Mapping plant-pollinator interactions across Europe

Abstract

Pollinators play a crucial role in maintaining Earth's terrestrial biodiversity and human food production by mediating sexual reproduction for most flowering plants. However, their diversity and role as pollinators are increasingly compromised by rapid human-induced environmental changes. One of the major challenges for pollinator conservation, is the lack of robust generalisable data across space and time to comprehend the conservation status and population trends among different pollinator species. Here, we present a dataset of plant-pollinator interactions at European level that consists of 51 studies distributed across 17 countries that comprise over a million of interactions between plants and pollinators. The dataset includes a total of 2065 pollinator and 1354 plant species that accounts approximately for 30% of each of the main pollinator groups (i.e., bees, syrphids and butterflies) and 5% of flowering plants that inhabit the European continent.

Introduction

1st paragraph

General introduction of how global change impacts plant-pollinator interactions

Maybe expand on some drivers? Climate change, habitat fragmentation, agricultural intensification, urbanization, pollution, pesticides and species' invasions

Highlight the relevance of large scale datasets to understand biological phenomena

2nd paragraph

3rd paragraph

4paragraph

Introduce research questions

LIST THEM HERE (Main ideas so far)

Questions that we would like to answer:

1) What are the most common plant a pollinator species? Are those shared across networks? Most common interactions across Europe? Interaction fidelity

2) Is generalization the rule? Or specialization? How this impacts indirect interactions? Go in the direction of pollinator importance?

Methods

Dataset description

This European metaweb consist of datasets of plant-pollinator interactions compiled initially by a wide number of researchers and institutions within the European continent. This dataset consist of 51 independent published and unpublished studies conducted during the time period 2004 - 2021 on 17 different countries (**Figure 1a**). The dataset contains a total of 1,150,703 distinct interactions, considering interaction as the contact of a given pollinator to the reproductive structure of a particular plant, from 2,065 pollinator and 1,354 plant species. The majority of plant and pollinator species tend to be regionally specific, with only a minor portion of them being shared across a broad range of studies (**Figure 1b**). These different studies differ in sampling effort and methodology, although most studies took place within a single flowering season (68.63%), sampled a given location an average of 7.56 days, and documented interactions mostly by using transects as sampling method (62.75%).

Explore habitat types! (I think I need to fix some)

Taxonomy

All plant and pollinator species names were checked and standardised according to the most recent

Taxonomic coverage

To calculate the completeness of the dataset

Check presentation from Herrera for cool graphs summarising patterns

Phylo for plants and pollinators!

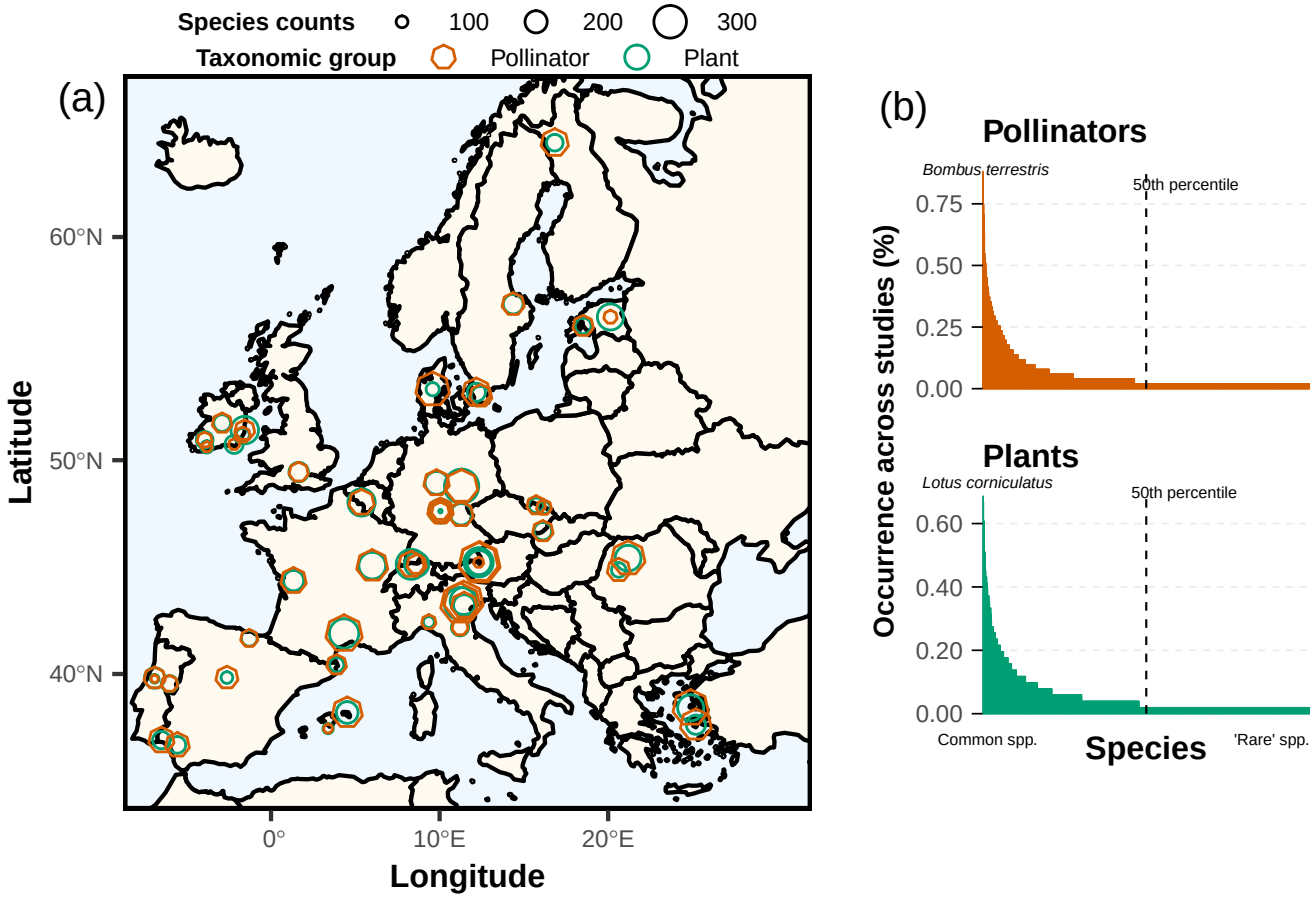
Species counts
100
200
300
Taxonomic group
Pollinator
Plant
(a)
60°N
50°N
40°N
Latitude
0°
10°E
20°E
Longitude
(b)
Pollinators
Bombus terrestris
50th percentile
0.75
0.50
0.25
0.00
Plants
Lotus corniculatus
50th percentile
0.60
0.40
0.20
0.00
Occurrence across studies (%)
Common spp.
Species
'Rare' spp.

Figure 1

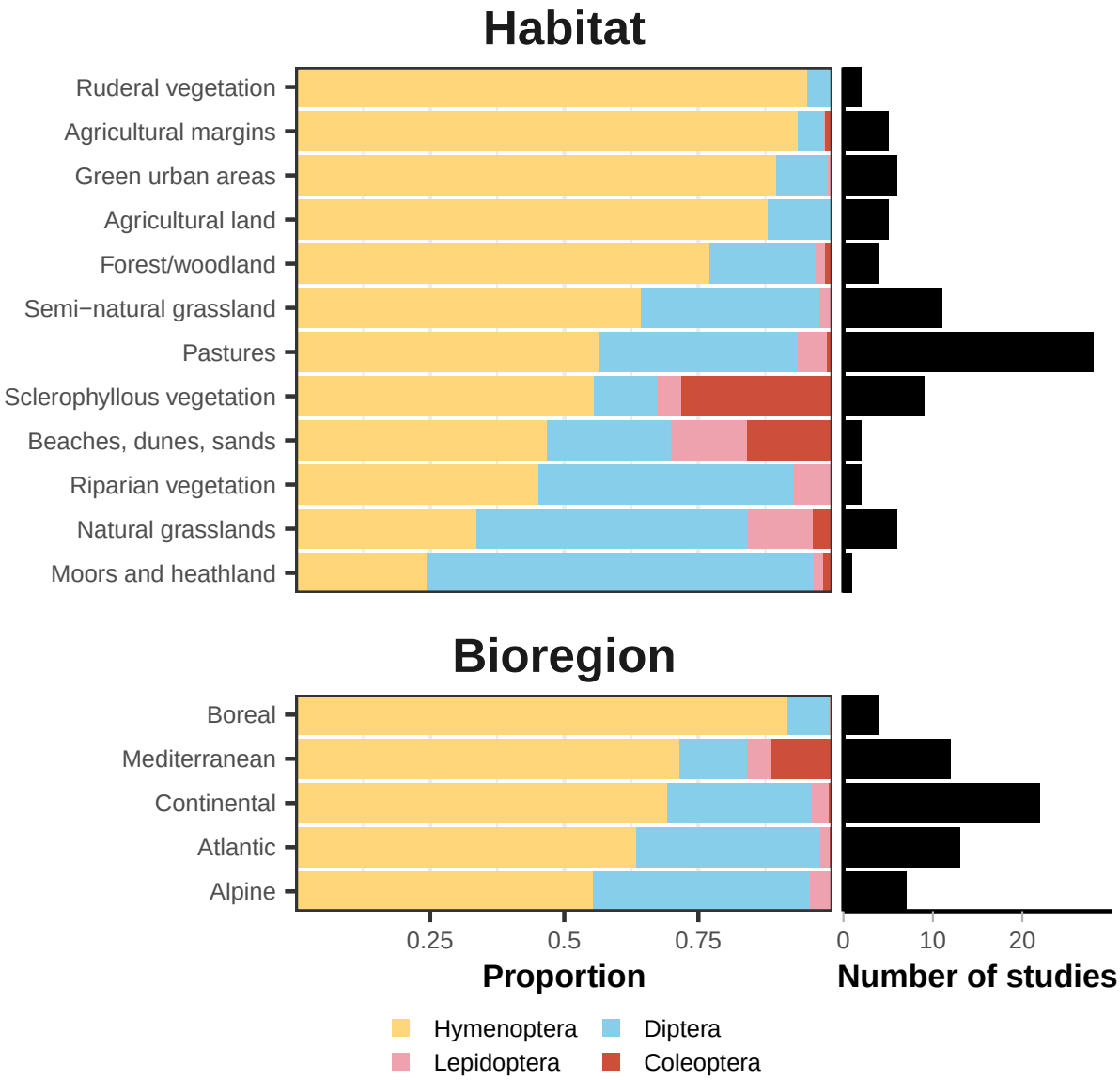

Figure 2. Proportion of the major pollinator orders by habitat types and bioclimatic regions in the SafeNet database. The orders, from left to right, include Hymenoptera, Diptera, Lepidoptera and Coleoptera. The horizontal barplot on the right indicates the number of studies that were conducted on each habitat type or bioclimatic region. Note that a single study can countribute to more than one habitat or bioclimatic region. Areas with a greater number of studies are more likely to depict accurate proportions of pollinators in those systems.

Results

Discussion