Supporting information:

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The following Supporting Information is available for this article:

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Appendix S1

Brief description of the different traits and categories compiled in this study divided in reproductive, floral and vegetative traits.

Reproductive traits

- Breeding system: The different plant species were classified in hermaphrodite, dioecious and monoecious species. Intermediate breeding systems or more complex ones were also annotated but all the species were divided into these three main categories for simplicity of the analysis.

- Selfing level: We recorded the selfing level of the different species with both quantitative and qualitative data. The qualitative data was divided in four main categories, high selfers, medium selfers, low selfers and none which was for the species that were unable to self-pollinate. In addition, quantitative data was also divided into these four categories with the following criteria: from 0% to lower than 1% 'none', from 1% to 25% 'low', from 26% to 75% 'medium' and from 76% to 100% 'high'. We opted for the metric of autonomous selfing because it was the most abundant one in the literature and more complex metrics that were more informative were scarce.

- Compatibility system: The different species were divided in three main categories in order to know their ability to self-pollinate. These categories were self-compatible, partially self-compatible and self-incompatible species. The field of selfing level is partly complementary to the compatibility system but is important to note that not all the self-compatible species or partially self-compatible species will self-pollinate.

Floral traits

- Flower morphology: We looked for images and illustrations of the flowers from the different species on the floras and available resources in order to categorize the flower shape. We divided the flowers in 8 main different categories: open, tube, campanulate,

funnelform, papilionaceous, spike and capitulum. See image X for the different flower morphologies.

- Flower symmetry: We also recorded if the flowers were bilaterally symmetrical "zygomorphic" or were radially symmetrical "actinomorphic".

- Flower and inflorescence size: We searched for flower length and flower and inflorescence width (mm) for all species. When possible, we calculated the not found measurements with the help of online images and the software ImageJ.

- Flower number per plant: We compiled information about the number of flowers per plant for all species. However, this field was rare to find and we also used online images of the different species in order to calculate rough numbers of flowers per plant. We referenced all the filled fields in order to be able to follow the images that were used for these counts. It is important to note, that these numbers are not pretended to be the exact number of flowers per species but an approximate indicator of the reproductive investment for the different species that allow the macroecological analysis of this field.

- Ovule number: We searched for the number of ovules per flower for all the different species. The number of ovules of Asteraceae species are considered as the total number of ovules per capitulum. Many species were filled by genus or family level because the number of ovules in this taxonomic groups is considered to be mostly constant (e.g., Lamiaceae Boraginaceae or Apiaceae).

- Style length: The length of the style (mm) of the different species was also included. When possible, we calculated style length from images and illustrations on the online floras.

- Nectar provision: We recorded the presence and absence of nectar for all species. In addition, we also searched for microlitres and milligrams of nectar per flower and nectar concentration. In general terms, nectar data was rarely present and we try to

minimise the loss of information by filling some species at family level. For instance, Solanaceae species are described as nectarless, and species that belonged to this family were recorded with 'absence' of nectar.

- Pollen grains per flower: We recorded pollen grains per flower for all species but this field was rarely described in the literature. When just the pollen:ovule ratio was found we converted it back to pollen grains by multiplying by ovule number.

Vegetative traits

- Life form, life span and plant height: We divided the different plant species in 4 main categories: herbs, vines, shrubs and trees. Moreover, we also divided the species between short-lived species (annual, biennial and short-lived perennials) and perennial species (long-lived). Finally, we also searched for the average height (m) of the different species and annotated the maximum and minimum height when possible. We conducted the average between the maximum and minimum height to get an approximate average height of the species when the average was not indicated.

Table S1. List of the 28 plant-pollinator studies used to build the plant trait database. Each study is shown with the first author that conducted the study, number of networks or metawebs that contains, type of information that contains (weighted or unweighted), the structure (web or metaweb), year of publication and digital object identifier or permanent link for each study.

First author	Year	Web N.	Network type	DOI
Arroyo-Correa	2019	3	Weighted web	https://doi.org/10.1111/1365-2745.13332
Bartomeus	2008	6	Weighted web	https://doi.org/10.1007/s00442-007-0946-1
Bartomeus	2008	16	Weighted web	https://github.com/ibartomeus/BeeFunData
Bek	2006	1	Unweighted web	Unpublished, Master thesis
Bundgaard	2003	1	Weighted web	Unpublished, Master thesis
Burkle	2013	1	Weighted web	https://doi.org/10.1126/science.1232728
Dicks	2002	2	Weighted web	https://doi.org/10.1046/j.0021-8790.2001.00572.x
Dupont	2003	3	Weighted web	https://doi.org/10.1111/j.1365-2656.2008.01501.x
Elberling	1999	1	Weighted web	https://doi.org/10.1111/j.1600-0587.1999.tb00507.x
Fang	2008	1	Weighted web	https://doi.org/10.1111/1749-4877.12190
Inouye	1988	1	Weighted web	https://doi.org/10.1111/j.1442-9993.1988.tb00968.x
Inouye	1990	1	Weighted metaweb	http://hdl.handle.net/2433/156099

First author	Year	Web N.	Network type	DOI
Kaiser-Bunbury	2017	8	Weighted web	https://doi.org/10.1038/nature21071
Kaiser-Bunbury	2011	6	Weighted web	https://doi.org/10.1111/j.1365-2745.2010.01732.x
Kaiser-Bunbury	2010	2	Weighted web	https://doi.org/10.1016/j.ppees.2009.04.001
Kato	2000	1	Unweighted web	http://hdl.handle.net/2433/156116
Kevan	1970	1	Unweighted web	https://doi.org/10.2307/2258569
Lundgren	2005	1	Weighted web	https://doi.org/10.1657/1523-0430(2005)037[0514:TDAHCW]2.0.CO;2
McMullen	1993	1	Unweighted metaweb	https://biostor.org/reference/244737
Olesen	2002	2	Weighted web	https://doi.org/10.1046/j.1472-4642.2002.00148.x
Peralta	2006	4	Weighted web	https://doi.org/10.1111/ele.13510
Primack	1983	3	Unweighted metaweb	https://doi.org/10.1080/0028825X.1983.10428561
Ramirez	1989	1	Unweighted web	https://doi.org/10.2307/2388282
Ramirez	1992	1	Unweighted metaweb	https://doi.org/10.1111/j.1095-8339.1992.tb00294.x
Robertson	1929	1	Unweighted metaweb	https://doi.org/10.5962/bhl.title.11538
Small	1976	1	Weighted web	/13960/t4km08d21

First author	Year	Web N.	Network type	DOI
Souza	2017	1	Weighted web	https://doi.org/10.1111/1365-2745.12978
Traveset	2013	1	Weighted metaweb	https://doi.org/10.1098/rspb.2012.3040

Table S2. Loadings and explained variance of the first three principal components from the phylogenetically informed principal component analysis with the full set of species after outlier processing (N = 1,236).

	PC1	PC2	PC3
Autonomous selfing	0.03	0.85	-0.51
Flowers per plant	0.75	-0.27	-0.24
Flower width	-0.67	-0.38	-0.30
Style length	-0.34	-0.37	-0.66
Ovule number	-0.53	0.00	-0.02
Plant height	0.56	-0.40	-0.46
Explained variation	26.72	25.08	19.17

Table S3. Loadings and explained variance of the first three principal components from the phylogenetically informed principal component analysis for the subset of species with quantitative information of nectar and pollen.

	PC1	PC2	PC3
Autonomous selfing	0.19	0.76	0.35
Flowers per plant	-0.62	-0.35	0.45
Flower width	0.66	-0.44	-0.08
Style length	0.54	-0.42	0.13
Ovule number	0.60	0.00	-0.04
Plant height	-0.38	-0.52	0.53
Microlitres of Nectar per flower	0.51	0.06	0.66
Pollen per flower	0.16	-0.50	-0.11
Explained variation	23.40	21.67	14.36

Table S4. Statistical association of the different categorical variables to the first two principal components from the pPPCA with the full set of species. For each categorical trait and principal component, sum of squares, F-value and P-value are provided.

Functional traits	Sum Sq	F value	Pr(>F)	PC
Breeding system	304.59	119.50	0.00	PC1
Compatibility system	89.12	23.31	0.00	PC1
Lifespan	35.65	27.97	0.00	PC1
Life form	565.87	222.00	0.00	PC1
Flower shape	132.24	20.75	0.00	PC1
Flower symmetry	0.37	0.29	0.59	PC1
Nectar provision	0.38	0.29	0.59	PC1
Breeding system	304.59	119.50	0.00	PC2
Compatibility system	89.12	23.31	0.00	PC2
Lifespan	35.65	27.97	0.00	PC2
Life form	565.87	222.00	0.00	PC2
Flower shape	132.24	20.75	0.00	PC2
Flower symmetry	0.37	0.29	0.59	PC2
Nectar provision	0.38	0.29	0.59	PC2

Table S5. Phylogenetic signal for all quantitative traits. Phylogenetic signal of nectar and pollen traits was calculated for the imputed dataset of the subset of species with quantitative information of nectar and pollen.

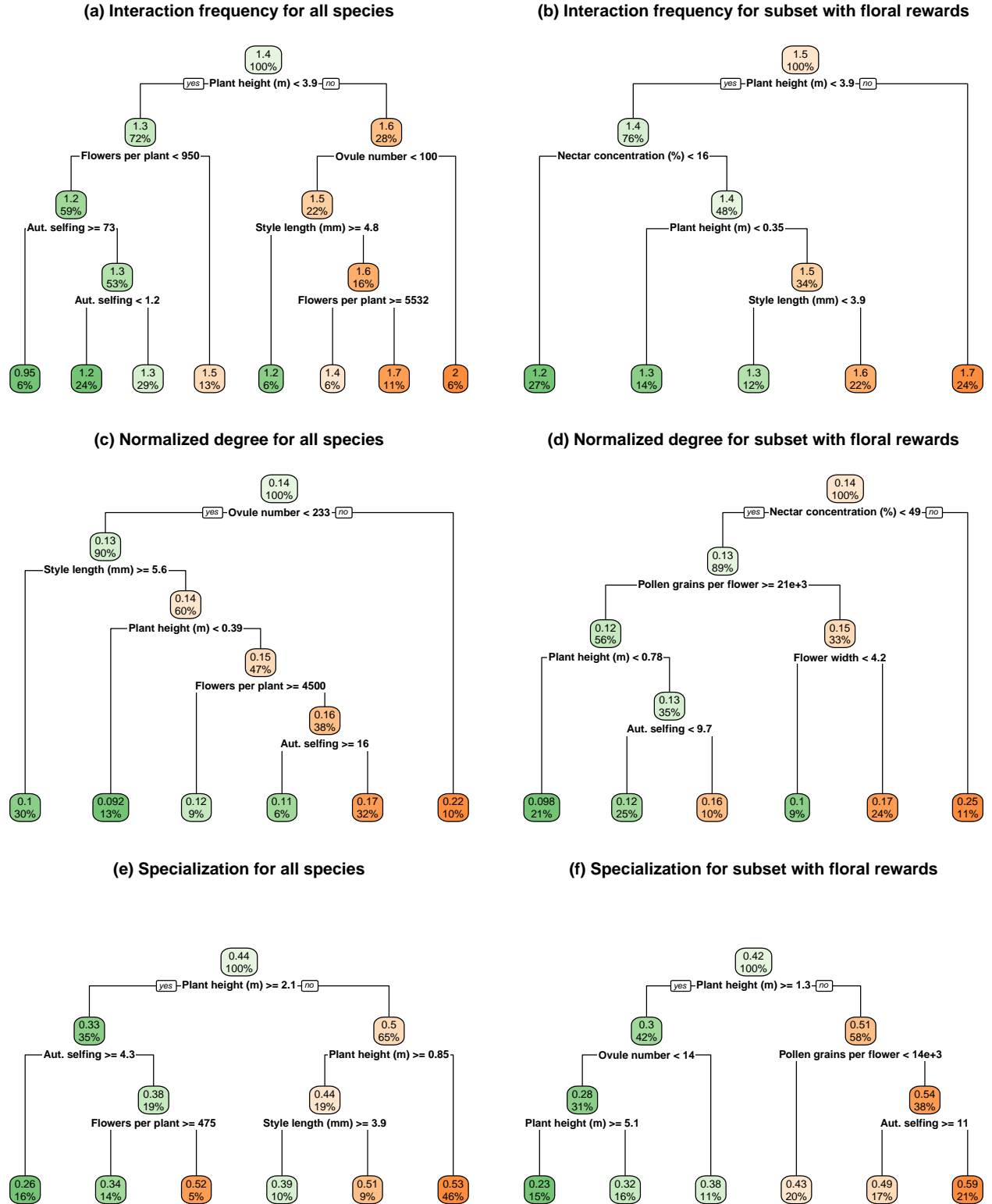| Functional traits	Lambda	P-value
Autonomous selfing	0.34	0.00
Flower number	0.69	0.00
Inflorescence width	0.57	0.00
Flower width	0.73	0.00
Flower length	0.75	0.00
Style length	0.49	0.00
Ovule number	1.00	0.00
Plant height	0.96	0.00
Nectar per flower (μl)	0.14	0.00
Nectar concentration (%)	0.65	0.00
Pollen grains per flower	1.00	0.00
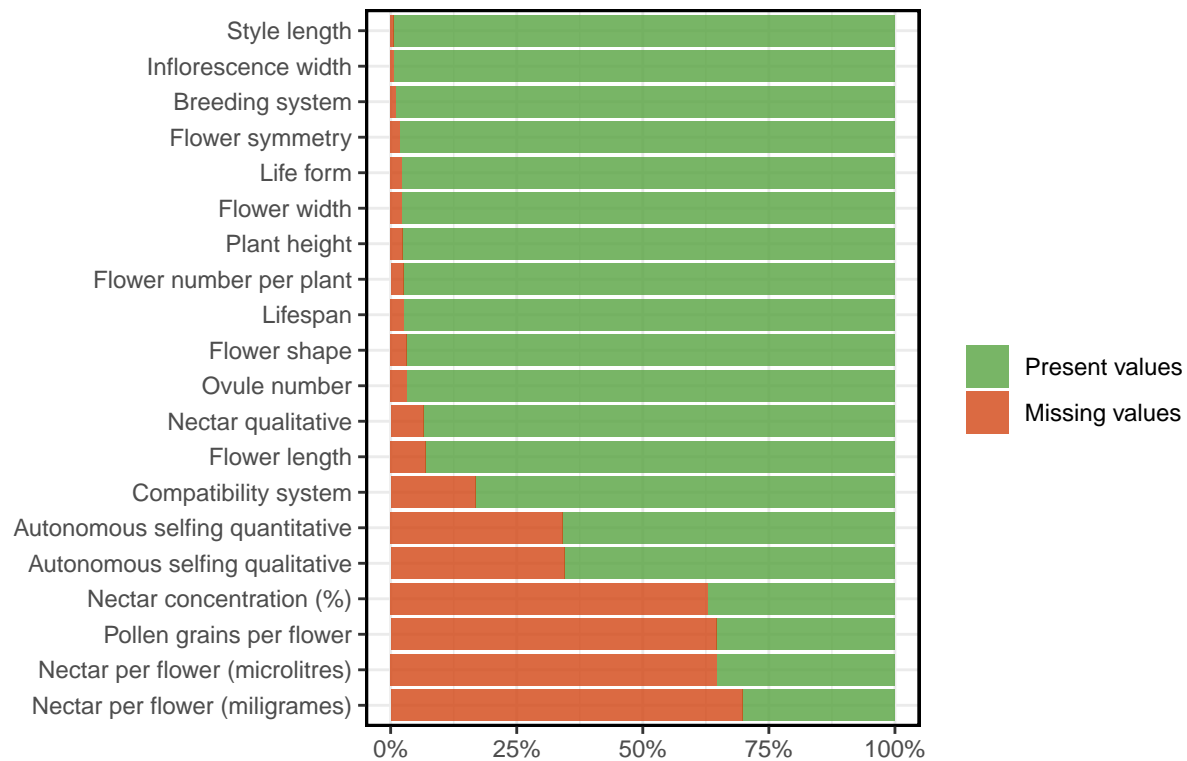
Fig S1. Percentage of present and missing values on the 20 traits compiled in this study (N = 1,506 species).
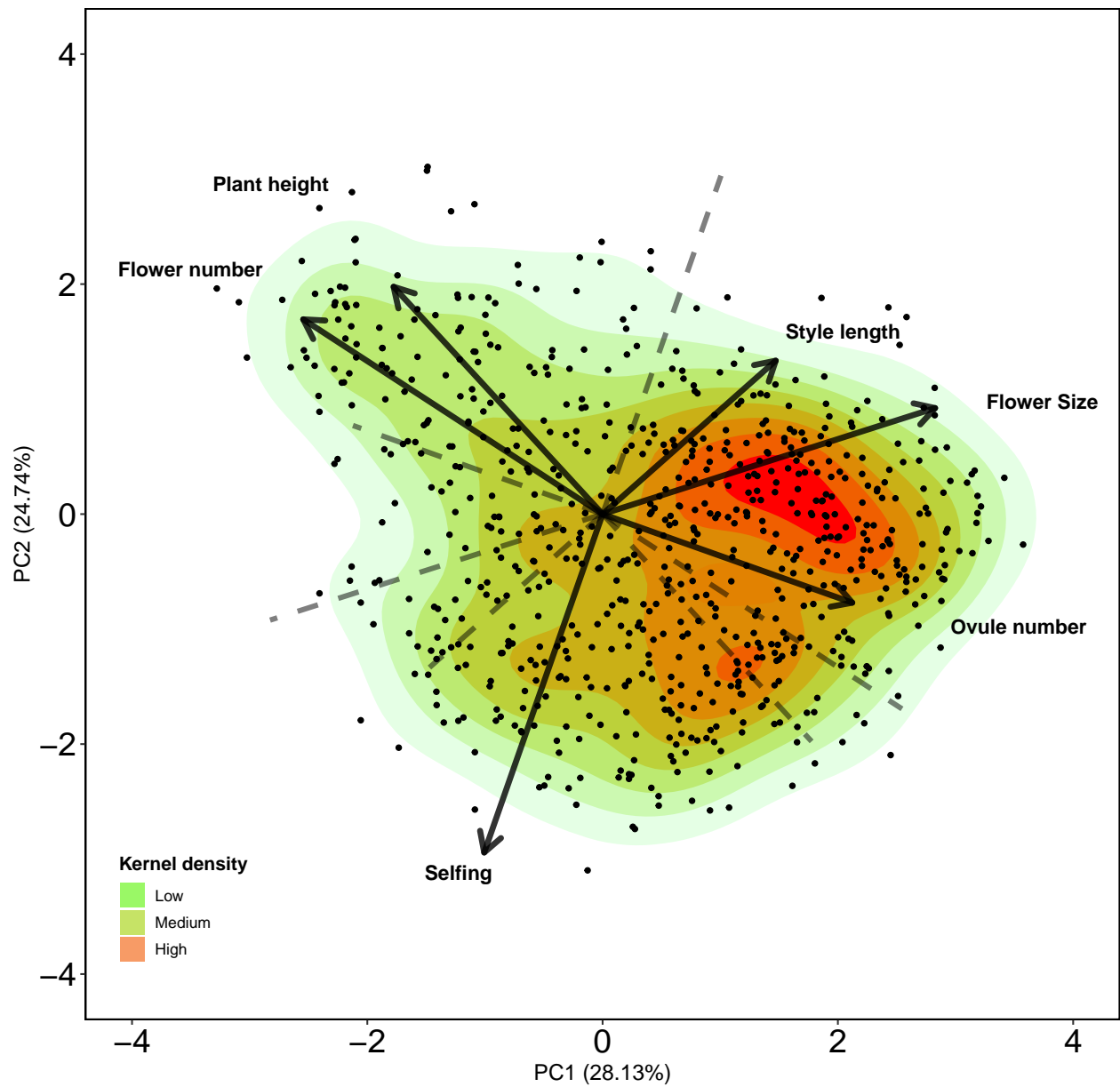
Fig S2. Phylogenetic informed principal component analysis for the species that did not have missing values (non-imputed dataset; N = 723).
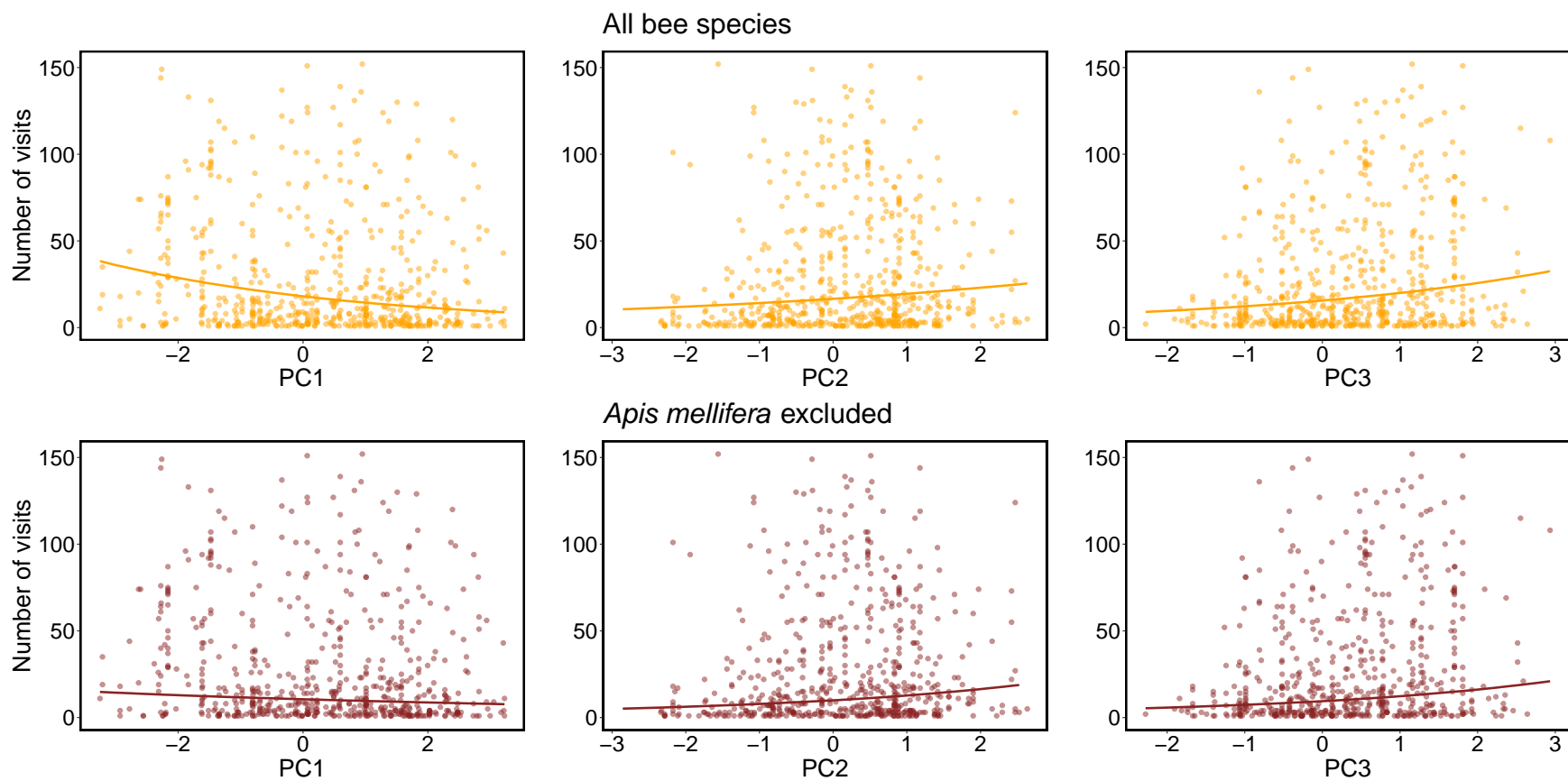
Fig S3. Fitted posterior estimates of the number of visits made by the functional group of Hymenoptera-Anthophila (bees) including (superior panel) and excluding (lower panel) *Apis mellifera* in relation to the main axes of trait variation (PC, PC2 and PC3).

(a) Interaction frequency for all species

(b) Interaction frequency for subset with floral rewards

(c) Normalized degree for all species

(d) Normalized degree for subset with floral rewards

(e) Specialization for all species

(f) Specialization for subset with floral rewards

Fig S4. Comparison of the regression tree analysis between the full set of species and the subset of species with floral rewards for each plant species level metric (interaction frequency, nomalized degree and specialization).

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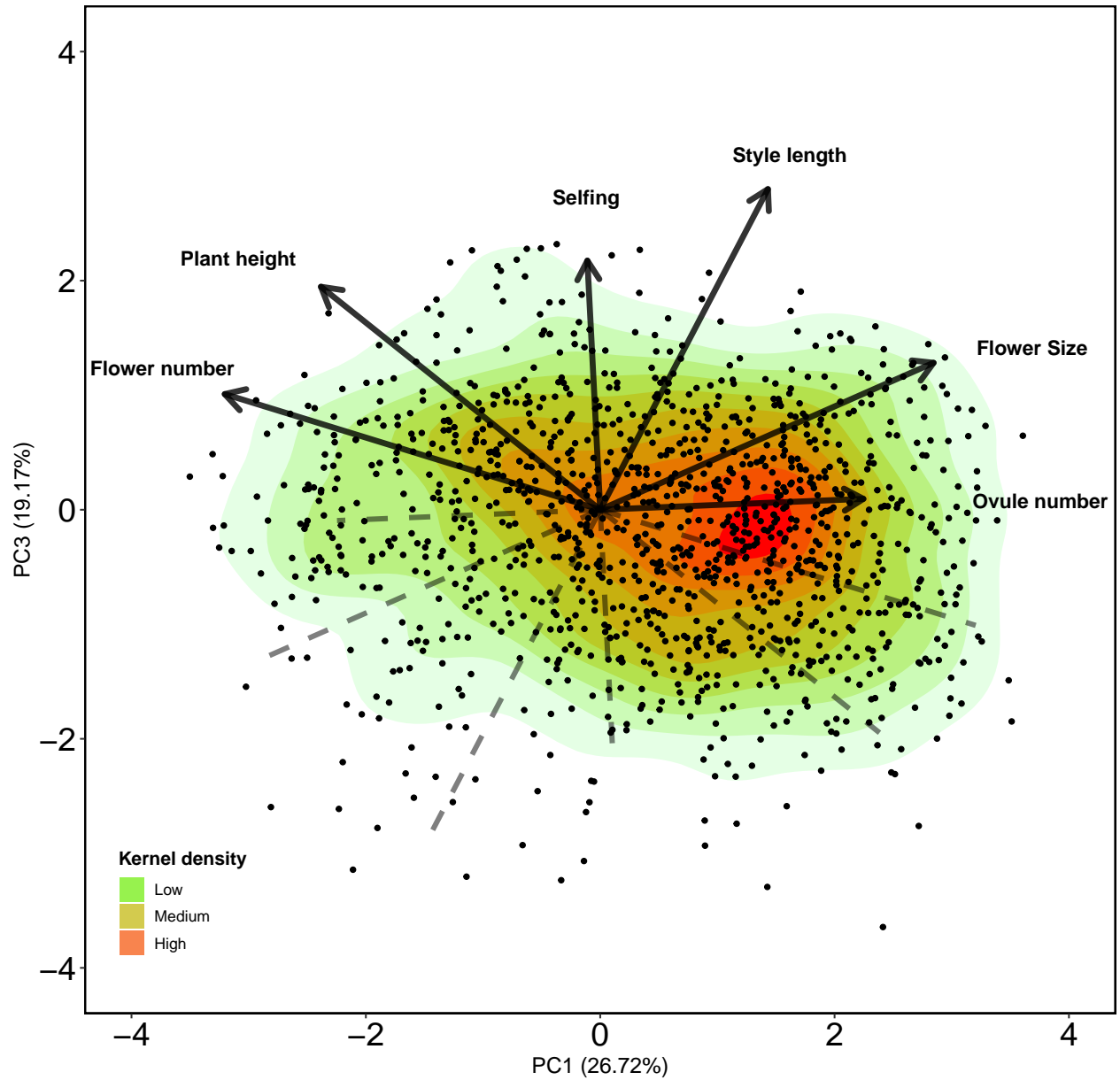
Fig S5. Phylogenetically informed principal component analysis showing the trait relationship with principal components one and three (PC1 and PC3) for the full set of species (N = 1,506).
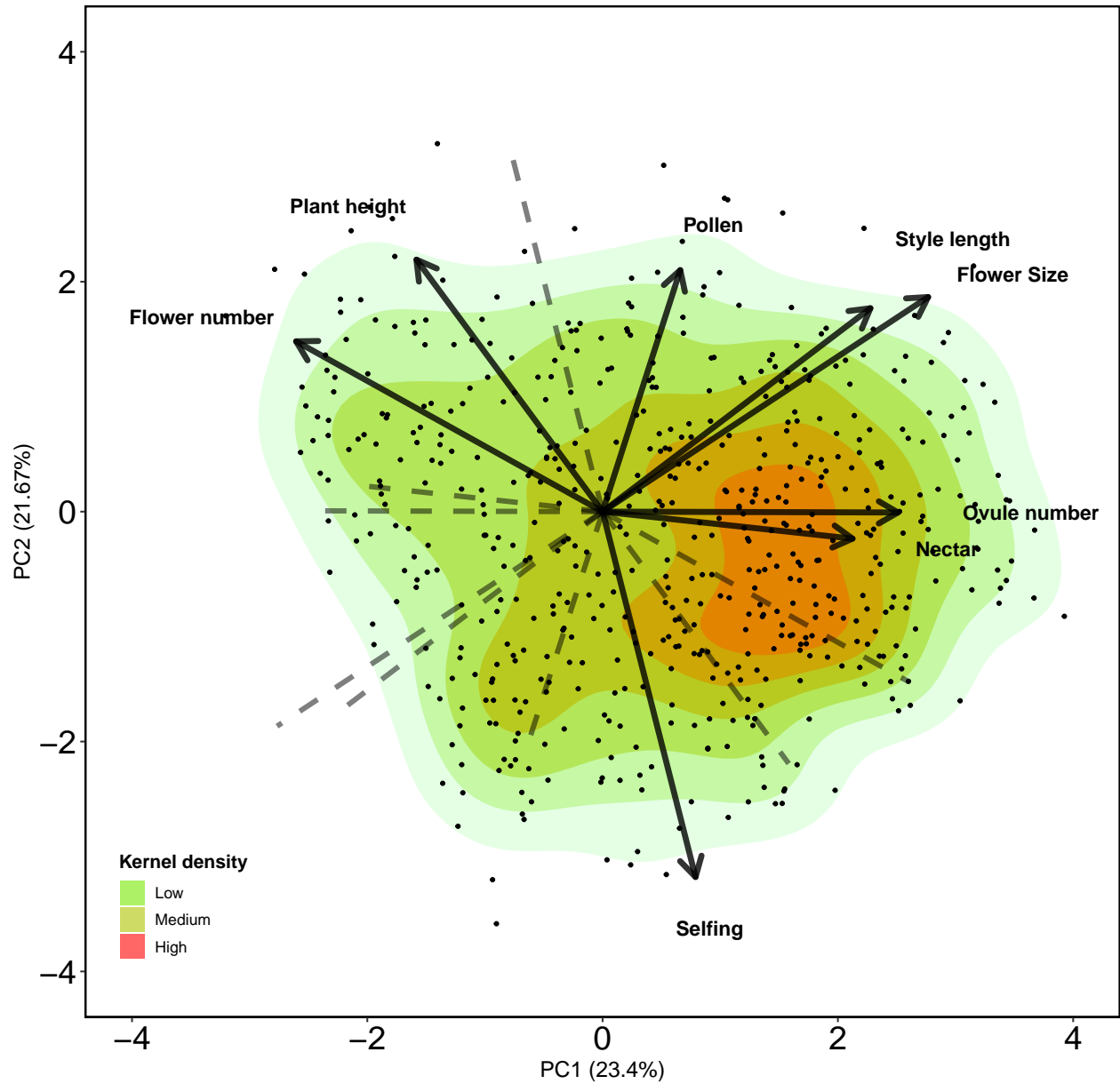
Fig S6. First two main principal components from the phylogenetic informed principal component analysis for the imputed dataset of the subset of species with quantitative information of nectar and pollen (N = 467).
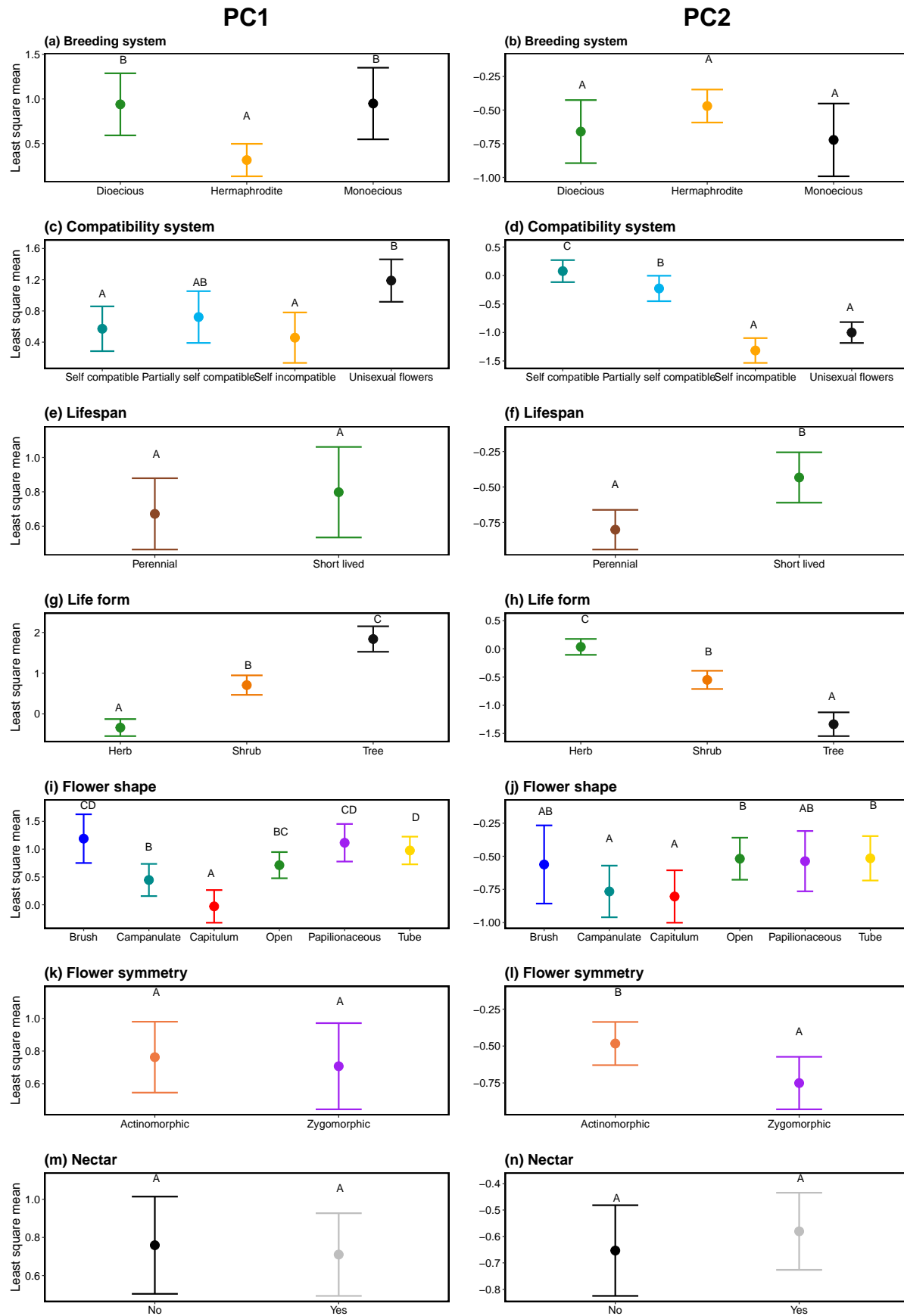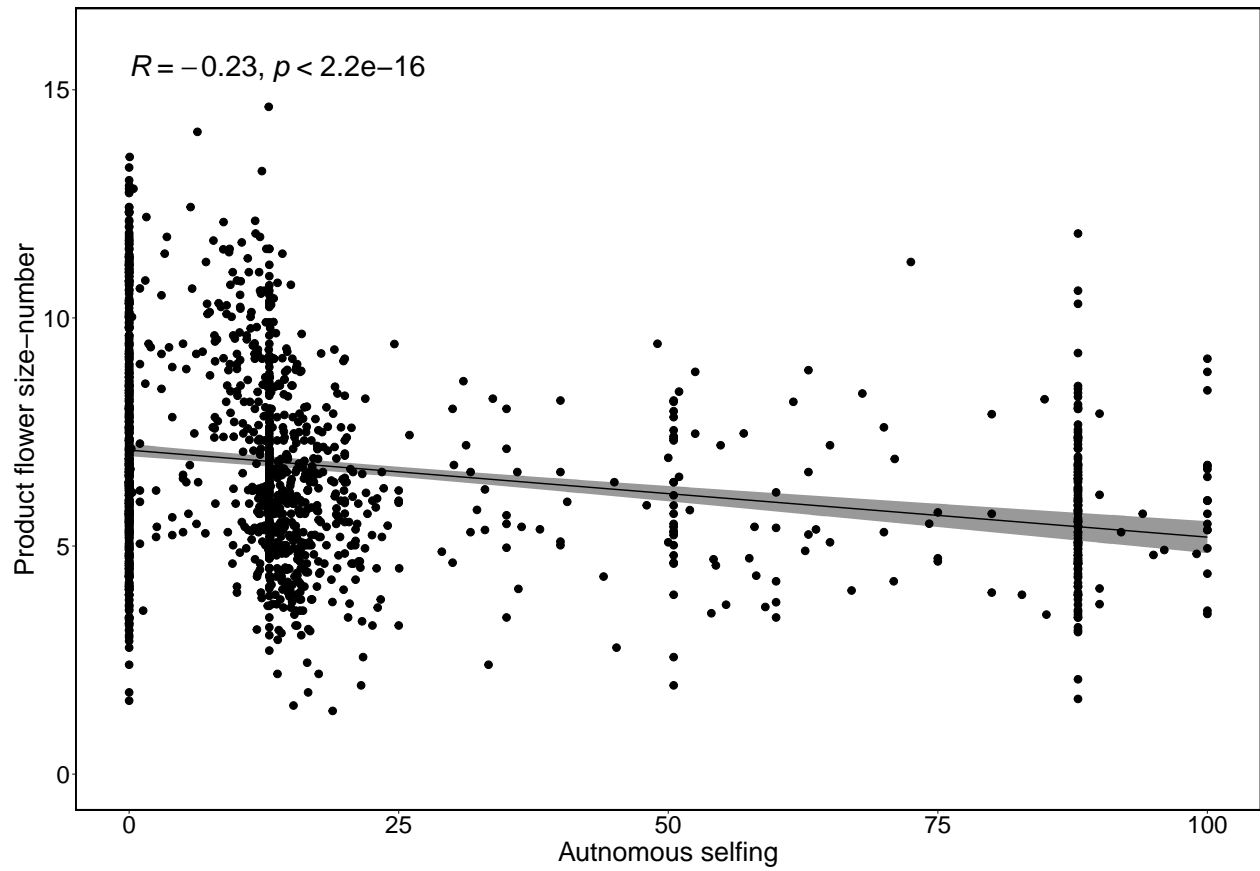
Fig S7. Statistical comparison of the different categories of the categorical traits on the main two axes of trait variation (pPCA with the full set of species). Categories that differ significantly are denoted with a different letter.
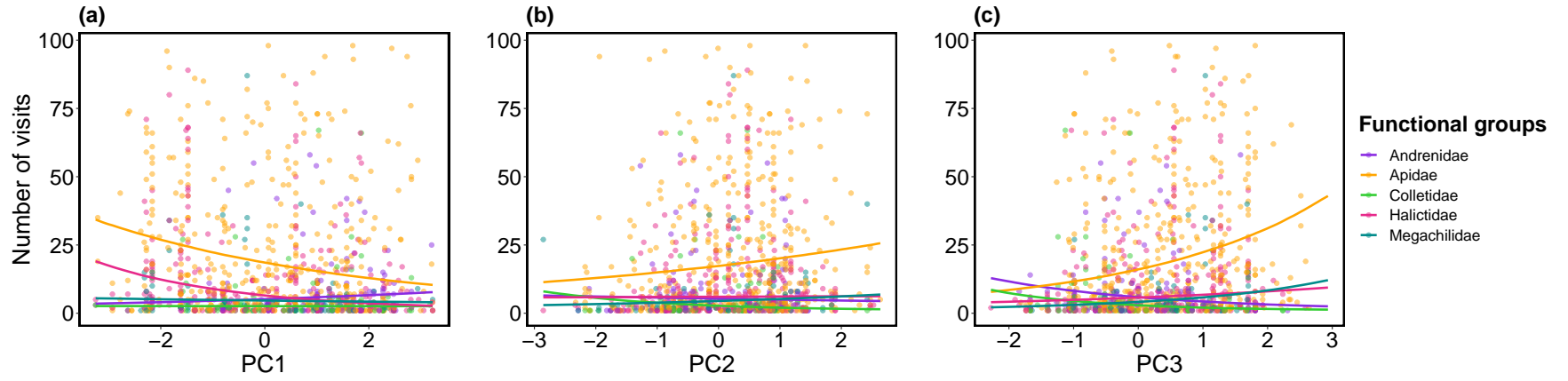
Fig S8. Fitted posterior estimates of the number of visits made by the different main visiting families of bees (Andrenidae, Apidae, Colletidae, Halictidae and Megachilidae) in relation to the main axes of trait variation (PC1, PC2 and PC3). We omitted in the plotting points over percentile 95 % percent due to extreme outliers.
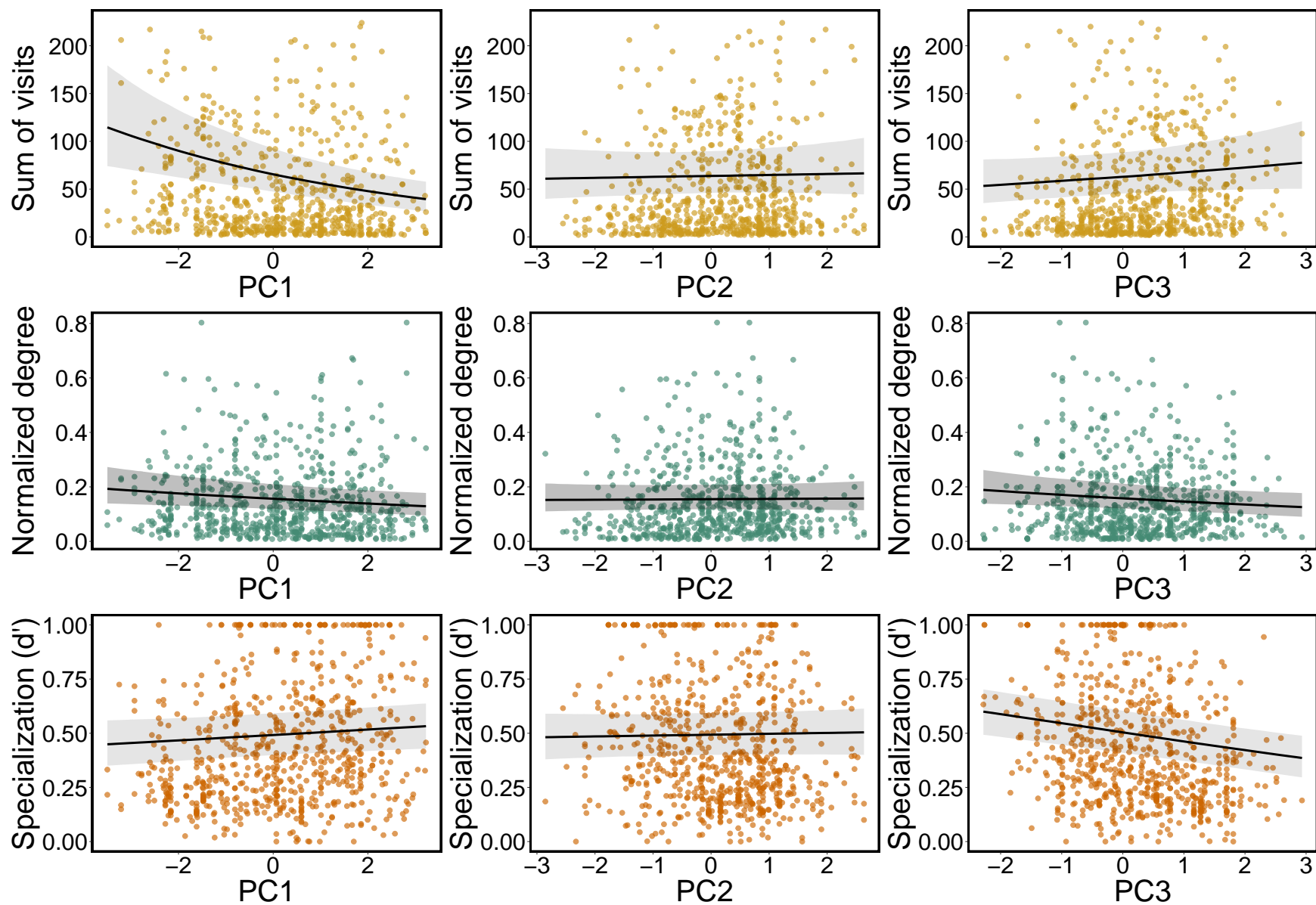
Fig S9. Sum of visits per plant, normalized degree and speciliazation modelled in function of the first three main axes of trait variation.

Fig S10. Pearson correlation between the product of flower number-flower size and autonomous selfing level.