**Supplementary Material**

**Table S1. Functional traits of bees and their functions (source: Borges et al. 2020).**

| Bee traits | Method | Levels | Function |
| --- | --- | --- | --- |
| ITD | Quantitative | - | Size can determine how far a bee can forage, how much pollen it can carry, whether it can access floral resources and physically interact with reproductive structures. |
| Sociality | Binary | 2 | Sociality is correlated with the flight phenology of bees. |
| Buzz pollination | Binary | 2 | Mechanism for nectarless plants to restrict access to pollen, reducing the loss of gametes to inefficient pollinators and pollen thieves. |

**Table S2. Functional traits of plants and their functions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Plant traits | Method | Levels | Function | Reference |
| Color | Qualitative | 7 | Flowers tune their visual signals to the pollinators' sensory system, making them as visible and attractive as possible to them. | Gumber, 2000; Russell et al. 2017. |
| Flower symmetry | Qualitative | 3 | Symmetry plays in pollinator behavior (e.g. perception, recognition, innate preferences, learning). | Yoder, 2020; stephens, 2024. |
| Flower structure | Qualitative | 7 | Classification according to pollination mode and functional structure | K. Faegri & L. Van Der PIJL, 1979 |
| Inflorescence type | Qualitative | 11 | The simultaneous display of multiple flowers on an inflorescence increases the plant's attractiveness to pollinators. | Jordan, 2006. |

**Table S3. Traits values ​​for each bee species.**

| **Species** | **ITD** | **Socialidade** | **Buzz** |
| --- | --- | --- | --- |
| Ancyloscelis sp | 3.2 | solitary | no |
| Aparatrigona impunctata | 1.575 | social | no |
| Apis mellifera | 2.793939 | social | yes |
| Augochlora Augochlora sp13 | 1.35 | solitary | yes |
| Augochlora Augochlora sp16 | 1.6 | solitary | yes |
| Augochlora aurinasis | 1.23 | solitary | yes |
| Augochlora Oxystoglossella sp03 | 1.3 | solitary | yes |
| Augochlora Oxystoglossella sp04 | 1.25 | solitary | yes |
| Augochlorella sp | na | solitary | yes |
| Augochloropsis hebescens | 2.675 | solitary | yes |
| Centris longimana | 7 | solitary | yes |
| Cephalotrigona capitata | 2.33 | social | no |
| Cephalotrigona femorata | 2.2 | social | no |
| Ceratina Ceratinula sp09 | 0.8 | solitary | no |
| Ceratina Ceratinula sp10 | 1.1 | solitary | no |
| Ceratina Ceratinula sp11 | 0.9 | solitary | no |
| Ceratina Crewella sp08 | 1.3 | solitary | no |
| Ceratina Crewella sp09 | 1.3 | solitary | no |
| Ceratina Crewella sp10 | 1.65 | solitary | no |
| Ceratina Crewella sp11 | 1.2 | solitary | no |
| Ceratina Crewella sp14 | na | solitary | no |
| Eufriesea superba | 5.85 | solitary | yes |
| Euglossa Euglossa sp01 | 3.391 | solitary | yes |
| Eulonchopria limbella | na | solitary | no |
| Exaerete frontalis | 6.092308 | solitary | no |
| Exomalopsis analis | 1.75 | solitary | yes |
| Exomalopsis auropilosa | 1.72 | solitary | yes |
| Frieseomelitta doederleini | 1.3 | social | no |
| Frieseomelitta flavicornis | 1.3 | social | no |
| Frieseomelitta longipes | 1.45 | social | no |
| Frieseomelitta portoi | 0.95 | social | no |
| Geotrigona mattogrossensis | 1.58 | social | no |
| Geotrigona subnigra | 1.55 | social | no |
| Megachile Dactylomegachile sp02 | 2.25 | solitary | no |
| Melipona amazonica | 2.303846 | social | yes |
| Melipona flavolineata | 2.714286 | social | yes |
| Melipona nebulosa | 3.3 | social | yes |
| Melipona puncticollis | 2.655556 | social | yes |
| Melipona seminigrapernigra | 2.94 | social | yes |
| Nannotrigona punctata | 1.3 | social | no |
| Nannotrigona schultzei | 1.2 | social | no |
| Neocorynura tarpeia | 1.5 | solitary | yes |
| Oxytrigona ignis | 1.4775 | social | no |
| Paratetrapedia leucostoma | 2.0623 | solitary | yes |
| Paratetrapedia testacea | 1.6 | solitary | yes |
| Paratrigona crassicornis | 1.25 | social | no |
| Partamona ailyae | 1.89 | social | no |
| Partamona vicina | 1.564912 | social | no |
| Plebeia fraterna | 1.194444 | social | no |
| Plebeia goeldiana | 0.9 | social | no |
| Plebeia minima | 0.9 | social | no |
| Ptilotrigona lurida | 1.657042 | social | no |
| Scaptotrigona nigrohirta | 1.7 | social | no |
| Scaptotrigona polysticta | 1.52 | social | no |
| Scaptotrigona postica | 2.05 | social | no |
| Tetragona beebei | 1.23 | social | no |
| Tetragona clavipes | 1.309524 | social | no |
| Tetragona dorsalis | 1.2 | social | no |
| Tetragona goettei | 1.2 | social | no |
| Tetragona truncata | 1.2 | social | no |
| Tetragonisca angustula | 0.976 | social | no |
| Trigona amalthea | 1.472857 | social | no |
| Trigona chanchamayoensis | 1.309836 | social | no |
| Trigona cilipes | 1.7 | social | no |
| Trigona dimidiata | 2 | social | no |
| Trigona guianae | 1.35989 | social | no |
| Trigona hypogea | 1.405 | social | no |
| Trigona lacteipennis | 1.45 | social | no |
| Trigona pallens | 1.451786 | social | no |
| Trigona recursa | 1.373864 | social | no |
| Trigona truculenta | 2.5125 | social | no |
| Trigona williana | 1.754722 | social | no |
| Xenochlora nigrofemorata | 2.45 | solitary | no |
| Xylocopa frontalis | 8.15 | solitary | yes |

**Table S4. Traits values ​​for each plant species.**

| **Species** | **Cor** | **Flower simetry** | **Flower shape** | **inflorescencia type** |
| --- | --- | --- | --- | --- |
| Aciotis acuminifolia | White | Radial | Dish | Dichasia |
| Aeschynomene americanavarglandulosa | Pink | Bilateral | Gullet | Racemes |
| Allobriquetia spicata | Yellow | Radial | Bell | Racemes |
| Banisteriopsis muricata | Pink | Bilateral | Flag | Corymbs |
| Bidens bipinnata | Yellow | Radial | Dish | Capitulums |
| Borreria ocymifolia | White | Radial | Dish | Glomerule |
| Borreria semiamplexicaule | Purple | Radial | Bell | Glomerule |
| Borreria sp. | White | NA | NA | Glomerule |
| Borreria verticillata | White | Radial | Dish | Glomerule |
| Brasilianthus carajensis | Purple | Radial | Dish | Dichasia |
| Byrsonima chrysophylla | Yellow | Bilateral | Flag | Racemes |
| Caamembeca spectabilis | Pink | Bilateral | Tube | Racemes |
| Cantinoa mutabilis | Azul | Radial | Bell | Thyrse |
| Cavalcantia glomerata | White | Asymmetry | Brush | Capitulums |
| Cenchrus polystachios | Red | Asymmetry | Incospicuos | Panicle |
| Centella asiatica | Pink | Radial | Dish | Umbel |
| Chamaecrista flexuosavarflexuosa | Yellow | Bilateral | Tube | Racemes |
| Chamaecrista nictitanssubsppatellaria | Yellow | Bilateral | Tube | Racemes |
| Chamaecrista trichopoda | Yellow | Bilateral | Tube | Racemes |
| Combretum laxum | White | Asymmetry | Incospicuos | Panicle |
| Croton hadriani | White | Asymmetry | Brush | Thyrse |
| Croton sp | White | Asymmetry | Brush | Thyrse |
| Cuphea annulata | Red | Bilateral | Flag | Racemes |
| Cuphea carthagenensis | Purple | Bilateral | Flag | Racemes |
| Elephantopus mollis | White | Radial | Dish | Capitulums |
| Fridericia patellifera | Red | Radial | Bell | Thyrse |
| Helicteres brevispira | Red | Asymmetry | Tube | Racemes |
| Helicteres eitenii | Red | Radial | Tube | Racemes |
| Hildaea pallens | Green | Asymmetry | Incospicuos | Panicle |
| Hyptis atrorubens | White | Radial | Incospicuos | Capitulums |
| Hyptis recurvata | White | Asymmetry | Incospicuos | Thyrse |
| Ipomoea carajasensis | Pink | Radial | Bell | Dichasia |
| Justicia birae | Red | Bilateral | Gullet | Spike |
| Justicia mcdadeana | Red | Bilateral | Gullet | Panicle |
| Lantana cujabensis | Yellow | Bilateral | Bell | Racemes |
| Lepidaploa arenaria | Purple | Radial | Bell | Capitulums |
| Ludwigia erecta | Yellow | Radial | Dish | Solitary |
| Mabea angustifolia | Red | Asymmetry | Incospicuos | Thyrse |
| Manihot tristis | White | Asymmetry | Incospicuos | Racemes |
| Marsypianthes chamaedrys | Purple | Bilateral | Dish | Capitulums |
| Mesosphaerum pectinatum | Purple | Radial | Flag | Thyrse |
| Mesosphaerum suaveolens | Purple | Bilateral | Flag | Thyrse |
| Mimosa acutistipula | Purple | Radial | Brush | Racemes |
| Mimosa debilis | Purple | Asymmetry | Brush | Glomerule |
| Mimosa pudicavarhispida | Purple | Asymmetry | Brush | Glomerule |
| Mimosa skinnerivarcarajarum | Purple | Asymmetry | Brush | Racemes |
| Mitreola petiolata | White | Radial | Bell | Dichasia |
| Operculina hamiltonii | Yellow | Radial | Bell | Cymes |
| Oxalis barrelieri | Pink | Radial | Bell | Cymes |
| Paspalum virgatum | Yellow | Asymmetry | Incospicuos | Panicle |
| Passiflora tholozanii | Red | Radial | Dish | Solitary |
| Peixotoa reticulata | Yellow | Radial | Dish | Umbel |
| Periandra coccinea | Red | Bilateral | Gullet | Cymes |
| Piper goeldii | White | Asymmetry | Incospicuos | Spike |
| Poaceae sp1 | NA | NA | Incospicuos | Panicle |
| Polygala Panicleta | White | Radial | Bell | Racemes |
| Pterolepis trichotoma | Purple | Radial | Dish | Dichasia |
| Rhynchanthera hispida | Purple | Radial | Dish | Thyrse |
| Riencourtia pedunculosa | Purple | Radial | Bell | Capitulums |
| Schultesia benthamiana | Yellow | Radial | Bell | Dichasia |
| Senegalia multipinnata | White | Radial | Brush | Panicle |
| Senna pendula | Yellow | Bilateral | Flag | Racemes |
| Senna quinquangulata | Yellow | Bilateral | Flag | Racemes |
| Serjania confertiflora | White | NA | NA | Thyrse |
| Serjania lethalis | White | Bilateral | Flag | Thyrse |
| Sida rhombifolia | Yellow | Radial | Dish | Solitary |
| Sida tuberculata | Yellow | Radial | Dish | Solitary |
| Sida urens | Yellow | Radial | Dish | Glomerule |
| Solanum schlechtendalianum | White | Radial | Dish | Cymes |
| Spigelia flemmingiana | Pink | NA | NA | Cymes |
| Stachytarpheta cayennensis | Azul | Radial | Bell | Racemes |
| Stylosanthes capitata | Yellow | Bilateral | Gullet | Racemes |
| Syngonanthus discretifolius | White | Asymmetry | Incospicuos | Capitulums |
| Taquara micrantha | Green | Asymmetry | Incospicuos | Panicle |
| Turnera laciniata | Yellow | Radial | Dish | Glomerule |
| Turnera melochioides | Yellow | Radial | Dish | Racemes |
| Urochloa decumbens | Green | Asymmetry | Incospicuos | Panicle |
| Vismia gracilis | Yellow | Radial | Dish | Racemes |
| Xyris brachysepala | Yellow | Radial | Dish | Spike |

**Table S5.**  **Spatial autocorrelation between the interaction metrics and the geographic space of the 14 sampling points using the global *Moran index.***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Metrics** | **Observed** | **Expected** | **Sd** | **P.value** |
| Interaction diversity | 0.012 | -0.076 | 0.112 | 0.426 |
| Interaction Evenness | -0.009 | -0.076 | 0.098 | 0.492 |
| Connectance | -0.1407 | -0.076 | 0.093 | 0.494 |
| H2' | 0.038 | -0.076 | 0.108 | 0.285 |

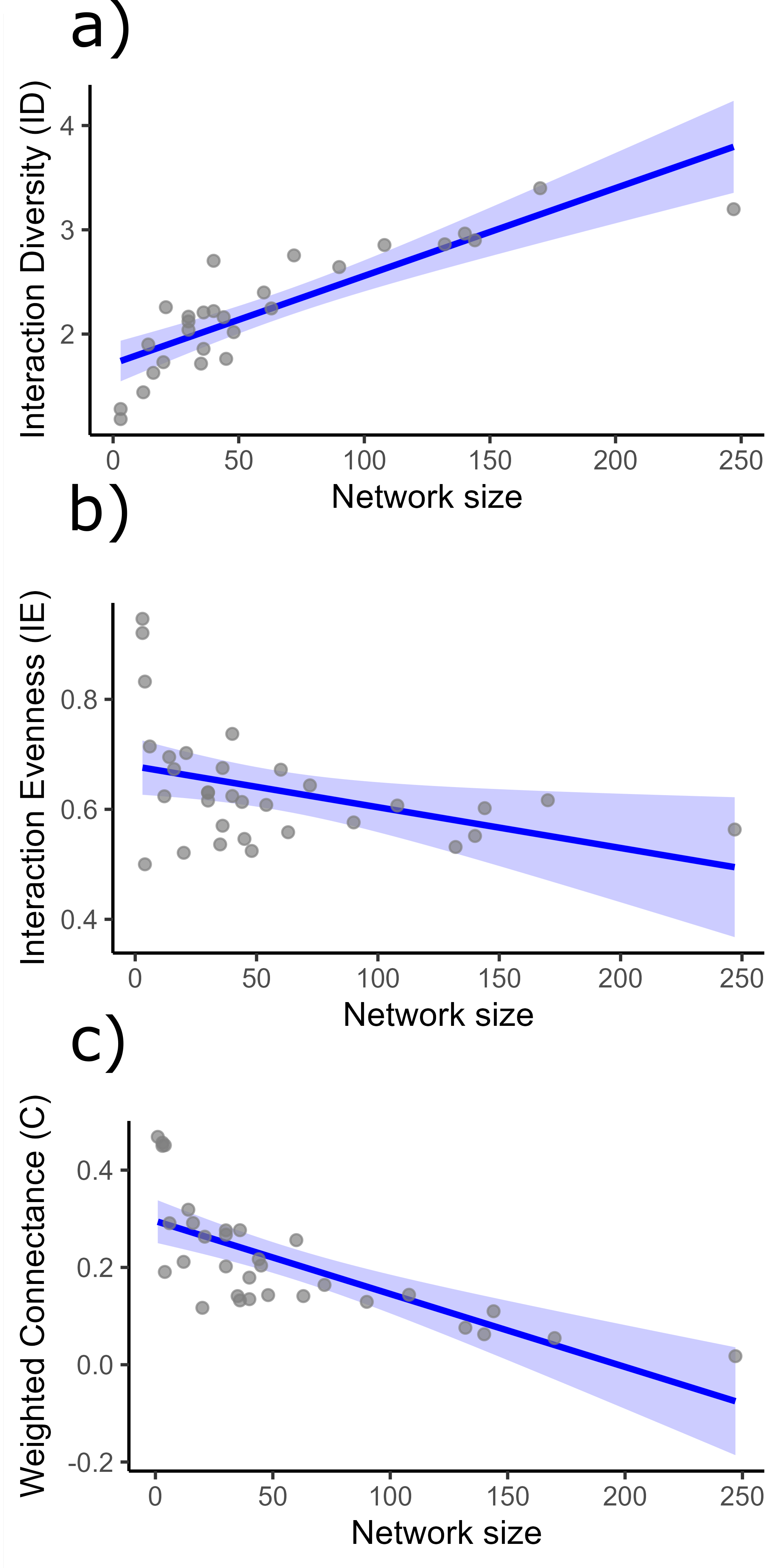
**Table S6. Models separate for each predictor variable for bees and plants.**

|  |  |  |
| --- | --- | --- |
| **FRic** | **FEve** | **FDis** |
| null | null | null |
| ~ Bee FRic + Plant FRic + network size | ~ Bee FEve + Plant FEve + network size | ~ Bee FDis + Plant FDis + network size |
| ~ Bee FRic + network size | ~ Bee FEve + network size | ~ Bee FDis + network size |
| ~ Plant FRic + network size | ~ Plant FEve + network size | ~ Plant FDis + network size |
| ~ Bee FRic | ~ Bee FEve | ~ Bee FDis |
| ~ Plant FRic | ~ Plant FEve | ~ Plant FDis |
| ~ Bee FRic + Plant FRic | ~ Bee FEve + Plant FEve | ~ Bee FDis + Plant FDis |
| ~ N size | ~ N size | ~ N size |

**Table S7. Models separate for bees and plants to determine which attributes are associated with the specialization of each.**

|  |  |
| --- | --- |
| **Bee** | **Plant** |
| d ~ ITD + Sociality + Buzz | d ~ Colour + Flower symmetry + Flower shape + inflorescence type |
| d ~ ITD + Sociality | d ~ Colour + Flower symmetry + Flower shape |
| d ~ ITD + Buzz | d ~ Colour + Flower symmetry |
| d ~ ITD | d ~ Colour |
| d ~ Sociality + Buzz | d ~ Flower symmetry + Flower shape + inflorescence type |
| d ~ Sociality | d ~ Flower symmetry + Flower shape |
| d ~ Buzz | d ~ Flower symmetry |
| Null | d ~ Flower shape + inflorescence type |
|  | d ~ Flower shape |
|  | d ~ inflorescence type |
|  | Null |

**Figure S1. Partial residuals of best models selected by AICc fitted from linear models for interaction metrics modulated by network size.**



**Figure S2. Partial residuals and marginal averages estimated from the linear model for Intertegular distance (mm) by Sociality in bees.**

