The Tachinid Times

Issue 36

In the footsteps of Merriam and Townsend

UNRAVELLING OVIPOSITOR EVOLUTION

The katydid *killers*

Reports on the tachinids of

Pine Barrens of New Jersey, USA

Oak Bay, New Brunswick, Canada

February 2023

TABLE OF CONTENTS

ARTICLES

The Tachinid Times

February 2023, Issue 36

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DISTRIBUTION

This newsletter is distributed near the end of February each year. It is published simultaneously in hardcopy and online, both based on the same PDF generated from an InDesign file. Hardcopies are distributed to several libraries and to a few readers who request them.

INSTRUCTIONS TO AUTHORS

This newsletter accepts submissions on all aspects of tachinid biology and systematics. It is intentionally maintained as a non-peer-reviewed publication so as not to relinquish its status as a venue for those who wish to share information about tachinids in an informal medium. All submissions are subjected to careful editing and some are reviewed if the content is thought to need another opinion. Some submissions are rejected because they are poorly prepared, not well illustrated, or excruciatingly boring.

Authors should try to write their submissions in a style that will be of interest to the general reader, in addition to being technically accurate. This is a newsletter, not *Science* or *Nature*. Try to illustrate submissions with high quality images sent to the editor as separate files at the same time as the text. Text files sent with embedded images will not be considered for publication. All content should be original; if copyrighted material (online or in print) is used then permission from the copyright holder is needed. Submitted pictures of tachinids in the field will be considered for the cover, table of contents, or a special section in the newsletter.

Student submissions are particularly welcome. Writing about a thesis study or a side project involving tachinids is a good way to inform others about a study that is underway before it has generated formal publications.

Please send submissions for the 2024 issue of *The Tachinid Times* to the editor by the end of January 2024.

FRONT COVER View westward of San Francisco Peaks from Bonito Park, northern Arizona, USA.
Photo: J.E. O'Hara, 2 September 2022

TABLE OF CONTENTS Sunset in the Magdalena Mountains east of Magdalena, Cibola National Forest, New Mexico, USA.
Photo: J.E. O'Hara, 29 May 2019

BELOW Lockett Meadow in the San Francisco Peaks of Arizona with Humphreys Peak in centre.
Photo: J.E. O'Hara, 5 July 2017

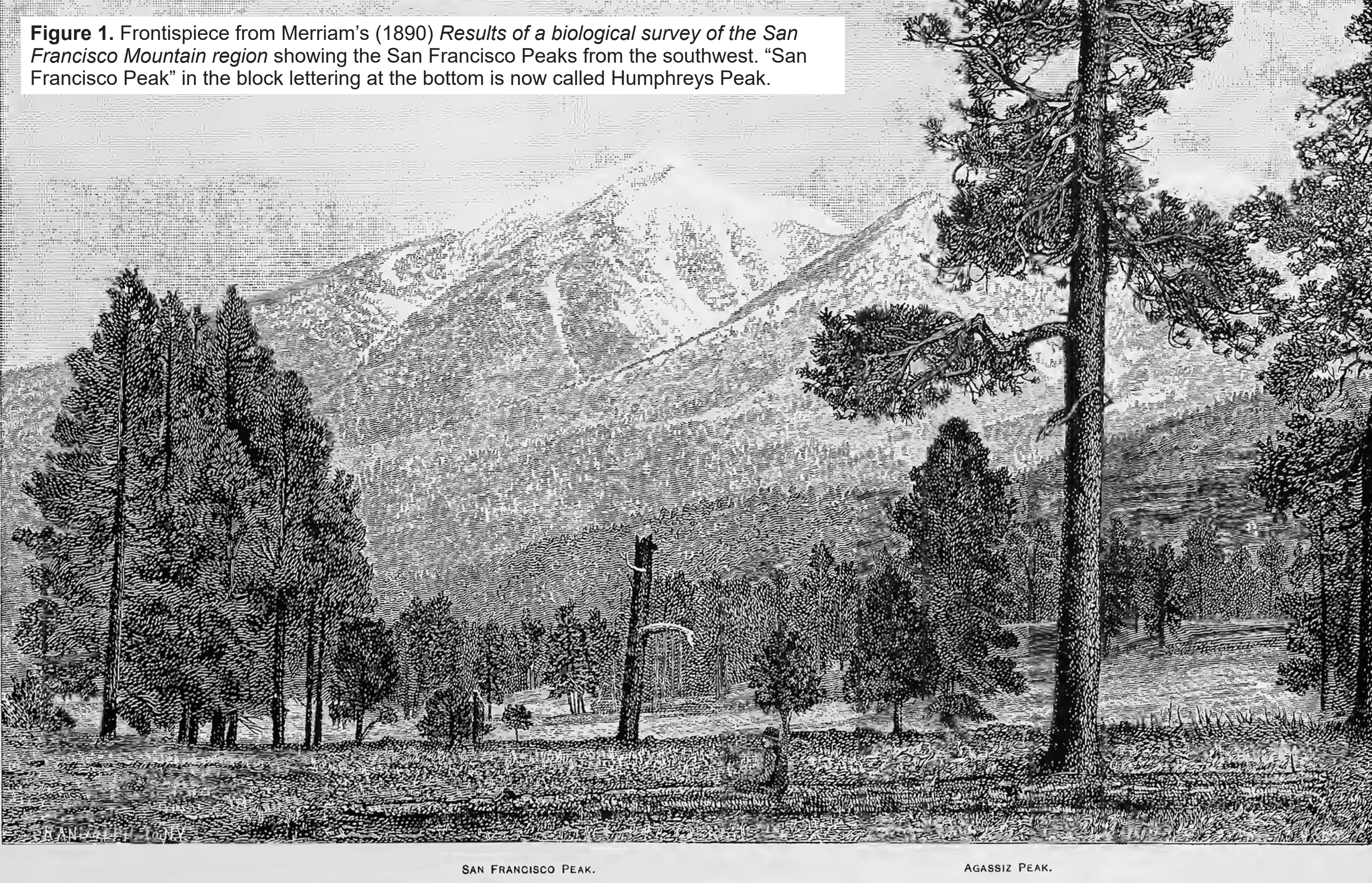

Figure 1. Frontispiece from Merriam's (1890) *Results of a biological survey of the San Francisco Mountain region* showing the San Francisco Peaks from the southwest. "San Francisco Peak" in the block lettering at the bottom is now called Humphreys Peak.

In the footsteps of C.H. Merriam and C.H.T. Townsend on the San Francisco Peaks of Arizona, USA

by James E. O'Hara

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Towering over the vast volcanic landscape of cinder cones, prairie, and ponderosa pine forest in north-central Arizona is a circular ring of mountain summits collectively known as the San Francisco Peaks. These are the remnants of a stratovolcano that formed some three million years ago and reached an elevation of ca. 4900 m, much higher than the present peaks (Bezy 2003). Later on, the core of the mountain collapsed and a depression, or caldera, took the place of the central peak and the sides of the original mountain became the summits of the San Francisco Peaks that we see today. The caldera is now a popular hiking destination called the Inner Basin, a high-elevation grassy meadow encircled by evergreens that give way to bare rock below the highest summits. Tallest of all is Humphreys Peak on the western side at an elevation of 3850 m (12,630 ft)—the highest summit in Arizona.

This story is about a little-known location in the San Francisco Peaks that served as a base camp for two groups of biologists in the late 1800s. One group was lead by C. Hart Merriam (1855–1942) (Fig. 2), who conducted a biological survey in the area for a couple of months in 1889, and the other included Charles H.T. Townsend (1863–1944) (Fig. 3) and his party of plant and insect collectors who camped in the same spot for several days in July 1892.

Figure 2. C. Hart Merriam, undated (U.S. Library of Congress Prints and Photographs Division).

My interest in the San Francisco Peaks began over 40 years ago in 1980 when I found siphonine tachinids (the subject of my graduate studies at the University of Alberta) under scattered ponderosa pines on the eastern side of the Peaks near Bonito Park. I have since returned to the Peaks area about ten times on collecting and vacation trips. I have followed the paved and dirt roads around the base and driven up to the wildflower-rich Lockett Meadow (2600 m, Figs. 16–19), and hiked from there along the aspen-lined trail to the Inner Basin (2990 m, Figs. 20–21).

"This story is about a little-known location in the San Francisco Peaks that served as a base camp for two groups of biologists in the late 1890s."

The name C.H.T. Townsend is a familiar one to tachinidologists due largely to the many species and genera he described and his 12-volume *Manual of Myiology* (Townsend 1936–1942), which deals primarily with the Tachinidae. Yet most of us who are well-acquainted with Townsend's works did not know a great deal about his life until detailed and entertaining biographies appeared about him, first in an issue of *Fly Times* and then in a larger work reviewing his 1500+ genus-group names (Evenhuis 2013, Evenhuis et al. 2015). It was in this biography that I first learned of Townsend's adventurous two-month collecting expedition in 1892 that started and ended in Las Cruces, New Mexico. The two most distant destinations on that trip were the Grand Canyon and the San Francisco Peaks in Arizona. Townsend would later write about his more memorable moments at each of these places in two articles in the journal *Appalachia* (Townsend 1895a, 1895b).

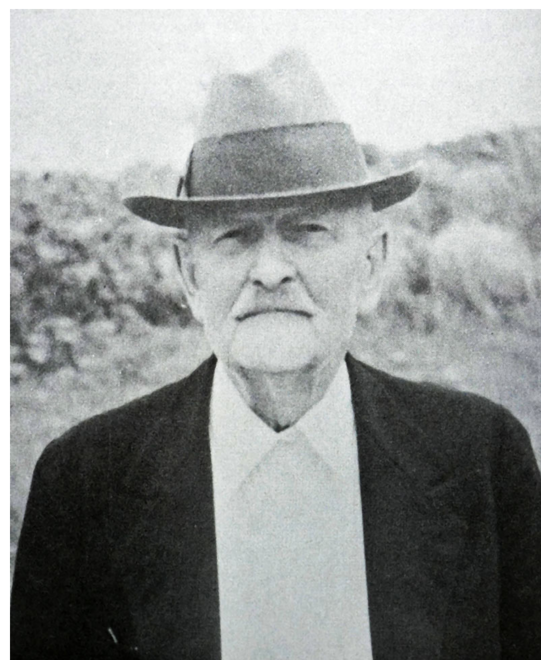

Figure 3. Charles H.T. Townsend in 1943 at the age of 79 (Arnaud 1958: 2).

My attention was drawn in particular to Townsend's (1895b) account of camping at "Hart Little Spring" and climbing to the summit of "San Francisco Mountain" (Humphreys Peak). To reach the summit he had to hike through extensive forest to timberline and from there "the summit still towered up at the same gradual ascent for nearly 1,300 feet, being one stretch of loose volcanic rock, save the patches of alpine plants here and there, which gradually grew less frequent toward the top" (p. 150). I was keen to see for myself this "Hart Little Spring" where Townsend spent his last hours at camp preparing the insects he caught on that sunny day in July 1892. But this was not to be – at least not at first – for I could not find a location for "Hart Little Spring" when I first looked for it online. Nor was I able to spot a sign for it when I drove along the Hart Prairie Road in 2018. I assumed the spring must be near or on the Hart Prairie Preserve on the western side of the San Francisco Peaks but I did not know where. Perhaps, I thought, the name and location of the spring had been lost to time.

C. Hart Merriam

My interest in Hart Little Spring was unexpectedly revived in 2019 when I received my October issue of *Arizona Highways* magazine. Contained therein was a 4-page spread about *A Pilgrimage to Base Camp* (Hineline 2019) that recounts the author's short hike to Merriam's base camp at Little Spring (aka Hart Little Spring)—the very hike that had eluded me. The story begins with a dramatic lead:

> "*Unlike the trek from Lukla to Everest Base Camp, which takes eight or nine days, the march to Merriam Base Camp is pretty quick – about eight or nine minutes. As hikes go, it's unimpressive, but the obscure camp it leads to played a vital role in the evolution of ecology.*" (Hineline 2019: 49)

Hineline's (2019) account goes on to review Merriam's life and accomplishments and describes the significance of the studies he conducted in the San Francisco Peaks while camped out at Little Spring. This reminded me of what Merriam is best remembered for: his concept of life zones, and particularly their vertical distribution on mountains and the correlation between latitude and elevation. Like many other students, I first heard about "Merriam's life zones" in a biology or ecology course at university. The zones were brought to life for me in the early 1980s when I was driving up to Mount Lemmon in the Santa Catalina Mountains outside Tucson and passed life zone markers strategically placed along the route[1]. I did not realize at the time that these life zones had been proposed by Merriam based on a study he conducted just 400 km north in the San Francisco Peaks.

The choice of the San Francisco Peaks for Merriam's survey was explained in his Prefatory Note to his published results:

> "*...many facts of scientific interest and economic importance would be brought to light by a biological survey of a region comprehending a diversity of physical and climatic conditions, particularly if a high mountain were selected, where, as is well known, different climates and zones of animal and vegetable life succeed one another from base to summit.*" (Merriam 1890: 1)

Merriam travelled by train from Washington, DC to Flagstaff, Arizona, a town ideally situated at 2100 m on the south side of the San Francisco Peaks. He arrived on 26 July 1889 and was joined the next day by his assistant Vernon Bailey. Other researchers would come and go at times during the course of the survey. The budget for the expedition was not as liberal as Merriam would have liked and he was forced to make some concessions to stretch the funds as far as he could:

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[1] For more information about this route, see *Guide to the Mt. Lemmon Highway* reprinted from *Sonoriensis* (Summer 1994) online at: http://www.eebweb.arizona.edu/Courses/Ecol406R_506R/Guide_to_MtLemmon_highway_Sonorensis1994.pdf.

> *"Much more would have been accomplished but for the insufficient fund available for the survey (only a little more than $600 to cover the total cost of transportation, outfitting, hire of animals and men, purchase of tents, supplies, etc.), thus permitting the employment of but one man as cook and general camp-hand; while the animals, both in number and quality, were far below the standard usually considered necessary for field work, which circumstance caused many annoying delays. All our traveling was done on horseback, and our packing on burros."* (Merriam 1890: 2)

The site of the base camp was described as follows:

> *"After spending three days in outfitting, we proceeded to Little Spring, at the north base of San Francisco Mountain, and pitched our tents in a grove of aspens and pines, on a knoll just northwest of the spring, at an altitude of 2,500 meters (8.250 feet). This was our base camp for two months, and from it numerous side-trips were made into the surrounding country."* (Merriam 1890: 3)

Merriam's objective was to conduct a biological survey of the area including the collection of mammals, birds, and reptiles, as well as the characterization of life zones based upon various parameters including the vertical distribution of indicator plants. Remarkably, the survey not only achieved these ambitious goals over the course of two months, but the subsequent report was published less than a year later (on 11 September 1890) and comprised 136 pages of text, 13 plates and 5 maps. Merriam was the sole author except for a chapter on reptiles. Hart Merriam was 35 years old when his survey was published and was already by then an accomplished mammologist and ornithologist, a general naturalist, and a former medical doctor (Osgood 1944). All this was before the recognition he received from his *Biological Survey of the San Francisco Mountain Region and Desert of the Little Colorado in Arizona* and subsequent publications where he elaborated upon his life zone ideas.

My initial interest in Little Spring had led to a dead end largely because I was unaware of its historical significance as Merriam's base camp in 1889. I learned from Hineline's (2019) article that the site is recognized as a Registered National Historic Landmark by the National Park Service because Merriam had set up his base camp there. Accompanying Hineline's text are pictures of the surroundings including a commemorative plaque (Fig. 4), Humphreys Peak, Little Spring, and a variety of widlflowers. Directions to Little Spring (which I had not been able to find before) were given as follows:

> *"From Flagstaff, go northwest on U.S. Route 180 for 9.5 miles to Forest Road 151 (Hart Prairie Road). Turn right (north) onto FR 151 and continue 7.5 miles to Forest Road 148B (look for the sign to Little Spring*). Park here and walk a half-mile on FR 148B to the Merriam Base Camp site. FR 151 is unpaved but is suitable for most vehicles in good weather."* (Hineline 2019: 51)
>
> * I did not see this sign when I visited in 2022.

The life zones of Merriam have generated much interest and discussion over the years. They continue to be used in certain circumstances and some aspects of the concept hold up better than others. On a global scale the "biome" has achieved greater acceptance and universality. Odum (1945) and Shelford (1945) are early works that discuss the relative merits of "life zones" vs. "biomes" and the review of Mucina (2019) gives a modern interpretation of the biome as a "crucial ecological and biogeographical concept".

Figure 4. Plaque at Little Spring identifying this location as the C. Hart Merriam Base Camp Site and a Registered National Historic Landmark. (Photo: J.E. O'Hara, 1 September 2022)

Charles H.T. Townsend

Townsend and his companions reached Little Spring at around 2:00 pm on 14 July 1892 after an exciting visit to the Grand Canyon to the north (Townsend 1895a, Evenhuis et al. 2015). They had seen the snow-capped summits of the San Francisco Peaks on their way to the canyon and were resolved to climb the tallest peak before heading back to Las Cruces. They spent the rest of that first day collecting around camp. Then, as evening approached, Townsend's thoughts turned to securing "game" for the coming days and matter-of-factly recounted the night spent at a nearby lake:

> *"That night, Mr. Cordley and I started after supper, which was finished about dark, for a small lake a mile and a half nearer the mountain, where we thought it likely we might see some deer the next morning. It was dark when we started, each with our guns and a blanket strapped on our shoulders. The trail lay through thick woods, over fallen logs and rocks, and up wooded slopes and gulches, yet we kept it with some difficulty, and found the lake about 9.30 p.m. Here we rolled ourselves up in our blankets, but saw no game, and returned to camp next morning in time for breakfast."* (Townsend 1895b: 149–150)

Townsend (1895b: 150–153) described in some detail his climb to the summit of Humphreys Peak on the second day, collecting insects along the way. There being no trail to follow, each person chose a slightly different route to the top. By today's standards an off-trail hike from Little Spring at 2550 m to the summit at 3850 m (a vertical difference of 1300 m or 4267 ft) would be regarded as strenuous but Townsend made light of it, remarking that "the climbing was not at all laborious; it only required persistent walking up a moderately steep slope", before adding "it is quite a little walk to the top".

Townsend reached the summit at noon, a little behind three of the others, but he had stopped now and then to collect insects along the way. He became a little disoriented during his descent "while wildly chasing bugs" and took a more southerly direction than he had intended. He was aware of possibly meeting at close quarters "bears, mountain lion, and other wild animals" as he pushed through some densely wooded spots and concluded "I would stand a pretty poor show if I should suddenly run against one of these animals, with only an insect net to defend myself". Upon reaching more level ground and not knowing exactly where he was, he tried to find the lake where he had camped the night before. Failing that, he struck a course westward to meet up with the main road running north (presumably Hart Prairie Road). He followed that to the side road (FR 148B) leading east to Little Spring. There was some amusement in camp when he arrived from that direction, as the others could infer the reason for it. Townsend tried to cover for himself, saying "I had just split off around the hill to see how the collecting was. They appreciated the joke, and then we all shouted." The party broke camp later that day to head for Flagstaff, but first Townsend had work to attend to: "I now mounted, pinned in boxes, and put away seventy specimens of insects that I had collected during the day."

Townsend and his "New Mexico party" parted company with the "Arizona party" (that had joined them at the Grand Canyon) when they arrived the next day in Flagstaff. They purchased provisions and began their journey homeward on 17 July. They headed east following at first a route similar to that of the present Interstate 40. This took them along the southern edge of the Navajo Reservation. They were unlucky enough to be on the road during an unusually tense time between the Navajo and white settlers[2]. They were warned their lives could be in danger but they pressed on nevertheless. Townsend (1895b: 154), in his usual fashion, made light of the danger: "I comforted myself with the remark that if the Indians captured us, they would at least secure a very complete outfit for collecting bugs".

The group passed through the Petrified Forest (later to be declared a national monument and then a national park) and proceeded eastward to the New Mexico border, spending "three interesting and very pleasant days" with the Zuni at their pueblo. The last stop of interest was a short distance to the east, Inscription Rock (now part of El Morro National Monument) where the signatures of Spanish explorers and later travellers are mixed with the petrogylphs of Ancient Puebloans. They crossed the mountains to Grants and continued eastward to Los Lunas, then followed the Rio Grande Valley to Las Cruces, arriving on 14 August. "We had thus driven over 1200 miles in two months, and our horses were now given a much needed rest" (Townsend 1895b: 157).

Little Spring, 1 September 2022

Mine was not the first "pilgrimage" to a place of some significance in the life of Charles H.T. Townsend. That distinction goes to Dan Hansen and Ronaldo Toma who visited a far more important location, the deserted homestead in Itaquaquecetuba, Brazil where the Townsend family lived for the last 25 years of his life (Hansen & Toma 2004). In that home Townsend wrote many taxonomic papers on the Tachinidae and the 12 volumes of his *Manual of Myiology*. Dan presented me with an unexpected gift upon his return from Brazil, a roofing tile embossed with the Townsend name recovered from a heap in front of the Olaria building on the old homestead (like the one in Fig. 8 in Hansen & Toma 2004: 5).

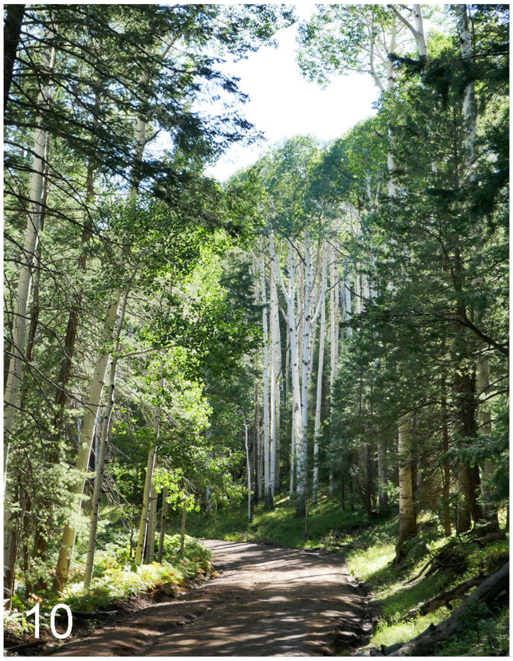
[2] This was started by the actions of Mormon pioneer Lot Smith and led to his death on 21 June 1892. See: https://archiveswest.orbiscascade.org/ark:/80444/xv38250

My visit to the area of Townsend's *Ascent of San Francisco Mountain* began on a sunny morning on the 1st September 2022. I headed northwest from Flagstaff, passing the turnoff to the Arizona Snowbowl ski resort and through Fort Valley before leaving pavement and taking the Hart Prairie Road northward. The ponderosa pine forest changed to semi-open prairie and soon I passed by the gated entrance to Hart Prairie Preserve (Fig. 6), a 100-hectare refuge for native plants and wildlife donated to The Nature Conservancy in 1994. The road curves to the west and skirts around the base of Fern Mountain (Fig. 7) before heading north again. Fern Mountain is a cone-shaped hill 100 m high with a faint trail leading to the summit from the southwestern side. I took this trail to the top later in the day, as I had on a couple of previous occasions. The well-defined summit has a sparse covering of grass, wildflowers, and shrubs (Fig. 5) and looks like a good hilltop for tachinids but on each of my visits I have seen limited activity.

I was aware as I drove north from Fern Mountain that I was entering Townsend country. He and his entomological companion, Arthur Burton Cordley (1864–1936), spent their first night wrapped in blankets beside a lake waiting for game that never materialized. That lake was likely Bismarck Lake, a feature marked on local maps with a national forest trail leading to it. I reached the trailhead by driving north 2.7 km from the gate at Hart Prairie Preserve and turning east on a signed side road. From there, the trailhead is just 1.0 km further on (Fig. 8). I first hiked this short 1.5 km trail in May 2018 before I knew about its possible connection to Townsend. It meanders through ponderosa pines and open prairie with the San Francisco Peaks as a backdrop. On that first hike I was not prepared for what I saw at the destination—a small muddy water hole. On this second visit in late summer, I was heartened to see some open water surrounded by lush vegetation (Fig. 9). I could envision this being an important water source for local wildlife, even though it seemed no more a lake than Fern Mountain was a mountain. Perhaps it was more 'lake-like' in Townsend's day.

Back on Hart Prairie Road, my directions and GPS coordinates told me the turnoff to Little Spring (Forest Road 148B) was close: another 1.9 km. A sign for Little Spring is supposed to mark the spot but I did not see it. I parked anyway and walked the rest of the way, first along the narrow road (Fig. 10) that ends at a "Road closed" gate and then along a trail. Was I on the right path? There was no marker for Little Spring but my GPS said I was on the right course. The evergreens and poplars gave way to a serene grassy meadow (Fig. 11), on the far side of which I could discern a metal fence enclosing a small patch of vegetation (Fig. 12). I knew this must be the fence I had read about that protects Little Spring from being trampled by larger 2- and 4-footed animals. Smaller creatures are free to pass underneath. I could not see the spring but I assumed it was hidden by the thick vegetation. Attached to the fence was a sign explaining how *Science Came to Little Spring Over 100 Years Ago* (Figs. 12, 14). I searched the area and soon found, in the shade of a tree, the rock and plaque marking this location as the *C. Hart Merriam Base Camp Site* (Figs. 4, 13). (And, I thought to myself, the *C.H.T. Townsend Base Camp Site* too.) It was somewhere close by that Townsend sat pinning his insects on 15 July 1892 after his *Ascent of San Francisco Mountain* and his circuitous return to camp. Present during my visit were dozens of *Ptilodexia* on the yellow heads of cutleaf groundsel (*Senecio eremophilus*) (Fig. 15) in the semi-shade of the trees and I wondered what tachinids Townsend caught when he was here over a century earlier.

Figures 5–9. **5**. View of San Francisco Peaks from Fern Mountain south of Bismarck Lake (1 September 2022). **6**. Gated entrance to Hart Prairie Preserve from Hart Prairie Road (also known as Forest Road 151) (1 September 2022). **7**. Fern Mountain to the north from entrance to Hart Prairie Preserve (1 September 2022). **8**. Trailhead for Bismarck Lake trail (7 May 2018). **9**. Bismarck Lake with San Francisco Peaks to the east (1 September 2022).



Figures 10–15. (All pictures taken on 1 September 2022.) **10**. View along short access road (Forest Road 148B) to Little Spring. **11**. Small meadow before reaching Little Spring. **12**. Little Spring area with rectangular metal fence surrounding the spring (sign on fence enlarged in Fig. 14). **13**. Plaque commemorating the *C. Hart Merriam Base Camp Site* in the shade of a tree by a fallen log (plaque enlarged in Fig. 4). **14**. Sign attached to fence with information about Merriam's research and historic spring. **15**. *Ptilodexia* sp. (Dexiinae, Dexiini) feeding from a flower (cutleaf groundsel, *Senecio eremophilus*) at Little Spring.

Figures 16–21. **16**. Lockett Meadow at 2600 m in the San Francisco Peaks, with view west towards Humphreys Peak (5 July 2017). **17**. Lockett Meadow Spring in the middle of Lockett Meadow (5 July 2017). **18**. *Adejeania vexatrix* (Osten Sacken) (Tachininae, Tachinini) feeding from a flower in Lockett Meadow (5 July 2017). **19**. *Tachina* sp. (Tachininae, Tachinini) feeding from a flower in Lockett Meadow (5 July 2017). **20**. Trail to Inner Basin from Lockett Meadow passing through a thick forest of quaking aspen (*Populus tremuloides*) (13 August 2013). **21**. Inner Basin meadow at 2990 m, with view west towards Humphreys Peak (13 August 2013).

Figures 22–27. 22. View of San Francisco Peaks looking west from Bonito Park on the east side of US Route 89 (31 August 2022). **23**. View of Sunset Crater volcano (in Sunset Crater National Monument) looking east from a hill north of Bonito Park (6 September 2014). **24**. Malaise trap on edge of Bonito Park with Sunset Crater to the east (6 August 1983, reproduced from slide). **25**. Wildflowers among the ponderosa pines on the edge of Bonito Park (12 August 2013). **26**. *Mochlosoma* sp. (Dexiinae, Dexiini) on the trunk of a ponderosa pine on the edge of Bonito Park (3 September 2014). **27**. A dispersed camping site on the far side of the meadow under the pines in the Coconino National Forest north of Bonito Park, where I have camped multiple times (5 August 2016).

Epilogue

Merriam and Townsend attracted both praise and ridicule for some of their work, both during their lifetimes and after their deaths. As an odd coincidence, both became known as taxonomic "splitters" for the many species (and in Townsend's case, genera) they described that were later synonymized with other names. For Merriam this was among mammals, for Townsend among flies. But the stories related here highlight a different aspect of both men: their adventurous spirit, love of the outdoors, and obsessive drive to collect. This last attribute served Townsend well for the next 50-odd years as he amassed a huge collection of flies, especially from Peru and Brazil. Most of these are still in existence in major collections and are a lasting legacy of his life in the field.

Coordinates and elevations for places mentioned above and for insect collecting in the area

West side of San Francisco Peaks

Junction of U.S. Route 180 and Hart Prairie Road (Forest Road 151): 35°17.17′N 111°45.43′W, 2331 m.
Hart Prairie Preserve gate (Fig. 6): 35°20.67′N 111°44.32′W, 2560 m.
Start of trail to summit of Fern Mountain: 35°20.78′N 111°44.67′W, 2545 m.
Summit of Fern Mountain (Fig. 5): 35°20.94′N 111°44.33′W, 2678 m.
Turn-off to Bismarck Lake: 35°21.77′N 111°44.73′W, 2609 m.
Trailhead for Bismarck Lake trail (Fig. 8): 35°21.79′N 111°44.08′W, 2605 m.
Bismarck Lake (Fig. 9): 35°21.88′N 111°43.26′W, 2683 m.
Turn-off to Forest Road 148B and Little Spring (park here or drive ahead 0.5 km and park at closed gate): 35°22.41′N 111°44.04′W, 2523 m.
Little Spring (Figs. 12–15): 35°22.49′N 111°43.53′W, 2550 m.

East side of San Francisco Peaks

Bonito Park on west side of Sunset Crater Volcano National Monument (Figs. 22, 24): 35°22.16′N 111°33.30′W, 2130 m. To get here from Flagstaff, drive north on US Route 89 and turn right (east) at 35°22.35′N 111°34.52′W and head towards Sunset Crater on the paved road. The ponderosa pine forest thins out on the right and becomes a large meadow called Bonito Park. A good place to stop for collecting is the small parking area on the right after 1.25 km (35°22.27′N 111°33.67′W) (Figs. 24–26). I have had better luck collecting tachinids among the sparse wildflowers and grasses under the scattered pines than in the meadow itself, which is dominated by the prairie sunflower (*Helianthus petiolaris*) (Fig. 22). I caught *Freraea montana* (Coquillett) (with a nearly straight M vein) and *Siphona* (*Aphantorhapha*) *arizonica* Townsend here in the early 1980s but have not seen them since. *Ptilodexia* and *Mochlosoma* (Fig. 26) are common. August and September have been the best months for me.
Lockett Meadow (Figs. 16–19): 35°21.63′N 111°37.24′W, 2600 m. To get here, turn left (west) at Sunset Crater road (see Bonito Park turn-off above) and follow directions to Lockett Meadow (take a right at 35°22.37′N 111°35.14′W and then a right again at 35°22.42′N 111°35.91′W). The dirt road is steep and narrow (one lane) in places. Tachinines are common on flowers in Lockett Meadow. There is a parking fee for day use but parking is free at the trailhead for the Inner Basin a little farther on.
Trailhead for Inner Basin trail from Lockett Meadow: 35°21.39′N 111°37.39′W, 2635 m. There are different wildflowers and thicker undergrowth here than in the open Lockett Meadow.
Inner Basin meadow (Fig. 21) (at pumphouse): 35°20.40′N 111°39.08′W, 2990 m.
Inner Basin trail: https://www.fs.usda.gov/recarea/coconino/recarea/?recid=55110.

Further information for insect collectors and visitors

A large portion of the land around and including the San Francisco Peaks belongs to the Coconino National Forest[1]. Casual insect collecting is generally permitted in national forests but if in doubt then visit or contact the Flagstaff Ranger Station[2]. A permit is required for scientific research in the Coconino National Forest and can be requested through the Coconino National Forest Supervisor's Office[3]. Some areas adjacent to, or surrounded by, the national forest are protected and no collecting of any sort is allowed without a permit, including Little Spring and Hart Prairie Preserve[4] on the west side of the Peaks and Sunset Crater Volcano National Monument[5] on the east side.

On the southern edge of the San Francisco Peaks at an elevation of 2100 m is Flagstaff, an outdoor/recreation-oriented city with a population of about 80,000. The downtown area reflects both the frontier heritage of the city[6] and its Route 66 history, and has an eclectic mix of restaurants, taverns, shops and art galleries. There is a wide range of hotels and motels with easy access to both sides of the Peaks. There are privately-operated campgrounds in the vicinity of Flagstaff and a popular primitive campground run by the Forest Service in the mountains at Lockett Meadow[7]. My personal preference when in the area is to split my time between lodging in Flagstaff and dispersed camping in locations on either side of the Peaks. "Dispersed camping" is the term for free camping on public land and there are many pull-offs along the dirt roads that allow this type of camping; just follow the rules posted online[8].

[1] https://www.fs.usda.gov/coconino, https://www.fs.usda.gov/main/coconino/about-forest/about-area
[2] 5075 US Route 89, Flagstaff, AZ, +1 928-526-0866; https://www.fs.usda.gov/recarea/coconino/recarea/ ?recid=70983
[3] https://www.fs.usda.gov/main/coconino/passes-permits/other
[4] https://www.nature.org/en-us/get-involved/how-to-help/places-we-protect/hart-prairie-preserve
[5] https://www.nationalparks.org/explore/parks/sunset-crater-volcano-national-monument
[6] https://www.legendsofamerica.com/az-flagstaff/
[7] https://www.fs.usda.gov/recarea/coconino/recarea/?recid=55136
[8] https://www.fs.usda.gov/detail/coconino/recreation/?cid=stelprdb5313448

Acknowledgements

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A brief report on Tachinidae collected during the 2022 North American Dipterists Society Field Meeting in the New Jersey Pinelands, USA

Figure 1. The view from a small hilltop in the New Jersey Pinelands.

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Introduction

The field meeting of the North American Dipterists Society (NADS) was held in mid-June of 2022 in the Pinelands (or Pine Barrens) of Southern New Jersey. The meeting was organized by Jon Gelhaus of the Academy of Natural Sciences of Drexel University. As in previous NADS field meetings, the meeting consisted largely of field trips to local sites to observe and collect flies, in addition to short research presentations, group meals, and general socializing amongst Diptera aficionados. An overall summary of the meeting was recently published by Gelhaus et al. (2022) in the last issue of *Fly Times*.

The New Jersey Pinelands Region includes a surprisingly large area of natural habitat in the Eastern U.S., clearly visible in satellite images (Fig. 2), despite New Jersey being the most densely populated state in the country. Although the pine barrens are ecologically diverse and unique, the region does not appear to have been heavily surveyed for most Diptera groups. Unfortunately, our collecting of tachinid flies (or bristle flies, as we like to call them) was quite poor, and we were only able to collect a relatively small number of individuals, 58 in total belonging to 30 total species. This poor collecting was partly due to unfavorable weather conditions (at least one day of rain), a lack of accessible aggregation sites such as bare hilltops, and time spent on other activities resulting in only modest collecting efforts (e.g., we spent a day exploring barrier island habitats at Island Beach State Park on the "Jersey Shore", where we did no collecting). However, it also appeared that for some reason tachinid activity and abundance was limited in general. Nevertheless, we here provide a report of Tachinidae collected in Southern New Jersey during the NADS meeting with some brief notes on particular habitats and species. All specimens are housed in the JOSC collection at Wright State University.

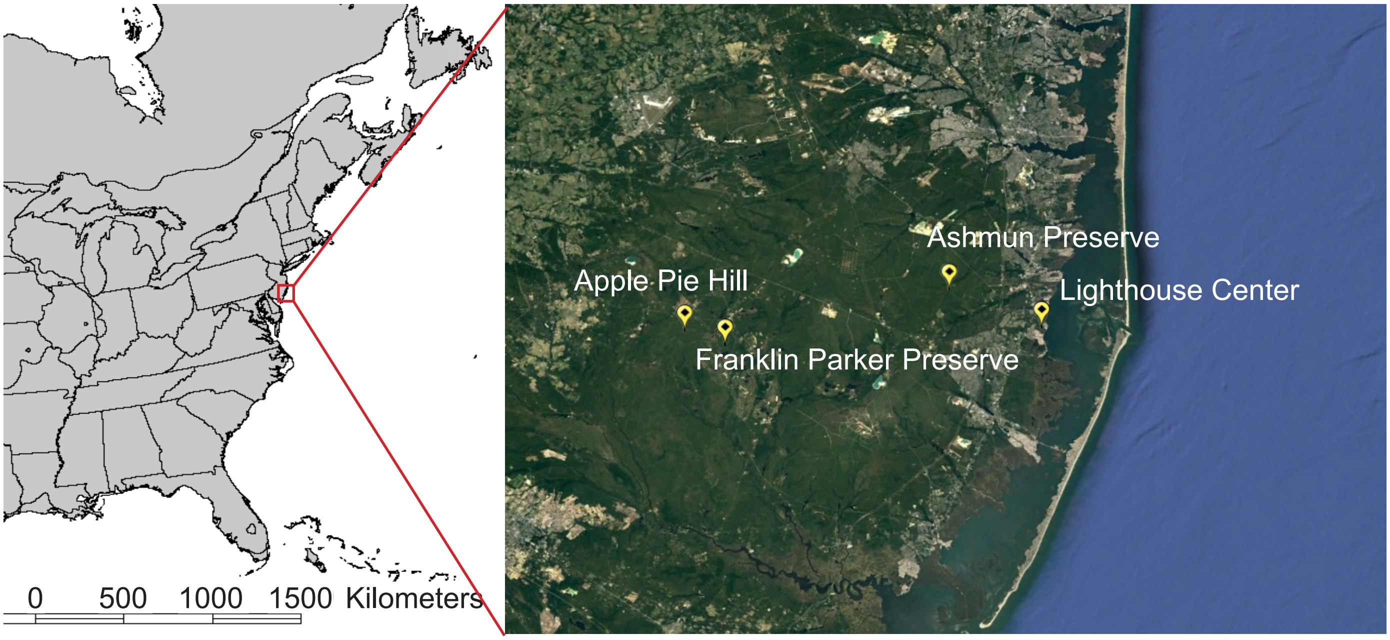

Figure 2. The pine barrens region of Southeastern New Jersey with the four areas where we collected Tachinidae.

Lighthouse Center

The meeting took place at the Lighthouse Center for Natural Resource Education in Waretown, New Jersey. This former camp for the blind is situated on Barnegat Bay of the New Jersey coast and encompasses a variety of habitats in its nearly 200 acres (about 78.5 ha), including a small area of beach, salt marshes, and coastal hardwood forest. Most of our collecting effort at this site was via two 6m Malaise traps (ours and that of Greg Dahlem) and through night collecting at a mercury vapor lamp and UV-light set up in an open area next to the Lighthouse Center lab building. We also tried some hand collecting along the forest edges, however these efforts were futile – we failed to net a single tachinid at this site. In addition, the Malaise traps (Fig. 3) captured remarkably few individuals and species relative to other places we have collected in the Northeastern region of the U.S. (Table 1).

Perhaps our most interesting find at this site was a series of *Cryptomeigenia* specimens belonging to three species (Fig. 4A-C) and the odd-looking dexiine, *Eutrixa exilis* (Coq.) (Fig. 4D). Interestingly, both of these groups attack adult beetles (primarily Scarabaeidae), and all of the specimens we collected via night lighting and in the Malaise traps were females, suggesting that our visit coincided with prime scarab-hunting season. *Cryptomeigenia* species are often quite similar in external appearance, but the variety of female terminalia

Figure 3. A Malaise trap at the Lighthouse Nature Center (with student Joe Wilson).

is remarkable, ranging from short, unmodified ovipositors to scoop-like plates to long, sharp piercers. This would be a fascinating group in which to explore the evolution of piercing terminalia as Blaschke et al. (2018) did with the Phasiinae.

Table 1. Tachinid species collected at the Lighthouse Nature Center (USA: NJ: Ocean Co., Waretown, 39.774, -74.196). Light at night = UV light or mercury vapor lamp.

Tachinid species	M	F	Method	Date(s)
Dexiinae: Eutrixini				
Eutrixa exilis (Coquillett)		1	Light at night	6/12
Voriini				
Thelaira americana Brooks		1	Malaise Trap	6/15
Exoristinae: Blondeliini				
Admontia ?pergandei (Coquillett)	1		Malaise Trap	6/14-15
Blondelia n. sp. nr. *polita*[1] (Townsend)	1		Light at night	6/13
Cryptomeigenia demylus (Walker)		4	Light at night (3)[2]/Malaise (1)	6/12,13,15
Cryptomeigenia dubia Curran		3	Window at night (1)/Malaise (2)	6/14-15
Cryptomeigenia cf. *simplex* Curran		1	Malaise Trap	6/15
Euthelairini				
Neomintho celeris (Townsend)		1	Malaise Trap	6/15
Goniini				
Hyphantrophaga blanda (Osten Sacken)		1	Malaise Trap	6/13
Hyphantrophaga cf. *sellersi*[3] (Sabrosky)	1		Malaise Trap	6/14
Phasiinae: Gymnosomatini				
Gymnoclytia occidua (Walker)		1	Malaise Trap	6/15
Tachininae: Leskiini				
Genea texensis (Townsend)		3	Malaise Trap	6/14
Minthoini				
Paradidyma affinis Reinhard		2	Malaise Trap	6/15
Paradidyma singularis (Townsend)		1	Light at night	6/12
Siphonini				
Actia diffidens Curran		1	Malaise Trap	6/13

[1] See discussion of Candace Mckee Ashmun Preserve below.
[2] One specimen collected by Z. Dankowicz.
[3] Keys to *H. autographae* (from Cuba), but *H. sellersi* seems more likely. Tarsi and body black in ground color.

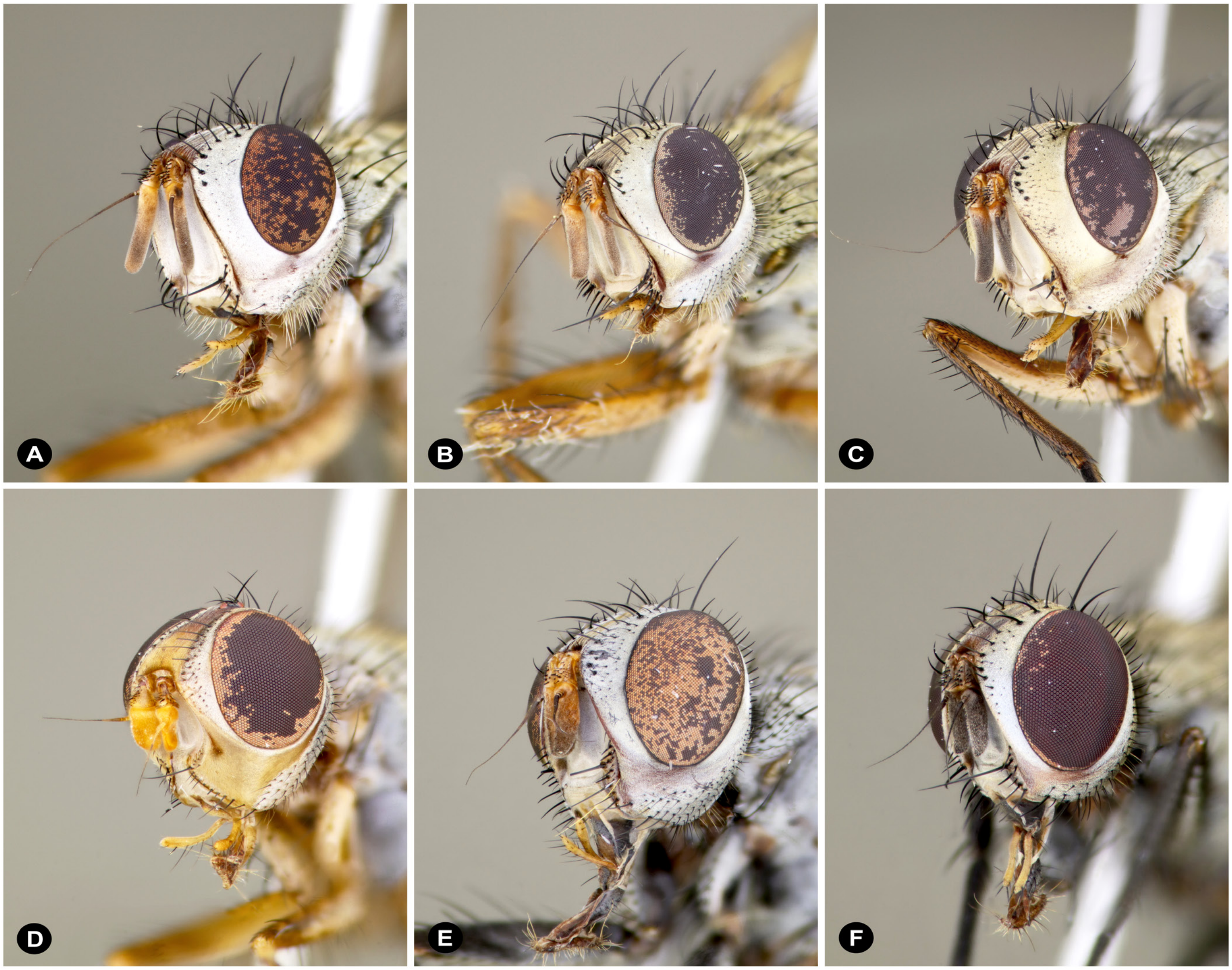

Figure 4. Head views of some of the primarily nocturnal, adult beetle-attacking, tachinid species we collected (all females). **A**. *Cryptomeigenia demylus* (Walker) (Exoristinae, Blondeliini). **B**. *C*. cf. *simplex* Curran. **C**. *C. dubia* Curran. **D**. *Eutrixa exilis* (Coquillett) (Dexiinae, Eutrixini). **E**. *Zaira georgiae* (B. & B.) (Blondeliini). **F**. *Zaira* n. sp.? (Images varied in scale.)

Candace Mckee Ashmun Preserve

The Candace Mckee Ashmun Preserve is a 4,000 acre preserve embedded in the larger (20,000 acre) Forked River Mountain Wildlife Area, located on the eastern edge of the New Jersey Pine Barrens. This area consists of classic pine barrens habitat, characterized by a broken forest (interspersed with openings) of mostly pitch pine and scattered oaks, with a fern-ericaceous-grass understory, growing on nutrient poor, white sand soils (Fig. 5). This piney upland habitat is interspersed with low-lying Atlantic white cedar and black gum swamps and other wetlands. The New Jersey Pine Barrens are the largest remnant of Atlantic pine barrens habitat, which is ecologically distinct from the surrounding eastern deciduous forest and harbors a number of endemic plant and animal species. We hand collected along a trail in the preserve on June 12th (with some spraying of honey-water on leaves), and again on June 15th, when a local conservation manager Bill Scullion guided us to a small hilltop in the middle of the forest. Although the small hilltop failed to attract tachinids, it did provide nice views of the surrounding landscape (Figs. 1, 6). Collecting was again relatively poor, amounting to only 15 individuals of nine species (Table 2), however, we did find some noteworthy taxa.

We collected a nice series of males of an undescribed *Blondelia* species on foliage along a trail in the preserve. This species was also collected at every other site where we collected during the trip. Although it bears a superficial resemblance to *B. polita* (Townsend), being somewhat small and dark (Fig. 7A), it is clearly distinguished from this and all other described North America species in having proclinate orbital setae in the males, and the facial ridge bristled on more than the lower half. Two females collected at the Franklin-Parker Preserve (below), bearing characteristic piercers and spine-like setae on the ventral abdominal tergites, confirm the species' placement in the genus *Blondelia*. We have collected similar (possibly conspecific) *Blondelia* specimens in the Eastern U.S. states of Kentucky (O'Hara & Stireman 2016) and West Virginia (Stireman & Perilla López 2022), suggesting that this unusual species or species complex is not restricted to the New Jersey coastal plain. Another notable find at the Ashmun Preserve was a small-bodied *Chetogena* species near *C. lophryi*. The two collected males were compared with *C. lophryi* and other *Chetogena* species in the CNC and USNM, and they are clearly distinct in terms of coloration (e.g., strongly gold fronto-orbital plate, thorax, and abdomen; Fig. 7B), external morphology (e.g., broad postpedicel), and terminalia. An additional male of this species was collected at Franklin Parker Preserve. A final interesting find was a female of *Zaira georgiae* (Brauer & Bergenstamm) (Fig. 4E). Members of this genus are typically nocturnal and attack adult beetles, like the related *Cryptomeigenia*, but this individual was collected during the day (sometime between about 10 AM and 2 PM), and this species may be diurnal.

Table 2. Tachinid species collected at the Candace Mckee Ashmun Preserve (USA: NJ: Ocean Co., 39.80, -74.266).

Tachinid species	M	F	Method	Date(s)
Exoristinae: Blondeliini				
Blondelia n. sp. nr. *polita* (Townsend)	5		Hand net	6/13, 15
Phyllophilopsis ?*nitens* (Coquillett)		1	Hand net	6/13
Zaira georgiae (Brauer & Bergenstamm)		1	Hand net	6/13
Eryciini				
Lespesia cf. *flavifrons* Beneway		1	Hand net	6/13
Euthelairini				
Neomintho celeris (Townsend)		1	Hand net	6/13
Exoristini				
Chetogena n. sp. nr. *lophryi* (Townsend)	2			6/13
Winthemiini				
Winthemia citheronia Sabrosky	1		Hand net	6/13
Tachininae: Tachinini				
Archytas aterrimus (Rob.-Des.) complex		2	Hand net	6/13
Deopalpus hirsutus Townsend		1	Hand net	6/13

Figure 5. A sandy trail we followed looking for tachinids in the Candace Mckee Ashmun Preserve, illustrating typical pine barrens habitat.

Figure 6. Fly collectors on a small hilltop overlooking the Candace Mckee Ashmun Preserve and surrounding pine barrens. From left to right: Joe Wilson (an undergraduate interested in Asilidae), Juan Manuel Perilla López, Greg Dahlem, and John Stireman.

Figure 7. Some notable tachinids collected in the New Jersey Pine Barrens. **A**. *Blondelia* n. sp. nr. *polita* (Townsend) (Exoristinae, Blondeliini), ♂. **B**. *Chetogena* n. sp. nr. *lophryi* (Townsend) (Exoristinae, Exoristini), ♂. **C**. *Oestrophasia calva* Coquillett (Dexiinae, Oestrophasiini), ♂. **D**. *Phytomyptera* sp. nr. *johnsoni* (Coquillett) (Tachininae: Graphogastrini), ♀. (Images varied in scale.)

Franklin Parker Preserve and Apple Pie Hill

One of the group excursions of the NADS meeting was to the Franklin Parker Preserve in the heart of the pine barrens. This preserve encompasses over 9,000 acres of pine-oak forests, bogs, and lakes, and is surrounded by 250,000 acres of public conservation lands including state forests and wildlife management areas. We spent several hours here looking for flies, mostly in open areas and along forest edges (Fig. 8). Although the area was relatively good for bombyliids and asilids, we collected few tachinids. We returned to the area after dinner to try some night collecting at a UV light, and were rewarded with a handful of additional tachinid specimens.

In addition to obtaining more specimens of the apparently undescribed *Blondelia* and *Chetogena* species mentioned above (Table 3), we made a few new “discoveries” at Parker Reserve. First, we collected two specimens of the interesting oestrophasiine *Oestrophasia calva* Coq. (one of which was later lost; Fig. 7C). *Oestrophasia*, like *Cryptomeigenia* and *Zaira*, are parasitoids of adult beetles, but unlike these distantly related blondeliines, they apparently accomplish parasitism via microtype eggs that are ingested by the host beetles (de Santis & Nihei 2022). Continuing with the adult beetle parasitoid theme, we collected two conspecific females of the genus *Zaira* at the UV-light at night (Fig. 4F). This is a difficult genus that is in need of revision, but we could not match these specimens to any known species. We suspect it may represent yet another undescribed species (note the relatively large eye compared to the other nocturnal beetle parasitoids). A third noteworthy species collected in the Preserve was an attractive species of *Phytomyptera* represented by a single female specimen. This small, dark, fly with wings boldly marked anteriorly (Fig. 7D) may also represent a new species. It is similar to *P. johnsoni* (Coquillett), sharing with this species marked wings, but comparisons with specimens of this species in collections suggests our specimen is distinct, or at the very least an unusual variant.

Table 3. Tachinid species collected at the Franklin Parker Preserve (USA: NJ: Burlington Co., Chatsworth, 39.81, -74.55, "FPP") and neighboring Apple Pie Hill (USA: NJ: Burlington Co., Chatsworth 39.807, -74.590, "APH"). Light at night = UV light or mercury vapor lamp.

Tachinid species	M	F	Method	Date(s)
Dexiinae: Dexiini				
Ptilodexia ?caroliniensis (Brauer and Bergenstamm)[1]	1		FPP: Hand net	6/14
Oestrophasiini				
Oestrophasia calva Coquillett	1		FPP: Hand net	6/14
Sophiini				
Cordyligaster septentrionalis Townsend[2]	1		FPP: Hand net	6/15
Exoristinae: Blondeliini				
Blondelia n. sp. nr. *polita* (Townsend)[3]	2	2	FPP (3), APH (1): Hand net	6/14, 15
Oswaldia sp. nr. *conica* (Reinhard)	1		FPP: Light at night	6/14
Zaira n. sp.		2	FPP: Light at night	6/14
Exoristini				
Chetogena n. sp. nr. *lophryi* (Townsend)	1	1	FPP: Hand net	6/14
Chetogena cf. *scutellaris* (van der Wulp)		1	APH: Hand net	
Goniini				
Distichona nr. *autumnalis* (Townsend)[4]		1	FPP: Hand net	6/14
Tachininae: Graphogastrini				
Phytomyptera sp. nr. *johnsoni* (Coquillett)		1	FPP: Hand net	6/14
Minthoini				
Paradidyma affinis Reinhard		1	FPP: Hand net	6/14
Paradidyma singularis (Townsend)	1	2	FPP: Light at night	6/14
Tachinini				
Archytas aterrimus (Rob.-Des.) complex	1		APH: Hand net	6/14

[1] This specimen could not be definitively identified and could be undescribed. It is dark like *P. obscura*, with the haustellum of intermediate length (0.57x head height) and a relatively robust body. It is most similar to *P. caroliniensis* but lacks red orange coloration on the abdomen and the haustellum is somewhat long.
[2] Collected by J. Gelhaus.
[3] This is a difficult genus and this specimen may belong to *O. conica* or perhaps an undescribed species.
[4] Probably *D. autumnalis*, but legs black, parafacial whitish, and abdominal microtomentum gray, in contrast to specimens collected in nearby West Virginia.

On our last day of collecting (June 15) we visited the nearby site of Apple Pie Hill. This is the highest point in the pine barrens region, rising a meager 209 ft. (63.7m) above sea level. As might be expected, a fire lookout tower sits atop the main hill. The fire tower itself is surrounded by a fence and was not accessible, but we looked for hilltopping tachinids around the periphery of the tower. During our search for bristle flies, we seem to have inadvertently set off an alarm, because an ear-piercing siren began wailing from the tower shortly after we arrived and we were forced to abandon our collecting efforts. Despite this site being a hilltop, we observed very few tachinids and collected only a handful (Table 3).

Figure 8. An artificial open grassy area surrounded by pine forest within the Franklin Parker Preserve. Several tachinids including a female of *Oestrophasia calva* were collected along this forest edge.

Final Thoughts

Although the total yield of our collecting efforts in terms of tachinid specimens and species was disappointing, we are glad we joined the meeting and visited the pine barrens. It is a unique area, reminiscent of forests far to the south or west, containing a variety of interesting habitats. As mentioned previously, the extent of natural and semi-natural habitat of the pine barrens in such a densely populated region is surprising and refreshing, and we look forward to returning and exploring the area more thoroughly.

The reasons behind our weak collecting results are unclear. As stated previously, we believe our poor collecting reflected a true lack of tachinid activity, as evidenced by the very low Malaise trap catches. This low level of activity could be due to the season we visited, perhaps being between major pulses of tachinid abundance associated with variation in host availability (i.e., between spring and later summer generations of caterpillars; Stireman & Workman 2023). The lack of clear aggregation sites where tachinid activity might be concentrated, such as bare hilltops or isolated canopy openings, may also have limited our success. Aggregation sites for tachinids must surely exist, but perhaps these are highly dispersed or associated with inaccessible areas of the canopy. Finally, although the pine barrens habitat is interesting and unique, the white sandy soils are nutrient-poor and the forest tends to be dominated by a relatively few highly tolerant tree and understory shrub species. Such low diversity in woody plants and perhaps low plant productivity could result in relatively low abundance and diversity of hosts, and hence tachinids. Shortly after our trip to New Jersey (18 June 2022) we stopped at an Appalachian forest site in eastern West Virginia (the Romney site of Stireman & Perilla López 2022) and were able to hand collect 83 individuals of 49 species in a single day with only moderate effort, considerably more than we collected in New Jersey over four days including Malaise trapping and night lighting.

Despite the relative low numbers of tachinid specimens we collected in New Jersey, we recovered a number of quite interesting taxa, including at least three apparently undescribed species and several others that could not be definitively assigned to a described species (representing new species or morphological variants or difficult species complexes). We are continually surprised at the discovery of novel species (and subspecific forms) in the relatively well-studied Eastern U.S. We are also often frustrated by our inability to confidently identify species from this region due to a lack of keys and modern taxonomic revisions, and the presence of many morphologically-difficult species complexes. Both of these issues highlight the need for more basic taxonomic study of North American Tachinidae. One benefit of our relatively poor collecting results was that we were able to spend more time scrutinizing the few specimens we did collect, carefully comparing them with museum specimens and identifying potentially new taxa. As the familiar adage states, sometimes “less is more.”

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MORPHOLOGY OF THE FEMALE OVIPOSITOR

as a valuable source to explain the diversification of oviposition strategies in Tachinidae (Diptera)

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Parasitoid species usually fascinate researchers and enthusiasts of natural history because of their interactions with their hosts. Either directly or indirectly, parasitoids exhibit a wide variety of oviposition strategies to parasitize their hosts and complete development. In insects, the most representative groups of parasitoids are found first in parasitic Hymenoptera, followed by tachinid flies (Diptera: Tachinidae) (Eggleton & Belshaw 1992, Feener & Brown 1997). Parasitic hymenopterans have complex ovipositors associated with accessory glands, which give females an advantage when accessing and manipulating hosts (Feener & Brown 1997); however, hymenopteran wasps usually must have direct contact with the host to lay their eggs. In Tachinidae, on the other hand, although the host range is less broad and the oviposition strategies are less sophisticated than in Hymenoptera, the diversity of direct and indirect oviposition strategies is impressive (O'Hara 1985, Stireman et al. 2006, Nakamura et al. 2013, Dindo & Nakamura 2018).

OVIPOSITION STRATEGIES IN TACHINIDAE

Several variations in direct and indirect oviposition strategies are found in the four tachinid subfamilies (see Fig. 7.3 in Nakamura et al. 2013). The direct type involves oviparous and ovoviviparous species that lay their eggs on the host's cuticle, e.g., in Winthemiini (Exoristinae) and Gymnosomatini (Phasiinae), or inject their eggs into the host's body, e.g., in Blondeliini (Exoristinae) and Phasiinae groups with piercing ovipositors. The greatest diversity of oviposition strategies in Tachinidae, however, are indirect, with ovoviviparous species that lay eggs with well-developed first instar larvae that either actively search for the host (i.e., searching type), e.g., in Dexiini (Dexiinae) and some Blondeliini (Exoristinae), or wait for the host to cross their path (i.e., waiting type), e.g., in Tachinini (Tachininae); and oviparous species that lay well sclerotized microtype eggs on the food plant to be ingested by the host, e.g., in Goniini and some Blondeliini (Exoristinae) and some Dufouriini (Dexiinae).

Parasitoid females are responsible for the success of the parasitization, as they have to precisely trace and locate the host's cues and lay their eggs in a suitable oviposition site. Therefore, females are expected to present features that reflect evolutionary adaptations during the diversification of oviposition strategies in parasitoid lineages, especially in the structures used during these processes, such as antennal and tarsal sensilla, egg/larval type, and ovipositors. In this brief review, I want to focus on the importance of the female ovipositor in the diversification of oviposition strategies in Tachinidae.

Several ovipositor characters are correlated with oviposition strategies of parasitoid species, such as ichneumonids (Belshaw et al. 2003), and of non-parasitic species as well, such as fig wasps (Elias et al. 2018), cerambycids (Lee & Lee 2020), moths (Kawakita & Kato 2016), and mantises and cockroaches (Hörnig et al. 2018). The major advantage of these studies lies in the possibility of inferring the oviposition strategies of related species that share the same characters and whose biology is unknown.

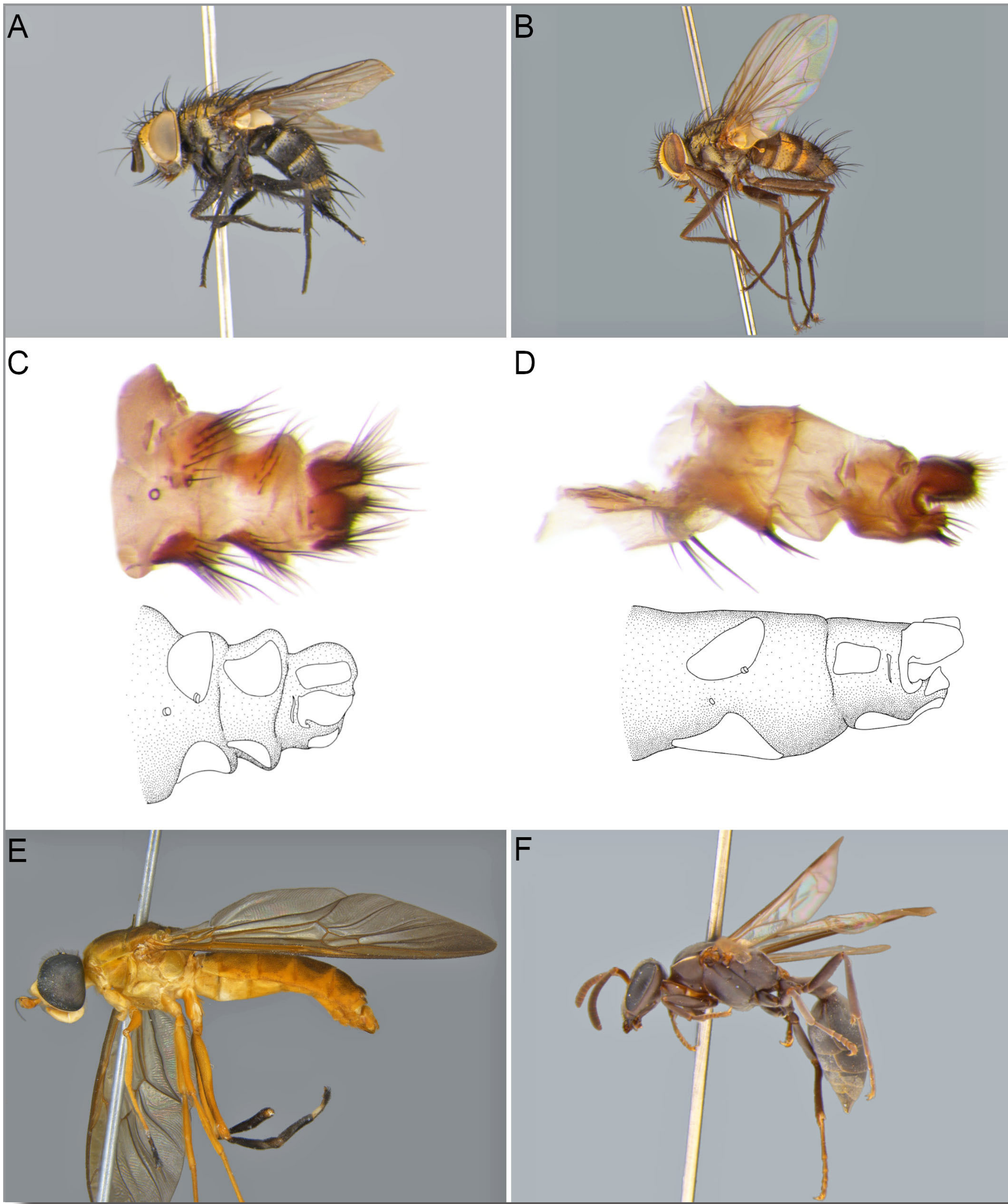

Figure 1. Comparison of ovipositors of two species of *Lixophaga* Townsend (Blondeliini) and their respective hosts. Images extracted from Gudin et al. (2022) and Gudin (2023). **A**. Female of *L. stratiophaga* Gudin. **B**. Female of *L. punctata* (Townsend). **C**. Image and line drawing of *L. stratiophaga* ovipositor in lateral view. **D**. Image and line drawing of *L. punctata* ovipositor in lateral view. **E**. Host of *L. stratiophaga*: *Ptecticus testaceus* (Fabricius) (Diptera: Stratiomyidae). **F**. Host of *L. punctata*: *Polybia* (*Myrapetra*) *scutellaris* (White) (Hymenoptera: Vespidae).

For instance, in Tachinidae, most species are not accessible for direct observation, especially in tropical environments where the majority of species inhabit the higher strata of forests (Amorim et al. 2022). Curiously, studies on the comparative morphology and evolution of ovipositors in tachinid females are scarce, preventing the inference of robust explanatory hypotheses regarding the diversification of oviposition strategies in the family. Herting (1957) was the first author to summarize the diversity and homologies of female ovipositors (also called female postabdomen or female terminalia) in tachinids and other calyptrate flies, arguing about the validity of these characters in explaining the diversification of Calyptratae lineages. Later, Cantrell (1988) provided a comprehensive descriptive and comparative contribution on the female ovipositors of the Australasian fauna of Tachinidae. Farinets (1994, 2006, 2010, 2017, 2018) has made valuable contributions to the homology and diversity of female ovipositors in Palaearctic Tachinidae as well.

In the last decade, however, the understanding of the evolution of oviposition strategies in Tachinidae has improved with the clarification of phylogenetic relationships in the family (Tachi & Shima 2010, Cerretti et al. 2014, Blaschke et al. 2018, Stireman et al. 2019). However, these inferences are based on ancestral state reconstruction or optimization of broad behavioral characters (e.g., oviparity with macrotype eggs and oviparity with microtype eggs), which provide limited explanations regarding oviposition strategies and how hosts are exploited in each group. For instance, oviposition with microtype eggs occurred independently in Tachinidae at least three times: most notably in the tribe Goniini but also in some blondeliine genera (e.g., *Anisia* Wulp) and in the dufouriine genus *Oestrophasia* Brauer & Bergenstamm (Wood 1985, de Santis & Nihei 2022). A closer analysis of ovipositor morphology shows that, although these three groups share a similar oviposition strategy, the evolutionary pathways that led to this result were different. Therefore, it is very important to clearly delimit the homologies and verify how ovipositor characters evolved in different lineages of Tachinidae.

Most taxonomic studies of Tachinidae have focused on the characters of the male terminalia because these tend to be more useful for discriminating between species than female ovipositors. However, there is evidence that the female ovipositor of tachinid flies is a valuable source of information for delimiting suprageneric groups, and sometimes species. De Santis and Nihei (2022) provided convincing evidence that ovipositor morphology has a strong phylogenetic signal in species of Dufouriini and related tribes, which is probably a result of adaptation to parasitize adult coleopteran hosts. In taxonomy, Dios & Nihei (2017, 2020) showed that the female ovipositor is informative for the delimitation of the genus and even species of Gymnosomatini; the same is true for other groups of Tachinidae, such as Ormiini (Nihei 2015, Gudin & Nihei 2019) and some Blondeliini (Burington 2022, Gudin et al. 2022, Gudin 2023).

MY POSTDOCTORAL PROJECT

In my postdoctoral research project, I am working with the comparative morphology of ovipositors of calyptrate flies, mainly Tachinidae, to provide a robust hypothesis on the evolution of oviposition strategies in these flies. I hope to delimit homologies, reconstruct the ancestral state of ovipositor characters in the main lineages of Calyptratae, and improve the knowledge about host use and oviposition strategies in particular groups.

During this project, I have had the opportunity to study the taxonomy and hosts of species of the New World genus *Lixophaga* Townsend (Blondeliini), whose ovipositor morphology seems to reflect the diversity of their hosts. *Lixophaga* species are parasitoids of borers of plants and fungi and show a varied set of hosts in the orders Coleoptera, Diptera, Hymenoptera and Lepidoptera (Gudin et al. 2022, Gudin 2023). When comparing the ovipositor morphology of two species that attack different hosts, it was possible to see an impressive intraspecific variation in both the length and shape of the sclerites (Fig. 1). *Lixophaga stratiophaga* Gudin is a parasitoid of fruit-boring Stratiomyidae larvae (Gudin et al. 2022), whereas *L. punctata* (Townsend) is the only species in the genus adapted to parasitize larvae of eusocial wasps of the genus *Polybia* Lepeletier (Hymenoptera: Vespidae) (Gudin

2023). Eusocial wasps are not borers, but their larvae are reared within comb cells that have varying degrees of exposure and length. *Lixophaga* species are ovoviviparous, laying eggs with well-developed first instar larvae at the entrance of the host cavity (Waggy & Beardsley 1974, Roth et al. 1978). Therefore, it is expected that *L. punctata* females have a similar oviposition strategy, laying eggs near the entrance of the nest. However, considering the challenges of parasitizing eusocial wasps, such as aggressiveness and parental care, it is expected that the ovipositor of this species reflects a process of adaptation to explore this new kind of host. Although preliminary, these findings provide evidence that ovipositor morphology is highly informative in this genus. Further details on this discussion can be found in Gudin et al. (2022) and Gudin (2023).

If you are interested in the evolution of oviposition strategies and host use in the Tachinidae, I am happy to collaborate. There is a lot of work to be done and fascinating discoveries ahead!

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Parasitism of *Neoconocephalus* katydids by *Ormia lineifrons* Sabrosky (Tachinidae: Ormiini)

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Tachinids are endoparasitoids of insects and a few other arthropods and the vast majority of them find hosts through olfactory and visual cues (Stireman et al. 2006). However, there is one small group of tachinids that has evolved a special way of locating hosts. This group has the ability to hear mating calls of their orthopteran hosts, which are mostly crickets, katydids and mole crickets (Lehmann 2003). They are able to detect sound through their prosternum, a structure on the underside of the thorax between the front legs. The prosternum in most tachinids and other flies is a narrow sclerotized plate but in these sound-detecting tachinids it has evolved into an inflated and intricate tympanal organ (Robert et al. 1992). Mechanical coupling within this hearing organ provides accurate directional hearing that allows these flies to home in on and parasitize calling hosts (Miles et al. 1995, Hoy & Robert 1996).

These sound-detecting tachinids are believed to belong to a single evolutionary lineage and have been assigned to their own tribe, the Ormiini, in subfamily Tachininae. This small tribe has only seven genera and 71 species but is worldwide in distribution (O'Hara et al. 2020). More than half the species belong to two New World genera, *Ormia* Robineau-Desvoidy (27 species in the Nearctic and Neotropical regions) and *Ormiophasia* Townsend (16 species, all Neotropical; Gudin & Nihei 2019).

Figures 1–2. Male of *Ormia lineifrons* Sabrosky. Collection data: USA, Florida, Lake Placid, Archbold Biological Station, 20-24.iii.1972, coll. L. Edwards, R. Morse, M. Turell & R. Lederhouse (deposited in the Canadian National Collection of Insects, Ottawa). **1**. Frontal view. **2**. Left lateral view. (Photos by S.J. Henderson.)

Most studies on sound reception, host-parasitoid relationships, and other characteristics that are unique to ormiines have involved *Ormia ochracea* (Bigot), a species widespread throughout the Americas and an immigrant species in Hawaii (e.g., Cade 1975, Robert et al. 1992, Walker 1993, Mason 2021, Broder 2022). I studied a lesser known ormiine species for my Master's thesis, *Ormia lineifrons* Sabrosky (Rogers 2021, Rogers & Beckers 2022) (Figs. 1, 2). This species is widespread in the Americas and parasitizes male katydids.

Only one host species was known for *O. lineifrons* when I started my thesis, the broad-tipped conehead katydid *Neoconocephalus triops* (Linnaeus). This record was based on rearings by Burk (1982) in Florida. Another observation that had been published on *O. lineifrons* in Florida noted the two sexes "hilltopping" for mating purposes, but not during the day as do most hilltopping tachinids but just after sunset and lasting less than 15 minutes (Lederhouse et al. 1976). The authors observed the same behavior in *Ormia dominicana* Townsend, and later Wood (1996) reported similar behavior in *Ormia reinhardi* (Sabrosky) in western Quebec. The male *O. lineifrons* shown in Figs. 1–2 was one of the original specimens upon which the observations of Lederhouse et al. (1976) were based.

Figure 3. Male *Neoconocephalus robustus* host multi-parasitized by *Ormia lineifrons* (puparium in yellow circle) and nematomorph parasites (red circle). (Photo by author.)

Katydids in the genus *Neoconocephalus* Karny (Tettigoniidae) rely on acoustic communication for mating, wherein males produce species-specific calls to attract females. My thesis focused on the parasitism of *Neoconocephalus* hosts by *O. lineifrons* in the vicinity of Murray, western Kentucky (Rogers 2021). I collected *Neoconocephalus* in fields from April to September in 2019 and March to October in 2020. I found the katydids by driving on country roads at night with open windows, listening for the loud and conspicuous calls of the males. I used these calls to locate the males, which I collected and took back to the lab to rear. I also tried to attract *Ormia* to recordings of the mating calls of *N. velox* Rehn & Hebard but this was unsuccessful. I collected close to 400 katydids belonging to six *Neoconocephalus* species during the 2019 and 2020 seasons. I found four of the species parasitized by *O. lineifrons*: *N. triops*, *N. nebrascensis* (Bruner), *N. robustus* (Scudder) and *N. velox* (Rogers 2021, Rogers & Beckers 2022). Of these, the last three were new records of parasitism by *O. lineifrons*. This parasitoid exerts a strong selective force on its hosts because it inevitably kills hosts within seven to nine days after parasitization.

An additional finding I can report here, that was not reported in my thesis, was the discovery of a captured male of *N. robustus* parasitized by both *O. lineifrons* and a horsehair worm (Nematomorpha: Gordioidea), possibly *Gordius* sp. (Fig. 3). Parasitism of *N. robustus* by *Gordius* sp. was reported once before by Nutting (1953: 76) based on records from Cape Cod, Massachusetts.

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Tachinidae of the Canadian Maritimes

with a survey in New Brunswick

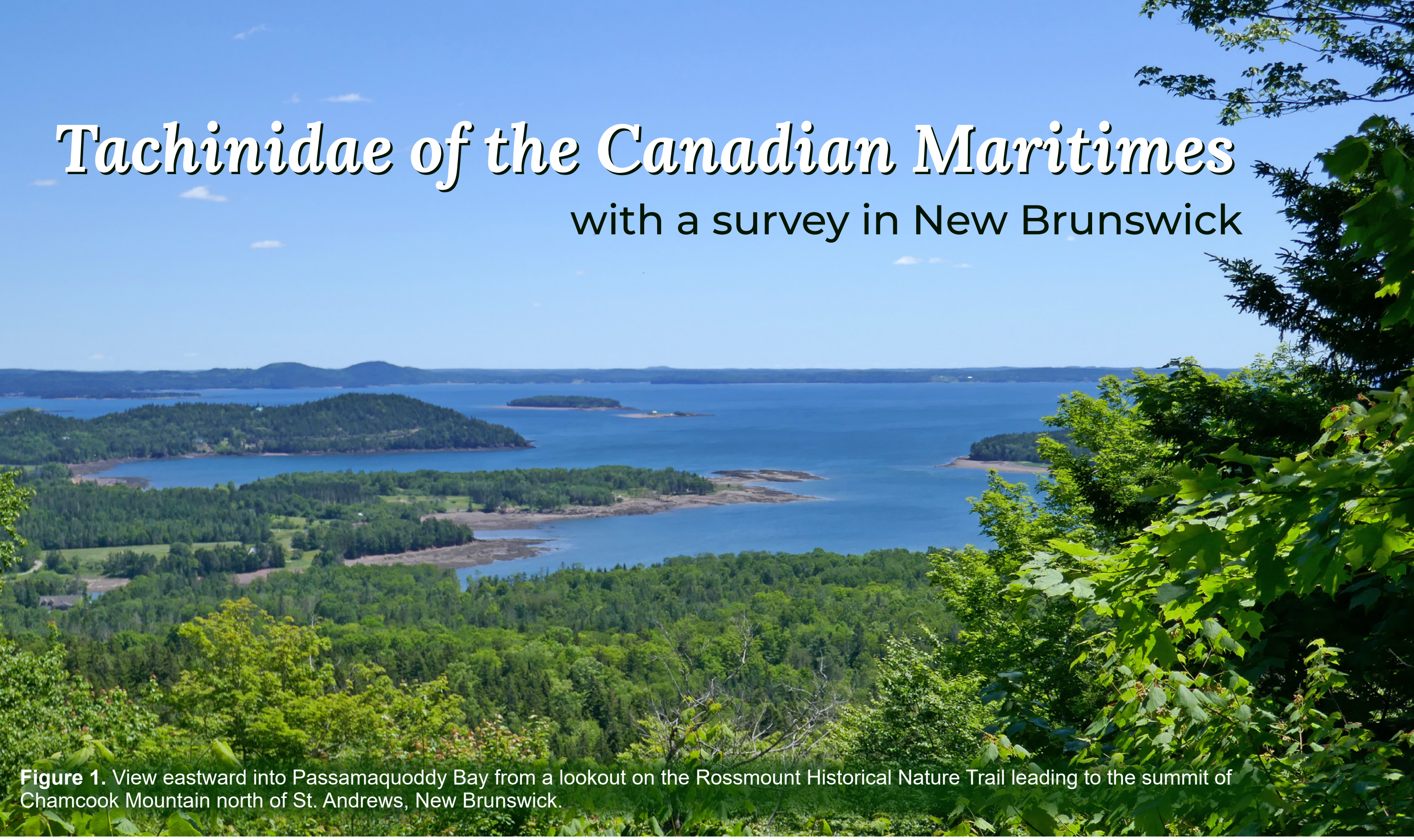

Figure 1. View eastward into Passamaquoddy Bay from a lookout on the Rossmount Historical Nature Trail leading to the summit of Chamcook Mountain north of St. Andrews, New Brunswick.

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Introduction

The small rural community of Oak Bay, New Brunswick, is situated between the popular tourist towns of St. Stephen and St. Andrews in the southeastern corner of the province. Extensive secondary forest stretches into the distance on either side of the rural road, Route 170, that passes along the edge of the community and provides residents with a quieter link between the two larger towns than the NB Route 1 highway a kilometre or so to the north. Along this rural road are widely-spaced private properties that form small indentations in the surrounding forest.

I spent a week at one of these rural properties along Route 170 during the summer of 2021. I had gone out there on a holiday to visit with two long-time friends. Travel restrictions imposed during COVID-19 were beginning to lift and I was contemplating a future return to New Brunswick on a tachinid collecting trip. I had completed a three-year tachinid survey in Ottawa the year before (as yet unpublished) and wanted to compare the results with a collection of tachinids from somewhere else in Canada.

At first I had in mind a road-trip style drive through the province with stops at various places, including Oak Bay. But as I looked out upon the hectare-sized property where I was staying, I could envision my 6-metre Malaise trap up against the forest at the back, and smaller Malaise traps in other places. Several hilltops were not far away. I could pin flies from traps daily and take trips to the hilltops to supplement the trap material. With these thoughts developing into a plan, I asked my hosts about it. Would they mind if I returned for two weeks in 2022 to collect tachinids, with the understanding that I would put Malaise traps all over their property, sort trap samples at their kitchen table, pin specimens until late in the evening in their living room, and store fresh trap samples in their refrigerator/freezer to kill hangers-on and relax specimens before pinning? I knew the answer would be yes before I asked, as they were well-acquainted with my job and peculiar habit of collecting flies. They looked forward to seeing their property transformed into a research site for a couple of weeks the next summer.

From my perspective there was much to gain from a brief tachinid survey in New Brunswick. For starters, we do not have a great collection of New Brunswick tachinids in the CNC. Some of our holdings from the province originated from an insect survey in Kouchibouguac National Park on the northeastern coast in 1977 and 1978 and from Forestry surveys that periodically reared tachinids and other parasitoids from various pest insects. Of particular interest were tachinids and other Diptera collected by CNC staff member Guy Shewell during the summers of 1957 and 1965 in the area of Chamcook between Oak Bay and St. Andrews, the same area where I would be collecting. I was also interested in DNA barcoding fresh material from New Brunswick for a couple of purposes: to see if there are geographical differences in the barcodes of what appear to be the same morphospecies (between Ottawa and New Brunswick, for example), and to expand the DNA barcode "library" I am building for CNC Tachinidae.

The Maritimes

The Canadian Maritimes are comprised of the three eastern provinces of New Brunswick, Nova Scotia and Prince Edward Island. This region was covered by a vast ice sheet during the last ice age, as was most of Canada. A warming trend led to a gradual thinning and retreat of the ice and bare land began to appear around 11,000 years ago. Tundra and post-glacial boreal forest gradually replaced the once ice-covered land. Forests that developed later have been described by Zelazny (2007: 72):

> "Since the immediately post-glacial period, the Appalachian Mountains have remained above sea level and thus have served as an effective north-south migration corridor. This has resulted in a blending of northern and southern floral and faunal elements in the Atlantic region. The unique mixture of forested and non-forested ecosystems in the Maritimes has been recognized by Canadian and North American classification frameworks as a definable forest region called the Acadian Forest or, more recently, the Atlantic Maritime Ecozone."

The forests of the Atlantic Maritime Ecozone at the time of European settlement in the early 1600s had been little impacted by the indigenous peoples of the region and has been described as "'*primeval' forests that included pine, hemlock, cedar, spruce, fir, and a number of hardwood species*", referring to forests in the present Annapolis County of Nova Scotia across the Bay of Fundy from the present city of Saint John, New Brunswick (Loo & Ives 2003: 46). The primary forests of N.B. were largely spared until the early 1800s when logging began in earnest, especially along streams and rivers that could float logs to the coast. Old growth white pine, which could reach five feet in diameter in such forests, was among the first species to be selectively logged. Farming became popular as the land was cleared and the present-day Oak Bay area that is largely forested today was likely farmland until well into the 1900s. Farming fell into decline as the people turned to other professions and farmland slowly reverted to forest over much of the region (Zelazny 2007). The secondary forest that exists today is less diverse than the original forest and is characterized by younger trees, averaging ca. 50 years old rather than 200+. Common tree species are balsam fir, red maple, white spruce, white birch, poplar, and alder (Loo & Ives 2003).

Materials & Methods

Main study site

The main study site was located on the west side of Route 170 on a private property beside the popular Oak Bay Snack & Dairy Bar. Between the back of the property and the NB Route 1 highway one kilometre to the west is unbroken forest. The rest of the surrounding area is a mix of forest and agricultural fields, with a network of rural roads and scattered private properties. Five Malaise traps were set up along the sides and back of the property at the locations indicated in the aerial view shown in Fig. 2. A distance of 120 metres separated the traps on either side of the property and the elevation of the traps averaged 23 metres above sea level. Additional details about the style, position, and duration of each trap are given below.

Location 1 (Fig. 3), 45.22510°N 67.19585°W. A 6-metre Malaise trap was set up against treeline at the back of property with one end facing east into the yard. No collecting head was attached to the back of the trap, which was among the trees. The trap head at the front was run "dry" (no ethanol) with a small piece of Ortho® Home Defense® Max™ No-Pest® Insecticide Strip as the killing agent. The head was emptied once or twice a day, removed from the trap after dusk, and replaced the next morning. The sampling period was 11 days from 28 June to 8 July 2022.

Figure 2. Aerial view of locations of the five Malaise traps on a property along Route170 through Oak Bay, New Brunswick. A 6-metre trap was in location 1, a Bugdorm and a Sante trap were in locations 2 and 3 (reversed halfway through survey), and two Bugdorm traps were in locations 4 and 5 (trap catches were combined).

Location 2 (Fig. 4), 45.22424°N 67.19549°W and **location 3** (Fig. 4), 45.22424°N 67.19534°W. A BugDorm ez-Malaise trap was placed in location 2 on 27.vi.2022 and a Sante Malaise trap was placed in location 3 on the same day. The backs of each were positioned against a row of trees, mostly overgrown alders, that mark the property line. Traps were 12 metres apart. The heads were facing north and the traps were partially shaded during the day. Both traps were run "wet" with 75% ethanol. Contents of the heads were emptied into jars of fresh 75% ethanol at two intervals, 27–29.vi.2022 and 30.vi.–3.vii.2022. The locations of the two traps were switched during early afternoon on the last day of the second interval (3.vii) with the BugDorm trap moving to location 3 and Sante trap to location 2. Contents of the heads were emptied and preserved as before at two intervals, 3–5.vii.2022 and 6–8.vii.2022. The total sampling period was 12 days from 27 June to 8 July 2022. These traps were reversed halfway through the sampling period so that the performance of the BugDorm and Sante traps could be compared without location bias in a future *Fly Times* article (see similar test of the two trap styles by Sharkey & Brown 2022).

Locations 4 and 5 (Fig. 5), both averaged to the coordinates 45.2252°N 67.1957°W. Two BugDorm ez-Malaise traps were set up in these locations. Trap 4 was placed on grass with the head facing south and back against a grassy meadow. Trap 5 was placed in the meadow with head facing east and back against a small shrub. Traps heads were run "dry" in the same manner as explained for the 6-metre trap, and heads were removed and replaced according to the same daily schedule. Daily samples were pooled from the two traps and treated as a single collecting event. Sampling period was 6 days from 3–8 July 2022.

Additional collecting sites

With the exception of one specimen caught at Todds Point (see below), all specimens not collected at the main study site were caught on three hilltops 10–15 kms south-southeast of Oak Bay, half to three-quarters of the way to St. Andrews along Route 127.

Figure 3. Six-metre Malaise trap in location 1 at the back (west side) of property. The collecting head was attached only at the front (east-facing) end.

Figure 4. Two Malaise traps along the property line on the south side of property. A Sante Malaise trap is in the foreground in location 3 and a BugDorm ez-Malaise trap is in the background in location 2. These traps were reversed halfway through the sample period.

Figure 5. Two BugDorm ez-Malaise traps on the north side of property, one on the edge of a meadow in location 4 and the other in the meadow in location 5.

Chamcook Mountain (Figs. 6, 9–13), 45.1250°N 67.0833°W, 190 metres (summit). The summit is granite and covers a broad dome-like area consisting of a complex mix of bare rock, conifers, patches of low vegetation, and damp mossy spots. Just a few metres below the summit is a grassy and partially-shaded area with wildflowers that was frequented by a few species of tachinids (Fig. 13). Flies were collected from the ground, tree trunks, and vegetation from mid-morning to mid-afternoon. They were collected into 50 ml conical centrifuge tubes charged with 1,2-dichloroethane as the killing agent. Dead specimens were transferred to a tissue-lined container after ca. 30 minutes in a killing tube. Collecting took place on three warm and sunny days, 28 & 29 June and 4 July 2022. For more information about Chamcook Mountain and the Rossmount Historical Nature Trail leading to its summit, see: https://www.hikingnb.ca/Trails/FundyWest/StAndrews/ChamcookMountain.html.

Chamcook Tower (Figs. 7, 14–16), 45.1254°N 67.0931°W, 160 metres (summit). This location gets its name from the huge communications tower on its granite summit (Fig. 7). Vegetation is generally low-lying and sparse on the broad rocky summit, with full-sized trees mostly confined to the outer edges and mountain sides (Fig. 14). Lowbush blueberry (*Vaccinium angustifolium*) (Fig. 15) grows among the rocks on the summit, a plant I did not see on the summit of Chamcook Mountain. This hilltop was visited once in mid-afternoon on 4 July after collecting earlier on Chamcook Mountain. Despite a careful search of the area and the weather being warm and sunny, no tachinids were seen on the ground or vegetation. The only tachinids captured were those landing on the sides of a concrete building to one side of the tower (Fig. 16). They were killed and stored as per Chamcook Mountain specimens.

Simpson Hill, Table Top (Figs. 8, 17), 45.1654°N 67.1279°W, 175 metres (summit), 45.1645°N 67.1265°W, 160 metres (collecting site off-summit). This hilltop is much different from the other two. It is granite like the others but much more rugged, with hollows and outcrops sparsely covered with conifers and patches of low vegetation (Fig. 8). It was visited once in late morning on a sunny and warm day, 7 July. After a careful inspection of the diverse hilltop area for about an hour, only two tachinids were captured. However, on our way down the mountain and only ca. 15 metres below the summit we passed through a profusion of ferns lit by patchy sunlight. Tachinids were common here and were collected from sunlit fern fronds. Specimens were killed and stored in the manner explained above. Information about the multiple trails on Simpson Hill can be found here: https://www.hikingnb.ca/Trails/FundyWest/SimpsonHill.html.

Todds Point (Fig. 18), 45.1713°N 67.1602°W, 5 metres. This location is at the southern tip of a short peninsula west of Simpson Hill on the far side of the St. Croix River. One tachinid was swept from a tree leaf on the bluff overlooking the view in Fig. 18 on 2 July 2022. It was killed and stored in the manner explained above.

Preparation and identification of specimens

Specimens collected by sweep net. These were specimens caught on hilltops and at Todds Point. They were killed with 1,2-dichloroethane and then transferred to tissue-lined containers as explained above. Specimens killed in this manner often stiffen up and a night in a relaxing container, either at room temperature or in a refrigerator, is usually long enough for them to become soft and pliable (too long and they will become moldy). The relaxing containers I used were plastic with a layer of damp sphagnum moss on the bottom (Figs. 20, 21). A small dish for holding specimens was placed on top of the moss. A piece of tissue between the dish surface and specimens prevented contact between the two, to avoid any moisture condensing on the dish from turning the bodies “greasy”. Specimens were pinned the next day following the methods I explained in a previous *Tachinid Times* article (O’Hara 2021).

Malaise-trapped specimens killed with No-Pest® strip. Each day’s catch from the traps in locations 1 (6-metre trap), 4 and 5 (BugDorm traps) were frozen overnight and tachinids were sorted from them the next morning (Fig. 19). Tachinids were placed in relaxing containers (Figs. 20, 21) until evening or the next day and then pinned (as described in previous paragraph). Non-tachinids were preserved in 75% ethanol for other CNC staff members to examine.

Malaise-trapped specimens collected into ethanol. These samples from traps in locations 2 and 3 were transferred to fresh 75% ethanol and stored in glass jars. Tachinids were sorted from them a few weeks later in Ottawa. Specimens were treated in batches, each batch representing a trap sample. Each batch was treated as follows: specimens transferred to 95% ethanol for roughly 12 hours, transferred to ethyl acetate for a similar amount of time, air-dried on tissue paper, and glued to the side of pins with white glue.

Pinned specimens. All specimens pinned fresh or mounted from ethanol were entered into the CNC specimen database with the pertinent data, assigned CNC database numbers, and labelled appropriately. Only DNA barcoded specimens from this study have been assigned names to the genus or species level in the database.

Identification and DNA barcoding. Specimens were sorted to tentative morphospecies and initial identifications were performed to genus and/or species with the help of the genus key of Wood (1987b) and by comparisons with identified specimens in the CNC. One or more specimens of all the presumed species were selected for DNA barcoding of the CO1 gene. A leg from each of them was sent to the Biodiversity Institute of Ontario (BIO) at the University of Guelph for the DNA barcoding. The resultant sequences are maintained in the Barcode of Life Data Systems (BOLD) repository and were compared to my “DNA barcode library” of over 4000 CNC Tachinidae in BOLD to determine which specimens could be identified as described species with a high degree of certainty, and which could be identified only to genus. Specimens in the latter category were assigned numbers preceded by “NB” (e.g., *Winthemia* sp. NB1, Fig. 27). Most specimens not identified to a named species belong to unresolved species complexes (possibly including undescribed species); in these instances there could be several species under one name, or several names and several similar species that cannot be properly matched.

Figures 6–12. 6. Spruce tree on summit of Chamcook Mountain where specimens of *Winthemia* sp. were station-taking on branches around chest height. **7**. Communication tower on summit of Chamcook Tower. **8**. Rugged granite summit of Simpson Hill. **9**. Flat granite summit of Chamcook Mountain. **10**. Male of *Winthemia* sp. station-taking on branch of spruce in Fig. 6. **11**. Another view of granite summit of Chamcook Mountain from mound of sphagnum moss. **12**. Sheltered sunny spot among spruce trees on Chamcook Mountain summit where some hilltopping tachinids landed on the ground and others on lower portions of tree trunks.

Figures 13–18. 13. Grassy and partially shaded area just below summit of Chamcook Mountain. **14**. View westward of St. Croix River from summit of Chamcook Tower. **15**. Lowbush blueberry on Chamcook Tower summit. **16**. *Billaea* sp. on side of building on Chamcook Tower summit in typical dexiine head-down station-taking position. **17**. Fern-lined trail below summit of Simpson Hill where male tachinids were common. **18**. View south of rocky beach along St. Croix River at Todds Point.

Figures 19–23. 19. A day's catch from the 6-metre Malaise trap ready for sorting after a night in freezer. **20**. Tachinids in a relaxing container with sphagnum moss. **21**. Closed relaxing container that will be left for the rest of the day or overnight before tachinids are pinned. **22**. Most of the pinned insects in their travel containers at end of collecting period. **23**. Alcohol material at end of collecting period, comprising unsorted samples from traps in locations 2 and 3 and trap residues (i.e., samples minus tachinids) from traps in locations 1, 4 and 5.

Checklist of Tachinidae of the Canadian Maritimes

The Tachinidae of New Brunswick are not particularly well known. The same can be said of Nova Scotia, and the tachinids of Prince Edward Island are even less known. Perhaps a somewhat more accurate measure of the tachinids in these Maritime provinces can be realized by treating them collectively rather than individually. The checklist of world Tachinidae (O'Hara et al. 2020) does not differentiate distributions at this fine a level and instead treats the three Maritime provinces in the "East" category of Canada along with Ontario, Québec, and the province of Newfoundland and Labrador. The earlier catalogue of O'Hara & Wood (2004) of the tachinids of America north of Mexico provided more detail and often cited Maritime provinces by name. I have prepared, and appended here, a checklist of the Tachinidae of the Canadian Maritimes to provide some clarity on the species known from the region.

This checklist has been developed mostly from the aforementioned checklist and catalogue. First, a list of tachinids belonging to the "East" category of Canada was generated from the current database of world Tachinidae—the same database that generated the world checklist of O'Hara et al. (2020) (as explained in O'Hara & Henderson 2022). This list was then compared to the catalogue of O'Hara & Wood (2004) and shortened to include only the species recorded from the Maritimes. A few species could not be reliably included or excluded based on these sources and decisions about them were made by checking their distributions in the CNC. This seemed like a reasonable solution given that the CNC had been surveyed by state and province during the development of the earlier 2004 catalogue. As a last step, species newly recorded from New Brunswick in the present survey were added. The resulting checklist of Maritime Tachinidae is, like most species lists, a work in progress and is limited in its completeness by such factors as identification difficulties and unrecorded species.

Results and Discussion

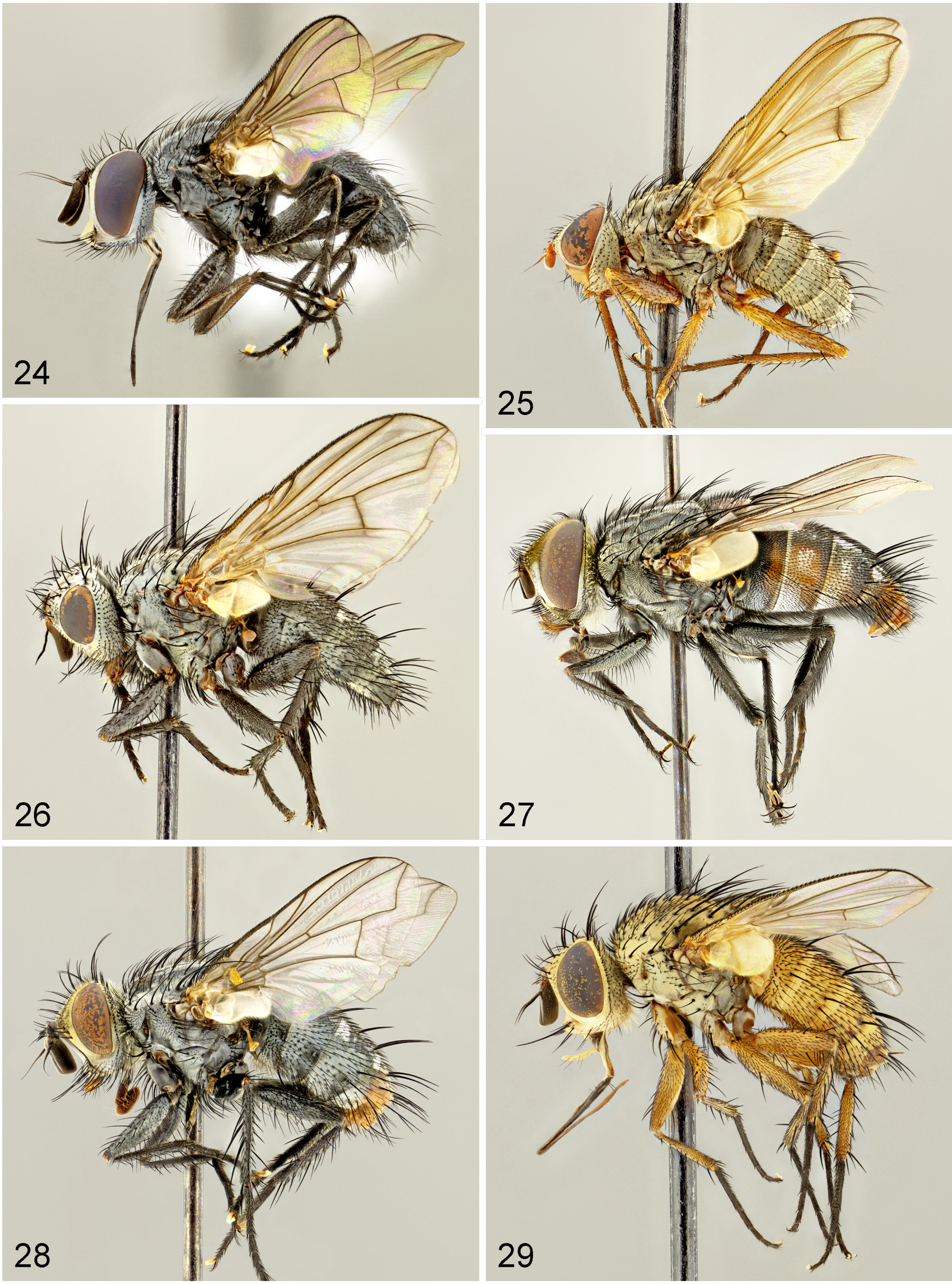
The state of tachinid taxonomy is somewhere between that of the poorly known Neotropical fauna and the exceptionally well-known European fauna. There has not been the same amount of taxonomic study of tachinids here in North America as in Europe and this is reflected in the level of determinations that are possible in a survey like this. We have fairly well-established and recognizable genera for the most part but difficulty at the species level in many of them, mainly because of: 1) unresolved species complexes (usually comprising both named and unnamed species), 2) undescribed species, and 3) misidentifications in collections (e.g., when more than one species is found under one name).

There is a work-around to this "taxonomic impediment" that is common to tachinid surveys like this one, and the one by Stireman & Perilla Lopez in this same issue of *Tachinid Times*. We can number species, as I have done here with the abbreviations "NB1", "NB2", etc., or use terms like "nr." and "cf." in association with a named species as the other authors have. This permits a more accurate assessment of species diversity even if names cannot be assigned to all species. I also have had the opportunity to compare the DNA barcodes of specimens of my initial species with my other DNA barcodes in BOLD, allowing for a re-evaluation of identifications.

Results

The weather was warm throughout the survey period with the usual maritime mix of sunny, cloudy and rainy periods, sometimes all in the same day. A remarkably high number of tachinid specimens and species were recorded over the 12 days. The total number of tachinid specimens caught, pinned and identified was 736 and tachinid diversity was 98 species. The names and numbers of the 98 species are listed in Table 1 by trap and hilltop, and also by sex. The Malaise traps were the big performers in terms of both specimens and species, although hand-collecting on hilltops added some species not captured in the traps. This brief survey produced more specimens and species of Tachinidae than an insect survey of Cape Breton Highlands National Park in northern Nova Scotia conducted by CNC staff over the summers of 1983 and 1984, which resulted in 430 specimens and 60+ species of Tachinidae (Wood 1987a: 113).

The 98 species caught during this survey are included in the appended *Checklist of Tachinidae of the Canadian Maritimes* and are indicated with a red asterisk (*). Sixty-nine of them have species names and 29 are listed with species numbers (NB1, etc.). All but two have accompanying DNA barcodes, with the two that are missing having failed during sequencing (*Ateloglossa cinerea* Coquillett and *Billaea* sp. NB1). Barcoded specimens are indicated in the list by their CNC database numbers and sex. Identifications of certain species are discussed in notes in the checklist.



Figures 24–29. Some of the tachinids caught during this survey. **24**. *Epigrimyia illinoensis* Robertson (Dexiinae, Epigrimyiini), CNC1966328♂, 4.9mm. **25**. *Eutrixa* sp. NB1 (Dexiinae, Eutrixini), CNC1966152♀, 5.7mm. **26**. *Triarthria setipennis* (Fallén) (Tachininae, Bigonichetini), CNC1966496♀, 6.2mm. **27**. *Winthemia* sp. NB1 (Exoristinae, Winthemiini), CNC1990898♂, 10.9mm. **28**. *Chrysotachina infrequens* O'Hara (Tachininae, Polideini), CNC1966401♂, 7.9mm. **29**. *Siphona* (*Siphona*) *geniculata* (De Geer) (Tachininae, Siphonini), CNC1966172♂, 4.7mm.

Table 1. List of the 98 tachinid species collected in the Oak Bay area of southeastern New Brunswick, Canada, 27 June to 8 July 2022, with specimen numbers per species and location. Specimens were collected using five Malaise traps in locations 1 to 5 on private property in Oak Bay (Figs. 2–5), and by hand collecting with an insect net on three local hilltops (Figs. 6–17) and at Todd's Point (Fig. 18) (see Materials and Methods for details). Most specimens not identified to a named species belong to unresolved species complexes (see species notes in *Checklist of Tachinidae of the Canadian Maritimes* at the end of this article). M = male(s), F = female(s).

Species list	Location 1 6m Malaise		Locations 2&3, mixed Malaise traps		Locations 4&5, Bugdorm Malaise traps		Chambook Mtn. & Tower		Simpson Hill		Specimen numbers
	M	F	M	F	M	F	M	F	M	F	
Dexiinae, Dexiini											
Ateloglossa cinerea Coquillett	2										2
Billaea sp. NB1							20*				20
Ptilodexia mathesoni (Curran)				1							1
Epigrimyiini											
Epigrimyia illinoensis Robertson	4	1			2						7
Eutherini											
Euthera tentatrix Loew	2	2		1							5
Eutrixini											
Eutrixa sp. NB1		1									1
Eutrixa sp. NB2				1							1
Uramyini											
Uramya limacodis (Townsend)							5				5
Voriini											
Athrycia cinerea (Coquillett)		1									1
Campylocheta sp. NB1		2					1				3
Campylocheta sp. NB2			1								1
Campylocheta sp. NB3	2	7		1							10
Periscepsia clesides (Walker) complex	5							1			6
Periscepsia helymus (Walker)		1		1							2
Spathidexia dunningii (Coquillett)	2		1		1						4
Spathidexia sp. NB1		1									1
Thelaira americana Brooks		1		1			1		1		4
Exoristinae, Blondeliini											
Admontia degeerioides (Coquillett)	2	6		6							14
Admontia sp. NB1		1									1
Belida chaetoneura (Coquillett)							20				20
Blondelia eufitchiae (Townsend)	1										1
Compsilura concinnata (Meigen)				2							2
Cryptomeigenia hinei (Coquillett) complex				2							1
Cryptomeigenia theutis (Walker) complex		5		11							16
Euthelyconychia xylota (Curran)		2		2		2			2		8
Lixophaga sp. NB1	5				1	1					7
Lixophaga sp. NB2	2		2	1			1				6
Lixophaga sp. NB3							1				1
Medina spinosa (Coquillett)							3				3
Medina sp. NB1		1				1					2
Medina [unassociated females]		2				1					3
Myiopharus aberrans (Townsend)		1									1
Oswaldia albifacies (Townsend)	4										4
Oswaldia assimilis (Townsend)	1		3		9	1					14
Oswaldia sp. NB1						1	9		8		18
Oswaldia sp. NB2						1					1
Oswaldia sp. NB3	1				1						2
Paracraspedothrix angulicornis (Curran)		1									1
Phyllophilopsis nitens (Coquillett)									2		2

Species list	Location 1 6m Malaise		Locations 2&3, mixed Malaise traps		Locations 4&5, Bugdorm Malaise traps		Chambook Mtn. & Tower		Simpson Hill		Specimen numbers
	M	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	
Eryciini											
Aplomya theclarum (Scudder)									1		1
Drino (*Drino*) sp. NB1	1	1									2
Hubneria estigmenensis (Sellers)	2										2
Lydella radicis (Townsend)		1									1
Lydella thompsoni Herting	1	1									2
Nilea mathesoni (Reinhard)		2		1							3
Nilea sp. NB1	1										1
Phebellia cerurae (Sellers)		1									1
Phryxe pecosensis (Townsend)		1									1
Exoristini											
Austrophorocera sp. NB1		1									1
Exorista (*Adenia*) *dydas* (Walker)	1	1									2
Parasetigena silvestris (Rob.-Des.)		1					14				15
Tachinomyia apicata Curran		1									1
Goniini											
Euexorista rebaptizata Gosseries	2	1									3
Platymya confusionis (Sellers)		3	1			1	3				8
Pseudochaeta (*Pseudo.*) *siminina* Reinhard	1										1
Winthemiini											
Winthemia occidentis Reinhard									2		2
Winthemia rufopicta (Bigot)		4									4
Winthemia sp. NB1		1					22		1		24
Winthemia sp. NB2		1					8				9
Winthemia sp. NB3		2		1							3
Phasiinae, Cylindromyiini											
Cylindromyia (*Cylin.*) *euchenor* (Walker)	1	3									4
Cylindromyia (*Neocyp.*) *interrupta* (Meigen)	3	5				4					12
Hemyda aurata R.-D.						1					1
Gymnosomatini											
Euclytia flava (Townsend)	1										1
Gymnoclytia occidua (Walker)	6	9		1							16
Gymnosoma par Walker				2							2
Phasiini											
Phasia robertsonii (Townsend)		4									4
Strongygastrini											
Strongygaster triangulifera (Loew)	4	7				1					12
Tachininae, Bigonichetini											
Triarthria setipennis (Fallén)		4		3							7
Ernestiini											
Linnaemya (*Ophina*) *glauca* (Brooks)	3										3
Linnaemya sp. NB1	5		1				1				7
Graphogastrini											
Graphogaster sp. NB1		2		1							3
Graphogaster sp. NB2	1										1
Phytomyptera palpigera (Coquillett)		1		1							2
Phytomyptera sp. NB1		1		1							2
Leskiini											
Clausicella turmalis (Reinhard)		4		1							5

Species list	Location 1 6m Malaise		Locations 2&3, mixed Malaise traps		Locations 4&5, Bugdorm Malaise traps		Chambook Mtn. & Tower		Simpson Hill		Specimen numbers
	M	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	
Genea tenera (Wiedemann)			1								1
Genea texensis (Townsend) complex			1	1							2
Polideini											
Chrysotachina infrequens O'Hara	2										2
Hystricia abrupta (Wiedemann)	1				1						2
Lydina sp. NB1						1					1
Siphonini											
Actia diffidens Curran	1	5	3	10	1						20
Actia dimorpha O'Hara	1	3		2	1	1					8
Actia interrupta Curran	1	5		2							8
Ceromya bicolor (Meigen)		1									1
Ceromya oriens O'Hara				1							1
Siphona (*Ceranthia*) *flavipes* (Coquillett)		1									1
Siphona (*Siphona*) *geniculata* (De Geer)	91	138	24	21	7	3					284
Siphona (*Siphona*) *hokkaidensis* Mesnil	2	1	3	3	2						11
Siphona (*Siphona*) *intrudens* Curran				1							1
Siphona (*Siphona*) *maculata* Staeger				4							4
Siphona (*Siphona*) sp. NB1				1							1
Siphona sensu lato sp. NB1			1								1
Tachinini											
Archytas (*Nemochaeta*) sp. NB1	2	1									3
Epalpus signifer (Walker)		1		7							8
Pararchytas decisus (Walker)	1										1
Peleteria (*Sphyrimyia*) *haemorrhoa* (Wulp)	1		1								2
Unplaced genera of Tachininae											
Eulasiona comstocki Townsend**											1
Unplaced tribe of Tachinidae, Myiophasiini											
Cholomyia inaequipes Bigot				1							1
Specimen totals	**169**	**255**	**43**	**95**	**26**	**20**	**109**	**1**	**17**	**0**	**736**

*The only specimens collected on the Chamcook Tower hilltop were 7 males of *Billaea* sp. NB1 and they are included here.
** One male of *E. comstocki* was collected at Todds Point, the only specimen collected from that location (no separate column included).

One species deserves special mention. Not often does a single tachinid species strikingly dominate in numbers over all others during a survey. Nor would one expect it to be a new record for the region, or be an introduced biological control agent released 50 years ago with no recorded establishment. Yet this is true of the diminutive *Siphona geniculata* (De Geer) (Fig. 29), introduced from Europe to the lower Fraser Valley of British Columbia between 1968 and 1975 and to Newfoundland in 1973–74 for control of a cranefly pest, *Tipula paludosa* Meigen (Wilkinson 1984). It became established in British Columbia but there has been no record of recovery in Newfoundland or of its presence anywhere else in eastern North America. It accounted for 284 of the 736 specimens of Tachinidae collected during the survey, or 39% of the total. I have confirmed its identification by morphology, and its DNA barcode matches that of European specimens on BOLD. Is this population descended from the release of *S. geniculata* in Newfoundland half a century ago? Perhaps so, if it is found to be widespread in eastern Canada, especially Newfoundland. It has not been caught around Ottawa.

The clear winner among the Malaise traps was the 6-metre one (Fig. 3, Tables 1, 2). It can be set up to catch specimens at both ends but I used it with only one head attached, the one facing east into the yard and unobstructed by the trees at the other end. Even with only one functional head, it caught more than double the number of tachinid specimens than the other four Malaise traps combined (424 vs. 184), or 1.5X as many with *S. geniculata* removed. It also ranked first in the number of species caught (72) and the number of unique species caught (31, or nearly one-third of all species) (Table 2), numbers significantly higher than those for the other traps even with the tachinids of two hedge-row traps combined (locations 2 & 3, Fig. 4) and the two other traps combined (locations 4 & 5, Fig. 5). I felt that the 6-metre trap was the best placed of the five traps on the property and this likely contributed to its high yield, but it is nevertheless deserving of its reputation among my colleagues as far superior at catching tachinids than the Sante and Bugdorm Malaise traps.

	6-metre Malaise trap	Hedge row Malaise traps 2 & 3	Malaise traps 4 & 5	Hilltops	Todds Point
6-metre Malaise trap		35	16	10	0
Hedge row Malaise traps 2 & 3			20	5	0
Malaise traps 4 & 5				3	0
Hilltops					0
Total species for each	72	53	20	19	1
Unique species for each	31	13	0	8	1

Table 2. The upper portion of this table shows the numbers of species in common among the three trap locations and the combined hilltops, along with the single species from Todds Point. The second row from the bottom shows the total number of species recorded for each trap location and combined hilltops. The bottom row shows the number of species unique to each category (e.g., 31 species caught only in the 6-metre Malaise trap).

The three hilltops did not contribute substantially to the survey's total with just 127 specimens belonging to 19 species (8 species unique to the hilltops, Table 2). The hilltops were clearly functioning as aggregation sites for mating, with males waiting in particular species-specific places for conspecific females. One indication of this was the preponderance of males collected: 126 males vs. 1 female. Another indication was the replacement of captured males by new conspecific males at their station-taking sites. The general *modus operandi* for tachinids is to hilltop on sunny days, arrive and depart at more or less predetermined times based on species and temperature, and take up positions that are instinctually predetermined and species-specific (e.g., Fig. 10). Females arrive, locate a conspecific male, and fly off somewhere to mate. The male possibly returns to its preferred spot to mate again but the female departs. Hence, females are only briefly present and rarely caught whereas males may be plentiful and easily caught.

Hilltops can vary from no tachinids at all to phenomenally productive and I often cannot predict what I will find when I get there, even when temperature, sun and time seem right. But I can suggest why relatively few tachinid species were caught during the three visits to Chamcook Mountain (Figs. 6, 9–13). A classic hilltop from a collector's point of view is one with a small and pointed summit and relatively low vegetation; not much higher than the top of an extended insect net. When tall trees are present, they draw some species higher above the ground and out of reach of nets. Chamcook Mountain is not a classic hilltop; it is a complicated one with a broad granite summit and trees (mostly spruce) around the edges (Figs. 9, 11), and with sunny openings here and there among the trees (Fig. 12). It is likely a good hilltop with a lot of tachinid species in different places but because of the complexity of the summit I only found a few of the favoured locations. An interesting account of tachinid hilltopping behavior was given by Monty Wood in an early issue of *Tachinid Times* (Wood 1996) based on years of observations on hilltops in western Québec.

Simpson Hill (Fig. 8, 17) has a more rugged summit than Chamcook Mountain and also a more clearly defined high point. I expected to see some male tachinids congregating there but I saw none at all. There were small microhabitats under the scattered trees, in sheltered areas among rocks, and even a small pond edged with grasses and other vegetation. The day was sunny and warm and the place looked promising but only two males of *Euthelyconychia xylota* (Curran) were caught, not far from one another on low-lying vegetation. Six more species (Table 1) were caught a short way down the trail from the summit on fern fronds in patchy sunlight (Fig. 17). Only males were caught and their behavior can be considered "hilltopping" as they were presumably there to mate, even though they were not at the actual summit. I have noticed this off-summit hilltopping before. Curiously, *Oswaldia* sp. NB1 and *Winthemia* sp. NB1 were caught hilltopping on the summit of Chamcook Mountain and were below the summit at Simpson Hill.

Closing Remarks

Taxonomy is a scientific discipline that seeks to categorize life on earth. When it comes to invertebrates, some are taxonomically better known than others and for those in the latter group there can be many unknowns: how to identify described species, how to recognize "new" species, what are the distributions of species, and for parasitoids like Tachinidae, what are their hosts? Species inventories and surveys can offer a faster route towards some level of understanding of a difficult group by providing preliminary information about the species present in an area as well as specimens for future revisionary studies. This brief survey from one area in southeastern New Brunswick is intended to contribute towards this goal in Nearctic Tachinidae.

This survey benefited greatly from molecular data in the form of so-called "DNA barcodes" that were available for nearly all species. This step was expensive and not an option for everyone, but it is a valuable complement to morphological identifications. Matches between barcodes from previously collected specimens and Oak Bay specimens were highly congruent within species. The one exception was the genus *Medina* where two or more morphospecies have the same DNA barcode. This interesting outcome deserves further investigation.

I will end on a cautionary note. Taxonomic surveys are becoming easier with the advent of molecular identifications. This is good news, but there is also a danger that molecular identifications will largely replace morphological identifications even in groups like Tachinidae where many species names are unstable. Platforms attach tachinid names to molecular data based on the names of identified specimens in collections, but it is the nature of insect collections for names to change through curation as groups become better known. A 100% match between a reference sequence and an unidentified sequence will produce a result only as reliable as the identification of the reference specimen.

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Checklist of Tachinidae of the Canadian Maritimes

... including species caught in the Oak Bay area of New Brunswick in 2022

The 232 numbered species in the checklist below represent all of the described species recorded from any of the three provinces of the Canadian Maritimes. It was compiled as explained in the Materials and Methods. Only species with nomenclaturally valid names are numbered. Additional species that were caught in 2022 but cannot be assigned a name are listed as "[genus name] sp. NB1", "… NB2" or "… NB3".

Specimens that were DNA barcoded (ca. 190) are indicated by their CNC database number and sex, beginning with "CNC". The known distributions of named species are given in more detail than in O'Hara et al. (2020) for the region of Canada called "East" in that checklist. It is divided here into Québec, Maritimes [N.B., N.S. and P.E.I.], Newfoundland, and Labrador [the last two a single province but treated separately].

As noted in the Materials and Methods section: "Most specimens not identified to a named species belong to unresolved species complexes; in these instances there could be several species under one name, or several names and several similar species that cannot be properly assigned."

Summary of findings

Number of named and numbered species: **232**
Number of species caught in 2022 (indicated with *): **98**

Number of species DNA barcoded: 96
Number of species caught that could be named (species number in red followed by *): 69
Number of species caught that could not be named (no species number but with *): 29

New records for Canadian Maritimes, not new for Canada (in red): **15**
New records for Canada and Maritimes (in red): **2**
New record for eastern Canada and Maritimes (in red): **1**[†]
[†]This species, *Siphona geniculata* (De Geer), is also reported for the first time from the United States (from Washington state, USA).

DEXIINAE, Dexiini

1. *Ateloglossa algens* (Curran)
Distribution. Nearctic: Canada (Yukon, Prairies, Ontario, Québec, Maritimes), USA (Southwest).

2.* *Ateloglossa cinerea* Coquillett, CNC1966405♂ (DNA barcode failed). New record for Maritimes.
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Great Plains, Northeast, Southeast).

* *Billaea* sp. NB1, CNC1966642♂ (DNA barcode failed), CNC1966711♂, CNC1966712♂
Note: There are six species of *Billaea* Rob.-Des. recorded from Canada but none east of Québec. Twenty specimens were caught on hilltops, all males. *Billaea* is in need of revision and I cannot reliably identify specimens; the two DNA barcodes obtained here match those for a mixed series CNC specimens of both *B. nipigonensis* Curran and *B. trivittata* (Curran).

3. *Estheria cinerea* (Townsend)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

4. *Ptilodexia canescens* (Walker)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Northern Rockies, Southwest, Great Plains, Northeast).

5. *Ptilodexia carolinensis* Brauer & Bergenstamm
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast).

6.* *Ptilodexia mathesoni* (Curran), CNC1967116♀
Distribution. Nearctic: Canada (Prairies Ontario, Québec, Maritimes), USA (Northeast).

7. *Ptilodexia obscura* West
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Northeast, Southeast).

8. *Ptilodexia rufipennis* (Macquart)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Pacific Northwest, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast, Florida).

9. *Zelia metalis* (Reinhard)
Distribution. Nearctic: Canada (B.C., Maritimes), USA (Great Plains, Texas, Northeast, Southeast).

Epigrimyiini

10.* *Epigrimyia illinoensis* Robertson (Fig. 24), CNC1966327♂, CNC1966398♀. New record for Maritimes.
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Great Plains, Texas, Northeast, Southeast).

Eutherini

11.* *Euthera tentatrix* Loew, CNC1966038♂, CNC1966388♀. New record for Maritimes.
Distribution. Nearctic: Canada (Ontario, Maritimes), USA (California, Southwest, Great Plains, Texas Northeast, Southeast, Florida). Neotropical: Greater Antilles (Bahamas).

Eutrixini

12. *Eutrixa exilis* (Coquillett)? [two spp. NB1, NB2]
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Southwest, Great Plains, Texas, Northeast, Southeast).

* *Eutrixa* sp. NB1 (Fig. 25), CNC1966152♀
* *Eutrixa* sp. NB2, CNC1967137♀
Note: These were compared to the holotype of the western species, *Eutrixa laxifrons* Reinhard, and are different. One of these species is likely *Eutrixa exilis*, but I do not know which one. The other would be an undescribed species. There is a lot of variation among CNC specimens under *E. exilis* and there are probably multiple species in North America.

Freraeini

13. *Freraea montana* (Coquillett)
Distribution. Nearctic: Canada (NWT, B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

Oestrophasiini

14. *Oestrophasia calva* Coquillett
Distribution. Nearctic: Canada (Prairies, Maritimes), USA (California, Northern Rockies, Southwest, Texas, Northeast, Southeast, Florida). Neotropical: Middle America (Mexico).

Uramyini

15.* *Uramya limacodis* (Townsend), CNC1966672♂, CNC1966676♂, CNC1966694♂.
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Northeast, Southeast).
Note: There is variation in the hairs on the underside of abdominal T2 (long yellow hairs among short darker hairs vs. only short darker hairs) but barcodes indicate one species. Probably the best distinguishing feature for separating *U. limacodis* and *U. pristis* (Walker) is the colour of the hairs on the anepisternum: dark in former and pale in the latter (see Gates et al. 2012: 44, Figs. 12, 13).

Voriini

16.* *Athrycia cinerea* (Coquillett), CNC1966147♀.
Distribution. Nearctic: Canada (all), USA (Northern Rockies, Southwest, Great Plains, Texas, Northeast). Neotropical: Middle America (Mexico).

17. *Blepharomyia tibialis* (Curran)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Alaska, Northeast, Southeast).

18. *Campylocheta nasellensis* (Reinhard)
Distribution. Nearctic: Canada (B.C., Ontario, Maritimes), USA (Pacific Northwest).

19. *Campylocheta orbitalis* (Webber)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Northeast).

20. *Campylocheta semiothisae* (Brooks) complex
Distribution. Nearctic: Canada (B.C., Ontario, Québec, Maritimes), USA (Great Plains, Northeast).

* *Campylocheta* sp. NB1, CNC1965996♀, CNC1966154♀, CNC1966637♂.
* *Campylocheta* sp. NB2, CNC1967068♂.
* *Campylocheta* sp. NB3, CNC1965995♀, CNC1966411♀.
Note: *Campylocheta* Rondani is a cosmopolitan genus of 48 species (O'Hara et al. 2020) with 11 named species in the Nearctic Region (O'Hara & Wood 2004: 18). Despite the key to Nearctic species published by Sabrosky (1975), I have found specimens of this genus nearly impossible to identify. I have little confidence that identified specimens in collections are correctly determined based on the general incongruence between DNA barcoding results and identified specimens in the CNC.

21. *Cyrtophloeba coquilletti* Aldrich
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Northeast, Southeast).

22. *Cyrtophloeba nitida* Curran
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, Southwest, Northeast, Southeast).

23. *Hypovoria discalis* (Brooks)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Maritimes), USA (California, Northern Rockies, Southwest, Northeast).

24. *Metaplagia brevicornis* Brooks
Distribution. Nearctic: Canada (Prairies, Ontario, Maritimes, Newfoundland), USA (Northeast).

25.* *Periscepsia* (*Ramonda*) *clesides* (Walker) complex, CNC1965988♂, CNC1966111♂, CNC1966682♀.
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Alaska, Pacific Northwest, Southwest, Great Plains, Northeast).
Note: The DNA barcodes for New Brunswick *P. clesides* belong to a single BIN, but other CNC specimens from eastern Canada identified as *P. clesides* belong to two slightly differentiated clades with different BINs. Specimens look very similar, with perhaps one form slightly more yellowish on the head than the other. I suspect "*P. clesides*" *sensu* CNC specimens is a species complex based on these differences in morphology and barcodes.

26.* *Periscepsia* (*Ramonda*) *helymus* (Walker), CNC1966252♀, CNC1967162♀.
Distribution. Nearctic: Canada (all), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

27. *Periscepsia* (*Ramonda*) *laevigata* (Wulp)
Distribution. Nearctic: Canada (all), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast). Neotropical: Middle America (Guatemala, Mexico).

28.* *Spathidexia dunningii* (Coquillett), CNC1966266♂.
Distribution. Nearctic: Canada (Yukon, Prairies, Ontario, Québec, Maritimes), USA (all mainland except Alaska). Neotropical: Greater Antilles (Jamaica, Puerto Rico).

29. *Spathidexia reinhardi* Arnaud
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: southern Lesser Antilles (Trinidad & Tobago).

* *Spathidexia* sp. NB1, CNC1966108♀.
Note: This is possibly a described species but not *S. dunningii* or *S. clemonsi* Townsend based on its unique DNA barcode.

30.* *Thelaira americana* Brooks, CNC1966720♂.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (all mainland except Alaska). Neotropical: Middle America (Mexico).

31. *Trochilodes leonardi* (West)
Distribution. Nearctic: Canada (Québec, Maritimes), USA (Northeast).

32. *Voria aurifrons* (Townsend)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Great Plains, Northeast).

33. *Voria ruralis* (Fallén)
Distribution. Nearctic: Canada (all), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast). Widespread throughout the world but likely a species complex, including in Nearctic Region.

34. *Wagneria cornuta* Curran
Distribution. Nearctic: Canada (Ontario, Maritimes), USA (Northeast).

35. *Wagneria pacata* Reinhard
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Maritimes), USA (California, Southwest, Great Plains, Northeast).

36. *Wagneria vernata* West
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast, Florida).

EXORISTINAE

Acemyini

37. *Ceracia dentata* (Coquillett)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (all mainland except Alaska). Neotropical: Middle America (Mexico), South America (Chile).

Blondeliini

38.* *Admontia degeerioides* (Coquillett), CNC1966334♂, CNC1966331♀, CNC1966400♀.
Distribution. Nearctic: Canada (all), USA (California, Southwest, Great Plains, Northeast, Southeast).

39. *Admontia pergandei* Coquillett
Distribution. Nearctic: Canada (B.C., Maritimes), USA (Pacific Northwest, Northeast, Southeast).

* *Admontia* sp. NB1, CNC1966040♀.
Note: The DNA barcode matches those of some unidentified Admontia specimens from Ottawa (e.g., CNC1707494) and Dayton, Ohio (CNC852617).

40.* *Belida chaetoneura* (Coquillett), CNC1966689♂, CNC1966691♂.
Distribution. Nearctic: Canada (all), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Northeast, Southeast).

41.* *Blondelia eufitchiae* (Townsend), CNC1966319♂.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast).

42.* *Compsilura concinnata* (Meigen), CNC1967087♀, CNC1967088♀.
Distribution. Nearctic (introduced): Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Great Plains, Northeast). Widespread in Old World.

43. *Cryptomeigenia demylus* (Walker)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Northeast, Southeast).
Note: There are 14 named species of *Cryptomeigenia* B. & B. in the Nearctic Region (O'Hara & Wood 2004: 83). DNA barcodes differ only slightly among sampled species. Female ovipositors differ considerably among species, from unmodified to triangular to slender and elongate, but within these types some species are difficult to separate.

44.* *Cryptomeigenia hinei* (Coquillett) complex, CNC1967073♀.
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Northeast).
Note: Female has unmodified ovipositor.

45.* *Cryptomeigenia theutis* (Walker) complex, CNC1965983♀, CNC1967086♀.
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Texas, Northeast, Southeast).
Note: Female has triangular and bluntly pointed ovipositor.

46. *Cryptomeigenia triangularis* Curran
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Northeast).

47. *Dolichotarsus livescens* Reinhard
Distribution. Nearctic: Canada (Québec, Maritimes), USA (Southwest). Neotropical: Middle America (Mexico).

48. *Eribella exilis* (Coquillett)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Northeast, Southeast).

49. *Eucelatoria borealis* Burington
Distribution. Nearctic: Canada (B.C., Ontario, Québec, Maritimes), USA (Northeast).

50. *Euthelyconychia vexans* (Curran)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Northeast).

51.* *Euthelyconychia xylota* (Curran), CNC1966730♂, CNC1966731♂, CNC1966750♀, CNC1966781♀, CNC1967205♀.
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Texas, Northeast, Southeast).

52. *Lixophaga discalis* (Coquillett)
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes), USA (Southwest, Great Plains, Northeast, Southeast).

53. *Lixophaga opaca* Reinhard
Distribution. Nearctic: Canada (Prairies Québec, Maritimes), USA (Pacific Northwest, Northern Rockies, Northeast).

54. *Lixophaga unicolor* (Smith)
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Pacific Northwest, Northern Rockies, Southwest Northeast).

55. *Lixophaga variabilis* (Coquillett)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Great Plains, Texas, Northeast, Southeast, Florida).

* *Lixophaga* sp. NB1, CNC1966045♂, CNC1966054♂, CNC1966257♂, CNC1966782♀, CNC1966811♂.
Note: There are 16 named species of *Lixophaga* Townsend in the Nearctic Region (O'Hara & Wood 2004: 92) and few can be reliably identified. Wood (1985: 53) wrote: "One of the 3 largest genera of Blondeliini in the New World, *Lixophaga* is also the most uniform, and the most difficult to characterize, especially on external features". The DNA barcodes for *Lixophaga* sp. NB1 do not match those of any of the other 15 or so Nearctic species of *Lixophaga* I have had barcoded.

* *Lixophaga* sp. NB2, CNC1966057♂, CNC1966677♂, CNC1967136♀.
Note: The DNA barcodes match those of an unidentified species of *Lixophaga* from Ottawa (e.g., CNC1711835).

* *Lixophaga* sp. NB3, CNC1966675♂.
Note: This single male barcodes as sister to *Lixophaga* NB2 but the abdomen is entirely pruinose with a brownish tinge on posterior tergites whereas in NB2 the abdomen has a dark median vitta.

56.* *Medina spinosa* (Coquillett), CNC1966639♂. New record for Canada and Maritimes.
Distribution. Nearctic: Canada (Maritimes), USA (Northeast).
Note: There is no separation of Nearctic *Medina* species in their DNA barcodes, but morphologically there are distinct differences that suggest the presence of several species. *Medina spinosa* is recognized here based the male features of dark upper and lower calypters and tuft of setae extending along length of the lateral arm of abdominal sternite 5 (both mentioned in unpublished notes of D.M. Wood on holotype from the White Mountains of New Hampshire, USA).

* *Medina* sp. NB1, CNC1966761♀
Note: Two females with underside of abdomen covered with a dense mat of short spines unlike those of a described species.

Medina sp., three unassociated females, two barcoded, CNC1966107, CNC1966754.
Note: These three females do not have the short stout spines on the underside of the abdominal tergites as is usual for *Medina spinosa*. They are not counted here as an additional species (hence no red asterisk).

57.* *Myiopharus aberrans* (Townsend), CNC1966216♀. New record for Maritimes.
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Northern Rockies, Great Plains, Northeast, Southeast, Florida).

58. *Myiopharus doryphorae* (Riley)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast). Neotropical: Middle America (Mexico).

59.* *Oswaldia albifacies* (Townsend), CNC1966249♂, CNC1966109♂.
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Northeast).
Note: The identity of *O. albifacies* is here based on a CNC male (CNC751516) that has been DNA barcoded and bears a D.M. Wood label that reads: "Ht of *albifacies* in USNM is this species".

60.* *Oswaldia assimilis* (Townsend), CNC1966756♀, CNC1966785♂, CNC1966812♂.
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Northeast, Southeast).

* *Oswaldia* sp. NB1, CNC1966629♂, CNC1966684♂, CNC1966726♂, CNC1966757♀, CNC1990885♂, CNC1990886♂.
Note: This is similar to *O. albifacies* but has a slightly less pruinose (more shiny) abdomen. The DNA barcodes match those of some unidentified *Oswaldia* specimens from Ottawa (CNC1711883) and Berks County, Pennsylvania (e.g., CNC751518).

* *Oswaldia* sp. NB2, CNC1966780♀.
Note: The DNA barcode matches that of an single unidentified *Oswaldia* specimen from Ottawa (CNC1712032).

* *Oswaldia* sp. NB3, CNC1966253♂.
Note: The DNA barcode matches that of an single unidentified *Oswaldia* specimen from Ottawa (CNC557451).

61.* *Paracraspedothrix angulicornis* (Curran), CNC1966406♀.
Distribution. Nearctic: Canada (Yukon, B.C., Ontario, Québec, Maritimes), USA (Alaska, Northeast, Southeast).
Note: The DNA barcode matches that of a specimen of *Paracraspedothrix montivaga* Villeneuve from Switzerland (CNC1547011). The possible synonymy of these names should be investigated.

62.* *Phyllophilopsis nitens* (Coquillett), CNC1966734♂.
Distribution. Nearctic: Canada (Ontario, , Québec, Maritimes), USA (Northeast, Southeast).

63. *Picconia derisa* (Reinhard)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Northeast).

64. *Vibrissina aurifrons* (Curran)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Northeast).

65. *Zaira calosomae* (Townsend)
Distribution. Nearctic: Canada (B.C., Maritimes), USA (Southwest, Northeast).

Eryciini

66.* *Aplomya theclarum* (Scudder), CNC1966733♂.
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast). Neotropical: Middle America (Mexico).
Note: DNA barcodes suggest there are two species under the name *A. theclarum* from Missouri westward.

67. *Carcelia* (*Carcelia*) *amplexa* (Coquillett)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Great Plains, Northeast, Southeast, Florida).

68. *Carcelia* (*Carcelia*) *laxifrons* Villeneuve
Distribution. Nearctic (introduced): Canada (Ontario, Québec, Maritimes), USA (Northeast). Widespread in Palaearctic Region and Oriental China.

69. *Carcelia* (*Carcelia*) *olenensis* Sellers
Distribution. Nearctic: Canada (B.C., Ontario, Québec, Maritimes, Newfoundland), USA (California, Northeast, Southeast).

70. *Carcelia* (*Carcelia*) *protuberans* (Aldrich & Webber)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Southwest, Texas, Northeast, Southeast).

71. *Carcelia* (*Carcelia*) *reclinata* (Aldrich & Webber)
Distribution. Nearctic: Canada (all), USA (all mainland except Alaska). Neotropical: Middle America (Mexico), South America (Colombia).

72. *Carcelia* (*Carcelia*) *tenuiforceps* (Reinhard)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Northeast).

73. *Drino* (*Drino*) *incompta* (Wulp)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (California, Southwest, Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: Middle America (Mexico).

74. *Drino* (*Drino*) *rhoeo* (Walker)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: Greater Antilles (Jamaica), eastern Lesser Antilles (Dominica), Middle America (Costa Rica, Mexico), South America (Argentina).

* *Drino* (*Drino*) sp. NB1, CNC1965978♂, CNC1966494♀.
Note: The two DNA barcodes do not match those of any other CNC specimens. This is a dark species similar to *D. bakeri* but has a completely pruinose abdominal tergite 5 (tip black in *D. bakeri*), broader parafacial and darker palpus.

75. *Drino* (*Palexorista*) *bohemica* Mesnil
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes, Newfoundland), USA (Northeast). Palaearctic: Europe, Transcaucasia, Russia, Japan. Oriental: China.

76.* *Hubneria estigmenensis* (Sellers), CNC1966456♂, CNC1966244♂.
Distribution. Nearctic: Canada (all), USA (Alaska, California, Northern Rockies, Southwest, Great Plains, Northeast).
Note: The DNA barcodes match that of a specimen of *Hubneria affinis* (Fallén) from the Czech Republic (CNC602748). The possible synonymy of these names should be investigated.

77. *Lespesia frenchii* (Williston)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (all mainland except Alaska).

78. *Lespesia melalophae* (Allen)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast). Neotropical: Middle America (Mexico).

79. *Lespesia samiae* (Webber)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

80.* *Lydella radicis* (Townsend), CNC1966153♀.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast). Neotropical: Middle America (Mexico).

81.* *Lydella thompsoni* Herting, CNC1966148♂, CNC1966393♀. New record for Maritimes.
Distribution. Nearctic (introduced): Canada (Prairies, Ontario, Québec, Maritimes). USA (Great Plains, Northeast, Southeast). Palaearctic: Central Asia, Europe, Japan, Middle East, Mongolia, Russia, Transcaucasia. Oceanian: Guam.
Note: This is tentatively identified as *L. thompsoni* because the DNA barcodes do not match those of *Lydella radicis*, and New Brunswick is within the range of the introduced *L. thompsoni*. These species are very similar morphologically.

82. *Madremyia saundersii* (Williston)
Distribution. Nearctic: Canada (all), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast). Neotropical: Middle America (Mexico).

83. *Nilea carpocapsae* (Townsend)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Southeast).

84. *Nilea erecta* (Coquillett)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (all mainland except Alaska).

85.* *Nilea mathesoni* (Reinhard), CNC1966143♀, CNC1967083♀. New record for Maritimes.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Florida, Northeast).

86. *Nilea sternalis* (Coquillett)
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast).

* *Nilea* sp. NB1, CNC1966100♂.
Note: This is a distinct species with no DNA barcode match. It is difficult to key to *Nilea* in Wood (1987) because it does not have a densely haired eye (couplet 17) or stout erect supravibrissal setae (couplet 42), but does have "katepisternum with posteroventral bristle arising nearly in line with anterior and posterior bristles and nearly equidistant between the two; only the anteroventral bristle displaced ventrally" (couplet 43, p. 1210).

87.* *Phebellia cerurae* (Sellers), CNC1966397♀. New record for Maritimes.
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Southwest, Northeast).

88. *Phebellia crassiseta* (Aldrich & Webber)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Northeast, Southeast).

89. *Phebellia curriei* (Coquillett)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Texas, Northeast).

90. *Phebellia helvina* (Coquillett)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, Southwest, Great Plains, Northeast).

91. *Phebellia nigripalpis* (Robineau-Desvoidy)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Northeast). Palaearctic: widespread.

92.* *Phryxe pecosensis* (Townsend), CNC1965986♀.
Distribution. Nearctic: Canada (all), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

93. *Phryxe vulgaris* (Fallén)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Northeast). Widespread in Palaearctic Region and Oriental China.

Euthelairini

94. *Neomintho celeris* (Townsend)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Northeast, Southeast, Florida).

Exoristini

* *Austrophorocera* sp. NB1, CNC1966321♀.
Note: Neither DNA barcodes or Wood's (1987) key clearly separates *Austrophorocera* Townsend from *Chetogena* Rondani. The single female is a better match for the former because "lower margin of face not protruding, not visible in profile" and "wing membrane flat at bend of M, not appearing as a continuation of M" (couplet 109, Wood 1987: 1221). However, the DNA barcode matches that of a specimen from Pinal County, Arizona that was identified as *Chetogena* sp. (CNC852651).

95. *Bessa harveyi* (Townsend)
Distribution. Nearctic: Canada (all), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

96. *Chetogena* (*Chetogena*) *vibrissata* (Brauer & Bergenstamm)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Southwest, Northeast).

97. *Chetogena* (*Diplostichus*) *lophyri* (Townsend)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast, Florida).

98.* *Exorista* (*Adenia*) *dydas* (Walker), CNC1966140♂, CNC1966264♀.
Distribution. Nearctic: Canada (all), USA (Alaska, all mainland except Alaska).

99. *Exorista* (*Exorista*) *mella* (Walker)
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes), USA (all mainland except Alaska).

100.* *Parasetigena silvestris* (Robineau-Desvoidy), CNC1966395♀. New record for Maritimes.
Distribution. Nearctic (introduced): Canada (Ontario, Québec, Maritimes), USA (Northeast). Palaearctic: widespread.

101. *Phorocera* (*Pseudotachinomyia*) *webberi* (Smith)
Distribution. Nearctic: Canada (B.C., Ontario, Québec, Maritimes), USA (Northern Rockies, Great Plains, Texas, Northeast, Southeast).

102. *Tachinomyia acosta* Webber
Distribution. Nearctic: Canada (B.C., Ontario, Maritimes), USA (Pacific Northwest, California, Northeast, Southeast).

103.* *Tachinomyia apicata* Curran, CNC1966037♀.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Northeast).

104. *Tachinomyia nigricans* Webber
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Northeast, Southeast).

105. *Tachinomyia panaetius* (Walker)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Great Plains, Northeast).

106. *Tachinomyia variata* Curran
Distribution. Nearctic: Canada (B.C., Prairies, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Florida). Neotropical: Middle America (Mexico).

Goniini

107. *Belvosia borealis* Aldrich
Distribution. Nearctic: Canada (Ontario, Maritimes), USA (California, Southwest, Great Plains, Texas, Northeast, Southeast, Florida).

108. *Ceromasia auricaudata* Townsend
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

109. *Cyzenis albicans* (Fallén)
Distribution. Nearctic (introduced): Canada (B.C., Maritimes), USA (Pacific Northwest, Northeast). Palaearctic: widespread.

110. *Cyzenis pullula* (Townsend)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Alaska, Pacific Northwest, Northern Rockies, Southwest, Northeast).

111. *Cyzenis ustulata* (Reinhard)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Southwest, Northeast, Southeast).

112. *Erynnia tortricis* (Coquillett)
Distribution. Nearctic: Canada (all), USA (all mainland except Alaska).

113.* *Euexorista rebaptizata* Gosseries, CNC1966399♂, CNC1966317♀.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast).

114. *Eumea caesar* (Aldrich)
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast).

115. *Frontiniella mitis* (Curran)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Northeast).

116. *Gonia aldrichi* Tothill
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Northern Rockies, Southwest, Great Plains, Northeast).

117. *Gonia brevipulvilli* Tothill
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

118. *Gonia chilonis* Walker
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Southwest).

119. *Gonia distincta* Smith
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Southwest, Northeast, Southeast).

120. *Gonia frontosa* Say
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast).

121. *Gonia smithi* Brooks
Distribution. Nearctic: Canada (Prairies, Ontario, Maritimes), USA (Northeast).

122. *Houghia sternalis* (Coquillett)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Northeast).

123. *Hyphantrophaga blanda* (Osten Sacken)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Southwest, Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: Middle America (Costa Rica).

124. *Hyphantrophaga virilis* (Aldrich & Webber)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast). Neotropical: Middle America (Costa Rica, Mexico).

125. *Leschenaultia exul* (Townsend)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Northeast, Southeast).

126. *Myxexoristops fronto* (Coquillett)
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (California, Northern Rockies, Southwest, Northeast).

127. *Onychogonia flaviceps* (Zetterstedt)
Distribution. Nearctic: Canada (all), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest). Palaearctic: Europe, Japan, Mongolia, Russia.

128. *Patelloa leucaniae* (Coquillett)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Texas, Northeast, Southeast, Florida).

129. *Patelloa pachypyga* (Aldrich & Webber)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Great Plains, Northeast).

130.* *Platymya confusionis* (Sellers), CNC1966117♂, CNC1966512♀.
Distribution. Nearctic: Canada (all), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast).

131.* *Pseudochaeta* (*Pseudochaeta*) *siminina* Reinhard, CNC1966248♂.
Distribution. Nearctic: Canada (Ontario, East), USA (Great Plains, Texas, Northeast, Southeast).

132. *Spallanzania hesperidarum* (Williston)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Southwest, Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: Middle America (Mexico).

Winthemiini

133. *Nemorilla pyste* (Walker)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (all mainland except Alaska). Neotropical: eastern Lesser Antilles (Virgin Islands), southern Lesser Antilles (Trinidad & Tobago), Middle America (Mexico).

134. *Smidtia fumiferanae* (Tothill)
Distribution. Nearctic: Canada (all), USA (Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast).

135. *Winthemia borealis* Reinhard
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, Northeast).

136. *Winthemia datanae* (Townsend)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (all mainland except Alaska). Neotropical: Middle America (Mexico).

137.* *Winthemia occidentis* Reinhard, CNC1966719♂, CNC1966727♂.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Northern Rockies, Southwest, Great Plains, Northeast). Neotropical: Middle America (Mexico).

138. *Winthemia quadripustulata* (Fabricius)
Distribution. Nearctic: Canada (all), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast). Widespread in Palaearctic Region and Oriental China.

139.* *Winthemia rufopicta* (Bigot), CNC1966267♀.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (all mainland except Alaska). Neotropical: Middle America (Panama).

140. *Winthemia sinuata* Reinhard
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Northern Rockies, Great Plains, Texas, Northeast, Southeast, Florida).

141. *Winthemia vesiculata* (Townsend)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Northeast).

* *Winthemia* sp. NB1 (Fig. 27), CNC1966141♀, CNC1966620♂, CNC1966646♂, CNC1966680♂.
Note: This species is easily confused with *Winthemia datanae* (Townsend) but the two can be easily separated by their DNA barcodes. Hilltopping males were common on Chamcook Mtn.
* *Winthemia* sp. NB2, CNC1966621♂.
Note: The DNA barcode matches those of some unidentified *Winthemia* specimens from Ottawa (e.g., CNC557323♀) and, Mt. Rigaud Québec (e.g., CNC751725). This species is morphologically similar to *W. quadripustulata* (Fabricius) but the two species have distinct DNA barcodes. It is possibly conspecific with *Winthemia illinoensis* Robertson, a name currently in synonymy with *W. quadripustulata* but perhaps a different species. Males were hilltopping on Chamcook Mtn.
* *Winthemia* sp. NB3, three females, not yet barcoded (CNC1966145, CNC1966251, CNC1967134).
Note: These have a completely black infuscated abdomen (i.e., no red). They are different from the other four collected species but have not been identified.

PHASIINAE

Catharosiini

142. *Catharosia lustrans* (Reinhard)
Distribution. Nearctic: Canada (B.C., Québec, Maritimes), USA (California, Great Plains, Northeast).

Cylindromyiini

143.* *Cylindromyia* (*Cylindromyia*) *euchenor* (Walker), CNC1965396♀, CNC1966976♂.
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (California, Southwest, Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: Middle America (Mexico).

144.* Cylindromyia (Neocyptera) interrupta (Meigen), CNC1965992♂, CNC1966042♂, CNC1966810♂.
Distribution. Nearctic: Canada (Yukon, B.C., Ontario, Québec, Maritimes), USA (California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast, Florida). Palaearctic: Europe, Transcaucasia, Russia, China.

145.* *Hemyda aurata* Robineau-Desvoidy, CNC1966746♀. New record for Maritimes.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast). Neotropical: Middle America (Mexico).
Note: O'Hara & Wood (2004: 219) recorded the Canadian distribution of *H. aurata* as "British Columbia to New Hampshire" and cited Manitoba as the type locality of a synonym, but did not specifically mention any eastern provinces. The CNC has specimens from Ontario and Québec and it is here recorded for the first time from the Maritimes.

Gymnosomatini

146.* *Euclytia flava* (Townsend), CNC1966142♂.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Labrador), USA (California, Southwest, Great Plains, Texas, Northeast, Southeast, Florida).

147. *Gymnoclytia dubia* (West)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (?California, Texas, Northeast).

148.* *Gymnoclytia occidua* (Walker), CNC1965982♀, CNC1966250♂.
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Southwest, Great Plains, Texas, Northeast, Southeast). Neotropical: Middle America (Mexico).

149. *Gymnosoma canadense* (Brooks)
Distribution. Nearctic: Canada (B.C., Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Southwest, Northeast, Southeast).

150.* *Gymnosoma par* Walker, CNC1967165♀.
Distribution. Nearctic: Canada (Yukon, Prairies, Ontario, Québec, Maritimes), USA (Northern Rockies, Great Plains, Northeast, Southeast).

151. *Xanthomelanodes arcuatus* (Say)
Distribution. Nearctic: Canada (B.C., Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Southwest, Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: Middle America (Mexico).

Leucostomatini

152. *Leucostoma simplex* (Fallén)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast). Neotropical: South America (Argentina, Chile). Widespread in Old World except for Oriental Region.

Phasiini

153. *Phasia aurulans* Meigen
Distribution. Nearctic: Canada (NWT, B.C., Prairies, Ontario, Québec, Maritimes), USA (Alaska, Pacific Northwest, Northeast, Southeast). Palaearctic: Europe, Japan, Kazakhstan, Korean Peninsula, Russia.

154. *Phasia diversa* (Coquillett)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Pacific Northwest, Great Plains, Texas, Northeast, Southeast).

155.* *Phasia robertsonii* (Townsend), CNC1966049♀, CNC1966337♀.
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Great Plains, Northeast, Southeast, Florida).
Note: This is the eastern equivalent of *Phasia aeneoventris* (Williston), and the possible synonymy of these names should be investigated. There is a great deal of intraspecific morphological variability in both of these but no differences in their DNA barcodes.

Strongygastrini

156. *Strongygaster robusta* (Townsend)
Distribution. Nearctic: Canada (B.C., Ontario, Maritimes), USA (Pacific Northwest, Northern Rockies, Southwest, Northeast, Southeast).

157.* *Strongygaster triangulifer*a (Loew), CNC1966051♂, CNC1966336♂.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast). Neotropical: eastern Lesser Antilles (Dominica), Middle America (Mexico), South America (Argentina, Brazil, Chile).

TACHININAE

Bigonichetini

158.* *Triarthria setipennis* (Fallén) (Fig. 26), CNC1966496♀. New record for Maritimes.
Distribution. Nearctic (introduced): Canada (B.C., Ontario, Maritimes, Newfoundland), USA (Pacific Northwest, California, Northern Rockies, Southwest, Northeast). Palaearctic: Europe, Transcaucasia, Middle East, Russia.

Brachymerini

159. *Pseudopachystylum debile* (Townsend)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Great Plains, Northeast, Southeast).

Ernestiini

160. *Gymnocheta vivida* Williston
Distribution. Nearctic: Canada (B.C., Ontario, Québec, Maritimes), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Northeast, Southeast).

161. *Linnaemya* (*Linnaemya*) *comta* (Fallén)
Distribution. Nearctic: Canada (all), USA (all). Neotropical: Middle America (Honduras, Mexico), South America (Chile, Peru). Widespread in Palaearctic Region and Oriental China.

162.* *Linnaemya* (*Ophina*) *glauca* (Brooks), CNC1966589♂.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, Northern Rockies, Southwest, Great Plains, Northeast).

163. *Linnaemya* (*Ophina*) *nigrescens* Curran
Distribution. Nearctic: Canada (all).

164. *Linnaemya* (*Ophina*) *tessellata* (Brooks)
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast).

* *Linnaemya* sp. NB1, CNC1966035♂, CNC1966590♂.
Note: The DNA barcode is in a group with various names, likely the result of multiple misidentifications. *Linnaemya* is a taxonomically difficult genus and identifying specimens is problematic.

165. *Panzeria ampelus* (Walker)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast).

166. *Panzeria bicarina* (Tothill)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Maritimes, Labrador), USA (Northern Rockies, Southwest, Great Plains).

167. *Panzeria fasciventris* (Curran)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Southwest, Great Plains, Northeast).

168. *Panzeria flavicornis* Brauer
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast).

169. *Panzeria frontalis* (Tothill)
Distribution. Nearctic: Canada (all), USA (Alaska, Northern Rockies, Southwest, Northeast).

170. *Panzeria nigropalpis* (Tothill)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northeast, Southeast).

171. *Panzeria platycarina* (Tothill)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Pacific Northwest, Northern Rockies, Southwest, Great Plains, Northeast, Southeast).

Graphogastrini

172. *Graphogaster macdunnoughi* (Brooks)
Distribution. Nearctic: Canada (NWT, Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Northeast).

173. *Graphogaster psilocorsiphaga* (Brooks)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Alaska, Northeast).

174. *Graphogaster slossonae* (Townsend)
Distribution. Nearctic: Canada (B.C., Ontario, Québec, Maritimes, Newfoundland), USA (Pacific Northwest, Northeast).

* *Graphogaster* sp. NB1, CNC1966269♀, CNC1966591♀.
Note: *Graphogaster* Rondani is a difficult genus and most specimens cannot be reliably identified. The DNA barcodes for this species match those of some unidentified *Graphogaster* specimens from Ottawa (e.g., CNC708018).

* *Graphogaster* sp. NB2, CNC1966318♂.
Note: The DNA barcode matches that of an unidentified *Graphogaster* specimen from Ottawa (CNC566045).

175. *Phytomyptera aenea* (Coquillett)
Distribution. Nearctic: Canada (Yukon, Prairies, Ontario, Québec, Maritimes), USA (California, Southwest). Neotropical: Middle America (Mexico).

176. *Phytomyptera nigra* (Brooks)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Northeast, Southeast).

177.* *Phytomyptera palpigera* (Coquillett), CNC1966156♀, CNC1967119♀.
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Northeast, Southeast).

178. *Phytomyptera vitinervis* (Thompson)
Distribution. Nearctic: Canada (NWT, B.C., Prairies, Ontario, Québec, Maritimes, Labrador), USA (Southwest, Great Plains, Texas, Northeast, Southeast, Florida).

* *Phytomyptera* sp. NB1, CNC1965993♀, CNC1967095♀.
Note: The DNA barcodes match those of unidentified *Phytomyptera* specimens from Ottawa (e.g., CNC1710067).

Leskiini

179. *Aphria ocypterata* Townsend
Distribution. Nearctic: Canada (Yukon, B.C., Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

180. *Clausicella politura* (Reinhard)
Distribution. Nearctic: Canada (NWT, Ontario, Québec, Maritimes), USA (Great Plains, Northeast).

181.* *Clausicella turmalis* (Reinhard), CNC1965984♀, CNC1966146♀.
New record for Maritimes.
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (?California, Great Plains, Texas, Northeast, Southeast).

182.* *Genea* (*Genea*) *tenera* (Wiedemann), CNC1967138♂.
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: Greater Antilles (Jamaica), South America (Guyana).

183.* *Genea* (*Genea*) *texensis* (Townsend) complex, CNC1967111♀, CNC1967135♂.
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Texas, Northeast, Southeast, Florida).
Note: DNA barcoding of CNC specimens divides "*G. texensis*" into three well-differentiated BINS with the two barcodes here belonging to different BINs.

184. *Leskia depilis* (Coquillett)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Northeast, Southeast, Florida).

Megaprosopini

185. *Microphthalma michiganensis* (Townsend)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Southwest, Great Plains, Texas, Northeast).

Neaerini

186. *Neaera leucoptera* (Johnson)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Southwest, Great Plains, Northeast).

Nemoraeini

187. *Xanthophyto* "*antennalis*" (Townsend)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Southwest, Northeast, Southeast). Neotropical: Middle America (Mexico).
Note: *Xanthophyto* Townsend is being revised by John Stireman. The identities and distributions of the two named Nearctic species are under review and new species will be described.

Polideini

188.* *Chrysotachina infrequens* O'Hara (Fig. 28), CNC1966261♂, CNC1966401♂. New record for Canada and Maritimes.
Distribution. Nearctic: Canada (Maritimes). USA (Northern Rockies, Northeast, Southeast).

189. *Chrysotachina slossonae* (Coquillett)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Northeast, Southeast, Florida).

190. *Homalactia harringtoni* (Coquillett)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast).

191.* *Hystricia abrupta* (Wiedemann), CNC1966243♂, CNC1966776♂.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast). Neotropical: Middle America (Mexico).

192. *Lydina americana* (Townsend)
Distribution. Nearctic: Canada (NWT, B.C., Prairies, Ontario, Québec, Maritimes), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast).

* *Lydina* sp. NB1, CNC1966786♀.
Note: Specimens of *Lydina* Rob.-Des. can be difficult to identify, especially females. This single female cannot be identified morphologically but its DNA barcode is interesting: it is in a BIN of its own among barcoded CNC specimens, not matching either of the named Nearctic species (*L. americana* and *L. areos* (Walker)) or the common species in Europe, *L. aenea* (Meigen).

193. *Lypha frontalis* Brooks
Distribution. Nearctic: Canada (Ontario, Maritimes), USA (Great Plains, Northeast).

194. *Lypha fumipennis* Brooks
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Northern Rockies, Great Plains, Northeast, Southeast).

195. *Lypha parva* Brooks
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Great Plains).

196. *Micronychia maculipennis* (Aldrich)
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Québec, Maritimes, Newfoundland), USA (Alaska, Pacific Northwest, Northeast).

Siphonini

197. *Actia autumnalis* (Townsend)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Southwest, Great Plains, Northeast, Southeast).

198.* *Actia diffidens* Curran, CNC1966499♀, CNC1966508♀, CNC1967097♂, CNC1967187♀.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Texas, Northeast, Southeast). Neotropical: Middle America (Mexico).

199.* *Actia dimorpha* O'Hara, CNC1966501♀, CNC1966507♂, CNC1966800♀, CNC1967185♀. New record for Maritimes.
Distribution. Nearctic: Canada (Ontario, Maritimes), USA (Northeast, Southeast, Florida).

200.* *Actia interrupta* Curran, CNC1966052♀, CNC1966262♀, CNC1967184♀.
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Northeast, Southeast).

201. *Ceromya americana* (Townsend)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (California, Southwest, Great Plains, Texas, Northeast, Southeast, Florida).

202. *Ceromya balli* O'Hara
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Great Plains, Northeast).

203.* *Ceromya bicolor* (Meigen), CNC1966263♂.
Distribution. Nearctic: Canada (all), USA (Southwest, Great Plains, Northeast). Palaearctic: Europe, Transcaucasia, Russia, Korean Peninsula, China.

204.* *Ceromya oriens* O'Hara, CNC1967140♀.
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Northeast, Southeast).

205. *Ceromya palloris* (Coquillett)
Distribution. Nearctic: Canada (B.C., Ontario, Québec, Maritimes), USA (Northeast).

206.* *Siphona* (*Ceranthia*) *flavipes* (Coquillett), CNC1966332♀.
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Northeast).

207. *Siphona* (*Siphona*) *cristata* (Fabricius)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Southwest). Widespread in Palaearctic Region and Oriental China, Taiwan.

208.* *Siphona* (*Siphona*) *geniculata* (De Geer) (Fig. 29), CNC1965997♂, CNC1966282♂, CNC1966288♂, CNC1966352♂, CNC1966418♀, CNC1966531♀, CNC1966572♂, CNC1966802♂, CNC1967152♂. New record for eastern Canada and Maritimes.
Distribution. Nearctic (introduced): Canada (B.C., Maritimes). USA (Pacific Northwest). Widespread in Palaearctic Region, also Taiwan in Oriental Region.
Note: *Siphona geniculata* was introduced into southwestern British Columbia and became established there. It was also released in Newfoundland but there has been no report of establishment. It was by far the most common species collected during this survey (284 specimens) and accounted for nearly 40% of all specimens.
I can also report here the first record of *S. geniculata* from the United States based on examined and DNA barcoded specimens in the CNC (from Washington state, Lewis County, Chehalis; e.g., CNC DIPTERA 162329). New record for United States (Pacific Northwest).

209.* *Siphona* (*Siphona*) *hokkaidensis* Mesnil, CNC1966233♂, CNC1966749♂, CNC1966774♂, CNC1967074♀, CNC1967155♂, CNC1967172♀, CNC1967177♂.
Distribution. Nearctic: Canada (all), USA (Alaska, Pacific Northwest, Northeast). Palaearctic: Europe, Japan, Russia.

210.* *Siphona* (*Siphona*) *intrudens* (Curran), CNC1967077♀.
Distribution. Nearctic: Canada (NWT, B.C., Prairies, Ontario, Québec, Maritimes), USA (Alaska, Pacific Northwest, California, Great Plains, Texas, Northeast, Southeast).

211.* *Siphona* (*Siphona*) *maculata* Staeger, CNC1967098♀, CNC1967130♀. New record for Maritimes.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Alaska, Pacific Northwest, Southwest, Great Plains, Northeast). Palaearctic: Europe, Transcaucasia, Russia.

212. *Siphona* (*Siphona*) *medialis* O'Hara
Distribution. Nearctic: Canada (B.C., Prairies, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

213. *Siphona* (*Siphona*) *multifaria* O'Hara
Distribution. Nearctic: Canada (all), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Northeast, Southeast, Florida).
Note: *Siphona multifaria* is likely a species complex based on DNA barcoding of CNC specimens.

* *Siphona* (*Siphona*) sp. NB1, CNC1967128♀.
Note: This unidentified female belongs to the *S.* (*S.*) *maculata* group and could be an undescribed species. The DNA barcode does not match that of a named eastern Nearctic species but does match an unidentified species on BOLD as a public record from P.E.I.

* *Siphona sensu lato* sp. NB1, CNC1967186♂.
Note: This species belongs to a lineage of *Siphona* that is neither subgenus *Siphona* Meigen (with a long geniculate proboscis) or subgenus *Ceranthia* Rob.-Des. (with reduced palpus). It is almost certainly an undescribed species. Among public records on BOLD it is closest to an unidentified species of *Siphona s.l.* from Guanacaste, Costa Rica.

Tachinini

214. *Archytas* (*Archytas*) *apicifer* (Walker)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (all mainland except Alaska). Neotropical: widespread.

215. *Archytas* (*Archytas*) *californiae* (Walker)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (all mainland except Alaska). Neotropical: Middle America (Mexico).

216. *Archytas* (*Nemochaeta*) *aterrimus* (Robineau-Desvoidy)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (California, Northern Rockies, Southwest, Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: Middle America (Mexico).

* *Archytas* (*Nemochaeta*) sp. NB1, CNC1966316♂, CNC1966389♂, CNC1966491♂.
Note: This belongs to an unresolved species complex and might be an undescribed species. The DNA barcodes match those of some *Archytas* Jaennicke specimens from Ottawa (e.g., CNC591938).

217.* *Epalpus signifer* (Walker), CNC1966215♀, CNC1967113♀.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (all mainland except Alaska).

218.* *Pararchytas decisus* (Walker), CNC1966315♂.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Texas, Northeast). Neotropical: Middle America (Mexico).

219. *Peleteria* (*Oxydosphyria*) *iterans* (Walker)
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast). Neotropical: Middle America (Mexico).

220. *Peleteria* (*Sphyrimyia*) *anaxias* (Walker)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (Southwest, Northeast, Southeast).

221.* *Peleteria* (*Sphyrimyia*) *haemorrhoa* (Wulp), CNC1965979♂, CNC1967157♂.
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes), USA (California, Southwest, Great Plains, Northeast, Southeast).

222. *Tachina* (*Nowickia*) *ampliforceps* (Rowe)
Distribution. Nearctic: Canada (NWT, B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), Greenland, USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

223. *Tachina* (*Nowickia*) *dakotensis* (Townsend)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes, Labrador), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast). Neotropical: Middle America (Mexico).

224. *Tachina* (*Nowickia*) *garretti* Arnaud
Distribution. Nearctic: Canada (Yukon, B.C., Prairies, Ontario, Québec, Maritimes), USA (Alaska, Pacific Northwest, Northern Rockies, Southwest, Northeast).

225. *Tachina* (*Nowickia*) *piceifrons* (Townsend)
Distribution. Nearctic: Canada (NWT, B.C., Prairies, Ontario, Québec, Maritimes), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast, Southeast).

226. *Tachina* (*Rhachogaster*) *algens* Wiedemann
Distribution. Nearctic: Canada (all), USA (Alaska, Pacific Northwest, California, Northern Rockies, Southwest, Great Plains, Northeast).

227. *Tachina* (*Rhachogaster*) *latianulum* (Tothill)
Distribution. Nearctic: Canada (B.C., Prairies, Ontario, Québec, Maritimes, Newfoundland), USA (Pacific Northwest, California, Northern Rockies, Southwest, Great Plains).

Unplaced genus of Tachininae

228.* *Eulasiona comstocki* Townsend, CNC1966717♂.
Distribution. Nearctic: Canada (B.C., Ontario, Québec, Maritimes), USA (California, Southwest, Great Plains, Northeast, Southeast). Neotropical: Middle America (Mexico).

UNPLACED TRIBES OF TACHINIDAE

Macquartiini

229. *Macquartia erythrocera* (Reinhard)
Distribution. Nearctic: Canada (Prairies, Ontario, Québec, Maritimes), USA (Southeast).

Myiophasiini

230.* *Cholomyia inaequipes* Bigot, CNC1967160♀. New record for Maritimes.
Distribution. Nearctic: Canada (Ontario, Maritimes), USA (Southwest, Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: widespread.

231. *Gnadochaeta metallica* (Townsend)
Distribution. Nearctic: Canada (Maritimes), USA (Great Plains, Texas, Northeast, Southeast, Florida). Neotropical: Middle America (Mexico).

232. *Gnadochaeta nigrifrons* (Townsend)
Distribution. Nearctic: Canada (Ontario, Québec, Maritimes), USA (Great Plains, Texas, Northeast, Southeast). Neotropical: Middle America (Mexico).

Tachinid bibliography

Included here are references on the Tachinidae that have been found during the past year and have not appeared in past issues of this newsletter. This list has been generated from an EndNote 'library' and is based on online searches of literature databases, perusal of journals, and reprints or citations sent to me by colleagues. The complete bibliography, incorporating all the references published in past issues of *The Tachinid Times* and covering the period from 1980 to the present is available online at: http://www.nadsdiptera.org/Tach/WorldTachs/Bib/Tachbiblio.html. I would be grateful if omissions or errors could be brought to my attention.

Please note that citations in the online Tachinid Bibliography are updated when errors are found or new information becomes available, whereas citations in this newsletter are never changed. Therefore, the most reliable source for citations is the online Tachinid Bibliography.

I am grateful to Shannon Henderson for performing the online searches that contributed most of the titles given below and for preparing the EndNote records for this issue of *The Tachinid Times*.

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