Chapter 2 Draft

Here I'm going to try to understand our data a bit better and state our hypothesis.

First I start with an abstract that could be our guide for hypothesis testing and analyses.

Abstract (draft)

Plant pollinator interactions are a keystone process for ecosystem functioning. However, we lack comprehensive information from both plants and pollinators that can inform from this mutualistic interaction worldwide. In order to tackle this, we have selected 30 networks distributed across the world and looked for key floral traits of plant-pollinator interactions for a total of 1600 species. Here we look how these floral traits shape the different plant-pollinator networks and the main fuctional groups of insect pollinating species. Giving the different nature of the data collated we do not compare across networks and we focus on the main general patterns/results within network. We have conducted our analysis at 3 levels, 1) unique networks, 2) metawebs and by 3) grouping both. We find that specific traits are associated with different guilds of floral visitors within these networks. We also highlight the lack of information about traits and the reproductive biology of the plant species of these networks. Our work shows the importance of deepen in species traits in order to understand key processes that can be seen with network metrics and highlights the importance of elemental ecology for species conservation.

What sort of data do we have?

There are approximately 1600 species from 30 different networks. All of these networks are phytocentric (built from plants). The different plant-pollinator communities have been studied with very different sampling effort and methodologies. Therefore, our aim is not to compare across studies but to create a general picture of how floral traits shape the different pollinator taxa and network metrics. Here, we combine the studies with multiple years of sampling and multiple sites within an area in metawebs. These networks give a broader perspective of the sampling area and inform about the regional species pool (Noreika et al. 2019). The data of these networks is quantitative (visitation) or qualitative (binary), there are in total 19 and 11 networks/metawebs of each, respectively.

Id	Longitude	Latitude	Country	Year	Networks	Plant spp	Pollinator spp	Network size	Sampling method	Sampling	Data type
Bartomeus 2008	3.296797	42.315336	Spain	2005	3	18	37	666	Plots with transects	Phytocentric	Quantitative
Fang 2012	99.63806	27.90139	China	2008-2010	3	130	247	32110	Plots	Phytocentric	Quantitative
Inouye 1990	135.866667	35.166667	Japan	1984-1987	4	114	883	100662	Transects	Phytocentric	Quantitative
Inouye 1988	148.266667	-36.45	Australia	1983-1984	1	40	85	3400	Plots	Phytocentric	Quantitative
Kaiser-Bunbury 2009	57.443254	-20.452076	Republic of Mauritius	2003-2004	2	96	184	17664	Plots	Phytocentric	Quantitative
Kaiser-Bunbury 2014	55.43333	-4.666667	Republic of Seychelles	2007-2008	6	37	341	12617	Transects	Phytocentric	Quantitative
Kato 2000	129.493741	28.377248	Japan	1996-1999	16	110	609	66990	Transects	Phytocentric	Quantitative
Kevan 1970	-71.3	81.816667	Canada	1967	1	20	91	1820	Randow census walks	Phytocentric	Qualitative
Lundgren 2005	-52	71	Greenland	2002	1	17	26	442	Randow census walks	Phytocentric	Quantitative
Olesen 2002 1	57.43	-20.25	Republic of Mauritius	1998-1999	1	17	26	442	Plots	Phytocentric	Quantitative
Mcmullen 1993	-90.600747	-0.290164	Ecuador	NA	All islands	105	54	5670	-	Phytocentric	Qualitative
Bartomeus 2008	3.296797	42.315336	Spain	2005	3	13	37	481	Plots with transects	Phytocentric	Quantitative
Primack 1983 1	171.566667	-42.95	New Zealand	1976-1978	1	18	60	1080	Randow census walks	Phytocentric	Qualitative

(continued)

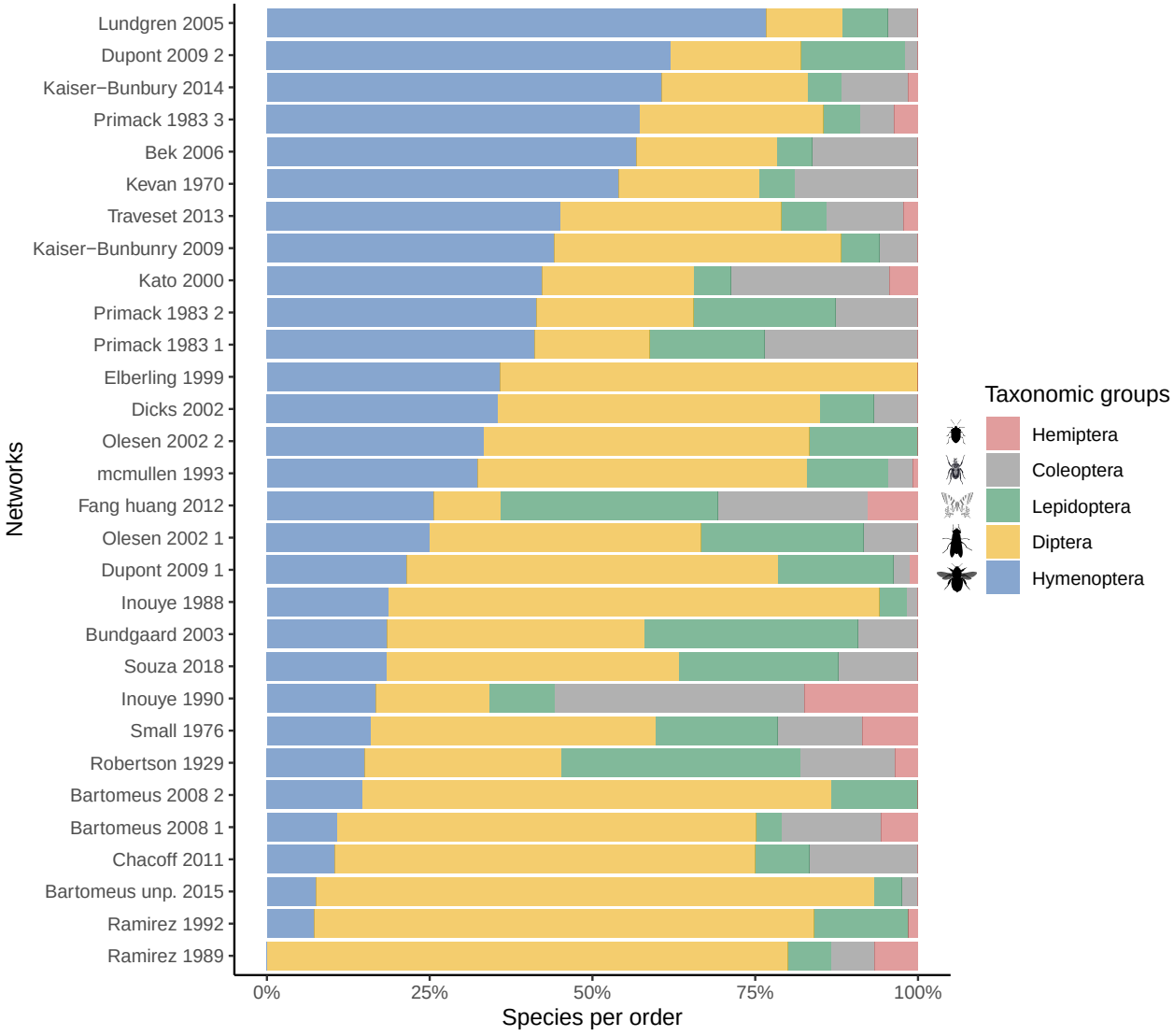
Id	Longitude	Latitude	Country	Year	Networks	Plant spp	Pollinator spp	Network size	Sampling method	Sampling	Data type
Primack 1983 2	171.78466	-43.02823	New Zealand	1976-1978	1	41	139	5699	Randow census walks	Phytocentric	Qualitative
Primack 1983 3	171.720224	-43.099531	New Zealand	1976-1978	1	49	118	5782	Randow census walks	Phytocentric	Qualitative
Ramirez 1989	-61.716667	5.583333	Venezuela	NA	1	48	49	2352	Randow census walks	Phytocentric	Qualitative
Ramirez 1992	-67.416667	8.933333	Venezuela	1983,1984,198	1	28	53	1484	Randow census walks	Phytocentric	Qualitative
Robertson 1929	-89.8968771	39.278958	United States	1997-1899	NA	456	1044	476064	-	Phytocentric	Qualitative
Small 1976	-75.5	45.4	Canada	1973	1	13	34	442	10h per spp	Phytocentric	Quantitative
Souza 2018	-57.885	-21.701111	Brazil	2008-2009	1	62	89	5518	Plots	Phytocentric	Quantitative
Traveset 2013	-91.012863	-0.6907	Ecuador	2010-2011	1	60	220	13200	Randow census walks	Phytocentric	Quantitative
Bartomeus 2015 unp.	NA	NA	Spain	2015	16	57	277	15789	Transects	Phytocentric	Quantitative
Bek 2006	10.216667	56.066667	Denmark	2003	1	37	225	8325	Plots	Phytocentric	Qualitative
Olesen 2002 2	-31	39.4	Azores	2000	1	10	12	120	Plots	Phytocentric	Quantitative
Bundgaard 2003	10.233333	56.066667	Denmark	2003	1	16	44	704	Plots	Phytocentric	Qualitative

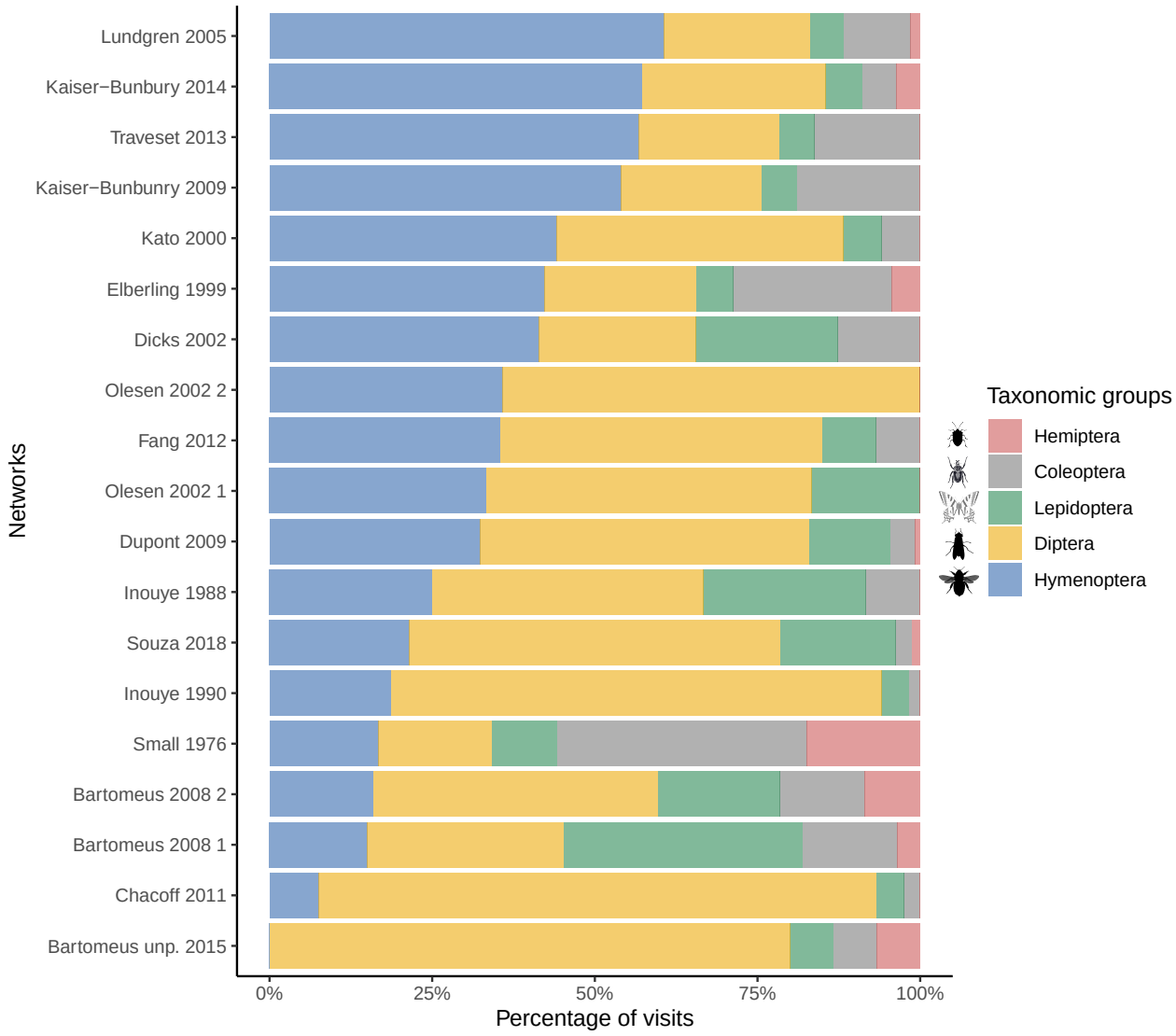
(continued)

Id	Longitude	Latitude	Country	Year	Networks	Plant spp	Pollinator spp	Network size	Sampling method	Sampling	Data type
Chacoff 2011	-68.015892	-32.008985	Argentina	2006-2009	4	59	196	11564	Plots	Phytocentric	Quantitative
Dicks 2002	NA	NA	England	2001?	2	23	80	1840	Plots	Phytocentric	Quantitative
Dupont 2009	NA	NA	Denmark	2005	2	31	329	10199	Plots	Phytocentric	Quantitative
Elberling 1999	18.5	68.35	Sweden	1994	1	24	118	2832	Plots with transects	Phytocentric	Quantitative
Dupont 2009 2	-20.5	74.5	Greenland	1996-1997	1	31	76	2356	Random census walks	Phytocentric	Qualitative

PLOT 1

Here I show the percentage or orders from the different species without consider visitation and just richness of species. Therfore, if we have a network with 4 species from from different orders, each will appear as 25% within the stack bar of the barplot.




Networks
Lundgren 2005
Kaiser−Bunbury 2014
Traveset 2013
Kaiser−Bunbunry 2009
Kato 2000
Elberling 1999
Dicks 2002
Olesen 2002 2
Fang 2012
Olesen 2002 1
Dupont 2009
Inouye 1988
Souza 2018
Inouye 1990
Small 1976
Bartomeus 2008 2
Bartomeus 2008 1
Chacoff 2011
Bartomeus unp. 2015
0%
25%
50%
75%
100%
Percentage of visits
Taxonomic groups
Hemiptera
Coleoptera
Lepidoptera
Diptera
Hymenoptera

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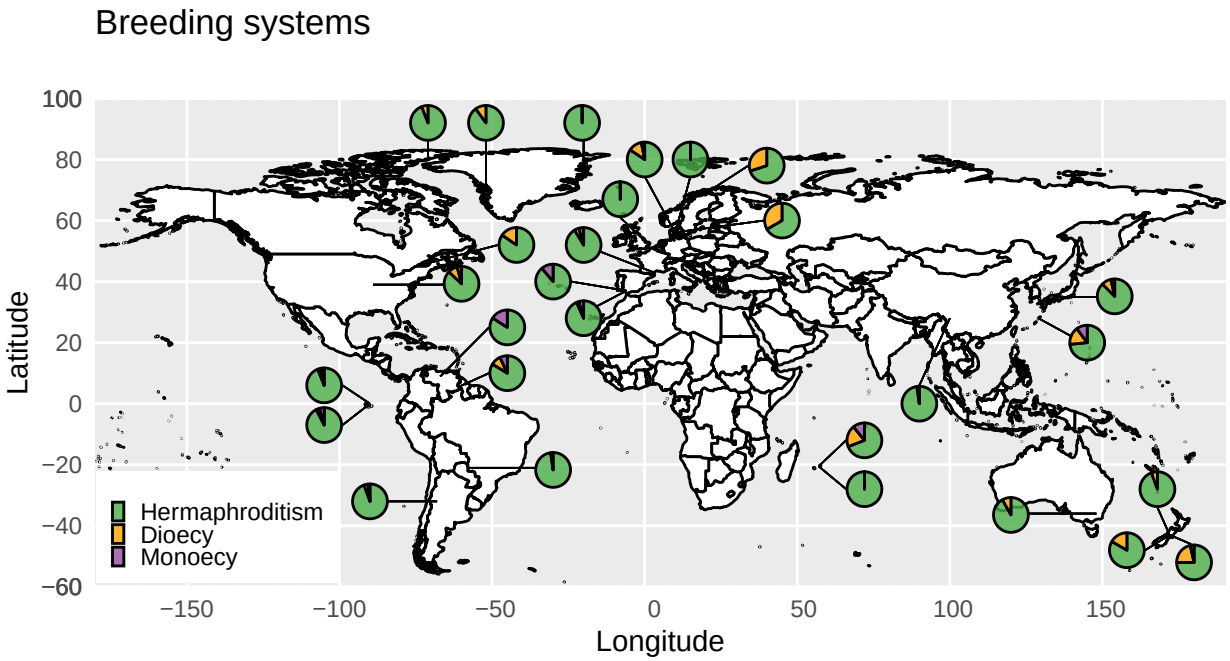
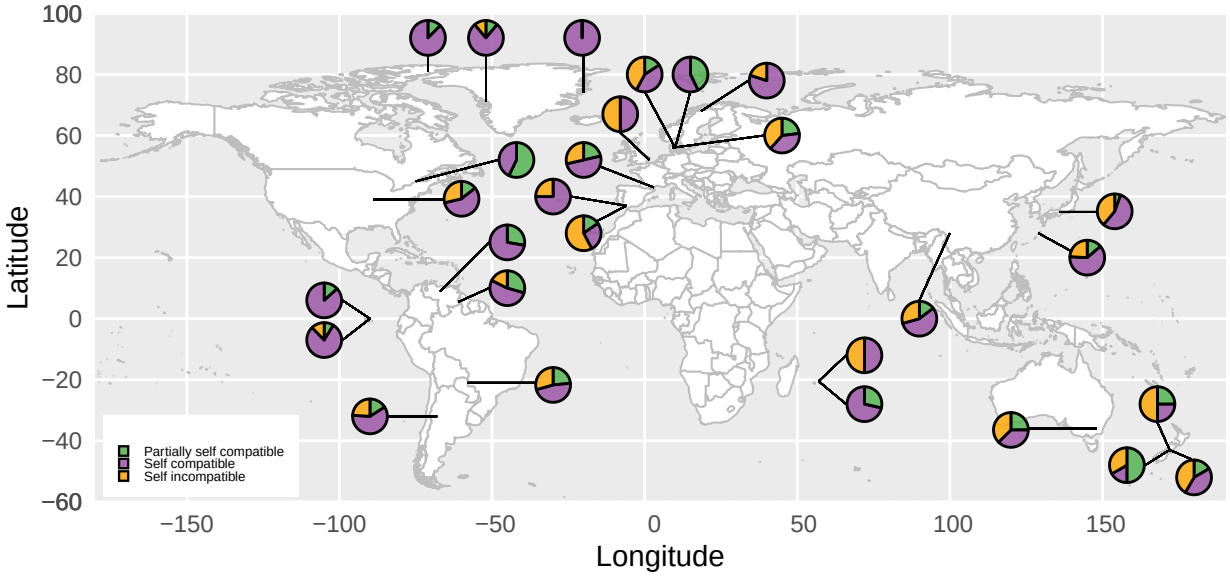
*PLOT 2**

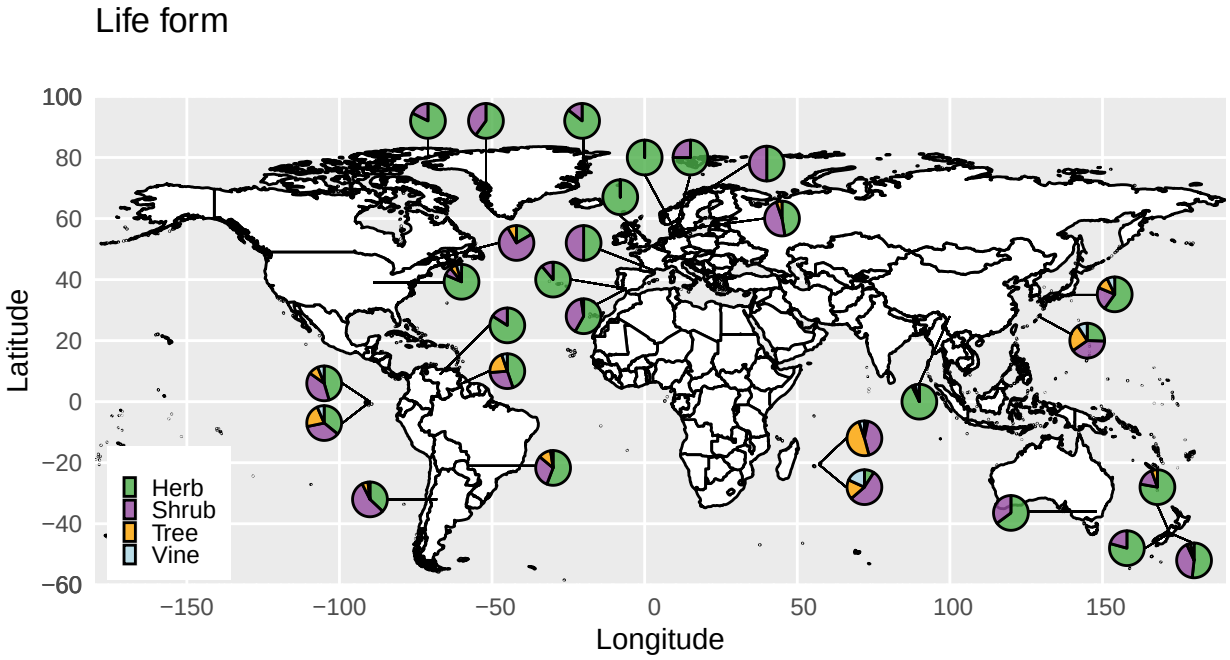

Breeding systems
Latitude
Longitude
100
80
60
40
20
0
−20
−40
−60
−150
−100
−50
0
50
100
150
Hermaphroditism
Dioecy
Monoecy

PLOT 3

Compatibility system



PLOT 4



REFERENCES

Noreika, Norbertas, Ignasi Bartomeus, Marie Winsa, Riccardo Bommarco, and Erik Öckinger. 2019. "Pollinator Foraging Flexibility Mediates Rapid Plant-Pollinator Network Restoration in Semi-Natural Grasslands." *Scientific Reports* 9 (1). Nature Publishing Group: 1–11.