



<http://dx.doi.org/10.11646/zootaxa.3878.2.2>

<http://zoobank.org/urn:lsid:zoobank.org:pub:9AA56D9F-FBAA-4947-9ECA-C4C7569890BD>

The host plants of the Telamonini treehoppers (Hemiptera: Membracidae: Smiliinae) and the first diagnoses of nymphs for 14 species

MATTHEW S. WALLACE

Department of Biological Sciences, East Stroudsburg University of Pennsylvania, 200 Prospect Street, East Stroudsburg, PA 18301-2999 USA. E-mail: mwallace@esu.edu

Abstract

Recent research on the treehopper tribe Telamonini has focused on their classification and Nearctic distribution but little has been published on their biology, including detailed information on their host plants as well as data on their nymphal stage. Any studies including host plant data have emphasized adult records (often unreliable due to their movements), largely ignoring the nymphs, which are the predominant feeding stage. This work provides the first comprehensive summary of Telamonini host plants, it documents the first positive identification of the nymphs for several telamonine species (and the genus *Helonica*), and it provides the first morphological diagnoses for 14 species, thus filling in major gaps in the life history of many species. Host plant records were determined based on accounts in the literature (adults and nymphs), from rearings of nymphs on host plants to the adult stage, and from label data on museum specimens. The Telamonini are known from 22 families, 41 genera, and 80 species of mostly woody, deciduous trees (of which, six species are new host plant records). Nearly half of all telamonines have been collected from more than one plant genus and only 12 species are known from a single host plant species. Telamonine nymphs were reared to the adult stage on 15 plant species. Of 68 telamonine species, 45 have been found on oak (*Quercus*), and white oak (*Q. alba*) is the most common telamonine host plant. *Telamona monticola* has the most recorded host plants with 29. The work includes 23 color illustrations showing both live and preserved nymphs, representing 15 species, all illustrated for the first time (eight are positively identified for the first time). Differences in nymphal morphology among species within *Archasia*, *Glossonotus*, *Heliria*, and *Telamona* suggest current generic definitions need revision. This study highlights the need for an increased emphasis on nymphal collections when determining treehopper host plants and inferring classifications.

Key words: checklist, diversity, host plants, immatures, Membracidae, Nearctic region, nymphs, *Quercus*, Telamonini, treehoppers

Introduction

The Telamonini (telamonines) are a predominantly North American tribe of large-sized (6–12 mm) treehoppers consisting of 10 genera and 68 species (Ball 1931; Wallace 2011; Deitz and Wallace 2010; Deitz and Wallace 2012). Wallace (2011) reinstated the Telamonini from synonymy with the closely related tribe Smiliini (*Cyrtolobus*, *Ophiderma*, *Smilia*, *Xantholobus*, etc.) as a result of a morphology-based phylogenetic analysis of 69 Smiliini species (sensu Deitz 1975). Telamonines are characterized by: their large size compared to most other Nearctic treehoppers (e.g. the Nearctic representatives of Acutalini, Membracini, and Smiliini), a distinctive anterior pronotal projection, longitudinal pronotal rugae, and hind wings with R_{4+5} and M_{1+2} veins free (Wallace 2011). Deitz and Wallace (2012) provided a checklist of Nearctic Telamonini species and their distribution by U.S. and Mexican states and Canadian provinces.

Despite the recent phylogenetic and geographical research, host plant records for telamonine treehoppers are relatively few and scattered in various regional studies published over the last 130 years. Significant works with Telamonini host plant data include Funkhouser (1917; listed host plants for telamonines collected in the Cayuga Lake Basin of New York); Ball (1931; remarked on host plants for many species in his taxonomic review of the Telamonini); Kopp and Yonke (1974; listed host plants for telamonines of Missouri); and Dietrich *et al.* (1999; provided host plants for many telamonines in North Carolina). Recently, Wallace (2011) provided a preliminary

Katja Seltmann for assistance with the Tri-Trophic Thematic Collection Network data; Stuart McKamey for assistance with nymphal characters; Mark J. Rothschild for donating specimens; and Jennifer L. Baker and Jaimie E. Brieger from the NCSU Libraries Special Collections for their assistance in retrieving literature. The copyrights for Figs. 1-3 belong to the author. This work was supported by East Stroudsburg University of Pennsylvania, and a 2013 East Stroudsburg University Faculty Development Grant. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect East Stroudsburg University of Pennsylvania.

Literature cited

- Andrews, E.A. (1929) The mound-building ant, *Formica exsectoides* F., associated with tree-hoppers. *Annals of the Entomological Society of America*, 22, 369–391.
- Ball, E.D. (1903) Descriptions of some new tree hoppers from the United States. *Proceedings of the Biological Society of Washington*, 16, 177–182.
- Ball, E.D. (1931) A monographic revision of the treehoppers of the tribe Telamonini of North America. *Entomologica Americana*, 12, 1–69.
- Ball, E.D. (1933) Some new treehoppers from the Southwest with notes on others. *Proceedings of the Biological Society of Washington*, 46, 25–32.
- Bartlett, C.R., Deitz, L.L., Rothschild, M.J. & Wallace, M.S. (2008) Treehopper diversity (Hemiptera: Membracidae) of Little Orleans, Allegany Co., Maryland. *Proceedings of the Entomological Society of Washington*, 110 (1), 130–143.
<http://dx.doi.org/10.4289/0013-8797-110.1.130>
- Beirne, B.P. (1961 [not dated]) *The Cicadas (Homoptera: Cicadidae) and Treehoppers (Homoptera: Membracidae) of Canada*. Canada Department of Agriculture, Research Branch, Science Information Section, Ottawa, 54 pp.
- Brimley, J.F. (1961) Notes on the Membracidae (Homoptera) of Prince Edward County, Ontario. *Canadian Field-Naturalist*, 75, 12–15.
- Burckhardt, D., Ouvrard, D., Queiroz, D. & Percy, D. (2014) Psyllid Host-Plants (Hemiptera: Psylloidea): Resolving a Semantic Problem. *Florida Entomologist*, 97 (1), 242–246.
<http://dx.doi.org/10.1653/024.097.0132>
- Daviault, L. (1937) Contribution à l'étude des insectes du Bouleau. *Le Naturaliste Canadien*, 64, 1–136.
- Deitz, L.L. (1975) Classification of the higher categories of the New World treehoppers (Homoptera: Membracidae). *North Carolina Agricultural Experiment Station Technical Bulletin*, 225, 1–177.
- Deitz, L.L. (1989) Bibliography of the Membracoidea (Homoptera: Aetalionidae, Biturritiidae, Membracidae, and Nicomiidae) 1981–1987. *North Carolina Agricultural Research Service Technical Bulletin*, 290, 1–31.
- Deitz, L.L. (team leader) (2008) (and updates) DrMetcalf: a resource on cicadas, leafhoppers, planthoppers, spittlebugs, and treehoppers. Available from: <http://www.lib.ncsu.edu/specialcollections/digital/metcalf/index.html> (accessed 10 June 2014)
- Deitz, L.L. & Kopp, D.D. (1987) Bibliography of the Membracoidea (Homoptera: Aetalionidae, Biturritiidae, Membracidae, and Nicomiidae) 1956–1980. *North Carolina Agricultural Research Service Technical Bulletin*, 284, 1–39.
- Deitz, L.L. & Wallace, M.S. (2010 and updates) Treehoppers: Aetalionidae, Melizoderidae, and Membracidae (Hemiptera). Available from: <http://treehoppers.insectmuseum.org> (accessed 10 June 2014)
- Deitz, L.L. & Wallace, M.S. (2012) Richness of the Nearctic treehopper fauna (Hemiptera: Aetalionidae and Membracidae). *Zootaxa*, 3423, 1–26.
- Dennis, C.J. (1952) The Membracidae of Wisconsin. *Transactions of the Wisconsin Academy of Sciences, Arts and Letters*, 41, 129–152.
- Dennis, C.J. (1962) Headstand mechanism in *Telamona unicolor* Fitch (Homoptera, Membracidae). *Entomological News*, 73 (2), 44.
- Dennis, C.J. (1965) Oklahoma treehoppers (Homoptera, Membracidae). *Proceedings of the Oklahoma Academy of Science*, 45, 50–64.
- Dennis, C.J. (1969) The treehoppers of Wisconsin in relation to the tension zone (Homoptera, Membracidae). *American Midland Naturalist*, 81 (1), 236–242.
<http://dx.doi.org/10.2307/2423665>
- Dietrich, C.H., McKamey, S.H. & Deitz, L.L. (2001) Morphology-based phylogeny of the treehopper family Membracidae (Hemiptera: Cicadomorpha: Membracoidea). *Systematic Entomology*, 26, 213–239.
<http://dx.doi.org/10.1046/j.1365-3113.2001.00140.x>
- Dietrich, C.H., Rothschild, M.J. & Deitz, L.L. (1999) Checklist and host plants of the treehoppers (Hemiptera: Membracidae) of North Carolina. *Proceedings of Entomological Society of Washington*, 101 (2), 242–262.
- Downes, W. (1919) Notes on a collection of Hemiptera. *Proceedings of the Entomological Society of British Columbia*, 1918, 13–16.

- Felt, E.P. (1903) Insects affecting forest trees. *Report Forest, Fish and Game Commission, State of New York*, 7, 479–534.
- Flynn, D.J., Balme, G.R., Deitz, L.L. & Rothschild, M.J. (2003) *Archasia pallida* (Fairmaire) (Hemiptera: Membracidae) in North Carolina. *Proceedings of the Entomological Society of Washington*, 105 (4), 1060–1061.
- Funkhouser, W.D. (1915) Life history of *Thelia bimaculata* Fab. (Membracidae). *Annals of the Entomological Society of America*, 8, 140–151.
- Funkhouser, W.D. (1917) Biology of the Membracidae of the Cayuga Lake Basin. *Cornell Agricultural Experimental Station Memoirs*, 2, 177–445.
- Funkhouser, W.D. (1923) Family Membracidae. In: *Britton's Guide to the insects of Connecticut. Part IV. The Hemiptera or sucking insects of Connecticut. Bulletin. State of Connecticut. State Geological and Natural History Survey*, 34, pp. 163–206.
- Glover, T. (1877) Homoptera. In *Report of the Entomologist and Curator of the Museum, Report of the Commissioner of Agriculture*, 1876, 17–46.
- Goding, F.W. (1893) Food plants of some N.A. Membracidae. *Insect Life*, 5, 92–93.
- Harris, T.W. (1841) Harvest flies, etc. (Hemiptera Homoptera). In: *A report on the insects of Massachusetts, injurious to vegetation*. Folsom, Wells, and Thurston, Cambridge, MA, 459 pp.
- Jones, H.C. (1937) The Membracidae of Nebraska (Homoptera). *Entomological News*, 48, 69–74.
- Katovich, S.A. & Ostry, M.E. (1998) Insects associated with butternut and butternut canker in Minnesota and Wisconsin. *Great Lakes Entomologist*, 31 (2), 97–108.
- Kopp, D.D. & Yonke, T.R. (1973) The treehoppers of Missouri: Part 1. Subfamilies Centrotinae, Hoplophorioninae, and Membracinae (Homoptera: Membracidae). *Journal of the Kansas Entomological Society*, 46 (1), 42–64.
- Kopp, D.D. & Yonke, T.R. (1974) The treehoppers of Missouri: Part 4. Subfamily Smilliinae; tribe Telamonini (Homoptera: Membracidae). *Journal of the Kansas Entomological Society*, 47 (1), 80–130.
- Lawson, P.B. (1922) The Membracidae of Kansas. *University of Kansas Scientific Bulletin*, 14, 27–110.
- Leonard, M.D. (1928) Families Cercopidae, Membracidae, and Cicadellidae. In: *A list of the insects of New York with a list of the spiders and certain other allied groups. Memoir. Cornell University Agricultural Experiment Station*, 101, 1–1121.
- Lin, C.P. & Wood, T.K. (2002) Molecular phylogeny of the North American *Enchenopa binotata* (Say) (Homoptera: Membracidae) species complex. *Annals of the Entomological Society of America*, 95 (2), 162–171.
[http://dx.doi.org/10.1603/0013-8746\(2002\)095\[0162:mpotna\]2.0.co;2](http://dx.doi.org/10.1603/0013-8746(2002)095[0162:mpotna]2.0.co;2)
- Loye, J.E. (1982) The bionomics of *Telamona monticola* (Homoptera: Membracidae). *Journal of the Kansas Entomological Society*, 55 (3), 598–604.
- Lugger, O. (1900) Sub-order Homoptera. In: *Bugs injurious to our cultivated plants. Bulletin of the Minnesota Agricultural Experiment Station*, 69, 1–259.
- Mason, C.E. & Loye, J.E. (1981a) An annotated list of treehoppers (Homoptera: Membracidae) of Delaware. *Entomological News*, 92 (1), 33–37.
- Mason, C.E. & Loye, J.E. (1981b) Treehoppers (Homoptera: Membracidae) collected at multiple levels in a deciduous woodlot in Delaware. *Entomological News*, 92 (2), 64–68.
- Matausch, I. (1910) Observations on Membracidae in the vicinity of Elizabeth and Newark, N. J. *Journal of the New York Entomological Society*, 18, 164–171.
- Matausch, I. (1912) Observations on some North American Membracidae in their last nymphal stages. *Bulletin of the American Museum of Natural History*, 31, 331–336.
- Metcalf, Z.P. & Wade, V. (1965) *General Catalogue of the Homoptera. A Supplement to Fascicle I - Membracidae of the General Catalogue of Hemiptera. Membracoidea. In Two Sections*. North Carolina State University, Raleigh, 1552 pp.
- Osborn, H. (1900) Remarks on the hemipterous fauna of Ohio with a preliminary record of species. *Annual Report of the Ohio State Academy of Science*, 8, 60–69.
- Osborn, H. (1922a) Homoptera in the vicinity of Cranberry Lake. *Technical Publication of New York State College of Forestry at Syracuse University*, 16, 24–54.
- Osborn, H. (1922b) Life history notes on Cranberry Lake Homoptera. *Technical Publication of New York State College of Forestry at Syracuse University*, 16, 87–104.
- Osborn, H. (1940) The Membracidae of Ohio. *Bulletin of the Ohio Biological Survey*, 7, 51–101.
- Osborn, H. & Drake, C.J. (1922) An ecological study of the Hemiptera of the Cranberry Lake Region, New York. *Technical Publication of New York State College of Forestry at Syracuse University*, 16, 5–24.
- Paiero, S.M., Marshall, S.A. & Hamilton, K.G.A. (2003) New records of Hemiptera from Canada and Ontario. *Journal of the Entomological Society of Ontario*, 134, 115–129.
- Plummer, C.C. (1936) New Membracidae (Homoptera) from Mexico, with notes on other species. *Annals of the Entomological Society of America*, 29, 682–693.
- Quisenberry, S.S., Yonke, T.R., & Kopp, D.D. (1978) Key to the genera of certain immature treehoppers of Missouri with notes on their host plants (Homoptera: Membracidae). *Journal of the Kansas Entomological Society*, 51 (1), 109–122.
- Severin, H.C. (1927) A third report upon the Membracidae (treehoppers) of South Dakota. *Proceedings of the South Dakota Academy of Science*, 11, 33–49.
- Southwick, E.B. (1892) Note on local Membracidae and Fulgoridae. *Science*, 19, 357.
<http://dx.doi.org/10.1126/science.ns-19.490.357>

- USDA: NRCS. (2014) The PLANTS Database. National Plant Data Center, Baton Rouge, LA. Available from: <http://plants.usda.gov> (accessed 10 June 2014)
- Tri-Trophic Thematic Collection Network. (2014 and updates) Supported by National Science Foundation grant ADBC#1115144. Available from: <http://tcn.amnh.org/> (accessed 10 June 2014)
- Van Duzee, E.P. (1889) Hemiptera from Muskoka Lake District. *Canadian Entomologist*, 21, 1–11.
- Van Duzee, E.P. (1908) Studies in North American Membracidae. *Bulletin of the Buffalo Society of Natural Sciences*, 9, 29–127.
- Wallace, M.S. (2008) Occurrence of treehoppers (Hemiptera: Membracidae: Smiliinae) on oaks in Delaware Water Gap National Recreation Area, 2004–2006. *Journal of Insect Science (University of Wisconsin, Madison)*, 8, 59. <http://dx.doi.org/10.1673/031.008.5901>
- Wallace, M.S. (2011) Morphology-based phylogenetic analysis of the treehopper tribe Smiliini (Hemiptera: Membracidae: Smiliinae), with reinstatement of the tribe Telamonini. *Zootaxa*, 3047, 1–41.
- Wallace, M.S., Bartlett, C.R., Deitz, L.L. & Rothschild, M.J. (2009) New state records of treehoppers (Hemiptera: Membracidae) for Delaware, Maryland, Mississippi, Pennsylvania, and West Virginia. *Proceedings of the Entomological Society of Washington*, 111 (3), 734–738. <http://dx.doi.org/10.4289/0013-8797-111.3.734>
- Wallace, M.S., Deitz, L.L. & Rothschild, M.J. (2003) Checklist of the treehoppers (Hemiptera: Membracidae) of Great Smoky Mountains National Park. *Proceedings of the Entomological Society of Washington*, 105 (3), 578–591.
- Wallace, M.S. & Maloney, S.M. (2010) Treehopper (Hemiptera: Membracidae) biodiversity and seasonal abundance in the Pocono till barrens, Long Pond, Pennsylvania. *Proceedings of the Entomological Society of Washington*, 112 (2), 281–294. <http://dx.doi.org/10.4289/0013-8797-112.2.281>
- Wallace, M.S. & Troyano, N.M. (2006) The oak-feeding smiliine treehoppers (Hemiptera: Membracidae) of Delaware Water Gap National Recreation Area. *Journal of the Pennsylvania Academy of Science*, 80 (1), 28–34.
- Wood, T.K. & Olmstead, K.L. (1984) Latitudinal effects on treehopper species richness (Homoptera: Membracidae). *Ecological Entomology*, 9, 109–115. <http://dx.doi.org/10.1111/j.1365-2311.1984.tb00703.x>
- Yothers, M.A. (1934) Biology and control of tree hoppers injurious to fruit trees in the Pacific Northwest. *Technical Bulletin. United States Department of Agriculture*, 402, 1–45.
- Yothers, M.A. & Allen, P.B. Jr. (1941) Observations of the biology and control of the treehopper *Heliria praealta* (Fowler) in orchards of the Pacific Northwest. *USDA Circular*, 606, 1–12.
- Zhang, J., Lashomb, J., Gould, A. & Hamilton, G. (2011) Cicadomorpha insects associated with bacterial leaf scorch infected oak in central New Jersey. *Environmental Entomology*, 40 (5), 1131–1143. <http://dx.doi.org/10.1603/en10083>