



THE TACHINID TIMES

ISSUE 37

Debut of *Istocheta* in British Columbia

The promise of bug-killing flies

The buzz on hovering

A mysterious tachinid, Ecuadoran diversity
and sugaring in the Henry Mtns

FEBRUARY 2024

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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 2025 issue of *The Tachinid Times* to the editor by the end of January 2025.

FRONT COVER Dipterists collecting near Lake Tahoe, Nevada, USA after 10th International Congress of Dipterology in Reno: Thomas Pape (front), Pierfilippo Cerretti (middle) and John Stireman (back).

Photo: J.E. O'Hara, 22 July 2023

TABLE OF CONTENTS Lyman Whitaker wind sculptures along Cottonwood Canyon Road west of Kodachrome Basin State Park, Utah, USA.

Photo: J.E. O'Hara, 27 July 2023

BELOW Somewhere along US Hwy 50 in Nevada, known as "The Loneliest Road in America".

Photo: J.E. O'Hara, 23 July 2023





Istocheta aldrichi (Mesnil) makes its biological control debut in British Columbia, Canada

by Victoria Makovetski^{1,2} and Paul K. Abram²

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Figure 1. A parasitized *Popillia japonica* collected from a trap after the release of *I. aldrichi* in Port Coquitlam, British Columbia.

Introduction

Western North America was free of the invasive Japanese beetle, *Popillia japonica*, for 100 years after the species was first accidentally introduced to the eastern part of the continent. Now there is a coordinated effort to stamp out new populations of this agricultural and ornamental pest in British Columbia. In 2023, the first experimental releases of a tachinid fly in British Columbia (BC) were done in support of this goal.

The effort to eradicate *P. japonica* from BC began in 2017, when the beetle was discovered in a localized area of downtown Vancouver. The eradication program has since grown to involve cooperation between municipalities, the provincial government, and the federal government (the Canadian Food Inspection Agency, CFIA). The eradication strategy involves an extensive trapping network for surveillance (5191 traps in 2023!), soil movement restrictions, and the widespread application of a larvicide to turf grass in areas where the beetle is detected. Thus far, this initiative has greatly reduced the population of this pest within Vancouver. However, *P. japonica* has spread into two neighboring cities, where smaller populations still persist. Two states in western United States, Washington and Oregon, are also attempting to eradicate recently detected populations of this pest. We became interested in whether biological control could be added to existing eradication strategies to further reduce beetle populations.

The first explorations into biological control options for *P. japonica* started more than a century ago, soon after it was first detected in North America in New Jersey in 1916. A team from the United States Department of Agriculture surveyed *P. japonica* in its native country of Japan and found various natural enemies attacking the beetle (Clausen et al. 1927). Among these, one species – the tachinid fly *Istocheta aldrichi* (Mesnil) – stood out for its impressive ability to parasitize *P. japonica*, particularly when the beetle populations were relatively low.

Like its host, *I. aldrichi* has a single generation per year, with adult flies typically emerging in late June in Japan (Clausen et al. 1927, Clausen et al. 1933). Mated females lay conspicuous, milky-white eggs on the beetle's pronotum. Female beetles are more often parasitized than males (Clausen et al. 1927, Legault et al. 2023). After the egg is laid, the fly larva enters the host's body within 24 hours by burrowing downwards through both the underside of the egg and the beetle's pronotum. Once inside, it feeds on the internal tissues and molts twice to become a mature third instar larva. The beetle falls to the ground soon after it is parasitized, buries itself in the soil, and dies within approximately five days. The tachinid larva completes development and enters the pupal stage. The puparium enters a diapause that lasts for eight months. In Japan, the adult fly emerges in late June, just before its host emerges. *Istocheta aldrichi* appears to be specialized on *P. japonica*, as it has not been recorded parasitizing any other insect species in Asia or North America (Fleming 1968, Arnaud 1978).

Following the field investigations of 1921–1923 (Clausen et al. 1927), *I. aldrichi* was released on multiple occasions in several places in eastern United States where *P. japonica* populations were very high. The fly became established, though recorded parasitism rates after releases were relatively low (<10%; Fleming 1968, Cappaert & Smitley 2002). Over the course of the past century, *P. japonica* has extended its range into neighboring states and southeastern Canada. Interestingly, *I. aldrichi* has accompanied *P. japonica* populations northward, including Ontario (O'Hara 2014) and Quebec (Gagnon et al. 2019), and to a lesser extent southward, as the beetle's range expanded. In sampled sites within Quebec, parasitism rates in *P. japonica* by *I. aldrichi* ranged from 3.9% to 27.3% (Gagnon et al. 2023), suggesting that the tachinid may be providing some level of helpful biological control.

By experimentally introducing the fly to Vancouver, BC for the first time in 2023, we explored the potential for incorporating this biological control agent into a comprehensive eradication strategy while pest populations were low. This is not typical; biological control releases are typically done when pest populations have already spread extensively and have reached high densities. This provided us with a unique opportunity to study what happens when a biological control agent is released pro-actively into a not-well-established, low-density pest population.

Building support for conducting experimental releases

Moving biological control agents from Ontario to BC is not regulated by the federal or provincial government, but we nonetheless wanted to practise due diligence before doing the first releases of *I. aldrichi* in BC. We developed a detailed proposal outlining the background scientific information about the pest issue, goals of the releases, the biology and host specificity of *I. aldrichi*, and plans for post-release monitoring. This document was reviewed by a variety of pest management, entomology, and conservation experts from multiple agencies, coordinated by the British Columbia Plant Protection Advisory Council (BCPPAC). These reviews supported the releases. Similarly, the municipalities of Vancouver, Burnaby, and Port Coquitlam, where *P. japonica* populations were known to be present, were consulted and they supported the use of public parks to conduct these experimental releases. We had the 'green light' to proceed!

Collecting parasitized beetles and rearing out *Istocheta*

In the meantime, we needed to develop practical ways of collecting parasitized beetles and rearing out the tachinid. We collected more than 10,000 parasitized beetles from areas of greater Montreal and Ottawa in 2022, in collaboration with colleagues from Agriculture and Agri-Food Canada (the Ottawa and Saint-Jean-sur Richelieu Research and Development Centres) and the Université de Montréal. The beetles were collected using a combination of commercially available traps and semiochemical attractants, and by hand-picking beetles off their

host plants. Then it was time to sort out the parasitized beetles – this involved going through many trays of beetles by hand and picking out the ones with clearly visible *I. aldrichi* eggs on their pronota. These were placed in groups on top of soil with some plant material for the beetles to feed on as they succumbed to parasitism and buried themselves in the soil. The beetle ‘cadavers’ containing parasitoid puparia were then shipped to our research centre in Agassiz, BC and dissected. About 56% of the cadavers, on average, contained *I. aldrichi* puparia, suggesting that some proportion of parasitism fails after eggs are laid on beetles.



Figure 2. A. Agriculture and Agri-Food Canada technicians Yonathan Uriel [left] and Jason Theissen [right] digging “crypt” in Agassiz, BC for burying overwintering *Istocheta aldrichi* puparia. **B.** Balls of *I. aldrichi* in “crypt”.

Getting parasitoid puparia through the winter

Next, we needed to figure out how to successfully overwinter the parasitized puparia. We wanted to know whether the mild winter climate of south coastal BC (relative to Ontario and Quebec) would be cold enough to allow the flies to complete their diapause. We also wanted to see what the best conditions were to keep them in after overwintering, and when they would emerge in the spring in BC if kept outdoors.

We buried half of the puparia in a shallow “crypt” outdoors at our research centre in Agassiz, BC (Fig. 2), and kept half of them in a refrigerated chamber indoors at 5°C (Fig. 3; these were dissected incrementally). We then experimented with different temperature treatments during the spring, including keeping them in the soil outdoors or warming them up gradually in incubators indoors. No matter what the overwintering or spring temperature treatments, about half the puparia survived and produced adult flies. The timing of fly emergence depended strongly on the spring temperature treatment – but most interestingly, the flies that were kept at BC soil temperatures (whether indoors or outdoors) emerged just a few days before the first *P. japonica* was caught by the CFIA in BC in 2023.

These results were encouraging as they indicated to us that if *I. aldrichi* were to establish in BC, it would be able to successfully overwinter and emerge at the right time to parasitize *P. japonica*.

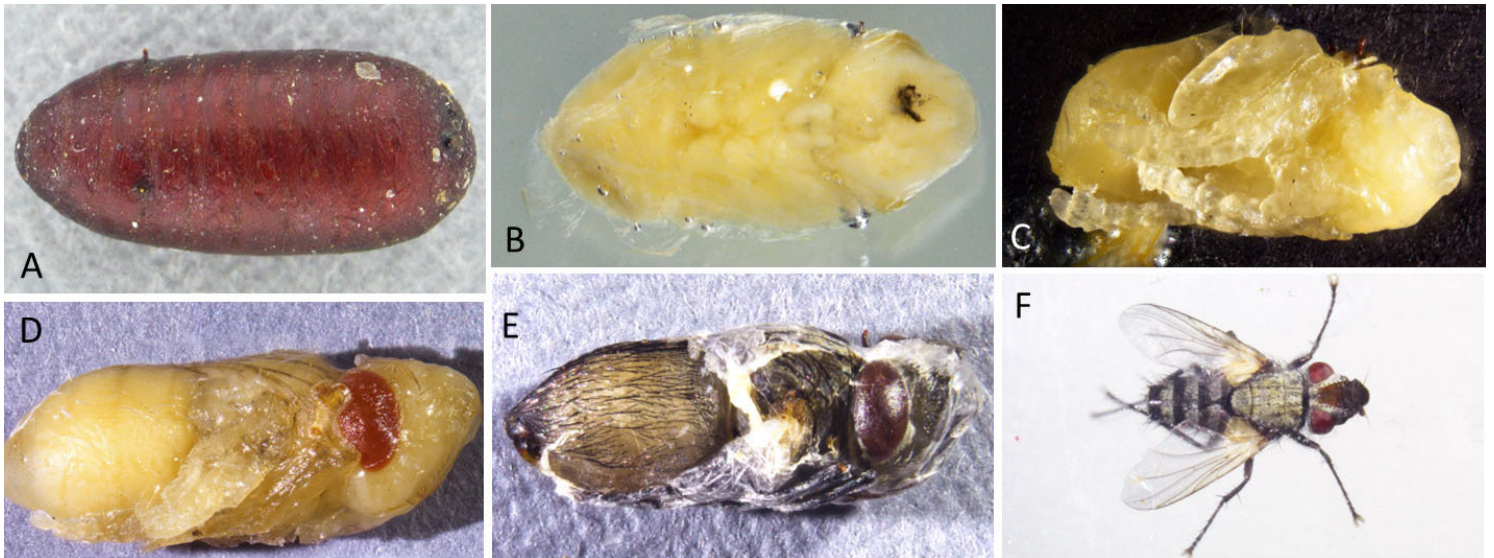


Figure 3. The development of *Istocheta aldrichi* during diapause. **A.** Puparium. **B.** Pre-pupa, segments beginning to differentiate. **C.** Dissected-out pre-pupa, segments continue to differentiate. **D.** Dissected-out pre-pupa, segments are distinguishable, eyes and hairs beginning to develop. **E.** Dissected-out adult fly nearing the end of its development, emergence soon to occur. **F.** The emerged adult fly.

Keeping the adult tachinids alive between emergence and release

As the first adult tachinids emerged, we had to find out what to feed them. First, we offered them sucrose, honey, bee pollen, and royal jelly (separately) to see which diet would keep them alive the longest. Each food source was mixed with water, making a concentration mimicking that of flowers and other natural nutrition sources. We recorded the lifespan of flies in days for each trial. Two treatments stood out as resulting in the longest-lived flies: those that were fed honey, and those that were fed pollen. These findings guided us in designing the next set of tests.

We next presented honey and pollen separately, as well as a combination of honey and pollen to see if the combined effect extended lifespan beyond that of honey or pollen alone. We also compared the lifespans of males and females. We did these tests at both warmer and cooler temperatures, expecting cooler temperatures to extend the lifespan of the flies (Fig 4).

We found that the tachinids lived the longest when fed just honey when they were kept in cooler conditions. We also found that males and females lived for about the same amount of time. Contrary to our expectations, the combination treatment of honey and pollen did not lead to a longer lifespan compared to each treatment individually. Flies that were fed honey alone, and kept in cooler conditions, lived (on average) for 18.3 days (the longest-lived fly was a female that made it to 43 days).

Based on the results of these trials, flies that emerged for the purpose of releases were held in cooler incubators and fed honey. The flies that were allocated for the field releases were counted as they emerged and kept together in a large net-mesh cage. As the first scheduled release date



Figure 4. For feeding trials, adult *I. aldrichi* were kept in mesh lid containers with a moistened Kimwipe and 2 cotton vial plugs: one for water and one for food treatment. The fly pictured is being fed with liquid honey.

approached, there was concern about the mating status of the female flies, as tachinid flies can be notoriously difficult to rear (Zhang et al. 2003, Plowes et al. 2012, Dindo & Grenier 2014). We monitored the flies closely for some time but did not see any mating activity. However, one day before the first release, mating among the caged *I. aldrichi* was finally observed. This observation raised our confidence in their ability to produce fertilized eggs and parasitize the beetles once released.

Identifying when and where to perform releases

Now that we had viable adult flies, we needed to know where best to release them. The incredible surveillance network of *P. japonica* traps set up by the CFIA, and the fact that the traps were checked frequently and the results posted to a real-time GIS application that we had access to, proved invaluable. We closely coordinated with the very helpful team at CFIA on a weekly basis to identify areas where they were catching beetles, so we could allocate our released flies to those areas. In the end, the vast majority of *P. japonica* were caught in Port Coquitlam in 2023, so most of the flies we released (i.e., 774 of a total of 801) were released there in a public park.

On the first day of releases, all the folks involved in coordinating the releases got together for a release and “ribbon-cutting” (Fig. 5). It was, in a way, a strange biological control release: despite *P. japonica* having recently been detected in CFIA’s traps in the vicinity of the park where we were doing releases, the beetle populations were at such low densities that it was impossible for human observers to find them on vegetation in the area. So, we were releasing flies into a park where we couldn’t see any of their hosts – not a typical situation for biological control researchers or practitioners! It was hard to know if we would see any results of these releases – we just had to wait and see what turned up in the traps.

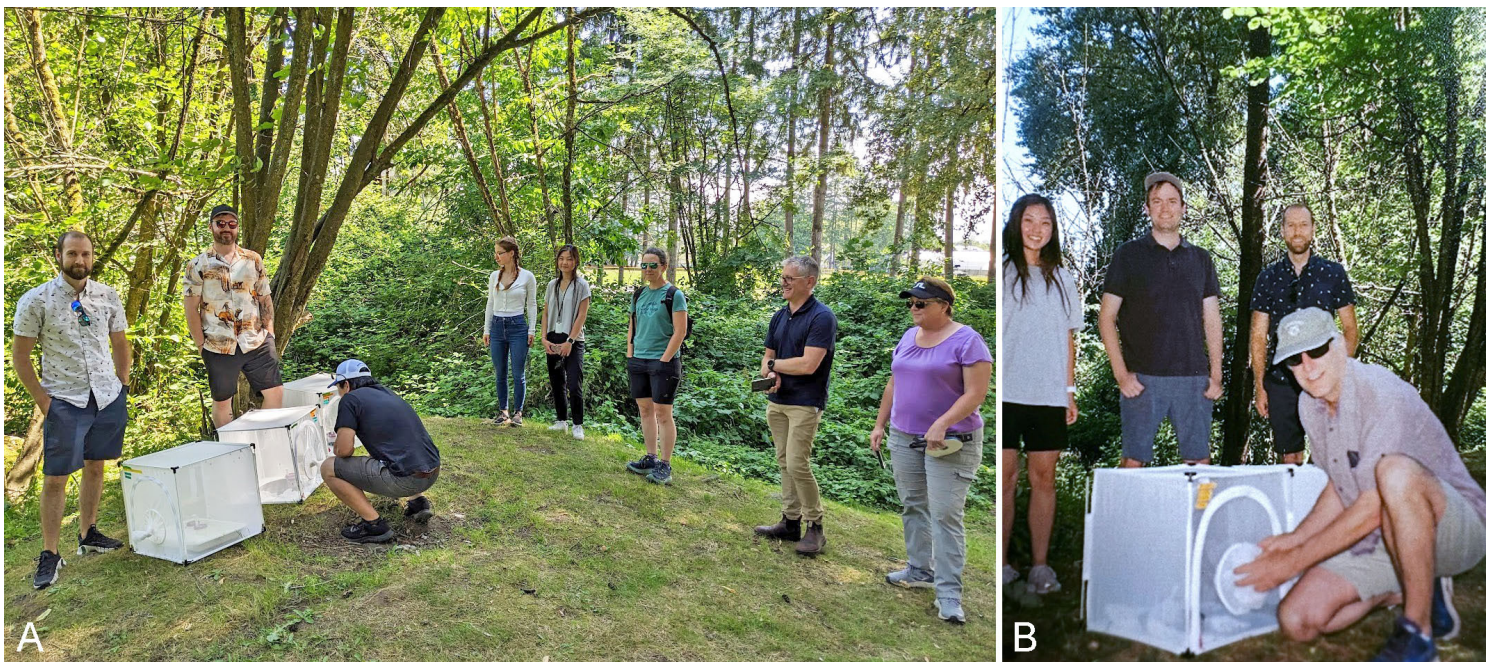


Figure 5. A. Preparing for the experimental releases of *Istocheta aldrichi* in Port Coquitlam, British Columbia, in 2023. Representatives of the city of Port Coquitlam, Canadian Food Inspection Agency, Agriculture and Agri-Food Canada, the Université de Montréal, and the province of British Columbia are pictured. **B.** Releasing the flies!

Monitoring for parasitism after releases

After a few days passed, more *P. japonica* were caught and reported in traps. We checked the database, sometimes 3–4 times a day, in high anticipation of signs of *I. aldrichi* presence. Amazingly, only 12 days after our first releases, a parasitized *P. japonica* was caught! After this first parasitism, more and more beetles were caught with the distinctive white tachinid eggs on their pronota. A total of 24 *P. japonica* were observed carrying one or more eggs (Fig. 1). These parasitized beetles were captured across seven different traps, all of them close to our release site. Because no parasitized beetles had ever been trapped in previous years or in locations farther away from our 2023 release sites, we were confident that these beetles were parasitized by our released flies. Remarkably, the parasitized beetles were found, on average, approximately 337 meters away from the release site, with the farthest capture occurring at an impressive distance of 470 meters. This meant that not only could the flies identify and parasitize *P. japonica*, but they could find them at very low densities and over some distance, and survive in BC's coastal climate.

Moving forward

We are eagerly anticipating the 2024 field season to see what another year of *I. aldrichi* experimental releases might bring: we have about another 5,000 fly puparia overwintering at the time of writing. We will be particularly interested to see whether the first *P. japonica* caught by traps in 2024, before we do any more *I. aldrichi* releases, show any evidence of parasitism – this would mean that parasitism took place because of our releases the previous field season and resulted in successful overwintering and emergence in the field.

Over the longer term, the role of *I. aldrichi* in providing biological control of *P. japonica* in BC will depend on how the eradication effort goes. If *P. japonica* is eradicated from BC, the fly will have helped to take out a few additional beetles that were not killed by other control measures along the way. If the beetle is not eradicated, then it is possible that our releases could result in the establishment of an *I. aldrichi* population that could spread geographically along with that of its host, hopefully “taking the edge off” the economic and environmental damage the beetle is expected to cause. We are developing mathematical modeling approaches to better understand the true level of Japanese beetle biological control provided by *I. aldrichi* so we can better track the impact of this parasitoid in the future, in BC and elsewhere.

Acknowledgements

We thank: Tracy Hueppelsheuser (BC Ministry of Agriculture and Food); Jacques Brodeur, Simon Legault, and Josée Doyon (Université de Montréal); Jacob Miall, Peter Mason, Jean-Philippe Parent, Jason Thiessen, and Jessie Moon (Agriculture and Agri-Food Canada); Jason Crandall, Troy Kimoto, Melissa Cook, Chantel Taylor, and the entire Japanese beetle surveillance team (Canadian Food Inspection Agency); Scott Wamsley (City of Port Coquitlam); Melinda Yong (City of Burnaby); Sophie Desserrault (City of Vancouver). We also thank Jim O'Hara (AAFC, Ottawa) for the invitation to submit an article and for confirming the identification of *I. aldrichi*. We extend a huge thank you to Richard McDonald (Symbiont Biological Pest Management, North Carolina) for helpful advice on collecting and rearing *I. aldrichi*. This research was funded by Agriculture and Agri-Food Canada.

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The mysterious tachinid

Phyllaristomyia fiebrigi Townsend

and new distribution records



Figure 1. *Phyllaristomyia fiebrigi* Townsend resting on leaves in a jar after capture in the Reserva Natural Rincón de Santa María, Corrientes Province, Argentina.

by Gastón Zubarán

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Last November, while conducting entomological field work in the Corrientes province of Argentina for the *Rincón Santa María Grassland Restoration Project*, I encountered an unusual tachinid. Its striking coloration was unlike anything I had seen before in a tachinid: the head was yellow, the thorax and abdomen yellow and black, and the wing was reddish-orange at its base and smoky black on the rest. The peculiar antenna, with a leaf-like arista arising from a long and slender postpedicel, was more noticeable later when the specimen was examined in the lab. This fly had landed on my backpack, which I had placed on the ground during my field work. The fly was calm, walking slowly around and not attempting to fly off the way most insects do when approached. On the contrary, even when a jar was placed over it there were no sudden change in behavior and it simply tried to climb the walls, without success. This tranquility allowed us to take pictures of it while it was walking on leaves placed in the jar (Figs. 1–2).

Back at my workplace in the Entomology Division of the Museo Argentino de Ciencias Naturales (MACN), this fly was pinned, labelled and photographed (Fig. 3). It was a male, but identification of it proved challenging. I examined it with my dipterist colleagues, and we noted with surprise the unique antennal morphology. The leaf-like terminal

aristomere of this fly had not been seen before in any tachinid studied at the Museum. The identification key of Wood & Zumbado (2010) for the tachinids of Central America was tried without success. For this reason, specialist Jim O’Hara of the Canadian National Collection of Insects (CNC) in Ottawa was consulted, who said he did not know the genus but thought it might belong to the tribe Goniini (Exoristinae). He reached out to several colleagues for help, sending them my field pictures of the fly (Figs. 1–2). One of them, Norm Woodley, a former dipterist with the National Museum of Natural History (USNM) in Washington, thought he had seen this fly before among the C.H.T. Townsend material in that collection. Norm travelled to Washington a short time later and looked for the fly in the USNM. He found this mysterious fly, as suspected, among the types in the Townsend material. It is a species represented in the collection by a male paratype of *Phyllaristomyia fiebrigi* Townsend, the only species in the genus. A note in the tray written by the late D. Monty Wood, a former CNC tachinid specialist, gave an unpublished assignment of the species to the well-known New World genus *Belvosia* Robineau-Desvoidy (tribe Goniini). Norm’s identification of the species allowed Jim to find archived pictures of the male paratype and its labels that Monty had taken during one of his trips to the USNM (Fig. 4).

Phyllaristomyia fiebrigi is a tachinid for which there are very few records. It was described by Townsend (1931: 467) from four specimens (3♂ 1♀) from two localities in Paraguay, San Bernardino and San Luis. He placed the genus in the tribe Belvosiini, which has since been incorporated into the tribe Goniini of subfamily Exoristinae (e.g., O’Hara et al. 2020). This tribe is considered monophyletic because of an unusual reproductive trait of females: they deposit tiny (“microtype”) eggs on the food plants of prospective hosts (usually caterpillars of Lepidoptera) that hatch in the gut after being accidentally ingested by a feeding host (Herting 1960, Stireman et al. 2006).

What makes this species particularly unusual is its male antenna, with its long and cylindrical postpedicel and bizarrely flattened and leaf-shaped arista. Townsend based the name of the genus on this last peculiarity, combining *phyllon* (Greek for “leaf”) with *arista* (Latin) and *myia* (Greek for “fly”) to



Figure 2. *Phyllaristomyia fiebrigi*, live specimen from the Reserva.



Figure 3. *Phyllaristomyia fiebrigi*, specimen from Reserva after pinning (specimen recorded in MACN as “MACN_En 39349”).

form the name *Phyllaristomyia*. The specific epithet *fiebrigi* was based on “Fiebrig”, the name of the collector of the holotype.

Up to the present day the genus has only been reported from Paraguay (original description) and Brazil (Guimarães 1971). My specimen is a new country record for Argentina, and Rodrigo Dios of the Museum of Zoology, University of São Paulo, Brazil kindly provided me with additional records from Brazil. All these currently known records of *P. fiebrigi* are shown here on the maps in Fig. 5 and in Table 1.

I collected my specimen of *P. fiebrigi* in the Reserva Natural Rincón de Santa María, a provincial reserve with an area of approximately 3000 ha, located in the department of Ituzzaingó in the north of the province of Corrientes. The Reserva was created to compensate for the loss of habitats caused by the creation of the Yacyretá Dam. It is bordered on the north by the Paraná River (separating Argentina from Paraguay), on the west by the reservoir of the Yacyretá Dam, and on the other sides by private properties with different uses such as cattle grazing and exotic tree plantations (Krauczuk & Giacomo 2007, Cockle et al. 2023). The ecoregion of the Campos y Malezales and the Esteros del Iberá converge here, with influences from the Delta and Island regions of Paraná and Chaco Húmedo (Burkart et al. 1999, Morello et al. 2012). The Reserva is characterized by different dominant areas of grasslands, native forest, and areas with exotic trees from old abandoned plantations. Many sectors remain flooded much of the time due to rainfall and the low soil permeability in much of the land (Krauczuk & Giacomo 2007, Cockle et al. 2023). Isolated native trees and some shrubs and vines can be found among the grasslands (Cockle et al. 2023) (Fig. 6). The Reserva belongs to the National State and is managed jointly by Argentina and Paraguay under the Yacyretá Binational Entity (EBY).



Figure 4. *Phyllaristomyia fiebrigi*, male paratype in USNM from San Bernardino, Paraguay, collected by Fiebrig. (Images by D. Monty Wood, Ottawa.)

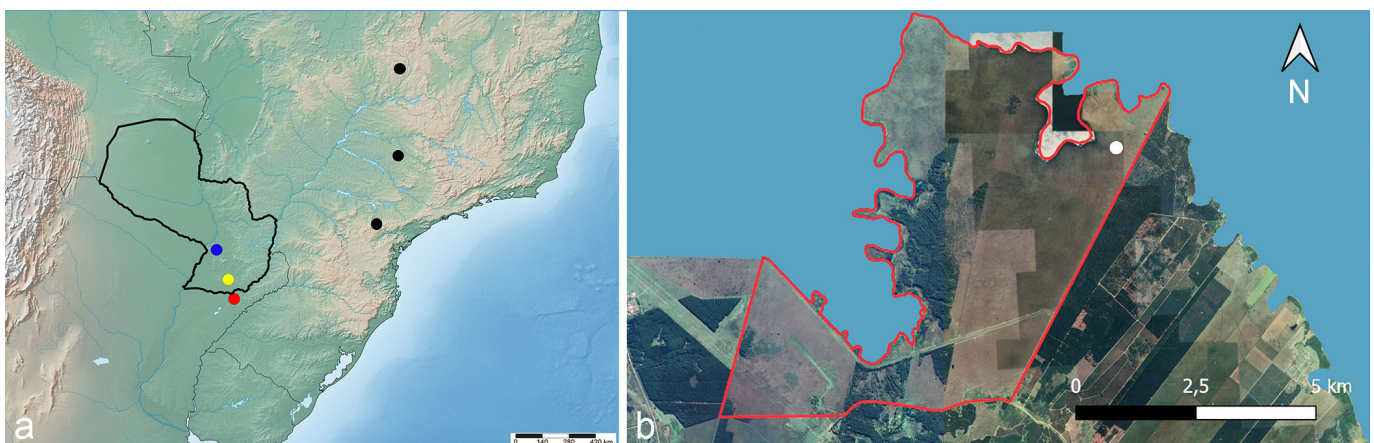


Figure 5. a. Distribution map for *P. fiebrigi*. The blue and yellow dots are the two localities of the type series in Paraguay (black outline), the black dots are localities in Brazil of specimens in MZUSP, and the red dot is the locality in Argentina where the author caught a specimen in the Reserva. **b.** Outlined in red is the Reserva Natural Rincón de Santa María in northern Argentina, and the white dot indicates where *P. fiebrigi* was collected by the author.

The habitat in which this unique tachinid was found is a grassland area near the northern limit of the Reserva, with a greater abundance of shrubs such as “chilcas” (*Baccharis* sp.), some isolated specimens of “curupí” (*Sapium haematospermum*) and other herbaceous plants. The weather at the time of year when the fly was collected (November 20th) was characterized by intense rains and high temperatures, resulting in a large amount of water in the soil. The grassland has irregular terrain, with tall grasses surrounded by puddles of water. The area is not frequently visited except by people who are conducting studies in the area. Thus the human impact is minimal, allowing the flora and fauna to follow their natural course without human interference.



Figure 6. Characteristic grassland of the Reserva Natural Rincón de Santa María in northern Argentina.

Phyllaristomyia fiebrigi is a tachinid about which very little is still known. There is no host data, or information about how other specimens were collected. Whether they were caught in flight, on flowers, in grassland or forest, remains unknown. The appearance of the single specimen in the Reserva has brought this rarely-seen species to the attention of staff rangers and other workers and this may lead to a future opportunity to study this species further. The Reserva is open to other researchers who want to carry out scientific studies and they can be on the watch for this species as well. Collecting and rearing lepidopteran larvae would be a good option too, not only to potentially discover the host of this species but to learn more about the tachinids and hosts in general. Natural Reserves and National Parks are important sources of new knowledge, with repositories of flora and fauna waiting to be discovered, studied and, above all, made known.

Acknowledgements

My thanks to Nestor Fariña and Olga Villalba, park rangers of the Reserva Natural Rincón de Santa María, for their help, willingness to collaborate with those wanting to carry out research in the reserve, and desire to make this wonderful place known. To Facundo Di Sallo, a Ph.D. student in ornithology and ecology at the Instituto de Biología Subtropical in Puerto Iguazú, for including me in the project. To Diana Marcela Torres, a tachinid specialist and Ph.D. student at MACN, for her help in identifying the fly and for reviewing this note. To Jim O’Hara, at the CNC

in Ottawa, for his efforts to assist with the identification of this tachinid. To Norm Woodley, a Research Associate at the Smithsonian Institution in Washington, for finding the species among the Townsend types in the USNM. To Rodrigo de Vilhena Perez Dios of the Diptera Laboratory at the Museu de Zoologia of the Universidade de São Paulo (MZUSP), for providing data on specimens in that collection. And to Mayra Crebay for her unconditional support, and great help with field work and data collection.

Table 1. *Phyllaristomyia fiebrigi*, bibliographic records and new records. H, Holotype; A, Allotype; P, Paratype.

Country	Department/ Province/State	Locality	Date	Collector	Sex	Source
Paraguay	Cordillera	San Bernardino		Fiebrig	m	Townsend 1931 (H, P)
Paraguay	Cordillera	San Bernardino		Fiebrig	f	Townsend 1931 (A)
Paraguay	Cordillera	San Bernardino		Fiebrig	m	Townsend 1931 (P)
Paraguay	Caazapá	San Luis		Reimoser	m	Townsend 1931 (P)
Brazil	Mato Grosso					Guimarães 1971: 184
Brazil	São Paulo	Batatais	March 1943	Stafuzza A.	m	Present work [MZUSP]
Brazil	Goiás	Viannopolis	March 1930	Spitz R.	m	Present work [MZUSP]
Brazil	Paraná	Jaguariaíva, P.R./P.E. Cerrado	16 Oct. 2001	Barbola L.F.	m	Present work [MZUSP]
Argentina	Corrientes	Ituzaingó, Reserva Natural Rincón de Santa María	20 Nov. 2023	Zubarán, G. & Crebay, M.	m	Present work [MACN]

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Hovering Tachinidae,



what's the
Buzz ?

by Theo Zeegers¹ and Piet van Dijk (photographer)

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Note: Translated and adapted from Zeegers (2024).

Introduction

The family of hoverflies (Syrphidae) is named after the persistent hovering behaviour of males of many species. Hovering, however, within Diptera is not limited to hoverflies. Males of many beeflies (Bombyliidae) and horseflies (Tabanidae) are known to hover persistently on a regular basis. Hovering amongst the Calyptratae is mostly reported within Muscoidea. Many species of *Fannia* (Fanniidae) do hover, though slightly bobbing up and down. Some Muscidae are also known to hover (Pajunen 1982). However, hovering males within Oestroidea are rarely reported.

Unambiguous records of persistent hovering Oestroidea are known to us only from a few species of Tachinidae, within two groups in the subfamily Exoristinae: the tribe Winthemiini and the *Carcelia*-group within Eryciini. Within Europe, the first author has repeatedly seen hovering males of *Carcelia dubia* (B. & B.), *C. puberula* Mesnil and *C. lucorum* (Meigen). Our colleague Menno Reemer has also observed an unidentified species of *Carcelia* hovering. *Carcelia* males are often seen in groups, called leks, at forest clearings or along forest edges. The three species seen by the first author were hovering at one to two meters above the ground. Shima (2015: 10) reported hovering by *Carcelia rasa* (Macquart) and Shima & Tachi (2022: 50) by *Senometopia cariniforceps* (Chao & Liang). From the tribe Winthemiini, Shima (1996: 185) reported hovering by *Smidtia amoena* (Meigen).



Figures 1–2. *Carcelia lucorum*, courtship hovering of male, Deventer, Douwelerkolk. **1.** An oblique view from behind, 25.ix.2023. **2.** Lateral view, 28.ix.2023. Photos by Piet van Dijk.

New records

New records of hovering males of *Carcelia lucorum* were made by the second author in the Netherlands near Deventer on several days at the end of September, 2023. He was able to take several photographs (Figs. 1–2), which show very nicely the front legs extending forward, even surpassing the anterior of the head and the front tarsi held upward. In any hovering syrphids we have seen, the front legs are kept tight to the body and behind the head.

Canopy leks

On arrival at a nature reserve in the south of the Netherlands on September 7th, 2023, the first author was baffled by a very loud buzzing, resembling a large group of hoverflies. At first, it was difficult to locate the source. Eventually, high up at approximately 25 meters above the ground in the canopy, groups of flies were detected (Fig. 3). The flies showed classic persistent hovering behaviour. Observation with binoculars and extreme crops of pictures made with a 180 mm lens on a 1.4 crop camera (hence, 5 times magnification) made it clear we were looking at rather large, stout Calyptratae. Two days later, another colleague Wouter van Steenis observed one of the males at approximately 10 m above the ground and confirmed it to be a bristly Calyptratae. Hovering males could be observed between 09:00–11:00 a.m. local time. Although we could not make a positive identification, given the locality and date and our previous observations, we believe the males belonged to a large *Carcelia* species, possibly *Carcelia bombylans* R.-D. or *C. rasa*.



Figure 3. Hovering males, probably of a *Carcelia* species, at a canopy lek about 25 meters above the ground, at 5 times magnification. Two males are in focus, and on the left a third male is out of focus. Photo by Theo Zeegers.

Conclusion

Reports of hovering male Tachinidae are restricted to a very limited set of species. Especially within the genus *Carcelia*, persistent hovering is frequently observed. This hovering is often just a meter or two from the ground and therefore easy to spot, but is sometimes high up in the canopy and located more by sound than by sight. We hope this report might draw more attention to the topic and behavior of hovering Tachinidae.

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A glimpse into the
incredible diversity of
Ecuadorean Tachinidae

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PRECEDING PAGE: Figure 1. The author next to Cascada Río Hollín, Napo Province, Ecuador. (Photo by Voker Bahn.)

Introduction

In the summer of 2023 I had the opportunity to visit the tropical South American country of Ecuador for two weeks with a study abroad course from my university focused on Tropical Ecology. I wasn't actually teaching the course, but I was invited to come along by the instructors due to my previous experience in Ecuador and knowledge of insects. I have visited Ecuador several times previously and have been enthralled by the great diversity of Andean tachinids, so I was excited to go along on the course. The fact that all the transportation and lodging were already arranged made it even more attractive – I didn't have to concern myself with trip logistics. However, this also meant I was somewhat at the mercy of the course itinerary in terms of where and when I was able to wander off and look for flies. Birds were the major focus of instructors for the course and the stops and sites visited were organized around visiting different types of tropical habitats and observing the local avifauna. This often was not ideal for collecting flies, but it did allow me to visit a wide variety of habitats. Fortunately, I was able to obtain a permit to collect flies with the aid of my friend and colleague, Dr. Diego Inclán, director of INABIO – Ecuador's national biodiversity institute – and fellow "bristle fly" enthusiast (e.g., see Inclán & Stireman 2013, Inclán et al. 2014). A major long-term goal of INABIO is to inventory the species of Ecuador. As a research associate of INABIO I am trying to aid them in this endeavor, challenging as it may be. All of the flies I collected technically belong to Ecuador but are on loan to me. In this article, I briefly recount some of the locations that I visited and provide lists of tachinid genera and species (mostly morphospecies) that I was able to collect, including some notes on select taxa. I then examine a few broad patterns of diversity and composition based on the specimens collected.

*In the summer of 2023
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Ecuador

As the country's name indicates, Ecuador is located on the equator in South America. The smallish country (slightly larger than the U.K., similar to the U.S. state of Wyoming) is bisected by the Andes Mountains, whose lofty volcanic peaks (4000 m+) and ridges divide the country into the lowland tropical forests of the Amazon Basin to the east and Chocoan tropical rainforest and deciduous coastal forests to the west (Fig. 2). Due to the great diversity of habitats and elevational turnover on the Andean slopes, the country is exceedingly diverse biologically, with more than 16,000 vascular plant species (Jørgensen & León-Yáñez 1999), at least 1686 bird species (Freile et al. 2024), 477 reptile species (Torres-Carvajal et al. 2019), 3000 butterfly species (Wilmott & Hall 2024), and who knows how many bristle flies! Ecuador boasts many reserves and protected areas and the government has paid some attention to the value of its great biodiversity resources, but threats to native habitats and species are increasing. Due to its diversity of species and habitats, and its reserve system, Ecuador has been popular with eco-tourists for decades (although recent shifts in South American drug trafficking have recently made some areas less safe for travel).

Methods

Because I was travelling with a university course on a bus, I generally went where the course went, which was focused on the Eastern Andean slope in central Ecuador, from the high páramo to the Amazon Basin. However, near the end of the course I was able to meet Diego Inclán and we visited a couple sites on the western slope and nearby lowlands.

My collecting was opportunistic. I grabbed my net and looked for flies whenever we stopped somewhere for long enough, the weather was conducive, and collecting was not prohibited. On most days it was raining or misting or heavily overcast and collecting was poor or nonexistent. Sometimes the sun would come out for a short while, usually while I was on the bus, and then as soon as we stepped off, the clouds would return (or at least it seemed so). Most specimens were obtained from a few sites and days where we experienced rare sunny or partly cloudy conditions. The majority of species were collected from one site, San Isidro, where I spent several nights and was able to collect on multiple days.

All collecting was done by hand with a butterfly net except for a few specimens that were cornered in buildings or were otherwise possible to collect directly into a vial or by hand (a few were brought to me by students on the course). Collecting was generally focused along roadsides, trails, or other forest edges, with flies being caught as they rested or skittered around on leaves. In several areas I employed a honey-water-cola spray (“fly juice”) to enhance collecting success. I observed few plants with flowers that tachinids might be apt to visit actually flowering, and very few of the tachinids collected were from flowers.

Flies were killed in a collection tube, moved to a labeled vial, and usually pinned the evening they were collected. Once I returned to my laboratory in Ohio, genera and species were identified using Wood & Zumbado (2010), Wood (1985), Townsend (1934–1942 and other works), and, when available, various keys to species of particular genera, as well as with specimens in my collection (JOSC). Often, specimens did not match satisfactorily with any genus in keys or my collection. These may reflect species that depart from the norm in known genera, undescribed genera, or known genera that I was simply unable to recognize. I have typically indicated these as a proposed genus with a question mark or indicated that they are “near” a particular genus. Some of the generic identifications and suggestions are probably incorrect. Very few specimens could be identified to species, and many of those that I did provide species names for are tentative identifications. This most likely reflects the vast diversity of undescribed species in the region, although it is possible (perhaps likely) that some of my unidentified species are in fact described.



Figure 2. A physical map of Ecuador showing sites where > 1 tachinid species were collected (and Quito, the capital).

Sites and Collecting Results

La Sierra – Andes Mountains

The High Country

After arriving in Quito on June 23rd and spending the night at a hotel near the airport, we headed up to the nearby Andean highlands (Fig. 3). High elevation páramo habitats of the Andes are extremely interesting biologically, and, when the weather clears, they offer amazing uninterrupted vistas of massive volcanos, shimmering grasslands, and scrub covered hillocks. At higher elevations, but below the permanent snow, plant communities are dominated by alien looking, cushion-forming herbs, club mosses, and bunch grasses. The Andean páramo also harbors a diversity of interesting Tachinidae. Unfortunately for me, it is also often cold, foggy, and windy, and I collected few tachinids in the higher Andes despite spending multiple days there. I was able to collect a few tachinids around a restaurant where we stopped for lunch near Parque Nacional Antisana, including a few larger “hedgehog” flies in the tribes Tachinini and Polideini and some smaller blondeliines. Perhaps most notable was a robust species of *Patelloa* (or something near it; Fig. 13C), that has apparently converged on the robust “hedgehog syndrome”. Interestingly, a species of *Microphthalma* (Megaprosopini; Fig. 13A) that I collected here, was also encountered outside my hotel in Quito at the end of the trip (~1100 m lower in elevation).



Figure 3. A rare break in the clouds allows a view of 5753 m Volcán Antisana from the surrounding high páramo plains.

nr. Laguna de Secas, west of PN Antisana (24 June) 3545 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Exoristinae	Blondeliini	<i>G. nr. Eribella/Lydinolydella</i> sp. 1	1	0	1	does not key
Exoristinae	Blondeliini	<i>Sphaerina</i> (or <i>G. nr.</i>) sp. 2	4	0	4	
Tachininae	Goniini	<i>Patelloa</i> (or <i>G. nr.</i>) #1 sp. 1	0	1	1	hedgehog fly mimic
Tachininae	Megaprosopini	<i>Microphthalma</i> sp. nr. <i>cuzcana</i> Townsend	0	1	1	
Tachininae	Polideini	<i>Hystricia flavitibia</i> Curran	1	1	2	
Tachininae	Tachinini ("Dejeaniini")	<i>Eulasiopalpus vittatus</i> Curran	1	0	1	
Laguna Papallacta (27 June) 3380 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Exoristinae	Blondeliini	<i>G. nr. Eribella/Lydinolydella</i> sp. 1	1	0	1	does not key
Quito (6 July) 2640 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Tachininae	Megaprosopini	<i>Microphthalma</i> sp. nr. <i>cuzcana</i> Townsend	1	0	1	

Tropical Montane Forest/Cloud Forest

We spent most of our time a bit lower than the páramo in the tropical montane forest and cloud forests on the eastern slope of the Andes between about 2700 m and 2000 m. This region is characterized by steep ridges and deep valleys swathed in dense forests of moderate stature. My past experience suggests that these elevations and habitats host an enormously rich fauna of tachinid flies and it did not disappoint.

Guango Lodge

The first site, where we spent several days, was Guango Lodge (2680 m), a private lodge and small forest reserve that is popular with birdwatchers due to the great richness and abundance of hummingbirds. Although the area is likely very rich in bristle flies as well, the cool temperatures and frequent rain and fog severely limited opportunities to observe, appreciate, and document this diversity. I don't recall seeing the sun at all during my stay here, but there were some days when the rain stopped and the sky lightened up sufficiently for some fly activity. Most of my collecting took place on a single day along an oil pipeline right-of-way that had been cleared of larger vegetation (Fig. 4). The results were dominated by smaller bodied Blondeliini and Voriini (*sensu lato*), including several specimens of possibly *Leptomacqartia* that are confusingly rhinophorid-like (Fig. 14F). Most of the species collected were blackish in color with variously darkened wings (often along the fore edge or along major veins) leading to confusing similarity among species (e.g., Figs. 13B, 14A). This same black body-dark wing syndrome was common among the co-occurring muscids as well. A likely hypothesis is that this reflects convergent adaptation to absorb solar radiation and warm up quickly in the brief periods of sunlight in this cool and cloudy habitat. A single species of *Winthemia* was collected (4 specimens), drawing attention to the relative scarcity of this genus among the mid-elevation Andean tachinid fauna. Collections and rearing from lower elevations in the Neotropics reveal a seemingly limitless diversity of species in this difficult genus, but in the cloud forests *Winthemia* seems to be rather uncommon.



Figure 4. Students walking along the pipeline right-of-way near Guango Lodge. Nearly all tachinids collected at this site were from vegetation along this path.

Guango Lodge (25 June) 2680 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Dexiinae	Dufouriini	<i>Ebenia</i> sp. 1	0	1	1	
Dexiinae	Voriini	<i>Campylocheta</i> sp. 4	1	0	1	
Dexiinae	Voriini	<i>Campylocheta</i> sp. 5	1	0	1	assuming = female from San Isidro?
Dexiinae	Voriini	<i>Cyrtophleba</i> sp. 2	0	1	1	
Dexiinae	Voriini	<i>Leptomacquartia</i> (?) sp. 1	0	2	2	looks like Rhinophoridae
Dexiinae	Voriini	<i>Trafoia</i> sp. 2B	1	0	1	could be male of 2A - but no ocellars and slight color differences
Dexiinae	Voriini	G. nr. <i>Cyrtophleba</i> sp. 1	1	0	1	
Dexiinae	Voriini ("Uramyini")	<i>Thelairaporina</i> (?) sp. 2	0	1	1	specimen decapitated in EtOH
Dexiinae	Voriini ("Uramyini")	<i>Thelairaporina</i> sp. 1	1	0	1	
Dexiinae	Voriini ("Uramyini")	<i>Thelairaporina</i> sp. 3	1	0	1	
Exoristinae	Blondeliini	<i>Anoxynops</i> sp. 3	1	0	1	
Exoristinae	Blondeliini	<i>Anoxynops</i> sp. 4	0	1	1	
Exoristinae	Blondeliini	Blondeliini G. poss. nr <i>Vibrissina</i> sp. 1	1	0	1	broad curved pafc. Not sure if even Blondeliini!
Exoristinae	Blondeliini	<i>Calolydella</i> sp. 2b	1	0	1	v. similar to C. sp. 2, could be conspecific but differs in coloration
Exoristinae	Blondeliini	<i>Calolydella</i> sp. 6	0	1	1	similar to C. sp. 5
Exoristinae	Blondeliini	<i>Chaetodoria conica</i> ? Townsend	1	0	1	
Exoristinae	Blondeliini	<i>Chaetostigmoptera</i> (or G. nr.) sp. 1	1	0	1	
Exoristinae	Blondeliini	<i>Chaetostigmoptera</i> sp. 2	0	1	1	
Exoristinae	Blondeliini	<i>Cryptomeigenia</i> (or G. nr.) sp. 2	2	2	4	could be very weird <i>Vibrissina</i> ?
Exoristinae	Blondeliini	<i>Erythromelana</i> cf. <i>jaena</i> Inclán	1	0	1	palpi diff. than <i>E. jaena</i> above, but unsure if diff. sp.
Exoristinae	Blondeliini	<i>Erythromelana jaena</i> Inclán	0	1	1	
Exoristinae	Blondeliini	<i>Eucelatoria nana</i> grp. sp. 3	0	1	1	
Exoristinae	Blondeliini	G. nr. <i>Eribella</i> / <i>Lydinolydella</i> sp. 1	1	0	1	see also Antisana, Papallacta
Exoristinae	Blondeliini	G. nr. <i>Lydinolydella</i> sp. 2	2	0	2	unsure of genus, striking wing markings
Exoristinae	Blondeliini	<i>Hypoproxynops</i> sp. 1	1	1	2	
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 1A	0	1	1	
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 2A	2	1	3	
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 2B	1	1	2	

Exoristinae	Blondeliini	<i>Italispidea</i> sp. 2C	0	1	1	
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 9	0	1	1	
Exoristinae	Blondeliini	<i>Lixophaga/Calolydella</i> sp. 5	0	1	1	diff. than <i>Calolydella/</i> <i>Lixophaga</i> sp. 5
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 7	1	0	1	
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 9	2	1	3	
Exoristinae	Blondeliini	<i>Myiopharus?</i> sp. 5B	0	1	1	could be distinct sp. from <i>M.</i> 5A, but quite similar
Exoristinae	Blondeliini	<i>Neominthopsis</i> (??) sp. 1	1	0	1	odd <i>Lixophaga?</i> <i>Eribella?</i>
Exoristinae	Goniini	G. nr. <i>Houghia</i> sp. 1	1	0	1	
Exoristinae	Goniini	Unk. G. nr. <i>Aplomyodoria?</i> sp. 2	1	0	1	
Exoristinae	Winthemiini	<i>Winthemia</i> sp. nr. <i>patagonica</i> (Blanchard)	2	2	4	
Tachininae	Minthoini	<i>Paradidyma</i> sp. 1	0	4	4	
Tachininae	Siphonini	<i>Siphona</i> sp.	0	1	1	

San Isidro area

Cabañas San Isidro is an ecolodge just down the road from Yanayacu Biological Field Station, a place I have visited and conducted research at off and on over the past 20 years (e.g., Stireman et al. 2017). Compared to the relatively bare bones and inexpensive Yanayacu, San Isidro is downright posh. It even has a heated swimming pool! Like Guango Lodge, it caters primarily to well-heeled birders. The lodge is surrounded by a very nice reserve of apparently primary montane tropical forest that can be explored on a number of relatively well-maintained trails. It occupies a “hanging valley” – a relatively flat (emphasis on the relatively) valley surrounded by steeper portions above and below. This makes it more accessible than the typical steep and narrow valleys of the Eastern Ecuadorean Andes. While at San Isidro, I was fortunate to have a couple of sunny days (or at least mornings or afternoons) for collecting flies. My collecting was focused on vegetation growing along the roadside next to the lodge grounds and along a trail that bordered forest on one side and more open, grassy, and somewhat swampy habitat on the other (Fig. 5). A couple specimens were also collected at a brief stop at the nearby Guacamayos ridge (Fig. 6), including a species of bristly *Chrysotachina* that is being described by my former PhD student, Juan Manuel Perilla López.

My collecting experience at San Isidro, as well as previous experience collecting tachinids in various parts of Ecuador, suggests to me that this type of forest at around this elevation (~2000 m) is where the peak of Andean tachinid diversity lies. The diversity seems endless – even in a small area. If one locates a good sunny, forest edge, and sprays a little sugar solution on the foliage, you can basically just stand there and keep busy collecting and stuffing flies into vials for hours as the flies keep coming in (Fig. 7; see this link for a short video of one particularly “hopping” spot [[watch video](#)]). After some time spent collecting in this manner, I started trying to avoid collecting more individuals of species that I thought I already had several of. This was due to both constraints on space in which to store pinned specimens and because I couldn’t help but feel a little bad about killing so many beautiful flies. I note however, that it is very unlikely that my collecting in this small area for this few days had any impact on the tachinid populations. Also, I cursed myself later, as I realized how many species are superficially similar and how many I might have missed due to my restraint.

Particularly striking is the great diversity of big bristly Tachinini – the so called “hedgehog flies”. These flies display a diversity of color patterns; e.g., orange, orange and black (Figs. 7A-C, Fig. 13E,F), yellow and black, black and white, and so on, and each of these color syndromes is represented by multiple, sometimes unrelated species – even crossing tribal boundaries into the Polideini and other tribes. I have been interested in these hedgehog flies, particularly the palpi-lacking clade “Epalpini”, for some time and I am attempting to obtain funding for focused studies on their diversity, ecology, and relationships in the tropical Andes. Perhaps even more impressive in terms of diversity (if not diversity of color pattern) are the Blondeliini (Figs. 7E, 14B,C,E,G). This tribe of mostly smaller tachinids tends to be pretty diverse nearly everywhere (i.e., across biogeographic regions and habitats), but they really dominate the fauna in the middle elevation Andes.



Figure 5. A trail near the San Isidro lodge along which many tachinids were collected.



Figure 6. A view of the cloud forest from Guacamayos ridge (near San Isidro) looking southeast towards the Amazon Basin.

Guacamayos ridge (28 June) 2247 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 2B2	0	1	1	could be = sp. 2B
Tachininae	Polideini	<i>Chrysotachina</i> n. sp. <i>sensu</i> Perilla-López,	0	1	1	
San Isidro lodge (30 June – 2 July) 2084 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Dexiinae	Voriini	<i>Campylocheta</i> sp. 1	1	0	1	
Dexiinae	Voriini	<i>Campylocheta</i> sp. 3	1	0	1	
Dexiinae	Voriini	<i>Campylocheta</i> sp. 5	0	1	1	assuming = male from Guango
Dexiinae	Voriini	<i>Cyrtophleba</i> sp. 1	1	0	1	
Dexiinae	Voriini	<i>Neotrafoiopsis</i> (?) cf. <i>andina</i> ? Townsend	2	6	8	possibly <i>Trafoia</i>
Dexiinae	Voriini	<i>Polygaster</i> sp. 1	4	0	4	
Dexiinae	Voriini	<i>Trafoia</i> sp. 2A	0	1	1	possibly female of sp. 2B?
Exoristinae	Blondeliini	<i>Anoxynops</i> sp. 1	4	1	5	
Exoristinae	Blondeliini	<i>Anoxynops</i> sp. 2	1	0	1	
Exoristinae	Blondeliini	<i>Blondelia</i> sp. 1	0	1	1	
Exoristinae	Blondeliini	G. nr. <i>Myiopharus</i> sp. 1	0	2	2	
Exoristinae	Blondeliini	G. nr. <i>Oxynops</i> sp. 1	0	3	3	nr. <i>Myiopharus</i> ? probably not <i>Oxynops</i>
Exoristinae	Blondeliini	<i>Calodexia</i> sp. 1	0	1	1	
Exoristinae	Blondeliini	<i>Calolydella</i> sp. 2	1	0	1	
Exoristinae	Blondeliini	<i>Calolydella</i> sp. 2a	0	2	1	could be = <i>C.</i> sp. 2?
Exoristinae	Blondeliini	<i>Calolydella</i> sp. 4	0	1	1	
Exoristinae	Blondeliini	<i>Calolydella</i> sp. 7	1	0	1	
Exoristinae	Blondeliini	<i>Calolydella/Lixophaga</i> sp. 5	1	0	1	3 presut. dorsocentrals, could be <i>Lixophaga</i>
Exoristinae	Blondeliini	<i>Chaetodoria conica</i> ? Townsend	2	0	2	
Exoristinae	Blondeliini	<i>Chaetostigmoptera</i> (or G. nr.) sp. 3	2	0	2	different genus?
Exoristinae	Blondeliini	<i>Chaetostigmoptera</i> sp. 4	1	0	1	
Exoristinae	Blondeliini	<i>Cryptomeigenia</i> (or G. nr.) sp. 1	1	1	2	possibly very odd <i>Vibrissina</i> ?
Exoristinae	Blondeliini	<i>Erythromelana</i> (or G. nr.) sp. 1	0	1	1	doesn't quite fit
Exoristinae	Blondeliini	<i>Erythromelana</i> cf. <i>napensis</i> Inclán	3	1	4	
Exoristinae	Blondeliini	<i>Erythromelana cryptica</i> grp. Inclán	0	2	1	unsure of species
Exoristinae	Blondeliini	<i>Erythromelana eois</i> Inclán	0	1	1	

Exoristinae	Blondeliini	<i>Erythromelana jaena</i> Inclán	1	0	1	
Exoristinae	Blondeliini	<i>Erythromelana</i> sp. nr. <i>abdominalis</i> Inclán	0	2	2	
Exoristinae	Blondeliini	<i>Erythromelana</i> sp. nr. <i>woodi</i> Inclán	0	1	1	entirely black
Exoristinae	Blondeliini	<i>Erythromelana woodi</i> Inclán	1	0	1	
Exoristinae	Blondeliini	<i>Eucelatoria tenella</i> grp. sp. 1	1	2	3	male could be diff.
Exoristinae	Blondeliini	G. nr. <i>Calolydella</i> sp. 1	2	0	2	
Exoristinae	Blondeliini	G. nr. <i>Calolydella</i> sp. 1a	0	1	1	differently marked but probably same as sp. 1
Exoristinae	Blondeliini	G. nr. <i>Eucelatoria</i> sp. 1	1	0	1	seems like <i>Blondelia</i> grp. Not <i>Eucelatoria</i> . Bristled facial ridge & hairy eyes.
Exoristinae	Blondeliini	<i>Hypoproxynops</i> sp. 1	0	4	4	
Exoristinae	Blondeliini	<i>Hypoproxynops</i> sp. 2	6	0	6	
Exoristinae	Blondeliini	<i>Hypoproxynops</i> sp. 3	1	1	2	
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 1A	0	3	3	could = <i>I.</i> sp. 1?
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 4	0	1	1	
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 5	0	1	1	or G. nr.
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 6	2	0	2	possibly different spp.
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 7	1	0	1	
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 8	1	0	1	
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 10	1	0	1	
Exoristinae	Blondeliini	<i>Leptostylum</i> sp. 2	0	2	2	
Exoristinae	Blondeliini	<i>Lixophaga</i> /G. nr. <i>Anoxynops</i> sp. 1	0	1	1	not <i>Anoxynops</i> , possibly nr. <i>Lixophaga</i> cf. <i>L.</i> sp. 4)
Exoristinae	Blondeliini	<i>Lixophaga</i> sp. 2	1	1	2	
Exoristinae	Blondeliini	<i>Lixophaga</i> sp. 3	1	1	2	
Exoristinae	Blondeliini	<i>Lixophaga</i> sp. 4	0	5	5	
Exoristinae	Blondeliini	<i>Lydellothelaira?</i> sp. 1	1	0	1	(<i>Myiopharus?</i> <i>Thelyoxynops?</i>)
Exoristinae	Blondeliini	<i>Lydellothelaira?</i> sp. 2	0	1	1	(<i>Myiopharus?</i> <i>Thelyoxynops?</i>) could be = sp. 1 but differs in ab. & wing coloration
Exoristinae	Blondeliini	<i>Lydinolydella</i> sp. 2	3	1	4	
Exoristinae	Blondeliini	<i>Lydinolydella</i> / <i>Euthelyconychia?</i> sp. 1	0	1	1	or <i>Myiopharus?</i>
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 1	0	2	2	no piercer
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 2	0	1	1	no piercer
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 3	0	3	3	>1 sp?
Exoristinae	Blondeliini	<i>Myiopharus</i> (?) sp. 4	0	1	1	nearly bare eyes, bare facial ridge

Exoristinae	Blondeliini	<i>Myiopharus</i> (?) sp. 5A	0	1	1	nearly bare eyes, bare facial ridge; 5A and B close, differ in color
Exoristinae	Blondeliini	<i>Myiopharus?</i> sp. 5B	0	1	1	nearly bare eyes, bare facial ridge
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 7	3	5	8	
Exoristinae	Blondeliini	<i>Myiopharus</i> (?) sp. 8	0	1	1	eye almost bare, gena thin, possibly diff. genus
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 13	1	0	1	
Exoristinae	Blondeliini	<i>Opsomeigenia?</i> (or <i>Eucelatoria?</i>) sp. 1	1	0	1	
Exoristinae	Blondeliini	<i>Phyllophilopsis</i> sp. 1	2	0	2	
Exoristinae	Blondeliini	<i>Phyllophilopsis</i> sp. 2	1	0	1	
Exoristinae	Blondeliini	Unk. G. nr. <i>Phyllophilopsis</i> #2 sp. 1	3	0	3	
Exoristinae	Blondeliini	<i>Ptilodegeeria</i> (?) sp. 1	1	0	1	or <i>Eucelatoria?</i>
Exoristinae	Blondeliini	<i>Sphaerina?</i> sp. 1	1	0	1	
Exoristinae	Blondeliini	<i>Vibrissina</i> (?) sp. 1	1	0	1	
Exoristinae	Eryciini	<i>Carcelia</i> (cf. <i>Calocarcelia</i>) sp. 1	5	1	6	
Exoristinae	Eryciini	<i>Carcelia</i> sp. 3	0	2	2	
Exoristinae	Goniini	<i>Chaetogaedia</i> (?) sp. 1	2	0	2	
Exoristinae	Goniini	<i>Chrysoexorista</i> sp. 2	1	2	3	
Exoristinae	Goniini	<i>Chrysoexorista</i> sp. 3	3	0	3	
Exoristinae	Goniini	<i>Gaediopsis</i> sp. 1	1	2	3	
Exoristinae	Goniini	<i>Gaediopsis</i> sp. 2	4	3	7	
Exoristinae	Goniini	<i>Leschenaultia</i> cf. <i>ciliata</i> (Macquart)	3	0	3	
Exoristinae	Goniini	<i>Leschenaultia</i> sp. nr. <i>currani</i> Toma & Guimaraes	1	2	3	
Exoristinae	Goniini	<i>Patelloa</i> sp. 1	2	2	4	
Exoristinae	Goniini	<i>Patelloa</i> sp. 2	0	1	1	
Exoristinae	Goniini	Unk. G. nr. <i>Aplomyodoria</i> sp. 1	1	0	1	
Exoristinae	Winthemiini	<i>Winthemia</i> sp. 2	0	1	1	
Tachininae	Graphogastrini	<i>Phytomyptera</i> sp. 1	1	0	1	
Tachininae	Minthoini	<i>Actinochaeta</i> sp. 1	0	1	1	
Tachininae	Minthoini	<i>Paradidyma</i> sp. 2	0	1	1	
Tachininae	Minthoini	<i>Paradidyma</i> sp. 3	2	2	4	
Tachininae	Nemoraeini	<i>Xanthophyto</i> n. sp. 1	1	0	1	revision of genus in progress by author
Tachininae	Nemoraeini	<i>Xanthophyto</i> n. sp. 2	1	0	1	revision of genus in progress by author

Tachininae	Polideini	<i>Chrysotachina</i> n. sp. <i>sensu</i> Perilla-López, unpub. Ph.D. thesis	1	1	2	
Tachininae	Polideini	<i>Ecuadorana</i> cf. <i>bicolor</i> Townsend	3	1	4	
Tachininae	Polideini	<i>Ecuadorana</i> nr. <i>bicolor</i> sp. 2 Townsend	1	0	1	
Tachininae	Polideini	<i>Ecuadorana</i> n. sp. 3	0	1	1	bluish sp.
Tachininae	Polideini	<i>Hystricia</i> n. sp. 2	1	1	2	
Tachininae	Tachinini ("Dejeaniini")	<i>Eudejeania</i> cf. <i>andeana</i> Sabrosky	1	0	1	probably this sp.
Tachininae	Tachinini ("Dejeaniini")	<i>Eudejeania</i> sp. nr. <i>melanax</i> (Walker)	0	1	1	possibly this sp.
Tachininae	Tachinini ("Dejeaniini")	<i>Eulasiopalpus</i> cf. <i>albipes</i> (Townsend)	0	1	1	
Tachininae	Tachinini ("Dejeaniini")	<i>Eulasiopalpus</i> sp. nr. <i>typicus</i> Curran	0	1	1	could be <i>E. typicus</i> – but seems grayer
Tachininae	Tachinini ("Dejeaniini")	<i>Jurinia</i> sp. 1	1	0	1	
Tachininae	Tachinini ("Dejeaniini")	<i>Oharamyia</i> n. sp. 1	0	1	1	
Tachininae	Tachinini ("Epalpini")	<i>Anepalpus</i> (?) sp. 1	0	1	1	
Tachininae	Tachinini ("Epalpini")	<i>Copecrypta</i> sp. 1	2	1	3	
Tachininae	Tachinini ("Epalpini")	<i>Cryptopalpus</i> sp. 1	0	1	1	" <i>Euquadratosoma</i> " grp.
Tachininae	Tachinini ("Epalpini")	Unk. genus 1 sp. 1	0	3	3	could be <i>Anepalpus</i> or <i>Lindigepalpus</i>
Tachininae	Tachinini ("Epalpini")	<i>Trichosaundersia</i> cf. <i>lineata</i> (sp. 2) Townsend	0	1	1	diff. than sp. 1. G. prob. = <i>Epalpus</i>
Tachininae	Tachinini ("Epalpini")	<i>Trichosaundersia</i> cf. <i>rufopilosa</i> Wulp	3	14	17	G. prob. = <i>Epalpus</i>
Tachininae	Tachinini ("Epalpini")	<i>Epalpus/Parepalpus</i> sp. 1	0	1	1	
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> sp. 3	0	1	1	
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> sp. 3A	1	0	1	possibly m. of sp. 3 but differs in several traits.
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> sp. 4	3	3	6	variable, could be > 1 sp.
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> sp. 4A	0	2	2	possibly = sp. 4
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> or nr. sp. 5	1	0	1	
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> sp. 6	0	1	1	
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> sp. 6A	0	2	2	distinct from sp. 6, possible 2 spp.

Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> sp. 7	6	7	13	possibly >1 sp.
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> sp. 8	1	3	4	
Tachininae	Tachinini ("Epalpini")	<i>Epalpus/Parepalpus</i> sp. 9	1	0	1	
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> sp. 10	2	4	6	
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> sp. 11	1	0	1	
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> (?) sp. 12	0	1	1	
Tachininae	Tachinini ("Epalpini")	<i>Epalpus</i> (?) sp. 13	0	1	1	
Tachininae	Tachinini ("Epalpini")	<i>Eucorpulentosoma</i> (?) sp. 1	0	1	1	
Tachininae	Tachinini ("Epalpini")	G. nr. <i>Lindigepalpus</i> (?) sp. 1	1	0	1	keys to <i>Lindigepalpus</i> in Wood & Zumbado
Tachininae	Tachinini ("Epalpini")	<i>Lindigepalpus</i> (?) sp. 1	1	1	2	m. seems like <i>Lindig.</i> f. similar to <i>Epalpellus</i>
Tachininae	Tachinini ("Epalpini")	<i>Lindigepalpus</i> sp. 2	4	2	6	
Tachininae	Tachinini ("Epalpini")	<i>Parepalpus</i> sp. 2	4	2	6	" <i>Oxapampoepalpus</i> " grp., could be <i>P. auroanalis</i> ?
Tachininae	Tachinini ("Epalpini")	<i>Quadratosoma/ Homosaundersia</i> (?) sp. 1	1	0	1	
Tachininae	Tachinini ("Epalpini")	<i>Quadratosoma/ Camposiana</i> sp. 2	1	0	1	
Tachininae	Tachinini ("Epalpini")	<i>Rhachoepalpus andinus</i> Townsend	1	0	1	
Tachininae	Tachinini ("Epalpini")	<i>Rhachoepalpus</i> cf. <i>nova</i> Curran	0	1	1	
Tachininae	Tachinini ("Epalpini")	<i>Rhachoepalpus</i> sp. nr. <i>blandus</i> Curran	2	0	2	
Tachininae	Tachinini ("Epalpini")	<i>Trichophora</i> cf. <i>tegulata</i> (Townsend)	1	0	1	
Tachininae	Tachinini ("Epalpini")	<i>Trichophora</i> sp. 2	1	0	1	
Tachininae	Tachinini ("Epalpini")	<i>Trichophora</i> sp. 3	1	0	1	
Tachininae	Tachinini ("Epalpini")	<i>Xanthoepalpus</i> sp. 1	0	1	1	
Tachininae	Tachinini ("Epalpini")	<i>Xanthoepalpus</i> (or <i>Xanthoepalpodes</i>) sp. 2	0	3	3	probably = <i>Xanthoepalpodes</i> , but genus prob. a syn. of <i>Xanthoepalpus</i>

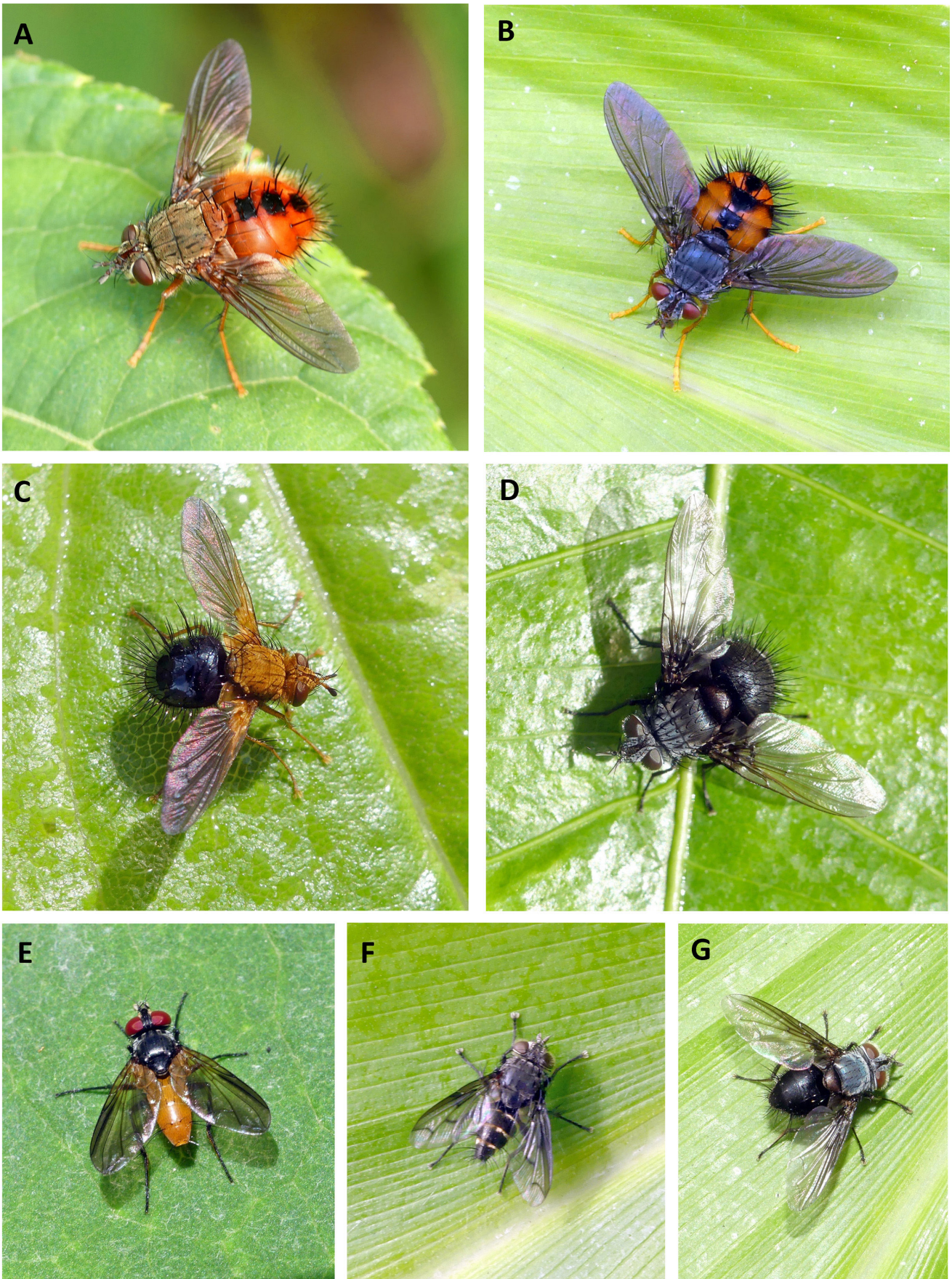


Figure 7. Examples of tachinids observed at San Isidro on foliage sprayed with a sugar solution. **A.** *Trichosaundersia* (?) sp. (Tachinini), **B.** *Epalpus* or possibly *Eulasiopalpus* sp. (Tachinini), **C.** *Epalpus* sp. (Tachinini), **D.** *Leschenaultia* sp. (Goniini), **E.** *Erythromelana* sp. (Blondeliini), **F.** *Cyrtophloebe* (Voriini), **G.** *Carcelia/Calocarcelia* (?) sp.

The Andean foothills - La Brisa and Narupa

We made a few stops at slightly lower elevations in the Andean foothills (between 1500 and 2000 m) where I was able to spend an hour or two collecting. The weather was generally overcast, but it was warm and bright enough for some tachinid species to be out and about. The first was a brief stop at a private birding reserve called La Brisa (1865 m), well known for its hummingbird feeders. This was one of the few places I was able to collect tachinids from flowers due to a dense stand of planted *Verbena*, though only a few specimens were taken from these flowers. Most were simply collected from foliage. Later, we stopped by Narupa Reserve (1690 m) for a couple hours on our way to the lowlands. This ca. 2000-acre reserve was established by the nonprofit Jocotoco Foundation as a buffer area next to Sumaco National Park. Most of our time was spent hiking along a nice trail loop through the forest, but I was able to spend a little time collecting flies on a small hilltop near the road. It wasn't great collecting, but I was able to collect a number of species of Blondeliini and Voriini, as well as some probably undescribed *Cholomyia* species.



Figure 8. View from a small hilltop at Narupa Reserve in the lower Andean foothills.

La Brisa (27 June) 1865 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Exoristinae		<i>Italispidea</i> sp. 3	0	1	1	similar to <i>I.</i> sp. 2c
Exoristinae		<i>Lydinolydella</i> sp. 2	1	0	1	
Exoristinae		<i>Medina</i> sp. 1	0	1	1	
Exoristinae	Eryciini	<i>Carcelia</i> sp. 1	1	0	1	" <i>Calocarcelia</i> "?
Exoristinae	Eryciini	<i>Carcelia</i> sp. 2	2	0	2	

Exoristinae	Goniini	<i>Hyphantrophaga</i> sp. 2	2	0	2	
Tachininae	Tachinini ("Epalpini")	<i>Trichosaundersia</i> cf. <i>rufopilosa</i> Wulp	0	1	1	smaller than others, no presut. acrostichals
Narupa Reserve (28 June) 1690 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Dexiinae	Voriini	<i>Campylocheta</i> sp. 2	1	0	1	
Dexiinae	Voriini	<i>Trafoia</i> sp. 1	1	0	1	
Dexiinae	Voriini	G. nr. <i>Cyrtophleba</i> sp. 2	1	0	1	
Exoristinae	Blondeliini	<i>Actinodorina</i> sp. 1	0	1	1	
Exoristinae	Blondeliini	G. nr. <i>Lixophaga</i> (or <i>Anisia</i> ?) sp. 1	0	1	1	rotund abdomen
Exoristinae	Blondeliini	Unk. G. nr. <i>Anisia</i> ? <i>Chaetona</i> ? sp. 1	0	1	1	parafacial diff. than <i>Anisia</i> , rotund ab.
Exoristinae	Blondeliini	<i>Calolydella</i> sp. 3	1	0	1	possibly = <i>C.</i> sp. 2 but shape/color diffs.
Exoristinae	Blondeliini	<i>Chaetodoria</i> ? <i>conica</i> Townsend	0	1	1	
Exoristinae	Blondeliini	<i>Eucelatoria dimmocki</i> grp. sp. 2	0	1	1	
Exoristinae	Blondeliini	G. nr. <i>Lixophaga</i> sp. 1	0	1	1	similar to <i>Erythromelana</i> but many traits diff.
Exoristinae	Blondeliini	<i>Italispidea</i> sp. 1	3	5	8	could be >1 sp.
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 10	0	1	1	
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 12	0	1	1	
Tachininae	Graphogastrini	<i>Phytomyptera</i> sp. 2	0	1	1	
Tachininae	Tachinini ("Dejeaniini")	<i>Oharamyia</i> cf. <i>vierecki</i> (Curran)	0	1	1	
Unplaced	Myiophasiini	<i>Cholomyia</i> n. sp. 1	0	1	1	
Unplaced	Myiophasiini	<i>Cholomyia</i> n. sp. 2	0	1	1	or G. nr., unlike other <i>Cholomyia</i> spp.

Lowland Tropical Forest

El Oriente – Amazon Basin

We eventually made it down to the Amazon Basin proper and took some long, motorized canoes (Fig. 9) to visit an indigenous Quechuan village and a wildlife rehabilitation center (AmaZoonico). I generally did not have opportunities to collect flies during this fascinating excursion to the lowlands, but I was able to opportunistically grab a few specimens while we were being served a local meal near the edge of the Napo river. In addition, on our way back to the uplands we stopped at an impressive and beautiful waterfall on the Río Hollín (see Fig. 1), where I managed to collect a couple females of *Lixophaga* (probably).



Figure 9. Our transportation mode on the Napo river in the Amazon Basin (near Ahuano).

Río Napo – nr. Ahuano (28 June) 403 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Dexiinae	Dexiini	<i>Billaea</i> sp.	1	0	1	or G. nr., small body
Exoristinae	Blondeliini	<i>Lixophaga/ Chaetostigma</i> ? sp. 1	0	1	1	Genus? divergent lat. scut. setae like <i>Anoxynops</i>
Unplaced	Myiophasiini	<i>Cholomyia</i> cf. <i>inaequipes</i> Bigot	1	0	1	
Cascada del Río Hollín (28 June) 1036 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Exoristinae	Blondeliini	<i>Lixophaga?</i> sp. 6	0	2	2	" <i>Plaxactia</i> " grp.?

La Costa - West Andean foothills and Coastal lowlands

Near the end of my travels in Ecuador, I parted ways with the course. The students and professors went on to some cultural activities in Otavalo and Quito and I headed westward with Diego Inclán, who graciously offered to take me along to visit a couple lower sites on the west side of the Andes. The first place we visited was a cattle ranch, Betania farm, in the lower Andean foothills near the small town of Nanegalito (about 1400 m; Fig. 10). The owner of the farm was interested in preserving some of the forested parts of his land for biodiversity, and Diego, as director of Ecuador's biodiversity institute, was advising him. I should note that our hosts at Betania farm were extremely generous feeding us and putting us up for the night. The forested areas of Betania farm were located on very steep and difficult to access slopes. However, we were able to do a little collecting one morning along a dirt road running through the property. Nearly everything we collected belonged to the Exoristinae, including several *Vibrissina* species, an interesting Masiphyini species, and a large black *Patelloa*-like species similar in its robust size and bristly hedgehog fly habitus to the species that I collected at high elevation near Volcán Antisana (Figs. 13C,D).

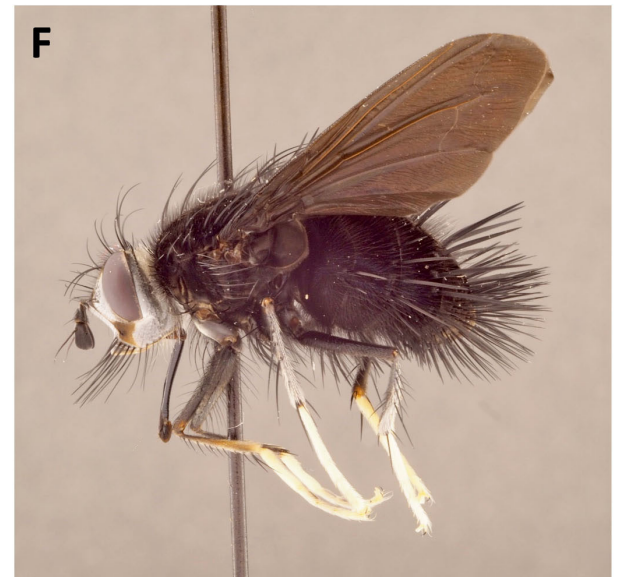


Figure 13. Some of the interesting tachinids that I collected in Ecuador. **A.** *Microphthalma* nr. *cuzcana* Townsend (♀, Antisana; Megaprosopini). **B.** *Trafoia* sp. 2 (♂, Guango; Voriini). **C.** *Patelloa* sp. or g.nr. (♀, Antisana; Goniini). **D.** *Patelloa* sp. or g.nr. #2 (♀, Betania farm; Goniini). **E.** *Trichophora* cf. *tegulata* (Townsend) (♂ San Isidro; Tachinini). **F.** Epalpinini, unk. **G.** (*Anepalpus?* *Vibrissoepalpus?*) (♀, San Isidro; Tachinini). Images are not to scale.

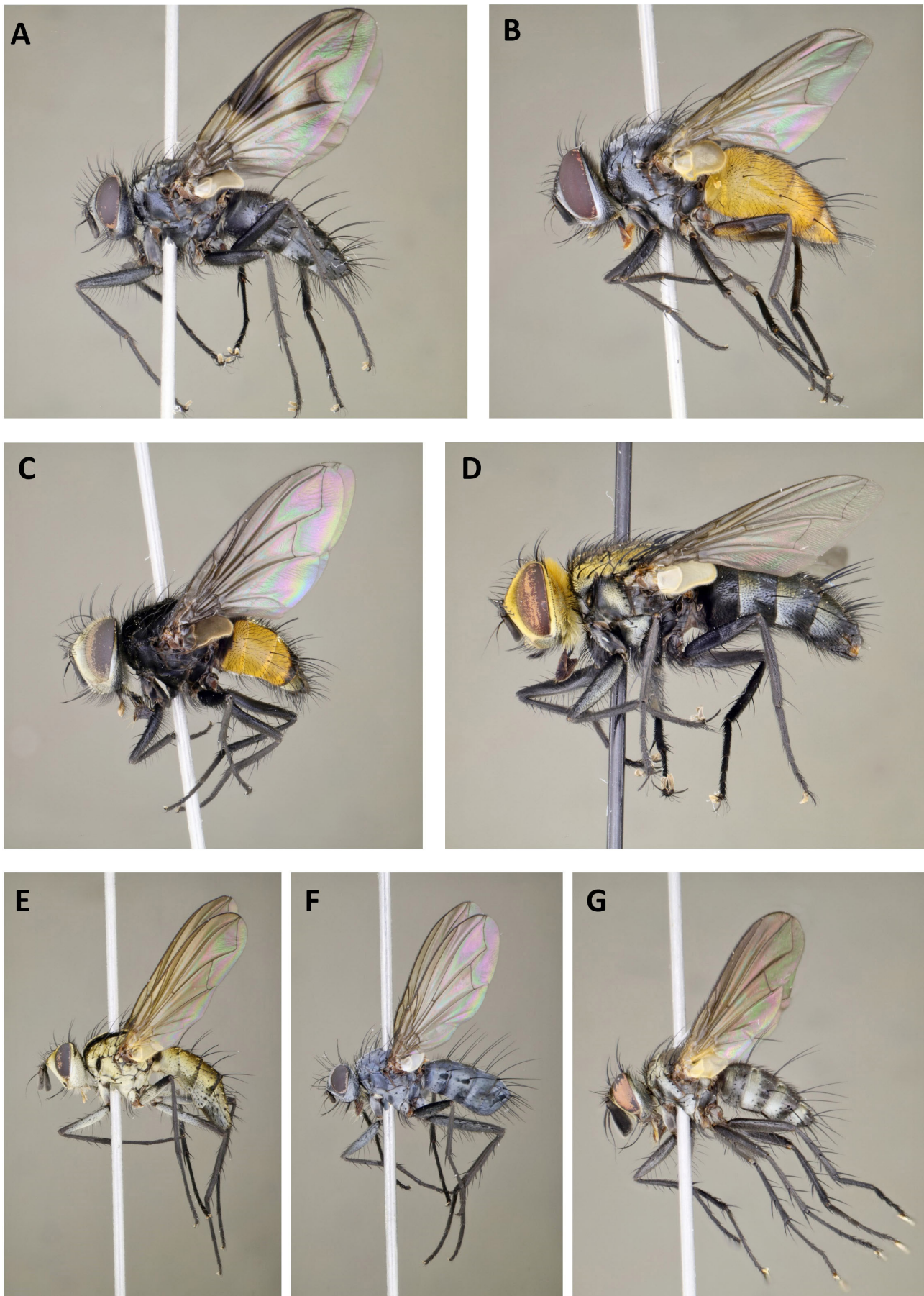


Figure 14. Interesting tachinids that I collected in Ecuador, continued. **A.** G. nr. *Lydinolydella* sp. (♂, Guango; Blondeliini). **B.** *Hypoproxynops* sp. (♂, San Isidro; Blondeliini). **C.** *Myiopharus* sp. (♂, San Isidro; Blondeliini). **D.** *Triodontopyga* sp. nr. *flavolimbiata* (Bigot) (♂, Chontaloma; Winthemiini). **E.** *Calolydella* sp. (♀, San Isidro; Blondeliini). **F.** *Leptomacquartia*? sp. (♀, Guango; Blondeliini – this species strongly resembles a rhinophorid). **G.** *Italispidea* sp. (♂, San Isidro). Images are not to scale.

After leaving Betania farm, we drove down to western lowland tropical forest in the vicinity of the town of Mashpi. Apparently, there is a very high-end hotel/resort in Mashpi that the rich and famous frequent. Being neither of those things, we stayed instead at a small farm/forest reserve called Chontaloma (Fig. 11; a much preferable place to stay in my opinion). Reserva Chontaloma is run by a delightful couple, Arturo and Paola, who provided us a cabin to stay in and all of our meals – which were largely derived from products of their small organic farm and neighboring eco-agricultural farms – for a very reasonable price. Diego and I were able to spend a morning collecting along a trail in the reserve. We were able to collect females of four species of *Calodexia* (parasitoids of cockroaches and followers of army ant swarms; Curran 1934, Rettenmeyer 1961), all in the same area. Our collection was again dominated by Exoristinae, with a good representation of Goniini. It is my impression that Goniini and Eryciini (as well as Winthemini; Fig. 14D) constitute a greater proportion of the bristle fly fauna at lower elevations in the Neotropics, although Blondeliini appear to be abundant and diverse at all elevations.

Nanegalito, Betania farm (4 July) 1380 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Dexiinae	Voriini	<i>Arrhinactia</i> sp. 1	1	0	1	
Dexiinae	Voriini	<i>Voria</i> cf. <i>erasmocoronadoi</i> Fleming & Wood	1	0	1	
Exoristinae	Blondeliini	G. nr. <i>Eucelatoria</i> ? sp. 1	1	0	1	does not seem like <i>Eucelatoria</i> but possibly?
Exoristinae	Blondeliini	G. nr. <i>Phyllophilopsis</i> sp. 1	1	0	1	prob. not <i>Phyllophilopsis</i> , unclear what it is
Exoristinae	Blondeliini	<i>Leptostylum</i> sp. 1	0	2	2	
Exoristinae	Blondeliini	<i>Lixophaga</i> (?) sp. 7	1	0	1	Possibly <i>Eucelatoria</i>
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 11	1	0	1	
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 14	0	1	1	
Exoristinae	Blondeliini	<i>Thelyoxynops</i> (or G. nr.) sp. 1	1	0	1	
Exoristinae	Blondeliini	<i>Vibrissina</i> sp. 1	5	1	6	
Exoristinae	Blondeliini	<i>Vibrissina</i> sp. 2	0	1	1	
Exoristinae	Blondeliini	<i>Vibrissina</i> sp. 3	0	1	1	
Exoristinae	Blondeliini	<i>Vibrissina</i> sp. 3a	0	2	2	could be = sp. 3, but I think distinct
Exoristinae	Eryciini	<i>Carcelia</i> sp. 4	0	2	2	
Exoristinae	Eryciini	<i>Casahuiria</i> sp. 1	0	2	2	
Exoristinae	Eryciini	<i>Drino</i> sp. 1	0	2	2	
Exoristinae	Eryciini	<i>Drino</i> sp. 2	1	0	1	
Exoristinae	Goniini	G. nr. <i>Patelloa</i> #2 sp. 1	0	1	1	
Exoristinae	Goniini	<i>Leschenaultia</i> sp. 3	0	1	1	
Exoristinae	Goniini	Unk. G. nr. <i>Pseudochaeta</i> ? sp. 1	0	2	2	

Exoristinae	Masiphyini	<i>Masiphya/ Mystacomyoidea</i> sp. 1	0	1	1	roughly keys to <i>Phasiopsis</i> (<i>Masiphya</i>) but female unknown. Female terminalia match <i>Mystacomyoidea</i> .
Exoristinae	Winthemiini	<i>Winthemia</i> sp. 4	1	0	1	
Tachininae	Polideini	<i>Chrysotachina</i> sp. 2	0	1	1	



Figure 10. Diego Inclán at Betania farm with steep forested slopes in the background.



Figure 11. Eco-agroforestry reserve Chontaloma main building, where we took our meals.

Reserva Chontaloma (5 July) 560 m						
Subfamily	Tribe	Species	M	F	Tot	Notes
Dexiinae	Dufouriini	<i>Cenosoma</i> n. sp.	1	0	1	
Dexiinae	Voriini	<i>Arrhinactia</i> sp. 2	1	0	1	
Exoristinae	Blondeliini	G. nr. <i>Chaetostigmoptera</i> sp. 1	0	1	1	
Exoristinae	Blondeliini	<i>Calodexia</i> cf. <i>fumosa</i> (Townsend)	0	5	5	
Exoristinae	Blondeliini	<i>Calodexia</i> sp. nr. <i>bella</i> Curran	0	1	1	
Exoristinae	Blondeliini	<i>Calodexia</i> sp. nr. <i>caudata</i> Curran	0	1	1	
Exoristinae	Blondeliini	<i>Calodexia</i> sp. nr. <i>similis</i> (Townsend)	0	1	1	

Exoristinae	Blondeliini	<i>Eucelatoria nana</i> grp. sp. 4	0	1	1	
Exoristinae	Blondeliini	G. nr. <i>Polygaster</i> sp. 1	0	1	1	
Exoristinae	Blondeliini	<i>Leptostylum</i> sp. 1	0	1	1	
Exoristinae	Blondeliini	<i>Lixophaga</i> G. nr. <i>Anoxynops</i> sp. 2	0	1	1	might not be <i>Lixophaga</i> - has <i>Anoxynops</i> -like scut. setae (see <i>Anoxynops</i> G. nr.)
Exoristinae	Blondeliini	<i>Lixophaga</i> sp. 1	2	2	4	male ab. pollinosity totally diff. could be diff. spp.
Exoristinae	Blondeliini	<i>Myiopharus</i> sp. 6	0	1	1	
Exoristinae	Blondeliini	<i>Sphaerina</i> (G. nr. 2) sp. 3	0	1	1	
Exoristinae	Blondeliini	<i>Thelyoxynops</i> sp. 1	0	3	3	
Exoristinae	Eryciini	<i>Carcelia</i> sp. 5	0	1	1	
Exoristinae	Eryciini	<i>Drino</i> sp. 1	0	1	1	
Exoristinae	Exoristini	<i>Austrophorocera</i> sp. 1	1	0	1	
Exoristinae	Goniini	<i>Chrysoexorista</i> sp. 1	0	1	1	
Exoristinae	Goniini	<i>Houghia</i> sp. 1	0	1	1	
Exoristinae	Goniini	<i>Houghia</i> sp. 2	0	1	1	could = sp. 1, but color diffs.
Exoristinae	Goniini	<i>Houghia</i> sp. 3	0	1	1	
Exoristinae	Goniini	<i>Hyphantrophaga</i> sp. 1	0	1	1	
Exoristinae	Goniini	<i>Leschenaultia</i> sp. 3	0	1	1	
Exoristinae	Winthemiini	<i>Triodontopyga</i> sp. nr. <i>flavolimbata</i> (Bigot)	7	1	8	
Exoristinae	Winthemiini	<i>Winthemia</i> sp. 3	0	1	1	



Figure 12. A Schmidt box containing most of the tachinid specimens collected during my trip (along with a few other odds and ends).

Discussion

Over all locations and collecting events, 479 tachinid specimens were collected (218 males and 261 females; Fig. 12). Again, all of these were collected by hand, and the majority came from one site, San Isidro. The total number of estimated species ranges from a “liberal” 244 (including all morphospecies suspected of being distinct) to a more conservative 236 (lumping similar recognizable “forms” together). Of course, the true number of species may be greater if there are many morphologically cryptic species, or lower if there is a lot of morphological variation within genetically cohesive species. I should note that based on current catalog information, only 99 named species are documented to occur in mainland Ecuador (O’Hara & Henderson 2022) (even though Stireman et al. 2017 reared 279 morphospecies from Lepidoptera). Almost two-thirds of species (61.9%) were represented by only a single specimen, and few species (8%) were represented by five or more specimens (Fig. 15). Such a distribution of species abundances indicates that I likely only collected but a fraction of the species occurring in the areas surveyed, even at the locations where I was able to collect many specimens. For example, rarefaction analysis of the San Isidro collections, where most specimens were collected (N=294), indicates a high, non-asymptotic slope of species richness against individuals collected, and extrapolation suggests that had I collected 500 specimens in total, I could expect to encounter an additional 45 species or so (Fig. 16).

As mentioned previously with respect to particular sites, the tachinid faunal composition was dominated by Exoristinae, which represented about two thirds of specimens and species (Fig. 17). However, it should be kept in mind that my collections are not a random sample of tachinids present in the sites and habitats visited and are likely biased in a number of ways. My collecting was focused on diurnal species that frequent forest edges at low heights. The fauna could be quite different up in the forest canopy. Furthermore, I often used a sugar solution sprayed on leaves to attract or at least “arrest” flies, and my collections are thus probably biased towards species that are attracted to or utilize honeydew on leaves, rather than obligate flower visitors. It was also probably biased against smaller, less noticeable taxa, and I was somewhat partial to collecting Tachinini where they were present. With these caveats in mind, I examine some of the observed patterns of taxon diversity and abundance.

Blondeliini dominated the tachinid fauna, accounting for nearly half of all specimens and species (Fig. 17). They were especially rich in the tropical montane forest and cloud forests at middle elevations where most of my collecting took place. At lower elevations, other exoristine clades such as Goniini and Eryciini were somewhat better represented, but Blondeliini was the richest tribe at every site in which I collected more than a handful of specimens. This tribe also posed the greatest difficulties with identification. There were many species that I could not place to genus, and many of my genus-level identifications are tentative. There appears to be a vast and largely unknown and undescribed fauna of this tribe in the Andes. The late Monty Wood made major advances in understanding this group in his revision of the North and Central American fauna (Wood 1985; also see Wood & Zumbado 2010), but there are many additional genera in South America that were not covered in this revision. I remember Monty telling me that many blondeliine genera that appear to be distinct at temperate latitudes are linked by intermediate forms in the tropics, blurring the boundaries between them. It is clear to me that an enormous and recent radiation of this tribe has occurred in South America, especially in the Andes. This radiation may be ongoing as evidenced by the many highly similar taxa and substantial variation within “species” that I observed. I collected many species of genera such as *Lixophaga*, *Myiopharus*, *Italisipidea*, *Calolydella*, and *Erythromelana* even within single sites (Figs. 7E, 14C,E,G). These genera are undoubtedly actively diversifying and each is probably represented by dozens if not hundreds of species in the Andes.

Tachininae were the second most abundant and diverse subfamily, largely due to the tribe Tachinini (Fig. 17). As indicated, these “hedgehog” flies were likely over-represented in my collections due to my interest in the group – but they are clearly fantastically diverse in the Andes. As with the Blondeliini, it is apparent that this tribe (particularly the “Epalpini” and “Dejeaniini” clades) has recently and explosively diversified in the Tropical Andean region and other higher elevations of the Neotropics, resulting in innumerable forms that have been split into dozens of genera. Only a handful of lineages from this great morass of Andean taxa have dispersed up through Central America and colonized temperate latitudes.

What is missing?

There were some notable deficiencies of certain taxa in my collections. Foremost is the complete lack of members of the subfamily Phasiinae. Of the 99 species currently cataloged as occurring in Ecuador, none are phasiines (O’Hara, pers. comm.). Although this should be taken as more an indication of our lack of knowledge than a true absence, I have collected relatively few phasiines in previous trips to Ecuador (with the notable exception of the odd genus *Neobrachelia*). Thus, the subfamily does appear to be poorly represented, at least in the Andean fauna. There are certainly plenty of heteropteran hosts available. Perhaps the phasiines tend to remain in the canopy? Dexiinae are another subfamily with relatively poor representation. I collected decent numbers and diversity of Voriini *sensu lato* (Fig. 17), although not as great a diversity as I expected based on previous experience (e.g., relatively few “Uramyini” and *Trafoia* spp.; Fig. 13B). But, what was really remarkable was the lack of Dexiini – this diverse tribe was represented by only a single specimen of *Billaea*, which was collected in the Amazon Basin lowlands. I do not believe that this reflects a true dearth of this tribe in the Andes. Rather, it was likely due to bias in my collecting methods. Dexiini may be more likely to be crepuscular, whereas most of my collecting was mid-morning or afternoon. Also, at least some taxa rest on tree trunks, whereas most of my collecting was focused on foliage. It is my guess that Dexiini are likely diverse in the lowlands and have reasonable diversity in the mid-elevation Andes, but this deserves further exploration.

I noted previously that the diverse and widespread genus *Winthemia* was uncommon in my collections, and this is also true of the somewhat similar tribe Exoristini. Only five species of Winthemiini and one of Exoristini were collected during my trip. I suspect that both of these tribes are much more diverse at lower elevations and their poor representation in my collections reflects the relative lack of collecting efforts in these areas. Another glaring deficiency is the Tachininae tribe Siphonini. I collected only a single species of *Siphona*. I believe that there are two reasons for this. First, I was not able to collect from flowers, and siphonines (as well as phasiines, see above) are major flower visitors. My previous experience net-sweeping from composite flowers at mid-elevations in the Andes suggests that the region harbors a quite rich fauna of siphonines, with dozens of undescribed species. The second reason is that they are small and are more likely to escape notice. This may also explain the relatively low number of species of other small bodied genera such as *Phytomyptera*, which are probably also highly diverse in the habitats visited.

A better understanding of the diversity and composition of the bristle fly fauna of Ecuador requires much more collecting in a wide variety of habitats and locations, as well as careful examination of specimens already present in collections. There is no question that Ecuador possesses a huge tachinid fauna and that most of it is undescribed. This limited, opportunistic survey and report, despite its biases and uncertainties, represents a small step towards illuminating this remarkable diversity.

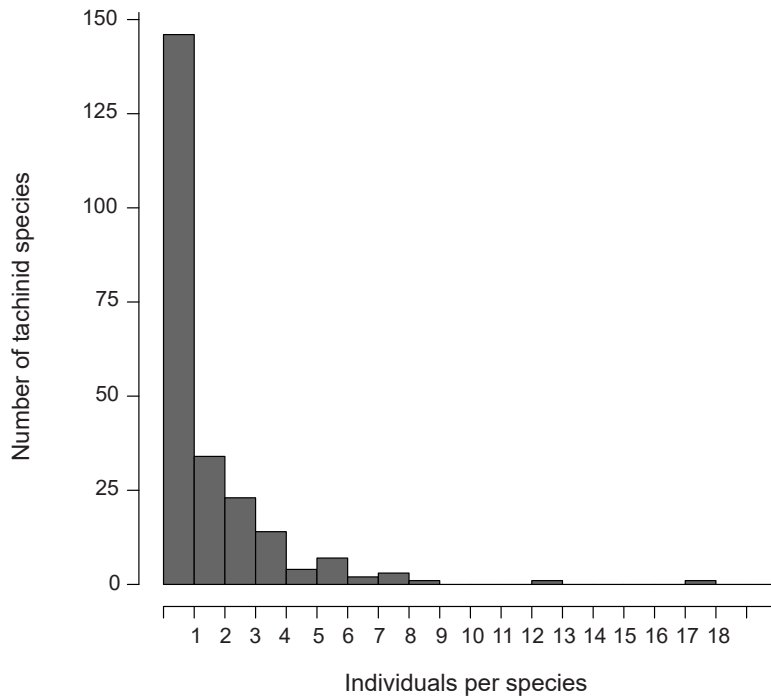


Figure 15. A species abundance distribution for all specimens that I collected in Ecuador. Note the large number of singletons.

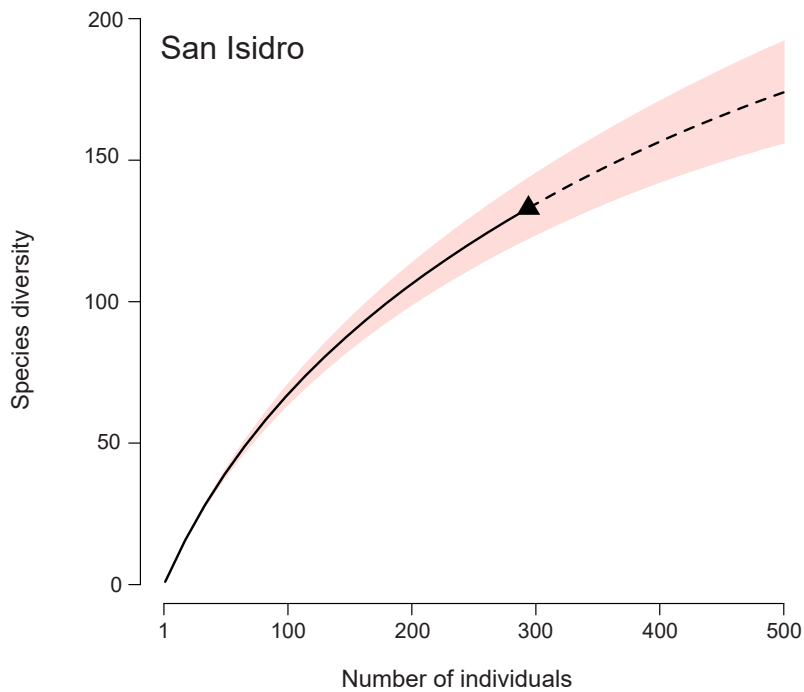


Figure 16. A species rarefaction curve for San Isidro, with extrapolated richness at 500 specimens. The black triangle marks the observed number of specimens and species. The colored area indicates 95% confidence limits.

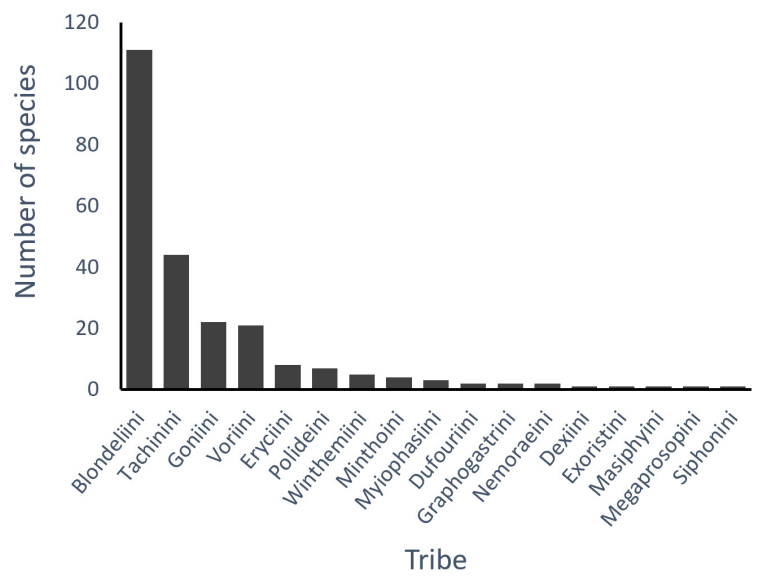
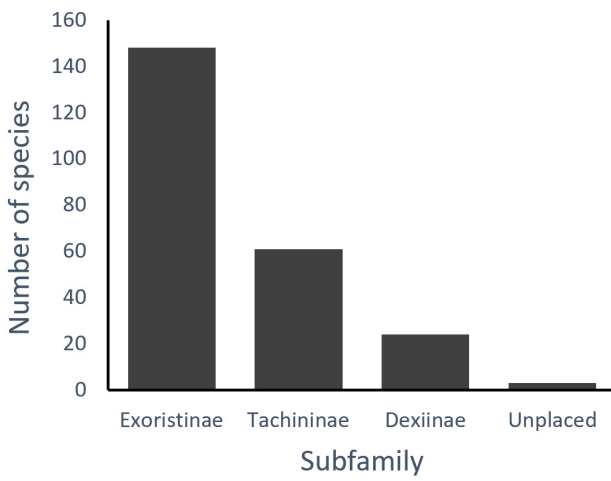
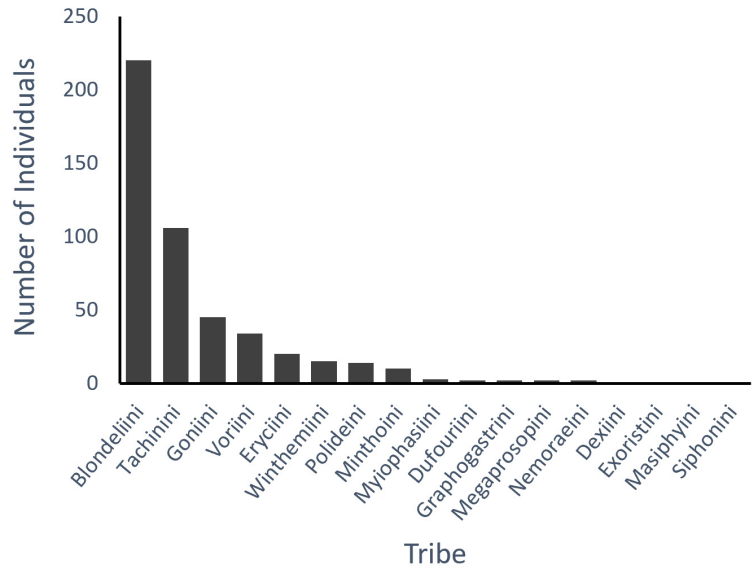
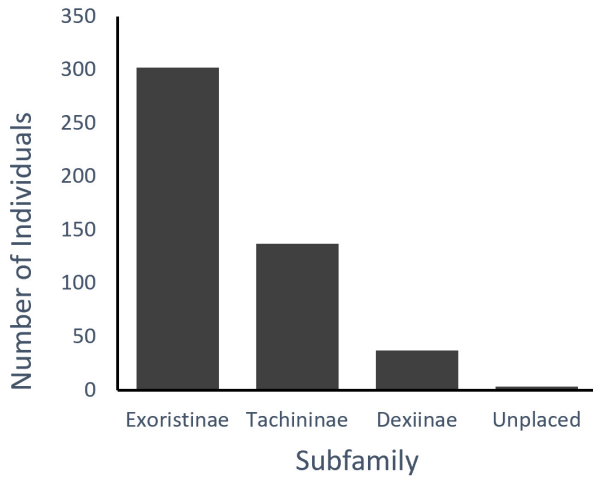



Figure 17. Abundance (top) and species richness (bottom) of tachinids collected in Ecuador according to subfamily (left) and tribe (right). Myiophasiini are considered to be unplaced as to subfamily.

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Bug-killing flies (Tachinidae: Phasiinae) in biological control: overcoming taxonomic problems as a starting point

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Tachinids are known for their parasitoid habit. Various attempts have been made to employ these flies for biological control, with approximately 100 tachinid species being used worldwide. The success rate varies among these attempts; however, in the few successful cases, excellent results were observed (Grenier 1988).

There are many possible reasons for these failures, mostly related to the lack of knowledge of the taxonomy, biology, and ecology of the tachinids, as well as logistical problems related to their breeding, transport and release. The taxonomic impediment and incorrect identification of the involved species and strains are well known barriers for effective biological control (Grenier 1988, Van Driesche 2004, Stireman et al. 2006). When one considers Neotropical tachinids and their long history of taxonomic problems, it is possible to observe a possible correlation between the lack of taxonomic knowledge and the limitations for biological control studies in the region (Guimarães 1977, O' Hara 2013).

Furthermore, many species of true bugs (Heteroptera) are important pests in many cultures. These pest species are difficult to control, and recently, some populations have been growing rapidly in different countries (Sosa-Gómez et al. 2019). Among tachinids, bug-killing flies (Phasiinae) are well known heteropteran parasitoids. Despite being the smallest Tachinidae subfamily, with approximately 650 species, their diversity in terminalia morphology, both male and female, is probably the most notable. This is probably related to their habit of using heteropterans as hosts, which are strongly sclerotized insects, instead of the more common soft-bodied larvae (Blaschke et al. 2018, Dios & Nihei in prep).

Numerous Neotropical phasiines have potential to be employed in biological control, with many species being observed in faunistic surveys or when breeding heteropteran pests (Agostinetto et al. 2018, Zerbino & Panizzi 2019, Aquino et al. 2020, Lucini et al. 2020). However, many species present problematic taxonomy and/or are undescribed species. Previous studies have shown that some failures in the introduction of phasiines for biological control were greatly or at least partially affected by wrongly identified species (Dios & Nihei 2017, Dios & Nihei 2020, Dios, Ziegler & Zeegers 2021). At the same time, knowing the local fauna for biological control is key for potential future applications, as using local biological control agents reduces the probability of any environmental impact and increases the chance of success (Van Driesche 2004, Lamichhane et al. 2015, Barratt et al. 2018).

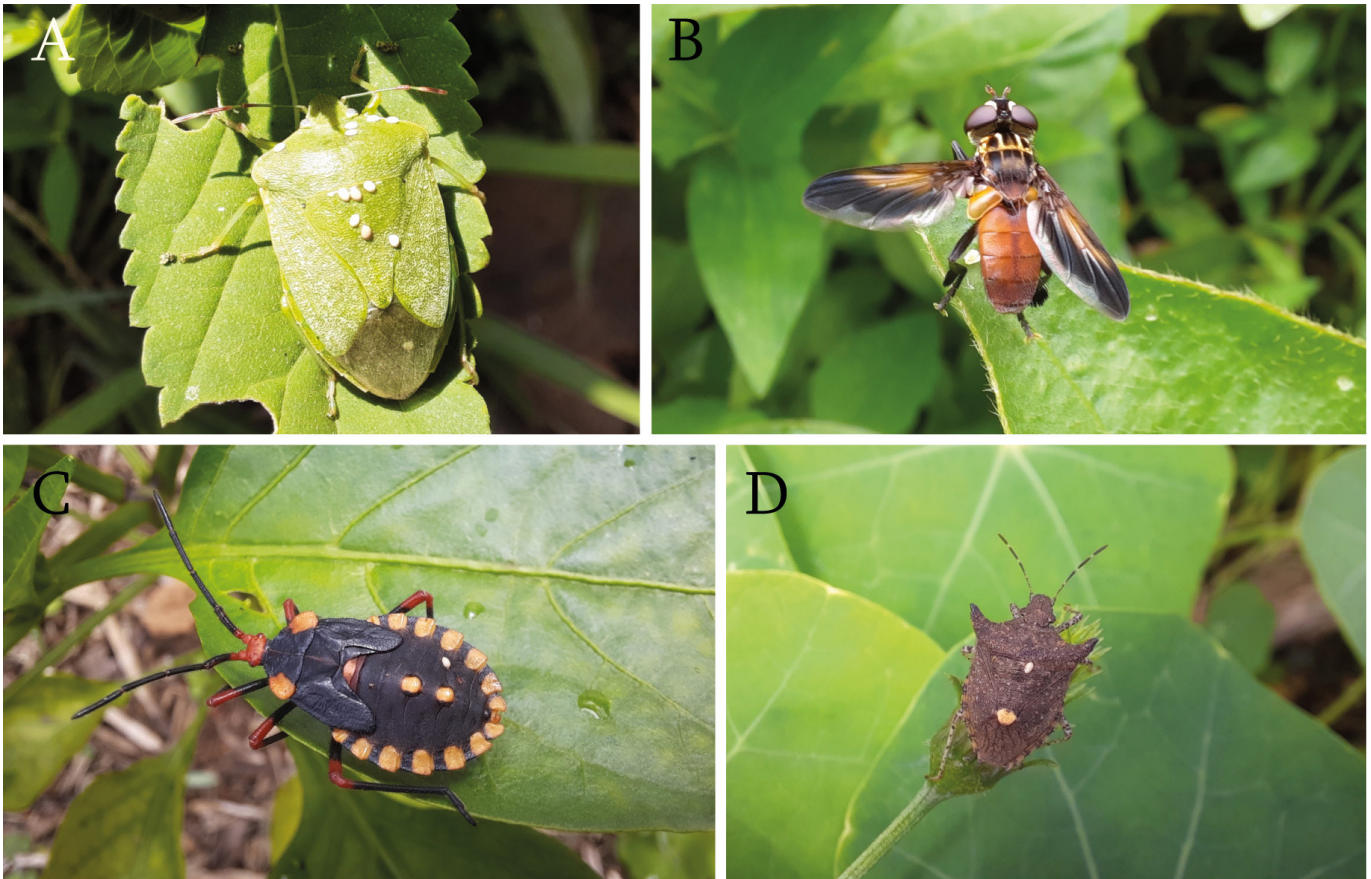


Figure 1. **A.** *Nezara viridula* (L.), the southern green stink bug (Pentatomidae), with *Trichopoda pictipennis* Bigot eggs. **B.** A male *T. pictipennis*. **C.** *Spartocera* sp. (Coreidae) last nymphal instar with an unidentified Gymnosomatini egg. **D.** *Euschistus* sp. (Pentatomidae) with an unidentified Gymnosomatini egg. All photographs taken in São Paulo, SP, Brazil.

Therefore, taxonomic knowledge and host relationships of Neotropical Phasiinae need to be comprehensively expanded. Aiming at this, I recently started a postdoc project approved by “Fundação de Amparo à Pesquisa do Estado de São Paulo” (FAPESP grant 2022/14482-6) which focuses on phasiine integrative taxonomy, combining important museum collections and fresh material reared from pests in different crops, with the intent to help future biological control studies and programs. The project is being developed as a collaboration between “Museu de Zoologia da Universidade de São Paulo” (MZSP) in São Paulo and “Escola Superior de Agricultura Luiz de Queiroz” (ESALQ) in Piracicaba. It is indispensable to integrate museum collections and their fundamental historical knowledge, highlighting their value for applied taxonomy and biodiversity research, while combining it with data obtained in the field.

I intend to complete taxonomic revisions of different Phasiinae groups, mainly those that parasitize heteropterans that feed on any kind of agricultural crop. I will explore the morphology extensively, including eggs and larvae, where possible, as well as sequence DNA barcodes of available specimens. For this purpose, we will use both museum specimens as well as material obtained from rearing bugs from different crops (Fig 1). A key to the genera of New World Phasiinae is in progress, new species are being described, and some genera will be synonymized. These studies will include all observed data that could help in future biological control studies; e.g., new host records, egg morphology, larval development, male/female mating behavior, and female oviposition (Fig 2).

The project already has a wide range of collaborators from different Latin American countries. It will have contributions from different ESALQ researchers, including those in the “São Paulo Advanced Research Center for Biological Control” (SPARCBio) directed by Prof. Dr. José Roberto Postali Parra, as well as researchers from “Consejo Nacional de Investigaciones Científicas y Técnicas de la Argentina” (CONICET - FCNyM, UNLP) in Argentina.

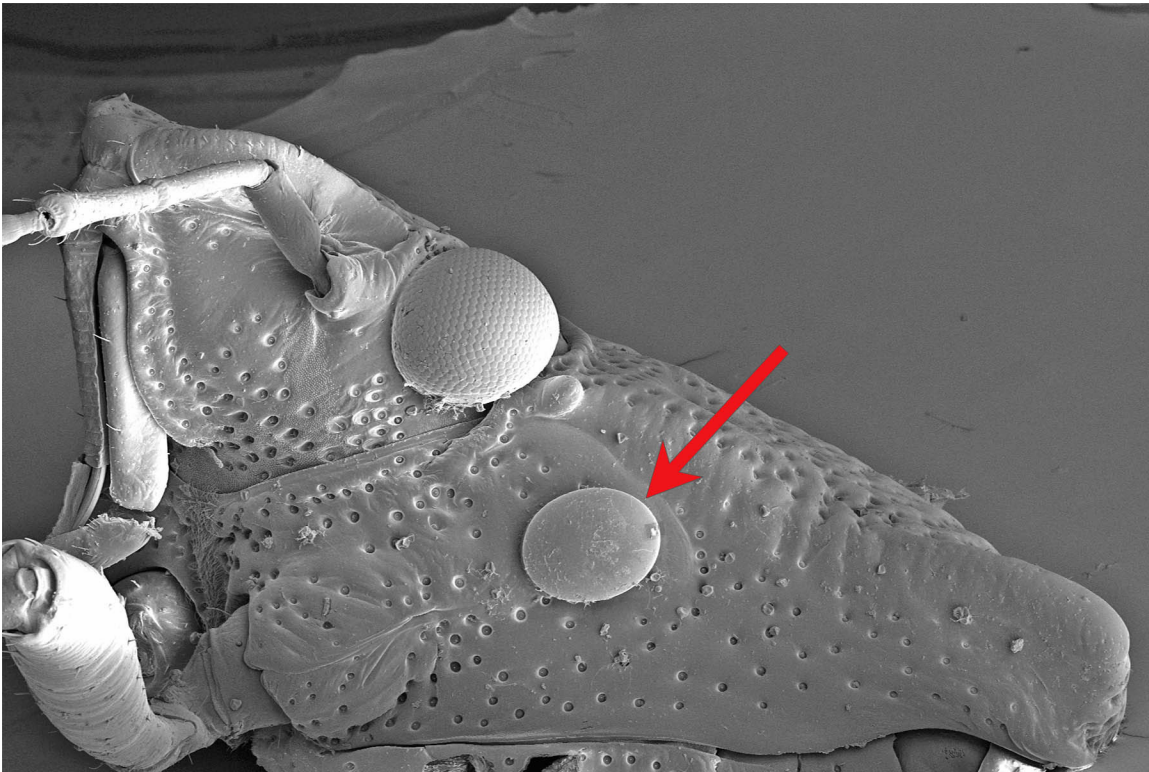


Figure 2. Scanning electron microscope image of a *Mormidea* sp. (Pentatomidae) head and prothorax with an attached *Gymnoclytia* sp. egg (red arrow).

To date, we already have some encouraging results: a probable undescribed species that has great potential for controlling one pest species, DNA barcode sequences for different phasiines, many new host records, and some data related to oviposition and larval development. I am also preparing manuscripts that deal with taxonomic synonyms, mainly in Gymnosomatini.

Concomitantly, I am studying other tachinid groups, especially when dealing with new host records and/or groups that parasitize other important insect pests. I have already received material reared from different pests all around Brazil, and I am preparing a few publications on this topic. This is easier now, as I am currently working in the MZSP, which has one of the largest and most important collections of Neotropical Tachinidae. Many tachinid experts have worked here, including José Henrique Guimarães, who was the collection curator for many years (Lamas et al. 2009). I have compiled all host data (mostly unpublished) from the collection, in addition to all tachinids with puparia, and already have more than 360 entries.

Hopefully, this project will be a starting point for new biological control studies with bug-killing flies, especially in Latin America. The correct species identification based on morphology and molecular data is crucial for future biological control programs. We expect our results will increase the chances of successful new alternatives for biological control with tachinid flies, while contributing to the taxonomy of the group as well.

If anyone has any material or data related to Phasiinae and their hosts, please feel free to contact me. Similarly, if anyone is interested in any tachinid data available at the MZSP collection, I am willing to help, as I think collaboration is key for modern science.

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“Sugaring” for Tachinidae in the HENRY MOUNTAINS of southern Utah, USA

Figure 1. Driving south on Lonesome Beaver Road towards the Henry Mountains in southern Utah.

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The Henry Mountains of southern Utah (Figs. 1, 2) are located near the centre of the Colorado Plateau, a physiographic feature of western North America that is bounded by the Rocky Mountains to the north and east, and by lesser mountains to the west and south. Geographically, the Colorado Plateau is in the Four Corners of the United States, an area so named because it is the only place in the country where the corners of four states meet: Colorado, New Mexico, Arizona and Utah. The Plateau encompasses about 335,000 km² and is drained primarily by the Colorado River and its tributaries, which flow from northeast to southwest before curving southward and emptying into the Gulf of California in Mexico.

The Colorado Plateau is home to the highest concentration of national parks and national monuments in the United States, including the “Mighty Five” parks (Zion, Bryce, Arches, Canyonlands and Capitol Reef), the Grand Canyon N.P., Mesa Verde N.P., Grand Staircase–Escalante N.M. and the recently expanded Bears Ears N.M. In addition to these specially protected areas are large tracts of land set aside as national forests and BLM land (public land administered by the Bureau of Land Management). Dozens of books and guides are available for visitors to the region covering everything from scenic drives to technical canyoneering and rock climbing.¹

There are important differences between the two main types of public land in the United States and these determine what recreational activities can be pursued within their boundaries. Generally speaking, national parks and

¹ One book that gives a particularly good overview of the Plateau’s parks and monuments and their attractions in terms of natural beauty, geology, and prehistoric human history is *Discovering the Colorado Plateau* (Haggerty 2021).

monuments are protected against removal of anything natural without a permit (be it geological, botanical or zoological, including insects), camping outside of campgrounds, and hunting and fishing. Natural forests and BLM land have fewer restrictions but there can be area-specific rules that limit certain activities, and hunting/fishing licenses are generally required.

The majority of visitors to the Colorado Plateau, especially those from other countries, are attracted to the area by the high density and splendor of the national parks and monuments. A minority of visitors, mostly North Americans



Figure 2. Map of the United States with state of Utah outlined in red. Insert shows a relief map of Utah with location of the Henry Mountains indicated and the “Mighty Five” national parks and nearby national monuments labelled.

who have seen the parks and have suitably equipped vehicles, seek out the quieter and lesser known public lands nearby that also offer remarkable recreational opportunities. The largest area in the latter category is a tract of BLM land bordered by Capitol Reef and Canyonlands/Arches national parks to its west and east, by the Glen Canyon National Recreation Area (along the Colorado and San Juan rivers) to the south, and by the Ashley National Forest to the north. This irregular egg-shaped area is about 200 km long and up to 150 km wide. Dominating the northern portion is the San Rafael Swell, described as follows by Utah tourism (see also Strom & Bailey 2022):

“Eons ago, tremendous geologic upheavals formed a giant dome of rock - a “swell” in the earth’s surface. The harsh elements beat against this dome and eroded it into a wild, broken array of multi-colored sandstone. Wind and water carved this jumble of rock into incredible formations as buttes, canyons, pinnacles and mesas emerged, making the Swell one of the most ruggedly beautiful pockets of terrain in the world.”

[Source: <https://www.utah.com/destinations/natural-areas/san-rafael-swell/>]

Cutting across the middle of this BLM land and the San Rafael Swell is the only major highway, Interstate 70, with this section being the longest stretch of interstate in the United States without towns or services (170 km). The “Swell” is home to the popular Goblin Valley State Park and the privately-owned (and off-limits) Mars Desert Research Station (MDRS).

Henry Mountains

The Henry Mountains are south of the San Rafael Swell and surrounded by a mix of desert, buttes, badlands, and canyons. There are indications nearby of ancient human habitation and more recent but largely discontinued mining (mostly for uranium, vanadium, gold, and other metals). To the north is the small town of Hanksville, the only source for gas and supplies in this portion of BLM land south of I-70.

The main range of the Henrys is roughly 40 km long by 15 km wide and the tallest peaks are Mount Ellen in the north (3511 m/ 11,520 ft) and Mount Pennell in the south (3478 m/ 11,410 ft). These mountains were formed not by the eruption of ancient volcanos (unlike the San Francisco Peaks to the south, O’Hara 2023a) but by igneous intrusions, called laccoliths, that pushed the rocks above them upwards during the Oligocene².

The Henry Mountains have the full range of vegetation “zones” that transition from the surrounding desert scrub to alpine on their highest peaks. The only thorough study of the flora of the Henrys was completed nearly a century ago as a thesis by Stanton (1931). Stanton found that the life zones proposed by C.H. Merriam several decades earlier (see O’Hara 2023a) did not work very well for the Henrys. He felt that the “confusion and zone jumbling” in the Henrys could be better classified on “climax plant forms”, with each climax termed a “formation” and each formation having an “association”. His results for the Henrys can be summarized as follows (Stanton 1931: 21–34, plant names updated):

Scrub Climax, Scrub Formation, 4300–6500 ft [1310–1980 m].

Ranges from desert to foothills.

Dominant plants are sagebrushes and saltbushes (*Artemisia* and *Atriplex*).

Woodland Climax, Pinyon-Juniper Formation, 6000–8000 ft [1830–2440 m].

Dominant trees are pinyon pine (*Pinus edulis*) and juniper (*Juniperus* spp.).

[This climax formation is where Stanton (1931) placed Gambel oak, *Quercus gambellii*, the tree species on which the tachinids discussed below were collected.]

Montane Forest Climax, *Pinus-Pseudotsuga* Formation, 7000–10,000 ft [2135–3050 m].

Dominant tree is Douglas fir. Less dominant are white fir, blue spruce and ponderosa pine.

Subalpine Forest Climax, *Picea-Abies* Formation, 8500–11,000 ft [2590–3350 m].

This formation is mostly confined to canyons on the east and north sides of the Henrys.

Dominant trees are Engelmann spruce and subalpine fir.

Subalpine Grassland Climax and Formation, 8500–11,000 ft [2590–3350 m].

Grasses, mostly in the genera *Festuca* and *Poa* as well as wheatgrass and spike trisetum.

² <https://geology.utah.gov/map-pub/survey-notes/geosights/the-henry-mountains/#:~:text=The%20Henry%20Mountains%2C%20however%2C%20are,Henry%20Mountains%20as%20%E2%80%9Claccoliths.%E2%80%9D>

I have passed through or visited the Colorado Plateau ten times since 2014 and have seen the Henry Mountains off in the distance during most of those trips. They looked rocky and barren and I had the impression they would not have much in the way of a tachinid fauna. I did not know anyone who had collecting insects there, let alone tachinids. That changed early last year when I came across a nice series of the tachinid *Ptilodexia conjuncta* (Wulp) in the Canadian National Collection of Insects (CNC) collected by Henry Howden and Jack Martin in 1968³. The flies were from a place called Lonesome Beaver Campground and had been identified by D.D. Wilder, who revised *Ptilodexia* for her Ph.D. thesis (Wilder 1979). A little searching on the Internet led me to an article by Howden (2008) in which he described the two weeks spent at the campground along with some of the unexpected incidents that happened there (most involving mice).

My realization that the Henry Mountains were deemed worthy of a visit by one of my mentors piqued my interest. I could, however, find no published mention of these mountains in the tachinid literature (not even in Wilder 1979) or in a Google search for “Tachinidae Henry Mountains”. The latter did turn up something of interest, a report by Woodbury (1958) on the biological resources of the Glen Canyon Reservoir area (roughly corresponding to the BLM land discussed here, including the Henry Mountains). The report has a list of Tachinidae known from the area based on the works of Rowe (1930, 1931). A meagre 14 species are listed, all collected some distance away from the Henrys in Blanding, Bryce Canyon, La Sal, Moab, Monticello and Verdure.

I got my chance to collect in the Henry Mountains after attending the 10th *International Congress of Dipterology* in Reno, Nevada, last July. After the meeting I spent a day with colleagues in the Lake Tahoe area (see cover of this newsletter issue) and then headed homeward via the Arizona Strip (the small portion of Arizona north of the Grand Canyon) and southern Utah. I was travelling in my own vehicle on a joint work/holiday trip and planned to spend some of my time exploring the area and part in the Henry Mountains looking for tachinids.

The San Rafael Swell can be excessively hot in mid-summer (average daily high of 35°C) and my arrival on July 28th coincided with a hot spell. That first day was uncomfortably hot by mid morning and I decided to escape the heat and drive into the Henry Mountains to begin my search for tachinids. I stopped at the small town of Hanksville for gas and information⁴ before heading south towards the Henrys on Lonesome Beaver Road (Figs. 1, 3, 4).

The elevation at Hanksville is about 1300 m and the road gradually climbs to 1900 m over the next 23 km before beginning to wind its way up into the mountains. From that point to Lonesome Beaver Campground (at 2480 m) is another 9–10 km over an easy route with only minor switchbacks and no steep sections. There are a couple of small streams that flow over the road and these spots might be problematic if trying to cross them during or after heavy rain.

³ Howden and Martin were both CNC staff members at the time, the former a scarab beetle specialist and the latter the collections manager. Howden left the CNC several months later, in September of 1968, to become a professor at nearby Carleton University. I took his courses on entomology and zoogeography at Carleton in the mid 1970s and enjoyed them so much that they started me on a path towards graduate school and my current position.

⁴ Checking weather and road conditions at the Hanksville BLM office (street address 380 E 100 N) is recommended before venturing off paved roads in the region. Road conditions can change rapidly and unpredictably due to rain, and cellphone service is limited. All roads in the Henrys are dirt and graded as needed on an irregular basis. The road to Lonesome Beaver Campground area is usually in good condition (Figs. 3–7) and a high clearance vehicle is not needed, but all-terrain tires are recommended because portions of the road are rocky and regular tires are prone to punctures. As with any travel off-road on BLM land, carry plenty of water and supplies in case of misadventure and be prepared to self-rescue if stranded. The local BLM office keeps a close watch on weather and road conditions but is not responsible for your safety in this “travel-at-your-own-risk” area.



Figures 3–8. 3. Cattle grazing on open range alongside Lonesome Beaver Road, Bull Mountain ahead on left (east). 4. Heading towards Sawmill Basin, white-topped peak on right is Mount Ellen. 5. Dandelion Flat Recreation Area in Sawmill Basin, 2445 m. 6. View along road where Gambel oaks were sugared, looking south towards Dandelion Flat; oaks are beyond 4Runner on the right. 7, 8. Two views of the sugared oak leaves.

I reached the empty campground and had hoped it would be a suitable place for collecting. My plan had been to drive as far as the campground while watching for places to collect along the way and then backtrack if I didn't like the campground area. This proved to be the case, as the campground is closely surrounded by evergreen forest. I went back to the Dandelion Flat Recreation Area, a more promising-looking spot less than 1 km down the road. It is a flat open space with a grassy meadow surrounded by mixed forest of aspen and evergreens (Fig. 5). The elevation is about 2445 m, in the transition zone between Stanton's (1931) Woodland Climax and Montane Forest Climax. There are picnic tables and grills in a shaded area, potable water, and a pit toilet – welcome and unexpected luxuries. The place was deserted and I could sweep and search for tachinids without providing entertainment for onlookers. Curiously, I caught nothing. I ate a quick lunch and continued back down the road for the next hour, stopping here and there at open places to check for tachinids on wildflowers and sweep the vegetation. This resulted in a single tachinid and I gave up on the idea of continuing this sort of collecting.

“Sugaring” seemed like the only prospect left, although I did not hold out much hope for it in the present circumstances. This method involves spraying a mixture of honey, cola and water on leaves in a sunny location to attract tachinids, and sometimes this works and sometimes it doesn't. My thoughts on sugaring have not changed since I wrote the following:

“Under the right circumstances this mixture attracts a wide variety of tachinids. Interestingly, it is nearly impossible to predict what the results of sugaring will be on any single occasion. What appears to be an ideal spot can attract almost nothing or result in phenomenal activity all day long, with some species appearing in large numbers and others being represented by only a specimen or two. Respraying the leaves every 20 minutes or so will ensure that activity does not wane.” (O'Hara 2012: 34.)

A sunlit stretch of Gambel oak about 0.5 km north of the Dandelion Flat Recreation Area caught my eye as a possible place to “sugar” (Figs. 6–8). I liked that the trees and leaves were close together, allowing me to apply liberal amounts of spray to the leaves and providing flies with a lot of places to land. I also liked the slope of the land, slightly downward to a stream 70 m behind the oaks and upward on the other side of the road. This may not have mattered, but tachinids sometimes congregate on sunlit vegetation at the top of a steep slope. There were no tachinids on the leaves when I applied the spray but after a few minutes they started to trickle in. Nineteen tachinids were caught that day on the sugared leaves between about 4–6 pm⁵. The sun had been in and out of clouds and the temperature was in the mid 20s (°C). I drove back to the Dandelion Flat Recreation Area for dinner and pinned my catch that evening in the car. I had not seen a vehicle all day and camped for the night next to the Recreation Area.

I drove out of the mountains the next morning (July 29th) to visit the Little Egypt Geologic Site⁶ on the eastern side of the Henrys and returned to my sugaring spot about noon. There were already a few tachinids on the oak leaves due to the residual effects of sugaring the day before. Clouds over the mountain peaks obscured the sun from time to time and cut down on fly activity but otherwise conditions were good and I spent the next few hours alternating between spraying leaves and collecting flies (Fig. 9). I stopped for an hour around 4 pm to pin what I had collected and then resumed collecting until 6 pm, and after that sporadically until 7 pm. Increased cloudiness had turned to intermittent rain and the combined effects of weather and lateness of the hour ended my collecting. I had caught 95 tachinids, 94 from sugared leaves and one *Microphthalma* sp. from the dirt road in front of the oaks (members of

⁵ Locality details: Utah, Garfield County, Henry Mountains, Sawmill Basin, 38°07.01'N 110°46.10'W, 2420 m.

⁶ <https://geology.utah.gov/map-pub/survey-notes/geosights/little-egypt/>
<https://www.americansouthwest.net/utah/little-egypt/index.html>

this genus are typically found on the ground and this one perhaps coincidentally landed near the oaks). I pinned my specimens and camped for the night in a nearby clearing.

The next day (July 30th) was my last in the Henrys. I drove out of the mountains for the morning and returned by 2 pm for more collecting at the sprayed oak leaves. The sky became overcast by 4:30 pm and I quit collecting, having caught 58 tachinids. I left the mountains and resumed my holiday before heading back to Ottawa.



Figure 9. Sprayed leaves of Gambel oak with tachinids indicated by arrows. **a.** *Mystacella ?frioensis* (Reinhard) (Exoristinae, Goniini). **b.** *Peleteria* sp. (Tachininae, Tachinini).

Results

A total of 172 tachinid specimens were collected in the Henry Mountains, all but two (see above) from sugared oak leaves along Lonesome Beaver Road south of Dandelion Flat Recreation Area (Fig. 10). This was not a determined effort to survey the Tachinidae of the Henry Mountains but rather a few days of opportunistic collecting that resulted in two noteworthy outcomes:

- an annotated list of 43 tachinid species, and
- a quantitative assessment of “sugaring” for tachinid collecting.

Back in Ottawa, specimens were entered into the CNC specimen database⁷ and assigned individual numbers, then labelled accordingly. Specimens were sorted to morphospecies and identified as far as possible using the key to genera by Wood (1987), and published revisions and CNC specimens for preliminary species identifications.

⁷ Canadian National Collection database: <https://www.cnc.agr.gc.ca/taxonomy/TaxonMain.php>.

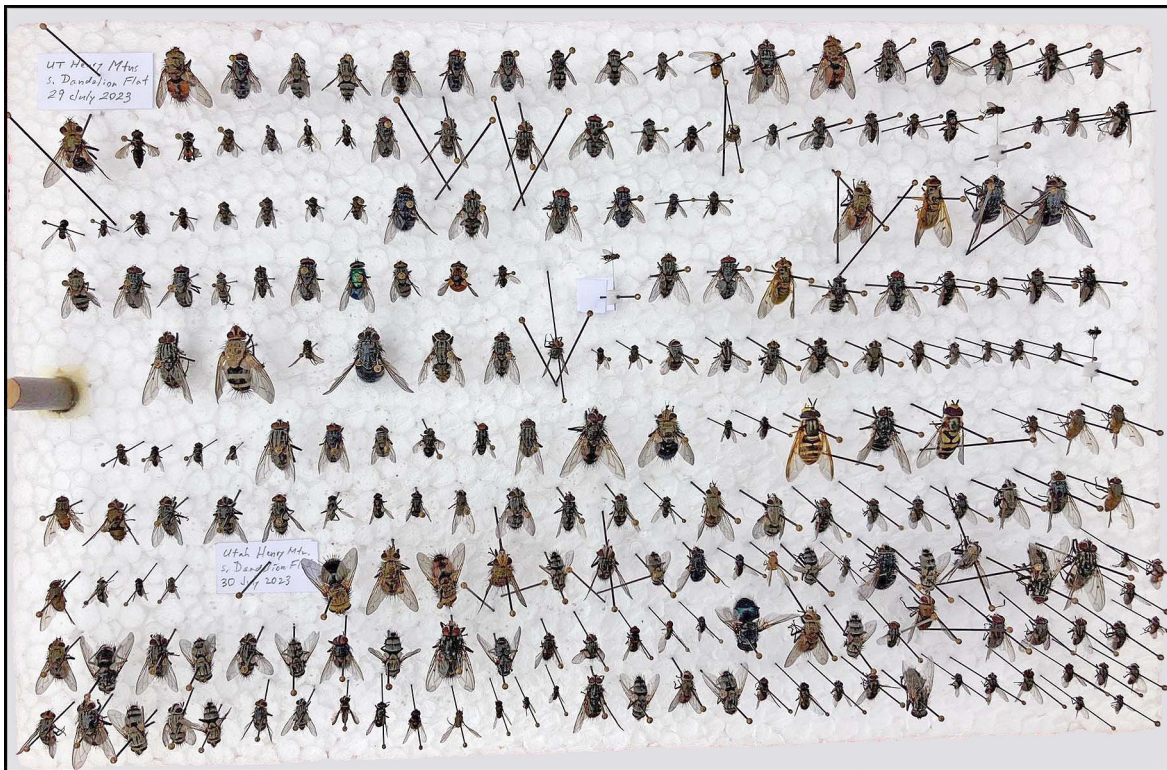


Figure 10. Flies caught during the last two days of collecting from the sugared oaks.

A leg from each of 69 specimens was removed and sent to the Biodiversity Institute of Ontario (BIO) at the University of Guelph for COI DNA barcoding. The resultant sequences were compared to my “DNA barcode library” of over 4000 CNC Tachinidae in the Barcode of Life Data Systems (BOLD) repository to further refine my identifications. A “match” was generally interpreted as sequences belonging to the same “BIN” (Barcode Index Numbers) in the BOLD system. But as discussed below, I encountered a few instances where the correlation between BINs and species is questionable (e.g., *Medina* sp. and *Frontiniella* spp.). Specimens that could not be identified beyond genus have been assigned a species number preceded by “SW” (= Southwest; e.g., *Phantasiomyia* sp. SW1, Figs. 15, 16).

I would not like to speculate on whether “sugaring” is more effective at attracting certain tachinid taxa than others, or how effective it is compared to other collecting methods. My reason for documenting my findings here is more to quantitatively demonstrate that sugaring for tachinids can be highly effective under the right circumstances. By way of comparison, the number of species collected by sugaring in the Henrys was 42% of the number I caught over 11 days by multiple Malaise traps and hilltopping in southern New Brunswick in 2022 (O’Hara 2023b) (41 vs. 98 species). Sugaring is also appealing as a collecting method because it can often be practiced at the same time as other collecting methods.

Another topic that can only be superficially addressed is the faunistic connections between the Tachinidae in the Henry Mountains and elsewhere. The mountain range is surrounded by desert and the tachinid fauna at about 2400 m – where I was collecting – has no counterpart close by. Presumably the fauna is most similar to that of the Manti-La Sal, Fishlake and Dixie National Forests of southern Utah, but no surveys of Tachinidae exist for any of those areas. Looking at my own data in the form of DNA barcoding matches, the most species shared with the Henrys

are from the Gila National Forest in southwestern New Mexico (see O'Hara 2012). This is not so unexpected given that I have over 600 specimens barcoded from New Mexico (compared to half that number from Arizona and much fewer from other states), but southern New Mexico also has a "Sky Islands" and Neotropical influence that I thought might distinguish its fauna more clearly from that of the Henry Mountains.

Species list of Tachinidae for Henry Mountains

The classification of Tachinidae in the following list, and the geographical divisions of North America and the world, follow O'Hara et al. (2020). Each tachinid specimen is denoted by its CNC database number and sex. Specimens that were COI DNA barcoded are shown in red. BIN (Barcode Index Numbers) assignments are given and sometimes discussed.

DEXIINAE, Dexiini

1. *Ptilodexia conjuncta* (Wulp), CNC5277289♂ [BIN AAZ3896].

Distribution. Nearctic: USA (California, Great Plains, Northern Rockies, Pacific Northwest, Southwest, Texas), Canada (British Columbia, East, Prairies). Neotropical: Middle America (Mexico).

Nearctic species of *Ptilodexia* B. & B. can generally be identified using the revision of Wilder (1979). In addition to the key, this work has well-prepared diagnoses, illustrations and distribution maps. The CNC has the added advantage of possessing specimens that were identified by D.D. Wilder during the course of her Ph.D. study of the genus. The single specimen identified here as *P. conjuncta* is a good match with specimens collected in the Henry Mountains (including Lonesome Beaver Campground) by Martin and Howden in July 1968 (see above). The DNA barcode of my Henry Mtns specimen matches that of two other CNC barcoded specimens, both previously identified as *Ptilodexia conjuncta*¹.

Wilder (1979: 24) treated *P. conjuncta* as a variable species, and I must have as well, because six other specimens I submitted for barcoding under the name *P. conjuncta* have been assigned to two other BINs by the BOLD algorithm^{2,3}. For present purposes, Wilder's identification of CNC specimens from the Henry Mtns as *P. conjuncta* is accepted as the proper assignment of the name. If this is the true identity of the species, then my listing of *P. conjuncta* from the Gila National Forest of New Mexico in O'Hara (2012: 38) was based on specimens of two other (possibly undescribed) species^{2,3}.

¹ CNC DIPTERA 105162 (NM, Torrance Co., Manzano Mtns); CNC852597 (UT, Salt Lake Co., Wasatch Mountains, Guardsman Pass).

² BINAAZ3897. DIPTERA 105163 (AZ, Cochise Co., Huachuca Mtns, Ramsey Canyon), DIPTERA 105164 (NM, Grant Co., Gila N.F., Gomez Peak), DIPTERA 105165 (NM, Gomez Peak), DIPTERA 105168 (NM, Gomez Peak trail), DIPTERA 105171 (NM, Gomez Peak).

³ BINAAZ3898, CNC DIPTERA 105166 (NM, Grant Co., Gila N.F., Gomez Peak).

EXORISTINAE, Blondeliini

2. *Blondelia polita* (Townsend), CNC5277224♂, CNC5277265♂ [BIN ACE6779].

Distribution. Nearctic: USA (California, Northern Rockies, Pacific Northwest, Southwest), Canada (British Columbia, Prairies). Neotropical: Middle America (Mexico).

The DNA barcode matches those of six specimens from southern Arizona and New Mexico (Gila N.F., O'Hara 2012: 39).

3. *Chaetonodexodes vanderwulpi* (Townsend), CNC5277206♂, **CNC5277282♂**, CNC5277287♂, CNC5277301♂, CNC5277240♀, CNC5277243♀, CNC5277279♀, CNC5277283♀, CNC5277284♀, **CNC5277337♀** [BIN ABW2496].

Distribution. Nearctic: USA (California, Florida, Great Plains, Southeast, Southwest, Texas). Neotropical: Greater Antilles (Puerto Rico).

The DNA barcodes match that of an Ohio specimen. This species was recorded from Gila N.F. by O'Hara (2012: 39).

4. *Medina* sp., **CNC5277288♂** [BIN AAG6902].

Four species of *Medina* R.-D. are currently recognized from America north of Mexico (O'Hara et al. 2020). There are morphological differences that help to separate these species, but more study is needed to fully resolve species limits. Curiously, the 29 *Medina* in my BOLD barcode library from throughout North America appear to belong to several species based on morphology but are all assigned to the same BIN in BOLD. This is one of the rare instances in which DNA barcodes do not seem to differentiate putative species. One species, *Medina barbata* (Coquillett), was recorded from Gila N.F. by O'Hara (2012: 39).

5. *Myiopharus ancillus* (Walker), CNC5277248♂, **CNC5277278♂**, CNC5277305♂, **CNC5277212♀**, CNC5277229♀ [BIN AAG2318].

Distribution. Nearctic: USA (Florida, Great Plains, Northeast, Southeast, Southwest, Texas), Canada (Ontario). Neotropical: Middle America (Mexico).

The DNA barcodes match those of four specimens from Arizona, Missouri, Ontario and Pennsylvania. This could be the same species recorded from Gila N.F. as *M. ?ancillus* by O'Hara (2012: 39).

Eryciini

6. *Aplomya theclarum* (Scudder), CNC5277234♂, CNC5277285♂, CNC5277306♂, **CNC5277326♂**, CNC5277327♂, CNC5277335♂, CNC5277343♂, CNC5277205♀, **CNC5277247♀** [BIN AAZ4724].

Distribution. Nearctic: USA (California, Great Plains, Northeast, Northern Rockies, Pacific Northwest, Southeast, Southwest, Texas), Canada (British Columbia, East, Ontario, Prairies, Yukon). Neotropical: Middle America (Mexico).

Aplomya theclarum is the only described species of *Aplomya* R.-D. in the New World except for *A. sellersi* (Thompson) in Trinidad & Tobago. The DNA barcodes of these Henry Mtns specimens match those of about 20 specimens from Arizona, Kentucky, Missouri, New Mexico, Ohio, Tennessee, Utah, New Brunswick, Ontario and Quebec. A second BIN (ABY9410) comprises unidentified *Aplomya* from Arizona, Missouri, New Mexico and Utah. O'Hara (2012: 39, Gila N.F.) listed *A. theclarum* as a species complex and O'Hara (2023b: 58, New Brunswick) commented: "DNA barcodes suggest there are two species under the name *A. theclarum* from Missouri westward".

7. *Carcelia (Carcelia) reclinata* (Aldrich & Webber), **CNC5277217♂**, CNC5277323♂, **CNC5277294♀** [BIN AAI3685].

Distribution. Nearctic: USA (California, Florida, Great Plains, Northeast, Northern Rockies, Pacific Northwest, Southeast, Southwest, Texas), Canada (British Columbia, East, NWT, Ontario, Prairies, Yukon). Neotropical: Middle America (Mexico), South America (Colombia).

The DNA barcodes match those of four specimens from Maryland, New Mexico and Quebec, and the species was recorded from Gila N.F. by O'Hara (2012: 39). A second BIN (AAG2429) in my BOLD barcode library

contains barcodes of four specimens identified as *C. reclinata* (from Maine, New Mexico, Alberta and Yukon) and these specimens are presumed to belong to a misidentified species close to *C. reclinata*. The type locality of *C. reclinata* is in the Manzano Mtns of central New Mexico, the same mountain range where a barcoded specimen of the presumed “true” *C. reclinata* was collected (CNC DIPTERA 104456).

8. *Carcelia (Euryclea) sp.*, CNC5277203♀, CNC5277251♀ [BIN AAP4825].

The DNA barcode matches those of four specimens from Arizona, Missouri and New Mexico. O’Hara (2012: 39, Gila N.F.) called the species “*Carcelia (Euryclea) sp. 1*” and noted: “New record for this subgenus in the New World. The species is undescribed.”

9. *Drino (Drino) sp. nr. incompta (Wulp)*, CNC5277345♂ [BIN AAZ4920].

O’Hara (2012: 39) recognized two species in Gila N.F. as near *D. incompta*, calling them “sp. 1” and “sp. 2” and noting “The identity of true *D. incompta* is uncertain and could be *D. nr. incompta sp. 1* or *sp. 2*, or a different species”. DNA barcodes of *Drino incompta sp. 1* from Gila N.F. have separated males into one BIN (AAZ4919) and females into another (AAZ4920), with the latter BIN also containing the Henry Mtns male.

10. *Nilea sp. SW1*, CNC5277274♂, CNC5277300♂ [BIN AAZ3936].

The DNA barcode is a match with only one other specimen in my BOLD barcode library, a male from Gila N.F. (CNC DIPTERA 105138) called *Nilea sp. 2* (not in O’Hara 2012). Another BIN (AAZ3935) comprises three barcodes as *Nilea sp. 1* (O’Hara 2012: 39) and two as *Nilea sp. 2* (different specimens from the *Nilea sp. 2* above but also from Gila N.F. and not in O’Hara 2012). These preliminary results suggest that a combined morphological and molecular approach will help to resolve species limits within this species group of a generally difficult genus.

Ethillini

11. *Neoethilla sp. SW1*, CNC5277208♂ [BIN AFM6428].

The genus *Neoethilla* was described by Cerretti et al. (2012) for an ethilline species previously mistaken as two *Winthemia* R.-D. species, *W. ignobilis* (Wulp, 1890) and *W. antennalis* Coquillett, 1902. The species was reported from Gila N.F. by O’Hara (2012: 39) as “*Winthemia antennalis*” and its pending transfer to Ethillini by Cerretti et al. was noted. Cerretti et al. (2012) synonymized *antennalis* with *ignobilis* and created the genus *Neoethilla* for the species. Three barcoded specimens of this species (now recognized as *N. ignobilis*) from Gila N.F. belong to BIN AAZ4736.

Another species of *Neoethilla* was recognized from Missouri as “*Neoethilla n. sp.*” in Stireman et al. (2020: 38) and is represented by specimen CNC1394271 (BIN ADZ9188) in my BOLD barcode library. The single specimen from Henry Mtns is likely a third, and also undescribed, species.

Exoristini

12. *Exorista (Adenia) dydas (Walker)*, CNC5277341♂, CNC5277328♀ [BIN ABZ7039].

Distribution. Nearctic: USA (Alaska, California, Florida, Great Plains, Northeast, Northern Rockies, Pacific Northwest, Southeast, Southwest, Texas), Canada (British Columbia, East, NWT, Ontario, Prairies, Yukon).

This widespread species is represented by about 20 barcoded specimens in my BOLD barcode library, from British Columbia to New Brunswick as well as Colorado, Maryland and Utah. It was not listed from Gila N.F. by O’Hara (2012).



Figures 11–12. 11. *Ceromasia auricaudata* Townsend (Exoristinae, Goniini), CNC5277211♂, 7.1 mm. 12. *Frontiniella parancilla* Townsend (Goniini), CNC5277344♂, 4.5 mm.

Goniini

13. *Ceromasia auricaudata* Townsend (Fig. 11), CNC5277211♂, **CNC5277292♂**, CNC5277236♀, CNC5277255♀, CNC5277259♀, CNC5277272♀, **CNC5277277♀**, CNC5277340♀, CNC5277367♀ [BIN AAG2173].

Distribution. Nearctic: USA (California, Great Plains, Northeast, Northern Rockies, Pacific Northwest, Southwest), Canada (British Columbia, East, Ontario, Prairies).

The two DNA barcodes are the only ones for *C. auricaudata* in my BOLD barcode library. The specimens were identified to genus using the key in Wood (1987) and to species by comparisons with identified specimens in the CNC.

14. *Chrysoexorista dawsoni* (Sellers), CNC5277291♂, **CNC5277333♂** [BIN AAI4063].
Distribution. Nearctic: USA (Southeast, Southwest).

The DNA barcode matches those of five specimens from Arizona and New Mexico. The species was first recorded from New Mexico by O'Hara (2012: 40, Gila N.F.).

15. *Erynnia tortricis* (Coquillett), CNC5277296♂, CNC5277316♂, **CNC5277330♂**, CNC5277342♂ [BIN AAZ4745].

Distribution. Nearctic: USA (California, Florida, Great Plains, Northeast, Northern Rockies, Pacific Northwest, Southeast, Southwest, Texas), Canada (British Columbia, East, NWT, Ontario, Prairies, Yukon).

The DNA barcode matches those of six specimens from New Mexico (Gila N.F., O'Hara 2012: 40), Ontario, Quebec and Yukon.

16. *Frontiniella parancilla* Townsend (Fig. 12), CNC5277235♂, CNC5277249♂, CNC5277336♂, CNC5277344♂ [BIN AAZ3925].

Distribution. Nearctic: USA (California, Northeast, Pacific Northwest, Southeast, Southwest, Texas). Neotropical: Middle America (Mexico).

The DNA barcodes of the two Henry Mtns specimens of *F. parancilla* are only slightly different from those of six specimens of *F. spectabilis* (Aldrich) (four from Quebec, one from Henry Mtns, and one from Gila N.F.), but all of these belong to BIN AAZ3925. I am inclined to recognize both species as valid following O'Hara (1993: 21), who noted: "Most adults of *F. spectabilis* are shiny yellow or golden dorsally in contrast to the silver or more subdued yellow of adults of other *Frontiniella* species".

17. *Frontiniella regilla* (Reinhard), CNC5277230♂, CNC5277238♂, CNC5277242♂, CNC5277246♂, CNC5277252♂, CNC5277257♂, CNC5277268♂, CNC5277334♂, CNC5277338♂, CNC5277228♀, CNC5277237♀, CNC5277250♀, CNC5277269♀, CNC5277264♂, CNC5277280♂, CNC5277362♀, CNC5277361♀ [BIN AAZ4790].

Distribution. Nearctic: USA (California, Southwest), Canada (British Columbia).

The morphological differences between *F. mitis* (Curran) and *F. regilla* are slight and variable, and all 26 barcoded specimens of the two species in my BOLD barcode library are in the same BIN. Although there could be just one variable species, O'Hara (1993: 30–33) noted that *F. mitis* and *F. regilla* are morphologically distinguishable and almost allopatric in their known distributions. Hence, two species are recognized here pending a modern morphological/molecular study of the genus.

18. *Frontiniella spectabilis* (Aldrich), CNC5277220♀ [BIN AAZ3925, same as *Frontiniella parancilla* above].

Distribution. Nearctic: USA (Northeast, Southeast, Southwest), Canada (British Columbia, East, Ontario, Prairies).

This species has golden pruinosity dorsally compared to silvery pruinosity in *F. parancilla*. The DNA barcode matches those of four specimens from Quebec and one from New Mexico (Gila N.F., as *F. ?spectabilis* in O'Hara 2012: 40), and is only slightly different from the barcode of *F. parancilla* (same BIN).

19. *Frontiniella* sp. SW1, CNC5277361♀ [BIN AEC5992].

The DNA barcode of this tiny (3 mm long) female is in a BIN of its own among the 40+ specimens of *Frontiniella* Townsend in my BOLD barcode library. The specimen resembles *Frontiniella regilla* but is treated here as different based on its unique DNA barcode.

20. *Gaediopsis* sp. SW1, CNC5277232♂, CNC5277245♂, CNC5277260♂, CNC5277267♂, CNC5277312♂, CNC5277319♂, CNC5277321♂, CNC5277322♂, CNC5277200♀, CNC5277207♀, CNC5277298♀, CNC5277320♀ [BIN AAI5685].

The DNA barcodes match those of seven specimens from Gila N.F. and one specimen from Arizona (Chiricahua Mtns, Rucker Canyon), all identified only as *Gaediopsis* B. & B. O'Hara (2012: 40) recorded several *Gaediopsis* species from Gila N.F., most only tentatively, but those identifications were deemed too questionable to include in my BOLD barcode library.

21. *Mystacella ?frioensis* (Reinhard) (Fig. 13), CNC5277216♂, CNC5277308♂, CNC5277313♂, CNC5277315♂, CNC5277317♂, CNC5277318♂, CNC5277324♂, CNC5277332♂, CNC5277359♂, CNC5277368♂, CNC5277369♂, CNC5277370♂, CNC5277215♀, CNC5277253♀, CNC5277303♀ [BIN ABY0456].

Distribution [for *M. frioensis*]. Nearctic: USA (California, Northern Rockies, Southwest, Texas), Canada (British Columbia). Neotropical: Middle America (Mexico).

The DNA barcodes do not match that of one specimen of *Mystacella chrysoprocta* (Wiedemann), the only representative of *Mystacella* Wulp in my BOLD barcode library. CNC specimens of *Mystacella frioensis* are somewhat variable in their abdominal pruinosity and I am uncertain whether they all belong to the same species. The identification of the Henry Mtns species is treated here as questionable for this reason.



Figures 13–14. 13. *Mystacella ?frioensis* (Reinhard) (Goniini), CNC5277216♂, 8.9 mm. 14. *Microchaetina ?rubidiapex* (Reinhard) (unplaced to subfamily), CNC5277201♂, 8.8 mm.

22. *Myxexoristops* sp. SW1, CNC5277218♂ [BIN AAV0942].

There are two described species of *Myxexoristops* Townsend in the New World, both widespread in America north of Mexico but not yet recorded from Mexico (O’Hara et al. 2020: 481): *M. fronto* (Coquillett) and *M. neurotomae* (Sellers). Neither species can be reliably identified from among the four or more morphospecies in the CNC. The DNA barcodes of six CNC specimens submitted to BOLD as *M. neurotomae* belong to two BINs, ADM8146 and AAV0942, and the barcode of the Henry Mtns specimen belongs to the latter.

23. *Patelloa* sp. SW1, CNC5277231♂, CNC5277223♀ [BIN AFL4908].

There are ten described species of *Patelloa* Townsend in America north of Mexico, and some are easier to identify than others. The barcode of this Henry Mtns species is in a BIN of its own among a cluster of BINs containing about a dozen identified and unidentified *Patelloa* species.

24. *Pseudochaeta* sp. SW1, CNC5277213♂, CNC5277219♂, CNC5277233♂, CNC5277270♂, CNC5277286♂, CNC5277314♂ [BIN AFM3631].

The two DNA barcodes are in a BIN of their own among five other *Pseudochaeta* Coquillett BINs in my BOLD barcode library. No *Pseudochaeta* species were recorded from Gila N.F. by O’Hara (2012).

Winthemiini

25. *Nemorilla pyste* (Walker), CNC5277202♂, CNC5277209♂, CNC5277210♂, CNC5277225♂, CNC5277241♂, CNC5277261♂, CNC5277263♂, CNC5277266♂, CNC5277273♂, CNC5277299♂, CNC5277304♂ [BIN AAE4074].

Distribution. Nearctic: USA (California, Florida, Great Plains, Northeast, Northern Rockies, Pacific Northwest, Southeast, Southwest, Texas), Canada (British Columbia, East, Ontario, Prairies). Neotropical: eastern Lesser Antilles (Virgin Islands), southern Lesser Antilles (Trinidad & Tobago), Middle America (Mexico).

The DNA barcodes of this common species match those of 12 specimens from Arizona, California, New Mexico (Gila N.F., O'Hara 2012: 40), Ontario and Quebec.

PHASIINAE, Gymnosomatini

26. *Gymnosoma* sp. SW1, CNC5277256♂ [BIN AAV0936].

The DNA barcode matches that of a specimen from Utah (Juab Co., Fish Springs WR) tentatively identified as *G. fuliginosum* R.-D.

27. *Xanthomelanodes* sp. SW1, CNC5277227♂, CNC5277365♂ [BIN AAP8643].

The DNA barcode matches those of five specimens of uncertain identification from Arizona, California, New Mexico (Manzano Mtns and Gila N.F. [O'Hara 2012: 40, as "*Xanthomelanodes arcuatus* (Say) or *X. californicus* Townsend"]) and Alberta.

TACHININAE, Ernestiini

28. *Linnaemya (Linnaemya) comta* (Fallén), CNC5277302♂ [BIN AAN6462].

Distribution. Nearctic: USA (Alaska, California, Florida, Great Plains, Northeast, Northern Rockies, Pacific Northwest, Southeast, Southwest, Texas), Canada (British Columbia, East, NWT, Ontario, Prairies, Yukon). Neotropical: Middle America (Honduras, Mexico), South America (Chile, Peru). Palaearctic: Central Asia, China, Europe, Kazakhstan, Korean Peninsula, Middle East, Mongolia, North Africa, Russia, Transcaucasia. Oriental: China (southern), India, Nepal, Taiwan.

The DNA barcode matches those of 14 specimens from Arizona, Nevada, Alberta, Ontario and Saskatchewan. The morphological identity of this species is uncertain in North America and O'Hara (2012: 40) recorded it from Gila N.F. as *Linnaemya* "?comta (Fallén)".

29. *Panzeria ampelus* (Walker), CNC5277221♂, CNC5277360♂, CNC5277307♀, CNC5277371♀ [BIN AFN9356].

Distribution. Nearctic: USA (California, Great Plains, Northeast, Northern Rockies, Pacific Northwest, Southeast, Southwest), Canada (British Columbia, East, Ontario, Prairies).

There is some morphological difference between the two males that were DNA barcoded, but the barcodes of all four Henry Mtns specimens are in the same BIN along with those of ten specimens from North Carolina, Pennsylvania, Virginia, Ontario and Quebec.

Leskiini

30. *Clausicella ?setigera* (Coquillett), CNC5277275♀ [BIN AAG2315].

Distribution [for *C. setigera*]. Nearctic: USA (California, Florida, Great Plains, Northeast, Northern Rockies, Pacific Northwest, Southeast), Canada (British Columbia, Ontario).



Figures 15–16. *Phantasiomyia* sp. SW1 (Tachininae, Leskiini), CNC5277254♂, 6.0 mm. **15.** Lateral. **16.** Close-up of head showing bright yellow antenna and black machete-shaped arista.

The DNA barcode matches those of six specimens from Arizona, Missouri, New Mexico (Portales and Gila N.F. [O’Hara 2012: 40]) and Ontario (as *C. politura* (Reinhard)). Another specimen from California (CNC DIPTERA 104403, Del Norte Co.) identified as *C. setigera* is in a BIN of its own (ACP6653). These inconsistencies suggest that there are taxonomic issues to resolve in the *C. politura/setigera* group.

31. *Clausicella turmalis* (Reinhard), CNC5277276♀ [BIN AAZ4986].

Distribution. Nearctic: USA (?California, Great Plains, Northeast, Southeast, Texas), Canada (East, Ontario).

The DNA barcode matches those of 14 specimens from Kentucky, Mississippi, Missouri, New Mexico (Portales and Gila N.F. [but not listed in O’Hara 2012]), New Brunswick and Ontario.

32. *Phantasiomyia* sp. SW1 (Figs. 15, 16), CNC5277254♂ [DNA barcode failed].

The male of this undescribed species of *Phantasiomyia* Townsend looks like a prettier version of *P. gracilis* Townsend with its bright yellow antenna, black machete-shaped arista, and laterally compressed first three tarsomeres of the fore leg. I had forgotten that I had collected it before until I saw the specimens in the CNC: 5♂♂ and 37♀♀ mounted from a Malaise trap placed at the north end of Shuswap Lake in British Columbia, 23–31 August 1987. The DNA barcodes of two males from that series (CNC DIPTERA 103987 and CNC DIPTERA 103987, BIN AAZ4655) are in my BOLD barcode library as “*Phantasiomyia* sp. 2” (this is not the same “sp. 2” recorded from Gila N.F. by O’Hara 2012: 40, which has not been barcoded). This undescribed species is also represented in the CNC by specimens from California (Enterprise), Utah (several localities), and British Columbia (Cultus Lake).

Megaprosopini

33. *Microphthalma disjuncta* (Wiedemann) sp. grp, CNC5277258♂ [BIN AFM4670].

Distribution [for *M. disjuncta*]. Nearctic: USA (California, Florida, Great Plains, Northeast, Northern Rockies, Pacific Northwest, Southeast, Southwest, Texas), Canada (British Columbia, East, Ontario, Prairies). Neotropical: Middle America (Guatemala, Mexico).

The DNA barcode of the single Henry Mtns specimen is in a BIN of its own. The barcodes of five other specimens (all identified as *M. disjuncta*) cluster next to this BIN and belong to four other BINs: AFM4670 (Arizona), AAM7883 (Texas), ACE8444 (Texas), and ACE4897 (Ontario). These specimens do not show as much morphological difference as one might expect of five BINs. O'Hara (2012: 40) recorded a species from Gila N.F. as "*Microphthalma disjuncta*", but this is best considered a placement to the *M. disjuncta* species group.



Figures 17–20. 17. *Paradidyma* sp. SW1 (Tachininae, Minthoini), CNC5277271♂, 7.3 mm. Lateral view. 18. Same, dorsal view. 19. *Paradidyma* sp. SW2, CNC5277366♂, 6.5 mm. Lateral view. 20. Same, dorsal view.

Minthoini

34. *Paradidyma* sp. SW1 (Figs. 17, 18), CNC5277271♂ [BIN ACA5015].

The DNA barcode of this Henry Mtns specimen is in a BIN of its own. Species of *Paradidyma* B. & B. are notoriously difficult to identify despite the revision of the genus by Reinhard (1934). Sixteen species were recognized from America north of Mexico in the catalogue of O'Hara & Wood (2004). My BOLD barcode library has 35 barcodes assigned to 17 BINs, with some agreement between tentative names and BINs. O'Hara (2012: 40–41) listed seven species from Gila N.F., two with names (*P. aristalis* Reinhard and *P. singularis* (Townsend)) and five with numbers (*P. spp.* 1–5).

35. *Paradidyma* sp. SW2 (Figs. 19, 20), CNC5277366♂ [BIN AAG2341].

The DNA barcode matches those of two specimens called *Paradidyma* sp. 1 in my BOLD barcode library, one from Arizona (Pinal Mtns) and the other from Alberta (Medicine Hat).

Nemoraeini

36. *Xanthophyto* sp. SW1 (Figs. 21, 22), CNC5277346♂, CNC5277347♂, CNC5277348♂, CNC5277350♂, CNC5277351♂, CNC5277352♂, CNC5277353♂, CNC5277354♂, CNC5277355♂, CNC5277349♀ [BIN AAZ3895].

The DNA barcodes match those of 11 specimens from Arizona and New Mexico. This species was called *Xanthophyto* sp. 2 and *X. sp.* 3 in O'Hara (2012: 41, Gila N.F.), the main difference between them being size (the latter smaller). John Stireman of Wright State University is revising the genus *Xanthophyto* Townsend.



Figures 21–22. *Xanthophyto* sp. SW1 (Tachininae, Nemoraeini), CNC5277347♂, 11.9 mm. 21. Lateral view. 22. View of abdomen with golden tergite 5.

Polideini

37. *Lydina americana* Townsend sp. grp, CNC5277356♂, CNC5277204♀, CNC5277239♀, CNC5277295♀, CNC5277364♀ [BIN AAG2432].

O'Hara (2002: 130) regarded *Lydina* as “the most difficult group of species to resolve within the Polideini of America north of Mexico” due to “the confusing amount of variation evident among the many specimens studied”. This was despite the fact that there are only two described species, *L. americana* and *L. areos* (Walker) in the region. O'Hara (2002) left the former unresolved as “*L. americana* (Townsend) species complex”. The DNA barcodes of the Henry Mtns specimens match those of two specimens from my backyard in Ottawa and a specimen from New Mexico (Mora Co., Lefebres Canyon).

Siphonini

38. *Siphona* sp. SW1 (Figs. 23–26), CNC5277262♂, CNC5277293♀ [BIN ACV1065].

This is one of many undescribed species of New World *Siphona* Meigen that do not belong to a named subgenus (see O'Hara 1989). These species are uncommonly collected and seldom represented in collections by more than a few specimens each. They are all of small size like other *Siphona* species. The DNA barcode of the Henry Mtns specimen matches that of a female from 4th of July Campground in the Manzano Mtns of New Mexico (CNC DIPTERA 105014, labelled in CNC as *Siphona s. lat.* New World sp. grp. 3, sp. 4).

Strongygastrini

39. *Strongygaster robusta* (Townsend), CNC5277329♂, CNC5277363♂, CNC5277339♀, CNC5277357♀ [BIN AAG2369].

Distribution. Nearctic: USA (Northeast, Northern Rockies, Pacific Northwest, Southeast, Southwest), Canada (British Columbia, East, Ontario).

The DNA barcodes match those of nine specimens from Virginia, British Columbia and Ontario. A specimen of *S. robusta* from Gila N.F. (and listed as such in O'Hara 2012: 41) is the sole member of a sister BIN (AEB0429). In this instance I think the identification of members of both BINs as the single species *S. robusta* is correct. Incidentally, the type locality of *S. robusta* is in the White Mtns of New Mexico east of Gila N.F.

Tachinini

40. *Archytas (Nemochaeta) lateralis* (Macquart), CNC5277226♂, CNC5277290♂, CNC5277297♀ [BIN AAC2588].

Distribution. Nearctic: USA (California, Florida, Great Plains, Northern Rockies, Southeast, Southwest, Texas), Canada (British Columbia, Prairies). Neotropical: Middle America (Mexico).

The DNA barcodes match those of seven specimens from several locations in Arizona and one specimen from Oaxaca in Mexico. The abdomens of the Henry Mtns specimens are a little darker than those of the other specimens, but this is probably not significant.

41. *Peleteria* sp. SW1, CNC5277214♂, CNC5277222♂, CNC5277244♂, CNC5277309♂, CNC5277331♂, CNC5277311♀ [BIN AEB0151].

The DNA barcode does not match that of another specimen in my BOLD barcode library. This species is unremarkable externally and the male terminalia were not examined. It could be a described or undescribed species.



23



24



25



26

Figures 23–26. *Siphona* sp. SW1 (Tachininae, Siphonini). **23–24.** CNC5277262♂, 3.3 mm. **23.** Lateral view. **24.** Dorsal view of abdomen. **Figs. 25–26.** CNC5277293♀, 3.5 mm. **25.** Lateral view. **26.** Dorsal view of abdomen.

42. *Peleteria* sp. SW2, ?CNC5277199♂, CNC5277325♂, CNC5277358♂ [BIN AAG2129].

These specimens are externally similar to *Peleteria* sp. SW1 but smaller (7–8 mm in length vs. 10 mm), and I thought they were the same species until DNA barcoding suggested otherwise (specimen CNC5277199 was not barcoded and could be *P.* sp. SW2 or a small SW1).

The other seven specimens in BIN AAG2129 are all from New Mexico but do not form a cohesive group. Two are from Portales and identified as *P. (Sphyrmyia) malleola* (Bigot)¹ and the rest are from Gila N.F. and identified as *P. (Sphyrmyia) obsoleta* Curran², *P. (S.)* sp. 1³ and *P. (S.)* sp. 2⁴ (these names corresponding with those used in O'Hara 2012: 41).

¹ CNC DIPTERA 162584, CNC DIPTERA 162585.

² CNC DIPTERA 105175 (Gomez Peak Trail).

³ CNC DIPTERA 105179 (Gomez Peak).

⁴ CNC DIPTERA 105180 (Gomez Peak), CNC DIPTERA 105181 (McMillen Campground), CNC DIPTERA 105182 (Group picnic area at base of Gomez Peak).

Unplaced to tribe

43. *Microchaetina ?rubidiapex* (Reinhard) (Fig. 14), CNC5277201♂ [BIN AEB6183].

Distribution [for *M. rubidiapex*]. Nearctic: USA (California, Northern Rockies, Pacific Northwest, Southwest), Canada (British Columbia).

The DNA barcode of the single Henry Mtns specimen is in a BIN of its own and not near those of two other *Microchaetina* specimens. The specimen has the general appearance of *M. rubidiapex*, including the darkened wing, but there is no red on the tibiae as mentioned in the description of the species and present in CNC specimens from Oregon. I plan to include a leg from an Oregon specimen of *M. rubidiapex* in my next submission to BOLD to see if the DNA barcode matches that of my Henry Mtns specimen.

Acknowledgements

I am grateful to Shannon Henderson of the CNC for her assistance with this project, particularly databasing the specimens and preparing the labels, sending legs to the Biodiversity Institute of Ontario in Guelph for COI DNA barcoding, imaging the specimens for the figures, and preparing the layout for this article. Scott Brooks, also of the CNC, kindly reviewed the manuscript and offered helpful corrections and suggestions.

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Skyline of Reno, Nevada (<https://dipterists.org/icdx/>).



Tachinidae presentations given during the **10TH INTERNATIONAL CONGRESS OF DIPTEROLOGY** Reno, Nevada, USA

Below are the abstracts of presentations given on Tachinidae during the *10th International Congress of Dipterology*. The Congress was held in the Silver Legacy Resort in Reno, 16–21 July, 2023, and the abstracts were published in the Abstracts Volume:

Gaimari, S.D., ed., Abstracts volume, 10th International Congress of Dipterology, 16–21 July 2023, Reno, Nevada, USA. *Fly Times* Supplement 5. xix + 238 pp.

A couple of reports about the Congress were published in the Fall issue of *Fly Times* and may be of interest to *Tachinid Times* readers:

Evenhuis, N.L. 2023. ICDX – Reno: a personal reflection from a Musca-teer. *Fly Times* 71: 93–96.

Gaimari, S.D. 2023. ICDX wrap-up. *Fly Times* 71: 97–102.

Di Marco, M., Santini, L., Corcos, D., Tschorsnig, H.-P. & Cerretti, P. Altitudinal homogenisation of mountain parasitoids across six decades.

(Page 44 in *Abstracts Volume*, oral presentation.)

Elevation gradients, characterized by significant environmental changes over short geographical distances, offer valuable insights into how biodiversity responds to climate change. High-altitude species often occupy specialized niches that render them particularly vulnerable to rapid environmental transformations. Recent evidence indicates that elevation strongly influences both the composition and intensity of host-parasitoid interactions. Parasitoid insects, crucial in regulating host populations and preventing outbreaks of herbivorous insects, may see their regulatory role impacted by climate change, especially in the case of specialized feeders. In this study, an exceptional dataset comprising over 46,000 records of parasitoid bristle flies (Diptera: Tachinidae) from various regions in Europe, spanning a wide range of altitudes and six decades, was analyzed. The objective

was to examine the temporal trend in the likelihood of encountering bristle flies with specialized diets (referred to as “oligophagous” species) at different altitudes. The aim was to determine whether the altitudinal gradient in specialization has undergone changes over time. The findings revealed a distinct reshuffling of bristle fly assemblages along altitudinal gradients, with specialized species becoming less abundant at higher elevations. Six decades ago, there was a clear altitudinal gradient in the proportion of specialized feeders, but over time, this proportion has become remarkably similar across different altitudinal bands. These results indicate an emerging homogenization in the dietary preferences of parasitoid communities, which could potentially reshape the ecological dynamics of mountain ecosystems by altering the mechanisms that regulate insect herbivory.

O’Hara, J.E. & Henderson, S.J. Catalogue of the Tachinidae (Insecta: Diptera) of the world.
(Page 157 in *Abstracts Volume*, poster presentation.)

The Tachinidae are one of the largest families of true flies (Diptera) with a species diversity that cannot be accurately estimated even to the nearest 10,000. The number of valid species names is approximately 8900, but undescribed species might exceed this number by two, three or more times based on preliminary data from surveys in biologically diverse parts of the world and caterpillar rearing programs such as those in Area de Conservación Guanacaste, Costa Rica and Yanayacu Biological Station, Ecuador. The present authors and the late D.M. Wood initiated a project about 15 years ago to prepare a comprehensive catalogue of the world Tachinidae to replace aging regional catalogues and to introduce a unified classification for the family. We are getting close to finishing this goal and have completed data entry for all generic and specific names (ca. 17,400), species distributions, and most of the name-bearing types (including sex(es), type locality(-ities) and depository(-ies)). The database can be queried to produce outputs of various sorts including catalogues/checklists by country or region, species lists by author, and name-bearing type lists by author, depository, country, and/or type locality. Two checklists of world Tachinidae have been prepared to date (2019, 2020) and a new one is planned for late 2023. The new checklist will include a hierarchical classification of the family with all valid generic and specific names, synonyms, species distributions, and references. Name-bearing type data, misidentifications, misspellings, and nomenclatural and other notes will be included in the world catalogue.

Pape, T., Cerretti, P., Szpila, K., Grzywacz, A., Wallman, J.F., Johnston, N.P., Beza-Beza, C.F., Yan, L., Zhang, D. & Wiegmann, B. Calibrated calyprate classification.
(Page 164 in *Abstracts Volume*, oral presentation.)

Calyprate phylogeny has seen major progress during the last two decades, and with an increasingly robust family-level topology driven by large amounts of molecular data, it is time to calibrate the classification. The position of Hippoboscoidea as a basal calyprate lineage is solid, and the division into two families, Glossinidae and Hippoboscidae, has much to recommend it. The concept of a non-monophyletic ‘muscoid grade’ is growing in acceptance, and apart from uncertainty relating to the first few splits at the base of the Anthomyiidae–Scathophagidae clade, families are well-supported, and their emerging internal phylogenetic resolution provides the first hints at a realistic subfamily classification. Oestroidea are undoubtedly monophyletic, and although the exact position of each of the mono-specific families Mystacinobiidae and Ulurumyiidae is not yet fully settled, family-level phylogeny within the superfamily has finally achieved sufficient support to allow blow fly classification to rest on robust monophyly. A subfamily classification for blow flies is now up for scrutiny. Botflies were long suspected as derived blow flies, but this is rejected by recent analyses, while molecular and morphological data disagree on botfly monophyly. Polleniidae classification has shifted from being a blow fly subfamily to being sister to Tachinidae. Rhinophorinae, now in Calliphoridae with a surprising position as sister to the macrolarviparous

Ameniinae, are now ready for a tribal classification. Rhiniinae have also returned to the Calliphoridae, with both molecular and morphological evidence corroborating Bengaliinae + Rhiniinae as a clade dominated by termite-associated species. The traditional classification of Tachinidae into four subfamilies has largely stood the test of molecular data, with only minor modification needed if Macquartini + Myiophasiini is corroborated as a basal tachinid branch.

Perilla López, J.M. & Stireman, J.O. III. Radiations within radiations: phylogenomics and morphological evolution of the tachinid tribe Polideini (Diptera: Tachinidae).

(Page 166 in *Abstracts Volume*, oral presentation.)

Polideini comprise a relatively small, eclectic, and rapidly diversifying tribe of Tachinidae (Bristle flies) in the subfamily Tachininae. This mostly New World tribe was assembled by O'Hara in 2002, in which he drew diverse taxa from nine tribes and multiple subfamilies together into one well-supported tribe. This important work also revised the North American genera of Polideini, however, the diverse Neotropical fauna was left largely unstudied. Here, we report on a phylogenomic analysis of the tribe using UCEs with focus on Neotropical taxa, including 59 taxa belonging to approximately 36 genera. Trees inferred via ML analysis of 676 (average) protein-coding UCE loci distribute the included taxa into 11 major clades, with most nodes being robustly supported. However, backbone nodes are very short, indicating an extremely rapid radiation of lineages, possibly associated with Andean orogeny. The tribe likely originated and diversified in South America, with multiple colonizations and one major radiation in the Nearctic. Each of the 11 major clades is morphologically diverse in itself, with limited external similarity of many contained taxa, although male terminalia traits support some relationships. Rampant intra-clade morphological disparity and convergent evolution plagues the phylogeny, with “hedge-hog body forms”, bright coloration, setal patterns and “sarcophagiform” body habitus evolving repeatedly in different lineages. This morphological confusion makes it difficult to determine the affinities of unsequenced taxa. Hosts are unknown for most taxa, but the ancestral host was likely lepidopteran caterpillars and several lineages have colonized unusual host groups. This analysis provides a first step towards understanding the diversity and evolution of the Polideini. However, the majority of species and genera of Neotropical Polideini remain undescribed and unknown, and those included here likely represent just the “tip of the iceberg” of Neotropical Polideini diversity.

Stireman, J.O. III. Taxonomy and systematics of the American bristle fly genus *Xanthophyto* Townsend (Diptera: Tachinidae).

(Page 196 in *Abstracts Volume*, oral presentation.)

Xanthophyto is a small genus of New World Tachinidae consisting of four described species, two Nearctic and two Neotropical. Members resemble flesh flies (Sarcophagidae) in overall appearance, often with the tip of the abdomen reddish in color. They are parasitoids of various families of caterpillars, often concealed feeders associated with conifers. Over the past several years I have been in the process of taxonomically revising *Xanthophyto*, evaluating species relationships, and delimiting and describing new species using external morphology, male terminalia, CO1 mtDNA sequence data, distributions, and host associations. Despite their relatively large size and the abundance of several (undescribed) species, at least 10 undescribed species exist in North America and at least 20 undescribed species occur in the Neotropics. The genus appears to have originated in the Neotropics but there have been several recent radiations of species in North America, making species boundaries difficult to recognize. Male terminalia exhibit relatively little variation among species except at the broadest scales and there is considerable convergence in external traits. I highlight evolutionary relationships among taxa, patterns of morphological evolution, and ecological/biogeographical patterns in the genus.

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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.uoguelph.ca/nadsfly/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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- parasitoid of a sawfly (*Monoctenus sanchezi* (Smith)), based on a 92% similarity in COI sequences in GenBank and no morphological comparison of specimens. Both the distribution and host are unlikely for *B. biserialis* and confirmation of the identification is needed. – J.E. O'Hara]
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