014 LS	0.000	0.000	0.244	0.267	0.206	0.083	0.290	NA	NA	NA	NA	NA
2014 M2	0.097	0.097	0.169	0.107	0.178	0.273	0.147	0.073	NA	NA	NA	NA
2014 NE	0.123	0.165	0.164	0.127	0.102	0.234	0.249	0.226	0.091	NA	NA	NA
2014 RP1	0.000	0.000	0.286	0.169	0.247	0.094	0.099	0.000	0.073	0.192	NA	NA
2014 RP2	0.107	0.123	0.066	0.091	0.128	0.139	0.330	0.226	0.048	0.000	0.165	NA

	2015 CPB	2015 CPM	2015 CPR	2015 CPS	2015 LB	2015 LM	2015 LO	2015 LS	2015 M2	2015 NE	2015 RP1	2015 RP2
2015 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPM	0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPR	0.000	0.420	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPS	0.292	0.500	0.300	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 LB	0.051	0.132	0.179	0.171	NA	NA	NA	NA	NA	NA	NA	NA
2015 LM	0.000	0.033	0.417	0.292	0.078	NA	NA	NA	NA	NA	NA	NA
2015 LO	0.037	0.047	0.694	0.422	0.108	0.117	NA	NA	NA	NA	NA	NA
2015 LS	0.031	0.043	0.429	0.415	0.081	0.097	0.031	NA	NA	NA	NA	NA
2015 M2	0.083	0.107	0.200	0.655	0.147	0.133	0.020	0.000	NA	NA	NA	NA
2015 NE	0.057	0.148	0.185	0.453	0.023	0.098	0.206	0.188	0.314	NA	NA	NA
2015 RP1	0.132	0.259	0.171	0.147	0.023	0.132	0.324	0.533	0.370	0.202	NA	NA
2015 RP2	0.085	0.145	0.171	0.280	0.017	0.161	0.324	0.533	0.309	0.255	0.000	NA

	2016 CPB	2016 CPM	2016 CPR	2016 CPS	2016 LB	2016 LM	2016 LO	2016 LS	2016 M2	2016 NE	2016 RP1	2016 RP2
2016 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPM	0.122	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPR	0.295	0.621	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPS	0.332	0.392	0.450	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 LB	0.364	0.248	0.020	0.018	NA	NA	NA	NA	NA	NA	NA	NA
2016 LM	0.236	0.285	0.570	0.278	0.178	NA	NA	NA	NA	NA	NA	NA
2016 LO	0.126	0.086	0.495	0.385	0.120	0.088	NA	NA	NA	NA	NA	NA
2016 LS	0.132	0.103	0.500	0.397	0.153	0.154	0.039	NA	NA	NA	NA	NA
2016 M2	0.262	0.285	0.382	0.238	0.149	0.000	0.129	0.177	NA	NA	NA	NA
2016 NE	0.212	0.202	0.469	0.238	0.060	0.000	0.113	0.119	0.000	NA	NA	NA
2016 RP1	0.159	0.207	0.250	0.048	0.021	0.151	0.566	0.432	0.203	0.175	NA	NA
2016 RP2	0.227	0.345	0.292	0.021	0.014	0.145	0.591	0.451	0.229	0.366	0.071	NA

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators

	2011 CPB	2011 CPM	2011 CPR	2011 CPS	2011 LM	2011 LO	2011 M2	2011 RP1	2011 RP2
2011 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPM	0.078	NA	NA	NA	NA	NA	NA	NA	NA
2011 CPR	0.118	0.363	NA	NA	NA	NA	NA	NA	NA
2011 CPS	0.081	0.008	0.371	NA	NA	NA	NA	NA	NA
2011 LM	0.307	0.127	0.286	0.124	NA	NA	NA	NA	NA
2011 LO	0.321	0.213	0.558	0.325	0.049	NA	NA	NA	NA
2011 M2	0.237	0.161	0.315	0.127	0.013	0.024	NA	NA	NA
2011 RP1	0.045	0.025	0.205	0.042	0.190	0.261	0.225	NA	NA
2011 RP2	0.109	0.029	0.385	0.020	0.217	0.296	0.143	0.074	NA

	2012 CPB	2012 CPM	2012 CPR	2012 CPS	2012 LM	2012 LO	2012 LS	2012 M2	2012 RP1	2012 RP2
2012 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPM	0.094	NA	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPR	0.450	0.379	NA	NA	NA	NA	NA	NA	NA	NA
2012 CPS	0.229	0.189	0.122	NA	NA	NA	NA	NA	NA	NA
2012 LM	0.162	0.052	0.322	0.095	NA	NA	NA	NA	NA	NA
2012 LO	0.031	0.036	0.398	0.157	0.133	NA	NA	NA	NA	NA
2012 LS	0.226	0.093	0.348	0.105	0.029	0.124	NA	NA	NA	NA
2012 M2	0.014	0.127	0.455	0.223	0.198	0.037	0.207	NA	NA	NA
2012 RP1	0.172	0.120	0.285	0.041	0.063	0.131	0.076	0.244	NA	NA
2012 RP2	0.248	0.224	0.132	0.012	0.121	0.209	0.127	0.310	0.038	NA

	2013 CPB	2013 CPM	2013 CPR	2013 CPS	2013 LB	2013 LM	2013 LO	2013 LS	2013 M2	2013 NE	2013 RP1	2013 RP2
2013 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

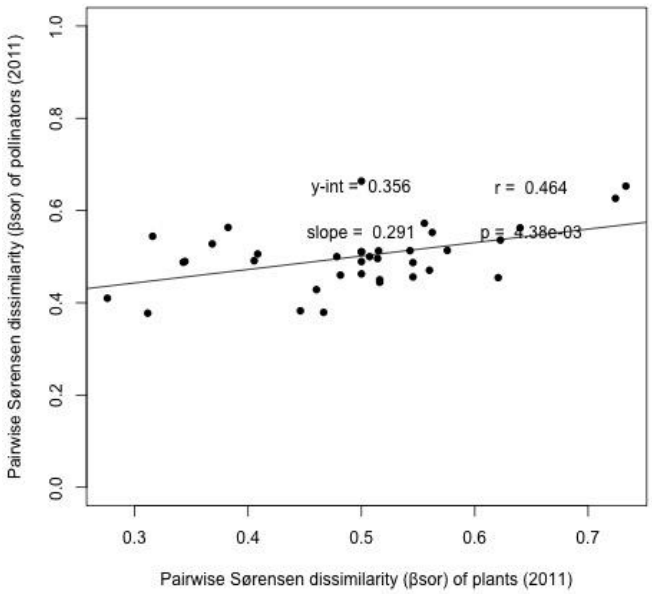
2013 CPM	0.117	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPR	0.184	0.366	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 CPS	0.046	0.165	0.218	NA	NA	NA	NA	NA	NA	NA	NA	NA
2013 LB	0.110	0.178	0.073	0.086	NA	NA	NA	NA	NA	NA	NA	NA
2013 LM	0.224	0.087	0.430	0.259	0.369	NA	NA	NA	NA	NA	NA	NA
2013 LO	0.173	0.048	0.505	0.220	0.347	0.044	NA	NA	NA	NA	NA	NA
2013 LS	0.088	0.031	0.325	0.149	0.228	0.114	0.106	NA	NA	NA	NA	NA
2013 M2	0.161	0.077	0.399	0.205	0.255	0.012	0.027	0.096	NA	NA	NA	NA
2013 NE	0.100	0.028	0.408	0.193	0.218	0.121	0.096	0.007	0.139	NA	NA	NA
2013 RP1	0.076	0.022	0.329	0.137	0.248	0.116	0.100	0.008	0.116	0.000	NA	NA
2013 RP2	0.010	0.131	0.177	0.033	0.094	0.228	0.267	0.122	0.242	0.109	0.115	NA

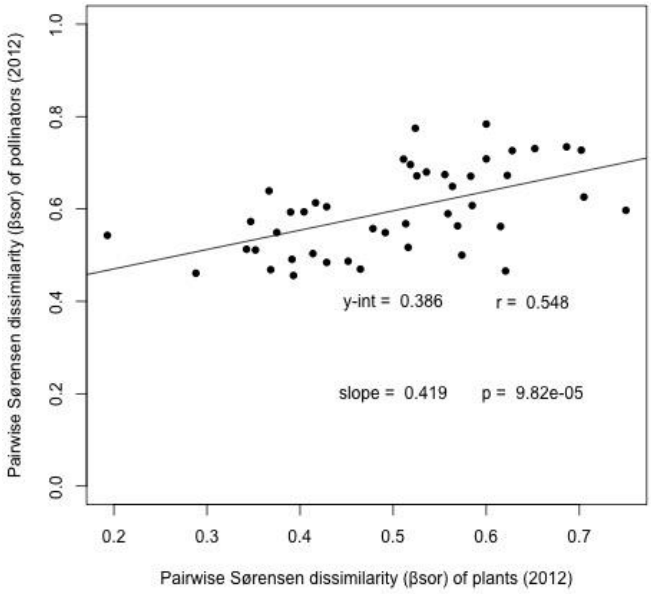
	2014 CPB	2014 CPM	2014 CPR	2014 CPS	2014 LB	2014 LM	2014 LO	2014 LS	2014 M2	2014 NE	2014 RP1	2014 RP2
2014 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPM	0.134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPR	0.053	0.207	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 CPS	0.285	0.064	0.318	NA	NA	NA	NA	NA	NA	NA	NA	NA
2014 LB	0.092	0.178	0.007	0.244	NA	NA	NA	NA	NA	NA	NA	NA
2014 LM	0.356	0.328	0.480	0.151	0.426	NA	NA	NA	NA	NA	NA	NA
2014 LO	0.235	0.110	0.269	0.038	0.335	0.141	NA	NA	NA	NA	NA	NA
2014 LS	0.306	0.157	0.249	0.069	0.390	0.097	0.032	NA	NA	NA	NA	NA
2014 M2	0.174	0.052	0.239	0.023	0.302	0.182	0.087	0.104	NA	NA	NA	NA
2014 NE	0.415	0.213	0.310	0.171	0.377	0.015	0.133	0.081	0.306	NA	NA	NA
2014 RP1	0.201	0.067	0.188	0.009	0.209	0.166	0.064	0.076	0.015	0.255	NA	NA
2014 RP2	0.194	0.071	0.197	0.011	0.249	0.158	0.032	0.071	0.047	0.190	0.043	NA

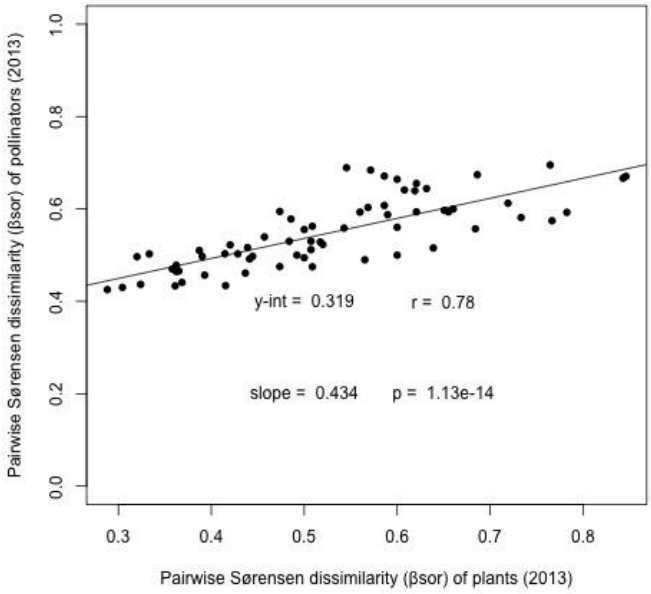
	2015 CPB	2015 CPM	2015 CPR	2015 CPS	2015 LB	2015 LM	2015 LO	2015 LS	2015 M2	2015 NE	2015 RP1	2015 RP2
2015 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPM	0.099	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPR	0.330	0.422	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 CPS	0.543	0.663	0.125	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015 LB	0.049	0.024	0.475	0.471	NA	NA	NA	NA	NA	NA	NA	NA
2015 LM	0.013	0.047	0.462	0.551	0.016	NA	NA	NA	NA	NA	NA	NA
2015 LO	0.067	0.166	0.491	0.621	0.097	0.072	NA	NA	NA	NA	NA	NA
2015 LS	0.027	0.090	0.310	0.438	0.078	0.073	0.009	NA	NA	NA	NA	NA
2015 M2	0.061	0.000	0.711	0.397	0.022	0.069	0.141	0.082	NA	NA	NA	NA
2015 NE	0.127	0.297	0.172	0.483	0.136	0.146	0.103	0.081	0.248	NA	NA	NA
2015 RP1	0.011	0.084	0.442	0.448	0.043	0.048	0.042	0.023	0.084	0.102	NA	NA
2015 RP2	0.038	0.024	0.475	0.471	0.000	0.025	0.137	0.071	0.028	0.225	0.154	NA

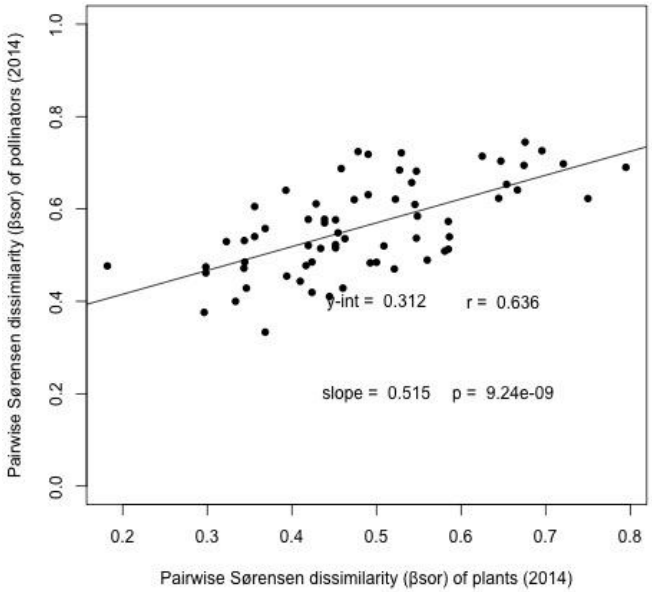
	2016 CPB	2016 CPM	2016 CPR	2016 CPS	2016 LB	2016 LM	2016 LO	2016 LS	2016 M2	2016 NE	2016 RP1	2016 RP2
2016 CPB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

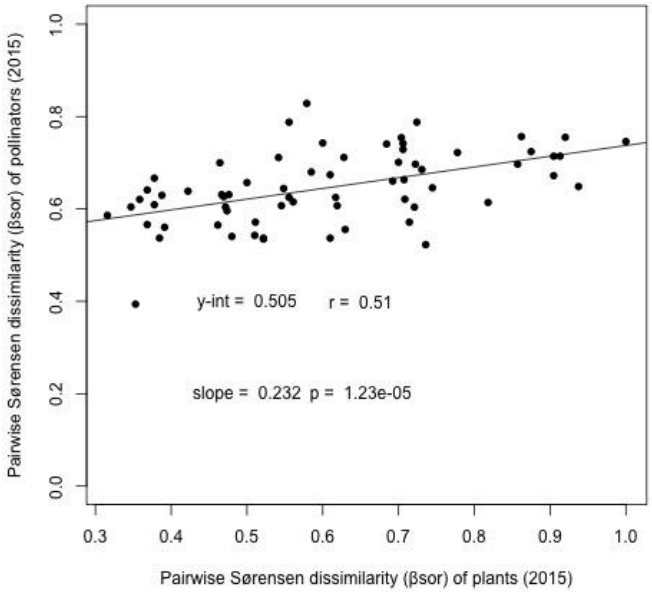
2016 CPM	0.064	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPR	0.237	0.181	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 CPS	0.145	0.042	0.130	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016 LB	0.141	0.083	0.028	0.015	NA	NA	NA	NA	NA	NA	NA	NA
2016 LM	0.063	0.025	0.163	0.023	0.078	NA	NA	NA	NA	NA	NA	NA
2016 LO	0.059	0.008	0.178	0.055	0.134	0.025	NA	NA	NA	NA	NA	NA
2016 LS	0.110	0.071	0.292	0.020	0.060	0.022	0.053	NA	NA	NA	NA	NA
2016 M2	0.012	0.087	0.275	0.142	0.254	0.153	0.099	0.220	NA	NA	NA	NA
2016 NE	0.005	0.050	0.205	0.097	0.152	0.097	0.054	0.144	0.022	NA	NA	NA
2016 RP1	0.006	0.065	0.154	0.115	0.271	0.093	0.099	0.145	0.010	0.015	NA	NA
2016 RP2	0.000	0.044	0.269	0.145	0.205	0.111	0.085	0.139	0.019	0.006	0.009	NA

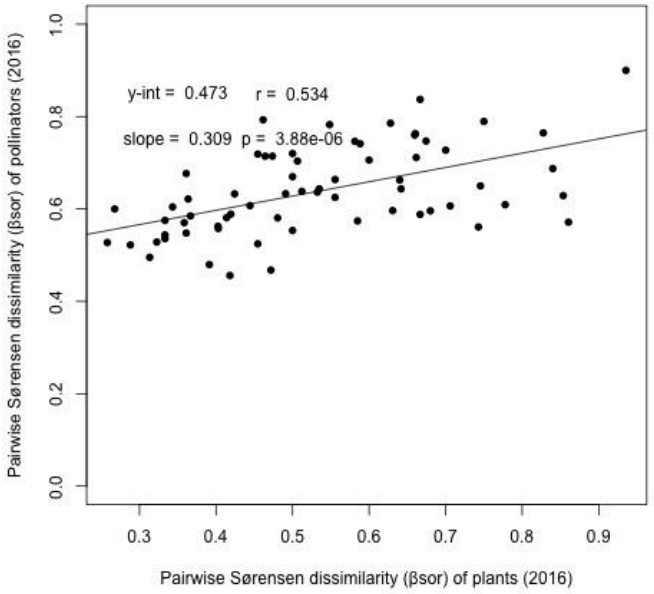


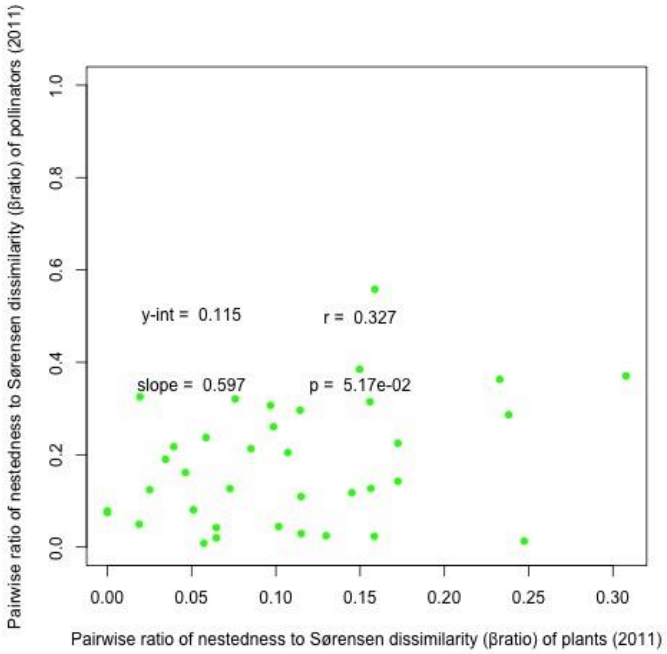

Pairwise Sørensen dissimilarity (βsor) of pollinators (2012)
Pairwise Sørensen dissimilarity (βsor) of plants (2012)
y-int = 0.386
r = 0.548
slope = 0.419
p = 9.82e-05
0.0
0.2
0.4
0.6
0.8
1.0
0.2
0.3
0.4
0.5
0.6
0.7

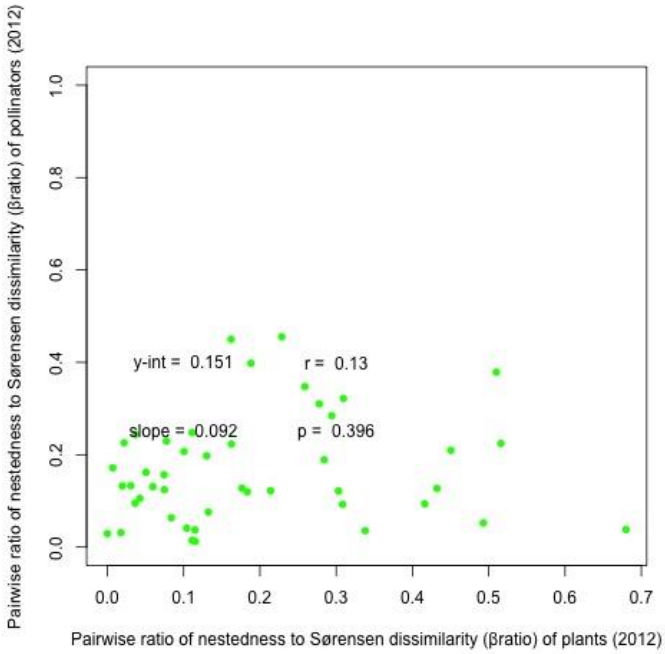

Pairwise Sørensen dissimilarity (βsor) of pollinators (2013)
Pairwise Sørensen dissimilarity (βsor) of plants (2013)
y-int = 0.319
r = 0.78
slope = 0.434
p = 1.13e-14
0.0
0.2
0.4
0.6
0.8
1.0
0.3
0.4
0.5
0.6
0.7
0.8

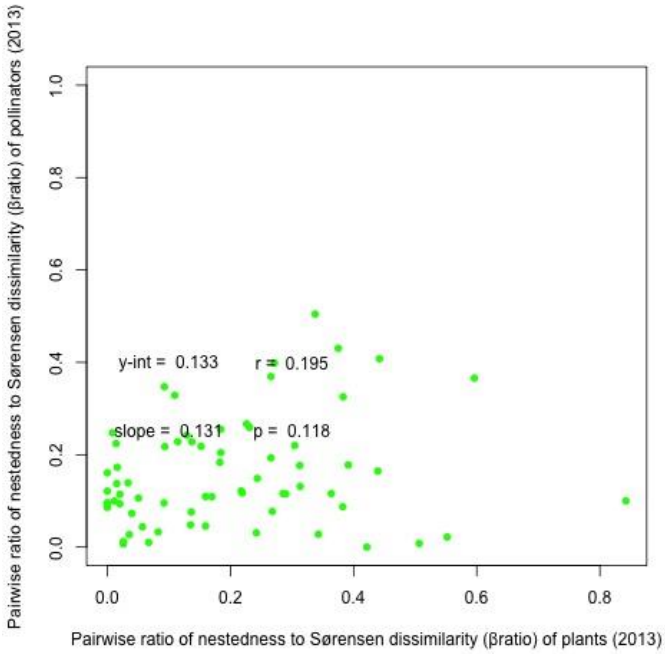

Pairwise Sørensen dissimilarity (βsor) of pollinators (2014)
Pairwise Sørensen dissimilarity (βsor) of plants (2014)
y-int = 0.312
r = 0.636
slope = 0.515
p = 9.24e-09
0.0
0.2
0.4
0.6
0.8
1.0
0.2
0.3
0.4
0.5
0.6
0.7
0.8

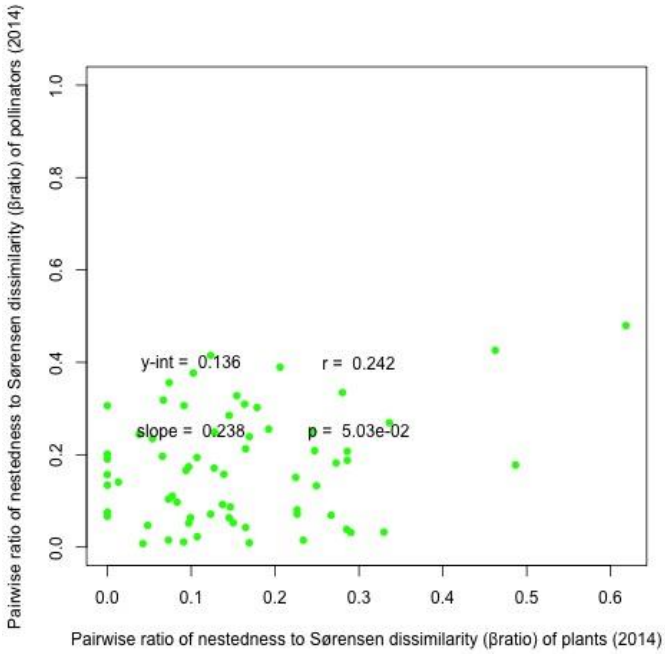

Pairwise Sørensen dissimilarity (βsor) of pollinators (2015)
Pairwise Sørensen dissimilarity (βsor) of plants (2015)
y-int = 0.505
r = 0.51
slope = 0.232
p = 1.23e-05
0.0
0.2
0.4
0.6
0.8
1.0
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0

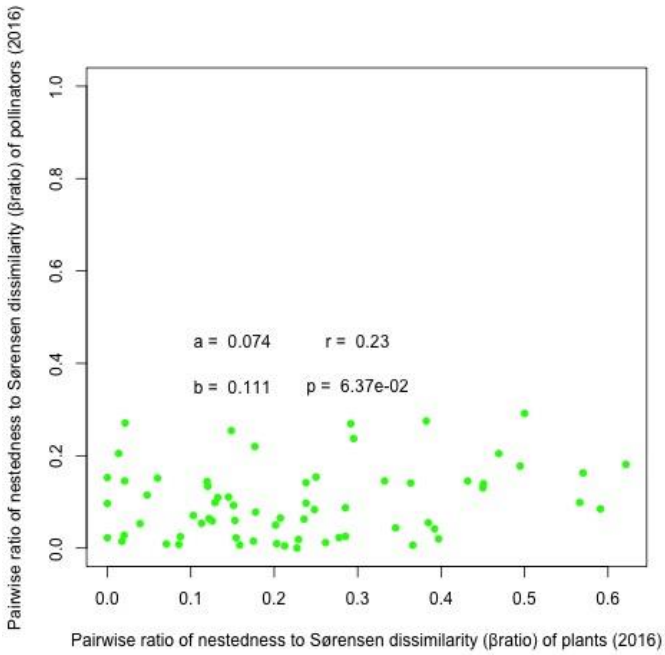

y-int = 0.473
r = 0.534
slope = 0.309
p = 3.88e-06
Pairwise Sørensen dissimilarity (βsor) of pollinators (2016)
Pairwise Sørensen dissimilarity (βsor) of plants (2016)
0.0
0.2
0.4
0.6
0.8
1.0
0.3
0.4
0.5
0.6
0.7
0.8
0.9

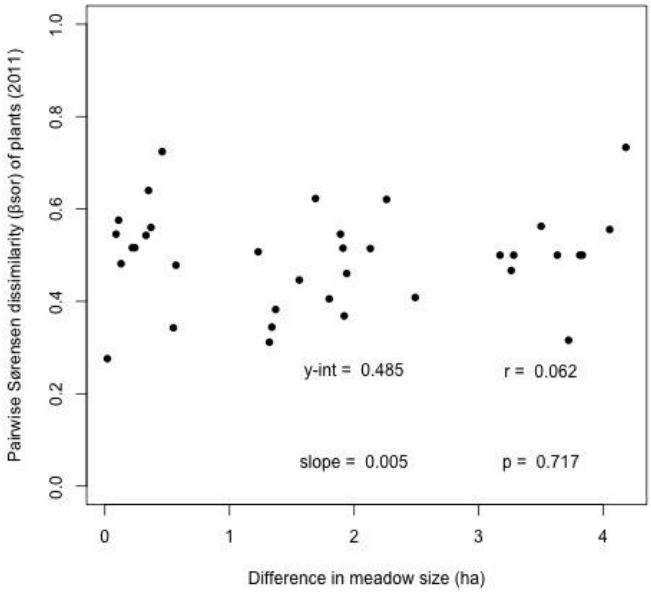

y-int = 0.115
r = 0.327
slope = 0.597
p = 5.17e-02
Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2011)
Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2011)
0.0
0.2
0.4
0.6
0.8
1.0
0.00
0.05
0.10
0.15
0.20
0.25
0.30

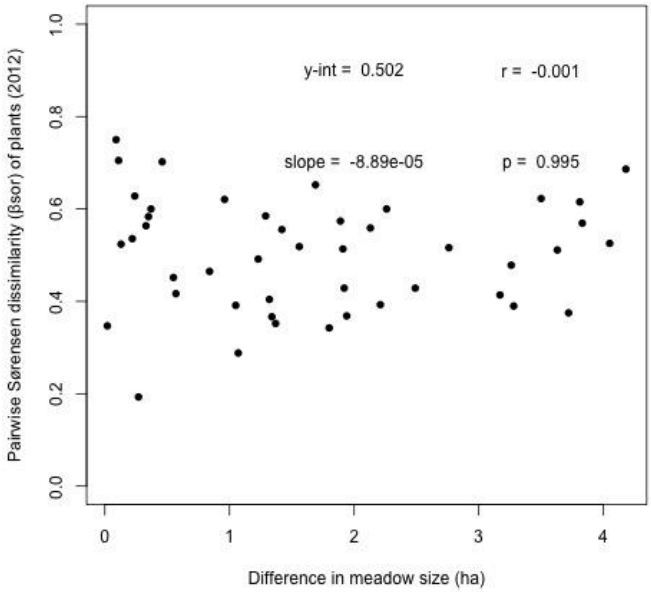

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2012)
Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2012)
y-int = 0.151
r = 0.13
slope = 0.092
p = 0.396
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

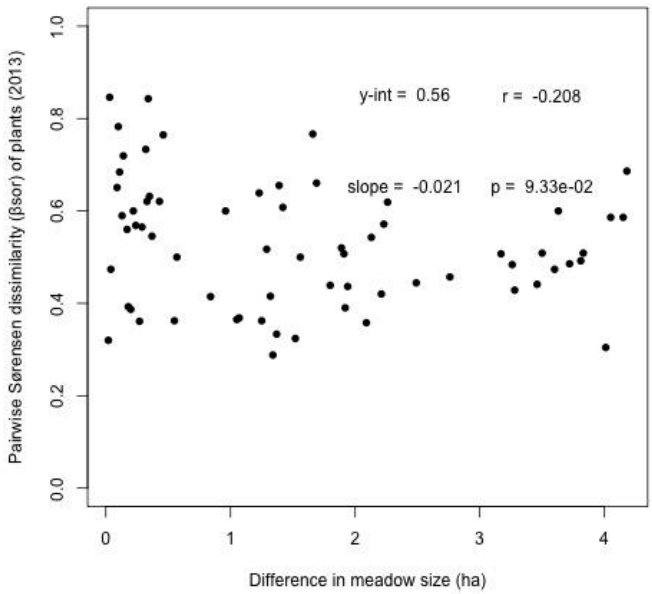

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2013)
Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2013)
y-int = 0.133
r = 0.195
slope = 0.131
p = 0.118
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.2
0.4
0.6
0.8

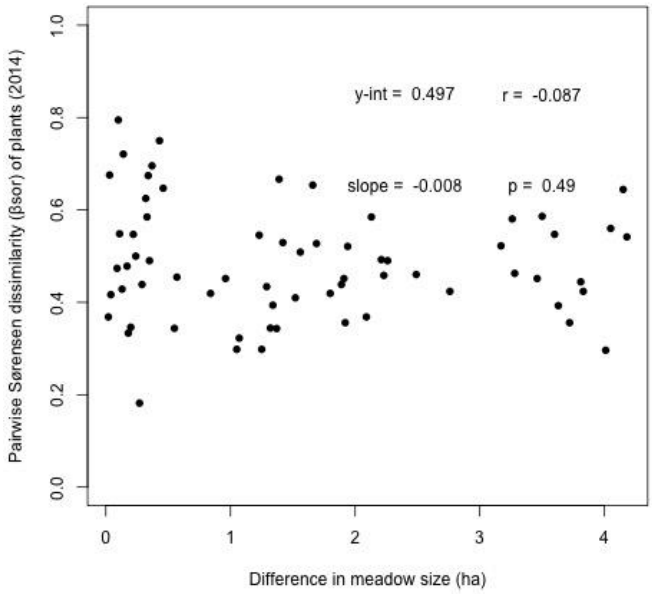

y-int = 0.136
r = 0.242
slope = 0.238
p = 5.03e-02
Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2014)
Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2014)

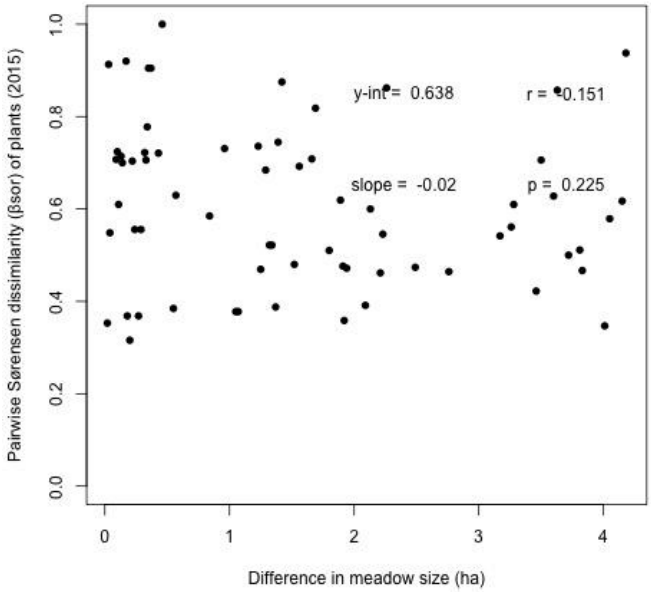

a = 0.074
r = 0.23
b = 0.111
p = 6.37e-02
Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2016)
Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2016)

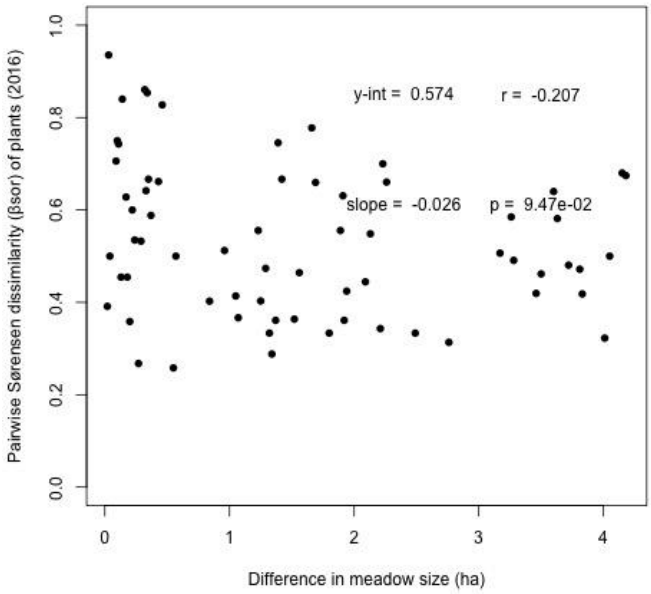

Pairwise Sørensen dissimilarity (βsor) of plants (2011)
Difference in meadow size (ha)
y-int = 0.485
r = 0.062
slope = 0.005
p = 0.717

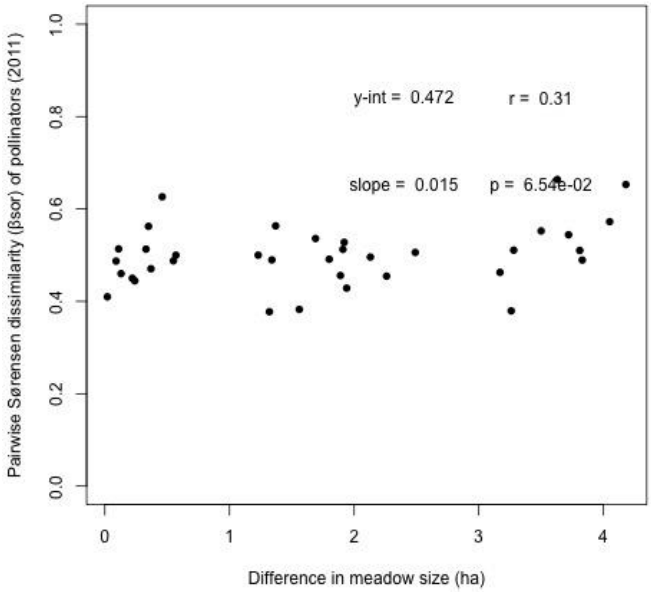

Pairwise Sørensen dissimilarity (βsor) of plants (2012)
Difference in meadow size (ha)
y-int = 0.502
r = -0.001
slope = -8.89e-05
p = 0.995

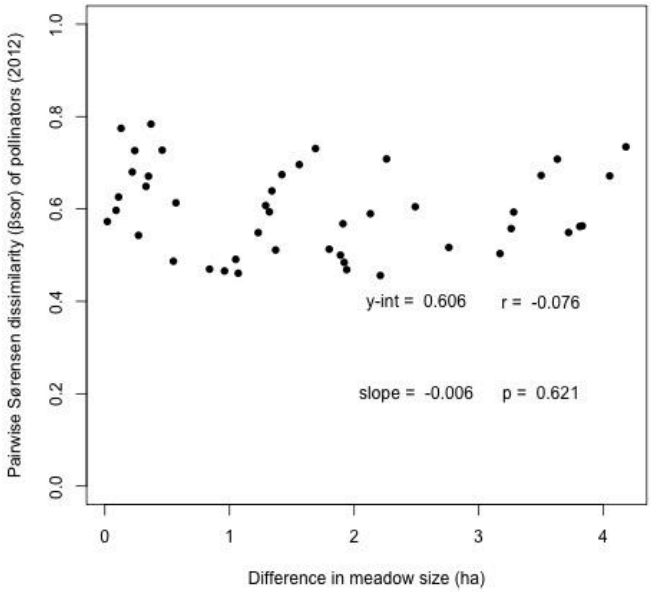

y-int = 0.56
r = -0.208
slope = -0.021
p = 9.33e-02
Pairwise Sørensen dissimilarity (βsor) of plants (2013)
Difference in meadow size (ha)
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

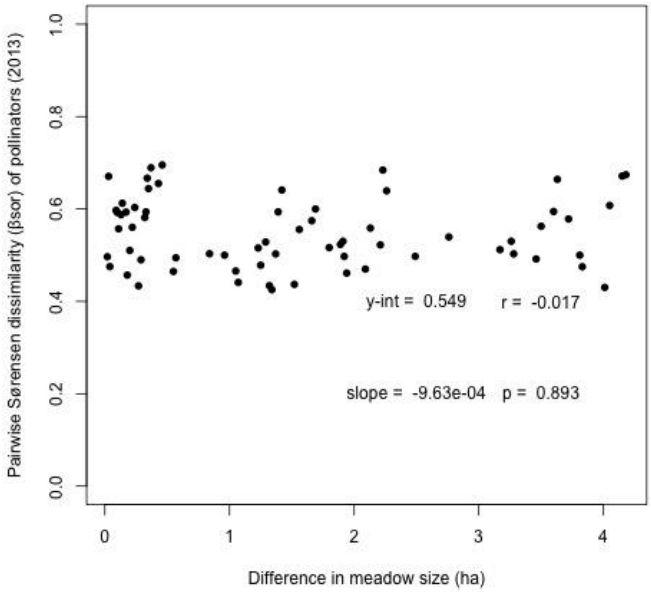

y-int = 0.497
r = -0.087
slope = -0.008
p = 0.49
Pairwise Sørensen dissimilarity (βsor) of plants (2014)
Difference in meadow size (ha)
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

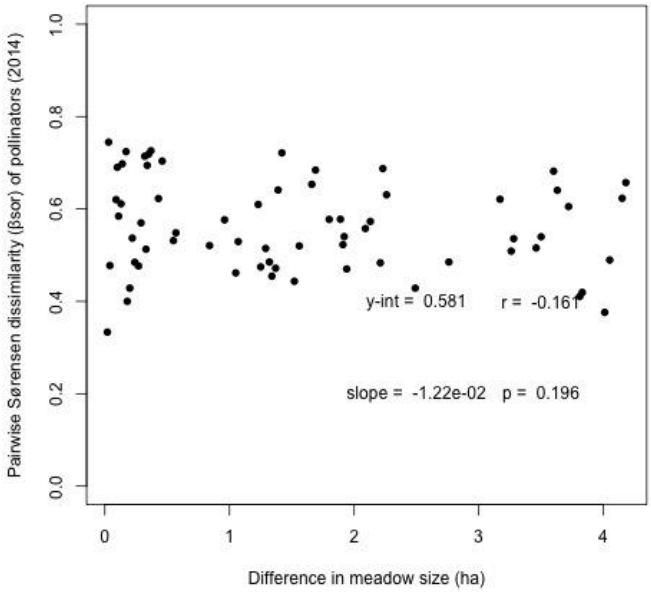

y-int = 0.638
r = 0.151
slope = -0.02
p = 0.225
Pairwise Sørensen dissimilarity (βsor) of plants (2015)
Difference in meadow size (ha)
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

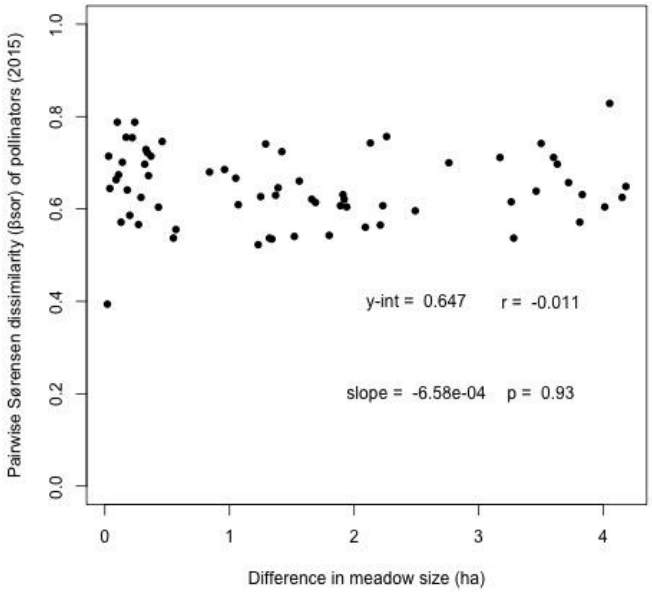

y-int = 0.574
r = -0.207
slope = -0.026
p = 9.47e-02
Pairwise Sørensen dissimilarity (βsor) of plants (2016)
Difference in meadow size (ha)
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

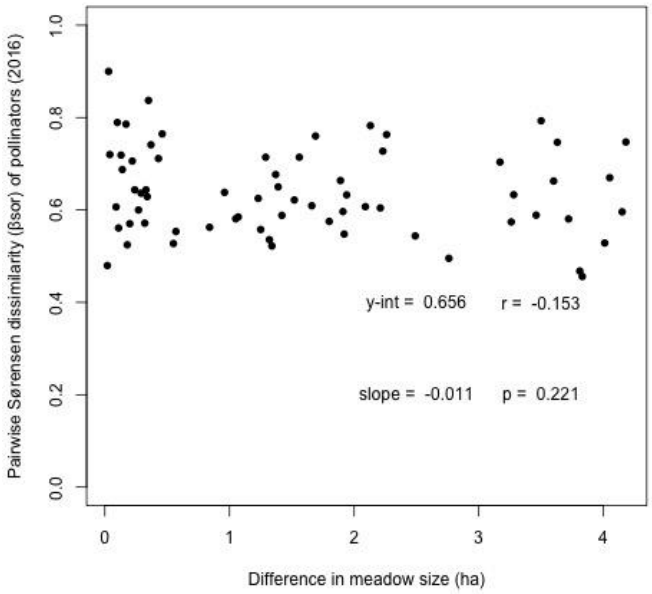

y-int = 0.472
r = 0.31
slope = 0.015
p = 6.54e-02
Pairwise Sørensen dissimilarity (βsor) of pollinators (2011)
Difference in meadow size (ha)
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

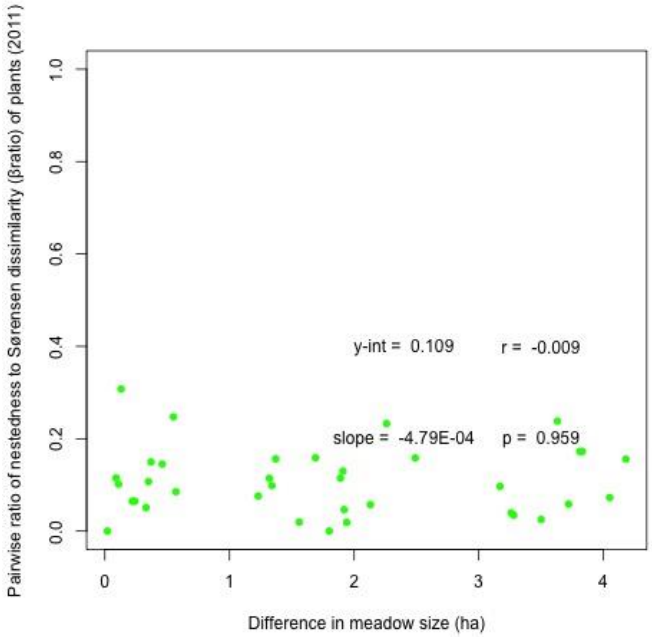

y-int = 0.606
r = -0.076
slope = -0.006
p = 0.621
Pairwise Sørensen dissimilarity (βsor) of pollinators (2012)
Difference in meadow size (ha)
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

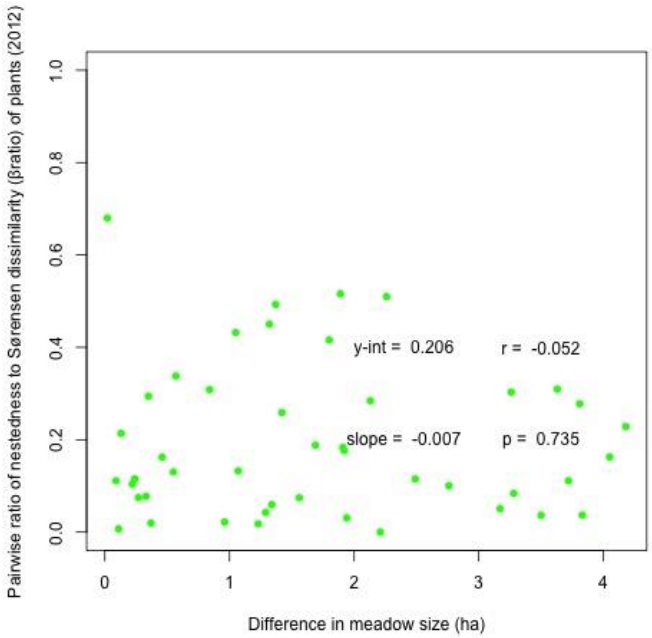

Pairwise Sørensen dissimilarity (βsor) of pollinators (2013)
Difference in meadow size (ha)
y-int = 0.549 r = -0.017
slope = -9.63e-04 p = 0.893

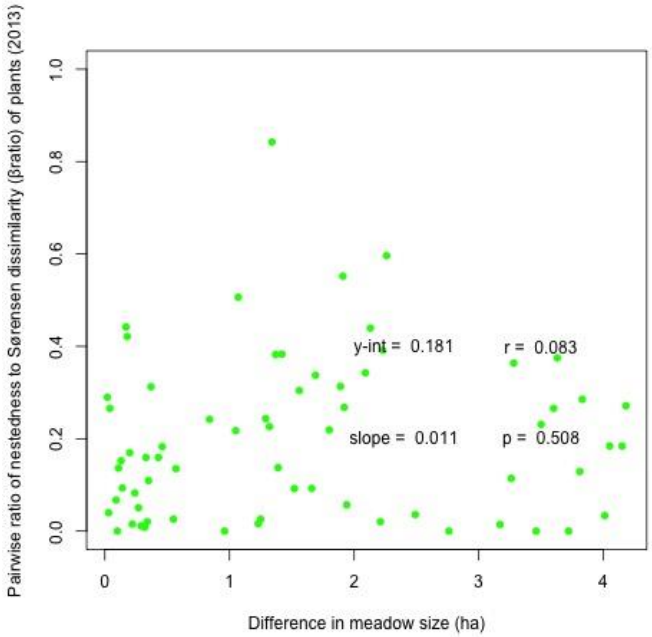

Pairwise Sørensen dissimilarity (βsor) of pollinators (2014)
Difference in meadow size (ha)
y-int = 0.581 r = -0.161
slope = -1.22e-02 p = 0.196

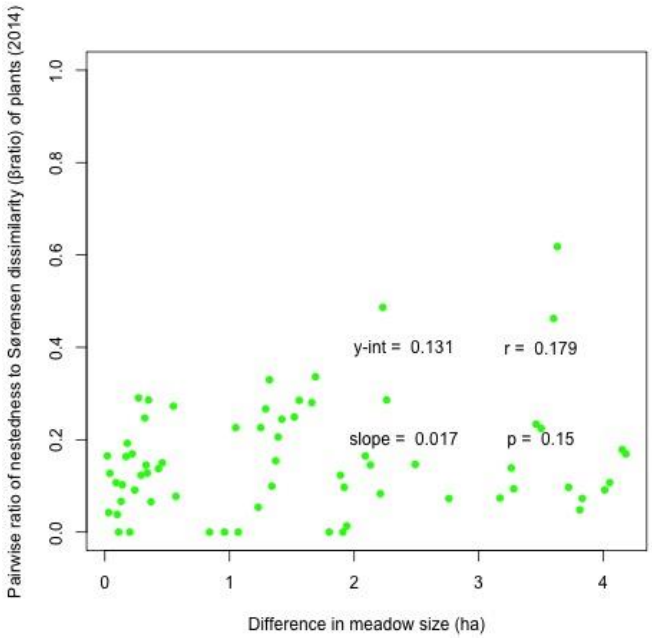

Pairwise Sørensen dissimilarity (βsor) of pollinators (2015)
Difference in meadow size (ha)
y-int = 0.647 r = -0.011
slope = -6.58e-04 p = 0.93
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

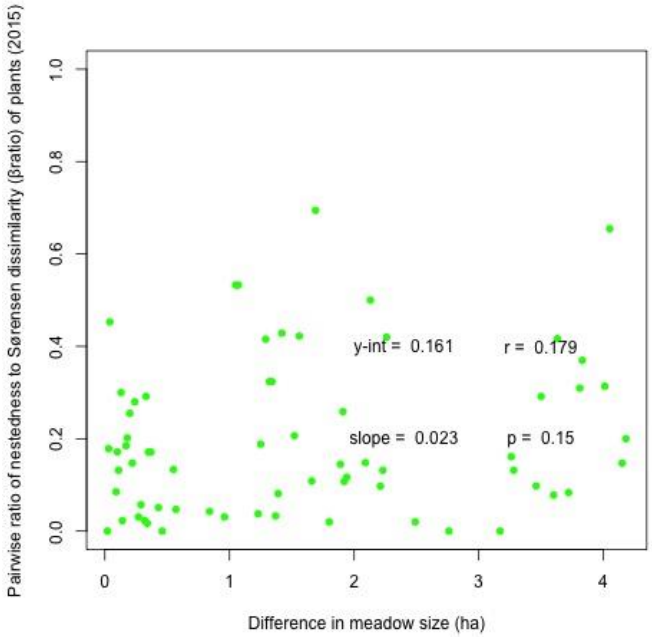

Pairwise Sørensen dissimilarity (βsor) of pollinators (2016)
Difference in meadow size (ha)
y-int = 0.656 r = -0.153
slope = -0.011 p = 0.221
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

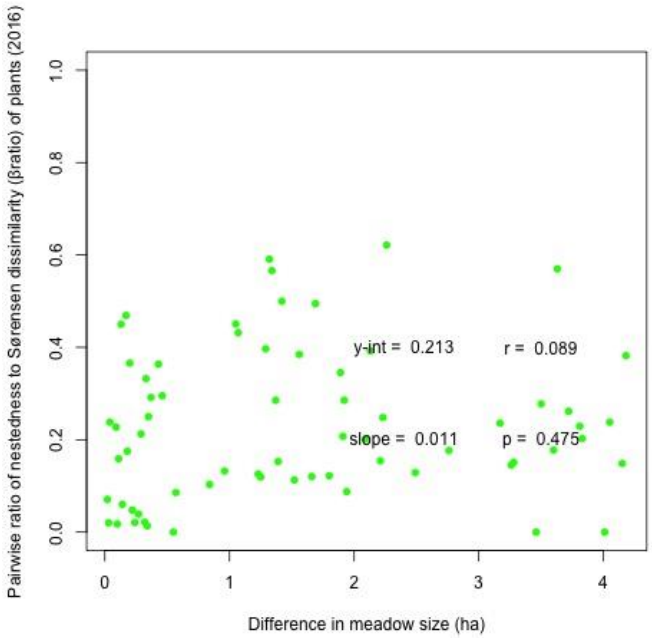

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2011)
Difference in meadow size (ha)
y-int = 0.109
r = -0.009
slope = -4.79E-04
p = 0.959

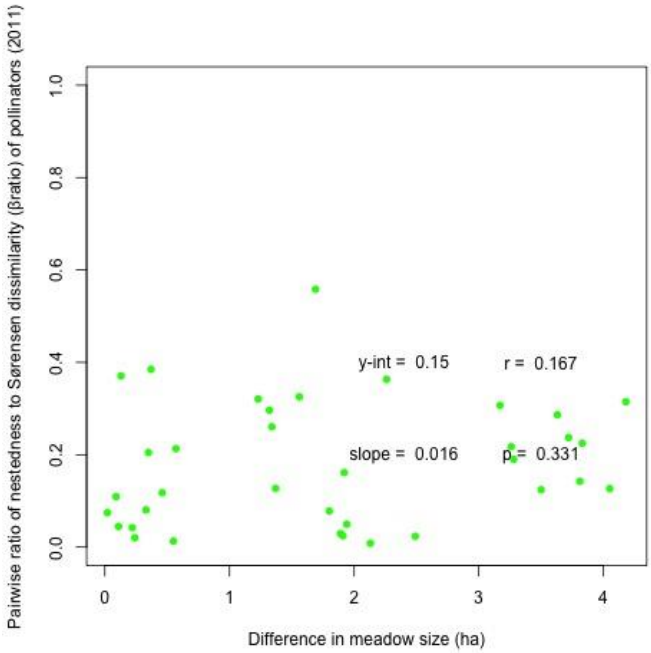

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2012)
Difference in meadow size (ha)
y-int = 0.206
r = -0.052
slope = -0.007
p = 0.735

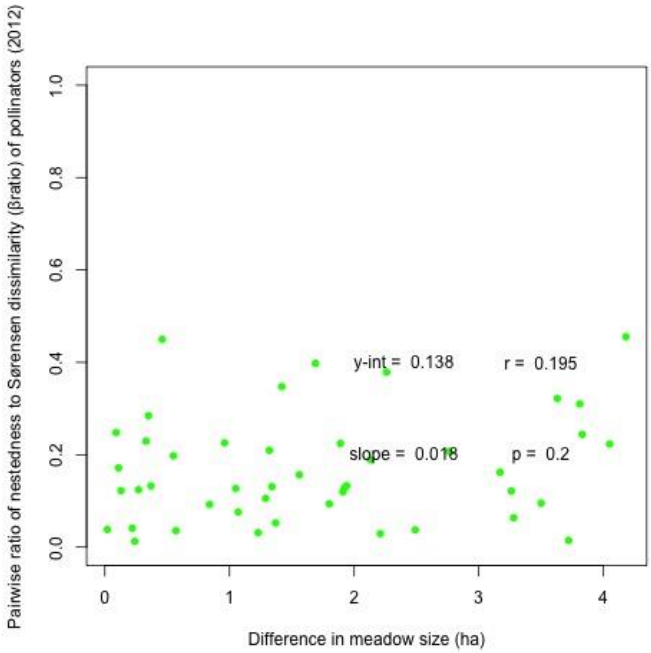

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2013)
Difference in meadow size (ha)
y-int = 0.181
r = 0.083
slope = 0.011
p = 0.508

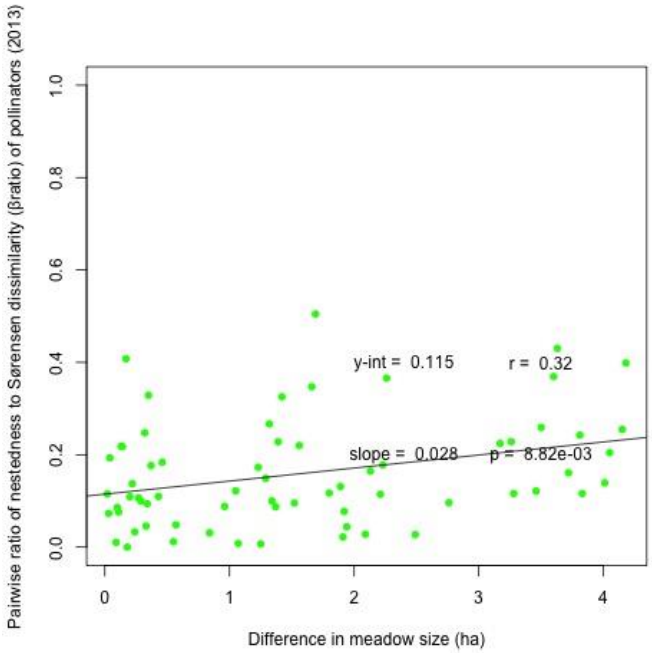

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2014)
Difference in meadow size (ha)
y-int = 0.131
r = 0.179
slope = 0.017
p = 0.15

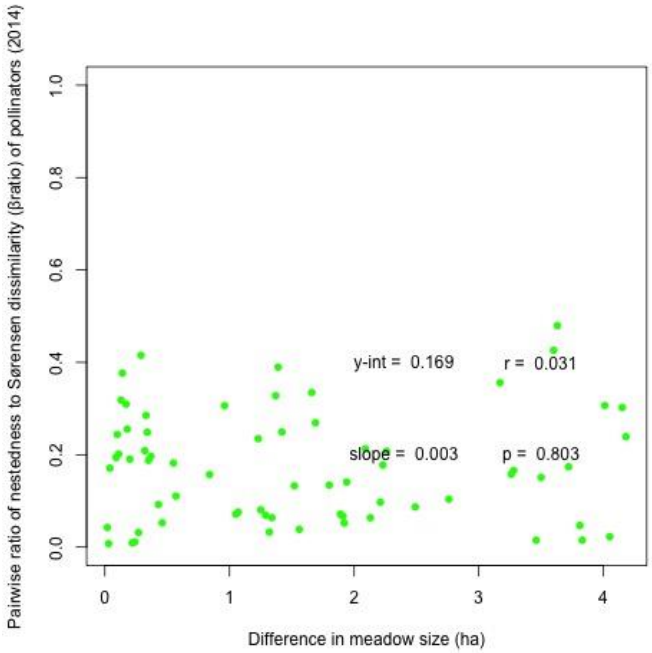

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2015)
Difference in meadow size (ha)
y-int = 0.161
r = 0.179
slope = 0.023
p = 0.15

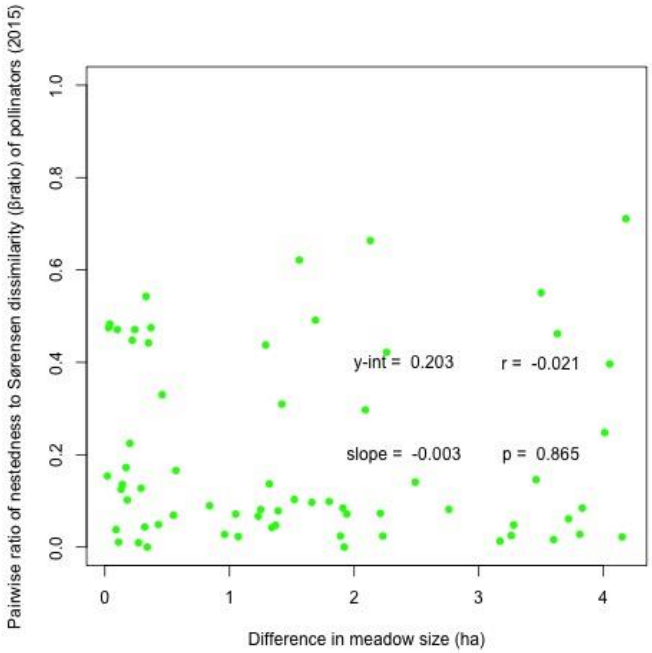

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2016)
Difference in meadow size (ha)
y-int = 0.213
r = 0.089
slope = 0.011
p = 0.475

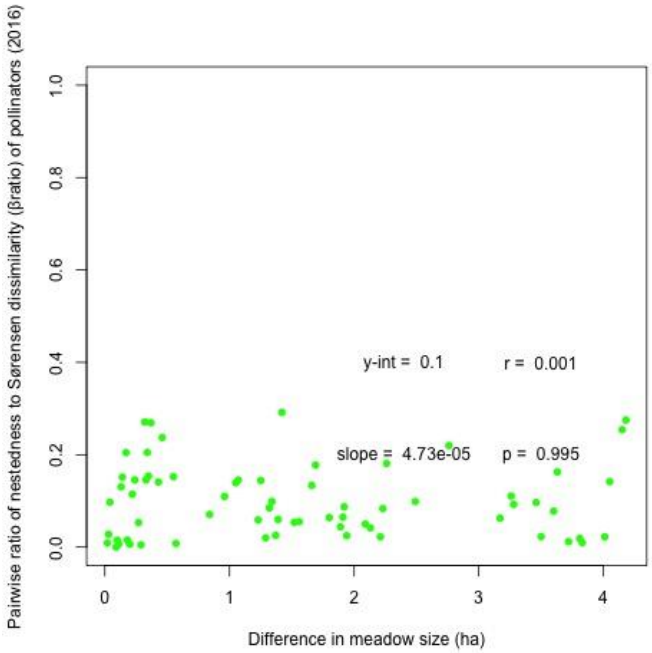

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2011)
Difference in meadow size (ha)
y-int = 0.15
r = 0.167
slope = 0.016
p = 0.331

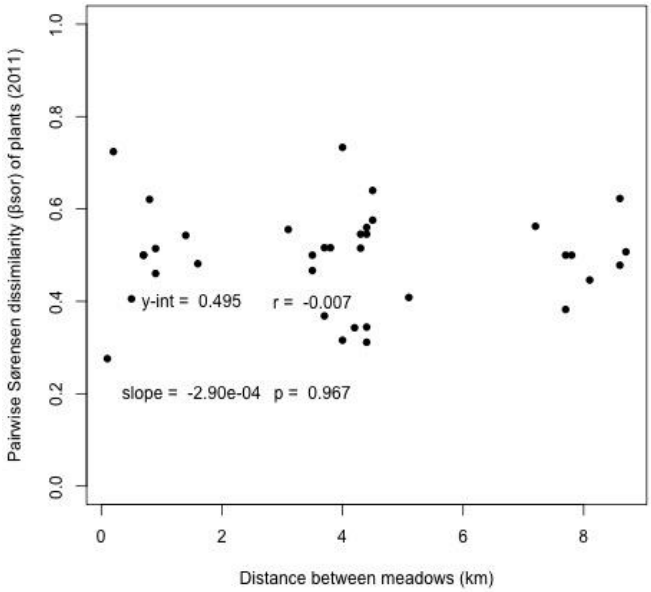

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2012)
Difference in meadow size (ha)
y-int = 0.138
r = 0.195
slope = 0.018
p = 0.2

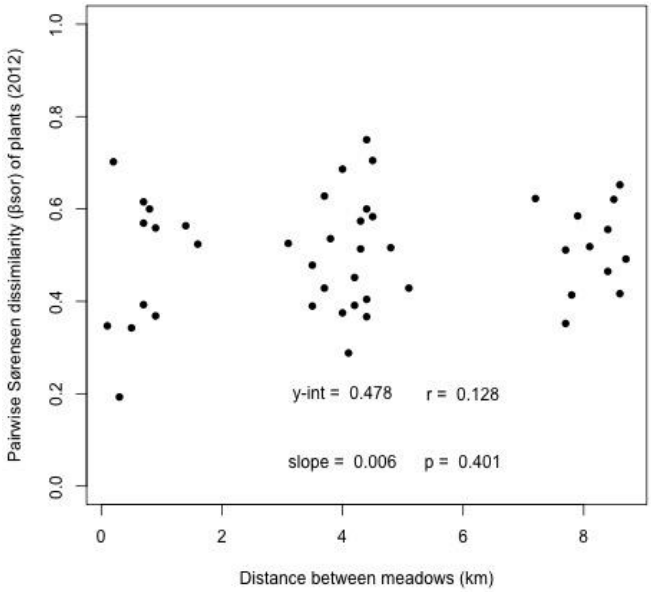

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2013)
Difference in meadow size (ha)
y-int = 0.115
r = 0.32
slope = 0.028
p = 8.82e-03
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

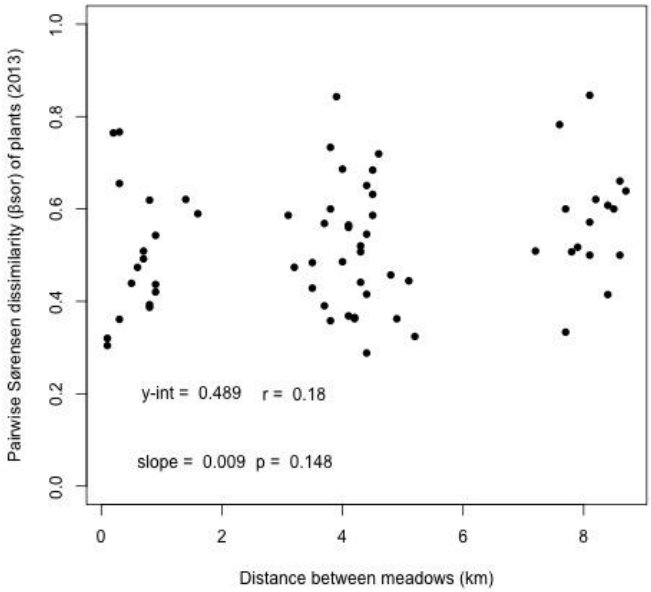

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2014)
Difference in meadow size (ha)
y-int = 0.169
r = 0.031
slope = 0.003
p = 0.803
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

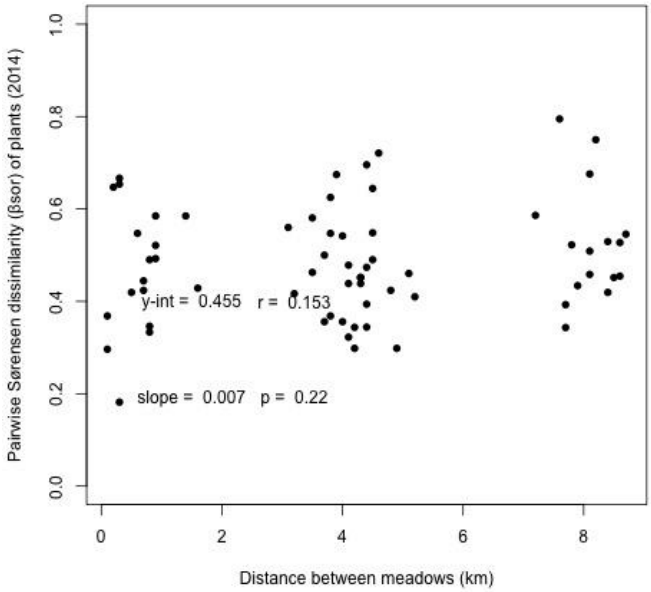

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2015)
Difference in meadow size (ha)
y-int = 0.203
r = -0.021
slope = -0.003
p = 0.865
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

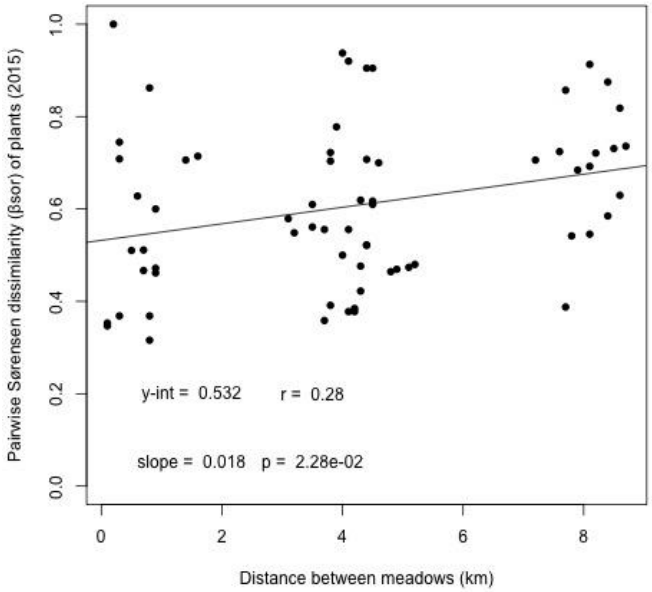

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2016)
Difference in meadow size (ha)
y-int = 0.1
r = 0.001
slope = 4.73e-05
p = 0.995
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4

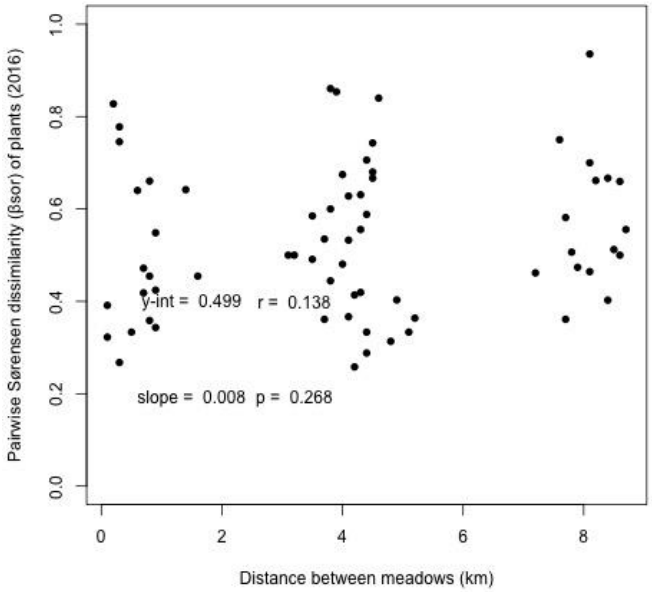

Pairwise Sørensen dissimilarity (βsor) of plants (2011)
Distance between meadows (km)
y-int = 0.495
r = -0.007
slope = -2.90e-04
p = 0.967

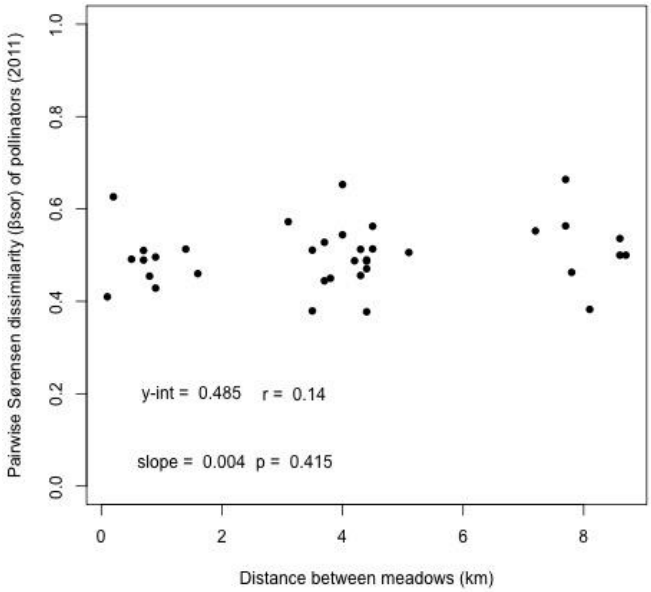

Pairwise Sørensen dissimilarity (βsor) of plants (2012)
Distance between meadows (km)
y-int = 0.478
r = 0.128
slope = 0.006
p = 0.401

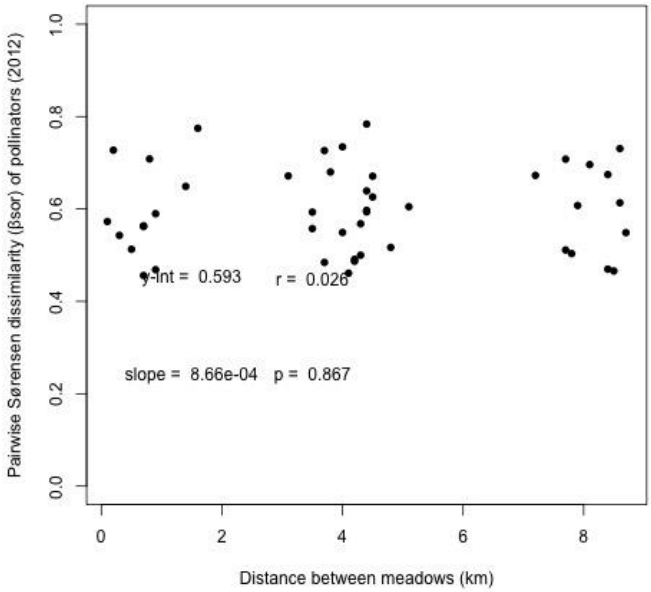

Pairwise Sørensen dissimilarity (βsor) of plants (2013)
Distance between meadows (km)
y-int = 0.489 r = 0.18
slope = 0.009 p = 0.148
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8

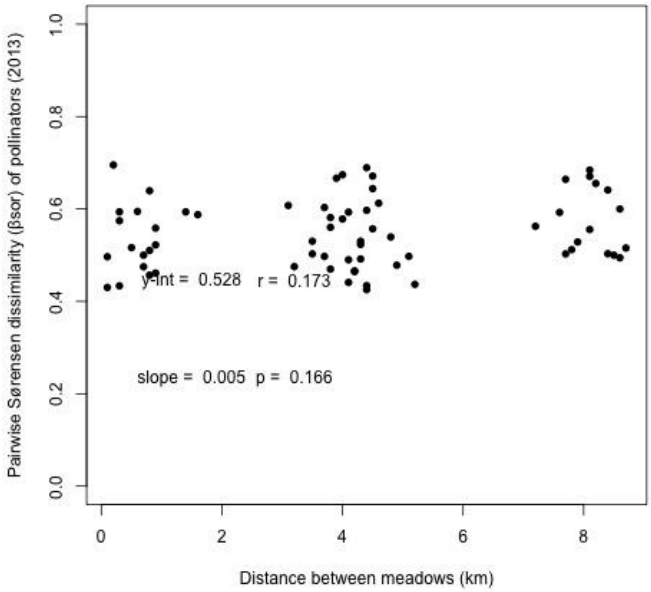

Pairwise Sørensen dissimilarity (βsor) of plants (2014)
Distance between meadows (km)
y-int = 0.455 r = 0.153
slope = 0.007 p = 0.22
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8

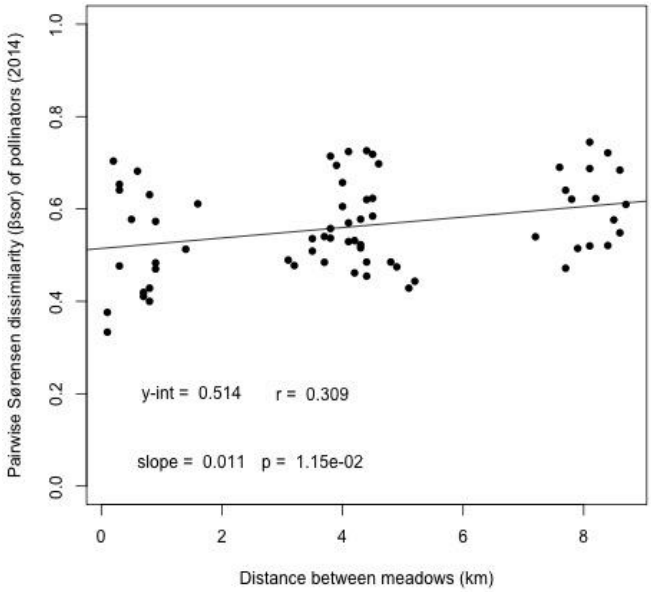

Pairwise Sørensen dissimilarity (βsor) of plants (2015)
Distance between meadows (km)
y-int = 0.532 r = 0.28
slope = 0.018 p = 2.28e-02
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8

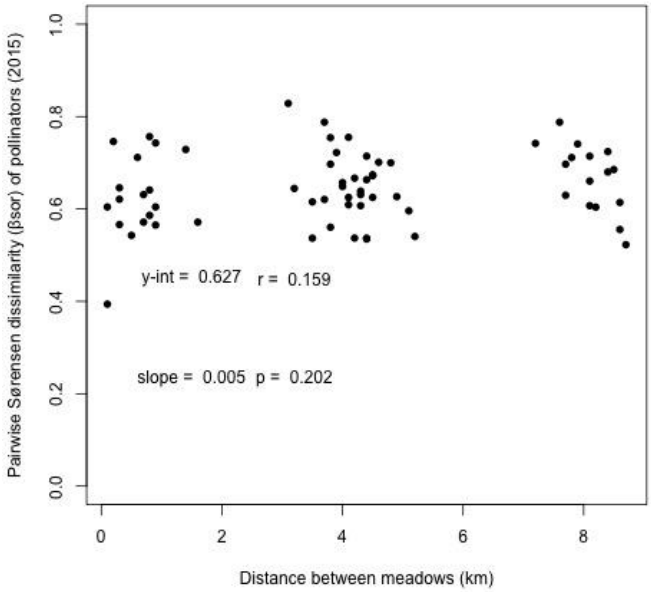

Pairwise Sørensen dissimilarity (βsor) of plants (2016)
Distance between meadows (km)
y-int = 0.499 r = 0.138
slope = 0.008 p = 0.268
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8

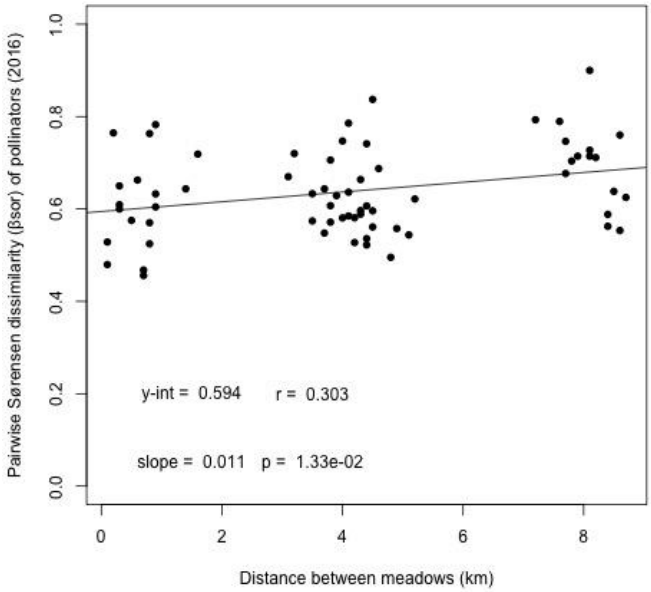

Pairwise Sørensen dissimilarity (βsor) of pollinators (2011)
0.0
0.2
0.4
0.6
0.8
1.0
y-int = 0.485 r = 0.14
slope = 0.004 p = 0.415
0
2
4
6
8
Distance between meadows (km)

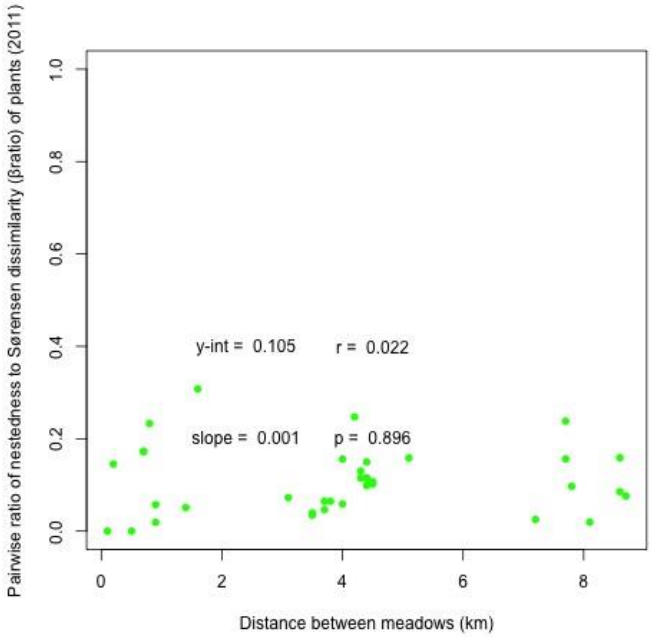

Pairwise Sørensen dissimilarity (βsor) of pollinators (2012)
0.0
0.2
0.4
0.6
0.8
1.0
y-int = 0.593 r = 0.026
slope = 8.66e-04 p = 0.867
0
2
4
6
8
Distance between meadows (km)

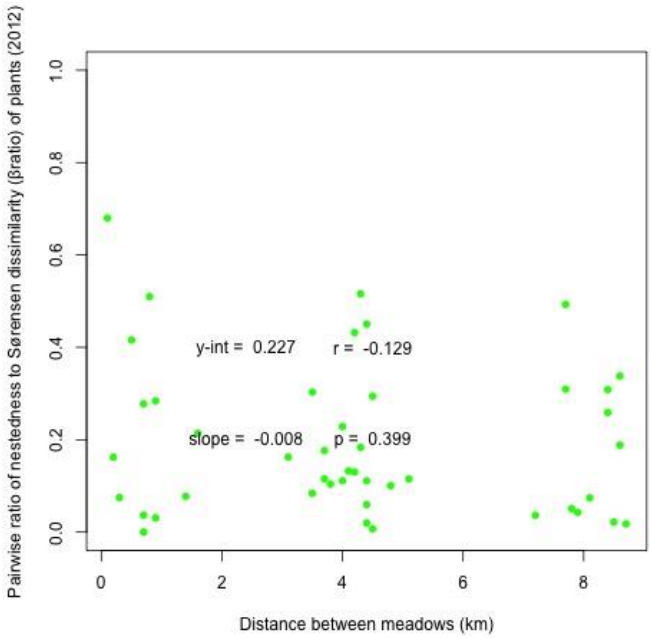

Pairwise Sørensen dissimilarity (βsor) of pollinators (2013)
1.0
0.8
0.6
0.4
0.2
0.0
y-int = 0.528 r = 0.173
slope = 0.005 p = 0.166
0
2
4
6
8
Distance between meadows (km)

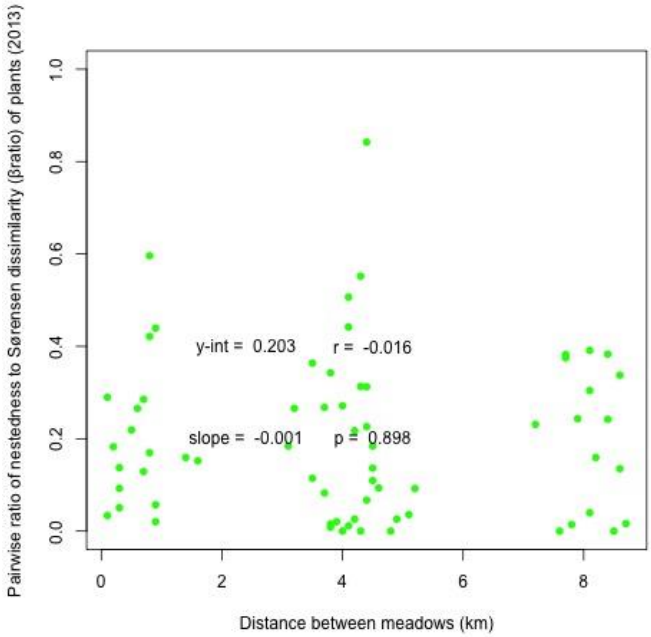

Pairwise Sørensen dissimilarity (βsor) of pollinators (2014)
1.0
0.8
0.6
0.4
0.2
0.0
y-int = 0.514 r = 0.309
slope = 0.011 p = 1.15e-02
0
2
4
6
8
Distance between meadows (km)

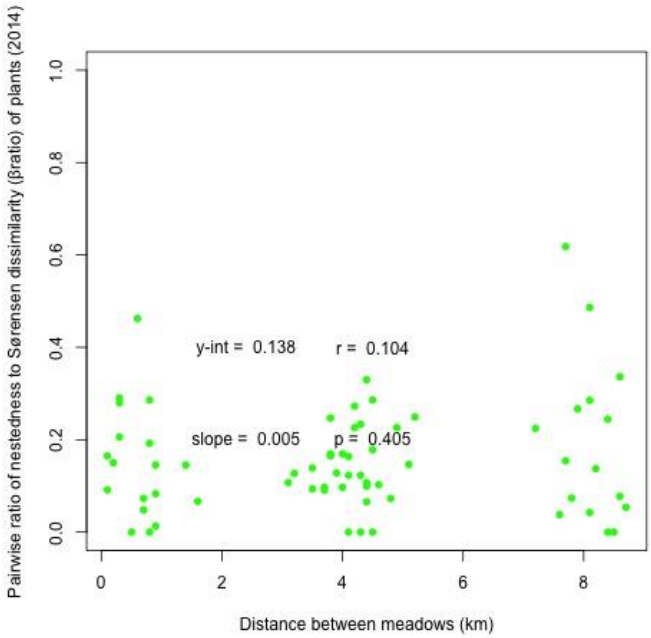

Pairwise Sørensen dissimilarity (βsor) of pollinators (2015)
1.0
0.8
0.6
0.4
0.2
0.0
y-int = 0.627 r = 0.159
slope = 0.005 p = 0.202
0
2
4
6
8
Distance between meadows (km)

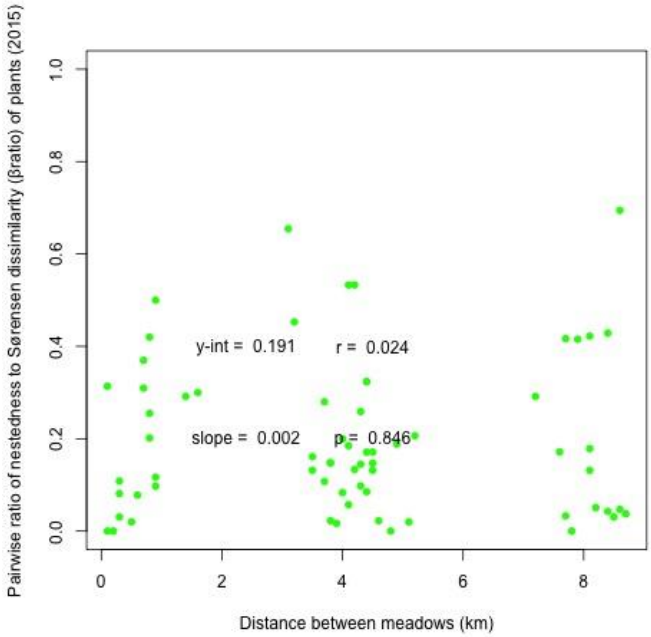

Pairwise Sørensen dissimilarity (βsor) of pollinators (2016)
1.0
0.8
0.6
0.4
0.2
0.0
y-int = 0.594 r = 0.303
slope = 0.011 p = 1.33e-02
0
2
4
6
8
Distance between meadows (km)

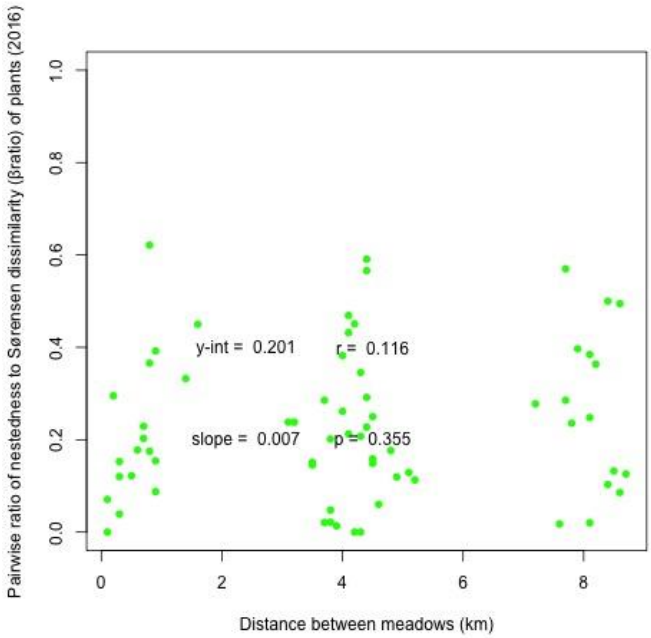

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2011)
y-int = 0.105
r = 0.022
slope = 0.001
p = 0.896
Distance between meadows (km)

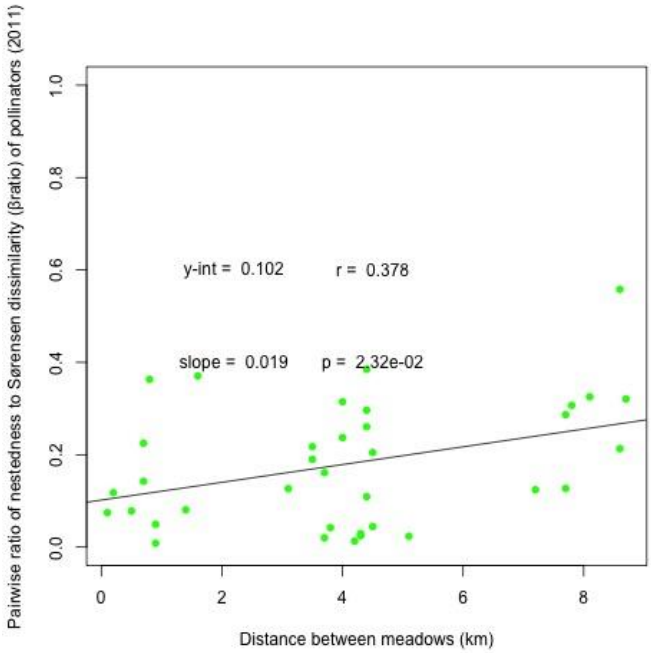

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2012)
y-int = 0.227
r = -0.129
slope = -0.008
p = 0.399
Distance between meadows (km)

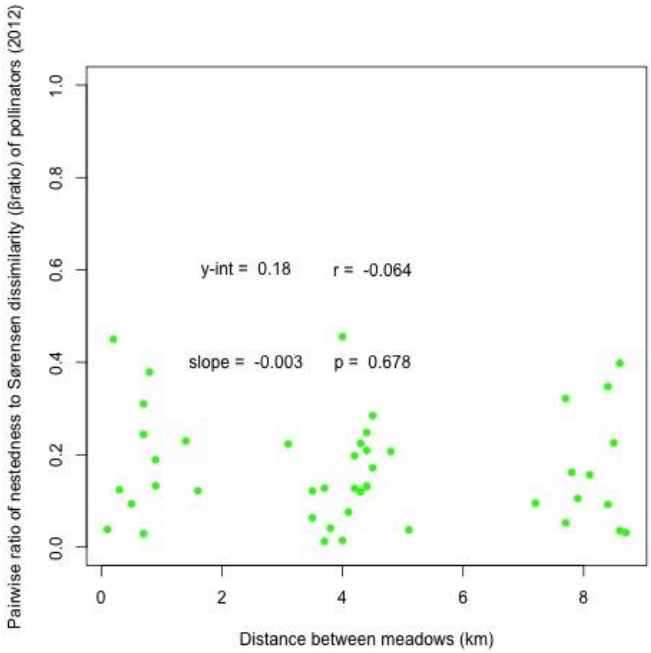

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2013)
y-int = 0.203
r = -0.016
slope = -0.001
p = 0.898
Distance between meadows (km)

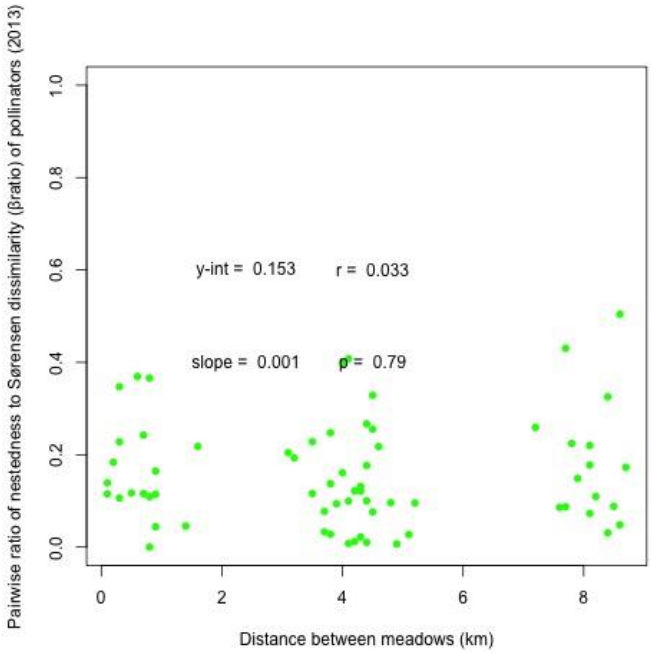

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2014)
y-int = 0.138
r = 0.104
slope = 0.005
p = 0.405
Distance between meadows (km)

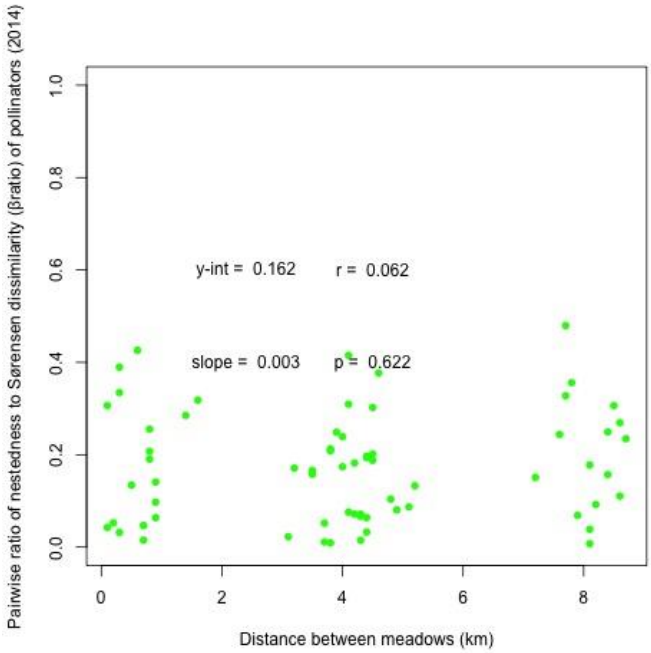

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2015)
y-int = 0.191
r = 0.024
slope = 0.002
p = 0.846
Distance between meadows (km)

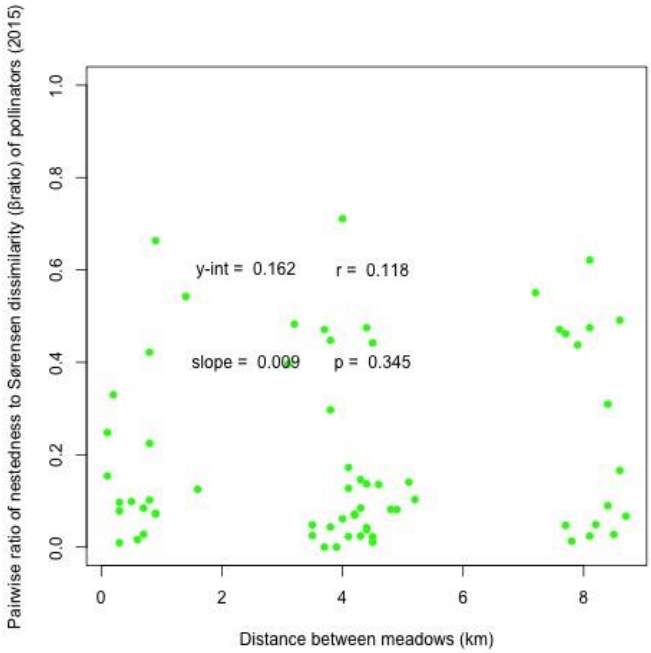

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2016)
y-int = 0.201
r = 0.116
slope = 0.007
p = 0.355
Distance between meadows (km)

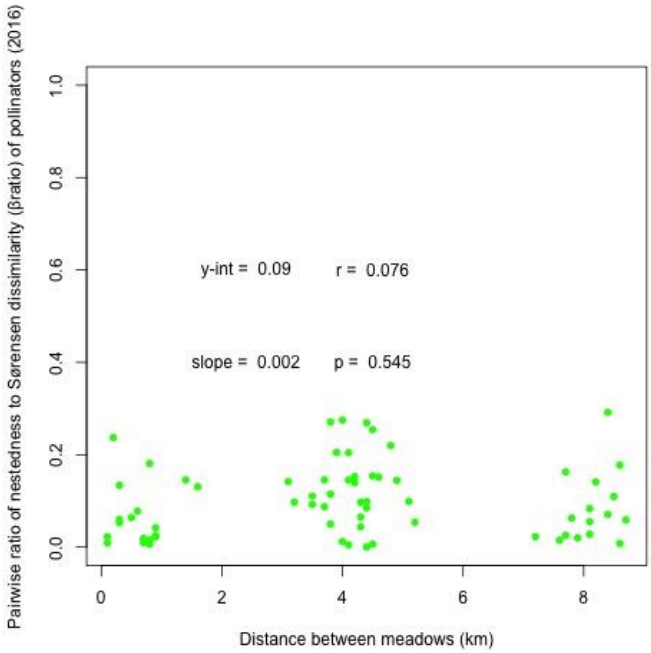

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2011)
y-int = 0.102
r = 0.378
slope = 0.019
p = 2.32e-02
Distance between meadows (km)

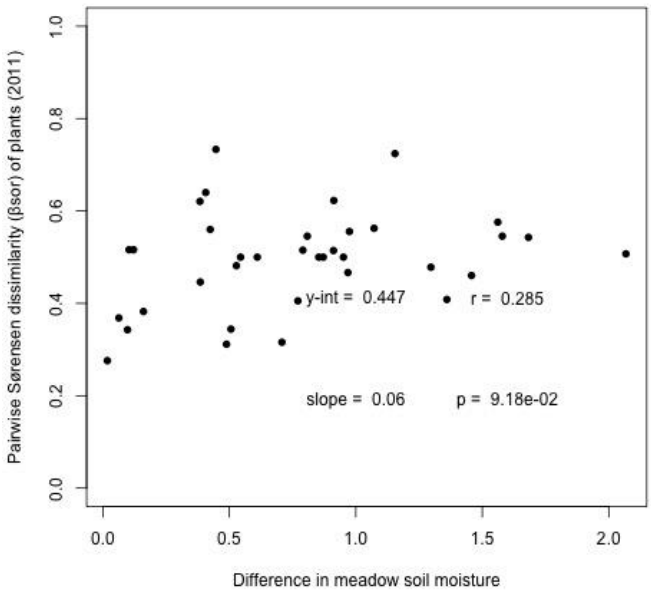

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2012)
y-int = 0.18
r = -0.064
slope = -0.003
p = 0.678
Distance between meadows (km)

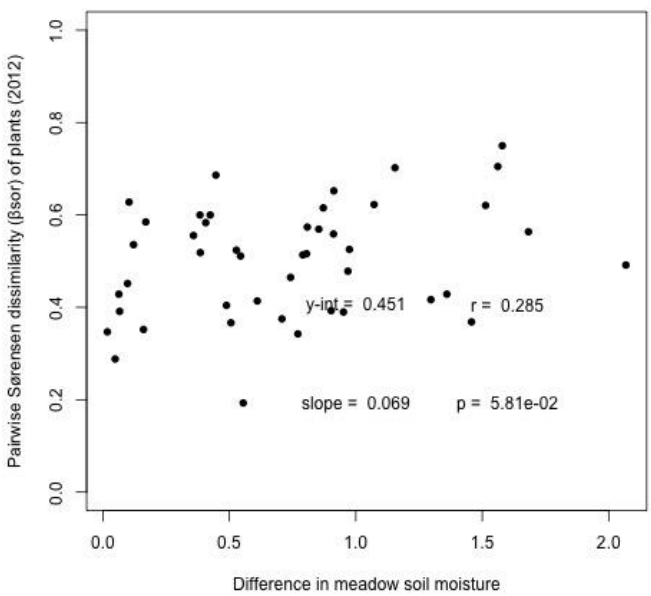

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2013)
y-int = 0.153
r = 0.033
slope = 0.001
p = 0.79
Distance between meadows (km)

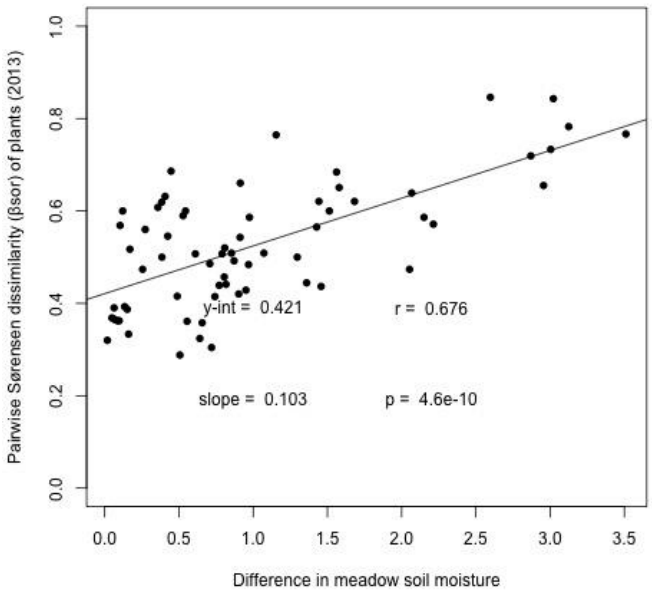

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2014)
y-int = 0.162
r = 0.062
slope = 0.003
p = 0.622
Distance between meadows (km)

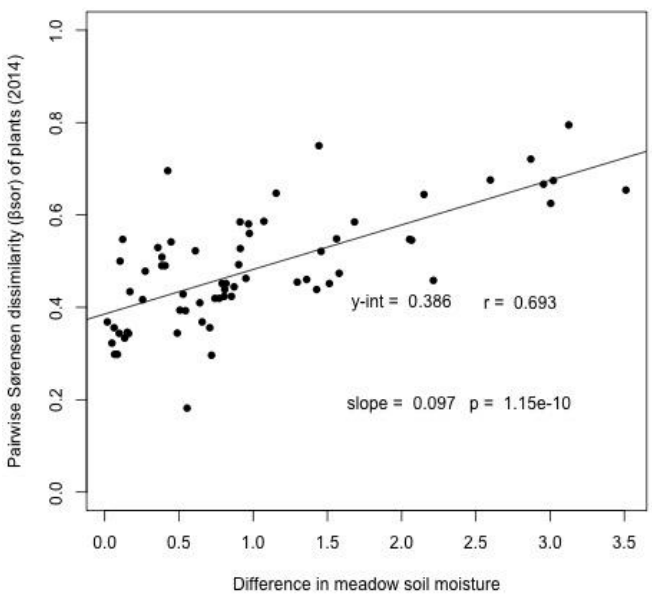

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2015)
y-int = 0.162
r = 0.118
slope = 0.009
p = 0.345
Distance between meadows (km)

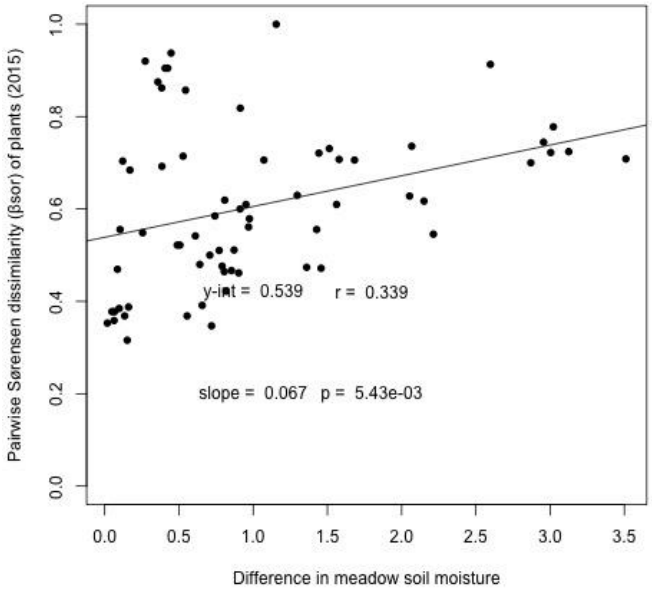

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2016)
y-int = 0.09
r = 0.076
slope = 0.002
p = 0.545
Distance between meadows (km)

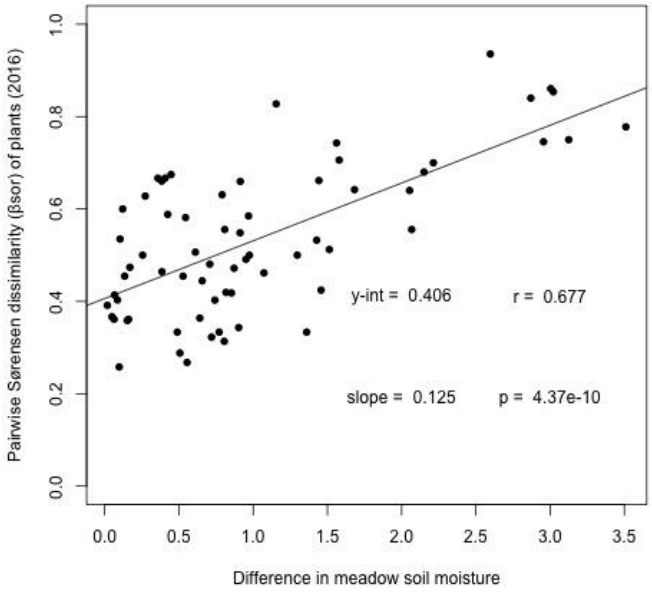

Pairwise Sørensen dissimilarity (βsor) of plants (2011)
Difference in meadow soil moisture
y-int = 0.447
r = 0.285
slope = 0.06
p = 9.18e-02
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0

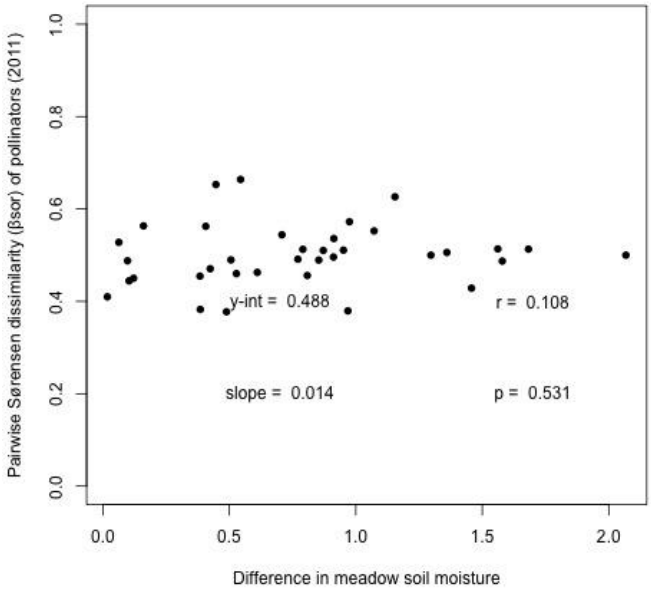

Pairwise Sørensen dissimilarity (βsor) of plants (2012)
Difference in meadow soil moisture
y-int = 0.451
r = 0.285
slope = 0.069
p = 5.81e-02
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0

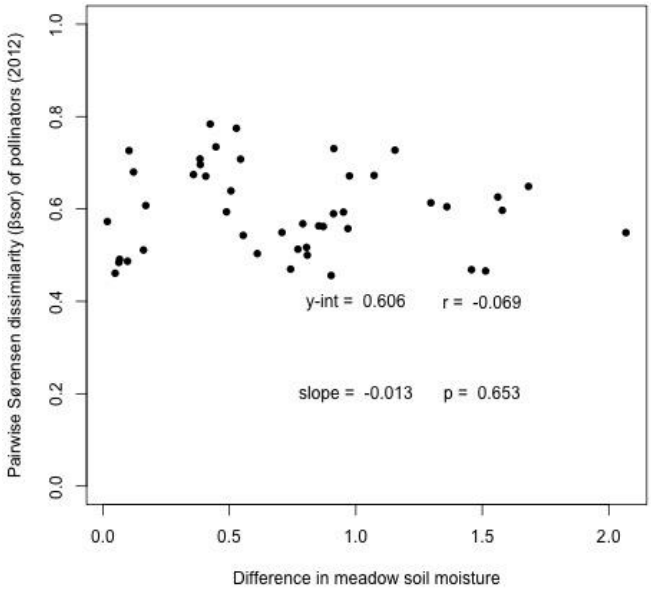

Pairwise Sørensen dissimilarity (βsor) of plants (2013)
Difference in meadow soil moisture
y-int = 0.421
r = 0.676
slope = 0.103
p = 4.6e-10
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

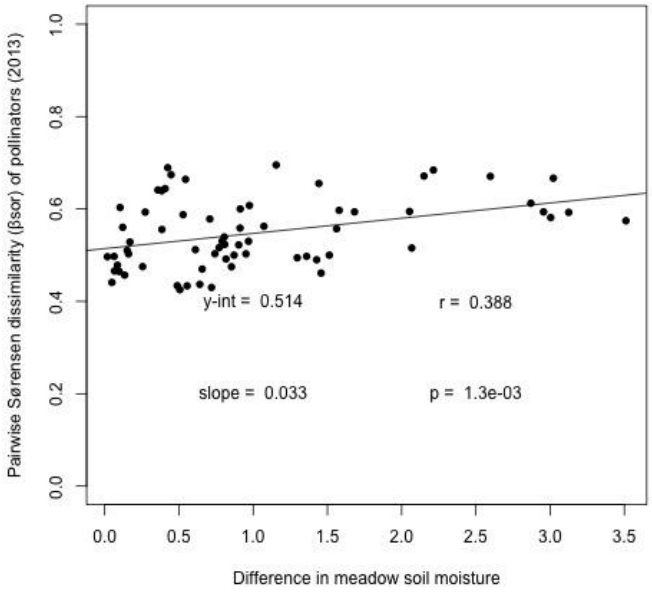

Pairwise Sørensen dissimilarity (βsor) of plants (2014)
Difference in meadow soil moisture
y-int = 0.386
r = 0.693
slope = 0.097
p = 1.15e-10
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

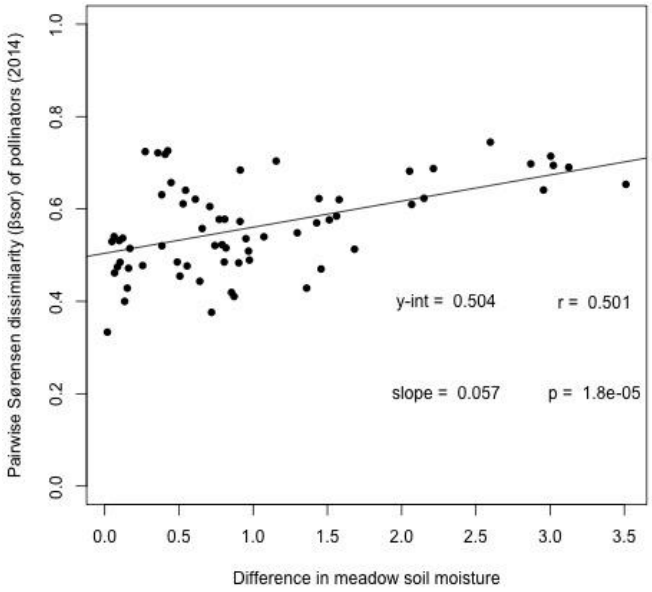

Pairwise Sørensen dissimilarity (βsor) of plants (2015)
Difference in meadow soil moisture
y-int = 0.539
r = 0.339
slope = 0.067
p = 5.43e-03
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

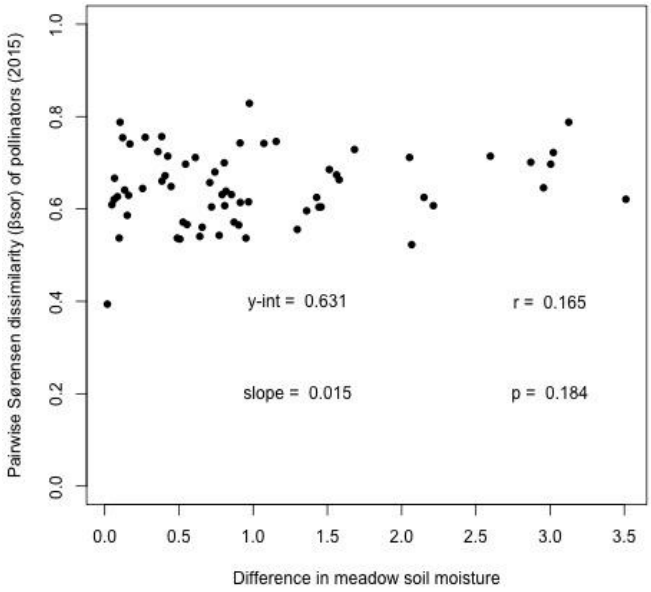

Pairwise Sørensen dissimilarity (βsor) of plants (2016)
Difference in meadow soil moisture
y-int = 0.406
r = 0.677
slope = 0.125
p = 4.37e-10
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

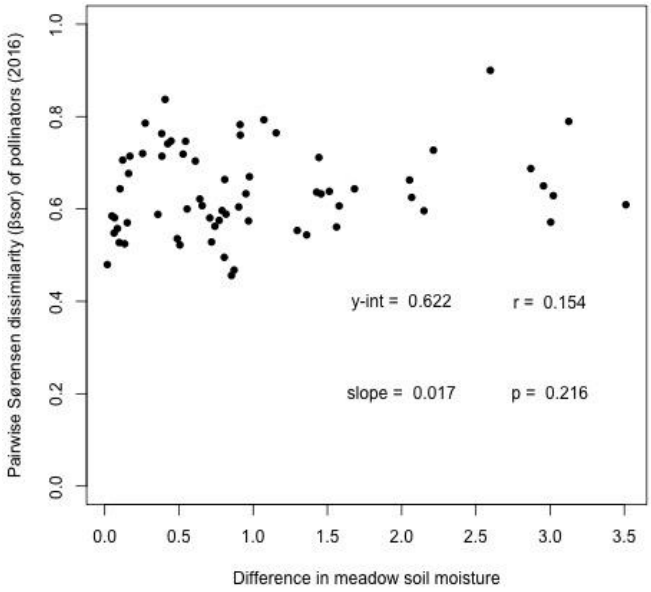

Pairwise Sørensen dissimilarity (βsor) of pollinators (2011)
Difference in meadow soil moisture
y-int = 0.488
r = 0.108
slope = 0.014
p = 0.531
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0

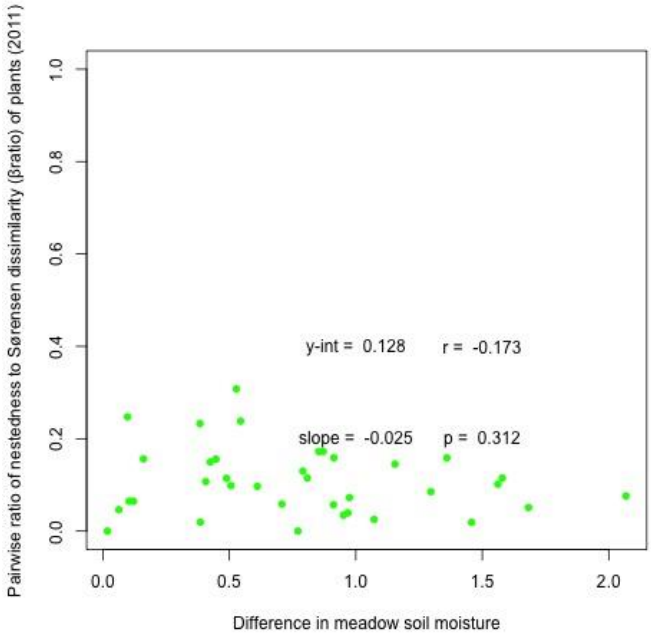

Pairwise Sørensen dissimilarity (βsor) of pollinators (2012)
Difference in meadow soil moisture
y-int = 0.606
r = -0.069
slope = -0.013
p = 0.653
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0

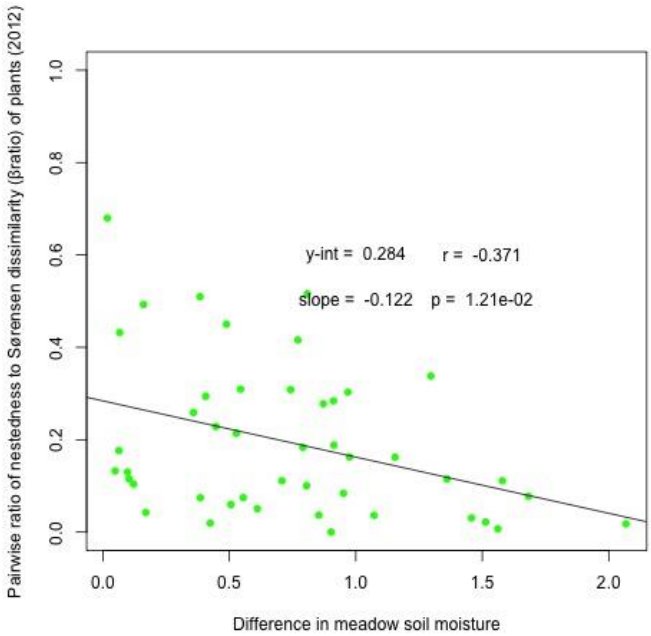

Pairwise Sørensen dissimilarity (βsor) of pollinators (2013)
Difference in meadow soil moisture
y-int = 0.514
r = 0.388
slope = 0.033
p = 1.3e-03
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

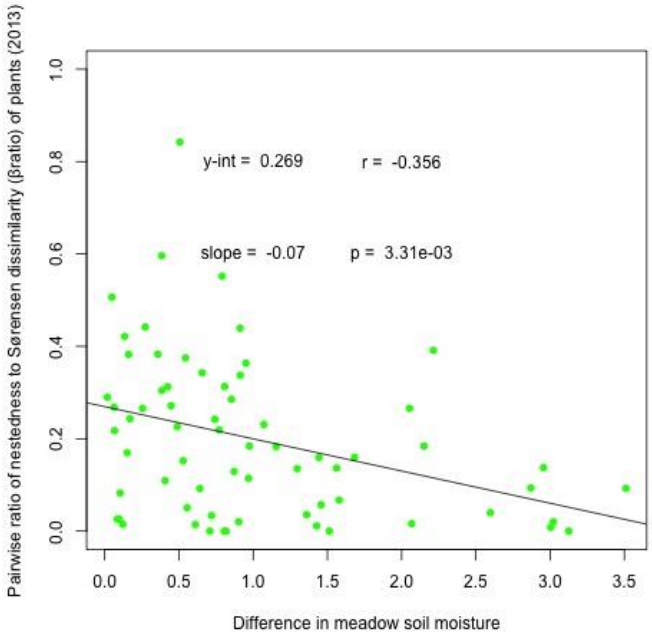

Pairwise Sørensen dissimilarity (βsor) of pollinators (2014)
Difference in meadow soil moisture
y-int = 0.504
r = 0.501
slope = 0.057
p = 1.8e-05
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

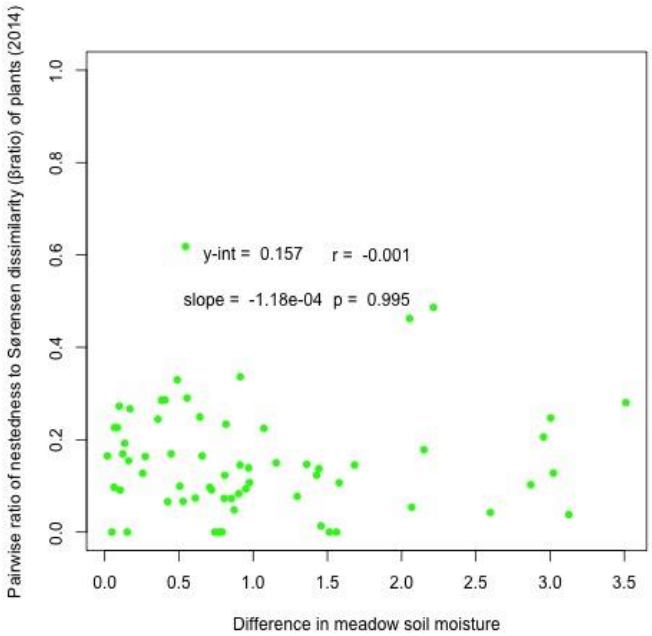

Pairwise Sørensen dissimilarity (βsor) of pollinators (2015)
Difference in meadow soil moisture
y-int = 0.631
r = 0.165
slope = 0.015
p = 0.184
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

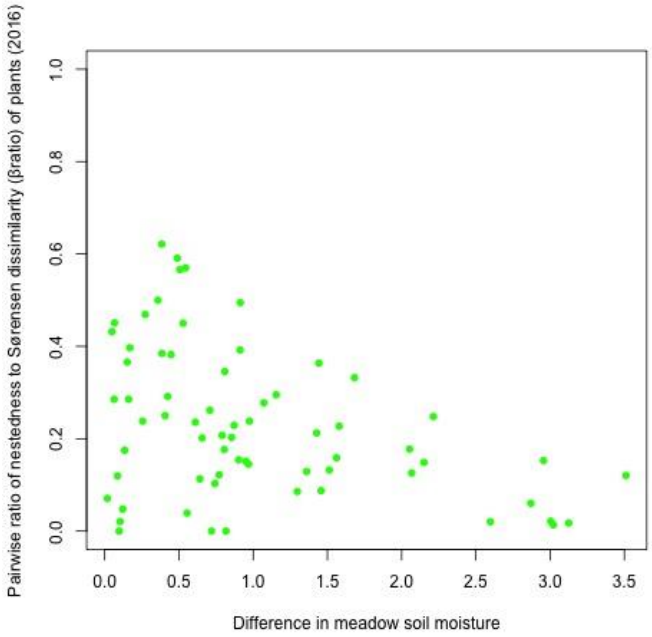

Pairwise Sørensen dissimilarity (βsor) of pollinators (2016)
Difference in meadow soil moisture
y-int = 0.622
r = 0.154
slope = 0.017
p = 0.216
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

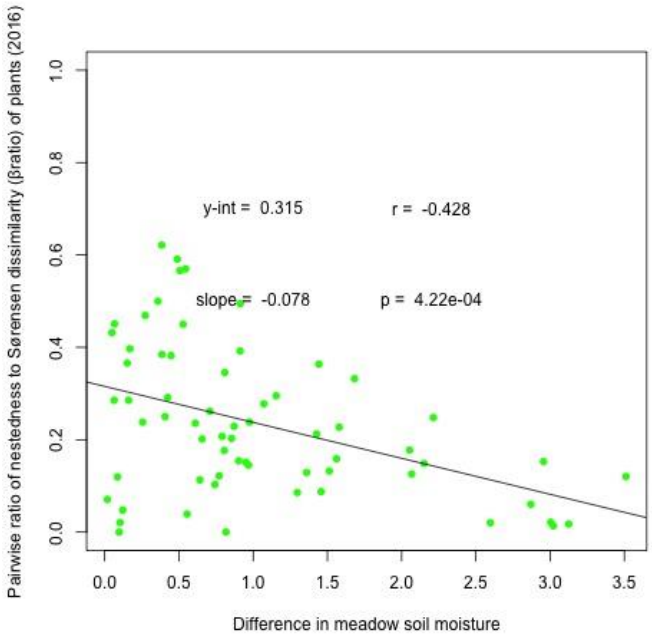

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2011)
y-int = 0.128 r = -0.173
slope = -0.025 p = 0.312
Difference in meadow soil moisture

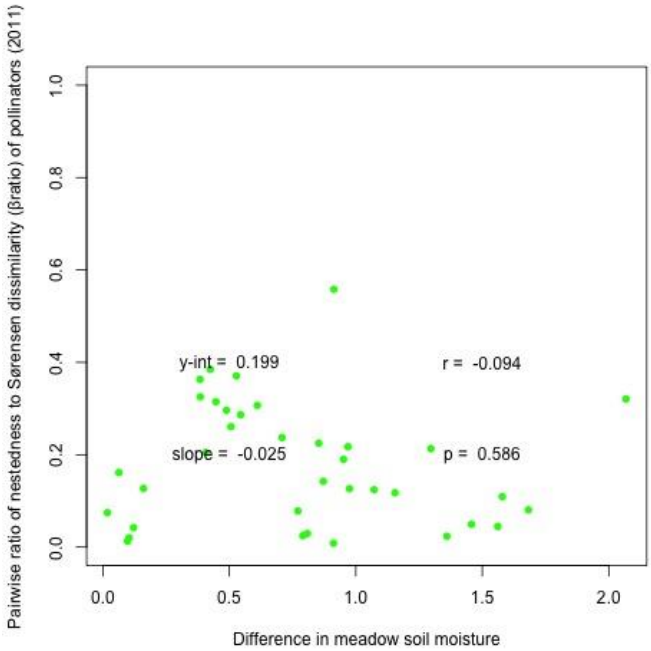

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2012)
y-int = 0.284 r = -0.371
slope = -0.122 p = 1.21e-02
Difference in meadow soil moisture

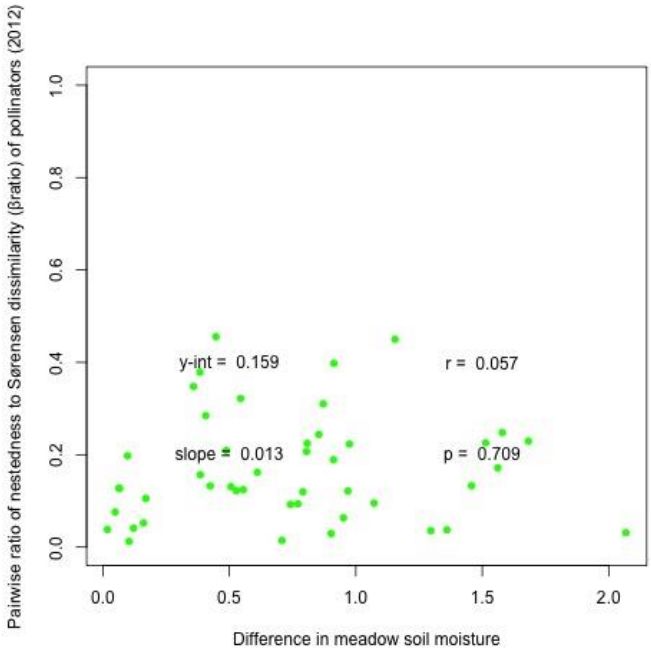

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2013)
y-int = 0.269
r = -0.356
slope = -0.07
p = 3.31e-03
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Difference in meadow soil moisture

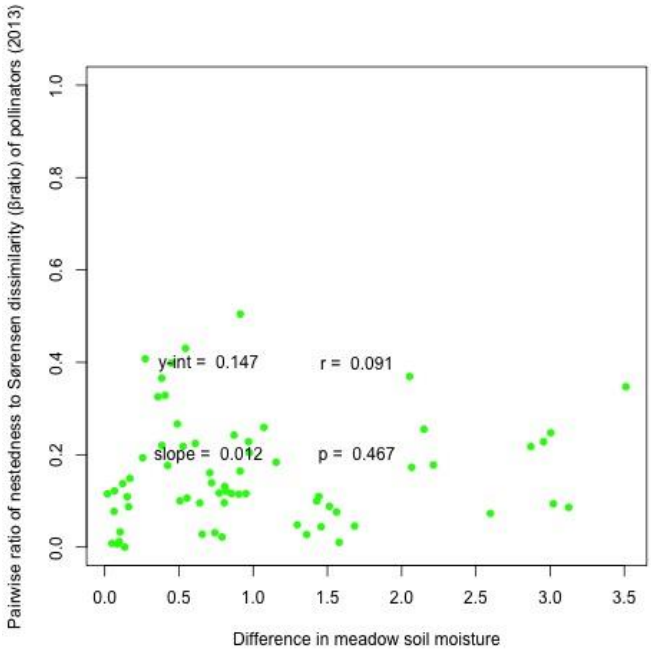

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2014)
y-int = 0.157
r = -0.001
slope = -1.18e-04
p = 0.995
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Difference in meadow soil moisture

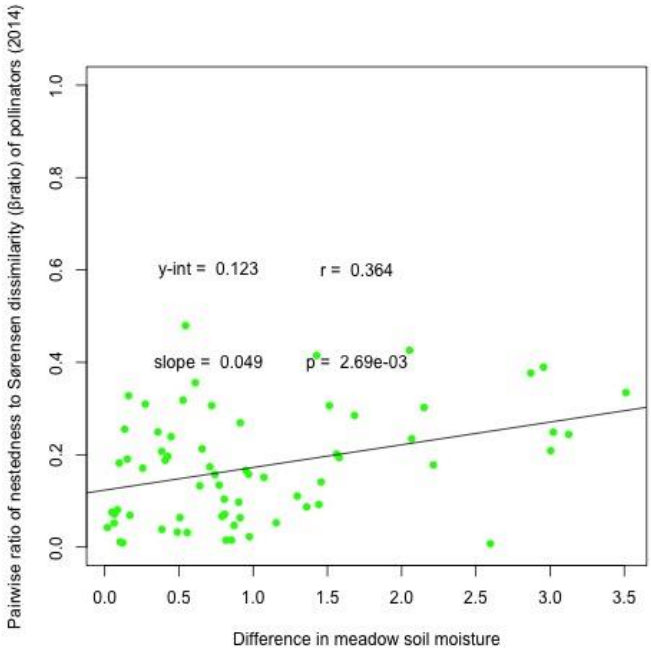

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2016)
Difference in meadow soil moisture

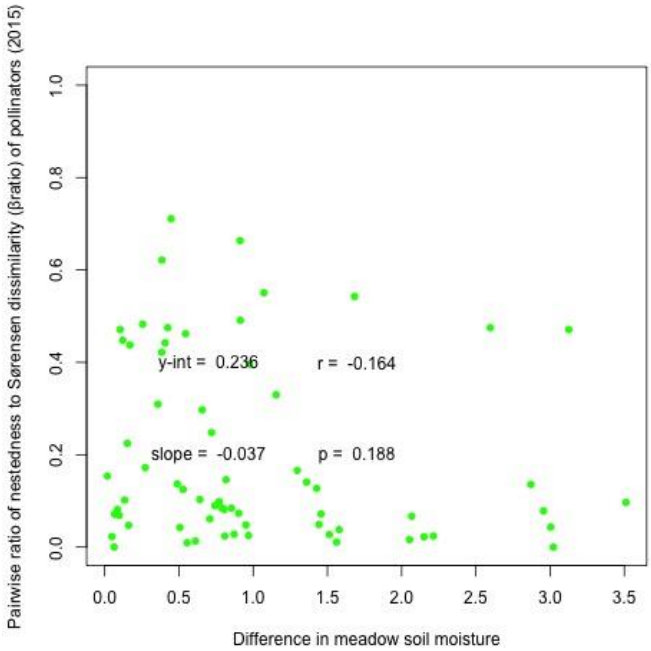

y-int = 0.315
r = -0.428
slope = -0.078
p = 4.22e-04
Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of plants (2016)
Difference in meadow soil moisture

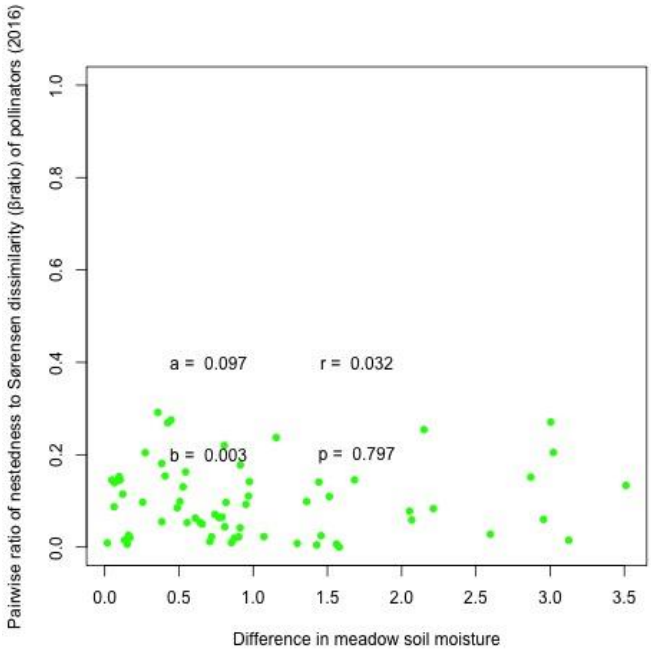

Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2011)
Difference in meadow soil moisture
y-int = 0.199
slope = -0.025
r = -0.094
p = 0.586
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0


Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2012)
Difference in meadow soil moisture
y-int = 0.159
slope = 0.013
r = 0.057
p = 0.709
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0


Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2013)
y-int = 0.147
r = 0.091
slope = 0.012
p = 0.467
Difference in meadow soil moisture


Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2014)
y-int = 0.123
r = 0.364
slope = 0.049
p = 2.69e-03
Difference in meadow soil moisture


Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2015)
Difference in meadow soil moisture
y-int = 0.236
r = -0.164
slope = -0.037
p = 0.188
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5


Pairwise ratio of nestedness to Sørensen dissimilarity (βratio) of pollinators (2016)
Difference in meadow soil moisture
a = 0.097
r = 0.032
b = 0.003
p = 0.797
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5