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**Appendices to J Poll Ecol 33(7), Arifin & Okamoto**

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Article

Floral scent and pollination on the invasive plant *Coreopsis lanceolata* in Japan

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**Appendix 1.** List and distribution of floral visitors of *Coreopsis lanceolata.* “No.” refers to the number of floral visitors collected. “%” refers to the relative abundance of floral visitors. The relative abundance was calculated by dividing the number of floral visitors collected for a specific species by the overall number of floral visitors collected. *N* in parenthesis refers to the total number of floral visitors collected for each population. Abbreviation: Aj = Ajiki; Hi1 = Hirai1; Hi2 = Hirai2; Km = Kami Minami Gata; Kd = Kidaiji, So = Sogaya; Tb = Tsubaki Bora; Yn = Yanagido. “Compiled” refers to the compilation of data of floral visitors collected across all populations.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Order/Family** | **Species** | **Aj (*N* = 97)** | | **Hi1 (*N* = 78)** | | **Hi2 (*N* = 93)** | | **Km (*N* = 59)** | | **Kd (*N* = 22)** | | **So (*N* = 57)** | | **Tb (*N* = 65)** | | **Yn (*N* = 5)** | | **Compiled (*N* = 476)** | |
|  |  | **No.** | **%** | **No.** | **%** | **No.** | **%** | **No.** | **%** | **No.** | **%** | **No.** | **%** | **No.** | **%** | **No.** | **%** | **No.** | **%** |
| **HYMENOPTERA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Apidae | *Apis mellifera* | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.04 | 0.00 | 0.00 | 1.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.000 | 0.011 |
|  | *Ceratina* (*Ceratina*) sp. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.00 | 0.03 | 0.00 | 0.00 | 2.000 | 0.004 |
|  | *Ceratina* (*Ceratinidia*) *flavipes* | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 2.000 | 0.004 |
|  | *Nomada japonica* | 0.00 | 0.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.000 | 0.011 |
| Halictidae | *Halictus* sp.1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.00 | 0.03 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 3.000 | 0.006 |
|  | *Halictus* sp.2 | 25.00 | 0.26 | 8.00 | 0.10 | 15.00 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 16.00 | 0.25 | 1.00 | 0.20 | 65.000 | 0.137 |
|  | *Halictus* sp.3 | 11.00 | 0.11 | 1.00 | 0.01 | 6.00 | 0.06 | 13.00 | 0.22 | 0.00 | 0.00 | 21.00 | 0.37 | 0.00 | 0.00 | 0.00 | 0.00 | 52.000 | 0.109 |
|  | *Halictus* sp.4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.000 | 0.004 |
|  | *Lasioglossum* sp.1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.000 | 0.006 |
|  | *Lasioglossum* sp.2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
|  | *Lasioglossum* sp.3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 5.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 6.000 | 0.013 |
|  | *Lasioglossum* sp.4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.00 | 0.05 | 0.00 | 0.00 | 3.00 | 0.05 | 7.00 | 0.11 | 0.00 | 0.00 | 13.000 | 0.027 |
|  | *Lasioglossum* sp.5 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
|  | *Lasioglossum* sp.6 | 9.00 | 0.09 | 5.00 | 0.06 | 0.00 | 0.00 | 4.00 | 0.07 | 0.00 | 0.00 | 1.00 | 0.02 | 6.00 | 0.09 | 1.00 | 0.20 | 26.000 | 0.055 |
|  | *Lasioglossum* sp.7 | 6.00 | 0.06 | 6.00 | 0.08 | 1.00 | 0.01 | 12.00 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 26.000 | 0.055 |
| Megacilidae | *Megachile* sp.1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
|  | *Megachile* sp.2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 0.07 | 0.00 | 0.00 | 1.00 | 0.02 | 3.00 | 0.05 | 0.00 | 0.00 | 8.000 | 0.017 |
|  | *Megachile* sp.3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 1.00 | 0.02 | 0.00 | 0.00 | 2.000 | 0.004 |
|  | *Megachile* sp.4 | 7.00 | 0.07 | 11.00 | 0.14 | 18.00 | 0.19 | 1.00 | 0.02 | 2.00 | 0.09 | 0.00 | 0.00 | 4.00 | 0.06 | 0.00 | 0.00 | 43.000 | 0.090 |
|  | *Megachile* sp.5 | 0.00 | 0.00 | 5.00 | 0.06 | 4.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 10.000 | 0.021 |
|  | *Megachile* sp.6 | 0.00 | 0.00 | 1.00 | 0.01 | 1.00 | 0.01 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.000 | 0.006 |
|  | *Megachile* sp.7 | 0.00 | 0.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
| **Appendix 1.** *Continued* | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Order/Family** | **Species** | **Aj (*N* = 97)** | | **Hi1 (*N* = 78)** | | **Hi2 (*N* = 93)** | | **Km (*N* = 59)** | | **Kd (*N* = 22)** | | **So (*N* = 57)** | | **Tb (*N* = 65)** | | **Yn (*N* = 5)** | | **Compiled (*N* = 476)** | |
| **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** |
|  | *Megachile* sp.8 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.05 | 0.00 | 0.00 | 3.00 | 0.05 | 0.00 | 0.00 | 4.000 | 0.008 |
| Scoliidae | *Campsomeriella* *annulata* | 1.00 | 0.01 | 5.00 | 0.06 | 4.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.000 | 0.021 |
| Vespidae | *Ancistrocerus* sp. | 0.00 | 0.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
|  | *Stenodynerus* sp. | 3.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.000 | 0.006 |
| ? | Symphita spp. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.000 | 0.004 |
| **DIPTERA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Calliphoridae | *Lucilia* sp. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
| Rhiniidae | *Stomorhina* sp. | 6.00 | 0.06 | 0.00 | 0.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 8.000 | 0.017 |
| Syrphidae | Eristalinae spp.1 | 8.00 | 0.08 | 6.00 | 0.08 | 9.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.00 | 0.05 | 0.00 | 0.00 | 26.000 | 0.055 |
|  | Eristalinae spp.2 | 2.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.000 | 0.004 |
|  | *Mesembrius flavipes* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.00 | 0.40 | 3.000 | 0.006 |
|  | Syrphidae spp.1 | 3.00 | 0.03 | 4.00 | 0.05 | 2.00 | 0.02 | 1.00 | 0.02 | 0.00 | 0.00 | 12.00 | 0.21 | 5.00 | 0.08 | 1.00 | 0.20 | 28.000 | 0.059 |
|  | Syrphidae spp.2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 1.00 | 0.02 | 1.00 | 0.02 | 0.00 | 0.00 | 3.000 | 0.006 |
| ? | Diptera spp.1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
|  | Diptera spp.2 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
|  | Diptera spp.3 | 0.00 | 0.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
| **LEPIDOPTERA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Crambidae | *Spoladea recurvalis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
| Hesperiidae | *Parnara guttata* | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
| Lycaenidae | *Everes argiades* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 1.00 | 0.02 | 0.00 | 0.00 | 2.000 | 0.004 |
|  | *Lycaena phlaeas* | 4.00 | 0.04 | 2.00 | 0.03 | 1.00 | 0.01 | 0.00 | 0.00 | 2.00 | 0.09 | 2.00 | 0.04 | 2.00 | 0.03 | 0.00 | 0.00 | 13.000 | 0.027 |
|  | *Zizeria maha* | 2.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.000 | 0.004 |
| Nymphalidae | *Argyreus hyperbius* | 0.00 | 0.00 | 1.00 | 0.01 | 0.00 | 0.00 | 2.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.000 | 0.006 |
|  | *Polygonia c-aureum* | 0.00 | 0.00 | 1.00 | 0.01 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.000 | 0.004 |
|  | *Vanessa cardui* | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
|  | *Ypthima argus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
| Papilionidae | *Papilio xuthus* | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
| **Appendix 1.** *Continued* | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Order/Family** | **Species** | **Aj (*N* = 97)** | | **Hi1 (*N* = 78)** | | **Hi2 (*N* = 93)** | | **Km (*N* = 59)** | | **Kd (*N* = 22)** | | **So (*N* = 57)** | | **Tb (*N* = 65)** | | **Yn (*N* = 5)** | | **Compiled (*N* = 476)** | |
| **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** | **No** | **%** |
| Pieridae | *Colias erate* | 0.00 | 0.00 | 9.00 | 0.12 | 11.00 | 0.12 | 0.00 | 0.00 | 1.00 | 0.05 | 1.00 | 0.02 | 2.00 | 0.03 | 0.00 | 0.00 | 24.000 | 0.050 |
|  | *Pieris rapae* | 0.00 | 0.00 | 4.00 | 0.05 | 4.00 | 0.04 | 1.00 | 0.02 | 4.00 | 0.18 | 1.00 | 0.02 | 3.00 | 0.05 | 0.00 | 0.00 | 17.000 | 0.036 |
| **COLEOPTERA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Chrysomelidae | Alticini spp. | 5.00 | 0.05 | 1.00 | 0.01 | 2.00 | 0.02 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.000 | 0.019 |
| Curculionidae | *Anthonomus bisignifer* | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 2.000 | 0.004 |
| Mordellidae | Mordellidae spp. | 0.00 | 0.00 | 0.00 | 0.00 | 3.00 | 0.03 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.000 | 0.008 |
| Oedemeridae | *Oedemera lucidicollis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
| Scarabaeidae | *Cetonia pilifera* | 1.00 | 0.01 | 1.00 | 0.01 | 1.00 | 0.01 | 0.00 | 0.00 | 1.00 | 0.05 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 5.000 | 0.011 |
|  | *Gametis jucunda* | 0.00 | 0.00 | 2.00 | 0.03 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.000 | 0.006 |
| **ORTHOPTERA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tettigoniidae | Tettigoniidae spp.1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
|  | Tettigoniidae spp.2 | 0.00 | 0.00 | 1.00 | 0.01 | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.000 | 0.004 |
|  | Tettigoniidae spp.3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 | 0.002 |
| **HEMIPTERA** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lygaeidae | *Nysius* sp. | 1.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.02 | 2.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.000 | 0.008 |
|  | *Tropidothorax sinensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.000 | 0.004 |

**Appendix 2. List of previous studies recording floral visitors of the genus *Coreopsis***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Species** | **Visitors** | **Locality** | **Note** | **References** |
| *Coreopsis lanceolata* | **Bees (long-tongued)**  Apidae (Apini): *Apis mellifera*  Apidae (Bombini): *Bombus impatiens,* *Psithyrus citrinus*  Anthophoridae (Ceratinini): *Ceratina calcarata*, *Ceratina dupla*, *Ceratina mikmaqi*, *Ceratina strenua*  Anthophoridae (Epeolini): *Triepeolus subnitens*  Anthophoridae (Nomadini): *Nomada australis*, *Nomada fervida*, *Nomada lepida*, *Nomada maculata*, *Nomada rubicunda*  Megachilidae (Anthidiini): *Dianthidium simile*  Megachilidae (Megachilini): *Megachile brevis*, *Megachile mendica*, *Megachile pugnata*  Megachilidae (Osmiini): *Osmia georgica*  Megachilidae (Stelidini): *Stelis lateralis*  **Bees (short-tongued)**  Halictidae (Halictinae): *Agapostemon splendens*, *Agapostemon texanus*, *Agapostemon virescens*, *Augochlora pura*, *Augochlorella aurata*, *Augochlorella persimilis*, *Augochloropsis metallica metallica*, *Augochloropsis sumptuosa*, *Halictus confusus*, *Halictus ligatus, Lasioglossum floridanum*, *Lasioglossum fuscipenne*, *Lasioglossum leucocomum*, *Lasioglossum paraforbesii*, *Lasioglossum pectorale*, *Lasioglossum perpunctatum*, *Lasioglossum pilosum, Lasioglossum vierecki*  Halictidae (Sphecodini): *Sphecodes pimpinellae*  Andrenidae (Andreninae): *Andrena rudbeckiae*  Andrenidae (Panurginae): *Perdita bequaerti* | Illinois, USA (Native range) | Data was compiled from various literatures without mentioning the important of each visitor  Most of Bees were reported to suck nectar  Lycaeides melissa samuelis as frequent floral visitor that sucks nectar | (Hilty 2020) |
| **Appendix 2.** *Continued* | |  |  |  |
| **Species** | **Visitors** | **Locality** | **Note** | **References** |
|  | **Wasps**  Scoliidae: *Campsomeris plumipes*  **Ants (however mostly show non-pollinating impact)**  Formicidae (Dolichoderinae): *Forelius pruinosus*  Formicidae (Formicinae): *Formica dolosa*, *Formica incerta*, *Formica subsericea*, *Lasius neoniger*  Formicidae (Myrmicinae): *Crematogaster cerasi*, *Myrmica* a*f-eva*, *Myrmica americana*  **Flies**  Syrphidae: *Eristalis stipator*, *Eristalis tenax*, *Eristalis transversa,* *Toxomerus marginatus*  Conopidae: *Physocephala texana*, *Zodion fulvifrons*, *Zodion intermedium*, *Zodion obliquefasciatum*  **Butterflies**  Nymphalidae: *Chlosyne nycteis*, *Phyciodes tharos*, *Vanessa virginiensis*  Lycaenidae: *Lycaeides melissa samuelis*  Pieridae: *Colias philodice*  **Beetles**  Buprestidae: *Acmaeodera neglecta*, *Acmaeodera ornata*, *Acmaeodera pulchella*  Cantharidae: *Chauliognathus pennsylvanicus*  Cerambycidae: *Pseudostrangalia cruenta*  Chrysomelidae: *Acanthoscelides calvus* |  |  |  |
| **Appendix 2.** *Continued* | |  |  |  |
| **Species** | **Visitors** | **Locality** | **Note** | **References** |
|  | Cleridae: *Trichodes nuttalli*  Dermestidae: *Cryptorhopalum triste*  Meloidae: *Nemognatha nemorensis*  Melyridae: *Collops quadrimaculatus*, *Collops vicarius*  Mordellidae: *Mordellistena aspersa*, *Mordellistena cervicalis*, *Mordellistena rubrilabris*  Scarabaeidae: *Trichiotinus viridans*  **Others**  Coreidae: *Merocoris distinctus*  Lygaeidae: *Lygaeus kalmii*  Miridae: *Lygocoris quercalbae*  Pachygronthidae: *Phlegyas abbreviatus*  Rhopalidae: *Harmostes reflexulus* |  |  |  |
| *Coreopsis lanceolata* | **Bee**  Apidae: *Apis cerana*  **Flies**  Syrphidae: *Eristalis cerealis,* *Phytomia zonata,* *Asarkina porcina, Chrysomyia megacephala*  **Butterflies**  Danaidae: *Euploea mulciber*  Lycaenidae: Lycaenidae spp.  Nymphalidae: *Argyreus hyperbius, Polygonia c-aureum, Neptis sappho* | Jiangxi Province, China (Introduced range) | *Apis cerana* was the most predominant floral visitor (approximately 45%) | (Zeng et al. 2021) |
| **Appendix 2.** *Continued* | |  |  |  |
| **Species** | **Visitors** | **Locality** | **Note** | **References** |
|  | Pieridae: *Pieris rapae*, *Pieris canidi*  **Hemiptera**  Reduviidae: *Aspongopus chinensis, Halyomorpha halys, Lineifer* spp.  **Beetle**  Coccinellidae: *Coccinella septempunctata* |  |  |  |
| *Coreopsis* spp. | **Bee**  Apidae: *Bombus edwurhii* | California, USA  (Native range) | 6 males recorded on flowers | (Thorp et al. 1983) |
| *Coreopsis basalis* | Primarily by bees | Central Texas, USA  (Native range) | Bees are native to central Texas but there is no detail about the species of bees | (Simpson & Neff 1987) |
| *Coreopsis palmata* | **Bee**  Halictidae: *Agapostemon texanus*  **Wasp**  Crabronidae: *Bembix spinolae*  Sphecidae: *Cerceris* sp.  **Syrphid fly**  Syrphidae: *Toxomerus marginatus* | Crow Hassan Park  Reserve, Eastern  Minnesota, USA  (Native range) | It is unusual to find an insect visitor on this plant (3 collections; 5 individuals; 4 species) | (Reed 1993) |
| *Coreopsis atkinsonia* | **Bee**  Colletidae: *Colletes kincaidii* | Utah, USA  (Native range) | The flower is planted in greenhouse. Both sexes were observed collecting nectar from all of the available flowers throughout the following week | (Torchio et al. 1988) |

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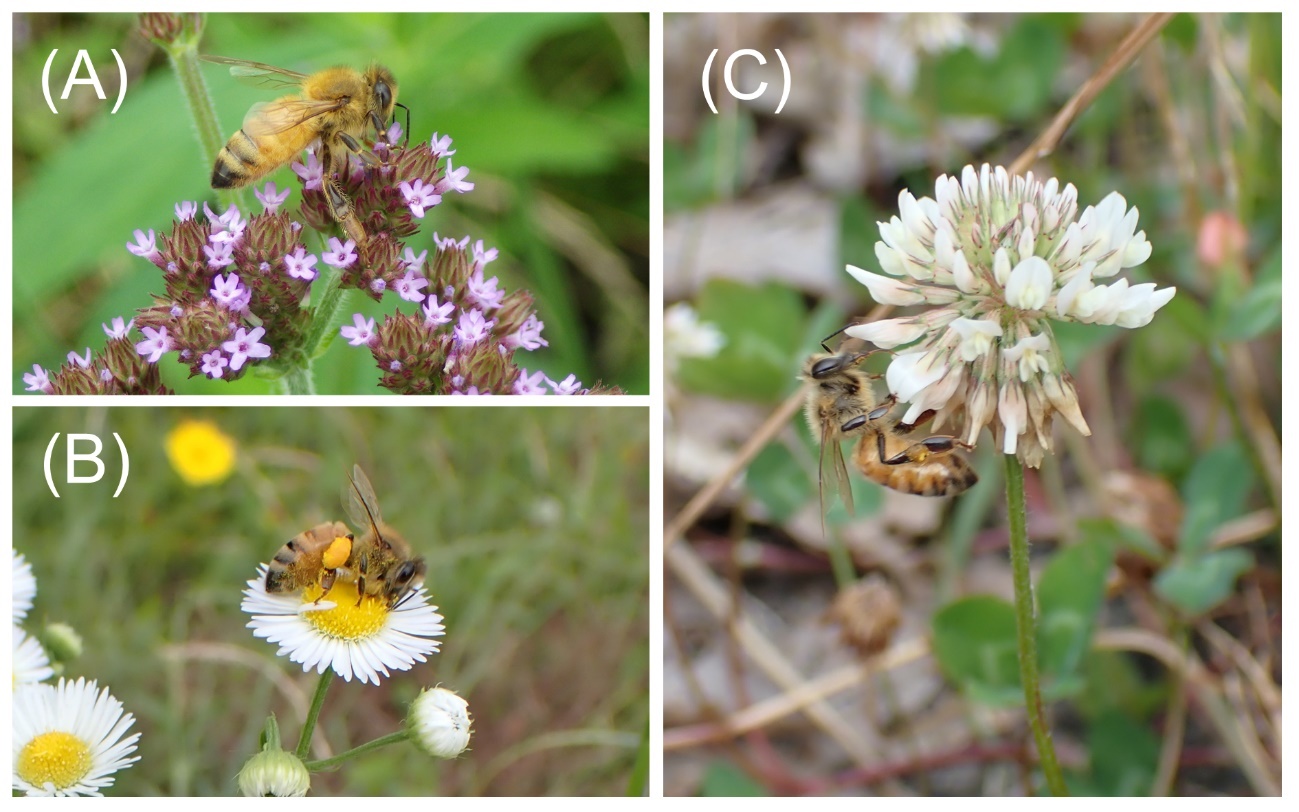
**Appendix 3. A comparison of floral morphology between the Tsubaki Bora population in Japan during the 2021 flowering season (*N* = 22) and the Jiangxi population in China during the 2018 flowering season (*N* = 30). The table provides data on various floral characteristics and allows for a comparison of the morphological differences between the two populations.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Indicator** | **Tsubaki Bora population (Japan)** | | **Jiangxi population (China)**# |
| **Mean ± SD** | **Range (Min-Max)** | **Mean ± SD** |
| Number of bract | 8.4 ± 0.4 | 8.0–10.0 | NA |
| Number of phyllary | 8.3 ± 0.5 | 8.0–10.0 | NA |
| Number of ray floret | 9.2 ± 2.4 | 8.0–17.0 | NA |
| Number of disk floret | 192.5 ± 44.0 | 113.0–299.0 | NA |
| Corolla diameter (mm) | 54.3 ± 5.1 | 46.5­­­–62.8 | 52.2 ± 4.4 |
| Tubular flower diameter (mm) | 10.6 ± 1.6 | 6.6–14.9 | 11.4 ± 0.9 |
| Length of ray floret (mm) | 25.6 ± 2.9 | 19.1–31.2 | NA |
| Width of ray floret (mm) | 16.7 ± 2.9 | 10.2–23.6 | NA |
| Length of disk floret (mm) | 8.5 ± 2.9 | 6.4–10.7 | 8.9 ± 0.7 |
| Width of disk floret (mm) | 1.1 ± 0.2 | 0.6–2.0 | NA |

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**Appendix 4. Composition of floral visitors of *Verbena brassiliensis* (*N* = 26, *N* refers to the total number of collected specimens) and *Erigeron annuus* (*N* = 30), the co-flowering species nearby *Coreopsis lanceolata* in Kami Minami Gata population. The observation of floral visitors was conducted for 1 hour each.**



**Appendix 5. *Apis mellifera* visited the co-flowering species nearby *Coreopsis lanceolata* such as (A) *Verbena brassiliensis*; (B) *Erigeron annuus*; (C) *Trifolium repens.***