



Discovery of the Palearctic species *Neaylax verbenacus* (Nieves-Aldrey, 1988) (Hymenoptera: Cynipidae: Aulacideini) in Manitoba, Canada

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Introduction

Gall wasps are plant-associated insects that cause their host plants to form novel and phenotypically diverse plant structures (galls), within which their offspring develop (Melika 2006). Gall wasps are usually host-specific, attacking one host plant species, or several species in the same genus (Melika 2006). Some gall wasps have been introduced outside their endemic ranges along with their host plants, and some of these species, such as *Dryocosmus kuriphilus* Yasumatsu and *Phanacis hypochoeridis* (Kieffer), have become “global invaders” and are commonly encountered across multiple continents (Buffington et al. 2020, Avtzis et al. 2018, Nastasi & Deans 2021). Further adding to knowledge of gall wasp introductions, we report the first record of *Neaylax verbenacus* (Nieves-Aldrey, 1988) in Canada, representing the first record of this genus and species in North America. This species is native to Mediterranean Europe (Nieves-Aldrey 1988, 2001, Melika 2006); our report represents the first record outside of its known endemic range.

Three adult female *Neaylax verbenacus* were observed and collected off *Salvia* × *digenea* plants in an urban garden in Winnipeg, Manitoba, Canada. Galls were subsequently observed on the fruits, the previously known plant organ galled by *N. verbenacus*. Both adult wasps and galls were posted as observations to the community science platform iNaturalist (<https://inaturalist.org>). Adult wasps were first observed on host plants on 5 June 2024, and galls were first observed on 7 July 2024. Collections and observations occurred throughout June, July, and August 2024 (GBIF 2024).

Adult wasps are deposited at PSUC (Frost Entomological Museum, The Pennsylvania State University, University Park, PA, USA).

Results and Discussion

The *Neaylax* specimens from Winnipeg (Fig. 1) are *N. verbenacus* based on the diagnostic characters given by Nieves-Aldrey (1988, 2001) and Melika (2006), particularly the lack of a strong median mesoscutal impression, the complete notauli (Fig. 2), the open fore wing marginal cell, and the lack of a pilose patch on the second metasomal tergite. This combination of characters distinguishes *Neaylax* from all other Nearctic Aulacideini (Nastasi et al. 2024a, 2024b). Our specimens perfectly agree with the SEM images in Nieves-Aldrey (2022), especially in characters of the mesosoma. The author of the species also confirmed the identification after examining our images (see acknowledgments).

Known hosts for *N. verbenacus* are *Salvia pratensis* L. and *S. verbenaca* L. (Nieves-Aldrey 1988, 2001). The host plant recorded here, *S.* × *digenea*, is a hybrid of disputed parentage, but may correspond to a cross of *S. amplexicaulis* Lam. with either *S. nemorosa* L. or *S.* × *sylvestris* L. Together, these and several other sage species form a complex group that is often treated simply as *S. nemorosa* (Stace et al. 2015). *Salvia nemorosa* was previously known to host two *Neaylax* species, *N. salviae* (Giraud) and *N. nemorosae* (Balás), but *N. verbenacus* has not yet been recorded from this plant or *S.* × *digenea* (Melika 2006).

The introduction of *Neaylax verbenacus* to Canada was probably accidental. *Neaylax* have been intercepted at US ports of entry on sage plants originating from Egypt and Israel (M. Buffington, pers. comm.). No further records of adults or galls were previously known in North America. After discussing findings with members of the community, the second author deduced that the plants on which *Neaylax* were observed were purchased from a

market and distributed by prominent nurseries in Manitoba. Whether the purchased plants were hosts of gall wasps, or gall wasps were already present in the area is unclear. Given that observations of *N. verbenacus* in Winnipeg were all relatively closely located, it is possible that these individuals represent a localized introduction rather than an established population.

Material

https://data.canadensys.net/micropublications/resource?r=specimen_33

Acknowledgments

Michael Skvarla provided excellent recommendations for structuring the manuscript. Chris Friesen facilitated the exchange of specimens between the first two authors. Lyndi Garnett provided commentary on the identity of the *Salvia* species. Matt Buffington and Jerry Bowdrey provided useful information on *Salvia* gall wasp records in the US and United Kingdom. José Luis Nieves-Aldrey confirmed the identity of the *Neaylax* species.

This material is based upon work supported by the National Science Foundation under Grant Nos. DEB-1856626 and DEB-2338008. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation. LFN was supported by additional awards from the Society of Systematic Biologists.

References

- Avtzis, D. N., Melika, G., Matošević, D. & Coyle, D. R. (2019) The Asian chestnut gall wasp *Dryocosmus kuriphilus*: a global invader and a successful case of classical biological control. *Journal of Pest Science*, 92, 107–115. <https://doi.org/10.1007/s10340-018-1046-1>
- Buffington, M. L., Forshage, M., Liljeblad, J., Tang, C. T. & van Noort, S. (2020) World Cynipoidea (Hymenoptera): a key to higher-level groups. *Insect Systematics and Diversity*, 4 (4), 1. <https://doi.org/10.1093/isd/ixaa003>
- GBIF.org (2024) GBIF Occurrence Download. <https://doi.org/10.15468/dl.839jea>
- Melika, G. (2006) Gall wasps of Ukraine, Volume 1. *Vestnik zoologii*, The Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, Kiev, Ukraine. pp. 1–300.

- Nastasi, L. F., Buffington, M. L., Davis, C. K. & Deans, A. R. (2024a) Key to the North American tribes and genera of herb, rose, bramble, and inquiline gall wasps (Hymenoptera, Cynipoidea, Cynipidae *sensu lato*). *ZooKeys*, 1196, 177–207. <https://doi.org/10.3897/zookeys.1196.118460>
- Nastasi, L. F. & Deans, A. R. (2021) Catalogue of rose gall, herb gall, and inquiline gall wasps (Hymenoptera: Cynipidae) of the United States, Canada and Mexico. *Biodiversity Data Journal*, 9. <https://doi.org/10.3897/BDJ.9.e68558>
- Nastasi, L. F., Tooker, J. F., Davis, C. K., Smith, C. N., Frey, T. S., Hatfield, M. J., Presnall, T. M., Hines, H. M. & Deans, A. R. (2024b) Cryptic or underworked? Taxonomic revision of the *Antistrophus rufus* species complex (Cynipoidea, Aulacideini). *Journal of Hymenoptera Research*, 97, 399–439. <https://doi.org/10.3897/jhr.97.121918>
- Nieves-Aldrey, J. L. (1988) Descripción de una especie de *Isocolus* Foerster con notas de otras especies de Aylaxini nuevas para la península Ibérica. *Eos: revista española de entomología*, LXIV, 221–227.
- Nieves-Aldrey, J. L. (2001) Hymenoptera, Cynipidae. In: *Fauna Iberica Vol. 16*. Ramos, M. A. et al. (Eds.). Museo Nacional de Ciencias Naturales Consejo Superior de Investigaciones Científicas. Madrid, Spain. 636 pp.
- Nieves-Aldrey, J. L. (2022) Description of *Fumariphilus* Nieves-Aldrey, gen. nov., a new genus of herb gall wasps, with a key to genera of the tribe Aulacideini (Hymenoptera: Cynipidae). *Zootaxa*, 5155, 393–413. <https://doi.org/10.11646/zootaxa.5155.3.5>
- Stace, C. A., Preston, C. D. & Pearman, D. A. (2015) *Hybrid flora of the British Isles*. Botanical Society of Britain and Ireland, London, England. pp. 1–501.



Figs 1–5: *Neaylax verbenacus* (Nieves-Aldrey), adult female PSUC_FEM_81691 and galls *in situ*. 1 lateral habitus; 2 dorsal mesosoma; 3 gall *in situ*; 4 gall, cross section with developing cynipid larva; 5 host plant, flowering.