

Training course: Use of Agrobiodiversity information in GBIF and other databases

Lisbon, 28 - 30 June 2017

Exercise 3:

Ecosystem services: Pollination

How to use this exercise and report template?

1. Please download this file from the link <https://goo.gl/yLubUK> as a Word docx file.
2. Suggestion: rename it as "Exercise_3_group#.docx" (replace # by the number/name of your group)
3. Fill in the responses in the Task sections of the file.

How to deliver the results report

1. Create (if you haven't done so) a folder for your group at the link <https://goo.gl/DXQ3gi>.
2. Upload all the report files and attachments to the newly created folder. Name attachment files consistently as "Exercise_1_attachment#"
3. Upload result report of all your exercises to the same folder

Introduction

Worldwide, the number of flower-visiting species is estimated to be around 150,000. Bees account for 25,000 to 30,000 species and together with flies, butterflies, moths, wasps, beetles and some other insect orders encompass the majority of pollinating species (FAO 2008). Wild bees coming from farm surrounding landscapes freely pollinate crop flowers, providing ecosystem services (Martins et al 2015). Losey & Vaughan (2006) estimated that native pollinators (almost exclusively bees) may be responsible for almost \$ 3.07 billion of fruits and vegetables produced in the United States. In Europe, pollination by honeybees and other taxa is worth approximately € 4.25 billion and € 0.75 billion, respectively (Potts et al. 2006).

However, pollinators and the services they provide are under increasing pressure from multiple anthropogenic sources, namely due to habitat loss and fragmentation, habitat isolation, agricultural intensification, agrochemicals, diseases, parasites, climate change, introduced non-native plants and competition with managed pollinators (Potts et al. 2006, and references therein). In a fragmented landscape, the entire home range of a bee species often covers several partial habitats, each of them containing just one of the needed resources and functioning, either as a nesting area or as a foraging area. Partial habitats are often divided by habitats not suitable to bees (e.g., roads, railways, sprayed arable fields). The loss of one of the partial habitats can lead to extinction of local bee populations (Westrich 1996).

The females of polylectic bees forage in a very wide spectrum of unrelated plants for pollen, such for example the mason bee *Osmia bicornis* (= *Osmia rufa*) (collects pollen from flowers belonging to 19 plant families), the honey bee, *Apis mellifera*, most bumble bees, *Bombus* spp., several species of *Lasioglossum*, as well as many solitary bees. The less specialized a bee is, the better it can survive in agricultural landscapes. On the other hand, oligolectic bees are highly specialized, visiting only a single species or a group of closely related plant species. Therefore, they can only provision brood cells if they find sufficient sources of pollen in the vicinity of the nest (Westrich 1996).

More than 600 species of bees (Hymenoptera, Apoidea) are known from Portugal (Baldock et al. in preparation). However, the number of existing species is probably much higher.

Task 1

- a) Using GBIF, compare the number of species of *Bombus* and *Lasioglossum* reported from Portugal and Spain.
- b) Compare the results with those obtained from Fauna Europae (<https://fauna-eu.org/>).
- c) How the information you obtained from GBIF fits well the actual knowledge (see data extracted from Baldock et al. (in preparation), in the annex). Please discuss.

Task 2

Osmia bicornis is a solitary, univoltine, polylectic bee species and a potential pollinator of some fruits crops, such as pear and apple. In addition to the flowers visited for their pollen, this bee visits many plant species for nectar, during its life cycle, between April and June. In Portugal, *O. bicornis* is a relatively common species, being present in Trás-os-Montes, Douro Litoral, Beira Alta, Estremadura, Ribatejo, Alto Alentejo, Baixo Alentejo, and Algarve (Baldock et al. in preparation).

Based on Flora-on (<http://flora-on.pt/>), please identify the potential sources of pollen and/or nectar available for *O. bicornis* in the region of Santarém, Portugal, during its life cycle (**Suggestion:** Export to an excel file the list of flowering species for each month and prepare a database; with the database create a pivot table “plant species *versus* flowering period” displaying the list of plant species and the corresponding flowering period, between April and June).

References

Baldock D, Wood TJ, Cross I & Smit J (in preparation). A list of the bees of Portugal (Hymenoptera: Apoidea).

FAO (2008) Rapid assessment of pollinators' status: a contribution to the international initiative for the conservation and sustainable use of pollinators. Global Action on Pollination Services for Sustainable Agriculture, FAO, Rome, Italy

Losey JE, Vaughan M (2006) The economic value of ecological services provided by insects. *BioScience* 56: 311-323

Martins KT, Gonzalez A, Lechowicz MJ (2015) Pollination services are mediated by bee functional diversity and landscape context. *Agriculture, Ecosystems and Environment*, 200: 12–20.

Potts SG, Petanidou T, Roberts S, O'Toole C, Hulbert A, Willmer P (2006) Plant-pollinator biodiversity and pollination services in a complex Mediterranean landscape. *Biological Conservation* 129: 519-529

Westrich P (1996) Habitat requirements of central European bees and the problems of partial habitats. In: Matheson A, Buchmann SI, O'Toole C, Westrich P & Williams IH (eds.) *The conservation of bees*. Linnean Society Symposium, Vol. 18. Academic Press, New York, pp.1-16

Annex

Species of *Lasioglossum* and *Bombus* reported by Baldock et al. (in preparation) for Portugal

Genus *Lasioglossum* CURTIS 1833

65 species. The genus is clearly polylectic almost only a few exceptions

Lasioglossum aeratum KIRBY 1802

Lasioglossum albipes FABRICIUS 1781

Lasioglossum albocinctum LUCAS 1849

Lasioglossum albovirens PÉREZ 1895 (= *Lasioglossum pseudoleptocephalum* BLÜTHGEN)

Lasioglossum angusticeps PERKINS 1895

Lasioglossum aureolum PÉREZ 1903

Lasioglossum bimaculatum DOURS 1872 *

Lasioglossum brevicorne SCHENCK 1868

Lasioglossum breviventre SCHENCK 1852

Lasioglossum buccale PÉREZ 1903

Lasioglossum calceatum SCOPOLI 1763

Lasioglossum callizonium PÉREZ 1895

Lasioglossum capitale PÉREZ 1903 *

Lasioglossum costulatum KRIECHBAUMER 1873

Lasioglossum discum SMITH 1853 ssp. *fertoni* VACHAL 1895

Lasioglossum dusmeti BLÜTHGEN 1924 *

Lasioglossum glabriusculum MORAWITZ 1872

Lasioglossum griseolum MORAWITZ 1872 *

Lasioglossum ibericum EBMER 1975

Lasioglossum immunitum VACHAL 1895

Lasioglossum interruptum PANZER 1798

[*Lasioglossum laterale* BRULLÉ 1832

Lasioglossum laticeps SCHENCK 1868 *

Lasioglossum lativentre SCHENCK 1853 *

Lasioglossum leucozonium SCHRANK 1781 ssp. *cedri* EBMER 1976

Lasioglossum limbellum MORAWITZ 1876

Lasioglossum lissonotum NOSKIEWICZ 1925

Lasioglossum littorale BLUTHGEN 1923 *

Lasioglossum lucidulum SCHENCK 1861 *

Lasioglossum malachurum KIRBY 1802

Lasioglossum mandibulare MORAWITZ 1866 (= *Lasioglossum carneiventre* DOURS)

Lasioglossum marginatum (BRULLÉ 1832)

Lasioglossum maurusium BLUTHGEN 1935 *

Lasioglossum mediterraneum BLÜTHGEN 1926

Lasioglossum mesosclerum PÉREZ 1903 *

Lasioglossum minutissimum KIRBY 1802

Lasioglossum minutulum SCHENCK 1853 *

Lasioglossum morio FABRICIUS 1793

Lasioglossum musculoïdes EBMER 1974

Lasioglossum nitidiusculum KIRBY 1802

Lasioglossum orihuelicum BLÜTHGEN 1924

Lasioglossum pallens BRULLÉ 1832 *

Lasioglossum parvulum SCHENCK 1853

Lasioglossum pauperatum BRULLÉ 1832

Lasioglossum pauxillum SCHENCK 1853

Lasioglossum perclavipes BLÜTHGEN 1934

Lasioglossum politum SCHENCK 1853 *

- Lasioglossum prasinum* SMITH 1848
- Lasioglossum pseudoplanulum* BLÜTHGEN 1924 *
- Lasioglossum punctatissimum* SCHENCK 1853
- Lasioglossum puncticolle* MORAWITZ 1872 *
- Lasioglossum pygmaeum* SCHENCK 1853 *
- Lasioglossum quadrinotatum* KIRBY 1802
- Lasioglossum semilucens* ALFKEN 1914
- Lasioglossum sexnotatum* KIRBY 1802
- Lasioglossum smeathmanellum* KIRBY 1802
- Lasioglossum soror* SAUNDERS 1901 *
- Lasioglossum sphecodimorphum* VACHAL 1892
- Lasioglossum strictifrons* VACHAL 1895 *
- Lasioglossum subaenescens* PÉREZ 1895 *
- Lasioglossum subhirtum* LEPELETIER 1841
- Lasioglossum transitorium* SCHENCK 1868 ssp. *planulum* PÉREZ 1903
- Lasioglossum vergilianum* PÉREZ 1903 *
- Lasioglossum villosulum* KIRBY 1802
- Lasioglossum virens* ERICHSON 1835 *
- Lasioglossum xanthopus* KIRBY 1802 *
- Lasioglossum zonulum* SMITH 1848 *

Genus ***Bombus*** LATREILLE 1802

13 species. As social bees, *Bombus* are well known to be widely polylectic

Bombus (Psithyrus) barbutellus KIRBY 1802 *

Bombus (Psithyrus) campestris PANZER 1801 *

Bombus (Psithyrus) vestalis GEOFFROY 1785 ssp. *obenbergeri* MAY 1944

Bombus hortorum LINNAEUS 1761

Bombus humilis ILLIGER 1806

Bombus lapidarius LINNAEUS 1758 ssp. *decipiens* PÉREZ 1890 *

Bombus lucorum LINNAEUS 1761 *

Bombus magnus VOGT 1911

Bombus muscorum LINNAEUS 1758

Bombus pascuorum SCOPOLI 1763

Bombus pratorum LINNAEUS 1758

Bombus ruderatus FABRICIUS 1775

Bombus terrestris LINNAEUS 1758 ssp. *lusitanicus* KRÜGER 1956