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EDITORIAL NOTES

Special issue on insect conservation in biodiversity hotspots

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Most of Earth's biodiversity is found in 36 biodiversity hotspots, particularly in the tropics and in Mediterranean-type environments, yet less than 10% natural intact vegetation remains therein. Biodiversity hotspots are most severely threatened worldwide due to ongoing fragmentation, deterioration and loss of natural and semi-natural habitats, agro-economic pressure, urbanization, pollution, and the accelerating rate of climate change. This is particular the case in tropical Africa and parts of Asia, where demographic pressure and the demand for agricultural land is highest (Habel et al. 2019). In global biodiversity hotspots, where endemism is high, and native vegetation highly impacted, many insect species are both endemic and threatened. However, insect diversity, endemicity and threat status are largely unknown in these regions. Indeed, many insect species are declining at rates that match and likely exceed those of vertebrates and vascular plants in many of these hotspots. Insect biodiversity and its conservation are thus among the main global topics in conservation science and one of the major challenges for the present and coming generations.

This special volume comprises a set of papers addressing the status and need to fill knowledge gaps of the diversity and conservation of insects and their habitats (Moir and Young 2023). Pearson and Wiesner (2023) underline that the depth and breadth of knowledge of a well-studied taxon 'tiger beetles', can justify its use as a model for choosing hotspots. They argued that perhaps the future of hotspots in biodiversity conservation might depend on the level of knowledge for a few well-studied taxa. Conservation efforts should be built on the identification of hotspots that are either species-rich or that harbor a high proportion of narrow-ranged (endemic) species with varying functional roles (Rocha-Ortega et al. 2023). The tropical and subtropical rainforests of eastern Australia have been regarded as a major component of Australia's global hotspot, yet these rainforests have been reduced in extent by about 30% of its original area, and the growing impacts of global warming means they cannot be regarded as 'safe' from a conservation point of view (Kitching et al. 2023). Despite the efforts conducted so far to compile data on water beetles in the Mediterranean hotspot, the information on the distribution of this insect group is scarce (Belhaj et al. 2023). Clearly, conservation-planning in biodiversity hotspots should be supported by a good understanding of the geographical distribution of species. This special issue also includes papers identifying main stressors for impoverishment and homogenization of insect faunas, such as the euglossine populations in human-modified Cerrado hotspot landscapes (Leão-Gomes and Vasconcelos 2023). In dung beetles, intraspecific changes in phenotypically plastic morphological traits can be a reliable indicator of habitat disturbance than changes in abundance in the Cerrado hotspot (Franco et al. 2023). Intriguingly, a study from Australian savannas showed that grazing by cattle—a dominant land-use therein- seemed to have generated a high resilience of the ant fauna in rather fire-prone grassy ecosystems subject to livestock grazing (Arcoverde et al. 2023). In an increasingly degraded world, overlooked hotspots for biodiversity must represent concern for the insect conservation agenda but also the need to promote legislation to protect fragile—but poorly known ecosystems that constitute the reservoirs of large distinctive insect communities, such as the wild bee community in the Californian biodiversity hotspot (Falcon-Brindis and León-Cortés 2023). Habitat heterogeneity might trigger negative changes in abundance of

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cavity nesting insect communities and their natural enemies in the Atlantic Forest in South America (Deus et al. 2023). Researchers have also documented significant changes in the species composition and richness of Arctiini moths in mountain ecosystems from the Mesoamerican biodiversity hotspot (Montañez-Reyna et al. 2023), and contrasting responses in the landscape-scale soil arthropod biodiversity due to a mix of biotopes from different landscapes in South Africa (Eckert et al. 2023). In addition, detailed, autecological and (climate change) distributional studies have always been and continue to be the backbone for preserving and restoring habitat suitability for insect populations at a range of scales. Several study cases have added to this body of work: *Eucornia sanarita*, an endemic butterfly to the Atlantic Forest biodiversity hotspot (Rosa et al. 2023), the emblematic monarch butterfly (*Danaus plexippus*) at the overwintering sites in Mexico (Sánchez-Tlacuahuac et al. 2023), and the Taiwan's endemic bumblebee *Bombus formosellus* lying in the middle of the mountains of southwest China, Philippines, and Japan (Lu and Huang 2023).

Overall, there is a world-wide objective to assess the stressors, patterns, process and/or consequences of insect decline and conservation—yet for biodiversity hotspots a complete and thorough picture is missing, and as some authors claim, this seems the final countdown for biodiversity hotspots (Habel et al. 2019).

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