

## Effects of area, isolation and anthropization of the island on the pollinator community, a case study in small Italian islands

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### Abstract:

In recent decades, pollinators experienced a significant decline due to climate change, introduction of alien species and pathogens, intensive agriculture and urbanization. In this context it is crucial to gain knowledge on the distribution of these fundamental animals. In the small Italian islands, data on the composition of pollinator fauna and associated ecosystem services are either non-existent or limited to a few case studies, together with the fact that bees are particularly difficult to identify, compromising any possibility of biodiversity conservation.

This study focuses on characterizing pollinator communities on small Italian islands (Ventotene, Santo Stefano, Procida, Ischia, Capri) and assessing the effects of human activities, with comparisons to mainland sites (Rome, Naples, Circeo National Park). The 588 specimens collected were identified using an integrated approach, combining molecular techniques (DNA barcoding) with morphological identification. Pollinator species richness was tested with parameters such as island size, isolation and other ecological and geographical variables, land use and floral species present at the sampling sites.

The results highlight that island environments are heavily influenced by physical and ecological factors, leading to simplified and disharmonic biological communities compared to the mainland. Pollinator communities are shaped by island isolation, human presence and flowering plant diversity. Human-induced habitat modifications were less impactful on islands compared to highly urbanized mainland areas. Despite the vulnerability of islands, they can sustain significant biodiversity and resilience through moderate urbanization and the conservation of natural resources, like floral diversity. The small island effect was observed, with smaller islands supporting high pollinator richness. Furthermore, isolation has driven unique genetic variations in island pollinator populations, emphasizing the need for localized conservation strategies.

This study enriched molecular databases with new haplotypes, provided insights into ecosystem dynamics, and emphasized sustainable urbanization and agricultural practices. It highlights islands as ideal models for understanding biodiversity and ecosystem resilience, with applications in conservation, landscape regeneration and sustainability.