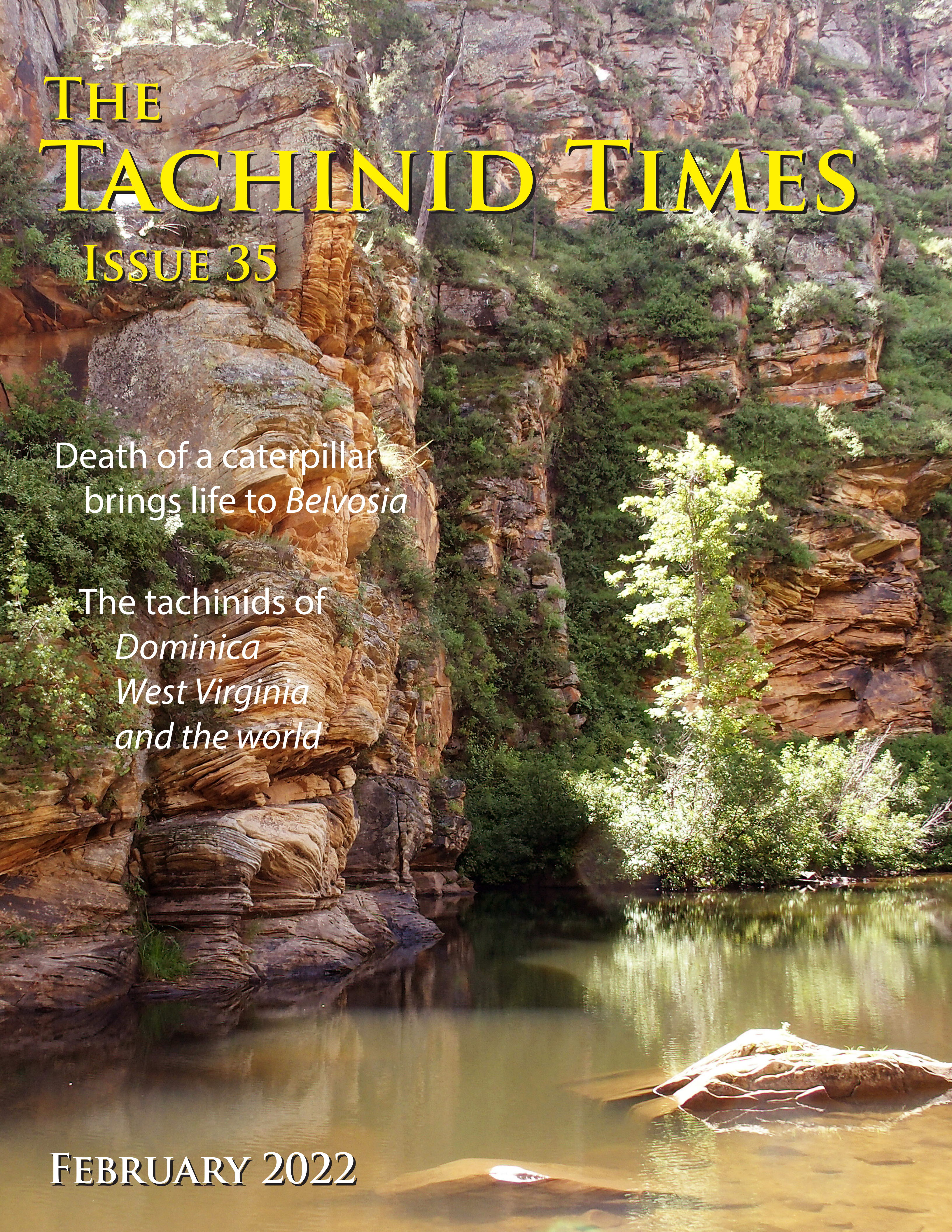

THE
TACHINID TIMES
ISSUE 35
Death of a caterpillar
brings life to *Belvosia*
The tachinids of
Dominica
West Virginia
and the world
FEBRUARY 2022

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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 (informally) 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.

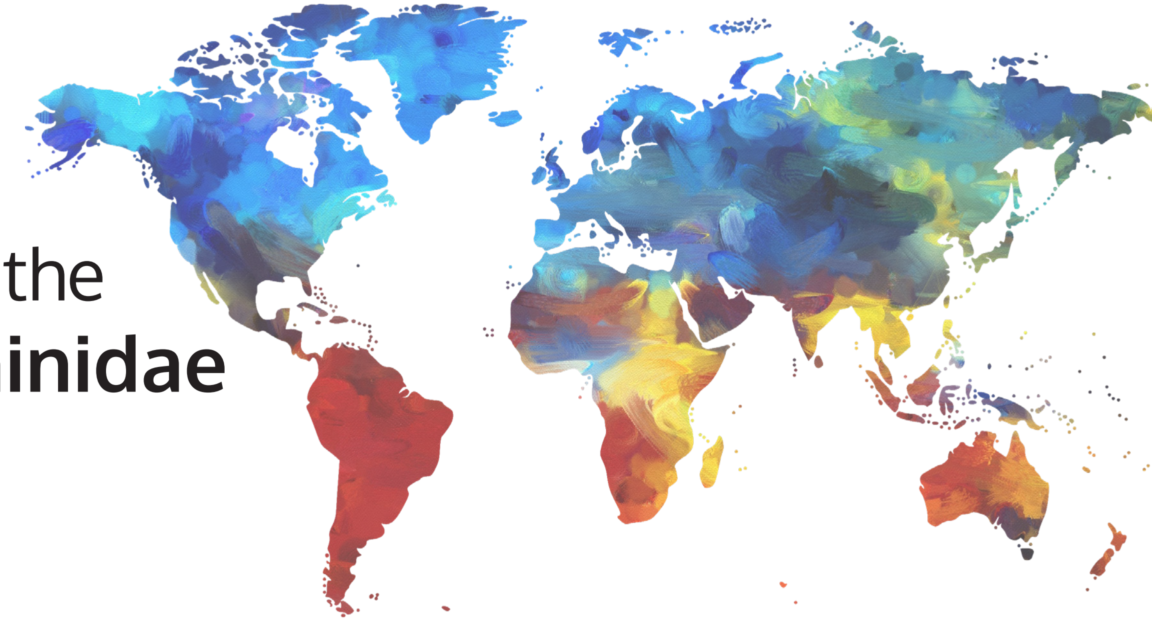
Student submissions are particularly welcome. Writing about a thesis study or a side project involving tachinids is a good way to inform others about a study that is underway before it has generated formal publications.

Please send submissions for the 2023 issue of *The Tachinid Times* to the editor by the end of January 2023.

FRONT COVER East Clear Creek at Kinder Crossing, Coconino National Forest, Arizona, USA.
Photo: J.E. O'Hara, 10 August 2016

TABLE OF CONTENTS A dilapidated Aermotor windmill wrapped with miniature Christmas lights on an abandoned ranch in the Magdalena Mountains east of Magdalena, Cibola National Forest, New Mexico, USA.
Photo: J.E. O'Hara, 29 May 2019

BELOW Rocky hills of eroded Navajo Sandstone in Coyote Buttes North on the Arizona-Utah border, USA.
Photo: J.E. O'Hara, 15 May 2018



Cataloguing the **world Tachinidae** (Diptera)

by James E. O'Hara and Shannon J. Henderson

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Three years ago in the pages of this newsletter we reviewed the history of our efforts to catalogue the Tachinidae of the world (O'Hara *et al*. 2019a). We explained our interpretations of such matters as name-bearing types, country/regional boundaries, and tachinid classification. We gave a graphical representation of the data flow from screen to screen in FileMaker Pro that makes our cataloguing of the Tachinidae possible. We also announced the simultaneous release of our first world checklist (O'Hara *et al*. 2019b). This consisted of a classification by subfamily, tribe, valid genus name and valid species name, and species distributions. Generic and specific synonyms were excluded and only a few general references were cited.

We announced a new checklist the following year (O'Hara *et al*. 2020a) and, again, this coincided with the release of the checklist itself (O'Hara *et al*. 2020b). This second (and still most recent) checklist incorporated taxonomic changes published since the first checklist and included generic (but not specific) synonyms and an extensive References section.

Our next contribution will build on the progress made since our last checklist and will raise the result, in our view, to full "catalogue" status through the addition of species level synonymy, misspellings, and data on name-bearing types (including type depositories and type localities). We have all the names in place and much of the information on types as well. But the final push is slow because there are a lot of generic and specific names in Tachinidae to deal with: over 17,400 in all. Not counting misspellings, these can be broken down into the following categories:

ca. 3530 nomenclaturally available generic names (ca. 1495 valid names)*
ca. 12200 nomenclaturally available specific names (ca. 8840 valid names)*
ca. 90 generic names that are *nomina dubia* (available but unrecognized names)
ca. 1270 specific names that are *nomina dubia* (available but unrecognized names)
ca. 115 generic names that are *nomina nuda* (unavailable names)
ca. 220 specific names that are *nomina nuda* (unavailable names)
*In general, available names that are not valid names are junior synonyms.

There are two aspects of our cataloguing of the Tachinidae that we will focus on below. One is a guide to searching for online type images in two national collections using database identifiers, which we will provide in our upcoming catalogue. The other is a series of nine maps showing the number of described species of Tachinidae recorded from each country (and sometimes region) in the world.

SEARCHING THE CNC DATABASE FOR DATA AND IMAGES

Brief background on the CNC

Figure 1. South entrance of K.W. Neatby Building, Ottawa. (Photo: J.E. O'Hara.)

The collections that form the Canadian National Collection of Insects, Arachnids, and Nematodes (CNC) date back to the late 1800s (Cumming *et al*. 2011). In 1917, the existing specimens were transferred to the Entomology Branch of the Department of Agriculture. The Division of Systematic Entomology was formed a couple of years later and the CNC began a period of significant growth. The collection was moved to its present location in what is now the "old wing" of the K.W. Neatby Building on the Central Experimental Farm in Ottawa (Fig. 1) in 1949. The original Neatby Bldg. was built in the 1930s and faced south (Fig.1), and a large L-shaped addition was added in the 1950s with a new front entrance facing north. The CNC is estimated to hold over 17 million specimens and is one of the largest collections of its kind in the world. Its primary function is not as a natural history museum but as a collection in support of scientific research within the Department of Agriculture and Agri-Food Canada.

Tachinidae types in the CNC

The Tachinidae collection of the CNC occupies approximately 1400 drawers of pinned specimens housed in about 50 cabinets. As a rough guess the number of specimens is around 350,000, up from Cooper & O'Hara's (1996) estimate of 250,000. It is richest in specimens from the Nearctic, Neotropical and western Palaearctic regions and Australia, and is the largest collection of Tachinidae in the world.

The first catalogue of CNC tachinid types was published by Cooper & O'Hara (1996) as part 4 in the series *Diptera types in the Canadian National Collection of Insects*. They provided detailed information on "897 holotypes, 239 associated allotypes, 35 lectotypes (no associated allolectotypes), 2 neotypes, and 117 species that are represented by syntypes" (p. 7). This translates to 1051 name-bearing types[1]. As further noted, "more than 90% of these represent nominal species described by seven authors, namely H.J. Reinhard (267 primary types), L.P. Mesnil

[1]This term "name-bearing type" is less familiar than "primary type" but is the term used in the Code (ICZN 1999) and encompasses holotypes, lectotypes, neotypes and syntypes (with one or more syntypes of a species counting as one collective name-bearing type).

(250), J. Villeneuve (178), W.R. Thompson (118), C.H. Curran (91), A.R. Brooks (58), and J.D. Tothill (22)" (p. 8). Four supplements to the *Diptera types* series were published online over the next 20 years with the fourth incorporating all the type data from the previous three in addition to data on types published after the third (Brooks *et al*. 2015). This added 90 name-bearing types of Tachinidae to the previous total.

Thirty-four of the 90 tachinid types listed in Brooks *et al*. (2015) were described by A.J. Fleming and D.M. Wood in a revision of *Houghia* Coquillett (Fleming *et al*. 2014). These revisions were based primarily on specimens reared from caterpillars in Area de Conservación Guanacaste (ACG), Costa Rica. The CNC became the depository for the caterpillar-reared Tachinidae back in the early days of the rearing program through an arrangement between ACG and CNC scientist Monty Wood (see Janzen & Hallwachs 2016 and below for more on the ACG inventory). Alan Fleming partnered with Monty Wood to undertake revisions of the hugely diverse but almost unknown tachinid fauna parasitizing caterpillars in ACG. This collaboration resulted in 16 revisions between 2014 and 2020 and the addition of 147 holotypes to our Tachinidae collection (113 of these published after Brooks *et al*. 2015). Monty was active on this project and others until his passing in 2020 (O'Hara *et al*. 2020, Adler & Currie 2021). Alan is continuing to revise ACG tachinids in the CNC in collaboration with Dan Janzen, Winnie Hallwachs and the rest of the ACG team and this will result in more CNC holotypes. The current number of name-bearing types in the CNC stands at about 1225 according to our FileMaker Pro database.

CNC specimen database

The CNC database is the repository for information on individual specimens in the CNC. Each databased specimen bears a unique identifier, generally a number preceded by several or more letters. The database can be searched by this identifier to jump directly to the

Figure 2. CNC database images of the holotype of *Ginglymyia bicolor* Curran, 1923. (Photos: M. Fleck.)

data page for that specimen, or by other data associated with the specimen (e.g., scientific name, year of collection, locality) to return a list of specimen matches. New specimens entering the collection are routinely databased and efforts are underway by the Collections team to database pre-existing specimens. A top priority has been the databasing and imaging of the thousands of name-bearing types. This began for the Tachinidae a couple of years ago and was just completed recently, with the exception of some types that have yet to be located or are out on loan. Three images of each type were generally taken: a full lateral, a full dorsal, and an angled view of the head. These are sharp, high-resolution images that can help researchers recognize a type's identity without physically examining the specimen.

Searching the CNC database

The homepage of the database is here:

https://www.cnc.agr.gc.ca/taxonomy/TaxonMain.php

The easiest way to search for a tachinid type in the database is by its unique identifier. These are generally the three letters "CNC" (or "DHJPAR" for ACG specimens) followed by numbers. These identifiers will be included in the entries for available species names in our upcoming catalogue.

Let us illustrate how to search for type data with a specific example. We have chosen the first tachinid described by a CNC staff member, the famous dipterist C.H. Curran. He was only briefly with the "Systematic Entomology Division" from 1922 to 1928 before leaving for a position at the American Museum of Natural History in New York, but he was a prolific author during his short time in Ottawa (Cumming *et al*. 2011). His first tachinid was described as *Ginglymyia bicolor* in a two-page article along with a new species of Bibionidae (Curran 1923). The tachinid name has since been placed in synonymy with an earlier Coquillett name but the genus remains the same (but with the spelling *Ginglymia* instead of *Ginglymyia*). The species entry will look like this in our catalogue:

johnsoni (Coquillett, 1895).– Nearctic: Canada (British Columbia), USA (California, Northern Rockies, Pacific Northwest, Southwest). Neotropical: Middle America (Mexico).

Lasioneura johnsoni Coquillett, 1895β: 50. Lectotype, unspecified sex [male, examined by DMW] (USNM), by fixation of Coquillett (1897α: 59) (examination of "type specimen" is regarded as a lectotype fixation). Type locality: USA, Washington.

Ginglymyia bicolor Curran, 1923α: 246. Holotype female (CNC, no. CNC1175812). Type locality: Canada, British Columbia, Saanich.

The identifier for *Ginglymyia bicolor* Curran is CNC1175812. Go to the homepage of the CNC database and click on "Specimen search" in the drop-down menu under "Specimen". Copy or type the identifier into the field "Specimen ID". Scroll down to the bottom of the page and click the highlighted "Search" button. "Search results" will appear with a line of columns. Click on "CNC1175812" under the "Specimen ID" column at the far left. This takes you to the "Specimen details" page. Below the written data are the four images associated with the holotype: three of the specimen and one of the labels (Fig. 2). Click on each to open a high resolution version of the image.

A cautionary note

The tachinid classification in the CNC database is not "paired" with our FileMaker Pro database and we only correct classification errors in it on an *ad hoc* basis. The database is managed by the Collections team, whereas our own FileMaker Pro database is the one we use for research and the cataloguing of world Tachinidae. Our upcoming catalogue will have the most up-to-date classification and the type identifiers will permit direct access to type images and data.

A different problem common to all specimen databases is that of misidentified specimens. Identifying tachinids to genus is sometimes difficult and species names can be challenging or impossible, depending on the group the specimen belongs to and where it is from. We commonly avoid entering species names into the database if we suspect they might be wrong and use instead names like "[Genus] sp. 1". Nevertheless, we have discovered (often after DNA barcoding) that the original identifications taken from tray labels are a "work in progress" in certain groups where species are difficult to tell apart. Keys are few and not always helpful. We are actively re-evaluating our specimens and barcoding results with the goal of eventually developing a "DNA barcode library" to help researchers with tachinid identifications. We will update names in BOLD (Barcode of Life Data Systems, Guelph) as we work through genera and will correct misidentifications in the CNC database at the same time. This is a slow process and in the interim the names of tachinid specimens in the CNC database should be considered within this context. Please contact us directly if you have questions about tachinid names or specimens in the CNC database.

If you wish to search the CNC database by a means other than a specimen's identifier then go to the *Manual for CNC Taxonomy and Specimen Database* by clicking "Help" on the homepage and then "CNC user manual".

Citing CNC data and images

You are permitted to download and use data and images from the CNC database. Our Collections Team has provided the following information about how to cite downloaded content:

> If you wish to use any of our images or data elsewhere, please ensure that it is accompanied by the following Attribution Statement:
>
> "Images and data provided by the Canadian National Collection of Insects, Arachnids, and Nematodes (CNC), ©Her Majesty The Queen in Right of Canada, as represented by the Minister of Agriculture and Agri-Food, licensed under the Open Government Licence – Canada."

Special thanks to the databasers

We extend our sincere thanks to Mariah Fleck, Julie-Anne Dorval and Kimberly Madge for databasing and imaging the CNC Tachinidae types. Our thanks also to the leaders of the CNC database project that made the databasing of the tachinid types possible, Michelle Locke and Owen Lonsdale.

SEARCHING THE MNHN DATABASE FOR DATA AND IMAGES

The Muséum National d'Histoire Naturelle (MNHN), colloquially known as the "Paris Museum", is one of oldest, largest and most revered scientific institutions in the world. There are extensive links on the Muséum's homepage (https://www.mnhn.fr/fr) to webpages about both the past and present activities of the Muséum. We will not attempt to encapsulate all of this in a few paragraphs here but instead encourage you to check out the Muséum's website for yourselves. A sense of what awaits the inquisitive person can be imagined by this brief passage from the English translation of the *Qu'est-ce que le Muséum?* page (https://www.mnhn.fr/fr/qu-est-ce-que-le-museum):

> "The adventure began in 1635 in the Royal Garden of Medicinal Plants, the former name of the Museum. From that time on, enthusiasts analysed, compared and brought back from their travels essences which enriched a nascent heritage. Some will leave their names to posterity, such as the naturalists Buffon, Cuvier or Lamarck. Over time, new disciplines develop, in particular chemistry from the 18th century, the establishment of which was the cradle in France, but also prehistory, archaeology, geology, anthropology, paleontology, allowing to accumulate new specimens and unprecedented knowledge."

The name-bearing types of Tachinidae in MNHN are principally those of the European dipterists J.W. Meigen (1764–1845), P.J.M. Macquart (1778–1855), J.-B. Robineau-Desvoidy (1799–1857), L. Pandellé (1824–1905) and L.P. Mesnil (1904–1986). The Muséum has yet to database all of their tachinid types and we do not know when the project will be completed. The database can be searched for Meigen and Macquart tachinid types (over 200 of the former and ca. 40 of the latter), but only some of the approximately 200 Robineau-Desvoidy tachinid types that Herting (1974) examined in Paris appear to have been databased. None of the expected 75-odd Pandellé types (Herting 1978) or nearly 200 Mesnil types (O'Hara 1996) can be searched on the database.

The homepage for searching the MNHN Diptera collection is here:

https://science.mnhn.fr/institution/mnhn/collection/ed/item/search?lang=en_US

The database is easily searched by the unique identifiers of databased specimens. These will be given in our catalogue in the same manner as explained above for CNC name-bearing names. We have chosen a name from the recent Tachinidae of Chile catalogue (O'Hara *et al*. 2021) to illustrate how to search for the data and images associated with *Hyadesimyia clausa* Bigot (one of the few Bigot types in MNHN). Our catalogue will show the species entry as:

clausa Bigot, 1888.—Neotropical: South America (Argentina, Chile).
Hyadesimyia clausa Bigot, 1888α: 27. Holotype male (MNHN, no. MNHN-ED-ED10216). Type locality: Chile, Magallanes y de la Antártica Chilena, Antártica Chilena, Isla Hoste, Bahía Orange area [ca. 55°31′S, 68°6′W].

The full MNHN identifier for *Hyadesimyia clausa* Bigot is MNHN-ED-ED10216 but just the last "ED" and number are needed to search the Diptera collection database. Go to the homepage given above and enter "ED10216" in the "General search" field. Press "OK" to open the associated webpage. Data is given for the specimen and a window is visible for scrolling through the four images (labels, full dorsal view, full lateral view, and full frontal view). Click on an image for a larger view. Go to "How to cite" on the right for an "Item id" link and "In print" citation. The database can also be searched by choosing "Advanced search" on the homepage and entering "ED10216" in the "Catalog number" field.

Our database is both nomenclatural and distributional in nature and this allows us to track both names and recorded distributions. We update the database regularly throughout the year to incorporate newly published information, and Shannon conducts a thorough literature search each January to fill in the gaps (thus resulting in the Tachinid Bibliography section at the end of each issue of *The Tachinid Times*).

We can search our distributional data in a variety of ways but three are especially useful: by region, country and species. The current number of tachinid species recorded per biogeographic region is shown in Figure 3.

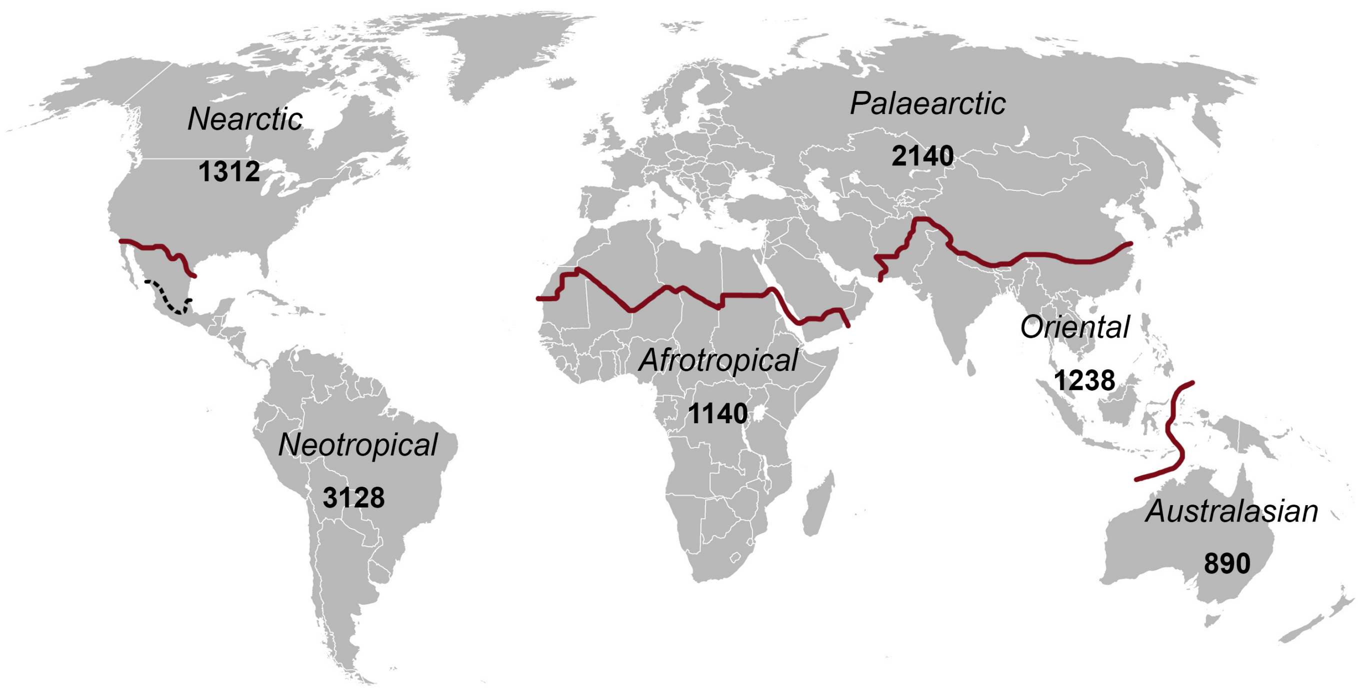

Figure 3. Number of tachinid species recorded per biogeographic region.

Our numbers of recorded species per county is shown in a series of nine maps in the Appendix. These maps and their divisions form the geographic basis of our database and were published previously in our last checklist (O'Hara *et al*. 2020b) without species per country.

The visual representation of recorded species per country in the accompanying maps may prove more interesting and thought-provoking than a simple list of countries and their tachinid numbers. The numbers are, as one would expect, based on published records. Yet published records for a family as poorly known as the Tachinidae clearly fall far short of the actual number of species inhabiting most parts of the world. Some countries in Europe may know their tachinid faunas fairly well but this is the exception. Generally speaking, globally recognized biodiverse parts of the world can be assumed to have significant tachinid faunas whether they have been inventoried or not. We can infer this from unstudied tachinid specimens that are accumulating in collections around the world, from the accounts of experienced collectors, and from published surveys both big and small that record high tachinid diversity. In less-studied parts of the world the majority of specimens are unidentifiable to species because many specimens belong to undescribed species and few keys exist to the described species. Reports of hitherto unreported diversity in Carnarvon National Park, Queensland, Australia (O'Hara *et al*. 2004), in the cloud forest of Zurquí de

Moravia, San José Province, Costa Rica (Borkent *et al*. 2018), and in the Southern Atlantic Forest, Brazil (Stireman 2021) are tangible indicators that tachinids are, on a global scale, little known. Current species numbers like 54 for Bolivia, 30 for Angola, 0 for Cambodia and 11 for Borneo (see maps) send a clear message that the tachinid faunas of such countries are virtually or entirely unknown.

The only place in the world where tachinid diversity is being explored in earnest is in Area de Conservación Guanacaste (ACG) in northwestern Costa Rica (Janzen & Hallwachs 2016). The rearing of caterpillars and their parasitoids at ACG, followed by the morphological study and DNA barcoding of the reared parasitoids, has revealed an extraordinary diversity in both hosts (11,000+ species of caterpillars) and Tachinidae (1100+ species). More recent Malaise-trapping in ACG has increased the tachinid total to ca. 1600 species (D.H. Janzen, pers. comm.). This is an ongoing project and the number of Tachinidae has yet to "top out" in ACG. This figure of 1600 species (an actual and not extrapolated number) is 10X higher than the number of tachinid species recorded for all of Costa Rica prior to the start of the caterpillar-rearing program. There is reason to believe that similar programs of study of hyperdiverse insect communities elsewhere in the world will discover similar levels of exceptional tachinid diversity.

Contact us if you would like a list of species and their distributions from a country or region listed in the following maps.

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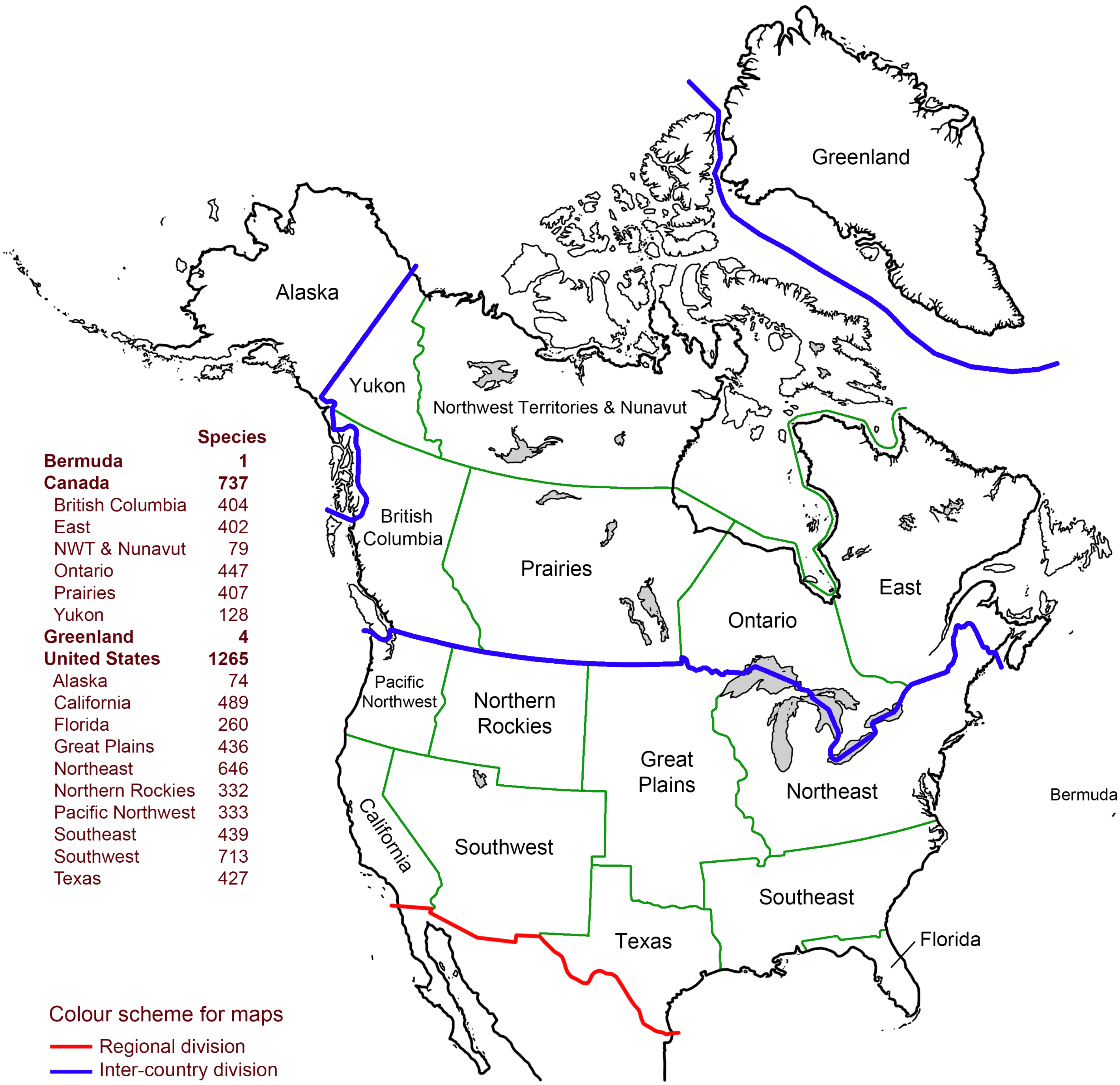
Appendix. World maps and species numbers.

Base maps, regions and countries follow O'Hara *et al*. (2020) and are explained in greater detail therein.

Map 1. Nearctic Region



	Species
Bermuda	**1**
Canada	**737**
British Columbia	404
East	402
NWT & Nunavut	79
Ontario	447
Prairies	407
Yukon	128
Greenland	**4**
United States	**1265**
Alaska	74
California	489
Florida	260
Great Plains	436
Northeast	646
Northern Rockies	332
Pacific Northwest	333
Southeast	439
Southwest	713
Texas	427

Map 2. Neotropical Region (Middle America)

Volcán Cacao, Area de Conservación Guanacaste (ACG)
(Photo: D.H. Janzen)

ACG is the site of the fastest growing inventory of Tachinidae in the world as part of a massive effort to rear and document the caterpillars and their parasitoids of this area (*e.g.*, Janzen & Hallwachs 2016). Fleming & Wood* and the ACG team doubled the number of described Tachinidae in Costa Rica since 2014 in an ongoing series of revisions based almost exclusively on ACG caterpillar-reared specimens (*e.g.*, Fleming *et al.* 2014, 2019; see also Smith *et al.*, 2007).

*D. Monty Wood, RIP; see obituaries by O'Hara *et al.* (2020) and Adler & Currie (2021).

Middle Amer. mainland	Species
Belize	1
Costa Rica	306
El Salvador	10
Guatemala	69
Honduras	25
Mexico	930
Nicaragua	19
Panama	108

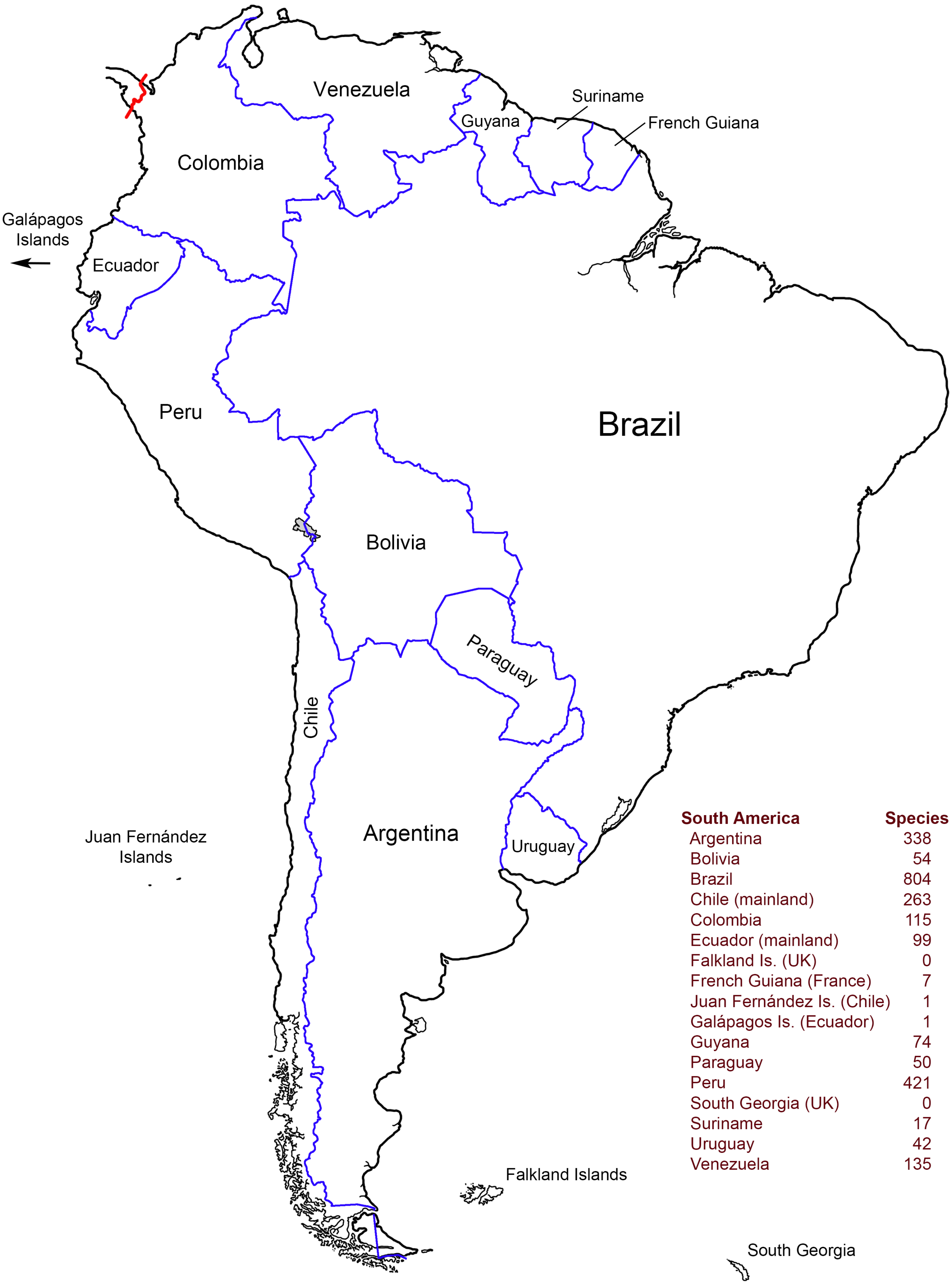
Greater Antilles	
Bahamas	5
Cayman Islands	0
Cuba	46
Dominican Republic	13
Haiti	10
Jamaica	62
Puerto Rico	75
Turks & Caicos	1

Southern Lesser Antilles	
17 Aruba	0
18 Blanquilla	0
19 Bonaire	0
20 Curaçao	0
21 Los Roques Arch.	0
21 Los Testigos	0
23 Margarita	0
24 Trinidad & Tobago	237

Eastern Lesser Antilles	
1 Anguilla	0
2 Antigua	2
3 Barbados	1
4 Dominica	3*
5 Grenada	1
6 Guadeloupe	6
7 Martinique	1
8 Montserrat	2
9 Saba	0
10 Saint-Barthélemy	0
11 Saint Kitts	0
12 Saint Lucia	0
13 Saint-Martin	0
14 Saint Vincent	13
15 Sint Eustatius	0
16 Virgin Islands	12

*This number is based on published records prior to the article by Wyatt & McAlister in this issue of *The Tachinid Times*.

Map 3. Neotropical Region (South America)



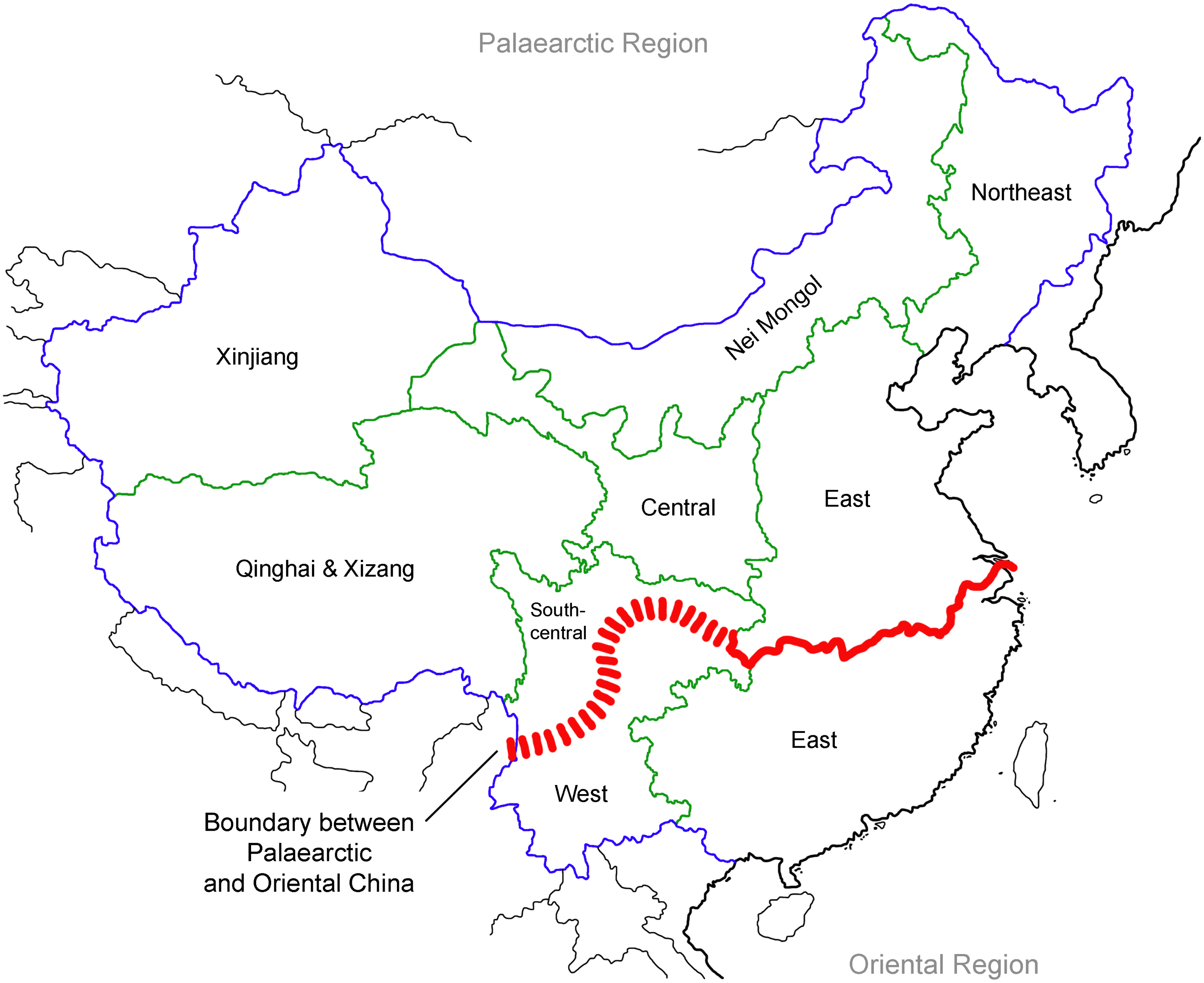
South America	Species
Argentina	338
Bolivia	54
Brazil	804
Chile (mainland)	263
Colombia	115
Ecuador (mainland)	99
Falkland Is. (UK)	0
French Guiana (France)	7
Juan Fernández Is. (Chile)	1
Galápagos Is. (Ecuador)	1
Guyana	74
Paraguay	50
Peru	421
South Georgia (UK)	0
Suriname	17
Uruguay	42
Venezuela	135

Map 4. Palaearctic Region

	Species
Central Asia	**316**
Kyrgyzstan	47
Tajikistan	135
Turkmenistan	114
Uzbekistan	85
Europe	**914**
Eastern Europe	**636**
Belarus	66
Czech Republic	471
Estonia	112
Hungary	446
Kal. Oblast' (Russia)	3
Latvia	81
Lithuania	173
Moldova	135
Poland	472
Romania	340
Slovakia	428
Ukraine	389
Scandinavia	**394**
Denmark	254
Finland	296
Iceland	0
Norway	232
Sweden	356
Southern Europe	**825**
Albania	67
Andorra	122
Bosnia & Herzegovina	93
Bulgaria	425
Corse (Corsica)	83
Croatia	306
Cyprus	44
Greece	367
Italy	663
Macedonia	92
Malta	65
Monaco	0
Montenegro	19
Portugal*	283
San Marino	0
Serbia	301
Slovenia	171
Spain**	509
Turkey	346
Western Europe	**718**
Austria	504
Belgium	282
Channel Islands	28
France***	614
Germany	507
Liechtenstein	15
Luxembourg	0
Netherlands	332
Switzerland	543
Japan	**546**
Hokkaidō	331
Honshū	460
Kyūshū	287
Shikoku	133
Kazakhstan	**120**
Korean Peninsula	**188**
North Korea	55
South Korea	158
Middle East	**454**
Afghanistan	9
Bahrain	0
Gaza Strip	0
Iran	267
Iraq	3
Israel	319
Jordan	2
Kuwait	0
Lebanon	12
"Palestine"	102
Qatar	0
Saudi Arabia	16
Syria	14
West Bank	0
Mongolia	**287**
North Africa	**210**
Algeria	59
Canary Islands	58
Egypt	68
Libya	1
Madeira (Portugal)	1
Morocco	64
Tunisia	40
Western Sahara	0
Russia	**855**
Eastern Siberia	392
Northern Far East	34
Southern Far East	494
Western Russia	481
Western Siberia	272
Transcaucasia	**426**
Armenia	70
Azerbaijan	74
Georgia	28

*including Azores, excluding Madeira, **excluding Canary Islands, ***excluding Corse (Corsica)

Map 5. Palaearctic and Oriental China



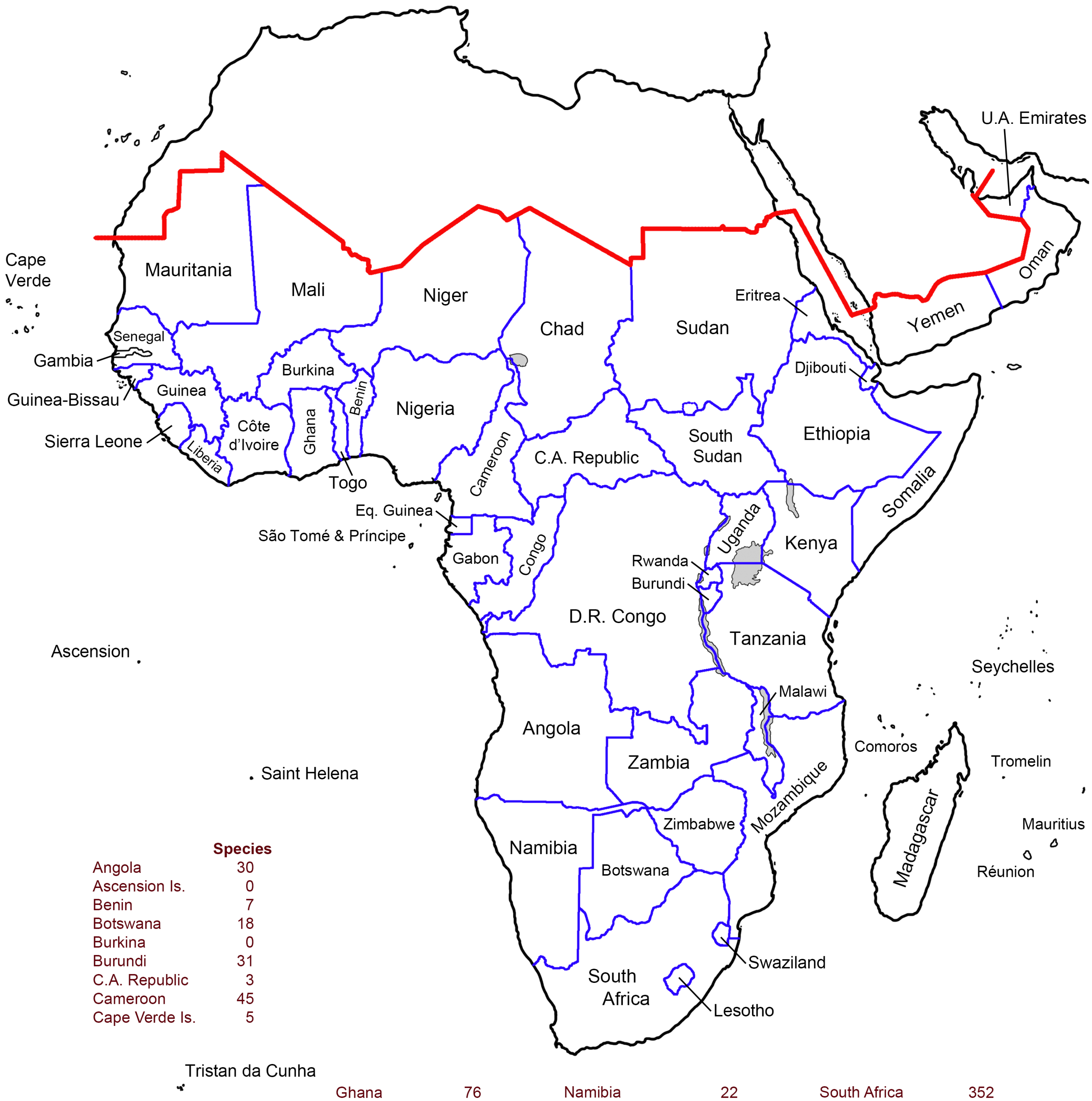
	Species
China (all)	**1219**
Palaearctic China	**1033**
Central	333
East	517
"NE China"	4
Nei Mongol	270
Northeast	481
Qinghai & Xizang	329
South-central	417
Xinjiang	160

Oriental China	**675**
East	500
West	424

East: Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hong Kong, Hunan, Jiangxi, Macau, Shanghai, Zhejiang.
West: southern portions of Chongqing and Sichuan, all of Yunnan except for extreme northwestern (Palaearctic) part.

Central: Gansu, Ningxia, Shaanxi.
East: Anhui, Beijing, Hebei, Henan, Hubei, Jiangsu, Shandong. Shanxi, Tianjin.
"NE China": species recorded from northeastern China for which no further distributional information is available.
Northeast: Heilongjiang, Jilin, Liaoning.
South-central: northern parts of Sichuan and Chongqing and extreme northwestern part of Yunnan.

Map 6. Afrotropical Region



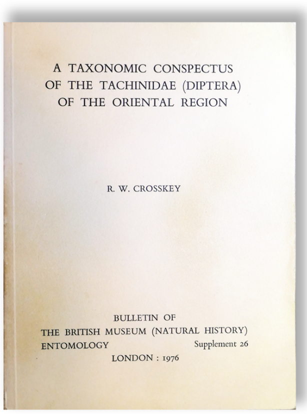
	Species
Angola	30
Ascension Is.	0
Benin	7
Botswana	18
Burkina	0
Burundi	31
C.A. Republic	3
Cameroon	45
Cape Verde Is.	5
Chad	0
Comoros Is.	0
Congo	4
Côte d'Ivoire	12
Djibouti	3
D.R. Congo	364
Eq. Guinea	4
Eritrea	19
Ethiopia	54
Gabon	2
Gambia	1
Ghana	76
Guinea	11
Guinea-Bissau	0
Kenya	181
Lesotho	5
Liberia	5
Madagascar	206
Malawi	126
Mali	3
Mauritania	0
Mauritius Is.	15
Mozambique	45
Namibia	22
Niger	0
Nigeria	143
Oman	0
Réunion Is.	7
Rwanda	54
Saint Helena Is.	2
São Tomé & Principe	1
Senegal	24
Seychelles Is.	9
Sierra Leone	52
Somalia	4
South Africa	352
Sudan & S. Sudan	42
Swaziland	1
Tanzania	197
Togo	2
Tristan da Cunha Is.	0
Tromelin Is.	0
U.A. Emirates	31
Uganda	220
Yemen	64
Zambia	25
Zimbabwe	129

Map 7. Oriental Region (eastern portion)

	Species		
Cambodia	**0**	**Laos**	**15**
Christmas & Cocos Is.	**0**	**Malaysia**	**219**
Indonesia (all)	**293**	East Malaysia	79
Indonesia (Oriental part)	**219**	Peninsular Malaysia	170
Borneo	11	**Myanmar** (Burma)	**115**
Jawa (Java)	104	**Philippines**	**104**
Lesser Sunda Is.	9	**Singapore**	**11**
Sulawesi	40	**Thailand**	76
Sumatera (Sumatra)	108	**Vietnam**	36
Japan (Oriental part)	**76**		
Ryukyu Is.	76		

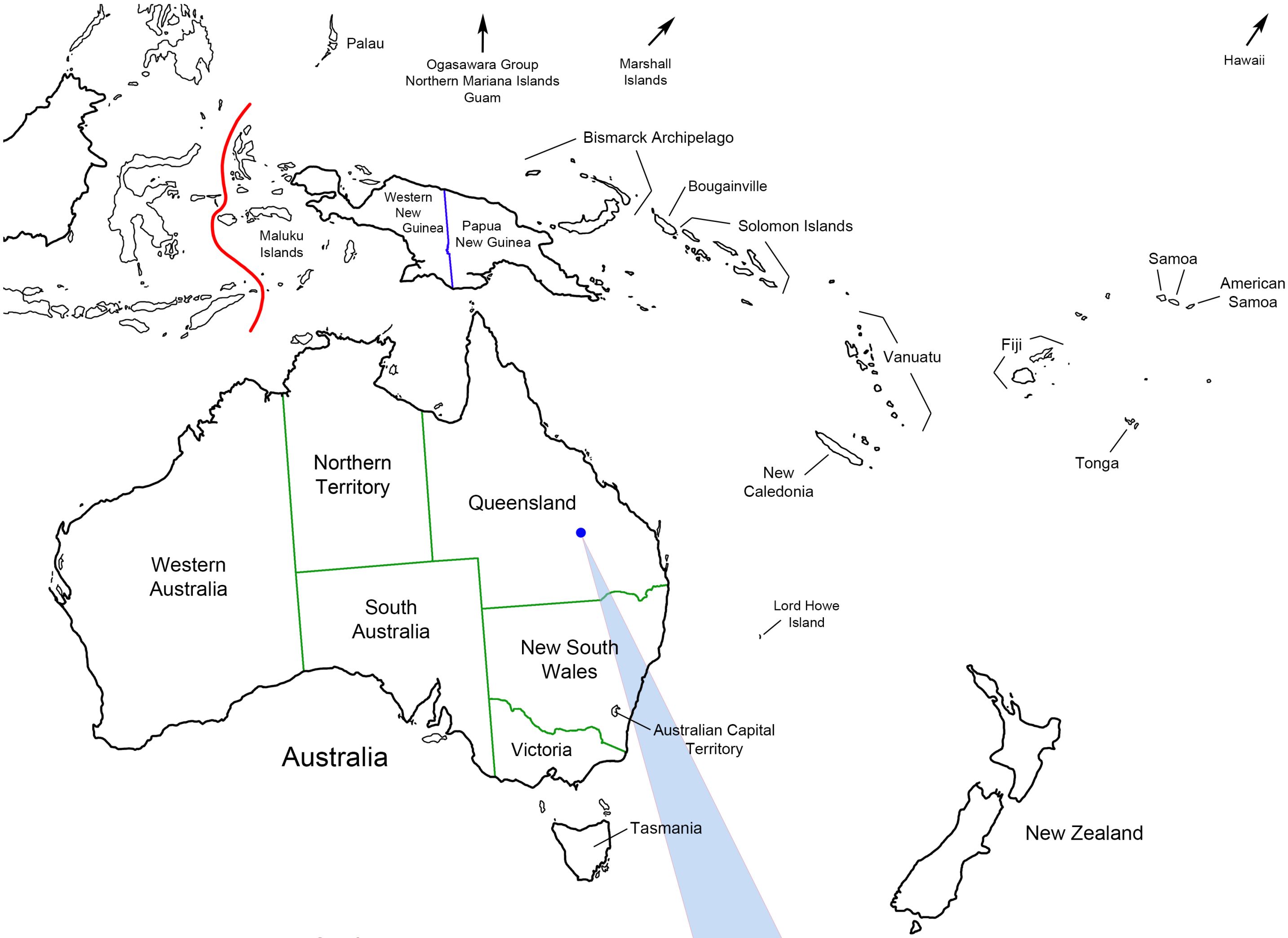
Map 8. Oriental Region (Indian subcontinent)

	Species
Andaman & Nicobar Is.	**0**
Bangladesh	8
Bhutan	**4**
India	**233**
Central	91
North	90
Northeast	52
Northwest	51
West	34
Maldives etc.	**1**
Nepal	**79**
Pakistan	**35**
Sri Lanka	**62**



Tachinid classification has changed significantly since Roger Crosskey's (1976) comprehensive conspectus of the Oriental Tachinidae but it continues to be the primary source of information on the tachinid fauna of this region.

Map 9. Australasian and Oceanian Regions



	Species
American Samoa	**5**
Australia	**534**
Australian Capital Territory	123
New South Wales	289
Northern Territory	56
Queensland	270
South Australia	82
Tasmania	121
Victoria	113
Western Australia	129
Bougainville	**9**
Easter Island	**1**
Fiji	**26**
Guam	**3**
Hawaii	**14**
Indonesia (Australasian)	**90**
Maluku Islands	68
Western New Guinea	30
Lord Howe Island	**5**
Marshall Islands	**0**
New Caledonia	**25**
New Zealand	**129**
Northern Mariana Is.	**1**
Ogasawara Group	**0**
Palau	**1**
Papua New Guinea	**121**
Bismarck Archipelago	26
Papua New Guinea	97
Samoa	**10**
Solomon Islands	**43**
Tonga	**4**
Vanuatu	**6**

John Stireman hilltopping for tachinids on “Fly Hill” in Carnarvon N.P., Australia, December 2013. This is recognized as a world hotspot for tachinid diversity (e.g., O’Hara *et al.* 2014). (Photo: J.E. O’Hara)

Tachinidae (Diptera) from Dominica (West Indies)

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Dominica is a small island in the eastern Caribbean (Fig. 2) about halfway between Puerto Rica and Trinidad in the Lesser Antilles (ca. 15°N 61°W). It is approximately 47 kms long and 26 kms wide with a total area of 75 sq. kms. The population of about 71,000 is relatively small compared to that of its nearest neighbours, Guadeloupe to the north and Martinique to the south. Most of the population live along the coast, and the capital of Roseau is on the southwest side at the mouth of the Roseau River.

The interior of Dominica is mountainous, the highest peak being Mount Diablotins at 1,447 m. The island is volcanic in origin with some volcanoes still active though rarely erupting, and has other associated features such as fumaroles and hot springs. The mountains are still extensively covered with tropical rain forest, more so than on other islands in the Lesser Antilles group. The island has a tropical maritime climate, with temperatures in Roseau averaging from 22°C in mid-winter to 31°C in mid-summer. Annual rainfall is high, with about 200 cm along the west coast, 250 cm along the east coast, and 500 cm or more in the mountains. The wet season lasts from June to December, sometimes with tropical storms including occasional hurricanes, and the driest months are between February and April.

Erica (Fig. 1) has been making annual visits to Dominica since 2015 as a participant in a series of Operation Wallacea biodiversity research expeditions, collecting many thousands of insects, particularly Diptera, though not surprisingly no visits have been possible since 2019 due to the Covid-19 pandemic. The visits were mostly made during June and July. Among the Diptera collected, 127 specimens representing 37 species of Tachinidae have been identified and are reviewed below. Given that virtually no previous records exist of the family from Dominica, this means that nearly all these species are recorded from the country for the first time. Only two three species have been recorded: *Eucelatoria* *dominica* Sabrosky (Sabrosky, 1981) (described from Dominica and possibly endemic), *Cylindromyia uniformis* Aldrich (Aldrich, 1926) (described from Mexico and Dominica and later recorded by Guimarães (1976) as widely distributed throughout Middle America), and *Trichopoda eupilipes* Dios & Nihei (Dios & Nihei, 2020) (described from; Dominica, Dominican Republic, Haiti and Montserrat). Given that so little is known about tachinids of this island, the present findings seemed well worth publishing.

Generally, the tachinid fauna of the West Indies is still quite poorly known with currently 395 species recorded from the area (J.E. O'Hara, pers. comm.). Many of these are known mainly from the series of detailed studies on *The Tachinids of Trinidad* by W.R. Thompson during the 1960s. Other islands such as Jamaica and Puerto Rico are relatively well studied but many of the other islands have few if any records. Most of the few records from the eastern Lesser Antilles date back to Williston's (1896) study of the Diptera of St. Vincent.

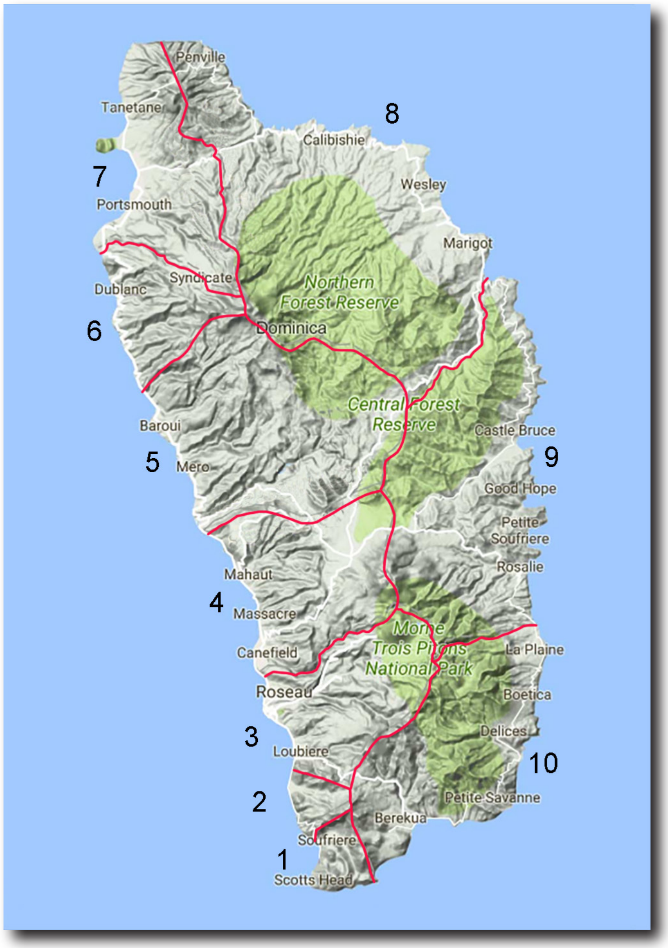

Figure 2. Topographic map of Dominica (image from Google Maps©).

The ten parishes have been delimited by red lines and numbered as follows:
1. Saint Mark.
2. Saint Luke.
3. Saint George.
4. Saint Paul.
5. Saint Joseph.
6. Saint Peter.
7. Saint John.
8. Saint Andrew.
9. Saint David.
10. Saint Patrick.

Materials and Methods

Dominica is divided into ten parishes, each extending from the coast inland to the mountainous interior (Fig. 2). The main localities where tachinids were collected were in the following four parishes:

- St David Parish: Castle Bruce (July/August 2015, June 2016, June 2017) on the east coast and 3 Rivers Eco Lodge (June 2018) a little further south and inland in the rainforest of the Rosalie River valley;
- St Mark Parish: Soufriere area (June 2016, June 2017) in the far southwest of the island;
- St Paul Parish: Pont Cassé, especially D-Smart Farm, among the forested hills in the central part of the island; and
- St Peter Parish: the Syndicate Forest of Morne Diablotin National Park during June 2018, an area well inland in the northwestern part of the island.

Other sites included Cabrits National Park, a coastal promontory in the northwest in St John Parish, in the Roseau River valley near the coast, at Freshwater Lake well inland in St George Parish, and along the Layou River valley in the southwestern part of St Joseph Parish.

Most of these specimens were collected by sweep-netting, others caught in Malaise traps (Fig. 3), and a few were caught by light-trapping. Those specimens which were swept or light-trapped were preserved dry and pinned, while those from Malaise traps were preserved in 100% ethanol but were later critical point dried and pinned for easier identification.

Collecting permits were issued by the Forestry, Wildlife and Parks Division in Dominica (e-mail: forestry@cwdom.dm), for this a detailed inventory had to be provided of the groups which were to be collected, an estimate of how many specimens were to be collected, and an explanation of why collecting them was necessary. Some of the specimens are to be returned to Dominica but records of the specimens collected, including images, are to be made available for all to access.

Figure 3. Two Malaise traps in the forest of 3 Rivers Eco Lodge. This area was more consistently monitored than other parts of Dominica.

Identifications were made by Nigel with specimens initially identified to genus using the keys by Wood (1987) and Wood & Zumbado (2010) and then compared with identified material in the NHMUK (Natural History Museum, London, United Kingdom) collection. In most cases the available keys for West Indian tachinids were of little use for identification of the species found here except for some small groups such as Eucelatoria (Sabrosky, 1981); and although Thompson's keys to Trinidadian species are much more comprehensive few of the species covered by them were found in Dominica, probably due to that island's proximity to the South American mainland to which its fauna is more closely related, with a greater diversity of species. The NHMUK collection has small numbers of tachinids from several of the West Indian islands including a few type specimens described by Curran and by Walker from Jamaica, and by Williston from St. Vincent. There are rather more specimens from Trinidad & Tobago though several of these have not yet been identified to species. Many of the tachinids from Dominica could not be positively identified to species and some of them are undoubtedly new to science.

Collecting localities and dates of collection will be given in a future publication in which the species listed here will be reviewed in more detail and new species described.

Tachinidae identified from Dominica

The classification of Tachinidae and cited distributions follow O'Hara *et al*. (2020).

DEXIINAE

DEXIINI

1. *Ptilodexia sororia* (Williston, 1896) (Described from St. Vincent)
Two females collected in June 2016, one swept and the other caught in a Malaise trap, from the Pont Cassé area in St Paul Parish. This species is probably endemic to the West Indies, previously recorded from St. Vincent, Jamaica and Puerto Rico.

EPIGRIMYIINI

2. *Beskia aelops* (Walker, 1849) (United States)
One male swept at D-Smart Farm, St Paul Parish, in June 2016. A distinctive and widespread New World species occurring throughout the Americas and previously recorded in the West Indies from St. Vincent, Puerto Rico and Dominican Republic.

VORIINI

3. *Meleterus nuperus* Reinhard, 1956 (United States) (Fig. 4a)
One female collected by light trap in forest at Pont Cassé in June 2016. This species was previously only recorded from the Nearctic Region.

4. *Spathidexia antillensis* Arnaud, 1960 (Puerto Rico) (Fig. 4b)
Several in Malaise trap samples, collected in St Paul Parish in June 2017, St David Parish in July 2018, and St Peter Parish in July 2019. Probably endemic to the West Indies, previously recorded from Cuba and Puerto Rico.

EXORISTINAE

BLONDELIINI

5. *Admontia* sp. cf. *nasoni* Coquillett, 1895
One female caught by light trap in forest at Pont Cassé in June 2016. It is quite similar to *A. nasoni* which is a Nearctic species described from northeastern United States but has a very narrow parafacial and the postpedicel of the antenna is very narrow and elongate and is extensively orange at the base. The only *Admontia* species previously recorded from the West Indies is *A. nigrita* Thompson, 1968 described from the island of Trinidad in Trinidad & Tobago (Thompson, 1968).

6. *Eucelatoria bigeminata* (Curran, 1927) (Virgin Islands)
Single specimens swept from riverside vegetation from four localities in St David Parish and St Joseph Parish in July 2015. It is otherwise known from southeastern United States, Mexico and other parts of the West Indies (Cuba, Puerto Rico, St. Vincent, Trinidad & Tobago, and Virgin Islands).

7. *Eucelatoria dominica* Sabrosky, 1981 (Dominica)
One male and one female caught by light trap at D-Smart Farm in St Paul Parish in June 2016 and a female swept from riverside vegetation in St David Parish in July 2015. Previously only known from the series of four males collected in the Layou Valley from which Sabrosky (1981) originally described this species.

8. *Eucelatoria ?carinata* (Curran, 1926)
A male and female swept from riverside vegetation in St Joseph Parish and another female caught in a light trap in forest near Pont Cassé in St Paul Parish. *Eucelatoria carinata* is a small species with no red on the abdomen and with median discal setae on tergites 3 to 5, and previously only known from the type locality in Jamaica (Curran, 1926).

9. *Lixophaga* sp.

One male caught in a light trap at 3 Rivers Eco Lodge, St David Parish in June 2018. Fourteen species of this large and mostly New World genus have been recorded from the West Indies, though most of these only from Trinidad & Tobago apart from two species described by Curran (1926) from Jamaica and the more widespread *L. diatraeae* (Townsend, 1916).

10. *Medina* sp.

One female swept at Syndicate Forest in St Peter Parish in June 2018. The small size (4 mm long) and modified terminalia are typical of *Medina*, a genus previously unrecorded from the West Indies.

11. *Myiopharus ?calyptratus* (Williston, 1896) (Fig. 4c)

Two females, both swept, one at Scott's Head, St Mark Parish, in June 2017 and the other at 3 Rivers Eco Lodge in St David Parish in June 2018. Described from St. Vincent by Williston (1896), and otherwise previously not recorded from anywhere else. After comparison with the female paralectotype of *M. calyptratus* in the NHMUK it seems likely that the Dominican specimens are conspecific. *Myiopharus* is a large New World blondeliine genus, with seven species previously recorded from the West Indies (mostly Trinidad & Tobago), including one from the eastern Antilles (*M. floridensis* (Townsend, 1892), Virgin Islands).

12. *Pseudoredtenbacheria* sp. (Fig. 4d)

One female swept from riverside vegetation in St David Parish in August 2015. It seems to differ from the three described species in this small Neotropical genus both by the more elongated postpedicel of the antenna and the reduced extent of yellow on the legs. The described species include two from Mexico and one from Brazil and the genus has not been previously recorded from the West Indies.

13. *Vibrissina* sp.

Four females caught in a Malaise trap at D-Smart Farm, St Paul Parish, in June 2016. A very small species with body length approximately 3.5 mm, and it shows typical characters of the genus such as setulose parafacial, ventrally keeled abdomen, and the basal depression on the abdomen extends to the hind margin of syntergite 1+2. *Vibrissina* is a mainly New World genus, especially Central America, but has not previously been recorded from the West Indies.

14. *Zaira* sp. cf. *angustifrons* (Reinhard, 1930)

One of the most common and widespread species collected in Dominica. Fifteen specimens were collected, most of which were swept but one male and two females were light-trapped. It is apparently very similar to *Z. angustifrons*, which has been recorded from the southern United States (Texas, Florida) and Cuba, but the abdomen and legs are almost entirely dark. Similar specimens are in the NHMUK from other islands in the Lesser Antilles (St. Vincent and St. Lucia).

ERYCIINI

15. *Drino rhoeo* (Walker, 1849) (Country of type locality unknown)

One female of this fairly widespread New World species collected in a Malaise trap at D-Smart Farm, St Paul Parish, in June 2016.

16. *Lespesia thompsoni* O'Hara & Wood, 2021 (Trinidad & Tobago) (Fig. 4e)

This species was formerly known as *Sturmiopsoidea obscura* Thompson, 1966 (O'Hara *et al*. 2020) but was moved to *Lespesia* in O'Hara *et al*. (2021) and renamed *thompsoni* because *obscura* was a junior secondary homonym in that genus. One male collected in a light trap at Rodney's Wellness Retreat in St Mark Parish in June 2016, and a female swept at 3 Rivers Eco Lodge in June 2018. Apparently conspecific with a series of reared specimens (from larvae and pupae of the pierid butterfly, *Ascia monuste*) from St. Kitts in the NHMUK identified by Monty Wood as "*Lespesia obscura*", a then unpublished combination. These specimens do show characters of *Lespesia* including the "comb" of anterodorsal setae on the hind tibia, four katepisternals and setae extending almost halfway up the facial ridge. The species was otherwise only known from the type locality in Trinidad & Tobago.

17. *Lespesia* sp. (Fig. 4f)
A female caught in a light trap at D-Smart Farm in St Paul Parish in June 2016 with an elongated tergite 5 (about 1.5 times the length of tergite 4), and weak ocellars. An older male specimen from Dominica collected by E.P. Becher in the NHMUK collection also has weak ocellars and may be the same species but is in poor condition with most of the abdomen missing. *Lespesia* is a fairly large and mostly New World genus, with 15 species previously recorded from the West Indies.

GONIINI
18. *Belvosia bicincta* Robineau-Desvoidy, 1830 (United States)
One female hand-caught at night at D-Smart Farm in St Paul Parish in June 2016. This is a widespread Neotropical species, also known from southern United States.

19. *Houghia* sp.
One female swept from riverside vegetation in St David Parish in July 2015. A species with wing vein R_1 setose. Fleming *et al*. (2014) described only four species with this character out of the 35 species in this genus they recorded from Costa Rica. They also synonymized several genera with *Houghia* which as result is now quite a large genus containing nearly 70 species. The genus is only previously known in the West Indies from Trinidad & Tobago.

20. *Hyphantrophaga* sp. cf. *blandoides* (Thompson, 1963) (Fig. 5a)
Two females swept from riverside vegetation in St David Parish in August 2015, a male caught in a light trap in St Mark Parish in June 2016, and two females caught in a Malaise trap at D-Smart Farm in St Paul Parish also in June 2016. Six species of the genus have previously been recorded from the West Indies.

21. *Leschenaultia* sp. (Fig. 5b)
One female somewhat resembling *L. cilipes* (Robineau-Desvoidy, 1830) caught in a Malaise trap at D-Smart Farm in St Paul Parish in June 2016. *Leschenaultia cilipes* is a widespread Neotropical species which has been recorded in the West Indies from Cuba, Dominican Republic and Puerto Rico.

22. *Prospherysa* sp. (Fig. 5c)
There is some doubt as to whether this species belongs in *Prospherysa*. Although it shows many characters typical of this genus including facial ridge setose on most of its height, eye bare, abdomen with discals, and no genal dilation. The head in profile is strongly receding, being much narrower at the level of the epistoma than at the level of the antennal base, the ocellars are weak, and it is a generally dark species lacking any red on the tip of the abdomen or on the legs, unlike many other *Prospherysa* species. Four males were caught singly at four localities in St David, St Mark and St Paul Parishes, in June 2016 and June 2017. A small mostly New World genus not previously recorded from the West Indies.

23. *Pseudochaeta ?syngamiae* Thompson, 1964
One male caught in a light trap at 3 Rivers Eco Lodge, St David Parish in June 2018. It is most likely either *P. syngamiae* or *P. nitens* Thompson, 1964, both described from Trinidad by Thompson (1964) but only distinguishable using male genitalia characters. This genus only previously known in West Indies from Trinidad & Tobago.

WINTHEMIINI
24. *Winthemia* sp. nr. *sexualis* Curran, 1927
Two females, one collected at St George Parish in July 2015 and the other at D-Smart Farm in St Paul Parish during June 2016. There are two males in the NHMUK from Barbados which are probably conspecific with the Dominica females and have hair patches on the ventral surfaces of tergites 4 and 5 but are not *W. okefenokeensis* Smith, 1916 as the front tarsi are not widened. Both males from Barbados are reared, from *Trichoplusia* sp. (Noctuidae) and *Anomis illita* (Erebidae).

PHASIINAE

GYMNOSOMINI

25. *Gymnoclytia* sp. nr. *immaculata* (Macquart, 1843) (Fig. 5d)

Two males swept at Sunrise Farm, St David Parish in June 2016 and one female from Springfield Centre in St Paul Parish in July 2015. *Gymnoclytia immaculata* is a mostly Nearctic species, in West Indies only recorded from Jamaica.

STRONGYGASTRINI

26. *Strongygaster triangulifera* (Loew, 1863) (United States)

A widely distributed species in the Americas but genus previously unrecorded from West Indies. One male swept on the Waikutubuli Trail in St Peter Parish during July 2018.

TACHININAE

GRAPHOGASTRINI

27. *Phytomyptera* sp. A (Fig. 5e)

This species is distinguished by a setose R_1, and the males having a large triangular postpedicel and extensive yellowish colour on the abdomen. Two males were light trapped at Pont Cassé in St Paul Parish in June 2016, two males were caught in a Malaise trap in St John Parish in July 2019, and three more individuals were caught by Malaise trap in St Paul Parish, including two males in June 2016 and a female in June 2017.

28. *Phytomyptera* sp. B (Fig. 5f)

A very small (body length 2 mm) and entirely dark species. Five males and two females were caught in a Malaise trap in St John Parish in July 2019, two males caught in a Malaise trap in St Paul Parish in June 2017 and one female swept at Freshwater Lake in St George Parish in June 2018.

29. *Phytomyptera* sp. C

Another dark species, but almost twice the size of the previous species. Three females collected: two caught by Malaise trap in St Paul Parish in June 2016, and the other swept in St Peter Parish in June 2018. It would be interesting to find males of this species as a similar looking undescribed species from Trinidad has males with a bifurcate postpedicel.

30. *Phytomyptera* sp. D

A somewhat aberrant *Phytomyptera* as the node of R_{4+5} has two or three small setae rather than a single strong seta. R_1 is setose on its apical third and the subcostal cell has a grey stigma. Two females caught in Malaise traps in St Paul Parish, in June 2016 and June 2017.

31. *Phytomyptera* sp. E

Another somewhat aberrant *Phytomyptera*, very small (body length 2 mm) and with R_{4+5} petiolate. Three males caught in a Malaise trap in St John Parish in July 2019.

32. *Phytomyptera* sp. F

Three females caught in a Malaise trap at 3 Rivers Eco Lodge, St Paul Parish in June 2017. A larger species quite similar to sp. B but the palpus is dark brown instead of yellow.

LESKIINI

33. *Crocinosoma* ?*cornuale* Reinhard, 1947

All collected at Syndicate Forest, St Peter Parish in 2018 with one female swept in June and two males caught in a Malaise trap in July. *Crocinosoma cornuale* is known from the United States to Costa Rica but has not been recorded from the West Indies.

34. *Crocinosoma* sp. A

A smaller, darker species than *C. cornuale*. A male was collected in a pan trap at 3 Rivers Eco Lodge in June 2018, and this species was quite numerous in Malaise trap samples from D-Smartfarm and 3 Rivers Ecolodge in St Paul Parish.

MINTHOINI

35. *Actinochaeta* sp.

Two female specimens collected in Malaise traps in St Paul Parish during June 2016 and June 2017. Four species of this genus have been described but this is the first record of it from the West Indies, the others only known from South and Central America, three of them described from Brazil.

36. *Paradidyma* sp. nr. *rufopalpus* (Curran, 1926)

This species resembles *P. rufopalpus*, which is only known from Jamaica. Two other species of *Paradidyma* are known from the West Indies, one also from Jamaica and the other from St. Vincent. In Dominica it appears to be widely scattered, on east coast and in hills. Five specimens were swept in June 2016 and June 2018, but two males were collected in Malaise traps in St Paul Parish during June 2016 and June 2017.

TACHININI

37. *Archytas basifulvus* (Walker, 1849) (Jamaica)

An apparently widespread Neotropical species, in the West Indies known from the Greater Antilles and Trinidad & Tobago. A female was swept in St Joseph Parish in July 2018.

Conclusions

These results show that there is much still to be discovered about the Caribbean fauna of Tachinidae, with 37 species collected from an island where only three species had previously been recorded. These specimens were mostly collected during June and July so there must be a possibility that there are yet more species to be discovered which fly at other times of the year. A study currently in preparation on the Muscidae collected on these field trips to Dominica resulted in the discovery of at least 10 undescribed species, many of which are probably endemic to Dominica or more widely in the West Indies. More detailed information on the Tachinidae of Dominica is to be published in a paper currently in preparation, including descriptions of new species.

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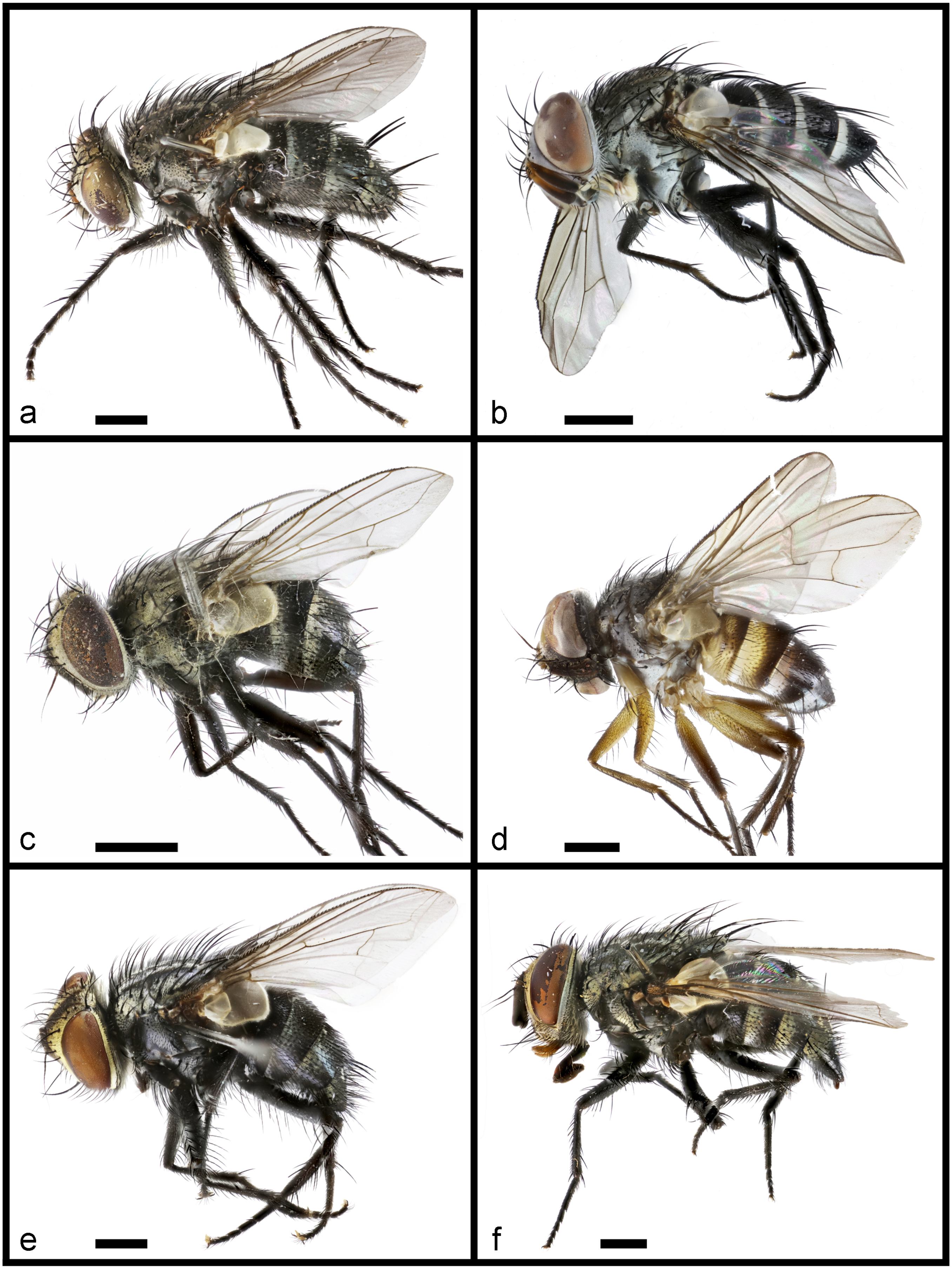

Figure 4. **a**. *Meleterus nuperus* Reinhard (Dexiinae, Voriini). **b**. *Spathidexia antillensis* Arnaud (Dexiinae, Voriini). **c**. *Myiopharus ?calyptratus* (Williston) (Exoristinae, Blondeliini). **d**. *Pseudoredtenbacheria* sp. (Exoristinae, Blondeliini). **e**. *Lespesia thompsoni* O'Hara & Wood (Exoristinae, Eryciini). **f**. *Lespesia* sp. (Exoristinae, Eryciini). Scale bars = 1.0 mm.

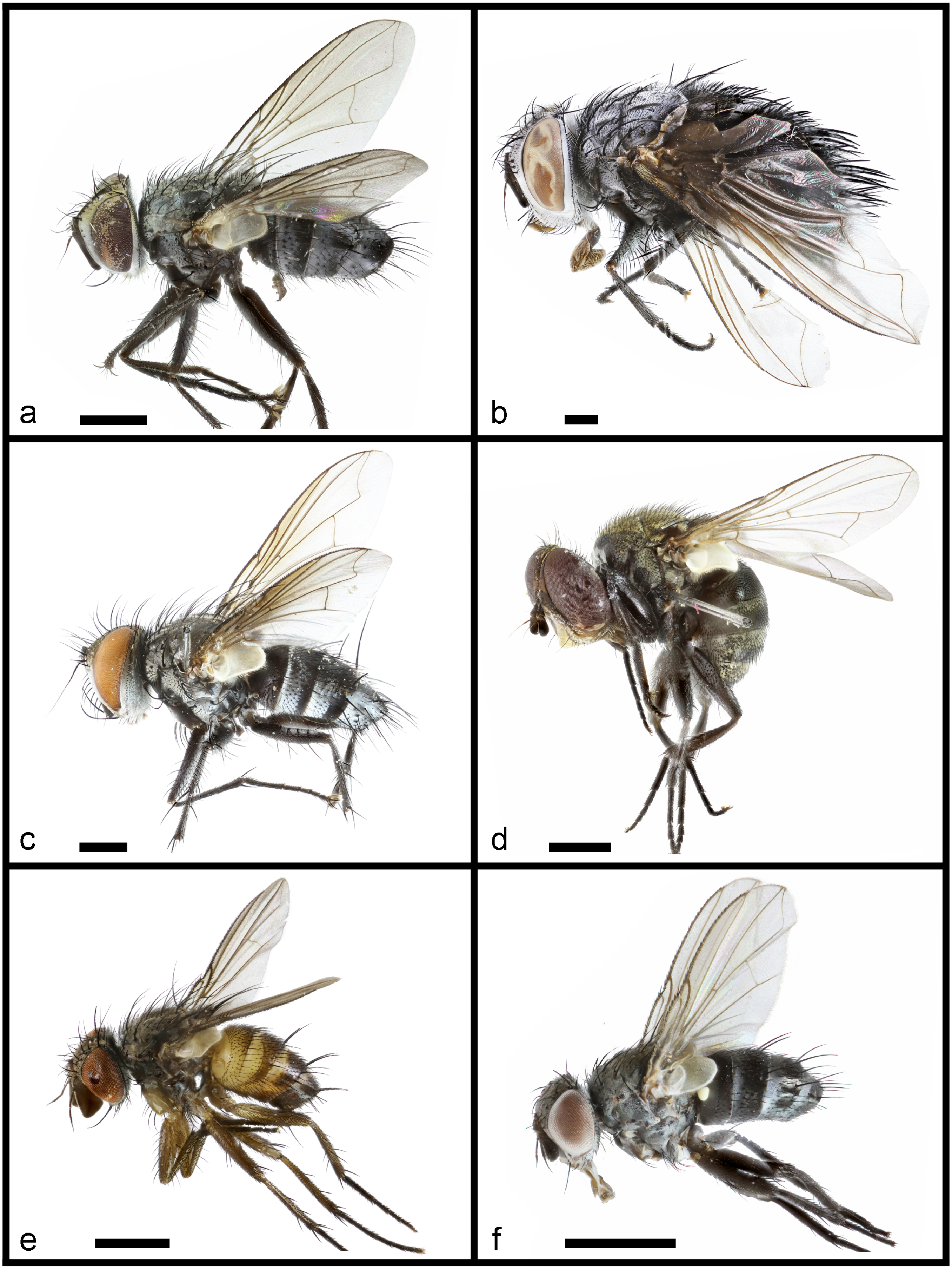

Figure 5. **a**. *Hyphantrophaga* sp. cf. *blandoides* (Thompson) (Exoristinae, Goniini). **b**. *Leschenaultia* sp. (Exoristinae, Goniini). **c**. *Prospherysa* sp. (Exoristinae, Goniini). **d**. *Gymnoclytia* sp. nr. *immaculata* (Macquart) (Phasiinae, Gymnosomini). **e**. *Phytomyptera* sp. A (Tachininae, Graphogastrini). **f**. *Phytomyptera* sp. B (Tachininae, Graphogastrini). Scale bars = 1.0 mm.

Figure 1. The rearing container.

A serendipitous rearing of *Belvosia argentifrons* Aldrich (Diptera: Tachinidae)

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In late September of 2020, a student brought me a huge caterpillar to show to my entomology class (Fig. 2a). I recognized it as the larva of the imperial moth, *Eacles imperialis* (Drury, 1773), a species of Saturniidae that is widely distributed in the eastern United States. He had found it in a bucket of water near the Northern Kentucky University Research and Education Field Station (REFS) located near Melbourne, Kentucky on the banks of the Ohio River (39°02′14″N 84°22′21″W, Fig. 2b). The area is covered with a fairly thick floodplain hardwood forest. Thinking that the caterpillar was dead, he placed it in a refrigerator for a day before dropping it off to me while I was teaching my class. After holding the caterpillar for a few minutes, the warmth of my hand brought it back to life, to the amazement of my class.

I have raised imperial moths for fun over the years, but the caterpillars were always bright green. This was the first time that I had seen one of the brown morphs of the caterpillars. Apparently, they come in a variety of colors from green to brown to burgundy. There was no obvious indication that the caterpillar was parasitized. I decided to raise the caterpillar and see if the brown caterpillar produced a different patterned adult than the green caterpillars I have raised in the past. I placed it in a large peanut butter jar (3 lb or 1.36 kg, Fig. 1) with dirt on the bottom and some dead leaves. I loosely placed the lid on the jar, which was a mistake. The caterpillar climbed up, pushed the lid off the jar and escaped into our dining room during the first night. My wife was very unhappy, but I found our little house guest, returned it to the jar and promised to not let it escape again. Within a couple of days, it had burrowed under the loose soil to pupate.

I placed the jar on a shelf in my garage in Cincinnati, OH so that it would stay near the temperature of the outdoors, but not too cold on the really cold winter days. I had hoped that it would emerge when other members of its species emerged to give it a chance to reproduce. The winter passed and no moth appeared. I thought that the moth had died but I did not throw the rearing container away. Then on 20 June 2021, I walked by the jar and movement caught my eye. It was not the imperial moth I expected. A large tachinid was sitting inside (Fig. 3a)!

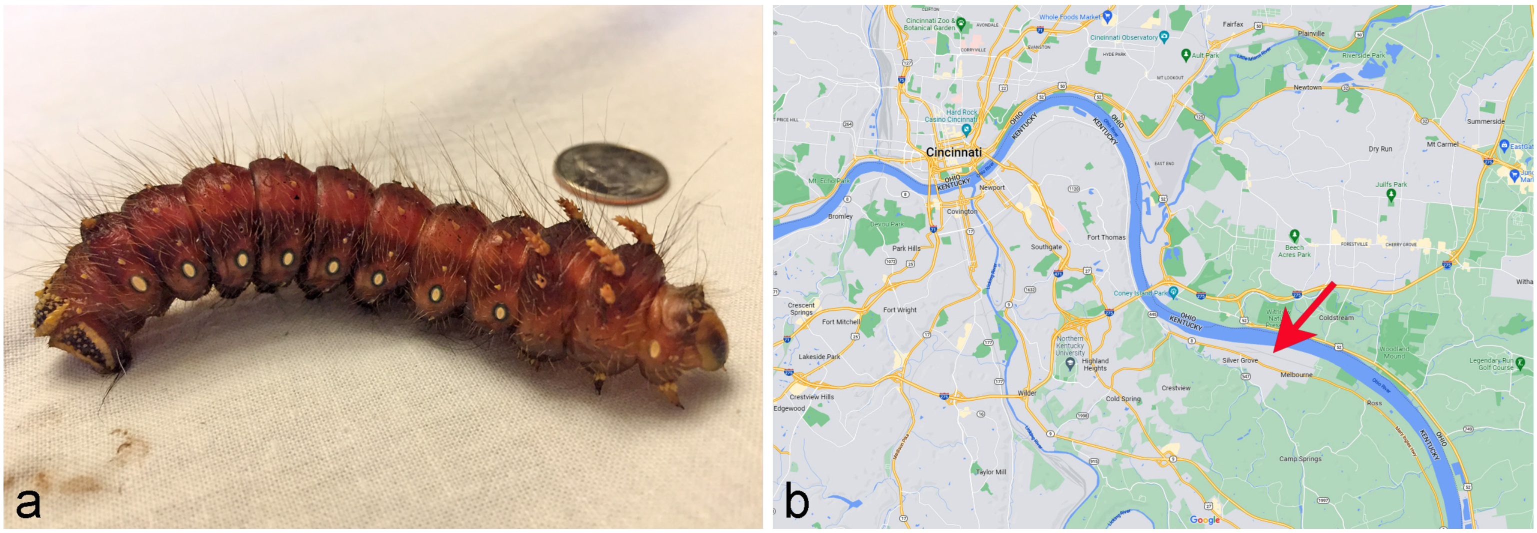

Figure 2. **a**. Parasitized imperial moth caterpillar with American quarter for scale. **b**. Google Maps© view of where caterpillar was collected (arrow) near Melbourne, Kentucky, USA.

When I emptied the jar, I found that five big *Belvosia* had emerged! I dissected the imperial moth pupa and found the five tachinid puparial casings (one in Fig. 4g–h) along with five more puparia that had not matured. I put the remaining puparia in a dry container just in case they were still alive, but I didn't have high hopes. All puparia were located in the thorax/head area of the pupa in a single mass. The flies all emerged from one hole on the side of the head area of the moth pupa (Fig. 3b–d). While the thorax was filled with puparia in a very thick matrix, the abdomen was empty of flies and was filled with fairly liquid and gooey abdominal remains. Within two days, three more adults emerged from the leftover puparia, although one was deformed (remaining teneral with wings that did not spread and the ptilinum expanded). The deformed one came out first. I thought maybe the other puparia needed a little more moisture, so I put them on a damp paper towel. Shortly after, there were two new (and perfectly formed) flies in the box. This serendipitous rearing yielded a total of 10 puparia. Eight flies emerged as adults and two did not. There were five males and three females (one shown in Fig. 4a–f).

I identified the adult flies as *Belvosia argentifrons* Aldrich using the key provided in Aldrich's (1928) revision. What started out as a half-hearted rearing of a moth turned into an unexpected adventure in fly rearing. This appears to be a new host record for this beautiful fly. There is one previous record of it being reared from a regal moth, *Citheronia regalis* (Fabricius) (Saturniidae), in Florida (Peigler 1996).

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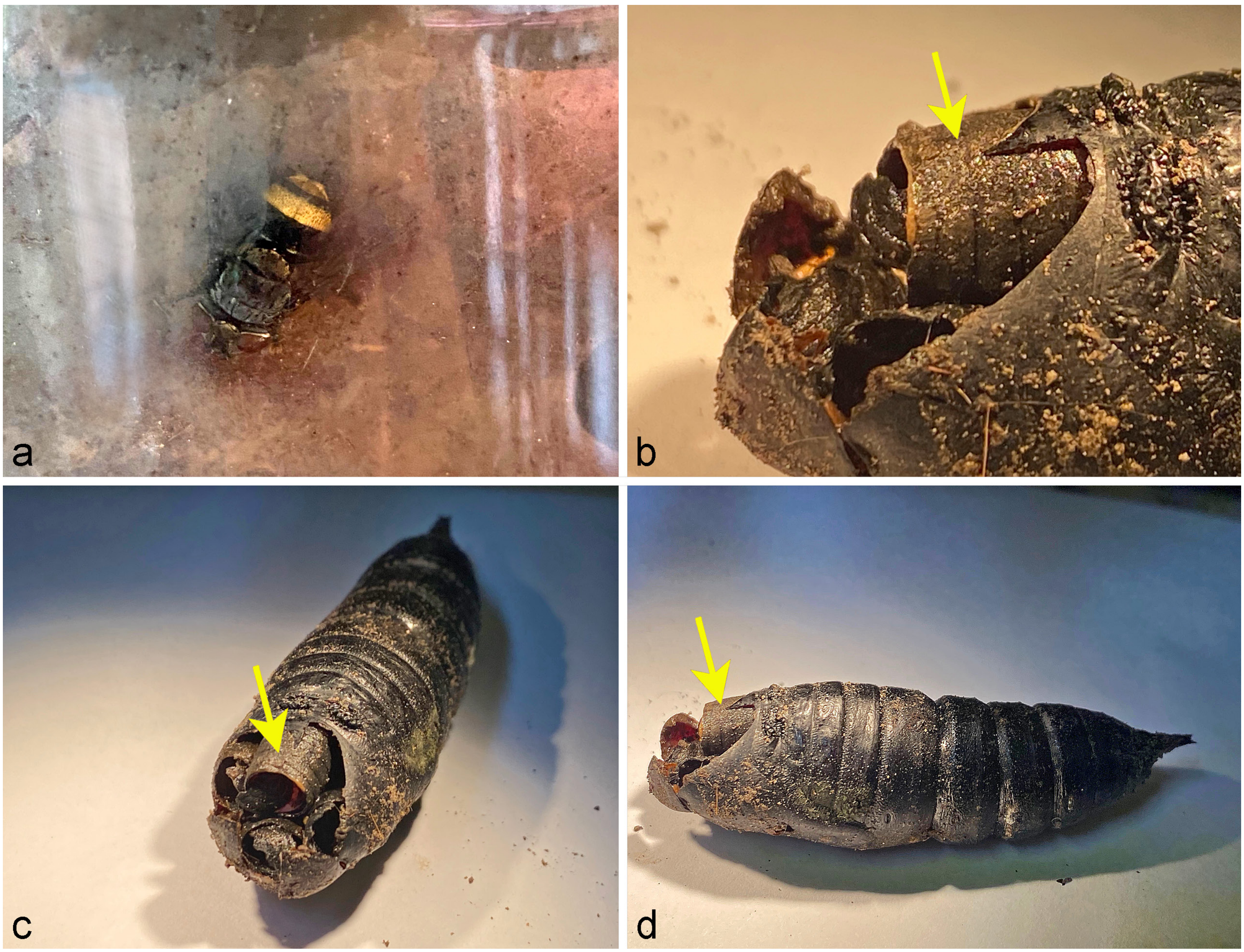

Figure 3. **a**. An adult *Belvosia* on a leaf inside the rearing container. **b–d**. Imperial moth pupa with an empty *Belvosia* puparium (arrow) visible at the front end.

Figure 4. One of the *Belvosia argentifrons* females and a puparium. **a**. Left lateral view of head and thorax. **b**. Left lateral view of thorax and abdomen. **c**. Frontal view of head. **d**. Dorsal view of head and thorax. **e–f**. Dorsal views of abdomen showing distinctive golden banding. **g**. Posterior view of puparium. **h**. Anterior view of puparium.

Opportunistic surveys of "bristle flies" (Tachinidae) in West Virginia, USA

by John O. Stireman III and Juan M. Perilla López

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West Virginia is one of the least densely populated states of the eastern United States, a somewhat surprising fact given its proximity to the nation's capital, Washington D.C. This landlocked state is located at about 38–39°N latitude, east of Virginia and Maryland, south of Pennsylvania and Ohio, and northwest of Kentucky (Fig. 1a). It stands out among U.S. states as among the most forested (79%, Vogt & Smith 2017) and most mountainous (lowest total area of level ground). In terms of physiogeography, the state is in the Central Appalachian Region characterized by the Appalachian Mountains (east) and Appalachian Plateau (west). The Appalachian Mountains are an extensive, ancient (480 myo) mountain range, primarily characterized by low, densely forested ridges and narrow valleys (Fig. 1b). The central and southern Appalachian region is considered one of the most biodiverse areas in North America, hosting a diverse temperate flora and fauna. The region is undoubtedly home to a diverse tachinid fauna, and this fauna is expected to be relatively well known given its proximity to major population centers of the U.S. East Coast. However, there have been few reported surveys of tachinids in the Appalachian region and there are few published species lists of tachinids for any region of the U.S. (though see, e.g., O'Hara & Stireman 2016, Stireman *et al*. 2018, 2020).

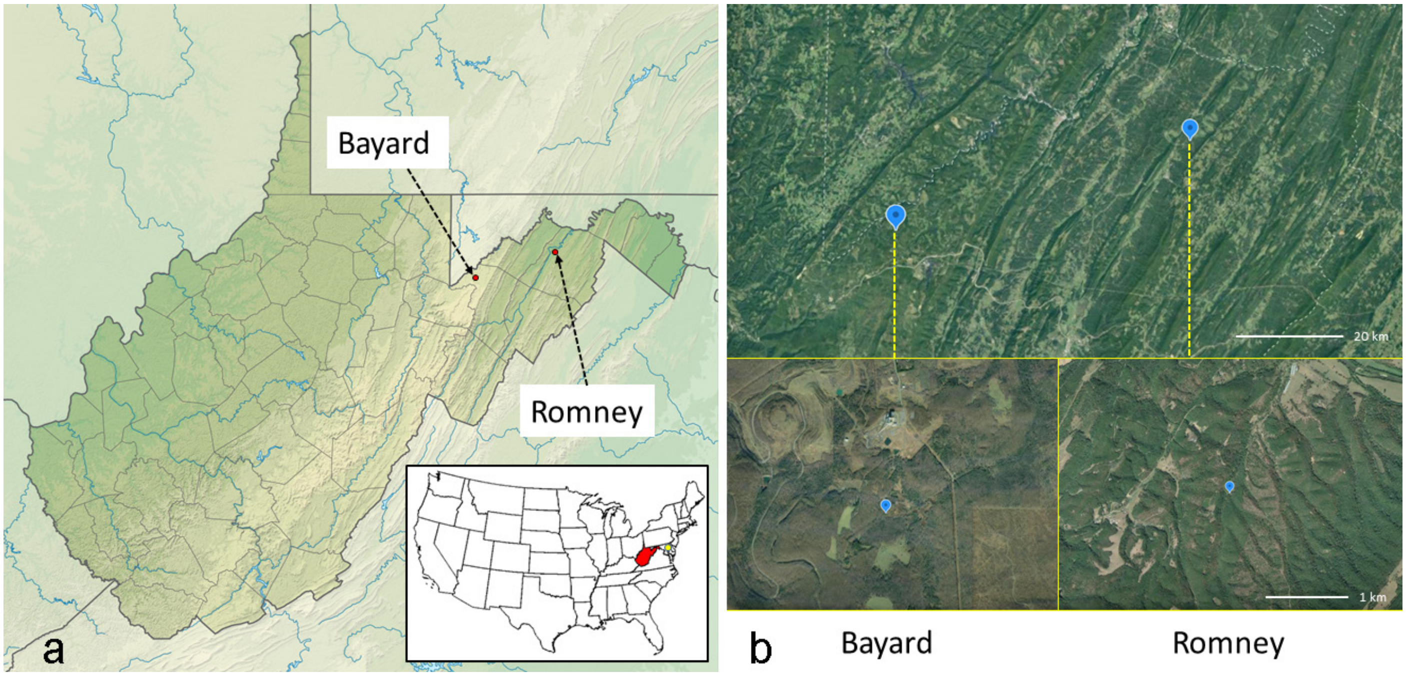

Figure 1. a. Geographic locations of the collecting sites in the eastern panhandle of the state of West Virginia, USA (in red on inset map). Washington D.C. is indicated by the yellow circle in the inset map. **b**. Satellite views of the two collecting sites and their surroundings from Google Earth©. The top image shows the proximity of the two sites (blue markers) among the longitudinal ridges and valleys of the Central Appalachian Mountains. Below are zoomed in views of each site. Collecting occurred within ca. 1 km of the blue markers.

Over the past two years (2020 and 2021), when opportunities for travel were limited due to the COVID-19 pandemic, we were able to visit two neighboring sites in the eastern panhandle of West Virginia and engage in some opportunistic collecting of tachinid flies. Both sites were located on private land owned by (different) friends and our visits were not specifically intended for research, but rather short weekend getaways to socialize, spend time outside, and, of course, do some "biologizing". However, we took advantage of the opportunities to collect tachinid flies over a few days and characterize the local fauna.

The two sites we surveyed are located relatively close to one another (<60 km apart; Fig. 1b) with similar floristic communities comprised primarily of oak-hickory, and oak-hickory-pine forests. The sites differ somewhat in elevation (~700m) and one ("Bayard") was visited in early September 2020 while the other ("Romney") was visited in mid-June 2021. At both sites, most of the collecting was conducted by hand and took place over 2–3 days. At neither site did we collect on prominent hilltops. We also erected a 6m Malaise trap for 1–2 days at each site with limited success. Here we provide a summary of the species and their numbers collected at each of these sites in West Virginia and briefly examine their taxonomic composition.

Collecting Sites

Bayard

Specimens were labelled with the following data, with "\" indicating a line break:
USA: WV: Grant Co. Bayard\ 39.2529, -79.3314\ 4-6.ix.2020, 900 m\ JO Stireman III

On 4 September, 2020, JOS spent several days at a private cabin near the town of Bayard, WV. The area was a mix of open wetland habitats and mature forest (oak, maple, hickory, pine with some scattered red spruce, *Picea rubens*, on higher north facing ridges). The first day was mostly cold and rainy, and most collecting occurred on June 5 and 6. Collecting was conducted primarily in the mid-morning hours along forest edges near the cabin and along roadsides of small gravel roads. "Fly juice" – a mix of water, cola, and honey – was sprayed on sunlit leaves to attract tachinids. Tachinids were very abundant at this site, with flies present in virtually every patch of sunlit leaves at the forest edge during the mid-morning hours. A Malaise trap erected near the cabin collected very few tachinids, and it was subsequently moved to an open marshy area for a day, where it performed somewhat better.

Romney

Specimens were labelled with the following data, with "\" indicating a line break:
USA: WV: Hampshire Co.\ 39.3998, -78.7048\ (1 mi. S. of S. branch of Potomac R.)\ 14-16 June 2021, 225m\ JO Stireman III & JM Perilla López

In mid-June (14–16) 2021, both authors visited the cabin of a friend and colleague, Harold Greeney, located near the South Branch of the Potomac River, between the towns of Romney and Springfield. This area was mostly forested with some open areas along the dirt access road and banks of a small intermittent stream. However, some of the surrounding area had been selectively logged in recent decades, leading to a more open savanna-like forest. The forest was primarily of the oak-hickory type, which is the dominant deciduous forest ecosystem of the region, with pines occurring on hill tops and ridges. Most of our collecting was along a dirt access road and a small intermittent stream, but we also spent a few hours collecting along forest edges next to the South Branch of the

Potomac River. We experienced heavy rain on one afternoon, but generally the weather was sunny and warm. Most of our collecting activity was concentrated in the mid-morning and early afternoon, and again, we used fly juice to aid in attracting tachinids to sunlit leaves. A Malaise trap was erected near the intermittent stream for two days, with moderate success. Tachinid flies were abundant at this site, especially on sunlit leaves beside the intermittent stream and access road, although not to the same degree as the Bayard site in September.

Specimen Identification

We identified the tachinid flies that we collected using Wood (1987), species keys to various genera, and by comparison with specimens in the JOSC collection at Wright State University (Dayton, OH). No specimens were compared directly to types and many specimens were identified third hand (i.e., with reference to specimens identified based on "reliably" identified specimens in the CNC or USNM, which were possibly compared to types) or purely using keys, species descriptions, and morphological clues. Thus, many identifications should be regarded as tentative. Identification was further complicated by the presence of intraspecific variation not encompassed by species descriptions and the likely presence of multiple undescribed species. As has been noted previously, nearly every genus of Tachinidae in North America is in need of revision and many new species await description, even in this well-studied area.

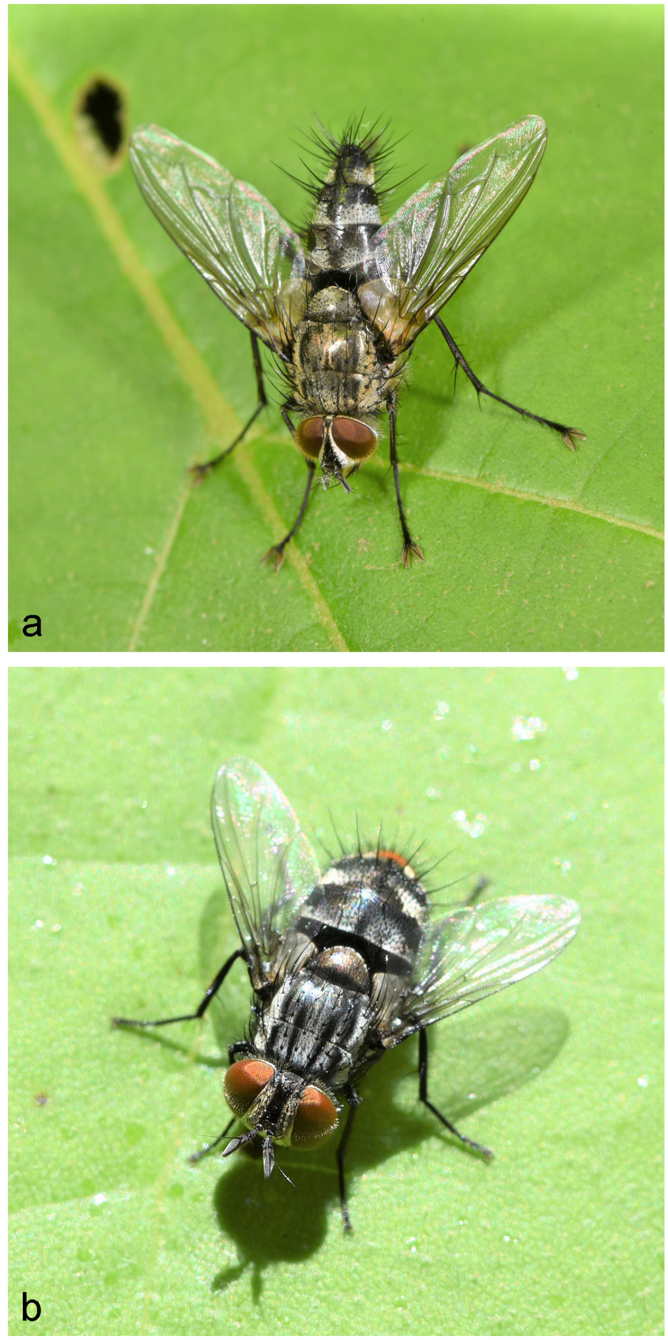

Figure 2. Two representative tachinids from the Romney site that were attracted to "fly juice" solution sprayed on leaves. **a**. *Uramya* sp. **b**. *Winthemia* sp.

Results and Discussion

We collected 636 individual tachinids belonging to approximately 137 species from these two sites over a few days each (Tables 1, 2; Figs. 2, 4). Seventy-six species were collected at the Bayard site (N=252), and 87 were collected at the Romney site (N=384). These estimates of species numbers are conservative. A number of forms that could represent distinct species were lumped together (e.g., *Uramya pristis*) and males and females were often lumped together as a species despite differences in morphology and uncertainty that they were conspecifics. On the other hand, we may have artificially divided some variable species. Species overlap between these neighboring sites was relatively low with only 26 species (19%) being collected from both sites.

The vast majority of species were collected by hand, and therefore our collections were biased towards larger and more apparent tachinids. Several of the smaller bodied taxa (e.g., *Siphona*, *Genea*), were mostly or only collected with the Malaise traps. Although 6m Malaise traps were erected at both sites, they did not collect many species or individuals, accounting for less than 10% of both of these totals. This is likely due to non-ideal placement of the traps, which was limited by the availability of sunlit areas with appropriately spaced, accessible tree trunks to support the trap.

Table 1. Summary of the number of species (spp.) and individuals (N), and their sex, collected in West Virginia from the two survey sites.

Site	Tot spp.	Unique spp.	Males	Females	Ratio	Tot. N
Romney (June)	87	61	275	109	2.52	252
Bayard (September)	76	50	78	174	0.45	384
Combined	137		353	283	1.25	636

Overall, we collected more males than females (Table 1), as is often the case due to males being more conspicuous with their activity often focused around prominent habitat features (e.g., prominent trees or shrubs, sunlit gaps, hilltops, etc.). However, sex ratios differed dramatically between the sites/collecting periods: in June (Romney) there were more than 2.5X as many males as females, but in September there were more than 2X as many females as males (Table 1). It is likely that these represent real differences in the relative abundance of males and females as collecting methods were largely the same across sites.

Over one-third of species were represented by a single individual (46 spp.) and over half by only one or two specimens (Table 2, Fig. 3). This high proportion of singletons and doubletons suggests that these communities are likely far richer than our list of species would suggest, a frequent conclusion of surveys of tachinid diversity (e.g., Stireman *et al*. 2020, Burington *et al*. 2020).

The composition of the fauna in terms of subfamilies and tribes was relatively similar among collecting events, and therefore we discuss these in sum, while noting some of the differences in the finer scale taxonomic composition in our discussion below. Overall, the community was dominated by Exoristinae both in terms of species (65%) and number of individuals (72.5%), with Tachininae, Dexiinae, and Phasiinae comprising a decreasing fraction of taxa (Fig. 5). Phasiinae, in particular, were underrepresented, with only 15 individuals representing six species collected. Within the Exoristinae, the diverse tribes Blondeliini, Goniini, and Eryciini made up most of the species diversity and abundance (Fig. 5). This taxonomic composition is similar to that found by Stireman *et al*. (2020), in their collections from the midwestern state of Missouri, where Exoristinae accounted for about 60% of species, with the same three tribes dominating the diversity. This observed dominance of Exoristinae is consistent with, albeit somewhat more exaggerated, the taxonomic composition of a tachinid community in temperate China (Pei *et al*. 2021).

The taxonomic composition of our collections probably reflects to some degree the relative diversities of the subfamilies and tribes present in these areas, but it may also reflect bias in our collecting methods and the habitats we focused on. As mentioned above, hand collecting tends to be biased towards larger, more conspicuous taxa, such that smaller bodied clades such as Siphonini, Graphogastrini, and perhaps some phasiine and blondeliine taxa are underrepresented. Nearly all of our hand collecting was direct netting of observed flies rather than "blind" sweeping of foliage, which likely accentuates this bias. Furthermore, we primarily collected flies that were walking or resting on leaves, many of which were likely attracted to natural or artificial honeydew. This may bias our collecting against taxa that are more regular or obligate flower visitors (e.g., many Phasiinae, Tachinini, Phasiini, Leskiini). Finally, most of our collecting was focused on forest edges from ground level to a bit over 2m. We did little collecting in more open herbaceous areas (although some collecting was done in wet meadows at the Bayard site), possibly biasing our catch against taxa associated with these habitats (e.g., Phasiinae), and we have little idea what species and in what numbers might be occurring in the forest canopy and treetops.

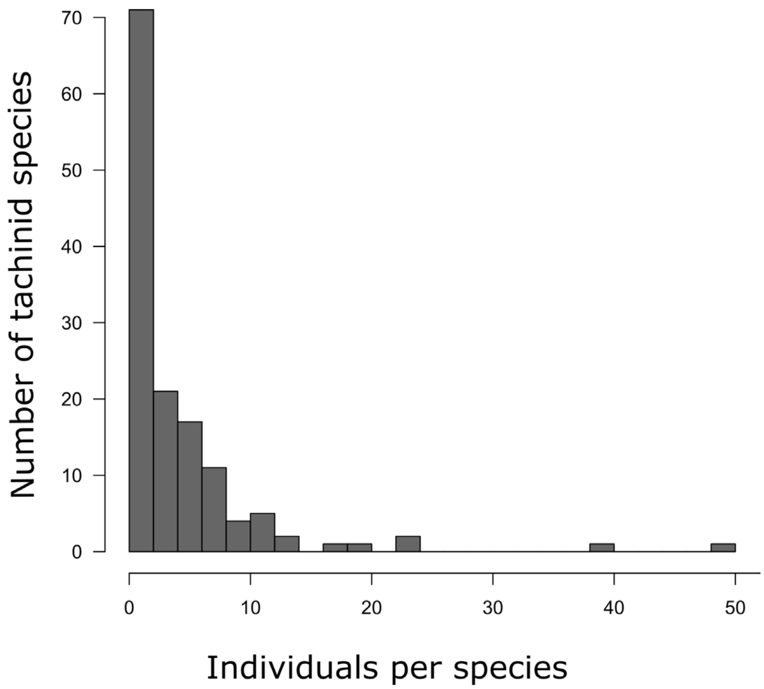

Figure 3. The frequency distribution of tachinid species abundances collected in this study.

There are three primary factors that may explain the low (~20%) overlap in tachinid species among sites. First, despite their proximity, the sites might differ in species composition due to the availability of different habitats, possibly related to their differing elevation. As mentioned above, there were some habitat differences between sites such as the presence of open, wet meadows at the Bayard site and savanna-like conditions at the Romney site, and plant composition likely differed between the sites. Second, the difference in collecting date, June versus September, is likely a major factor explaining differences in composition and sex ratio. Tachinid species and communities are well documented to vary over time within a site (Stireman 2008, Inclan & Stireman 2011, Pei *et al*. 2021), which is expected as the availability of hosts varies with the season. The bias towards males in June and females in September likely reflects earlier emergence and shorter lifespans of males and phenological matching of female activity to periods of greatest host availability. Finally, given the large number of species represented by only one or a few individuals, low overlap among sites is expected just due to sampling error (i.e., chance). At the extreme, the maximum possible overlap between sites based on our collections is 2/3 because 1/3 of the species are represented by just a single individual. The limited surveys we conducted do not allow us to assess the relative contribution of these three factors, but we suspect that seasonality and chance play important roles.

A few taxa stood out at the Romney site either in their occurrence and/or abundance (Table 2). Interestingly, the most abundant tachinid in our collections at this site was *Neomintho celeris* (Fig. 4d), a species with no known host, that probably parasitizes Orthoptera. Most of these specimens were male. The goniines *Belvosia unifasciata* and *Hyphantrophaga blanda* were also quite abundant at this site. The abundance of the former is likely underestimated because they were relatively easily recognized both visually and due to their buzzing sound, and after collecting many, we subsequently avoided them. The latter species, *H. blanda*, was one of the few that were found at

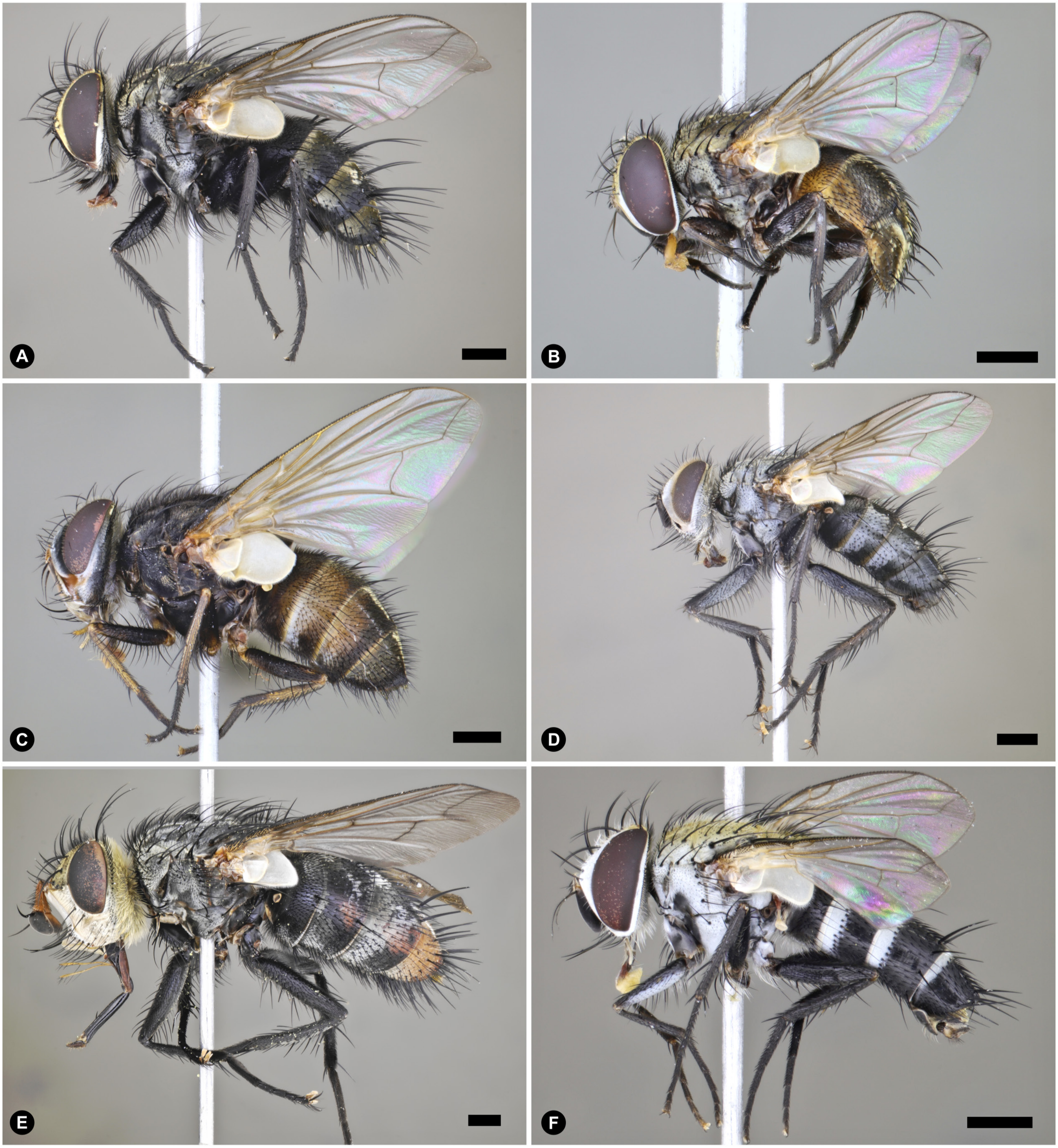

Figure 4. Representative tachinids collected in West Virginia (Romney site). **a**. *Anoxynops aldrichi* (Curran) (Exoristinae: Blondeliini). **b**. *Hypertrophomma opacum* Townsend (Exoristinae: Goniini). **c**. *Myiopharus canadensis* Reinhard (Exoristinae: Blondeliini). **d**. *Neomintho celeris* (Townsend) (Exoristinae: Euthelairini). **e**. *Peleteria* cf. *anaxias* (Walker) (Tachininae: Tachinini). **f**. *Spathidexia cerussata* Reinhard (Dexiinae: Voriini). Scale bars = 1.0mm.

appreciable frequencies at both sites (2nd and 3rd most abundant at Romney and Bayard, respectively), suggesting it is likely multivoltine. *Aplomya theclarum* was the most abundant eryciine at either site, as well as in Stireman *et al*.'s (2020) collections from Missouri in June. *Uramya pristis s.l.* (Fig. 2a) rounds out the top five most abundant tachinids at Romney. The same or similar species was also present in Bayard, and it appears to either display considerable intraspecific variation or consist of a species complex (note: varieties 2–4 in Table 2 were lumped as *U. pristis* for analysis and species counts). An attractive and relatively abundant tachinid of note at the Romney site was *Spathidexia cerussata* (Fig. 4f), however, we only collected males of this species. Finally, we note the collection of a female of *Chrysotachina infrequens*, a species previously known only from three specimens from Wyoming, North Carolina, and Virginia (O'Hara 2002).

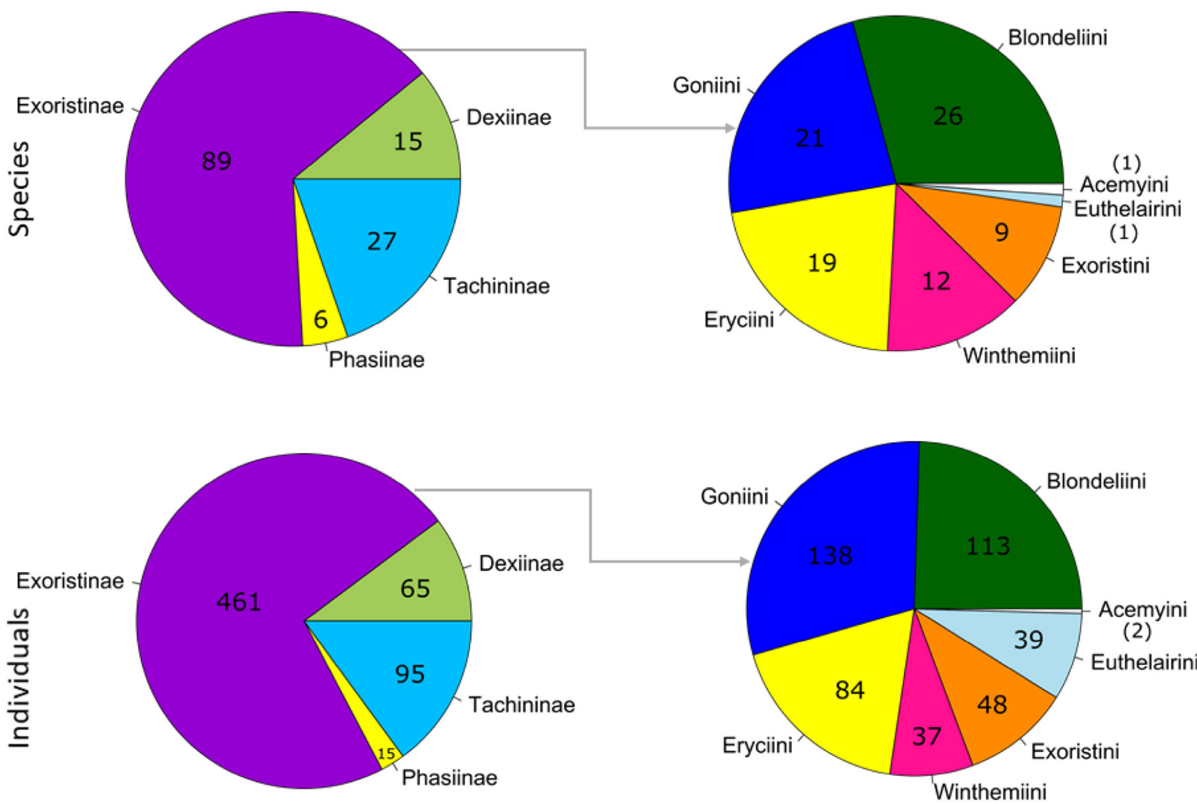

Figure 5. Pie charts illustrating the relative abundance of species (top) and individuals (bottom) among tachinid subfamilies (left) and tribes within Exoristinae (right).

The Bayard site differed substantially from Romney in the relative abundance of genera and species and the occurrence of some notable species. The most abundant tachinid at the Bayard site was *Calolydella lathami*, the only member of this genus north of Mexico. Interestingly, this most abundant species, with collections consisting almost entirely of females, was absent at the Romney site (and vice versa). Its relative abundance is likely underestimated as this species was so common that at some point we stopped collecting them. The exoristine *Austrophorocera einaris*, a parasitoid of Limacodidae (Gates *et al*. 2012), was the second most abundant species at Bayard, and several additional *Austrophorocera* species appeared to be present as well (although females were difficult to place). This contrasts with the dominant exoristine taxon in June at the Romney site, *Tachinomyia variata*, parasitoids of Lasiocampidae, Erebidae, and Noctuidae (Arnaud 1978, Strazanac *et al*. 2001). The ernestiine, *Panzeria platycarina*, was found in appreciable numbers (females) at Bayard, but was absent in June at Romney. Members of the tachinine genus *Archytas* were present at both sites in a variety of forms. Even though this genus was revised relatively "recently" (Ravlin & Stehr 1984), species can be difficult to identify and closely related species complexes may exist. This is particularly evident in the *A. aterrimus* complex where three or four morphologically distinct groups are evident. *Hystricia abrupta* (Polideini) and *Jurinia pompalis* (Tachinini) were two other notable tachinines found at Bayard. Although they are not rare, the authors had not collected them previously in the region.

We hope to be able to visit these and other sites in West Virginia in the future to more fully document the species and patterns of diversity in these rich forests. Ideally, we would conduct parallel studies at both of these sites across seasons and years to tease apart the effects of habitat, phenology, local dynamics, and chance in shaping the abundance, diversity, and taxonomic composition of these communities. Alas, we have neither the funding nor the time for such a project. Still, at the very least, we plan to continue to report the findings of our casual and systematic surveys of "bristle flies" in *The Tachinid Times* and elsewhere, adding what we can to the accumulated knowledge of tachinid biodiversity.

Acknowledgements

We would like to thank Chris and Carolyn Bailey and Harold Greeney for inviting us to visit their properties in West Virginia, housing us in their cabins, and allowing us to collect flies on their land. We would also like to thank Jim O'Hara for comments and editing, and for his continued efforts to compile and *The Tachinid Times*.

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Table 2. List of species of Tachinidae collected from the two survey sites in West Virginia with numbers of males and females and notes on selected taxa.

Species	M	F	Total	Locality	Notes
DEXIINAE					
Dexiini					
Billaea cf. *interrupta* (Curran)	1		1	Romney (June)	
Billaea cf. *trivittata* (Curran)	3	2	5	Romney (June)	
Ptilodexia rufipennis (Macquart)	4	1	5	Bayard (Sept.)	Possibly multiple species
Cordyligaster septentrionalis Townsend	1	1	2	Romney (June)	
Uramyini (Voriini)					
Uramya limacodis (Townsend)	3		3	Romney (June)	
Uramya n. sp.		1	1	Romney (June)	
Uramya pristis (Walker) complex	13	4	17	Romney (June)	(Not separated into varieties)
Uramya nr. *pristis* (Walker) var. 1		2	2	Bayard (Sept.)	Gold dusting on abdomen/thorax
Uramya nr. *pristis* (Walker) var. 2		1	1	Bayard (Sept.)	3 katepisternals
Uramya nr. *pristis* (Walker) var. 3		1	1	Bayard (Sept.)	Bronzy face
Uramya nr. *pristis* (Walker) var. 4		4	4	Bayard (Sept.)	Gray abdomen
Voriini					
Athrycia cinerea (Coquillett)		1	1	Bayard (Sept.)	
Campylocheta eudryae (Smith)		1	1	Bayard (Sept.)	
Campylocheta plathypenae Sabrosky	1		1	Romney (June)	
Spathidexia cerussata Reinhard	11		11	Romney (June)	
Spathidexia dunningii (Coquillett)	1	3	4	Bayard (Sept.)	
Thelaira americana Brooks	1	1	2	Bayard (Sept.)	
	1	0	1	Romney (June)	
Voria aurifrons (Fallén)		2	2	Romney (June)	
EXORISTINAE					
Acemyini					
Ceracia dentata (Coquillett)	1	1	2	Romney (June)	
Blondeliini					
Anoxynops aldrichi (Curran)	7		7	Romney (June)	
Blondelia hyphantriae (Tothill)		4	4	Bayard (Sept.)	
	4	2	6	Romney (June)	
Blondelia sp. 2	2	2	4	Romney (June)	
Calolydella lathami (Curran)	1	17	18	Bayard (Sept.)	
Compsilura concinnata (Meigen)	4	2	6	Bayard (Sept.)	
	1		1	Romney (June)	
Eucelatoria auriceps (Aldrich)	2		2	Romney (June)	
Eucelatoria n.sp. Burington		1	1	Bayard (Sept.)	

Species	M	F	Total	Locality	Notes
Eucelatoria dimmocki (Aldrich)		2	2	Romney (June)	
Lixophaga cf. *unicolor* Townsend		1	1	Bayard (Sept.)	
Lixophaga nr. *diatraeae* (Townsend)	4	3	7	Bayard (Sept.)	
Lixophaga nr. *diatraeae* (Townsend) sp. 2		4	4	Bayard (Sept.)	
Lixophaga parva (Smith)	1		1	Bayard (Sept.)	
Lixophaga sp. 1		1	1	Romney (June)	Doesn't seem to match Bayard (Sept.) specimens
Medina barbata (Coquillett)?		1	1	Romney (June)	
Myiopharus americanus (Bigot) 2	2		2	Bayard (Sept.)	
Myiopharus canadensis Reinhard	1		1	Bayard (Sept.)	
	1		1	Romney (June)	
Myiopharus nr. *aberrans* (Townsend)	1		1	Bayard (Sept.)	
Myiopharus sedulus (or nr.) (Reinhard)		2	2	Bayard (Sept.)	
	1		1	Romney (June)	
Opsomeigenia cf. *pusilla* (Coquillett)	1	1	2	Bayard (Sept.)	
		2	2	Romney (June)	
Oswaldia aurifrons (Townsend)		1	1	Bayard (Sept.)	
Oswaldia cf. *conica* (Reinhard)		3	3	Bayard (Sept.)	
	7	3	10	Romney (June)	Unsure if females are same sp., could be >1 sp. of males too
Oswaldia cf. *valida* (Curran)		3	3	Bayard (Sept.)	Could be variants of *O. anorbitalis* (Brooks)
	1	1	2	Romney (June)	Male and female could be different species
Thelairodoria setinervis (Coquillett)	2	1	3	Bayard (Sept.)	
	5		5	Romney (June)	
Vibrissina cf. *leibyi* (Townsend)	1	1	2	Romney (June)	
Vibrissina spinigera (Townsend)	4	1	5	Romney (June)	
Zaira cf. *nocturnalis* (Reinhard)	1		1	Bayard (Sept.)	
Eryciini					
Aplomya theclarum (Scudder)	16	3	19	Romney (June)	
Carcelia amplexa (Coquillett)	5		5	Bayard (Sept.)	
Carcelia diacrisae (Sellers)	10	1	11	Romney (June)	
Carcelia sp. nr. *flavirostris* (Wulp)	1	1	2	Romney (June)	
Carcelia formosa (Aldrich & Webber)	5	1	6	Romney (June)	
Carcelia inflatipalpus (Aldrich & Webber)	3	1	4	Romney (June)	
Carcelia olenensis (Sellers)	1		1	Romney (June)	
Carcelia cf. *perplexa* Sellers	1		1	Bayard (Sept.)	
Drino cf. *bakeri* (Coquillett)		1	1	Romney (June)	
Drino rhoeo (Walker)		1	1	Bayard (Sept.)	

Species	M	F	Total	Locality	Notes
Lespesia anisotae (Webber)	2	1	3	Romney (June)	
Lespesia cf. *schizurae* (Townsend)		1	1	Romney (June)	
Lespesia stonei Sabrosky		1	1	Bayard (Sept.)	
	10		10	Romney (June)	
Nilea cf. *valens* (Aldrich & Webber)		5	5	Bayard (Sept.)	
	4		4	Romney (June)	
Nilea sternalis (Coquillett)		1	1	Bayard (Sept.)	
Phebellia helvina (Coquillett)		2	2	Bayard (Sept.)	
Phebellia cf. *trichiosomae* (Sellers)	2	1	3	Bayard (Sept.)	
Phryxe pecosensis (Townsend)		1	1	Bayard (Sept.)	
Prooppia cf. *nigripalpis* (Rob.-Des.)	1	1	2	Bayard (Sept.)	
Euthelarini					
Neomintho celeris (Townsend)	34	5	39	Romney (June)	
Exoristini					
Austrophorocera einaris (Smith)	11	2	13	Bayard (Sept.)	
Austrophorocera stolida (Reinhard)	3		3	Bayard (Sept.)	
Austrophorocera n. sp.?	1		1	Bayard (Sept.)	
Austrophorocera sp. *2*		3	3	Bayard (Sept.)	= females of above?
Austrophorocera sp. 4		1	1	Bayard (Sept.)	= females of above?
Austrophorocera sp.?		5	5	Bayard (Sept.)	= females of above?
Exorista dydas (Walker)		1	1	Bayard (Sept.)	
Exorista mella (Walker)	3	1	4	Bayard (Sept.)	
	1	1	2	Romney (June)	
Chetogena subnitens (Aldrich & Webber)	2	1	3	Romney (June)	
Tachinomyia variata Curran	8	4	12	Romney (June)	
Goniini					
Allophorocera sp.		5	5	Bayard (Sept.)	Possibly *Euceromasia* sp.
Belvosia unifasciata (Rob.-Des.)	19	5	24	Romney (June)	
Chaetogaedia analis (Wulp)		1	1	Bayard (Sept.)	
	1	1	2	Romney (June)	
Distichona autumnalis (Townsend)	2	3	5	Bayard (Sept.)	
Euceromasia sp. 1		2	2	Romney (June)	
Euexorista rebaptizata Gosseries		1	1	Bayard (Sept.)	
Eumea sp. nr. *caesar* (Aldrich)	2		2	Romney (June)	
Houghia cf. *coccidella* (Townsend)		1	1	Bayard (Sept.)	
		4	4	Romney (June)	
Houghia sp. nr. *setipennis* Coquillett	1	1	2	Romney (June)	
Hypertrophomma opacum Townsend		2	2	Romney (June)	

Species	M	F	Total	Locality	Notes
Hyphantrophaga blanda (Osten Sacken)	4	8	12	Bayard (Sept.)	
	22	16	38	Romney (June)	Could be multiple spp., lots of variation
Hyphantrophaga blandita (Coquillett)		8	8	Bayard (Sept.)	
Hyphantrophaga cf. *euchaetiae* (Sellers)	1		1	Romney (June)	
Hyphantrophaga sp. nr. *sellersi* (Sabrosky)	1	1	2	Romney (June)	Close to *H. blanda* but legs all yellow, could be *H. sellersi*, but antennae not yellow
Hyphantrophaga virilis Aldrich & Webber		2	2	Bayard (Sept.)	
		4	4	Romney (June)	
Leschenaultia n. sp.? (*reinhardi* Toma & Guimarães?)	2	3	5	Bayard (Sept.)	
		1	1	Romney (June)	
Mystacella chrysoprocta (Wiedemann)		1	1	Bayard (Sept.)	
Patelloa cf. *leucaniae* (Coquillett)		4	4	Bayard (Sept.)	
Pseudochaeta cf. *frontalis* Reinhard		1	1	Romney (June)	
Pseudochaeta pyralidis Coquillett		1	1	Bayard (Sept.)	
	4	1	5	Romney (June)	
Pseudochaeta siminina Reinhard	1	1	2	Bayard (Sept.)	
Winthemiini					
Hemisturmia n. sp.?	2		2	Romney (June)	
Hemisturmia parva (Bigot)	1		1	Romney (June)	
Winthemia cf. *abdominalis* (Townsend)	1		1	Romney (June)	
Winthemia cf. *aurifrons* Guimarães	4	2	6	Bayard (Sept.)	possibly *W. datanae* variants
Winthemia sp. nr. *borealis* Reinhard	1		1	Romney (June)	Smallish, bristles on hind tibia widely spaced, with marginals on T3
Winthemia datanae (Townsend)		8	8	Bayard (Sept.)	could be multiple spp.
Winthemia nr. *datanae*		1	1	Bayard (Sept.)	
Winthemia cf. *occidentis* Reinhard	1	1	2	Romney (June)	
Winthemia cf. *rufonotata* (Bigot)		1	1	Bayard (Sept.)	
Winthemia rufopicta (Bigot)	2	6	8	Bayard (Sept.)	
	1		1	Romney (June)	
Winthemia cf. *sinuata* Reinhard	1		1	Romney (June)	
Winthemia quadripustulata (Fabricius) form C	4		4	Romney (June)	
PHASIINAE					
Cylindromyiini					
Cylindromyia fumipennis (Bigot)	1	1	2	Romney (June)	
Cylindromyia interrupta (Meigen)?	1	2	3	Bayard (Sept.)	
Gymnosomatini					
Gymnoclytia occidua (Walker)	1		1	Bayard (Sept.)	
	4	1	5	Romney (June)	

Species	M	F	Total	Locality	Notes
Gymnosoma par (Walker)	1		1	Bayard (Sept.)	
	1		1	Romney (June)	
Trichopoda pennipes (Fabricius)		1	1	Romney (June)	
Strongygastrini					
Strongygaster triangulifera (Loew)		1	1	Romney (June)	
TACHININAE					
Ernestiini					
Linnaemya comta (Fallén)	1		1	Romney (June)	
Panzeria nigripalpis (Tothill)	1		1	Bayard (Sept.)	
Panzeria platycarina (Tothill)	1	10	11	Bayard (Sept.)	
Graphogastrini					
Phytomyptera sp.	1		1	Bayard (Sept.)	
Leskiini					
Clausicella turmalis (Reinhard)		1	1	Romney (June)	
Genea cf. *pavonacea* (Reinhard)	1		1	Bayard (Sept.)	
	7		7	Romney (June)	Seems like *G. cinerea* (James), are these synonyms?
Genea sp. nr. *texensis* (Townsend)	1		1	Bayard (Sept.)	
Leskia cf. *depilis* (Coquillett)		1	1	Bayard (Sept.)	
Minthoini					
Paradidyma cf. *petiolata* Reinhard	2	1	3	Romney (June)	
Paradidyma sp. nr. *petiolata* Reinhard		1	1	Romney (June)	No M-petiole, smaller, but possibly weird petiolata
Paradidyma nr. *singularis* (Townsend)		2	2	Romney (June)	
Polideini					
Chrysotachina infrequens O'Hara		1	1	Romney (June)	
Chrysotachina slossonae (Coquillett)	1		1	Romney (June)	
*Mauromyia brevi*s (Coquillett)	1		1	Romney (June)	
Siphonini					
Ceromya balli O'Hara / *oriens* O'Hara		3	3	Bayard (Sept.)	
Siphona illinoensis (Townsend)	2		2	Bayard (Sept.)	
	2	4	6	Romney (June)	
Tachinini					
Archytas aterrimus (Rob.-Des.)	3	2	5	Romney (June)	
Archytas sp. nr. *aterrimus* (Rob.-Des.)		8	8	Bayard (Sept.)	Thorax with bronze shiny reflections
Archytas sp. nr. *aterrimus* / *instabilis* (Curran)		4	4	Bayard (Sept.)	Thorax shiny bluish reflections, but small
	1	1	2	Romney (June)	Male and female may be different spp.
Archytas lateralis (Macquart)	2		2	Bayard (Sept.)	Small in size, dark
	2		2	Romney (June)	

Species	M	F	Total	Locality	Notes
Archytas cf. *nivalis* Curran	1	1	2	Romney (June)	Doesn't quite match externally, but male genitalia good match. Unclear if female is different (has different coloration).
Copecrypta ruficauda (Wulp)	6	1	7	Romney (June)	
Deopalpus contiguus (Reinhard)	1		1	Romney (June)	
Deopalpus cf. *hirsutus* Townsend	9		9	Romney (June)	In key tegula red, but black in spp. Identity unclear from descriptions
Hystricia abrupta (Wiedemann)		3	3	Bayard (Sept.)	
Jurinia pompalis (Reinhard)		2	2	Bayard (Sept.)	
Peleteria anaxias (Walker)	1	2	3	Romney (June)	Large for *P. anaxias*, but genitalia seem to match

Student News

Maria Candela Barakat

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I am a biologist in the fourth year of my Ph.D. thesis at the National University of La Plata (UNLP) in Argentina. My study is about the interaction between the parasitoid tachinid flies of the subfamily Phasiinae and their hosts, the stink bugs of the family Pentatomidae.

My research is supervised by Dr. María Fernanda Cingolani and we are part of the Biological Control and Pest Ecology group in the Centro de Estudios Parasitológicos y de Vectores (CEPAVE) in the city of La Plata, Buenos Aires. The Centre is devoted to the study of natural enemies of invertebrates and vertebrates of sanitary importance, pests and pollinators.

I am particularly interested in the study of a possible interaction between two species of the genus *Trichopoda* and the red-banded stink bug, *Piezodorus guildinii* (Westwood). This stink bug is an important pest of soybeans in Argentina and its distribution extends as far north as the southern United States.

Piezodorus guildinii is not known to be attacked by parasitoids in its adult stage. This stage of the stink bug is a "vacant niche" that could perhaps be filled by a biological control agent that targets adult stink bugs. *Trichopoda* species are of interest in this search because they parasitize adults of other pentatomid bugs. The aim of my thesis is to evaluate if *P. guildinii* can potentially be an alternative host for these flies.

Figure 1. María Candela Barakat looking for parasitized stink bugs in a field near La Plata city, Buenos Aires.

There are two species of *Trichopoda* that I am studying: *T. giacomellii* (Blanchard) and *T. gradata* Wiedemann. The latter was also known as *Trichopoda argentinensis* (Blanchard) in some earlier studies. The taxonomy and names of South American *Trichopoda* species were the subject of recent papers (Dios & Nihei 2017, 2020) and were discussed in a recent catalogue (O'Hara *et al*. 2021). The tachinid parasitism of another Neotropical pentatomid, the red-shouldered stink bug (*Thyanta perditor* (F.)), was recently reviewed in Lucini *et al*. (2020).

I am currently carrying out no-choice experiments with *P. guildinii* and *T. giacomellii* to evaluate the fitness of the parasitoid when parasitizing this alternative host. I am also testing the fitness of the parasitoid's progeny that have developed on this host by taking morphological measures of the F1 flies and comparing them with flies that emerged from their usual host *Nezara viridula* (L.), the southern green stink bug.

Biological control of pests through natural enemies is one of the most important options to reduce pest populations and minimize the impact to the environment. Increasing this knowledge will contribute to a better use of these beneficial insects.

Figure 2. **a**. An egg of a *Trichopoda* fly attached in the body of an adult stink bug. **b**. An adult *Trichopoda* emerging from its puparium (note expanded ptilium above the antennae that is used to break open the front of the puparium). **c**. Adult female of *Trichopoda giacomellii.*

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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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