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EARLY VIEW ARTICLE

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Special issue series: Advancing wild bee research and conservation through standardized methods


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We are living in a time of unprecedented global change and biodiversity loss. To “monitor” is, at its essence, to pay attention to and track the status of something. All wild creatures are deserving of respect, attention, and conservation intervention when needed. Monitoring is the practice that helps us know when action needs to be taken to help support the continuation of wild populations during these problematic times.

This special issue series of the *Journal of Melittology* is a product of the U.S. National Native Bee Monitoring Research and Coordination Network (<https://www.nativebeemonitoring.org/>). This network was funded by the Pollinator Health Program of the National Institute of Food and Agriculture within the United States Department of Agriculture. The network has worked from 2020 onward to connect and support the bee research, monitoring, and conservation communities; establish standardized protocols and practices in wild bee data collection; and identify strategic next steps for implementation of a unified national monitoring program. Network members (>800) come from local, state, and federal governments, academia, non-profits, and other groups. Network members are primarily based at US institutions, as the research coordination network focuses on US bee monitoring. Members are diverse in terms of their career stage, gender, and geography within the US. The articles in this special issue series were authored by a subset of network members. These authors were given information from the broader bee research and conservation communities that was captured through a series of workshops held from 2021–2023. The authors then transformed this information into the articles presented here.

This special issue series focuses on advancing standardized, reproducible methods for the study of wild bees. In Levenson *et al.* (2024a) and Cariveau *et al.* (2024), we outline methods for two of the most popular types of wild bee data collection: assessing

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wild bee communities and analyzing plant-pollinator interactions. In Otto *et al.* (2024), we provide methods for generating occupancy data, which is an emerging type of data collection for wild bees that is already used extensively in vertebrate monitoring programs. We also provide methods for collecting wild bee samples for parasite and pathogen analyses in Strange *et al.* (2024), and samples intended for genetic/genomic and other molecular analyses in López-Urbe *et al.* (2024). In Du Clos *et al.* (2024), we outline a framework for wild bee data management, *The Wild Bee Data Standard*, for how data can be recorded, managed, and reported, regardless of whether data collection efforts follow the aforementioned protocols. The methods in these articles can be embedded within monitoring schemes or can also be used for stand-alone data collection efforts. We see a community need for establishing standardized methods that are scalable in this way, as we outline in Levenson *et al.* (2024b). The standards presented here can, for example, help reduce the barrier to entry for new data collectors, ensure that data meet quality thresholds, and support interoperability across projects.

We recognize that data collected using other methods are, and will continue to be, of enormous value. We also acknowledge the value of related, previously-published protocols; many of the authors of these previous protocols have also co-authored the articles in this special issue. Our intention here is to build on previous methods and provide additional guidance that we ourselves would have appreciated having earlier in our work. We place a heavier emphasis on data standards than previous efforts, integrating insights from the broader biodiversity data standards community. We also developed the protocols and practices in these articles through a more open process than has been previously used, receiving guidance from the broader bee research, conservation, and monitoring community on many of the design aspects of these protocols.

We fully intend to update these protocols as our fields continue to evolve and as new methods are developed. Our protocols heavily emphasize lethal collection, given that many bees cannot be readily identified to species. We have, however, included non-lethal methods whenever possible and we look forward to a future where emerging non-lethal methods are field-deployable at the scale of lethal methods. Although these protocols are based on the experience of North American researchers, we expect they can be modified or adapted to other regions of the world. We also envision many exciting opportunities to collaborate with wild bee researchers around the world to develop global standards for wild bee data collection.

We are honored to publish these articles in the *Journal of Melittology*, a journal founded by the late Charles Michener at the University of Kansas, along with his colleagues, and now managed under the revitalizing leadership of Victor H. Gonzalez. We extend our sincere thanks to Victor H. Gonzalez for his leadership and support, Claus Rasmussen for his editorial guidance, and to the reviewers for their timely and valuable comments and suggestions. We are also grateful to Marianne A. Reed, Digital Publishing and Repository Manager at the University of Kansas Libraries, and Eric Bader, Publishing Specialist and Layout Editor of the journal, for their invaluable support in ensuring the success of this project. The *Journal of Melittology* has a cherished history amongst wild bee researchers, and we are grateful for the opportunity to share our work in this venue and contribute to its legacy.

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Journal of Melittology

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The *Journal of Melittology* is an international, open access journal that seeks to rapidly disseminate the results of research conducted on bees (Apoidea: Anthophila) in their broadest sense. Our mission is to promote the understanding and conservation of wild and managed bees and to facilitate communication and collaboration among researchers and the public worldwide. The *Journal* covers all aspects of bee research including but not limited to: anatomy, behavioral ecology, biodiversity, biogeography, chemical ecology, comparative morphology, conservation, cultural aspects, cytogenetics, ecology, ethnobiology, history, identification (keys), invasion ecology, management, melittopalynology, molecular ecology, neurobiology, occurrence data, paleontology, parasitism, phenology, phylogeny, physiology, pollination biology, sociobiology, systematics, and taxonomy.

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