

Supporting information:

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The following Supporting Information is available for this article:

Table S1. List of the 28 plant-pollinator studies used to build the plant trait database.

Table S2. Loadings of the first three principal components of the phylogenetic informed principal component analysis with all species.

Table S3. Loadings of the first three principal components of the phylogenetic informed principal component analysis with the subset of species with data of nectar and pollen quantity.

Table S4. Statistical association of the different categorical variables to the principal components one and three from the pPPCA with the full set of species.

Table S5. Phylogenetic signal of the different quantitative traits.

Figure S1 Percentage of present and missing values of the different variables.

Figure S2 Phylogenetic informed principal component analysis for the species that did not have missing values.

Figure S3 Fitted posterior estimates of the number of visits made by bees including and excluding honey bees on the main axes of trait variation.

Figure S4 Trait relationship of PC1 and PC3 with the phylogenetic informed principal component analysis with the full set of species.

Figure S5 Phylogenetic informed principal component analysis for the imputed dataset of the subset of species with quantitative information of nectar and pollen.

Figure S6 Fitted posterior estimates of the number of visits made by the main functional groups of bees on the main axes of trait variation.

Figure 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).

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 |

(continued)

| 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 |

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| 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 for the full set of species (N = 1,506).

| | 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 | -0.23 | -0.50 | 0.66 |
| Flowers per plant | 0.63 | 0.43 | 0.38 |
| Flower width | -0.72 | 0.33 | -0.19 |
| Style length | -0.57 | 0.30 | 0.07 |
| Ovule number | -0.60 | 0.02 | -0.11 |
| Plant height | 0.41 | 0.65 | 0.29 |
| Microlitres of Nectar per flower | -0.45 | 0.38 | 0.59 |
| Pollen per flower | -0.03 | 0.66 | -0.25 |
| Explained variation | 24.70 | 20.59 | 15.66 |

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 (μ l) per flower | 0.13 | 0.01 |
| Nectar (mg) per flower | 0.38 | 0.00 |
| Nectar concentration (%) | 0.61 | 0.00 |
| Pollen grains per flower | 0.84 | 0.00 |

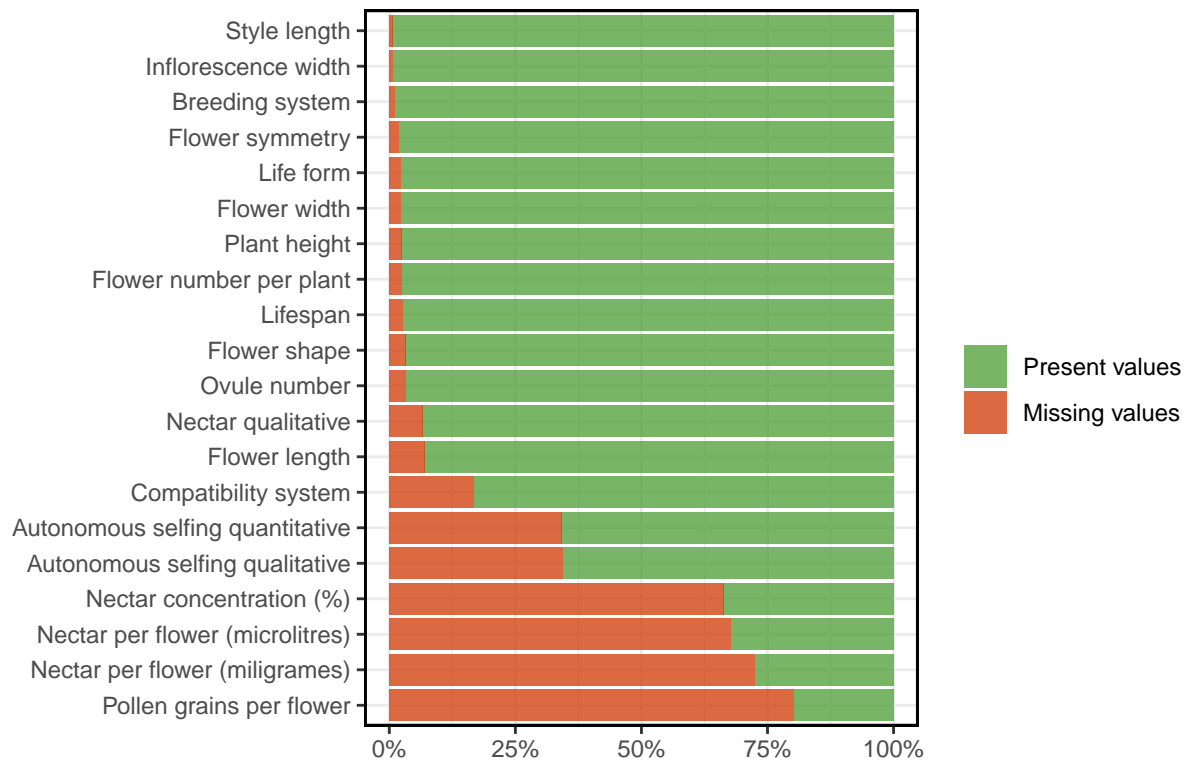


Fig. S1 Percentage of present and missing values on the 20 traits compiled in this study (N = 1,506 species).

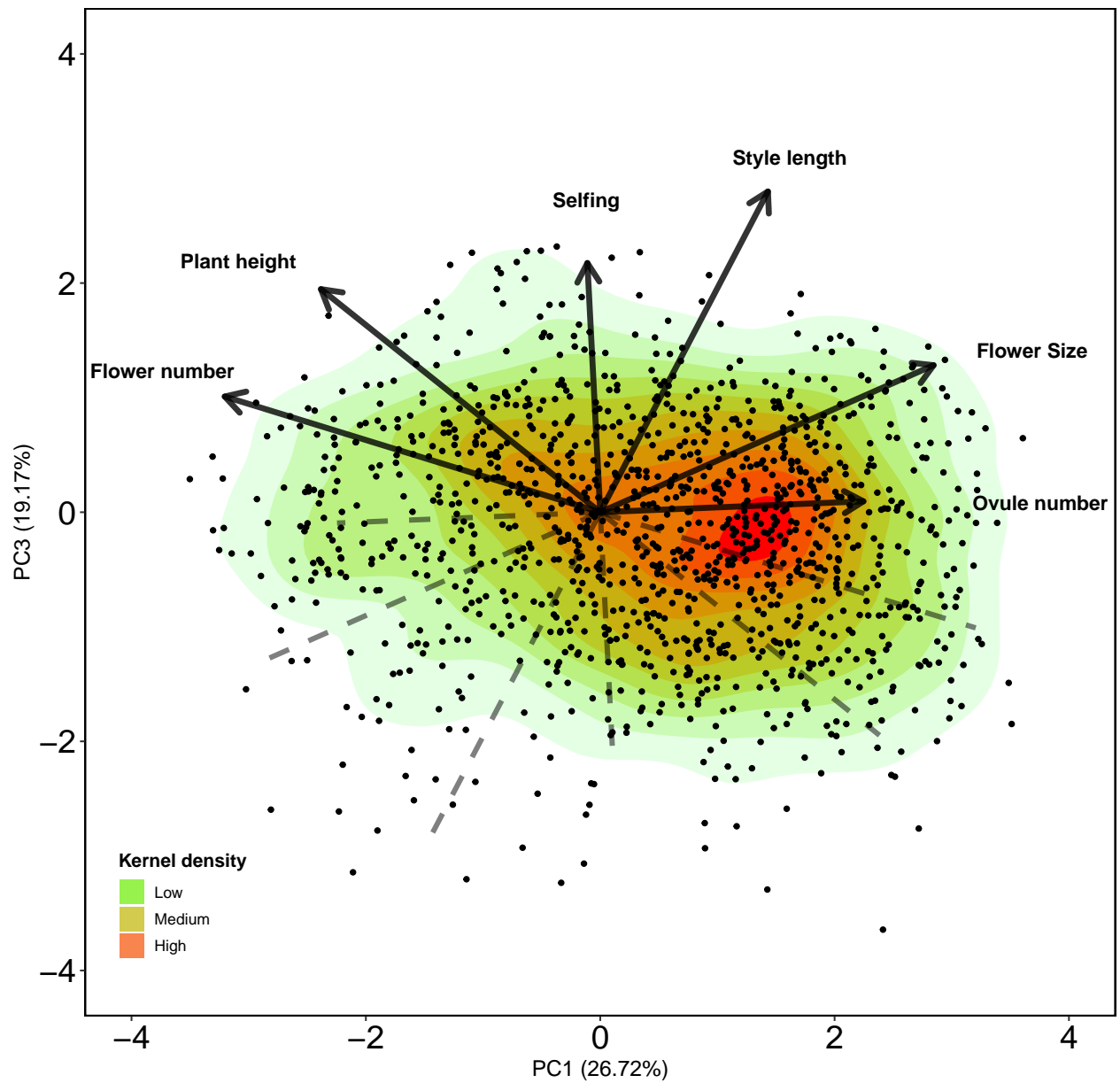


Fig. S2 Phylogenetic informed principal component analysis for the species that did not have missing values (non-imputed dataset; $N = 723$).

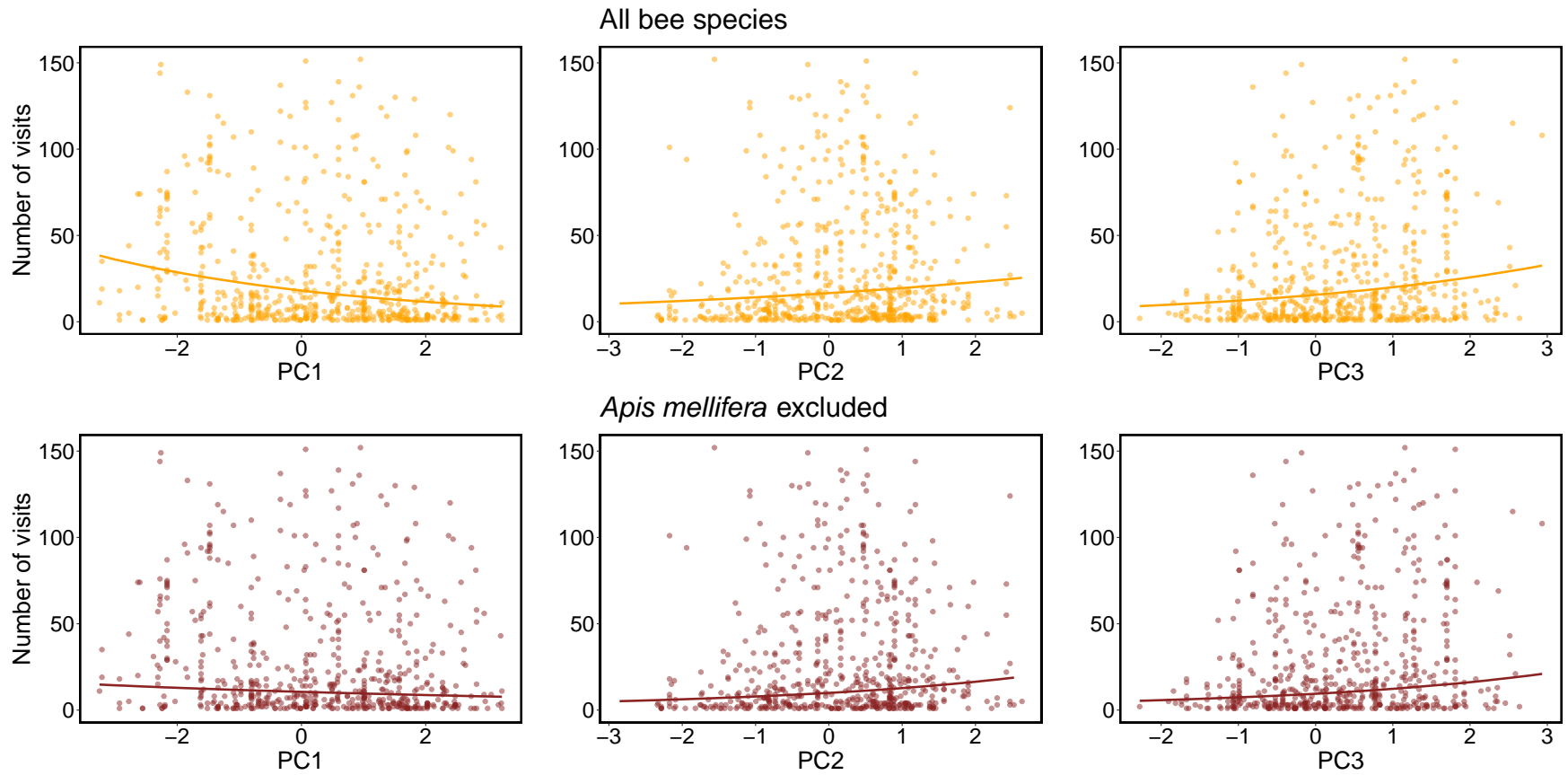


Fig. S3 Fitted posterior estimates of the number of visits made by the functional group of Hymenoptera-Anthropophila (bees) including (superior panel) and excluding (lower panel) *Apis mellifera* in relation to the main axes of trait variation (PC, PC2 and PC3).

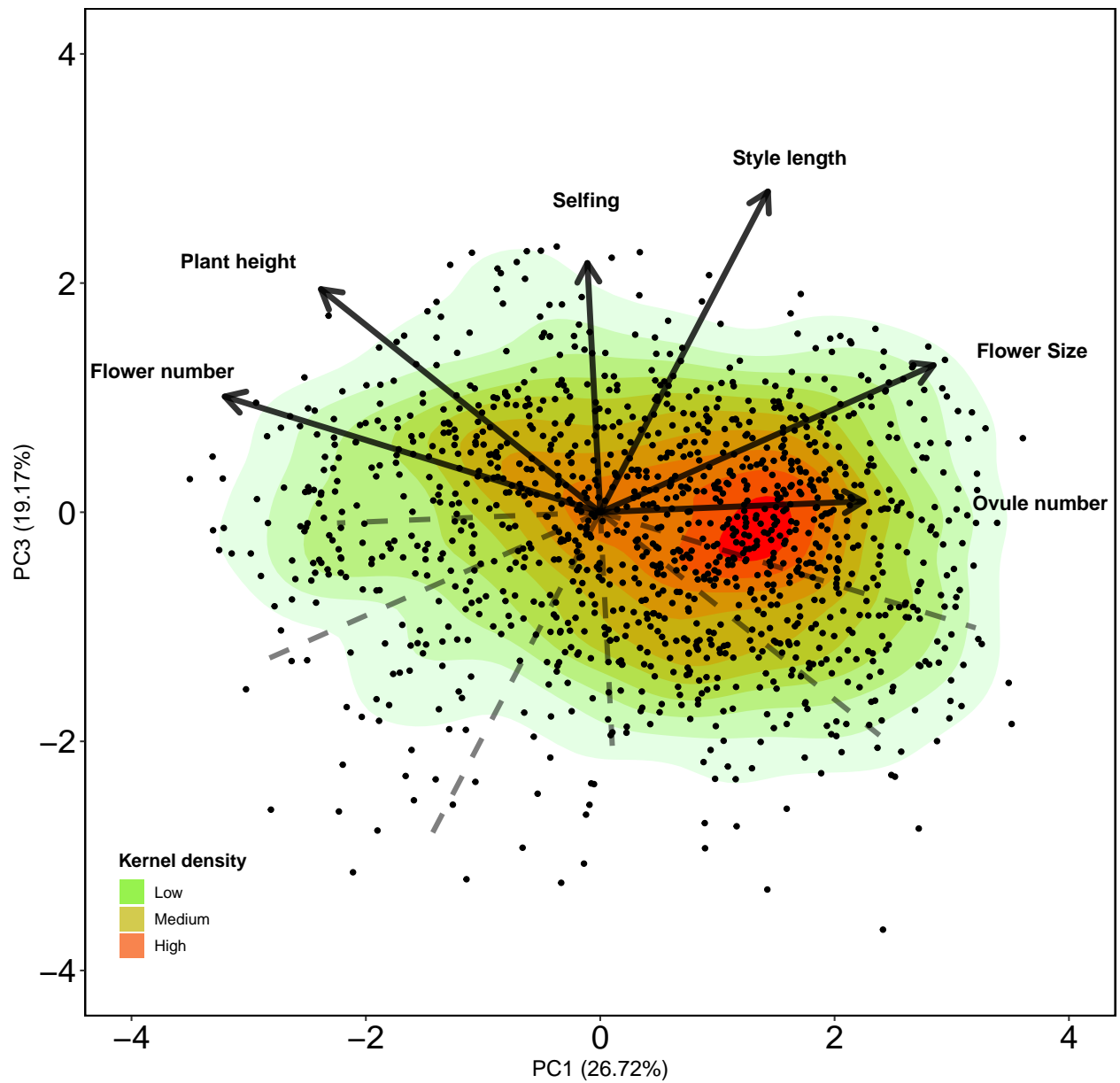


Fig. S4 Phylogenetically informed principal component analysis showing the trait relationship with principal components one and three (PC1 and PC3) for the full set of species (N = 1,506).

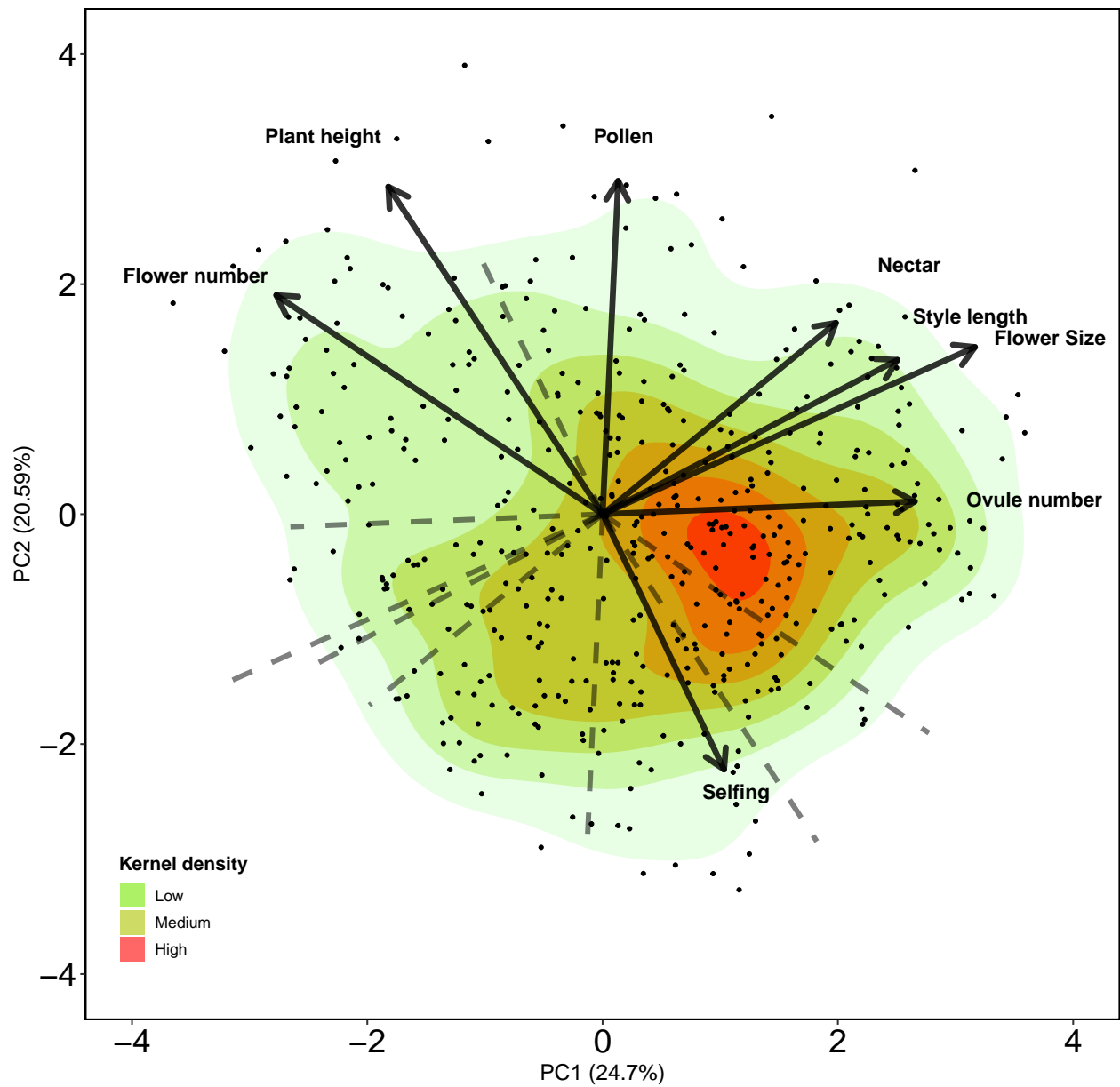


Fig. S5 First two main principal components from the phylogenetic informed principal component analysis for the imputed dataset of the subset of species with quantitative information of nectar and pollen ($N = 467$).

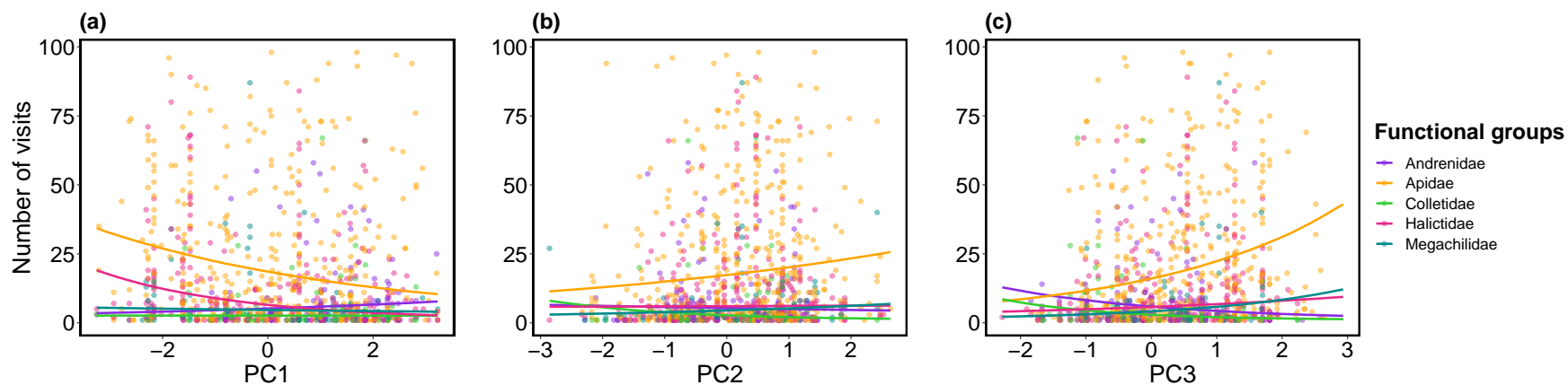


Fig. S6 Fitted posterior estimates of the number of visits made by the different main visiting families of bees (Andrenidae, Apidae, Colletidae, Halictidae and Megachilidae) in relation to the main axes of trait variation (PC1, PC2 and PC3). We omitted in the plotting points over percentile 95% due to extreme outliers.

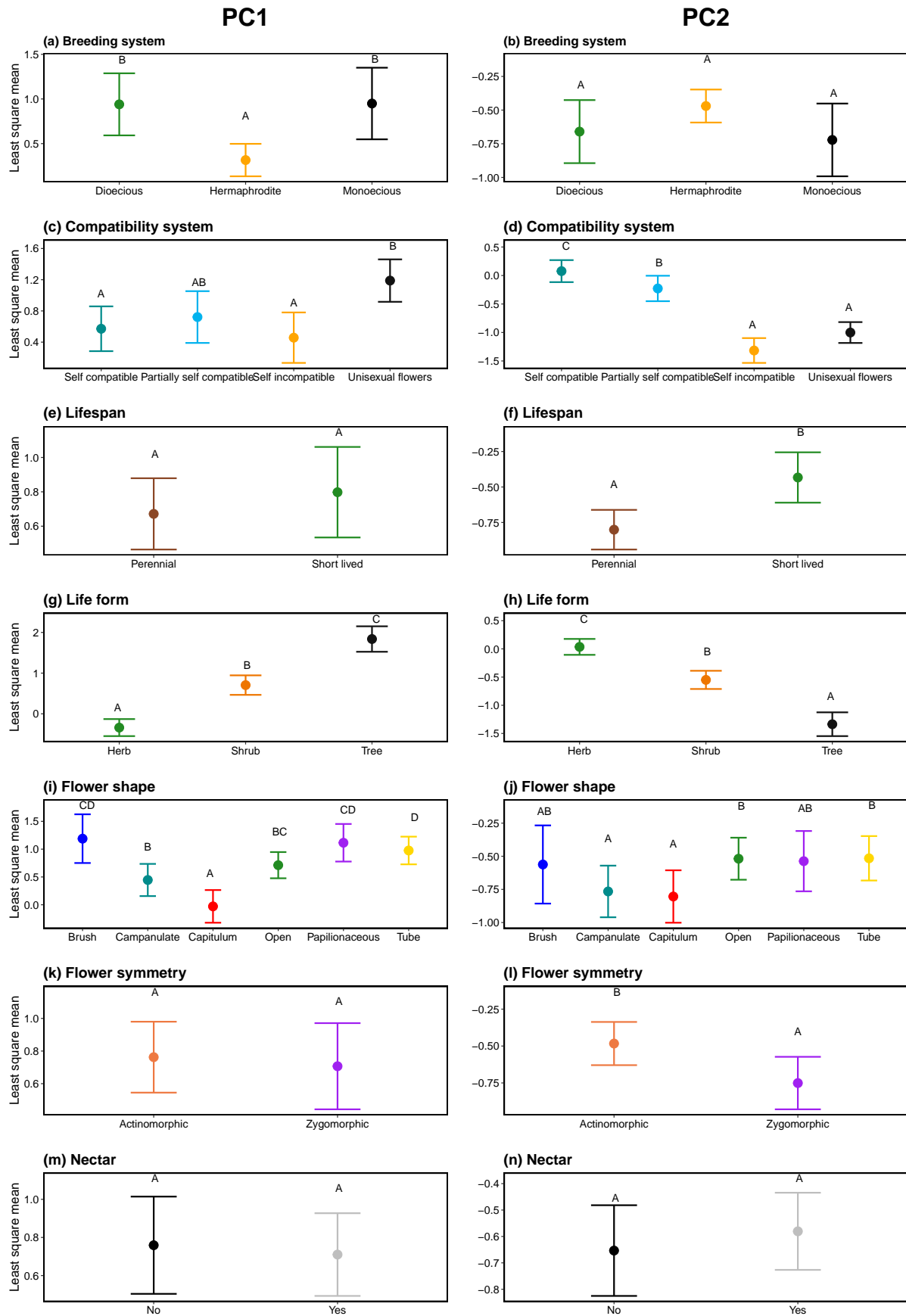


Fig. S7 Statistical comparison of the different categories of the categorical traits on the main two axes of trait variation (pPCA with the full set of species). Categories that differ significantly are denoted with a different letter.