

Aton Forest Fellow's Annual Report and Prospectus

Charley Eiseman
December, 2023

The general focus of my research, both at Aton Forest and elsewhere, is documenting the host plants and natural history of understudied herbivorous insects. This month I completed the third installment of the third edition of my self-published serial e-book *Leafminers of North America*, and I am in the process of compiling a similar guide to North American sawfly larvae. I am continually updating both guides with information gleaned from newly published literature, photographs posted online (iNaturalist.org and BugGuide.net), and my own observations. When my own observations represent significant new information (e.g., new species or previously unknown host associations), I am documenting them thoroughly in peer-reviewed publications.

Research at Aton Forest

This year I visited Aton Forest five times. I photographed at least one example of each type of leaf mine and sawfly larva I encountered, along with miscellaneous other insects and signs thereof (e.g., galls and folded or tied leaves). Herbivorous insect larvae that I could not identify to species in the field were collected in an attempt to rear them to adults. The dates of each visit are listed below, along with the general area explored, a link to view photos from that day, my specific objectives/targets for the day (if any), and a list of some other highlights (new discoveries or mysteries to follow up on in the future).

May 17 – State Line Hill Rd.; stream near Aton Forest headquarters; hill south of Doolittle Lake Brook

https://www.inaturalist.org/observations?on=2023-05-17&place_id=any&subview=table&user_id=ceiseman&verifiable=any

I navigated to GPS coordinates of known sites for *Peltigera* lichens to look for leaf-mining midge larvae, but I failed to find the lichens. Other targets included the mystery feeding sign on interrupted fern (*Osmunda claytoniana*) noted in June 2022 (consisting of narrow channels on the lower leaf surface) and leafminers on *Conocephalum* liverworts and white wood aster (*Eurybia divaricata*). I found the fern feeding sign, but the culprit was not in evidence, so I will have to check even earlier next year. I did not find any leaf mines at all during this visit, but I collected a small piece of *Conocephalum* in a vial just in case there were insect larvae hidden inside.

- The piece of liverwort produced an adult midge (Chironomidae: *Paraphaenocladus exagitans*) five days later, and an adult leaf-mining fly (Agromyzidae: *Phytoliriomyza ?dorsata*) at the end of the month.
- Reared *Coelostathma discopunctana* (Tortricidae) from wild sarsaparilla (*Aralia nudicaulis*)—a new host record, and in time to add it to my paper about Lepidoptera that feed on this plant.
- Adults of the weevil *Anthonomus suturalis* (Curculionidae) were abundant in association with *Phylloxera* galls on hickory. I confirmed my hunch that the larvae of this species develop in the galls by collecting some galls and having adults emerge a few weeks later.

June 11 – Headquarters; nearby stream; Doolittle Lake Brook

https://www.inaturalist.org/observations?on=2023-06-11&place_id=any&subview=table&user_id=ceiseman&verifiable=any

Targets included leaf mines of the unknown fly (Agromyzidae: *Liriomyza*) on false hellebore (*Veratrum viride*), which I succeeded in finding, and of the possibly undescribed fly (Anthomyiidae: *Chirosia*) on silvery spleenwort (*Deparia acrostichoides*), which I did not find.

- Collected larvae of two different sawfly species on bristly locust (*Robinia hispida*) at Headquarters; there is a confusing group of species on locusts, and more rearing is needed to sort them out.
- Collected beetle larvae feeding on hooked buttercup (*Ranunculus repens*) and reared an adult *Prasocuris vittata* (Chrysomelidae); probably the first rearing record for this species, although adults have been found on other buttercup species previously.

June 20 – Stream near headquarters; swamp between N Colebrook Rd and State Line Hill Rd

https://www.inaturalist.org/observations?on=2023-06-20&place_id=any&subview=table&user_id=ceiseman&verifiable=any

I made a brief visit to look again for mines of the silvery spleenwort fly, and I found a few just getting started (on June 18 2022, mines were abundant, many of them already empty, and all the ones I collected turned out to be parasitized by braconid wasps).

- Collected larvae of a likely undescribed leaf-mining fly (Agromyzidae: *Phytomyza*) on marsh marigold (*Caltha palustris*).
- Collected a leafhopper from silvery spleenwort, which turned out to be a new host record for *Eupteryx flavoscuta* (Cicadellidae).

August 26 – Headquarters; Bull Pasture

https://www.inaturalist.org/observations?on=2023-08-26&place_id=any&subview=table&user_id=ceiseman&verifiable=any

I came primarily to lead a walk/talk about leafminers, and did a bit of documenting and collecting while I was at it.

- Found a leaf mine of an undescribed beetle (Buprestidae: *Brachys*) on maleberry (*Lyonia ligustrina*); more specimens are needed before this species can be named.

August 27 – State Line Hill Road

https://www.inaturalist.org/observations?on=2023-08-27&place_id=any&subview=table&user_id=ceiseman&verifiable=any

A brief morning exploration before heading home.

- Found a conspicuous bud gall on mint (*Mentha*) that doesn't seem to match anything that has been described before, but is probably caused by a midge (Cecidomyiidae).

September 24 – Cabin; Doolittle Lake Brook; Bull Pasture

https://www.inaturalist.org/observations?on=2023-09-24&place_id=any&subview=table&user_id=ceiseman&verifiable=any

I had no particular objective for this visit; I spent the night in the cabin after participating in the Berkshire Biodiversity Day on September 23, and I did a little exploring and collecting before heading home.

- Found leaf mines of an undetermined leaf-mining fly (Agromyzidae: *Phytomyza*) on American fly honeysuckle (*Lonicera canadensis*), previously known from a single female specimen I reared in Massachusetts several years ago. Males are needed to identify or describe the species.
- Found *Caliroa* (Tenthredinidae) larvae on maleberry (*Lyonia ligustrina*), the first record of any sawfly feeding on this plant.

- Collected leaf mines of *Macrosaccus morrisella* (Gracillariidae) from hog peanut (*Amphicarpaea bracteata*) to rear adult moths for comparison with similar ones reared from groundnut (*Apios americana*) that I suspect represent an undescribed species.

October 18 – N Colebrook Road; Doolittle Lake Brook

https://www.inaturalist.org/observations?on=2023-10-18&place_id=any&subview=table&user_id=ceiseman&verifiable=any

My main objective was to collect more mines of the American fly honeysuckle fly, and that was successful.

- Collected a stem-mining fly larva (Agromyzidae: *Ophiomyia*) on rough bedstraw (*Galium asprellum*), possibly the same species I found on sweet-scented bedstraw (*G. triflorum*) last year and hoped to find again.
- Collected larvae of a leaf-mining moth on red oak (*Quercus rubra*) that I had assumed was *Stigmella altella* (Nepticulidae) until I reared some adults last year (from larvae collected elsewhere) and discovered that it is an undescribed species.

Field Research at Other Sites

I conducted investigations of herbivorous insects in my own yard (Northfield, MA) and surrounding areas throughout the growing season. Explorations farther afield included:

- April 27 – A successful trip to Egremont, MA, with the goal of collecting and rearing a new species of dark-winged fungus gnat (Sciaridae) that mines in petioles of Virginia waterleaf (*Hydrophyllum virginianum*)
- May 11 to October 12 (11 days total) – With Adam Kohl, I conducted rapid ecological assessments of the Norcross Wildlife Foundation's properties in south-central MA and adjacent CT, and identified vascular plants in long-term monitoring plots at one of the properties. I observed and collected herbivorous insects opportunistically during this work as well as while conducting the fieldwork listed below.
- May 23 to October 3 (14 days total) – I continued the botanical inventory and natural community mapping study of 24 summits in Mount Washington, MA and surrounding areas, sponsored by Green Berkshires, that I began in 2021.
- June 6 – I conducted a rare plant survey for Kestrel Land Trust in the Mt. Holyoke Range (western MA).
- July 4 to August 11 – With Julia Blyth and our baby daughter Ayla, I documented and collected leafminers and sawfly larvae throughout the midwestern and western US. My observations from this trip can be viewed here:
https://www.inaturalist.org/observations?d1=2023-07-04&d2=2023-08-11&place_id=any&subview=table&user_id=ceiseman&verifiable=any
- August 11 to 12 – Julia, Ayla, and I participated in a bioblitz at Red Stone Farm in Pike County, Ohio. My observations from this event can be viewed here:
https://www.inaturalist.org/observations?d1=2023-08-11&d2=2023-08-12&place_id=31&subview=table&user_id=ceiseman&verifiable=any
- September 23 – I attended the Berkshire Biodiversity Day in Egremont, MA. My observations from this event can be viewed here:
https://www.inaturalist.org/observations?on=2023-09-23&place_id=any&subview=table&user_id=ceiseman&verifiable=any

Other Activities

- Over the winter I worked on a new project involving the taxonomy of tischeriid moths that mine leaves of oak and chestnut, as well as on the guide to sawfly larvae and reports on the work for Green Berkshires.
- April 13 – I gave a Zoom talk, “Turning a Barren Lawn into Thriving Habitat,” for Greening Greenfield’s “Lawns to Meadows” series.
- April 23 – I presented my “Native Plants as Insect Habitat” talk in Wendell, MA.
- May 1 – I led a nature walk for the Western Mass City Nature Challenge in New Salem, MA
- May 26 – I answered questions about vernal pool certification after an online streaming of a video I recorded on this topic several years ago.
- July 16 to 19 – I attended the International Congress of Dipterology in Reno, NV, and gave a plenary presentation entitled “Leaf-mining Diptera in North America.”
- August 5 – As an instructor at the Lepidoptera Course at the Southwestern Research Station in Portal, AZ, I gave a lecture about leaf-mining moths and then led a field trip on the same topic.
- August 26 – Leafminer walk and talk at Aton Forest.
- September 16 – I led an invertebrate tracking walk at Fitzgerald Lake Conservation Area, Northampton, MA.
- September 23 – I presented a slideshow entitled “Backyard Leafminers” at the Berkshire Biodiversity Day in Egremont, MA.
- Throughout the year, I served as a consultant for the Greentree Foundation’s survey of moths on their property in Manhasset, NY, continuing the work we began in 2022.
- Throughout the year, as part of my leafminer and sawfly research, I have reviewed and identified photos of these insects submitted to iNaturalist (including those added to the “Leafminers of North America” project I created). According to the website’s calculations as of December 29 (<https://www.inaturalist.org/stats/2023/ceiseman>), in 2023 I have helped 2,647 people with 29,844 identifications.

Peer-reviewed Articles Published in 2023

- Xuan, Jing-Li, Sonja J. Scheffer, Owen Lonsdale, Brian K. Cassel, Matthew L. Lewis, Charles S. Eiseman, Wan-Xue Liu, and Brian M. Wiegmann. 2023. A genome-wide phylogeny and the diversification of genus *Liriomyza* (Diptera: Agromyzidae) inferred from anchored phylogenomics. *Systematic Entomology* 48: 178–197.
- Eiseman, Charles S., Armin Namayandeh, John van der Linden, and Michael W. Palmer. 2023. *Metriocnemus erythranthei* sp. nov. and *Limnophyes viribus* sp. nov. (Diptera: Chironomidae: Orthocladiinae): leafminers of monkeyflowers, speedwells, and other herbaceous plants, with new observations on the ecology and habitats of other leaf-mining Chironomidae. *Zootaxa* 5249(1): 41–68.
- Eiseman, Charles S. and David R. Smith. 2023. A review of Nearctic *Empria* Lepeletier and *Taxonus* Hartig species (Hymenoptera: Tenthredinidae: Allantinae) feeding on rosaceous herbs and shrubs with two species newly reported from *Geum* L. *Proceedings of the Entomological Society of Washington* 125(1): 68–76.

Eiseman, Charles S., David R. Smith, and Tracy S. Feldman. 2023. Distinguishing larvae and prepupae of the two buttonbush-feeding sawflies (Hymenoptera: Tenthredinidae: *Pseudosiobla* Ashmead). *Proceedings of the Entomological Society of Washington* 125(1): 195–200.

[Several other articles are in press; *Proceedings of the Entomological Society of Washington* experienced major delays this year, with the “January” issue not being published until November.]

Other 2023 Publications and Reports

Eiseman, Charley. 2023. BugTracks. <https://bugtracks.wordpress.com/> [5 blog posts in 2023]

Nieukerken, Erik J. van and Charles S. Eiseman. 2023. Superfamily Nepticuloidea [families Nepticulidae and Opostegidae]. pp. 24–28 *In* Pohl, Gregory R. and Stephen R. Nanz (eds.). *Annotated Taxonomic Checklist of the Lepidoptera of North America, North of Mexico*. Wedge Entomological Research Foundation, 580 pp.

Nieukerken, Erik J. van, Charles S. Eiseman, and Donald R. Davis. 2023. Family Heliozelidae. p. 33 *In* Pohl, Gregory R. and Stephen R. Nanz (eds.). *Annotated Taxonomic Checklist of the Lepidoptera of North America, North of Mexico*. Wedge Entomological Research Foundation, 580 pp.

Nieukerken, Erik J. van and Charles S. Eiseman. 2023. Family Tischeriidae. pp. 35–36 *In* Pohl, Gregory R. and Stephen R. Nanz (eds.). *Annotated Taxonomic Checklist of the Lepidoptera of North America, North of Mexico*. Wedge Entomological Research Foundation, 580 pp.

Eiseman, Charles S. 2023. Family Bucculatricidae. pp. 48–49 *In* Pohl, Gregory R. and Stephen R. Nanz (eds.). *Annotated Taxonomic Checklist of the Lepidoptera of North America, North of Mexico*. Wedge Entomological Research Foundation, 580 pp.

Eiseman, Charles S. and Donald R. Davis. 2023. Family Gracillariidae. pp. 50–56 *In* Pohl, Gregory R. and Stephen R. Nanz (eds.). *Annotated Taxonomic Checklist of the Lepidoptera of North America, North of Mexico*. Wedge Entomological Research Foundation, 580 pp.

Eiseman, Charley. 2023. *Leafminers of North America, Third Edition*. Privately published e-book, clxviii+406 pp. Available from: <http://charleyeiseman.com/leafminers/>

Plans for 2023

This winter, my projects include completing a monograph on leaf-mining flies (Agromyzidae), continuing work on the taxonomy of tischeriid moths, continuing to update the *Leafminers of North America* guide, continuing to work on the guide to sawfly larvae, and preparing reports on my botanical / natural community surveys for Green Berkshires. If time permits, I also hope to complete a paper on my ten-year survey of leaf-mining moths on Nantucket. Other writing projects include ongoing collaborations on the taxonomy and natural history of leaf-mining flies in the families Chironomidae, Chloropidae, and Sciaridae; beetles in the families Buprestidae, Chrysomelidae, and Curculionidae; and moths in the families Bucculatricidae, Cosmopterigidae, Elachistidae, Gracillariidae, Heliozelidae, Nepticulidae, and Tortricidae. These collaborations will become higher priorities when my collaborators are able to find time to work on them.

During the field season, in addition to continuing to add to the overall list of herbivorous insects documented at Aton Forest, I will have a list of specific targets in mind each time I visit, with the goal of collecting larvae and rearing them to adults so that the species in question can be identified (and described, if they turn out to be new). Although I succeeded in collecting a number of these species this year, I have left them on this list for now because I won't know until spring whether I have succeeded in rearing adults.

They include:

- Early May: mystery feeding channels on interrupted fern
- May / early June: *Phytomyza* on white wood aster, *Pseudopostega* on bugleweed
- Throughout the season, beginning in June: check thallose liverworts along Doolittle Lake Brook for mining fly larvae; collect mines of *Ophiomyia parda/quinta* on asters and *Phytomyza agromyzina/notopleuralis* on dogwoods, with the hope of rearing enough adults to determine whether these species pairs represent synonyms
- Mid- to late June: *Chirosia* on silvery spleenwort, *Agromyza* on avens, *Liriomyza* on false hellebore, *Phytomyza* on marsh marigold, leaf spot gall midge on sweetgale, bud gall midge on meadowsweet, leaf curl gall midge on highbush blueberry
- Mid- to late summer: stem-mining *Ophiomyia* on bedstraws; *Mentha* bud gall midge
- Autumn: check American fly honeysuckle (*Lonicera canadensis*) along Doolittle Brook for *Phytomyza* leaf mines; maleberry *Brachys* and *Caliroa*

Other fieldwork will include further surveys sponsored by Green Berkshires in the vicinity of Mount Washington, MA, and probably further ecological assessments for the Norcross Wildlife Foundation.

I am scheduled to teach a “Leaf and Stem Mining Insects” field seminar at the Eagle Hill Institute in Steuben, ME from August 4 to 9.