VES News

The Newsletter of the Vermont Entomological Society

Number 107
Spring 2020

VES NEWS

The Newsletter of the
Vermont Entomological Society

The **Vermont Entomological Society** (VES) is devoted to the study, conservation, and appreciation of invertebrates. Founded in 1993, VES sponsors selected research, workshops and field trips for the public, including children. Our quarterly newsletter features developments in entomology, accounts of insect events and field trips, as well as general contributions from members or other entomologists.

VES is open to anyone interested in arthropods. Our members range from casual insect watchers to amateur and professional entomologists. We welcome members of all ages, abilities and interests.

You can join VES by sending dues of $15 per year to:

Deb Kiel
147 Allen Irish Road
Underhill, VT 05489

Cover Photo:
Blister Beetles (Family Meloidae)
by Bill Boccio.

Back Cover Photo:
Unequal Cellophane Bee (*Colletes inaequalis*)
by Laurie DiCesare

For more information on the Vermont Entomological Society, visit
www.VermontInsects.org

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VES Financial Statement 2019
Submitted by Treasurer Deb Kiel

Assets at Start	**$4,194.82**
Income:	
Membership Dues	$590.00
Donations	$ 22.00
Book Royalties	$ 32.00
Ross Bell Memorial	$200.00
Newsletter Purchases	$ 4.00
Total Income:	**$848.00**
Expenses:	
Newsletter Printing	$1013.46
Overpayment for Newsletter	$ 1.48
Postage	$ 143. 04
Stipend for Editing Newsletter	$ 400.00
Stipend for Publisher Tutorial	$ 65.00
Cost of Publisher Program	$ 100.00
Webhosting (2018 &2019)	$ 327.00
Memorial for Dick Dearborn	$ 100.00
Paper Statement Fees	$ 27.00
Charge for Canadien check	$ 5.57
Total Expenses:	**$2182.55**
Assets at End of Year	**$2,860.27**

Newsletter Schedule

Spring:	Deadline April 7 - Publication May 1
Summer:	Deadline July 7 - Publication August 1
Fall:	Deadline October 7 - Publication November 1
Winter:	Deadline January 7 - Publication February 1

Membership ~ Check Your Mailing Label

The upper right corner of your mailing label will inform you of the month and year your VES membership expires.
Dues are $15 and can be sent to our Treasurer:
Vermont Entomological Society
c/o Deb Kiel
147 Allen Irish Road
Underhill, VT 05489

President's Message

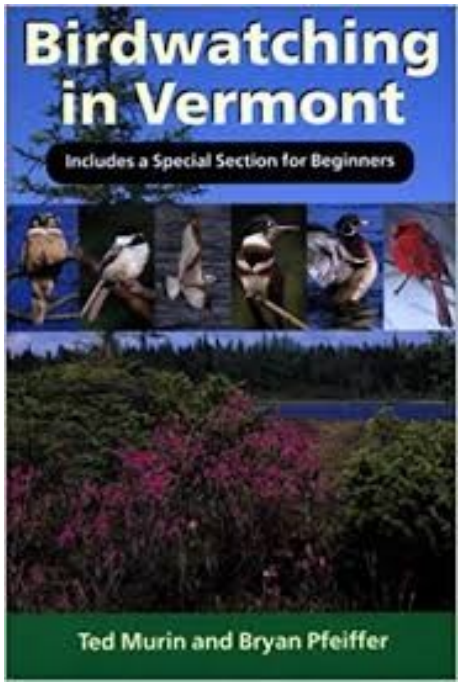
As I am writing this correspondence, the Covid-19 pandemic has taken a dream-like grip on most of our realities. We are dealing with social distancing, facial masks, home quarantines, food safety, nonessential buying, essential employees, lack of income, payment of bills, not being able to visit friends or relatives, motels and rest areas being closed, etc. We are, to a certain extent, able to recreate within the current "stay at home" conditions, but with the fear that even more restrictive measures my occur. Still, I hope that some of the current restrictions and conditions will have abated by the time folks receive this newsletter. In addition to our annual planning meeting being postponed, many other local and national events have been canceled. We have not yet rescheduled our planning meeting, but would hope to do it later in the year. We still have some events on our calendar and will of course be aware of social distancing protocol, etc. at the time. It's anticipated that even when current restrictions are lifted, some people will be less inclined to participate with others before being vaccinated against the Covid-19 virus. We may offer some ad hoc field trips later in the year, and we will notify folks about those opportunities via e-mail or Facebook.

One of our scheduled field trips is to Cranberry Meadow in Woodbury. This property (28 acres) is fortunately being bought and conserved by the town of Woodbury. Cranberry Meadow is a fen composed of a floating sedge mat surrounded by the slow part of a good-sized brook. We hope to visit and find some cool stuff as well as provide faunistic information for the town.

Michael Sabourin
VES President

Book Review

by Michael Sabourin



Birdwatching in Vermont

by Ted Murin and Bryan Pfeiffer

I came across this book while looking up a field location on the internet. Although nearly twenty years old, the book is still a valuable resource and is still available at many local bookstores. I obtained my first copy this fall at Bear Pond Books in Montpelier - when you could still walk in. The book is primarily about birds, but the localities as easily transferable to insects and other flora and fauna. This is especially timely when we are currently looking for new sites to explore around the state. It includes a special section for beginners and is moderately priced at around $20. University Press New England, Lebanon, NH @2002, 189 pp.

Savannah Ferreira

I am Savannah Ferreira, Forest Health Specialist for the Department of Forests, Parks and Recreation working out of the Forest Biology Lab in Randolph. I have always had a deep-rooted passion for trees and tree health and am very excited to take on this new position. I have been studying trees and tree biology since 2011 and have a high school degree in arboriculture, a bachelor's degree in forestry and a master's degree in plant pathology.

My passion for trees and tree health started when I went to the vocational school, Bristol County Agricultural High School in Dighton, Massachusetts. Here I was introduced to arboriculture, and every day we spent class time learning and caring for trees. My favorite class that nudged me toward this career was "Introduction to Entomology and Pathology", which really opened my eyes to an entirely new biological system that I never knew existed.

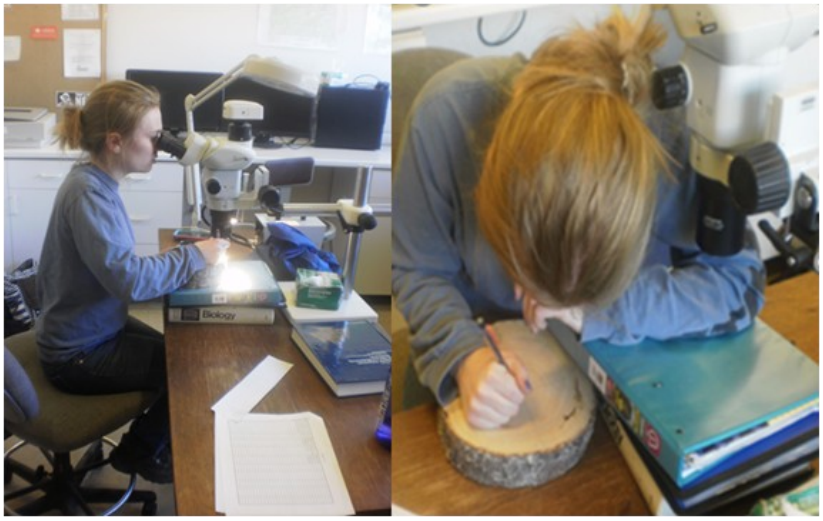
Savannah Ferreira and red oak (*Quercus rubra*)
Photo credit: Matthew Kasson

After graduating, I knew I wanted to continue learning about trees, so I went to the University of Maine in Orono, where I majored in forestry. Here I obtained my International Society of Arboriculture arborist's license and continued to nurture my love for trees and tree health. Early in my academic career I became involved in a research project focused on the fungal canker pathogen *Caliciopsis pinea* and eastern white pine management. I then started my own research project focused on the same fungal pathogen, documenting how eastern white pine was able to compartmentalize the pathogen-associated damage, walling-off necrotic tissue to protect the remaining healthy tissue. This project was done so that forest health managers could better understand individual tree physiology, and therefore how to best manage their health.

When I graduated from the University of Maine, I continued my studies at West Virginia University, where I completed my master's degree in plant pathology. Here, my research focused on the fungal canker pathogens *Diplodia* spp. and trying to understand their contributions to oak decline across the Mid-Atlantic region. This research allowed me to work in a variety of forests all the way from Pennsylvania to Virginia and introduced me to new forest types as well as insect and disease complexes outside of New England.

Although I got to work in some incredible landscapes, I am happy to be back in New England, and to have started this position this winter. I am so excited for all the opportunities for new projects and collaborations and am looking forward to meeting and working with all of you soon!

Savannah Ferreira and chestnut oak (*Quercus montana*)
Re-isolating fungi following a cut stem inoculation assay.
Photo credit: Matthew Kasson



Savannah Ferreira and eastern white pine (*Pinus strobus*)
Dot-dating a pine sample to determine age of fungal infection and age of successful compartmentalization.
Photo credit: Kara Costanza

Chasing Arthropods on Snow

By Erika Mitchell

I've always been surprised and fascinated to discover spiders walking on the snow. This past winter, I decided to try to learn more about spiders and other arthropods on snow by actively searching for them and recording everyone I found.

In Central Vermont, the beginnings of our permanent winter snow pack arrived on November 8, 2019. I found my first arthropod on the snow, a soldier beetle larva (Cantharidae) on November 11. After finding that first arthropod of the snow season, I began devoting more of my daily walks searching for them. By the end of December, I had logged 88 arthropods on the snow. In mid-January, I decided to make my hunt more systematic. I selected a 1-mile, out-and-back route (thus, 2 miles total for each trip) that took me through varied habitat, including the edge of a stream, the edge of an open agricultural field, and through a dense softwood forest. I walked this route nearly every day with exceptions only for illness or travel. I varied my walking times throughout the day, but usually walked in early afternoons when the temperatures were often warmest.

I searched for arthropods intensively as I walked. I also recorded air temperatures at 1.5 meter above the ground, 1 cm above the ground, and at the snow surface. I haven't done a formal analysis of the temperature data yet, but at first glance, it appears that the surface temperatures are the most important variables for predicting when the arthropods will or won't be active. Temperature changes at the snow surface may lag behind air temperature changes by many hours. As a result, I sometimes found active arthropods on the snow on very cold days (10˚-15° F) when the previous day has been "warm" (25˚-30°F) and the snow surface was still above 20° F. Conversely, on days that seemed warm enough for arthropods (25˚-30° F) when temperatures had been very cold (0° F) over night and the snow surface was still well below 20° F, I found no active arthropods. Next season I plan to be even more systematic with my measurements and do a formal study of temperature, wind velocity, and humidity at different heights above the surface to see if any of these factors might help predict arthropod activity.

As of March 31, when portions of the route still had 10" or more of snow, I had found a total of 449 arthropods, or an average of 2.5 arthropods/mile. The most common orders were Araneae, Plecoptera, and Diptera (see Figure 1, Frequency by Order). Phenology seems to play a role in which species are active, with Araneae most frequent in January (32 specimens), Araneae and Diptera in February (48 specimens each), and Plecoptera in March (87 specimens). Excepting periods of extended very cold weather, I found active arthropods on the snow virtually every day (62 out of 76 days).

As the last of this season's snows melt away, I'm already looking forward to next year and the thrill of finding these resilient species. I hope to take Kefyn Catley's spider identification workshop at Eagle Hill Institute this summer. In the meantime, I would be very grateful for any identification help for the specimens that I have found or suggestions for identification resources. I have posted my finds on an iNaturalist project called "Arthropods on Snow" (https://www.inaturalist.org/projects/arthropods-on-snow). This project is open to any observations of arthropods on snow, with over 1800 postings from around the world. Vermont seems to be ideally located for finding arthropods on snow, since it is cold enough to have a long-lasting snowpack, but not too cold for winter arthropod activity, so join me in the hunt next season!

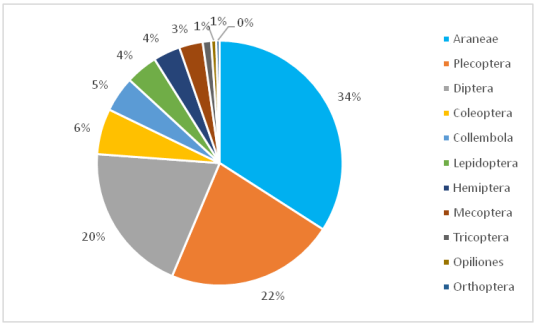


Figure 1. Frequency by Order (clockwise from Araneae to Orthoptera.) Chart by Erika Mitchell.

More information about the Eagle Hill Institute course:
Spider Ecology, Identification, Biology, and Photography taught by Kefyn Catley, August 9–15, 2020.

https://www.eaglehill.us/programs/nhs/seminar-flyer-pdfs/2020%20Catley.pdf).

Snow midge (Chironomidae, possibly *Diamesa*). Calais, VT. 2.17.20. Photo by Erika Mitchell

Winter stonefly (Capniidae, possibly *Allocapnia nivicola*). Calais, VT. 3.24.20. Photo by Erika Mitchell

Longjawed orbweaver (Tetragnathidae, *Tetragnatha*). Calais, VT. 2.27.20. Photo by Erika Mitchell.

Non-Biting Midge Hatch in Williston: A Feast for Ducks

By Donald H. Miller

On March 24, I observed a pair of mallards rapidly picking something off the open surface of a sediment pond at the Commons in Williston. At no time during several minutes of observation did I see either duck partially submerge to feed in typical pond-duck fashion. The waterfowl were swimming somewhat erratically back and forth as they rapidly fed on insects. The odd behavior immediately piqued my interest.

The pond was dug out during the summer of 2019 and didn't fill up until very late in 2019. It is roughly a tenth of a hectare in size, and no more than three meters deep throughout. During construction, essentially all vegetation and the bottom organic material were removed from the area, down to the underlying layer, mostly of clay. While observing the mallards, I noticed numerous tiny flies around the edge of the pond, skimming over the water surface or flying just a few millimeters above the surface. There must have been hundreds present. It was obviously a major hatch, an emergence of what I guessed was some species of non-biting midge or Chironomidae. Later I was able to confirm this identification.

Strangely, during the short period of time that I observed the hatch, I didn't notice any flying well above the surface. Many were already dead, lying in drifts along the edge of the pond, apparently blown there by the wind.

During the night, the pond froze over completely. I checked it again the next day and observed two robins picking tiny objects off the surface of the ice in very rapid succession. I suspect they were also feeding on midges. They were definitely not feeding on earthworms.

I collected eight specimens: four males and four females, all preserved in alcohol. All were chironomids, and I think all were the same species. Both males and females varied in total length by a few millimeters and when I placed two of the largest females next to the largest males, the females were approximately one to two millimeters longer. The total length of at least three or four of the largest was approximately eight to ten millimeters.

My observations left me with these thoughts:

1) I was amazed that there would be a major hatch of hundreds of non-biting midges so early in the season from a pond that was first excavated less than a year ago. How did so many become established in the pond so quickly and what was the source of the population? I saw no evidence that they were flying in from the adjacent marsh.

2) What did the larvae feed on from the time the ova were deposited until they developed into adults? The bottom of the pond could not have had much organic matter at all.

3) If the mallards and the robins were indeed very actively feeding on the midges, it must have been a welcome source of nutrients so early in the spring of the year.

General Notes on Chironomidae

1. There are roughly 800 described species in North America, 10,000 in the world, consisting of six subfamilies in North America and eleven in the world. Five subfamilies with at least 330 species are currently known to occur in Vermont.
   In Michigan, there is a fairly well-documented total of 305 species, plus 247 thought to be there but not yet documented,
2. Ecologically, one subfamily occupies a great diversity of habitats, mostly in freshwater. At least one species, *Clunio marinus,* is entirely marine, being transported by sea turtles.
3. One group, essentially most of the subfamily Chironominae, is known as blood worms because their hemolymph contains free hemoglobins. Thus, they can live in very low oxygen habitats.
4. Anhydrobiosis: At least one African species of chironomid, when desiccated completely, even to the point of its DNA fragmenting, can rehydrate while restoring the integrity of its DNA, an amazing feat by any measure!
5. Chironomids are major players in nutrient cycling and energy transfer in a myriad of mostly-freshwater ecosystems. Indigenous people in some areas depend on these insects for food at certain times of the year, including natives who live along the shore of Lake Victoria in Africa.
6. Management issues: Some midges swarm in and around human dwellings and other areas used by humans (such as golf courses). They are regarded as pests because of their sheer numbers. Furthermore, the hemoglobins in their hemolymph can sometimes cause severe allergic reactions in humans, especially when the midges are very abundant. Since they superficially resemble mosquitoes, large swarms naturally cause more than a little trepidation**!**
7. If chironomids are "non-biting midges," what are the "biting midges"? Non-biting midges are in the giant family Ceratopoginidae, known in many areas as "no-see-ums," "punkies" and other colloquial names. These are not known vectors for any organisms that cause disease in humans in the United States. However, as many ranchers in the western states know, some biting species are associated with a very serious disease of cattle, known as blue tongue. These biters are a bane to humans as well!

E. 0. Wilson's book *Biophilia* and many of his other writings have inspired many of us to recognize the value of all life forms, even biting and non-biting midges. We destroy them at our own peril!

Non-Biting Midges Ontario, Canada, 2009. Photo by Donald H. Miller

References:

Eiseman, Charley, and Noah Charney. *Tracks and Signs*. 2010. Mechanicsburg, PA: Stackpole Books. (See discussion and photograph on pages 266-267 of chironomid larval tunnels on a submerged leaf.)

Hutchinson, *G. Evelyn. A Treatise on Limnology: The Zoobenthos*. 1933. New York: Wiley & Sons.

Marshall, Steven. *Flies: The Natural History and Diversity of Diptera*. 2012. Buffalo, NY: Firefly Books. (See superb discussion of chironomids on pages 113-117.)

Wilson, Edward O. *Biophilia.* 1984. Cambridge, MA: Harvard University Press.

A Sampling of Pug Moths (*Eupithecia*) from One Location

JoAnne Russo

Michael Sabourin brought boxes of moths to our annual "Post-season Wrap-up" for lepidopterists held at the Cornell University Insect Collection, Ithaca, New York, hosted by Jason Dombroskie. After most of his "giveaways" were picked over, I claimed a whole box of unidentified Pug Moths (*Eupithecia*). The Pugs are the classic "little brown moths" (Figure: 1) whose genus consists of almost 200 species in North America, yet are virtually impossible to identify by wing maculation. For those who only photograph moths, the worst comment to hear when asking for a specific identification is "Sorry, needs dissection".

Figure 1: Pug Moths *(Eupithecia)* from Mark Mello's collection.
Photo credit: JoAnne Russo

Most of Michael's *Eupithecia* moths were collected from his residence in Marshfield, Vermont. Totaling 47 specimens, Michael's backyard produced 13 species collected from May 2, 2013 to August 1, 2019 (23 days were in May, 6 days in June, 8 days each in July and August, and 2 days in November). Of the 13 species, 8 were *Eupithecia fletcherata;* 6 each of *E. columbiata*, *E. miserulata* and *E. misturata;* 5 *E. annulate;* 3 each of *E. palpata, E. satyrata* and *E. lariciata;* 2 each of *E. sheppardata* and *E. absinthiata;* and 1 each of *E. anticaria*, *E. perfusca* and *E. strattonata*. 36 females accounted for 77%, while 23% (11) were male.

Figure 2: *Eupithecia lariciata*; left image is split *corpus bursae* showing spermatophore, center image is the spermatophore, right image shows the remaining two

In one interesting dissection of a female *Eupithecia lariciata,* the corpus bursae (the membranous, spiky pouch into which a spermatophore is deposited by the male during mating) was filled with 3 spermatophores. It seemed that the last one deposited had over-loaded her usually robust corpus bursae, resulting in a split (Figure: 2). Chris Schmidt, a lepidopterist from Ottawa, Canada, told me of finding 12 spermatophores in a corpus bursae of a Southern Oak Dagger Moth *(Ancronicta increta)*.

Males of a few species of *Eupithecia* can be determined without dissection. This method is done by brushing the scales off the tip of the abdomen revealing the 8th sternite (sclerotized ventral plate). *Eupithecia miserulata, E. columbiata* and *E. columbiata* have unique shapes that can easily be seen when the scales are removed (Figure 3).

Although most of Michael's *Eupithecia* species had been reported in the 1995 *Moths and Butterflies of Vermont* survey, *Eupithecia annulata* was not. Checking iNaturalist.org observations, it has only been recorded at Michael's Marshfield location in 2016 and 2018 and the author's home in Rockingham, Vermont in 2018 (Figure 4) during the first two weeks in May. I'm sure it's more common in Vermont but this species falls into the "needs dissection" category.

Figure 4: *Eupithecia annulata*, May 2, 2018, Rockingham, Vermont. Collection and photo credit: JoAnne Russo

Author's Note: Anyone wanting to collect this genus or anyone with a collection of Eupithecia in need of identification can contact me at sukirusso@yahoo.com.

References/Sources/Literature:

Ferris, Clifford D., Lepidoptera of North America 14. Geometroidea: Geometridae: Larentiinae: Eupitheciini (Part), Colorado State University. Department of Bioagricultural Sciences and Pest Management; C.P. Gillette Museum of Arthropod Diversity, 2019. https://mountainscholar.org/handle/10217/186354.

Bolte, K.B., Guide to the Geometridae of Canada (Lepidoptera), VI. Subfamily Larentiinae, 1. Revision of the Genus Eupithecia, Spring 1990. The Entomological Society of Canada – No. 151.

McDunnough, James H., Revision of the North American Species of the Genus *Eupithecia* (Lepidoptera: Geometridae); Bulletin of the American Museum of Natural History, Volume 93, Article 8, New York, NY: 1949. http://digitallibrary.amnh.org/handle/2246/1247.

Lepidoptera Glossary: http://pnwmoths.biol.wwu.edu/about-moths/glossary/.

Jason Dombroskie, Manager of the Cornell University Insect Collection and the Coordinator of the Insect Diagnostic Lab, Comstock Hall, Cornell University, Ithaca, New York.

Christian Schmidt, Research Scientist, Canadian National Collection of Insects, Arachnids and Nematodes (CNC), Ottawa, Canada.

Grehan, J.R., et. al., 1995. *Moths and Butterflies of Vermont, a faunal checklist.* Agricultural Experiment Station, University of Vermont, Department of Forests, Parks and Recreation, State of Vermont Misc. Publication 116. January, 1995.

iNaturalist, Vermont Atlas of Life project, https://www.inaturalist.org/projects/vermont-atlas-of-life.

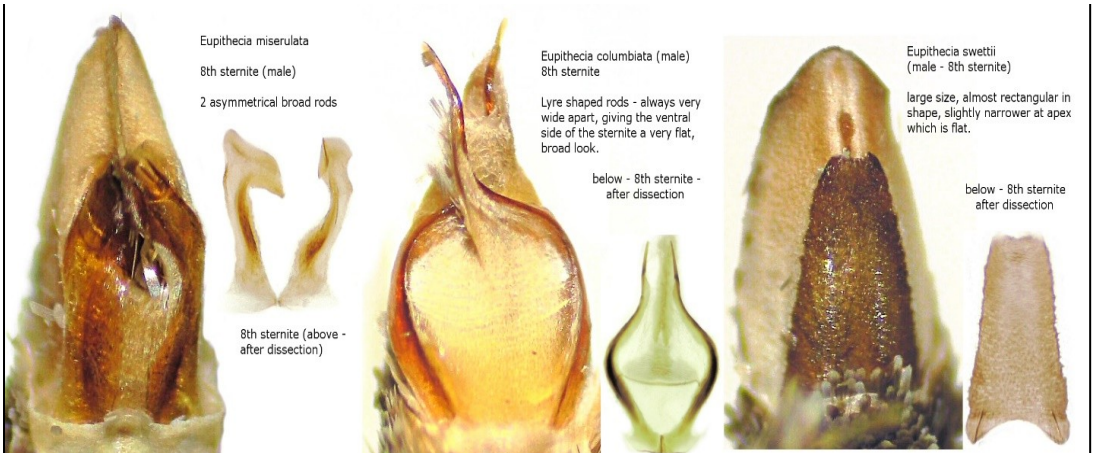


Figure 3: 8th Sternite with scales removed showing the unique feature of *Eupithecia miserulata, E. columbiata* and *E. swettii.* Photo credit: JoAnne Russo

EAB (Emerald Ash Borer) Update:
New detections of the Emerald Ash Borer in Plainfield, VT have expanded the currently-known infested areas in Central Vermont. In addition, two new detection sites in Sullivan County, New Hampshire identify infested areas that extend into Vermont. These areas include: most of Rockingham; large portions of Springfield, Westminster, Hartford, and Hartland; and portions of Norwich, Windsor, Athens and Grafton. If you are buying firewood now for next winter, it's important to remember that untreated ash firewood should never be moved out of infested areas. Be sure that your purchase or transportation of both log length and split firewood will not enable the spread of EAB. Reference: anr.eabinfestedareamap@list.vermont.gov. For more information see: https://www.vtinvasives.org/land/emerald-ash-borer-vermont.

Leek Moth (*Acrolepiopsis assectella*):
During the past couple of years, the Leek Moth (*Acrolepiopsis assectella*), has been spreading across western and central VT. This insect, a small mottled brown moth with a wingspan of about 13 mm., can do significant damage to a garlic crop. However, you are not likely to see the moth until after the damage has been done. In the fall you should make sure you are planting clean bulbs. Throughout the growing season, monitor for larval damage and remove any caterpillars you may find. For more information see: https://nysipm.cornell.edu/agriculture/vegetables/leek-moth-information-center/.

Unequal Cellophane Bees (*Colletes inaequalis*):
Solitary Unequal Cellophane Bees (*Colletes inaequalis*) have recently been confirmed at both Airport Park and Rossetti Natural Area in Colchester, VT (see photo on back cover.) For a primer on these interesting insects, that line their brood cells with biodegradable plastic, see the Washington Post (Winter 2011) article by Patterson Clark (online) entitled "Polyester Bees: Born in a Plastic bag." Laurie DiCesare has been photographing the bees and only recently learned their identity by posting photos on iNaturalist.org. She would now like to learn what is "unequal" about the bees. If you know the name derivation, please write to her at NatureHaven@MyFairPoint.net.

Field Notes:

New Guidance for Safe Outdoor Recreation from Lake Champlain Land Trust:

During this time of uncertainty, they recommend extreme caution when venturing outdoors.

Public health officials are recommending that people recreate in their own backyard or neighborhood. Walking or biking along local streets, roadways, or on wide recreation paths that allow for safe social distancing have been suggested as potentially safe options.

It's recommended that you:

- Do not drive more than 10 miles to reach a Natural Area;
- Turn around or leave if you find a trailhead or trail is crowded;
- Avoid trails where you are unable to maintain a safe social distance of at least six feet;
- When passing others on any trails, move as far away as possible and look away;
- Only walk with members of your immediate family;
- Avoid muddy trails and remote areas where rescue is difficult.

Save the Dates:

June 13, 2020 (3:30 p.m.): Cranberry Meadow, Woodbury, VT: Meet at Mirror Lake parking lot. Access to the meadow is from the roadside. There is a steep bank about 6 feet into willow brush and participants need to be able to go down and up again with help. Contact: Michael Sabourin, mothvet@yahoo.com, 802.426.2133 or Susan Sawyer sksawyer@gmail.com.

June 28, 2020 (11a.m.): Buckner Preserve, West Haven, VT: Meet at Tim's Trailhead. Contact: Michael Sabourin 802.426.2133, mothvet@yahoo.com; or Laurie DiCesare NatureHaven@MyFairPoint.net, 802.893.1845. E-mail Laurie for directions.

July 11, 2020 (departure time TBD): Appledore Island, ME with Maine Entomological Society and Cambridge Ento. Club. Boat will depart from the UNH pier in Newcastle, NH in the morning for an oceanic excursion to the island. Contact: Michael Sabourin, mothvet@yahoo.com, 802.426.2133.

July 12, 2020 (10 a.m.): Birds of VT Museum, Huntington, VT: Annual butterfly and bug walk, 900 Sherman Hollow Road, Contact: www.birdsofvermont.org. 802.434.2167.

July 18-19, 2020, Telephone Gap, Bioblitz, Chittenden, VT: Everything is still on track, although if social distancing is still needed, they'll find a way to keep everyone safe. Contact: MaryBeth Deller, mary.deller@usda.gov.

Aug. 8, 2020 (11a.m.): Victory, VT with NEK Audubon: Meet at Damon's Crossing. Contact : Michael Sabourin, mothvet@yahoo.com, 802.426.2133 or Laura Tobin, nekaudubon1@gmail.com.

Bugs that Stink: Stink Bugs, Shield Bugs and Cat-facing Bugs

From the State Entomologist: Judy Rosovsky

Hemipterans are a large order of insects that includes some oddly-shaped and colorful insects that have provided taxonomists with much fodder for argument and reclassification. Historically this order was separated into the Hemipterans ("true bugs") and Homopterans that could be distinguished by easily-identifiable characteristics such as having half leathery and half translucent wings, hence hemi (half) – ptera (wings), versus entirely leathery wings (Homo-ptera). True bug mouthparts appear to arise from the front of the head, whereas the Homopteran mouthparts appear to arise from the back.

Well-known Hemipteran groups contain the notorious assassin bugs, such as the deadly kissing bug, and more innocuous aquatic insects like waterstriders, backswimmers, and lace and stink bugs. Homopterans encompass cicadas, plant and leaf hoppers, aphids, psyllids, whiteflies, scale insects and other plant pests. Both groups are characterized by having sucking-piercing mouthparts. These two major divisions are currently combined but may continue to be revised in the future as DNA analysis has not yet brought complete clarity to their taxonomic relationships.

A quick note on kissing bugs; this is a suite of about 11 Hemipteran species in the family Reduviidae, subfamily Triatominae, that fall primarily in the genus *Triatoma* (Marshall, 2006). They can potentially carry and transmit a parasite that causes Chagas disease, sometimes known as trypanosomiasis. The parasite is *Trypanosoma cruzi*, and is found in insect feces. That fecal material transmits the parasite by getting into human wounds or mucus membranes by way of the eyes, nose, or mouth. To the untrained eye, kissing bugs can be mistaken for leaf-footed insects like the western conifer seed bug, a common New England invader.

Rough stink bug (*Brochymena arborea*)
Shoulder spines are visible above front legs.
Photo by Robert Webster, www.xpda.com CC BY-SA 4.0

Stink bugs are true Hemipterans. They are in the family Pentatomidae, from the Greek *penta* meaning five, and *tomos* meaning section. In England what we call stink bugs are called "shield bugs", but in the U.S. shield bugs can fall into any of four Hemipteran families. American stink bugs derive their name from the stink glands that produce an odiferous substance when the insect is disturbed. This is not, however, a deterrent to human consumption. In some African, Asian and South American countries they are eaten cooked or raw (Van Huis, 2013).

Marshall (2006) states that about a third of the stink bugs in the U.S. are insect predators and fall into the subfamily Asopinae. The other two thirds are plant pests, some of economic importance, though there can be an occasional insect eater in the herbivorous subfamilies, too. Some of the better-known stink bug pests are the green stink bug (*Chinavia hilaris*) the brown and one-spotted stink bugs (*Euschistus servus* and *E. variolarius*) and the infamous introduced species, the brown marmorated stink bug (*Halyomorpha halys*) or BMSB (Koch *et al.*, 2017). Common beneficial stink bugs include the spined soldier bug (*Podisus* sp.), the two spotted stink bug (*Perillus bioculatus*) and the rough stink bug (*Brochymena arborea*). Predatory stink bugs usually have spines on their shoulders (thorax) whereas the plant pests have rounded shoulders.

Both the predatory and the plant-eating stink bugs use their sucking-piercing mouthparts to pierce tissues of their targets, then inject digestive material and suck up the liquefied contents. Damage to plants can occur anywhere above the ground, and all life stages except the eggs and first-instar nymphs feed on the plants (Koch, *et al.*, 2017). It is possible that the broad host preferences of stink bugs might mitigate their damage to crops, as they feed on a wide variety of species throughout the growing season. Some are significant agricultural pests, especially on fruit, corn and soybeans, and both native and BMSB populations seem to be increasing (Koch, *et al.*, 2017). The plants are mechanically injured by the mouthparts and chemically injured by the digestive enzymes. Damage can be severe enough to cause yield loss and the earlier in the plant's development that feeding damage occurs, the greater the injury (Rice, *et al.*, 2014).

Brown marmorated stink bug (*Halyomorpha halys*)
No shoulder spines, bright antennal bands.
Public domain photo.

The biggest stinker is the BMSB. In addition to causing extensive crop damage to over 100 host plants, this insect can be a public nuisance. An article in the New Yorker magazine describes a couple who returned to discover 26,000 stink bugs in their home! (Schulz, 2018). Every time they thought they had gotten rid of them, more would reveal themselves, like the ones that emerged from the blow dryer. Crushing or stressing BMSBs can cause them to release their smelly chemical defense. Luckily for us, an inexpensive new indoor trap has been vetted by researchers at Virginia Tech (Loeffler, 2014). Fill a turkey pan with soapy water, shine a light on it, and leave it overnight. (The bugs won't release their smell when they drown). This device will work for homeowners, but it doesn't help farmers. Broad-spectrum insecticides are required to kill BMSBs outdoors but those chemicals will kill the natural enemies of the BMSB as well.

The BMSB was first brought to the U.S. from Asia by what is thought to have been a single introduction to Allentown, Pennsylvania in 1996 (Rice, *et al.*, 2014). It was not immediately identified as an exotic. Since then, this pest has made its way to at least 41 states, including Vermont. At one time Jon Turmel and Trish Hanson (both longtime former entomologists for the state), and I tried to determine the distribution of BMSB in VT but we found that very few specimens appeared in our collections. We concluded that the insect was probably ubiquitous in VT, so no one was bothering to collect specimens. The BMSB does not appear to be blamed for much agricultural damage in the state, which may be due to its cold intolerance or because it takes time for the insect population to reach the level required for economic damage.

Entomologists know that keeping a yard or garden healthy means maintaining good habitat not only for their plants but also for populations of the natural enemies of plant-eating insects. Always make sure you know exactly what you are treating or killing when you attempt to manage pest insects. There is a good guide for distinguishing BMSB from other similar stink bugs at https://www.stopbmsb.org/stink-bug-basics/look-alike-insects. The guide shows some of the distinguishing features of the predatory stink bugs, including the spiny versus round shoulders, and antennal color or patterns. If you're not sure, you can send me a photo or specimen and I will identify it for you.

Bugs that Stink: Stink Bugs, Shield Bugs and Cat-facing Bugs *(continued)*

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Marshall, S.A. 2006. Insects: Their Natural History and Diversity: with a Photographic Guide to Insects of Eastern North America. Firefly Books, Buffalo, NY.

Rice, Kevin B., *et al.* 2014. Biology, Ecology, and Management of Brown Marmorated Stink Bug (Hemiptera: Pentatomidae), *Journal of Integrated Pest Management*, Volume 5, Issue 3, 1 September 2014, pages A1–A13, https://doi.org/10.1603/IPM14002.

Schulz, K. 2018. When Twenty-Six Thousand Stinkbugs Invade Your Home. New Yorker, online version. https://www.newyorker.com/magazine/2018/03/12/when-twenty-six-thousand-stinkbugs-invade-your-home.

Van Huis, A.; *et. al.*, 2013. Edible Insects: Future prospects for food and feed security. Food and Agriculture Organization (FAO) of the United Nations: Rome, Italy, 2013. http://www.fao.org/3/i3253e/i3253e.pdf.

Peach with cat-facing injury from stink bugs.
These injuries cause the fruit to pucker like the cheeks of a cat.
Photo by Utah State University Extension; used with permission.

Zadock Thompson Invertebrate Collection and the Corona Virus

By Zoe Albion

The hallways of Blundell house are unusually quiet. They have been for several weeks, since the University of Vermont shut down its campus and all "non-essential" work. Classes have been moved online, activities have been cancelled or postponed, and the only thing to be heard at the Zadock Thompson Invertebrate collections is the hum of an empty freezer. After a very busy start to the spring semester, volunteers have dispersed and all events and presentations have been called off. However, work hasn't stopped. Here's what the museum is up to during the shelter-in-place order of COVID-19.

Bugspotting at-home:

Just because the University is closed doesn't mean learning can't continue! An effort led by volunteer Jim Talbot is encouraging enthusiasts to sample invertebrate life in a way that respects social distancing guidelines. Participants can observe outside around their home, making note of arthropod orders, environments, and replicates (how many of each insect you see.) A carefully-written protocol asks for two weekly observation samples, one nocturnal and one diurnal. Don't know what a creature is? You can look it up on BugGuide.net or iNaturalist.org. These observations are compiled so finds can be shared with everyone. Pictures are encouraged, and they might even make it onto our social media: Twitter and Instagram.

Digitization Work Goes Online:

For several years, volunteers at the Zadock Thompson Invertebrate collection have been photographing and uploading pictures of specimens to the internet, a meticulous process that allows our collection to be viewed by anyone around the world. As of now, we have records hosted on SCAN and GBIF, as well as the server of Vermont Center for Ecostudies through our collaboration on their bee survey. However, these records only include images of the specimens and their labels. The label data has not yet been transcribed, making searches and analyses of our collection more difficult. Fortunately, volunteers are stepping up! Label transcription is possible remotely, as long as you have a bit of time and an internet connection.

The collection is still being monitored to ensure its safety, but we don't know when regular activities will be permitted to resume. For now we hope that this health crisis passes quickly, and that we are all able to enjoy the natural world around us, whether it be a predatory mud dauber nest in the woods of North Carolina, or a silverfish on a bathroom floor in Vermont.

If you are interested in getting involved with the collection either remotely or in-person at a later date, please e-mail us at uvm.vtzt@gmail.com. Be well!

Odds and Ends

Books for Sale: The Gordon Nielsen estate has generously donated a number of books to the VT Entomological Society. (Please see the list below.) There are recommended prices based on fair market value but best offers will be considered; Contact: Michael Sabourin, mothvet@yahoo.com, 802.426.2133.

List of Books for Sale:

Adler, Peter H. et al. 2004. The Black Flies (Simuliidae) of North America [$100]

Anderson, Robert S. and Stewart B. Peck. 1985. The Insects and Arachnids of Canada Part 13 (carrion beetles) [$50]

Arnett, Jr. Ross H. et al 2002. American Beetles volume 2 (Scarabaeoidea through Curculionoidea) [$50]

Blatchley, W. S. 1926. Heteroptera or True Bugs of Eastern North America [$50]

Bright, Donald. 1987. The Insects and Arachnids of Canada Part 15 (Buprestidae) [$50]

Bright, Donald. 1993. The Insects and Arachnids of Canada Part 21 (weevils) [$50]

Dillon, Elizabeth S. and Lawrence S. Dillon. 1972. A Manual of Commonn Beetles of Eastern North America volume 1 [$10]

Dillon, Elizabeth S. and Lawrence S. Dillon. 1972. A Manual of Commonn Beetles of Eastern North America volume 2 [$5]

Eichlin, T. D. and W. D. Duckworth. 1978. The Moths of N. America Fascicle 5.1 Sesioidea [$75]

Eidt, D. C. 1969. Memoirs of the Entomological Society of Canada 59 (Immature Forms of N. Anerican Sawflies) [$8]

Ferguson, D. C. 1978. The Moths of N. America Fascicle 22.2 (Lymantriidae) [$50]

Grehan, John R. et al. 1995. Moths and Butterflies of Vermont - A faunal checklist [$5]

Hodges, Ronald W.. 1974. The Moths of N. America Fascicle 6.2 Oecophoridae [$50]

Hodges, Ronald W.. 1978. The Moths of N. America Fascicle 6.1 Gelechioidea Cosmopterigidae [$40]

Hodges, Ronald W.. 1983. Check List of the Lepidoptera of America North of Mexico [$25]

Hodges, Ronald W.. 1986. The Moths of N. America Fascicle 7.1 Gelechiidae (Part) [$75]

Jeppson, Lee R. et al. 1975. Mites Injurious to Economic Plants [$100]

Lafontaine, J. D.. 1987. The Moths of N. America Fascicle 27.2 (Euxoa)[$85]

Lafontaine, J. D. and R. W. Poole. 1991. The Moths of N. America Fascicle 25.1 (Plusiinae) [$50]

Linsley, … Cerambycidae of North America I- V and VII(1) set assessed in good condition [$350]

Martin, J. E. K. 1977. The Insects and Arachnids of Canada Part 1 (Collecting and preserving insects) [$25]

McAlpine, J. F. et al. 1981. Manual of Nearctic Diptera Volume 1[$195]

McAlpine, J. F. et al. 1987. Manual of Nearctic Diptera Volume 2[$290]

McAlpine, J. F. and D. M. Wood. 1989.Manual of Nearctic Diptera Volume 3 [$150]

Monroe, Eugene. 1972. The Moths of N. America Fascicle 13.1A Pyralidae (Part) [$20]

Monroe, Eugene. 1972. The Moths of N. America Fascicle 13.1B Pyralidae (Part) [$20]

Monroe, Eugene. 1973. The Moths of N. America Fascicle 13.1C Pyralidae (Part) [$20]

Monroe, Eugene. 1976. The Moths of N. America Fascicle 13.2A Pyralidae (Part) [$20]

Monroe, Eugene. 1976. The Moths of N. America Fascicle 13.2B Pyralidae (Part) [$25]

Poole, Robert W. 1995. The Moths of N. America Fascicle 27.2 (Culliinae) [$60]

Rings, Roy W. et al. 1993. The Owlet Moths of Ohio -Noctuidae [$50]

Todd, E. L. 1982. The Noctuid type material of John B. Smith (Lepidoptera) [$10]

Yanega, Douglas. 1996. Field Guide to Northeastern Longhorned Beetles [$25]

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