

Pollinator hotspots in Europe: conservation insights from opportunistic data

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Pollinating insects provide a key ecosystem service across both natural and agricultural systems by enabling the reproduction of wild flowering plants and crops. However, current knowledge of pollinator diversity patterns across Europe remains fragmented, largely due to uneven monitoring efforts and variable taxonomic expertise among countries. In addition to standardized monitoring data, opportunistic data can provide valuable information that supports a first, overall understanding of pollinator hotspots across Europe. By leveraging the most extensive presence-only dataset of European pollinators, we identified potential hotspots of diversity and endemism for wild bees, hoverflies, moths, and butterflies at 10 km resolution using species distribution models. Cross-taxon congruence in potential species richness was generally low, likely reflecting group-specific climatic requirements and different life histories. Despite this spatial variability, several mountain ranges, such as the Alps and the Balkan Peninsula, consistently emerged as key hotspots for all groups. Potential species richness was only weakly associated with endemism, with Mediterranean islands and high-latitude mountains hosting unique pollinator diversity at the continental scale despite their overall lower species richness.

Pressures from agricultural intensification, landscape simplification, and climate change pose significant challenges to the conservation of pollinator communities across Europe. In many cases, hotspots overlapped with areas of higher habitat protection, highlighting opportunities to implement pollinator-friendly management within existing protected areas. Overall, spatial mismatches among pollinator taxa, as well as between species richness and endemism, complicate the identification of priority areas for conservation and underscore the need for conservation strategies. Multispecies opportunistic data can be used to drive standardized, coordinated, transnational monitoring programs.