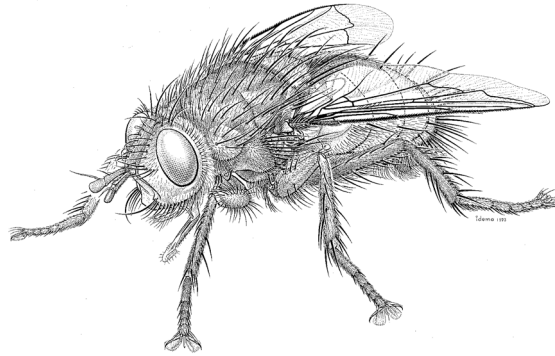


The Tachinid Times

ISSUE 24
February 2011



Jim O'Hara, editor
Invertebrate Biodiversity
Agriculture & Agri-Food Canada
C.E.F., Ottawa, Ontario, Canada, K1A 0C6
Correspondence: james.ohara@agr.gc.ca or oharaje@hotmail.com

ISSN 1925-3435 (Print)
ISSN 1925-3443 (Online)

My thanks to all who have contributed to this year's issue of *The Tachinid Times*. This is the largest issue of the newsletter since it began in 1988, so there still seems to be a place between peer-reviewed journals and Internet blogs for a medium of this sort. This year's issue has a diverse assortment of articles, a few announcements, a listing of recent literature, and a mailing list of subscribers. The Announcements section is more sizable this year than usual and I would like to encourage readers to contribute to this section in the future. This year it reproduces the abstracts of two recent theses (one a Ph.D. and the other a M.Sc.), which is a great way for us to know what graduate work has been completed on the Tachinidae. There is also an announcement of a M.Sc. opportunity in tachinid biology and systematics, which could mark the start of a long and illustrious career in tachinidology for some lucky student with a budding interest in the family. There are two announcements of new publications that are especially noteworthy for aficionados of the Tachinidae. Lastly, I have included among the announcements all the tachinid-related presentations given last August during the International Congress of Dipterology in Costa Rica, as I have done for past congresses.

The Tachinid Times is primarily an online newsletter but continues to be offered in hardcopy to provide a permanent record of all issues in a few libraries around the world, and to comply with the wishes of those persons who prefer to receive a print copy for their own files. Both versions are based on the same PDF original and have the same pagination and appearance. The online version of this issue is available as a PDF file (ca. 6 MB in size) on the North American Dipterists Society (NADS) website at: <http://www.nadsdiptera.org/Tach/TTimes/TThome.htm>.

Next year's *The Tachinid Times* will be the 25th issue so let us make it a memorable one! If you wish to contribute next year, then please send me your article, note or

announcement before the end of January 2012. This newsletter accepts submissions on all aspects of tachinid biology and systematics, but please keep in mind that this is not a peer-reviewed journal and is mainly intended for shorter news items that are of special interest to persons involved in tachinid research. Student submissions are particularly welcome, especially abstracts of theses and accounts of studies in progress or about to begin. I encourage authors to illustrate their articles with colour images, since these add to the visual appeal of the newsletter and are easily incorporated into the final PDF document. Please send images as separate image files apart from the text.

New record of *Loewia crassipes* (Mesnil) from Turkey by Cezary Bystrowski

The genus *Loewia* Egger, 1856 comprises 16 species, the most recently described being *L. cretica* Ziegler from Crete, *L. montivaga* Richter from the southern Caucasus, and *L. erecta* Bergström from Fennoscandia and Poland (Herting and Dely-Draskovits 1993; Ziegler 1996; Richter 1998; Pape and Thompson 2010). All members of this genus are distributed in the Palaearctic Region, with one of them (*L. foeda* (Meigen)) also known from the Nearctic Region (Wood and Wheeler 1972). The adults are rather small or medium-sized flies with a dark black body (Figs. 1–2). Hosts are probably centipedes (Chilopoda) based on the known records of *L. foeda* parasitizing *Lithobius* species (Thompson 1915; Wood and Wheeler 1972).

Little is known about the distribution of some species of the genus. Some of them appear to be stenochorous (i.e., have narrow ranges), for example *L. rondanii* (Villeneuve) known from Corsica and Sardinia, and *L. cretica* known only from Crete. On the basis of published data, the distribution of *L. crassipes* (Mesnil) looks similar and the species can be treated as stenochorous too because it is

known only from the Middle East (Israel) (Mesnil 1953; Cerretti and Freidberg 2009; Pape and Thompson 2010). Here, I present new records of this species from Turkey.

I saw specimens of *L. crassipes* for the first time in the Tel Aviv University zoological collection in 2006. About 50 specimens collected in Israel by Kugler and his colleagues are stored there. I also had an opportunity to collect 10 males of this fly during a few field trips in this country. The material was gathered in the northern part of Israel, in the region of Golan Heights (Qatsrin and Ramot Naftali).



Figures 1–2. *Loewia crassipes* (Mesnil), Turkey 2010. 1. (above) Male. 2. (below) Female.

During later years, I found *L. crassipes* in Turkey at a few different locations near Bellen (Iskanderun), Mersin, Gazipaşa, Antalya, and Manavgat. It is a rather local but abundant species in many places along the south coast of the country and can be collected even in close vicinity to the sea. For example, I found specimens resting on sea-shore stones near the harbor in Gazipaşa (SE from Alanya). Males, sometimes in numbers, would aggregate in separate places, usually on stones and rocks. They would fight for “best location” on “meeting” spots. Females were observed rarely, but a few times an opportunity to take some photographs occurred (Fig. 2). Females are distinctive and easy to recognize because of their very wide frons, wide and bristled parafacial area (cf. Figs. 3–4) and

of course the characteristic wing venation, which in this species is similar to that in males.



Figures 3–4. *Loewia crassipes*, head in lateral view. 3. (left) Male. 4. (right) Female.

Surprisingly, in the time since Mesnil (1953) first published his description of the male of *L. crassipes* (originally as *Ostroloewia crassipes*), the morphological characteristics of the female of this species have not been described. I would like to prepare a description of the female of *L. crassipes* on the basis of specimens in my collection in the coming year.



Figures 5–6. 5. (above) Vicinity of Iskanderun, Turkey (2010), showing the typical vegetation type known as Mediterranean makia. 6. Author and daughter in the Mediterranean makia of Turkey in 2010.

My last excursion to Turkey in 2010 was unique and interesting not only for me but also for my daughter Maria. It was the first time when we were able to rest, collect and spend our holidays together in Mediterranean “makia” (a characteristic vegetation type of the region) (Figs. 5–6).

References

- Bergström, C. 2007. *Loewia erecta* n. sp. (Diptera: Tachinidae) – a new parasitic fly from Fennoscandia and Poland. *Stuttgarter Beiträge zur Naturkunde. Serie A (Biologie)* **708**: 1–16.
- Cerretti, P. and Freidberg, A. 2009. Updated checklist of the Tachinidae of Israel. *Tachinid Times* **22**: 9–16.
- Herting, B. and Dely-Draskovits, Á. 1993. Family Tachinidae. Pp. 118–458. *In*: Soós, Á. and Papp, L., eds., *Catalogue of Palaearctic Diptera. Volume 13. Anthomyiidae—Tachinidae*. Hungarian Natural History Museum, Budapest. 624 pp.
- Mesnil, L.P. 1953. Nouveaux tachinaires d’Orient (1^{re} et 2^e parties). *Bulletin et Annales de la Société Entomologique de Belgique* **89**: 85–114, 146–178.
- Pape, T. and Thompson F.C., eds. 2010. *Systema Dipterorum*. Version 1.0. Available online: <http://www.diptera.org>.
- Richter, V.A. 1998. New and little known species of tachinids (Diptera, Tachinidae) of the fauna of Russia and neighbouring countries. *Entomologicheskoe Obozrenie* **77**: 704–712. [In Russian. English translation in *Entomological Review* **78**: 620–626, 1998.]
- Thompson, W.R. 1915. Sur le cycle évolutif de *Fortisia foeda*, diptère parasite d’un *Lithobius*. *Comptes Rendus des Séances de la Société de Biologie, Paris* **78**: 413–416.
- Wood, D.M. and Wheeler, A.G., Jr. 1972. First record in North America of the centipede parasite *Loewia foeda* (Diptera: Tachinidae). *Canadian Entomologist* **104**: 1363–1367.
- Ziegler, J. 1996. *Loewia cretica* spec. nov. – ein neue Raupenfliege von Kreta (Diptera, Tachinidae). *Studia Dipterologica* **3**: 323–328.

Preliminary comparison of tachinid species assemblages in three different open habitats in south-central Finland by Jaakko Pohjoismäki

Species richness is often considered as a good environmental indicator. When need for habitat protection is evaluated, it is often impossible to thoroughly estimate local diversity within given limited sampling and reporting time. In search for relevant indicators, insect parasitoids could prove to be particularly interesting as their diversity is expected to correlate with overall arthropod diversity in a given habitat. Compared to parasitic wasps, tachinid flies (Diptera: Tachinidae) with a more limited number of species could prove to be a more accessible taxon for sampling when species richness needs to be evaluated. Unfortunately, many Tachinidae are rather polyphagous parasitoids of Lepidoptera and it is not well known what

governs their diversity. Additionally, as heat-loving insects, most tachinids are more common in open, warm habitats restricting their usefulness when evaluating forested landscapes. However, this is not always the case as *Phytomyptera cingulata* (as *Elfia cingulata*) has been used as an indicator of food web intactness in old growth forests (Komonen 2001) and similar examples are likely to exist elsewhere.

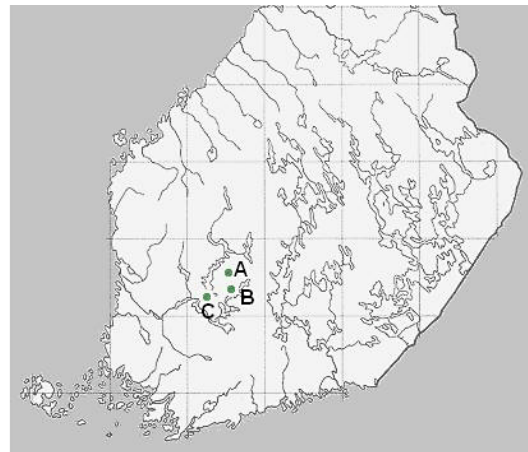


Figure 1. Map of southern Finland showing the study locations. Distance between A and B is about 20 km and between B and C about 30 km.

In order to find nominators for tachinid diversity, I compared in this microstudy the species assemblages of tachinid flies in three different, geographically adjacent, open habitats in the Pirkanmaa region of south-central Finland (Fig. 1). The sampling was mainly done by one Malaise trap per location in the summers of 2007 and 2008, combined with active netting in summers 2007–2009. Tachinidae specimens were pinned and identified using the Central European key (Tschorsnig and Herting 1994).

Location A (Ta: Juupajoki, Lakkasuo, 61°47'55"N, 24°18'19"E) is a 7000 year old eccentric raised bog with limited disturbance by man. The mire has a clear hydrological gradient towards the middle and is unusually diverse, having parts with mesotrophic, oligotrophic and ombrotrophic vegetation types. The Malaise trap was situated during the summers of 2007 and 2008 (first week of May to end of September) in the oligotrophic region of the mire, consisting solely of *Sphagnum* mosses together with sparse field vegetation of *Eriophorum vaginatum* L., *Andromeda polifolia* L., *Rubus chamaemorus* L., *Calluna vulgaris* L., and *Empetrum nigrum* L. (Fig. 2). The bordering area is defined with low, sparse pines (*Pinus sylvestris* L.) and on the southern edge by shrubs of *Betula nana* L. and *Salix* spp. Because of the surrounding pine trees, the Malaise trap location was relatively well shielded from wind. Tachinids were collected also by active netting

during 4–5 sampling times per summer in the close vicinity of the trap. In the spring the biotope experiences extreme temperature fluctuations and is very hot during sunny summer days. Lakkasuo can be imagined to represent the true Taiga habitats that existed in Finland before forced land usage and improvement for forestry purposes.



Figure 2. View of location A in May. Malaise trap was situated to the left of the picture.

Location B (Ta: Orivesi, Siitama, 61°37'40"N, 24°12'41"E) is a man-made south-west to north-east oriented powerline clearing. In the studied area, the 50–75 m wide powerline travels through spruce and pine forests and diverse microhabitats of bare rock surfaces, heath and wet meadows. In 2007 and 2008, from early May to the end of September, a Malaise trap was situated on dry grassland having considerable new growth of *Betula pubescens* L. saplings. Besides sedges and grasses, vegetation in the vicinity consisted of Umbelliferae such as *Anthriscus* and *Angelica* and Asteraceae like *Solidago*. The area remains open as tree saplings are cleared infrequently by the powerline company. Additionally, in 2007–2009 active netting was carried out 4–5 times per summer. The sampling area included approximately 500 m of the powerline clearing around the trap. Due to its orientation as well as being rather narrow and shielded, this location also gets very warm on hot summer days.

Location C (Ta: Tampere, Sarankulma, 61°27'18"N, 23°44'16"E) is a ruderate area (~200 x 70 m) in Tampere city suburb. Besides an old NW to SE oriented sandy railroad bank there are dry clay soil fields with low undergrowth of grasses, Cichoriaceae (*Hieracium*, *Pilosella*, *Leontodon* spp.) and Asteraceae (*Matricaria* spp.) surrounded mainly by sparse deciduous woods (*Betula* spp., *Alnus incana* L., *Salix caprea* L.). The railroad bank can be regarded as a hot, xerothermic habitat. One Malaise trap was used in May–September 2008, situated on the railroad bank among low grasses and sparse *Salix phylicifolia* L. bushes. Further specimens were collected with active

netting in 2008 and 2009.

In total, 560 specimens belonging to 85 species of Tachinidae were collected from the three study areas (Table 1). This is almost 40% of all tachinid species recorded from the geographical district of Tavastia australis (Ta). The species assemblages between the different locations were surprisingly different (Fig. 3, Table 2). This is largely explained by the fact that almost half of the species were recorded only once. Only four species (*Cylindromyia brassicaria*, *Smidtia amoena*, *Platymyia fimbriata* and *Eriothrix rufomaculata*) were recorded in all three locations. All these species are common and likely to represent generalists with loose habitat requirements and effective dispersal. Although sharing only 15 species, the overall diversity is fairly comparable between locations A and B. This likely reflects the diversity of lepidopteran hosts in these habitats. Albeit significantly more specimens were caught from the mire, the powerline habitat had a few more species, presumably due to the terrestrial and arboreal host guilds. This is evident in the existence of tachinids parasitizing centipedes (Chilopoda) and longhorn beetles (Cerambycidae) in location B. Moreover, the difference in the number of specimens was due to a single species, *Platymyia fimbriata*, and is not likely bear greater significance since parasitoid species abundances are known to fluctuate.

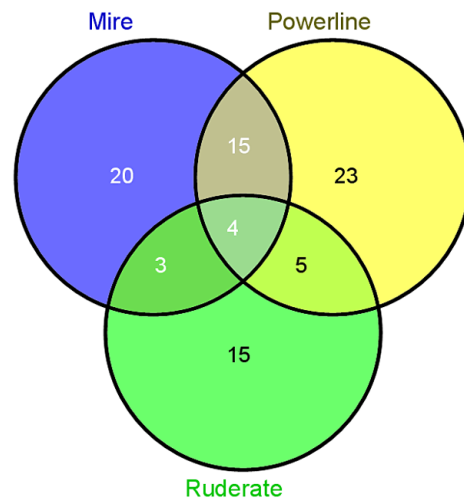


Figure 3. A Venn diagram of the tachinid species listed in Table 1. Numbers show the species overlap and the differences between the three locations: e.g., 20 species detected in mire only, 15 species shared between mire and powerline, four species in common for all habitats. For Venn diagram generation see Oliveros (2007).

Whereas most species listed in Table 2 occur also in diverse environments, there are some examples of specialized species restricted to specific habitats. One such

Table 1. Tachinidae caught from the three study locations. Known or assumed host orders as follows: Chi – Chilopoda (centipedes); Col – Coleoptera (adult/larval beetles); Dip – Diptera (Tipulidae larvae); Hem – Hemiptera (true bugs); Hym – Hymenoptera (Symphyta; sawfly larvae); Lep – Lepidoptera (larvae of moths and butterflies); Ort – Orthoptera (Acrididae grasshoppers). Note that all *Tachina magnicornis* specimens recorded here represent the species that has been confused with the “true” *magnicornis* (see Novotná *et al.* 2009).

Location A: Mire			Location B: Powerline			Location C: Ruderate		
42 species	Host	n	47 species	Host	n	27 species	Host	n
Phasiinae			Phasiinae			Phasiinae		
<i>Catharosia pygmaea</i> (Fallén)	Hem	1	<i>Besseria anthophila</i> (Loew)	Hem	1	<i>Cylindromyia brassicaria</i> (Fabr.)	Hem	6
<i>Cylindromyia brassicaria</i> (Fabr.)	Hem	1	<i>Cylindromyia brassicaria</i> (Fabr.)	Hem	1	<i>Cylindromyia interrupta</i> (Meigen)	Hem	2
<i>Gymnosoma nudifrons</i> Herting	Hem	1	<i>Cylindromyia interrupta</i> (Meigen)	Hem	1	<i>Cylindromyia pusilla</i> (Meigen)	Hem	5
			<i>Gymnosoma nudifrons</i> Herting	Hem	1	<i>Phasia pusilla</i> Meigen	Hem	1
Exoristinae			Exoristinae			Exoristinae		
<i>Acemya ruffibibia</i> (von Roser)	Ort	2	<i>Allophorocera ferruginea</i> (Meigen)	Dip	5	<i>Aplomya confinis</i> (Fallén)	Lep	3
<i>Bactromyia aurulenta</i> (Meigen)	Lep	1	<i>Aplomya confinis</i> (Fallén)	Lep	2	<i>Bessa selecta</i> (Meigen)	Hym	1
<i>Blondelia nigripes</i> (Fallén)	Lep	1	<i>Belida angelicae</i> (Meigen)	Hym	8	<i>Brachicheta strigata</i> (Meigen)	n/a	4
<i>Carcelia laxifrons</i> Villeneuve	Lep	1	<i>Bothria subalpina</i> Villeneuve	Lep	8	<i>Cyzenis jucunda</i> (Meigen)	Lep	1
<i>Drino galii</i> (Brauer & Bergenstamm)	Lep	1	<i>Carcelia laxifrons</i> Villeneuve	Lep	1	<i>Gonia divisa</i> Meigen	Lep	2
<i>Eumea linearicornis</i> (Zetterstedt)	Lep	1	<i>Cyzenis jucunda</i> (Meigen)	Lep	1	<i>Gonia picea</i> (R.-D.)	Lep	8
<i>Eumea mitis</i> (Meigen)	Lep	1	<i>Hubneria affinis</i> (Fallén)	Lep	10	<i>Oswaldia muscaria</i> (Fallén)	Lep	1
<i>Exorista deligata</i> Pandellé	Lep	1	<i>Lydella stabulans</i> (Meigen)	Lep	19	<i>Platymyia fimbriata</i> (Meigen)	Lep	3
<i>Exorista</i> sp.	n/a	2	<i>Meigenia dorsalis</i> (Meigen)	Col	1	<i>Pseudoperichaeta nigrolineata</i> (Walker)	Lep	1
<i>Medina collaris</i> (Fallén)	Col	1	<i>Nilea hortulana</i> (Meigen)	Lep	1			
<i>Meigenia dorsalis</i> (Meigen)	Col	1	<i>Nilea rufiscutellaris</i> (Zetterstedt)	Lep	3	<i>Smidtia amoena</i> (Meigen)	Lep	2
<i>Oswaldia spectabilis</i> (Meigen)	Lep	1	<i>Onychogonia flaviceps</i> (Zetterstedt)	Lep	1			
<i>Pales pavida</i> (Meigen)	Lep	1	<i>Oswaldia spectabilis</i> (Meigen)	Lep	2			
<i>Paratryphera barbatula</i> (Rondani)	Lep	1	<i>Paratryphera barbatula</i> (Rondani)	Lep	1			
<i>Phryxe magnicornis</i> (Zetterstedt)	Lep	1	<i>Phebellia vicina</i> (Wainwright)	Lep	2			
<i>Platymyia fimbriata</i> (Meigen)	Lep	117	<i>Platymyia fimbriata</i> (Meigen)	Lep	2			
<i>Senometopia pollinosa</i> (Mesnil)	Lep	1	<i>Smidtia amoena</i> (Meigen)	Lep	6			
<i>Smidtia amoena</i> (Meigen)	Lep	7	<i>Tlephusa cincinna</i> (Rondani)	Lep	5			
<i>Tlephusa cincinna</i> (Rondani)	Lep	5	<i>Winthermia quadripustulata</i> (Fabr.)	Lep	1			
			<i>Zaira cinerea</i> (Fallén)	Col	1			
Tachininae			Tachininae			Tachininae		
<i>Actia lamia</i> (Meigen)	Lep	1	<i>Appendicia truncata</i> (Zetterstedt)	Lep	4	<i>Actia lamia</i> (Meigen)	Lep	9
<i>Appendicia truncata</i> (Zetterstedt)	Lep	1	<i>Ceromya bicolor</i> (Meigen)	Lep	2	<i>Ceranthis tenuipalpis</i> (Villeneuve)	Lep	3
<i>Ceromya bicolor</i> (Meigen)	Lep	13	<i>Ceromya silacea</i> (Meigen)	Lep	1	<i>Eurithia anthophila</i> (R.-D.)	Lep	1
<i>Eurithia connivens</i> (Zetterstedt)	Lep	1	<i>Entomophaga sufferta</i> (Villeneuve)	Lep	1	<i>Loewia erecta</i> Bergström	Chi	1
<i>Gymnocheta viridis</i> (Fallén)	Lep	1	<i>Eurithia consobrina</i> (Meigen)	Lep	2	<i>Phytomyptera zonella</i> (Zetterstedt)	Lep	3
<i>Linnaemya vulpina</i> (Fallén)	Lep	31	<i>Leskia aurea</i> (Fallén)	Lep	1	<i>Siphona confusa</i> Mesnil	Lep	3
<i>Peribaea hertingi</i> Andersen	Lep	2	<i>Loewia foeda</i> (Meigen)	Chi	1	<i>Siphona flavifrons</i> Staeger	Dip	1
<i>Siphona cristata</i> (Fabr.)	Lep	1	<i>Lypha dubia</i> (Fallén)	Lep	2	<i>Siphona maculata</i> Staeger	Lep	1
<i>Siphona maculata</i> Staeger	Lep	1	<i>Siphona boreata</i> Mesnil	Lep	1	<i>Solieria pacifica</i> (Meigen)	Lep	17
<i>Siphona setosa</i> Mesnil	Lep	4	<i>Siphona confusa</i> Mesnil	Lep	2	<i>Siphona setosa</i> Mesnil	Lep	1
<i>Tachina fera</i> (L.)	Lep	2	<i>Tachina fera</i> (L.)	Lep	27			
<i>Tachina magnicornis</i> (Zetterstedt)	Lep	2	<i>Tachina magnicornis</i> (Zetterstedt)	Lep	13			
<i>Tachina ursina</i> Meigen	Lep	2	<i>Tachina ursina</i> Meigen	Lep	4			
Dexiinae			Dexiinae			Dexiinae		
<i>Athyrcia impressa</i> (van der Wulp)	Lep	1	<i>Athyrcia impressa</i> (van der Wulp)	Lep	2	<i>Dinera griseescens</i> (Fallén)	Col	3
<i>Blepharomyia pagana</i> (Meigen)	Lep	26	<i>Athyrcia trepida</i> (Meigen)	Lep	2	<i>Eriothrix rufomaculata</i> (De Geer)	Lep	10
<i>Campylocheta inepta</i> (Meigen)	Lep	6	<i>Billaea triangulifera</i> (Zetterstedt)	Col	5	<i>Phyllomya volvulus</i> (Fabr.)	Hym	1
<i>Campylocheta praecox</i> (Meigen)	Lep	11	<i>Blepharomyia pagana</i> (Meigen)	Lep	1			
<i>Cyrtophleba vernalis</i> (Kramer)	n/a	12	<i>Campylocheta praecox</i> (Meigen)	Lep	6			
<i>Eriothrix rufomaculata</i> (De Geer)	Lep	22	<i>Cyrtophleba vernalis</i> (Kramer)	n/a	4			
<i>Ramonda ringdahli</i> (Villeneuve)	Lep	1	<i>Dinera ferina</i> (Fallén)	Col	6			
			<i>Eriothrix rufomaculata</i> (De Geer)	Lep	1			
			<i>Phyllomya volvulus</i> (Fabr.)	Hym	2			
			<i>Thelaira nigrina</i> (Fallén)	Lep	1			
total		291			175			94

example is the obligatory psychid moth parasitoid *Exorista deligata* recorded from the mire location. This species is extremely rare and has been recorded only six times from Finland. Suitable large hosts such as *Acanthopsyche atra* L., *Canephora hirsuta* Poda and *Phalacropterix graslinella* Boisduval (all Lep: Psychidae) are commonly found in

Lakkasuo.

Lakkasuo yielded also a number of other interesting tachinids. *Phryxe magnicornis* was recorded as new to Finland (confirmed by C. Bergström) and I was able to net two more specimens of this species from another mire in southern Finland in 2008, indicating that the species might

Table 2. Tachinid species recorded in only one of the locations in this study. Note that almost half of all species were detected in only one habitat.

Only in mire (20/42)	Only in powerline (23/47)	Only in ruderate (15/27)
<p>Phasiinae <i>Catharosia pygmaea</i></p> <p>Exoristinae <i>Bactromyia aurulenta</i> <i>Blondelia nigripes</i> <i>Drino galii</i> <i>Eumea linearicornis</i> <i>Eumea mitis</i> <i>Exorista</i> sp. <i>Exorista deligata</i> <i>Medina collaris</i> <i>Pales pavidata</i> <i>Phryxe magnicornis</i> <i>Senometopia pollinosa</i></p> <p>Tachininae <i>Acemya rufitibia</i> <i>Eurithia connivens</i> <i>Gymnocheta viridis</i> <i>Linnaemya vulpina</i> <i>Peribaea hertingi</i> <i>Ramonda ringdahli</i> <i>Siphona cristata</i></p> <p>Dexiinae <i>Campylocheta inepta</i></p>	<p>Phasiinae <i>Besseria anthophila</i></p> <p>Exoristinae <i>Allophorocera ferruginea</i> <i>Belida angelicae</i> <i>Bothria subalpina</i> <i>Hubneria affinis</i> <i>Lydella stabulans</i> <i>Nilea hortulana</i> <i>Nilea rufiscutellaris</i> <i>Onychogonia flaviceps</i> <i>Phebellia vicina</i> <i>Winthemia quadripustulata</i> <i>Zaira cinerea</i></p> <p>Tachininae <i>Ceromya silacea</i> <i>Entomophaga sufferta</i> <i>Eurithia consobrina</i> <i>Leskia aurea</i> <i>Loewia foeda</i> <i>Lypha dubia</i> <i>Siphona boreata</i></p> <p>Dexiinae <i>Athrycia trepida</i> <i>Billaea triangulifera</i> <i>Dinera ferina</i> <i>Thelaira nigrina</i></p>	<p>Phasiinae <i>Cylindromyia pusilla</i> <i>Phasia pusilla</i></p> <p>Exoristinae <i>Bessa selecta</i> <i>Brachicheta strigata</i> <i>Gonia picea</i> <i>Gonia divisa</i> <i>Oswaldia muscaria</i> <i>Pseudoperichaeta nigrolineata</i></p> <p>Tachininae <i>Ceranthia tenuipalpis</i> <i>Eurithia anthophila</i> <i>Loewia erecta</i> <i>Phytomyptera zonella</i> <i>Siphona flavifrons</i> <i>Solieria pacifica</i></p> <p>Dexiinae <i>Dinera grisescens</i></p>

be confined to these habitats in Finland. The rare grasshopper parasitoid *Acemya rufitibia* found at the Lakkasuo site has also been collected from a similar mire in eastern Finland (J. Kahanpää, pers. comm.). *Myrmeleotettix maculatus* Thunberg is the commonest acridid in Lakkasuo and is possibly a suitable host for *A. rufitibia*. The most interesting findings are the two small *Exorista* specimens. They seem to be close to non-Finnish *Exorista tubulosa* Herting, but are likely to represent an undescribed species (C. Bergström, pers. comm.). I have seen two additional males of this species from a mire in northern Finland.

The Lakkasuo mire seems also to support a number of tachinids that are more commonly found in man-made cultural landscapes, including *Cylindromyia brassicaria*, *Gymnocheta viridis*, *Meigenia dorsalis* and *Actia lamia*. It may well be that some insect species thought to have arrived in Finland when agriculture changed the landscape, have actually already existed in open habitats provided by mires and bogs. *Drino galii* can be regarded as an atypical

finding for a mire as there are no suitable host plants for its hawkmoth host *Hyles gallii* Rottemburg. In fact, I have collected another large hawkmoth parasitoid *Frontina laeta* Meigen from a second mire habitat also lacking suitable hosts. It may well be that these tachinids have the tendency to migrate long distances or are otherwise prone to disperse from their typical environments. Overall, the tachinid species living in boreal mires and bogs are poorly known and larger studies would certainly yield exciting results.

In contrast to the more natural environments, the suburban location C had markedly fewer tachinid species despite a comparable collecting effort. Larger tachinids were rare and Phasiinae parasitizing heteropteran bugs were over-represented, apparently due to the low local diversity of Lepidoptera (a general trend in urban habitats). Most tachinids recorded from this location seem to be confined to terrestrial host guilds, such as *Dinera grisescens* (Col: Carabidae) and *Gonia* spp. (Lep: Noctuidae larvae living in grass tufts). *Pseudoperichaeta nigrolineata*

and *Ceranthia tenuipalpis* were recorded as new to the region and represent the northernmost observations of these species in Finland. It is likely that these species benefit from the warmer microclimate provided by the railroad bank and surrounding suburban area.

Low local tachinid diversity in location C can be misleading due to the smaller size of the area when compared to locations A and B. In fact, the mosaic of diverse habitats seems rather typical for sparsely built urban areas. During the same study period I recorded 57 species of tachinids in the Tampere city area, supported by man-made parks, gardens and road cuts.

As expected, there seems to be significant variation of tachinid species assemblages between different open habitats within the same geographical region. Overall habitat diversity is likely to correlate with the diversity of available host guilds, but this does not necessarily translate into significant differences in tachinid diversity, as evidenced in the locations A and B. Considering that the powerline (location B) had a gradient of habitats from moor-like dry soils to wet meadows, bushes and forest edges the five species difference compared to the seemingly more uniform mire habitat seems marginal. Likely a number of other environmental factors, such as microclimate variation, play their role in determining tachinid abundance and diversity. Local long-term studies to correlate habitat type, plant and host diversity with tachinid diversity would thus prove interesting. For monitoring purposes, it might then be possible to single out locally important indicator species. However, the usefulness of tachinids is limited by the small number of specimens caught from the majority of species and rare indicator species are unlikely to get sampled during short study periods.

References

- Komonen, A. 2001. Structure of insect communities inhabiting old-growth forest specialist bracket fungi. *Ecological Entomology* **26**: 63–75.
- Novotná, H., Vaňhara, J., Tóthová, A., Muráriková, N., Bejdák, P., Tkoč, M. and Rozkošný, R. 2009. Identification and taxonomy of the West Palaearctic species of *Tachina* Meigen (Diptera: Tachinidae) based on male terminalia and molecular analyses. *Entomologica Fennica* **20**: 139–169.
- Oliveros, J.C. 2007: VENNY. An interactive tool for comparing lists with Venn Diagrams. <http://bioinfogp.cnb.csic.es/tools/venny/index.html>.
- Tschorsnig, H.-P. and Herting, B. 1994. Die Raupenfliegen (Diptera: Tachinidae) Mitteleuropas: Bestimmungstabellen und Angaben zur Verbreitung und Ökologie der einzelnen Arten. *Stuttgarter Beiträge zur Naturkunde. Serie A (Biologie)* **506**: 1–170.

First records and other interesting finds of Tachinidae from Israel and adjacent areas *by Joachim Ziegler*

During two brief private visits in March 1995 and 1999, I had the opportunity of spending several days collecting Diptera in Israel and in adjacent areas especially of the Jordan Rift Valley. In 1999 I was also able to visit the Zoological Institute of Tel Aviv University and was very grateful for the opportunity of making the personal acquaintance of Professor Jehoshua Kugler.

Biogeographically this area is part of the Palaearctic Region. But it is also a transition zone between two other regions of the Old World, the Afrotropical Region and the Oriental Region, and is therefore of special interest. This country is small in area, but has a very diverse natural endowment that offers varied environments for numerous Tachinidae. Although settled for thousands of years and with many cultural layers, it is still possible to find near-natural habitats. The fauna is well known thanks to the intensive work of Kugler and is therefore better investigated than in other countries of the Middle East (Kugler 1980). Nevertheless, I was able to find some surprises during my few days of collecting. A revised checklist of Israel was recently published in *The Tachinid Times* by Cerretti and Freidberg (2009), and this has provided a stimulus for me to publish some of my own captures.

Alongside the species listed below and some specimens that still remain unidentified, I found the **first record** of *Drino latigena* (Mesnil, 1944) for the region. Three males were collected on the north edge of the Jordan Valley on 6 March 1999, some 6 km south of Bitronot, on a bush of *Rhus tripartita* (Anacardiaceae) more than 2 m in height. As these flies are very shy and fly rapidly, and the bushes are armed with thorns, it was a bloody action. As soon as the third fly was captured after a violent stroke of the net, I had to bind up my hand which had been wounded by the long thorns.

Even the identification of these three *Drino* males involved certain difficulties. In this transition zone between the Afrotropical, Oriental and Palaearctic Regions, there are a number of *Drino* species of which at least three are extremely similar: *Drino latigena*, *Drino maroccana* Mesnil, and *Drino imberbis* (Wiedemann). As with so many other old descriptions, Wiedemann's (1830) description of *Drino imberbis* from material from Egypt is too imprecise to enable the species to be recognised with certainty. *Drino maroccana* was described by Mesnil (1951) from Morocco, whilst the third species, *Drino latigena* (Mesnil 1944), was not mentioned in the Palaearctic catalogues of Herting (1984) and Herting and Dely-Draskovits (1993) because for many years it was known only from the Afrotropical Region. Recently, however, it has been found in the Middle East (Zeegers 2010). Mesnil's (1944) original description

of *Phorcida* (= *Drino*) *latigena* is inaccurate in certain characters. In particular, the description of “Parafaciaux très larges, près de 3 fois plus larges que les antennes ...” does not fit my specimens. During a visit to the Paris Museum, I was able to examine the holotype of *Phorcida latigena* Mesnil and established that the parafacial is nothing like as broad as this and that the type is identical with my specimens from the Jordan Valley. There is an improved description of this species in Mesnil (1951) and the species can be reliably identified using the key in that paper. Crosskey (1967) also dealt with these *Drino* species. The taxonomic characters of the species occurring in Israel were described in detail by him under the names *Palexorista imberbis* and *P. zonata* (Curran). Unfortunately, Crosskey’s description of *Palexorista imberbis* is practically identical with that of Mesnil’s *Drino latigena* (a species Crosskey did not mention), and his description of *Palexorista zonata* matches *Drino imberbis* of authors. This is confusing and moreover is not supported by study of the Wiedemann types, which are probably lost. I am therefore following the interpretation of Herting (1984: 193, note 142), according to which the Wiedemann name *imberbis* is used for the widespread and more abundant of the two species (with *Sturmia zonata* Curran, 1927 in synonymy) and the name *latigena* is used for the other species.

Crosskey (1967: 93) attempted to locate the syntypes of *Tachina imberbis* Wiedemann, 1830. Material from the Lehmann collection was undoubtedly destroyed by fire during World War II together with the other collections of the Hamburg Museum. According to the description, at least one male was supposed to be in the Berlin Museum (“im Berliner Museum”). Crosskey wrote: “... Dr Schumann [the erstwhile curator] informs me that the Tachinid collection in Berlin Museum is in such need of curation that it is impossible to trace a possible type existing in it at the present time”. In recent years the various parts of the Berlin Museum collection of Tachinidae (and of other families) have been amalgamated into a main collection, newly laid out, and the species names and their locations in the collection entered into a digital database. The compilation of a type catalogue is underway. No type material of *Tachina imberbis* has been found in the course of these activities. Furthermore, the historic Berlin Diptera catalogues, into which a record of all the accessions was entered including numerous examples of Wiedemann type specimens, contain no mention of *Tachina imberbis*. It can therefore be accepted that the syntypes intended for the Berlin Museum never arrived here. Theoretically, the type material of this species should have been received by the Copenhagen or Vienna museums with the remains of Wiedemann’s own collection. But there is no trace of this species in those two collections, so we really have to accept that the type material is lost.

The two species occurring in Israel can generally be identified with the key in Mesnil (1951), with reference also to the characters listed in Crosskey (1967). The variation is however greater than these authors indicated, for which reason I have given below, and have expanded and elaborated on, the most important characters for separating the males of these two species.

***Drino latigena* (Mesnil, 1944)** (first record): Arista thickened in basal 0.55–0.75. Postpedicel 2.0–2.5 times as long as pedicel. Parafacial in profile at its narrowest point 0.8–1.1 times as wide as the postpedicel, its absolute measurement 1.5–2.0 times as wide as the postpedicel. Frons at its narrowest point 0.90–1.00 times as wide as an eye in dorsal view. Section of *M* between crossvein *dm-cu* and bend of *M* equal in length to the distance between bend of *M* and wing margin. Abdomen on the upper and lower sides with extensive light reddish-yellow lateral spots. Surstylus without stubby black spinules on outer apical part but with fine blond hairs.

***Drino imberbis* (Wiedemann, 1830)** (= *Sturmia zonata* Curran, 1927): Arista thickened in basal 0.40–0.45. Postpedicel 2.4–3.3 times as long as pedicel. Parafacial in profile at its narrowest point 0.6–0.9 times as wide as the postpedicel, its absolute measurement 1.15–1.40 times as wide as the postpedicel. Frons at its narrowest point 0.75–0.85 times as wide as an eye in dorsal view. Section of *M* between crossvein *dm-cu* and bend of *M* 1.15–1.45 times longer than the distance between bend of *M* and wing margin. Yellow lateral spots on the abdomen less pale, usually not visible in dorsal view. Surstylus with stubby black spinules on outer apical part.

In general, the identification of a further 40 species was more straightforward, and they are listed in the “Species list” below together with their locality data. They include another five new records, including one undescribed species.

Species list

Species names and locality names are listed in alphabetical order. Additional information about the collecting sites is given under “List of localities”.

Amelibaea signifera (Villeneuve, 1929)

En Afeq, 4.iii.1995, 2♀♀ on flowers of *Bifora* sp. – Mizpé Gilboa, 4.iii.1995, 1♂ on flowers of *Bifora* sp.; 6.iii.1999, 4♂♂ on flowers of *Euphorbia hierosolymitana*. – Sede Boqer, 8.iii.1995, 3♂♂ 2♀♀ on flowers of *Anthemis melampodina*.

Baumhaueria goniaeformis (Meigen, 1824)

Gamla, 3.iii.1995, 4♀♀ on flowers of *Bifora* sp.

Besseria lateritia (Meigen, 1824)

Pezáel, 8.iii.1999, 2♂♂ 1♀ on flowers of *Senecio glaucus*.

Brachychaeta petiolata Mesnil, 1953

Mezoké Derogot, 7.iii.1999, 12♀♀ on flowers of *Ochradenus baccatus*. – Mizpé Gilboa, 6.iii.1999, 2♂♂ 1♀, on flowers of *Euphorbia hierosolymitana*. – Pezáel, 8.iii.1999, 3♂♂ 7♀♀ on flowers of *Senecio glaucus*. – Zomet Adummim, 5.iii.1999, 2♂♂ on flowers of *Minuartia picta*.

Chetogena aegyptiaca (Villeneuve, 1923)

Gamla, 3.iii.1995, 1♀ on flowers of *Bifora* sp. – Pezáel, 8.iii.1999, 4♂♂ 7♀♀ on flowers of *Ochradenus baccatus*. – Sede Boqer, 8.iii.1995, 1♀ on flowers of *Anthemis melampodina*. – Zomet Adummim, 5.iii.1999, 2♂♂ sitting on stones.

Chetogena obliquata (Fallén, 1810)

Biq'at Sayyarim, 12.iii.1995, 10♂♂ on stones, 2♀♀ on shrubs of *Retama raetam*. – Gamla, 3.iii.1995, 1♂ on leaves of herbs. – Mizpé Gilboa, 4.iii.1995, 1♂ on hilltop sitting on stone; 6.iii.1999, 5♂♂ on flowers of *Euphorbia hierosolymitana*. – Nahal Ramon, 9.iii.1995, 1♂ on shrubs of *Retama raetam*.

Dufouria canescens Herting, 1981

First record. En Afeq, 4.iii.1995, 1♂ on flowers of *Bifora* sp.

Eliozeta helluo (Fabricius, 1805)

Mizpé Gilboa, 6.iii.1999, 1♀ on flowers of *Euphorbia hierosolymitana*.

Engeddia multisetosa Kugler, 1977

Mezoké Derogot, 7.iii.1999, 1♀ on flowers of *Ochradenus baccatus*.

Eumeella perdives (Villeneuve, 1926)

Gamla, 3.iii.1995, 8♂♂ on leaves of herbs. – Mezoké Derogot, 7.iii.1995, 1♀; 4.iii.1999, 1♀; 7.iii.1999, 1♂; all on flowers of *Ochradenus baccatus*. – Mizpé Gilboa, 4.iii.1995, 1♂ on hilltop sitting on stone; 6.iii.1999, 19♂♂ on flowers of *Euphorbia hierosolymitana*.

Gonia maculipennis Egger, 1862

Mizpé Gilboa, 4.iii.1995, 3♀♀ on flowers of *Bifora* sp.; 6.iii.1999, 11♂♂ 1♀ on flowers of *Euphorbia hierosolymitana*.



Figure 1. *Gonia umbripennis* Herting, 1958. Male on flowers of *Ochradenus baccatus* near Mezoké Derogot, 4.iii.1999.

Gonia umbripennis Herting, 1958 (Fig. 1)

Mezoké Derogot, 4.iii.1999, 1♂ 1♀ on flowers of *Ochradenus baccatus* and 5♂♂ 2♀♀ on leaves of herbs; 7.iii.1999, 1♀ on

flowers of *Ochradenus baccatus*. – Pezáel, 8.iii.1999, 8♂♂ 13♀♀ on flowers of *Senecio glaucus*.

Gymnophryxe theodori (Kugler, 1968)

Mezoké Derogot, 4.iii.1999, 2♂♂ 1♀ on flowers of *Ochradenus baccatus* and *Tamarix tetragyna*. – Sede Boqer, 8.iii.1995, 3♀♀ on leaves of herbs.

Leucostoma crassum Kugler, 1966

Enot Qane, 4.iii.1999 1♂ on flowers of *Ochradenus baccatus*. – Mezoké Derogot, 6.iii.1995, 1♂ on leaves of herbs; 7.iii.1995, 1♂; 4.iii.1999, 3♂♂ 2♀♀; 7.iii.1999, 13♂♂ 1♀, all on flowers of *Ochradenus baccatus*. – Qalya, 4.iii.1999, 1♀; 8.iii.1999, 2♂♂; all on flowers of *Tamarix tetragyna*. – Pezáel, 8.iii.1999, 2♂♂ on flowers of *Senecio glaucus* and *Ochradenus baccatus*. – Zomet Adummim, 5.iii.1999, 1♂ sitting on stone.

Leucostoma engeddense Kugler, 1966

Mezoké Derogot, 6.iii.1995, 1♂ on leaves of herbs.

Linnaemya neavei Curran, 1934

Mezoké Derogot, 7.iii.1995, 1♀ on leaves of herbs. – Qalya, 4.iii.1999, 1♂ on flowers of *Tamarix tetragyna*.

Linnaemya setifrons Zimin, 1954

Mezoké Derogot, ex larva 27.iii.1995, 1♂. Host: larva Lepidoptera *Orgyia dubia* Tausch.

Macquartia praefica (Meigen, 1824)

Mizpé Gilboa, 6.iii.1999, 1♂ on flowers of *Euphorbia hierosolymitana*.

Macquartia tessellum (Meigen, 1824)

Mezoké Derogot, 7.iii.1995, 2♂♂ on flowers of *Ochradenus baccatus*. – Netanya, 1.iii.1995, 2♂♂ sitting on the soil.

Meigenia mutabilis (Fallén, 1810)

En Gedi, 7.iii.1995, 4♂♂ on leaves of herbs. – Mezoké Derogot, 6.iii.1995, 6♂♂ on leaves of herbs; 7.iii.1995, 4♂♂ on flowers of *Ochradenus baccatus*.

Meigenia simplex Tschorsnig & Herting, 1998

Mezoké Derogot, 7.iii.1995, 1♂ on flowers of *Ochradenus baccatus*.

Nemorilla maculosa (Meigen, 1824)

Biq'at Sayyarim, 12.iii.1995, 1♂ on shrubs of *Retama raetam*. – Bitronot, 6.iii.1999, 1♂ on leaves of *Rhus tripartita*. – En Gedi, 7.iii.1995, 1♂ on leaves of herbs. – Mezoké Derogot, 4.iii.1999, 1♂ on flowers of *Ochradenus baccatus*.

Neoemdenia mirabilis Mesnil, 1953 (Fig. 2)

En Afeq, 4.iii.1995, 1♂. – HaMa'ala, 2.iii.1995, 1♂ 2♀♀. – Mizpé Gilboa, 4.iii.1995, 3♂♂ 1♀. All specimens on flowers of *Bifora* sp.

Pales latifrons Kugler, 1980

Biq'at Sayyarim, 12.iii.1995, 3♀♀ on shrubs of *Retama raetam*. – Mezoké Derogot, 6.iii.1995, 1♀ on leaves of herbs; 7.iii.1995, 17♂♂ 17♀♀ on flowers of *Ochradenus baccatus*.

Peleteria ruficornis (Macquart, 1835)

Biq'at Sayyarim, 12.iii.1995, 1♀ on shrubs of *Retama raetam*. – Qalya, 4.iii.1999, 3♂♂; 5.iii.1999, 2♂♂; all on flowers of

Tamarix tetragyna. – Wadi Qilt, 5.iii.1995, 1♂ on flowers of *Anthemis palaestina*.



Figure 2. *Neomendonia mirabilis* Mesnil, 1953. Female on flowers near HaMa'ala, 2.iii.1995.

Phasia mesnili (Draber-Moňko, 1965)
Pezáel, 8.iii.1999, 1♂ on flowers of *Senecio glaucus*.

Phorocera atricans Tschorsnig, 1992
First record. Mizpé Gilboa, 4.iii.1995, 1♂ on hilltop sitting on stone.

Plagiomima sinaica (Villeneuve, 1909)
Pezáel, 8.iii.1999, 1♂ on flowers of *Senecio glaucus*.

Platymya antennata (Brauer & Bergenstamm, 1891)
Mizpé Gilboa, 4.iii.1995, 1♀ on flowers of *Bifora* sp. – Zomet Adummim, 5.iii.1999, 1♂ on flowers of *Minuartia picta*.

Pseudomintho diversipes (Strobl, 1899)
Wadi Qilt, 5.iii.1995, 1♂ on flowers of *Anthemis palaestina*.

Rossimylops magnificus (Kugler, 1972)
Qalya, 5.iii.1999, 1♂. – Mezoké Derogot, 7.iii.1999, 1♂. Both specimens on flowers of *Ochradenus baccatus*.

Siphona ingerae Andersen, 1982
First record. Hare Gilboa, 4.iii.1995, 1♀ on leaves of herbs (determination confirmed by Stig Andersen in 2000).

Spallanzania sp. nov. (Fig. 3)
Undescribed species. Mezoké Derogot, 7.iii.1995, 1♂; 4.iii.1999, 1♂; 7.iii.1999, 3♂♂ 1♀; all on flowers of *Ochradenus baccatus*. – Enot Qane, 4.iii.1999, 1♀ on flowers of *Ochradenus baccatus*. The West Palaearctic species of this genus are being revised by the present author.

Steleoneura czernyi Stein, 1924
Mezoké Derogot, 7.iii.1995, 3♂♂ on a hilltop sitting on stones; 7.iii.1999, 1♂ on flowers of *Ochradenus baccatus*. Hilltopping behaviour by this species was also observed by Bystrowski and Zeegers (2008).

Tachina magnicornis (Zetterstedt, 1844)
Baniyas, 2.iii.1995, 1♀ on flowers of *Smyrnum* sp. – Gamla, 3.iii.1995, 5♂♂ 2♀♀ on flowers of *Euphorbia hierosolymitana*. – Mizpé Gilboa, 4.iii.1995, 1♀ on flowers of *Bifora* sp.

Tachina rohdendorfi Zimin, 1935
First record. Qalya, 4.iii.1999, 1♂ on flowers of *Tamarix tetragyna*. – Pezáel, 8.iii.1999, 1♂ on flowers of *Ochradenus baccatus*.

Wagneria albifrons Kugler, 1977
Zomet Adummim, 5.iii.1999, 3♀♀ sitting on stones.

Wagneria dilatata Kugler, 1977
Mezoké Derogot, 4.iii.1999, 1♀ sitting on a stone.

Weberia digramma (Meigen, 1824)
Nahal Hevyon, 8.iii.1995, 1♂ on flowers of *Anthemis* sp. – Pezáel, 8.iii.1999, 1♀ on flowers of *Senecio glaucus*. – Zomet Adummim, 5.iii.1999, 2♂♂ on flowers of *Minuartia picta*, 2♂♂ 1♀ on leaves of herbs.

Zeuxia abberans (Loew, 1847)
Mezoké Derogot, 6.iii.1995, 1♀ on leaves of herbs; 7.iii.1995, 2♂♂ on hilltop sitting on stones. – Wadi Qilt, 5.iii.1995, 4♂♂ on flowers of *Anthemis palaestina*.

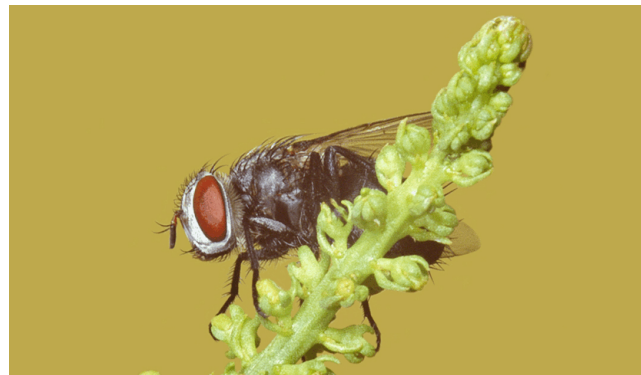


Figure 3. *Spallanzania* sp. nov. A female of this undescribed species sitting on a branch of *Ochradenus baccatus*. Mezoké Derogot, 7.iii.1999.

List of localities

Baniyas (Golan Mts.) 15 km north-east of Shemona, 400 m, 33°15'N 35°43'E.

Biq'at Sayyarim Valley (Negev) 30 km north-west of Elat, 600 m, 29°48'N 34°51'E.

Bitronot, Wadi 6 km south of Bitronot Brosh (Jordan Rift Valley), -200 m, 32°16'N 35°33'E.

En Afeq 8 km south-east of Akko, 50 m, 32°51'N 35°06'E.

En Gedi (Dead Sea area), -350 m, 31°28'N 35°22'E.

Enot Qane north of Mizpé Shalém (Dead Sea area), -390 m, 31°39'N 35°26'E.

Gamla (Golan Mts.) 10 km south-east of Qazrin, 400 m, 32°54'N 35°45'E.

HaMa'ala (Jordan Valley) 16 km south-east of Shemona, 50 m, 33°03'N 35°36'E.

Hare Gilboa (Gilboa Mts.) 6 km south-west of Bet She'an, 350 m 32°29'N 35°26'E.

Mezoké Derogot near Mizpé Shalém (Dead Sea area), 10 m, 31°35'N 34°23'E.

Mizpé Gilboa (Gilboa Mts.) 8 km south-west of Bet She'an, 480 m 32°28'N 35°25'E.

Nahal Hevyon Valley (Negev) 11 km south-east of Yeroham, 300 m, 30°57'N 35°01'E.

Nahal Ramon Valley, Makhtesh Ramon (Negev), 400 m, 30°37'N 34°51'E.

Netanya 30 km north of Tel Aviv-Yafo, 50 m, 32°19'N 34°51'E.

Pezáel, Slope west of Pezáel (Jordan Rift Valley), north of Yeriho, -100 m, 32°03'N 35°25'E.

Qalya (= Kalia) north of Qumran (Dead Sea area), -380 m, 31°45'N 35°28'E.

Sede Boqer (Negev), 450 m, 30°53'N 34°47'E.

Wadi Qilt 5 km south-west of Yeriho, 200 m, 31°50'N 35°25'E.

Zomet Adummim north-east of Jerushalayim, 380 m, 31°47'N 35°17'E.

Acknowledgements

My particular thanks go to Dr Adrian C. Pont (Goring-on-Thames) for checking the English of the manuscript, and to my wife Christiane Lange for her valuable help during the field work in Israel.

References

- Bystrowski, C. and Zeegers, T. 2008. Some interesting Tachinidae from Israel. *Tachinid Times* **21**: 16–17.
- Cerretti, P. and Freidberg, A. 2009. Updated checklist of the Tachinidae of Israel. *Tachinid Times* **22**: 9–16.
- Crosskey, R.W. 1967. A revision of the Oriental species of *Palloxorista* Townsend (Diptera: Tachinidae, Sturmiini). *Bulletin of the British Museum (Natural History). Entomology* **21**: 35–97.
- Herting, B. 1984. Catalogue of Palearctic Tachinidae (Diptera). *Stuttgarter Beiträge zur Naturkunde. Serie A (Biologie)* **369**: 1–228.
- Herting, B. and Dely-Draskovits, Á. 1993. Family Tachinidae. Pp. 118–458. *In*: Soós, Á. and Papp, L., eds., *Catalogue of Palearctic Diptera. Volume 13. Anthomyiidae—Tachinidae*. Hungarian Natural History Museum, Budapest. 624 pp.
- Kugler, J. 1980. New taxa of Tachinidae (Diptera) with a list of the species from Israel and adjacent territories. *Israel Journal of Entomology* **13** [1979]: 27–60.
- Mesnil, L.P. 1944. Nouveaux Larvaevoridae exotiques du Muséum de Paris (Diptera). *Revue française d'Entomologie* **11**: 10–17.
- Mesnil, L.P. 1951. 64g. Larvaevorinae (Tachininae). *Die Fliegen der Palaearktischen Region* **10** (Lieferung 166): 161–208 + pls. III–V.
- Wiedemann, C.R.W. 1830. *Aussereuropäische zweiflügelige Insekten. Als Fortsetzung des Meigenschen Werkes. Zweiter Theil*. Schulz, Hamm. xii + 684 pp. + 5 pls.
- Zeegers, T. 2010. Order Diptera, family Tachinidae. Pp. 673–686. *In*: Harten, A. van, ed., *Arthropod fauna of the UAE. Volume 3. Dar Al Ummah, Abu Dhabi*. 700 pp.

Collecting and preserving tachinid legs for molecular study

by James E. O'Hara

Monty Wood, in the abstract to his recent International Congress of Dipterology presentation “Tachinidae in the era of molecular systematics”, wrote that the Tachinidae are “woefully unprepared for the molecular revolution of the 21st century” (Wood 2010: 278; see abstract in its entirety on page 24). The Tachinidae are so large, exhibit so much morphological diversity (but also homoplasy), have such a little-known phylogeny and such an unstable classification, that few dipterists or molecular systematists venture into them. We know more about some lineages than others and more about some faunas than others but overall – throughout the family and on a global scale – there is a great deal we do not know. Monty observed that as we move forward in the 21st century “morphological observations can still contribute to a better understanding of tachinid phylogeny, even as these same taxa are being sequenced” (Wood 2010: 278). I also believe it will take both morphological and molecular approaches proceeding in unison for tachinid phylogeny to be better elucidated. In this respect I am especially encouraged by the recent results of Tachi and Shima (2010) and the proposed study of Stireman (2010).

If we really want molecular systematics to contribute significantly to tachinid phylogenetic studies, then it must be “fueled” by funding, people, and specimens. The last is both critical to the success of such studies and a way for any collector of Tachinidae to play a role. It is not easy for a researcher to go into the field and find exactly the taxa he or she is after, but local collectors may come across some of these taxa by chance or by knowing where and when they are likely to occur. With some additional effort, collectors can preserve some of their tachinids, or parts of them, for molecular studies that have already started or are being proposed.

I began collecting whole tachinids into 95% ethanol for molecular sequencing in 2007. I do not intend to sequence tachinids myself, but I can collaborate with others who are sequencing tachinids, or I can trade specimens, or I can simply provide specimens to others who will make good use of them. I realized at the beginning of 2010 that simply collecting whole specimens into ethanol and storing them in a freezer has its limitations. In particular, it is difficult and time-consuming to identify these ethanol-preserved specimens, and data from them were not properly recorded. Hence, I developed a method of collecting, preserving, databasing and imaging specimens that I initiated early last year (2010) and tested on three field trips. By explaining my methods here, I hope to encourage others to preserve tachinid material for DNA analysis; not necessarily by adopting my methods but perhaps by de-

veloping their own that achieve similar results. In brief, my method consists of catching tachinids in the field, transporting them alive to work area (generally a motel room), killing them, pinning each specimen, removing three legs and placing them in a small vial of ethanol, attaching a code label to the pinned specimen and placing a matching code label in the vial, keeping vials cold during the trip, placing vials in a -80°C freezer after the trip, imaging and identifying the pinned specimens, and databasing the relevant particulars.

Pre-field trip preparations

My database is a simple flat-field Excel spreadsheet with the following column fields: specimen code number, image link, family, genus, species, author, sex, date, country, state, county, longitude, latitude, locality, collector, killing method, and notes. My code numbers derive from the date of collection; e.g., OH25-04-10-005 is my 5th DNA specimen/sample collected on 25 April 2010. I fill in most of the fields during my field trip and complete the rest later after the specimens have been imaged and identified.

I prepare all the code labels I am likely to need in advance of my trip. They are made in duplicate but in two sizes, one small to attach under a pinned specimen and one larger to go into a vial with the legs. I prepare thirty labels for each day of potential collecting. Since I also collect and pin other tachinids and keep their legs intact, processing 30 specimens for DNA analysis is the most I can handle at the end of a day in the field. I can expect the processing to take on average an hour per 10 specimens, and on top of that I need time to pin whatever else has been collected during the day.



Figures 1–2. Vials used in the field for holding live tachinids. 1. (left) Empty vials. 2. (right) Vials with live tachinids in a mesh bag.

During the field trip

I carry 20 ml plastic screw-cap vials with holes drilled in the top for holding tachinids captured during the day (Figs. 1–2). If I am near my vehicle, then I keep the tachinids in a cooler on ice. This slows down their metabolism and they will live for many hours. If a cooler is not available, then the live tachinids are sheltered from the sun and

kept as cool as possible. They are also kept in the dark (generally in a mesh bag at the top of my backpack) to reduce their activity and boost their chances of survival. On a warm day, there might be a little die-off over the course of a day's collecting.

I have two priorities in the field, one to collect tachinids for the Canadian National Collection and the other to collect material suitable for molecular analysis. Therefore, I like to collect and kill one or more specimens of each species to pin intact before collecting a live specimen from which I will remove and preserve legs. I try for as much taxonomic diversity as possible in both categories. I am limited in the number of live specimens I can process each day, so I generally do not keep more than two live specimens of each taxon. In contrast to these live specimens, I will collect, kill and pin many other specimens on a good day. It is always my goal to find rare and new species and species of special phylogenetic significance.



Figure 3. Nalgene 2.0 ml vials used for preserving legs and box for storing vials in freezer.

My preferred method of killing live tachinids prior to leg removal is by freezing. A compact fridge/freezer combination is becoming increasingly common in even modest-priced motels in North America. Alternately, cyanide is thought to be a good killing agent that does not degrade DNA. Regardless of how my tachinids are killed, I try to process them as soon as possible after they are dead. Before removing any dead flies from the freezer, I cut my pre-printed labels so they are ready to go. Then, working with batches of 5–10 specimens at a time, I pin each one and pull off the right legs by pinching each leg at the coxa with fine forceps. I remove the right legs because I like to view tachinids from the left side when I study them under a microscope and thus want to leave the left legs intact. It is probably sufficient to remove a single leg from a larger tachinid, but I have been taking three from tachinids of all sizes (extra legs may come in handy later on or can be traded with colleagues). The three legs from each specimen are placed together in a 2.0 ml Nalgene® cryogenic screw-cap vial (Fig. 3) with 95% ethanol and a code label.

[Molecular systematists disagree about which is better, 95% or 100% ethanol; the former contains a little water, which is bad, but the latter contains traces of nasty chemicals, which is possibly also bad.] As an added precaution against mixing up specimens from different places, I add a handprinted label bearing the locality (abbreviated) and date to each vial. A code label is pinned below each three-legged fly after each vial receives its legs and labels. Finally, the code number is written on the outside of each vial in indelible ink. The vials are placed in a box with 81 slots (Fig. 3), the box is put in a sealed plastic bag, and the bag and box are kept cool (in a freezer, refrigerator or cooler) for the duration of the trip. I place ice packs around the vial boxes in my luggage for the flight home. This may not be necessary, but in general it is good practice to keep the vials cool if it is possible to do so.



Figure 4. Optivisors in use during field trip to Queensland, Australia in 2002. Author at left, Jeff Cumming (empidoid researcher at CNC) at right.

Usually some sort of magnification is needed when removing legs from specimens. There are different products available depending on one's budget and preference. For routine pinning, I like to use a DA-7 Donegan Optivisor® Headband Magnifier (Fig. 4). For removing legs, I use a 20x Nikon Mini Naturescope Field Microscope (Fig. 5). The microscope has good optics and is ultra compact, but unfortunately the magnification is fixed (at 20x) and the eyepieces are not tilted to a comfortable angle (they point vertically). The microscope is fitted with a tripod socket and by mounting it on a small tripod one can tilt the scope to a better angle and the working height is improved. The best tripod is a low-profile one like the Manfrotto 709 Digi Tabletop Tripod (Fig. 5).

Post-field trip

Once home, my vials and legs go straight into a freezer. I am fortunate enough to have access to a -80°C freezer, so my vials go in there. The freezer has long nar-

row trays, each of which accepts four 90-vial boxes. A regular freezer can be substituted for a -80°C one, and a refrigerator can be used if a freezer is not available. However, for optimum results over time, colder is better.



Figure 5. Compact 20x Nikon Naturescope mounted on a Manfrotto Tabletop Tripod. Padded carrying case shown to right and forceps included for scale.

The last step, which is not essential but I regard as useful, is to take a digital image (left lateral view) of each coded specimen (Fig. 6). The equipment we use for this is explained in the [Photographic Methods](#) section of our TachImage Gallery (more about that in the Announcements section of this newsletter). We do not montage these images and they do not need to be perfect, since they are intended for reference and not publication. The images are converted to PDFs, cropped, and linked in the specimen database. I prefer PDFs to jpg images because they can be united into a single PDF document with each page numbered with the relevant code number.



Figure 6. Databased specimen OH06-10-10-019 with right legs removed and preserved for DNA analysis. *Patelloa facialis* (Coquillett) collected from a sugared sycamore tree in Marijilda Wash, east side of Graham Mountains, Arizona, USA, 4025', 32°42.4'N 109°46.5'W, 6 October 2010.

References

- Stireman, J.O. III. 2010. A modest (?) proposal: the phylogeny and evolution of world Tachinidae (Diptera). *Tachinid Times* **23**: 2–3.
- Tachi, T. and Shima, H. 2010. Molecular phylogeny of the subfamily Exoristinae (Diptera, Tachinidae), with discussions on the evolutionary history of female oviposition strategy. *Systematic Entomology* **35**: 148–163.
- Wood, D.M. 2010. Tachinidae in the era of molecular systematics. P. 278. *In*: Zumbado, M.A., ed., Abstracts Volume, 7th International Congress of Dipterology, San José. 296 pp. [Electronic publication.]

The invasive species, *Trichopoda pennipes* (F.) (Diptera: Tachinidae), found in Israel

by Amnon Freidberg, Elizabeth Morgulis* and Pierfilippo Cerretti

* Same address as A. Freidberg, see Mailing List.

The following story is being told by the senior author in first-person singular. On 30 June, 2010, I (AF) and EM, my then fresh M.Sc. student, were on a collecting trip to the area of Ma'agan Mikha'el, a Kibbutz on the Central Coastal Plain of Israel, about 70 km north of Tel Aviv. This area is famous for its wildlife, particularly thriving inside and around the many fish ponds. On the way out we stopped at what appeared to be an abandoned watermelon field. Although some fruits were still there, the plants were partly desiccated. Here and there were some taller wild plants, including *Datura* sp. (Solanaceae) and *Scolymus* sp. (Asteraceae). While I was trying to collect pest fruit flies, EM swept the vegetation without any particular target species in mind. After several minutes devoted to these activities, EM called me, announcing the capture of “a strange fly”. When I approached, she showed me the fly in a killing jar. It was easy for me to suggest that it was a Phasiinae, although it was also clear that I had never seen such a species in the local fauna. Because the habitat was generally very uniform (originally a monoculture) and relatively simple, I suggested to try and locate potential hosts – i.e., bugs (Hemiptera). Indeed, there were immatures and adults of two species of bugs on both taller plants, and we collected about 20 live specimens and took them to the lab, where they were placed in a small cage together with cuttings of the relevant plants. About three weeks later, an adult fly emerged (Fig. 1), and following a quick search we discovered the puparium among the debris scattered on the floor of the cage. The two species of bugs were *Nezara viridula* (Linnaeus) and *Carpocoris mediterraneus* Tamanini. Unfortunately, they were kept together in the cage, and the exact host is unknown, although *N. viridula* is a known host of Phasiinae.

We took photographs of the pinned swept specimen and sent them to PC who identified this specimen readily as *Trichopoda pennipes* (Fabricius, 1781). The male has a

reddish-orange abdomen and small terminalia, and the female has a black abdomen (although within the species as a whole, female abdominal colour is varied and can range from reddish-orange to black). No distinct sexually-linked differences were detected in the frons. It was interesting that EM, who had had very little experience in collecting flies and no previous knowledge about the local fauna could identify her finding as something unusual. This, of course, was related to the strikingly scaled hind legs, a very obvious peculiarity even in the field, which was also responsible to my recognition of this fly as a new member of the local fauna. *Nezara viridula* is a known host of *T. pennipes* (Arnaud 1978; Tillman 2006).



Figure 1. Male of *Trichopoda pennipes* reared from a bug in Israel.

Trichopoda pennipes, of American origin, has recently invaded southern Europe (Cerretti 2010), and is probably the only tachinid species in the Israeli fauna for which we can suggest an invasive route of arrival into the country. A checklist of the Tachinidae of Israel was published in this newsletter two years ago (Cerretti and Freidberg 2009). A look at this list will show that the Phasiinae fauna of Israel as then known comprised 46 species in 21 genera. Of these, two monotypic genera (the leucostomatine *Dionomelia* Kugler, 1978 and *Oblitoneura* Mesnil, 1975) and at least 15 species were described from Israel. Many of these, including the aberrant *Oblitoneura agromizina* Mesnil, are still known from Israel only. The current record raises the numbers to 22 genera and 47 species. A new species of *Besseria* from Israel is currently under description (Cerretti *et al.*, in press). It is speculated that additional species of Phasiinae, as well as other Tachinidae, will eventually be discovered in Israel, especially if the current diversity of habitats is maintained. This unfortunately is far from being secured, as the human population in the tiny country of Israel has a very high growth rate, and this process claims natural habitats that are converted into cement.

The two specimens on which this story is based are deposited at TAUI (Tel Aviv University's collection). The collection data are: 78429 ISRAEL: Ma'ayan Zevi, 30.vi.2010, E. Morgulis (1♀); same collection data, ?ex. *Nezara viridula* (assumed host; requires confirmation), eclosed about 20.vii.2010 (1♂, with associated puparium).

References

- Arnaud, P.H., Jr. 1978. A host-parasite catalog of North American Tachinidae (Diptera). United States Department of Agriculture. Miscellaneous Publication **1319**. 860 pages.
- Cerretti, P. 2010. I tachinidi della fauna italiana (Diptera: Tachinidae), con chiave interattiva dei generi ovest-paleartici. Vol. 1. Centro Nazionale Biodiversità Forestale – Verona. Cierre Edizioni, Verona. 573 pp + CD-ROM.
- Cerretti, P. and Freidberg, A. 2009. Updated checklist of the Tachinidae of Israel. *Tachinid Times* **22**: 9–16.
- Cerretti, P., Lo Giudice, G. and Mei, M. [in press] A new *Besseria* Robineau-Desvoidy (Diptera: Tachinidae) from Israel. *Israel Journal of Entomology*.
- Tillman, P.G. 2006. Susceptibility of pest *Nezara viridula* (Heteroptera: Pentatomidae) and parasitoid *Trichopoda pennipes* (Diptera: Tachinidae) to selected insecticides. *Journal of Economic Entomology* **99**: 648–657.

Exploring a reproductive isolation mechanism in uzifly, *Exorista sorbillans* (Diptera: Tachinidae) by Bandekodigenahalli M. Prakash and Hosagavi P. Puttaraju

Introduction

The genus *Exorista* comprises a number of species that are widely distributed in tropical and subtropical zones. The ovipositional behavior varies from one species to another, but all of them are endoparasitoids of lepidopteran insects. Through their interactions with hosts, they are helping to control the population levels of lepidopteran pests and thereby reduce the loss of forest cover and agricultural crops. The exception is the uzifly, *Exorista sorbillans* (Wiedemann) (syn. *E. bombycis* (Louis)), an endoparasitoid of the silk-producing lepidopteran, *Bombyx mori* (Linnaeus). The uzifly causes about 8–10% losses in total silk production (life cycle shown in Figs. 1–4). In India at least nine species of *Exorista* have been reported (Crosskey 1976; Mitra and Sharma, 2010). Our earlier investigation in Indian populations of *E. sorbillans* revealed cryptic variation (Venkatachalapathy 2002; Prakash 2006), which of course needs to be resolved through further molecular analysis. Description of cryptic species has important implications for conservation and planning, integrated pest management, evolution, and speciation. Research on cryptic species has increased exponentially over the past two decades. Studying cryptic variation to uncover the various hidden aspects is also on the rise

among Indian scientists. By understanding these aspects, pest infestations on the silkworm *B. mori* can be effectively managed.



Figure 1. Fifth instar fifth day silkworms (*Bombyx mori* (Linnaeus)) infested with the uzifly *Exorista sorbillans* (Wiedemann). Female uziflies lay eggs on 3rd to 5th instar silkworm larvae. Eggs hatch in 40–48 hours and the first instars bore into the host's body. A black scar appears at the point of entry.

Potentialities of cryptic variation

The Indian uzifly *E. sorbillans* harbors *Wolbachia* bacteria, an endosymbiotic manipulator of arthropod reproduction that induces a number of potential reproductive anomalies (Puttaraju and Prakash 2005a,b,c; Prakash 2006; Prakash and Puttaraju 2009), which are regarded as the raw material for speciation (Rose and Doolittle, 1983). In *E. sorbillans*, we found two superclade (A and B) *Wolbachia*, which induce a number of reproductive anomalies including bidirectional cytoplasmic incompatibility in natural populations where the following conditions exist:

- varying climatic temperature and humidity;
- varying individual ages;
- natural antibiotics; and
- bacterial density variation due to trivial conditions.



Figure 2. Uzifly maggots emerging from infested silkworm cocoons. Infested late fifth instars spin flimsy cocoons. Holes in cocoons caused by uzifly maggots make the cocoons unsuitable for reeling.

Wolbachia also causes fecundity reduction in the cured (antibiotic-treated) populations. Further research is required to determine whether A or B group *Wolbachia* induce the effect. Moreover, we observed a 2:1 sex ratio in a *E. sorbillans* population where the reproducing females were free from *Wolbachia*. We concluded from all of these results that *Wolbachia* is potentially responsible for inducing reproductive isolation, and thereby has a strong driving force in the evolution of cryptic variation in the Indian populations of *E. sorbillans*.



Figure 3. Second day uzifly puparia. After emerging from silkworm larvae or cocoons, uzifly larvae search for suitable places for pupariation in cracks or soil.

Integrated approach to the management of *E. sorbillans*

Most *Exorista* species are beneficial and contribute to economic gain because they are parasitize pest lepidopterans. However, *E. sorbillans* causes severe economic losses by attacking the silkworm *Bombyx mori*, which yields fabulous silk commonly called the ‘queen of textile’. A number of approaches have been suggested over the years for control of the uzifly, but none have yielded satisfactory results because of their own limitations. Therefore, we have suggested a new approach of using *Wolbachia* endobacterium. The reproduction of *E. sorbillans* depends on *Wolbachia* partially if not completely (Puttaraju and Prakash 2005a,b,c; Prakash and Puttaraju 2006; Puttaraju and Prakash 2009). Use of antibiotics in the silkworm diet not only increases the performance of silkworms in terms of their reproductive efficacy but also kills *Wolbachia* endosymbionts and helps in controlling the uzi menace by reducing the fertility and fecundity of the parasitoid (Puttaraju and Prakash, 2005b). The majority of arthropods require a facultative association with *Wolbachia* for their physiological requirements, but in the uzifly there is a more intimate association as evidenced by a transitional shift from a facultative to an obligate mode. *Wolbachia* is playing a crucial role in the evolution of obligate symbiosis in the uzifly, controlling the nutritional and reproductive physiology responsible for normal oocyte production. Elimination of *Wolbachia* with antibiotics leads to ab-

normal growth and proliferation of oocytes with inhibition of normal functioning of nurse cell nuclei, as also seen in *Asobara tabida* Nees (Hymenoptera: Braconidae) (Pannebakker *et al.* 2007).



Figure 4. A freshly eclosed male uzifly. Flies start eclosing after 10–12 days in their puparia. Males usually eclose earlier than females.

In conclusion, *Wolbachia* is a potential manipulator of arthropod reproduction and may rejuvenate interest in the biological control of Indian uzifly *Exorista sorbillans*. The mechanism of reproductive isolation induced by *Wolbachia* contributes greatly to the microevolution of the uzifly. Exploiting the endosymbiotic *Wolbachia* and the cryptic variation induced by these bacteria in their hosts adds a new dimension to management of the uzifly *Exorista sorbillans*.

References

- Crosskey, R.W. 1976. A taxonomic conspectus of the Tachinidae (Diptera) of the Oriental Region. Bulletin of the British Museum (Natural History). Entomology Supplement **26**. 357 pp.
- Dedeine, F., Boulétreau, M. and Vavre, F. 2005. *Wolbachia* requirement for oogenesis: occurrence within the genus *Asobara* (Hymenoptera, Braconidae) and evidence for intraspecific variation in *A. tabida*. *Heredity* **95**: 394–400.
- Mitra, B. and Sharma, R.M. 2010. Checklist of Indian tachinid flies (Insecta: Diptera: Tachinidae). PDF document, 18 pp. Available from: <http://zsi.gov.in/checklist/Indian Tachinid flies.pdf>.
- Pannebakker, B.A., Loppin, B., Elemans, C.P.H., Humblot, L. and Vavre, F. 2007. Parasitic inhibition of cell death facilitates symbiosis. *Proceedings of the National Academy of Sciences of the United States of America* **104**: 213–215.
- Prakash, B.M. 2006. Molecular evidence for *Wolbachia* in sericultural insect pests and its role in controlling uzi fly, *Exorista sorbillans*. Ph.D. thesis. Bangalore University, Bangalore.
- Prakash, B.M. and Puttaraju, H.P. 2006. Cytogenetic mechanism of cytoplasmic incompatibility in the uzi fly, *Exorista sorbillans* (Diptera: Tachinidae). *Cytologia* **71**: 345–351.

- Puttaraju, H.P. and Prakash, B.M. 2005a. *Wolbachia* and reproductive conflict in *Exorista sorbillans*. Archives of Insect Biochemistry and Physiology **60**: 230–235
- Puttaraju, H.P. and Prakash, B.M. 2005b. Effects of *Wolbachia*-targeted tetracycline on a host-parasitoid-symbiont interaction. European Journal of Entomology **102**: 669–674.
- Puttaraju, H.P. and Prakash, B.M. 2005c. Effects of *Wolbachia* in the uzifly, *Exorista sorbillans*, a parasitoid of the silkworm *Bombyx mori*. Journal of Insect Science **5** (Article 30): 7 pp. Available online: insectscience.org/5.30.
- Puttaraju, H.P. and Prakash, B.M. 2009. Effects of elimination of *Wolbachia* on oogenesis of the uzifly *Exorista sorbillans*, a parasitoid of the silkworm, *Bombyx mori*. Entomological Research **39**: 372–379.
- Rose, M.R. and Doolittle, W.J. 1983. Molecular biological mechanism of speciation. Science **220**: 157–162.
- Venkatachalapathy, K.N. 2002. Cytological, morphological and biochemical investigations in the uzifly, *Exorista sorbillans* (Wied.) and *Blepharipa zebina* (Walk.). Ph.D. thesis. Bangalore University, Bangalore.

ANNOUNCEMENTS

M.Sc. opportunity in biology and systematics of Neotropical Tachinidae

by John O. Stireman III

I am seeking a student to pursue a Master's degree in Biological Science at Wright State University in Dayton, Ohio, focused on the systematics and biology of tachinid flies. This position is associated with a larger, collaborative, NSF funded *Biological Surveys and Inventories* project to document the diversity of Lepidoptera and parasitoid taxa and their interactions in the montane rainforest of Ecuador (see <http://www.insectscience.org/9.26/> and <http://caterpillars.unr.edu/lacat/ecuador/index.htm>).



Figure 1. Unidentified Ecuadorian blondeliine tachinid awaiting further study.

We have collected and reared (from Lepidoptera) an impressive diversity of tachinids from Ecuador (over 200 “species” so far) (Fig. 1), the majority of which appear to be undescribed. The student will work with me to select a manageable taxon of interest, which is well represented in the rearings, to revise taxonomically and analyze phylogenetically. The student will also help to develop web resources, and contribute to the analysis of ecological associations and patterns of diversity of Ecuadorian tachinids. The applicant does not have to be a United States citizen, and applications from Latin American students are particularly encouraged.

The project will involve travel to and collecting in Ecuador and travel to the CNC, USNM, and perhaps other museums. Funds are available to support travel and research and summer stipends. Support (including tuition) will be provided during the academic year through teaching assistantships in biology courses at Wright State University (e.g., General Entomology) and the applicant must be academically competitive to obtain these assistantships. Stipend and teaching assistantship support are ca. \$4500/quarter. (See <http://www.wright.edu/sogs/index.html> for information on graduate admissions.)

If interested, please send via e-mail a curriculum vitae and a statement of interest to john.stireman@wright.edu or mail to my address in the Mailing List at the end of this newsletter.

Ph.D. thesis defended by Natálie Muráriková

Masaryk University, Brno, Czech Republic
Supervisor: Prof. RNDr. Jaromír Vaňhara

Title: Revision of taxonomic position of the model species groups in the family Tachinidae (Diptera), reconstruction of their phylogeny on the basis of the morphological characters and molecular-genetic methods. 2010, 83 pp. + CD.

Abstract (see Muráriková *et al.* 2010 in Tachinid Bibliography section below): Artificial neural networks (ANN) methodology, molecular analyses and comparative morphology of the male postabdomen were used successfully in parallel for species identification and resolution of some taxonomic problems concerning West Palaearctic species of the genus *Tachina* Meigen, 1803. Supervised feed-forward ANN with back-propagation of errors was applied on morphometric and qualitative characters to solve known taxonomic discrepancies. Background molecular analyses based on mitochondrial markers COI, Cyt b, 12S and 16S rDNA and study of male postabdominal structures were published separately. All three approaches resolved taxonomic doubts with identical results in the following five cases: case 1, the four presently recognized subgenera of the genus *Tachina* were confirmed and the description of

a new subgenus was recommended; case 2, the validity of a new boreo-alpine species (sp. n.) was confirmed; case 3, the previously supposed presence of *T. casta* (Rondani, 1859) in central Europe was not supported; case 4, West Palaearctic "*T. nupta* (Rondani, 1859)" was contrasted with East Palaearctic specimens from Japan, which seem to represent a valid species not conspecific with central European specimens; *T. nupta* needs detailed further study; case 5, *T. nigrohirta* (Stein, 1924) resurrected recently from synonymy with *T. ursina* Meigen, 1824 was confirmed as a valid species. This parallel application of three alternative methods has enabled the principle of 'polyphasic taxonomy' to be tested and verified using these separate results. For the first time, the value of using the ANN approach in taxonomy was justified by two non-mathematical methods (molecular and morphological).

M.Sc. thesis defended by Diego Javier Inclan Luna

Wright State University, Dayton, Ohio, USA

Supervisor: Dr. John O. Stireman III

Title: Revision of the genus *Erythromelana* Townsend, 1919 (Diptera: Tachinidae) with notes on their phylogeny and diversification

Abstract: The Neotropics harbor an enormous diversity of tachinid flies, yet the fauna remains poorly known. The tribe Blondeliini is particularly diverse in this region and desperately needs taxonomic attention. Here, I present a revision of the Neotropical genus *Erythromelana* Townsend including the redescription of three previously described species and the description of 11 new species. Two species previously assigned to this genus, are resurrected as distinct genera. *Erythromelana* species are widely distributed from southern Mexico to northern Argentina, with the Andes being a hotspot of diversity. *Erythromelana* are specialized on geometrids in the genus *Eois*, which mainly feed on plants in the genus *Piper*. I constructed a morphological database (N = 210), and used these data along with DNA sequence data to define taxa and infer phylogenetic relationships. The phylogeny, biology and patterns of diversity of *Erythromelana* are examined.

New book! Tachinids of Italy

Cerretti, P. 2010. I tachinidi della fauna italiana (Diptera Tachinidae) con chiave interattiva dei generi ovest-paleartici. Volumes I & II. Centro Nazionale Biodiversità Forestale, Verona. 573 pp. (Vol. I) + 339 pp. (Vol. II) + CD ROM.

ISBN 978-88-8314-569-8

List price is €120.00

Text in Italian. Two volumes in a slipcase. Comprehensive work on the Tachinidae of Italy, with keys to

genera and species. Illustrations of 602 species from 236 genera. CD with interactive keys to the West Palaearctic genera.



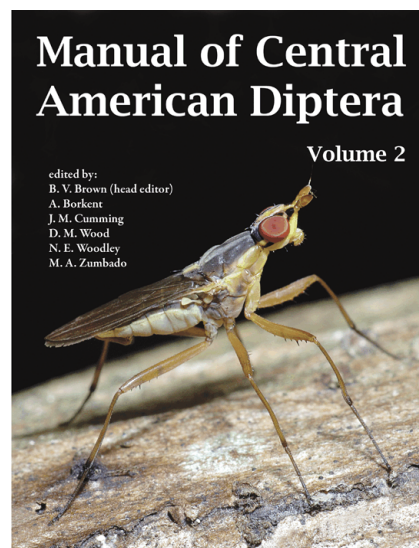
This set can be ordered from the publisher by sending a message to edizioni@cierrenet.it, and is also available online at www.ibs.it, www.webster.it, www.hoepli.it, and www.casalini.it.

Another new book! Manual of Central American Diptera. Volume 2

Brown, B.V., Borkent, A., Cumming, J.M., Wood, D.M., Woodley, N.E. and Zumbado, M.A., eds. 2010. Manual of Central American Diptera. Volume 2. NRC Research Press, Ottawa. xvi + 715–1442 pp.

ISBN-13 9780660199580

CAN\$94.95. Other Countries: US\$94.95



This is the second and last volume of the Manual, the first having been published in 2009. For persons interested in the Tachinidae, this is the volume that contains the long-awaited chapter on the Tachinidae of Central America by Monty Wood, assisted by Manuel Zumbado. The full citation of that chapter is:

Wood, D.M. and Zumbado, M.A. 2010. Tachinidae (tachinid flies, parasitic flies). Pp. 1343–1417. *In*: Brown, B.V., Borkent, A., Cumming, J.M., Wood, D.M., Woodley, N.E. and Zumbado, M.A., eds., *Manual of Central American Diptera*. Volume 2. NRC Research Press, Ottawa. xvi + 715–1442 pp.

Volume 2 of *Manual of Central American Diptera* can be purchased online from NRC Research Press at <http://pubs.nrc-cnrc.gc.ca/eng/books/books/9780660199580.html>.

TachImage Gallery

This series of web pages by Jim O'Hara and Shannon Henderson on the [Tachinid Resources](#) site displays images of tachinid flies, using mostly specimens housed in the Canadian National Collection of Insects in Ottawa. The purpose of these pages is to show high resolution lateral and dorsal views of authoritatively identified specimens. Each species has its own web page and each page has thumbnail images that can be displayed in a larger frame. Images within the larger frame can be zoomed and moved around within the frame thanks to [Zoomify](#) technology. Label and related information are displayed in a box below the main picture frame, and links and references are given below that. There are about 60 species pages at present and new species pages will be added periodically.

A more extensive review of the functionality of the [TachImage Gallery](#) is given in *Fly Times* 45: 4–5 (October, 2010).

Seventh International Congress of Dipterology

The 7th International Congress of Dipterology was held in San José, Costa Rica, 8–13 August 2010. The meeting was well attended by dipterists around the world and was a great success, thanks largely to the efforts of Manuel Zumbado and members of his Organizing Committee (especially Hazel Ramírez, Logistics Co-ordinator). The congress was well attended by dipterists interested in Tachinidae (some shown in Fig. 1), and there were a number of stimulating talks and posters on tachinid ecology and systematics.



Figure 1. A happy bunch of tachinidologists during ICD7. From left to right: Thomas Pape (Denmark; a sarcophagid and oestroid specialist and honorary tachinidologist), Jim O'Hara (Canada), John Stireman (USA), Pierfilippo Cerretti (Italy), Jaromír Vaňhara (Czech Republic), Joachim Ziegler (Germany), and Silvio Nihei (Brazil). Photo courtesy of Christiane Lange and Joachim Ziegler.

The abstracts of talks and posters that focussed on the Tachinidae are reproduced below from the Abstracts Volume of ICD7 (edited by M.A. Zumbado). The Abstracts Volume was published online as a PDF (not printed) and is available as a free download from the ICD7 website (<http://www.inbio.ac.cr/icd7/index.php/Contenidos-ICD/final-docs.html>) or the ICD website (<http://www.nadsdiptera.org/ICD/ICDhome.htm>). Each of the presentations is cited in the Tachinid Bibliography section of this newsletter.

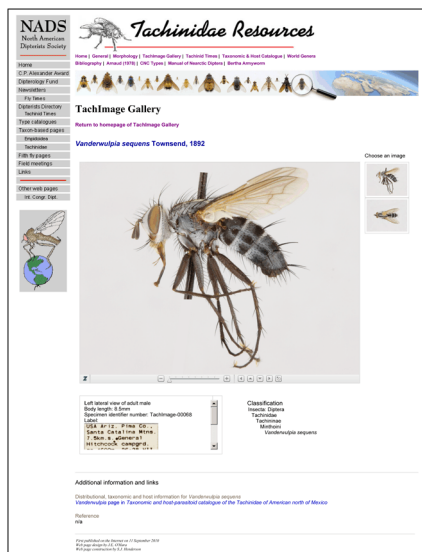
Over 200 genera and counting – the megadiverse fauna of Afrotropical Tachinidae

Oral presentation by P. Cerretti¹, J.E. O'Hara², D.M. Wood² and J.O. Stireman III³

¹ Dipart. di Biologia e Biotecnologie, Sapienza Università di Roma, Rome, Italy

² Canadian National Collection of Insects, AAFC, Ottawa, ON, Canada

³ Wright State University, Dayton, OH, USA



E-mail: pierfilippo.cerretti@uniroma1.it

Tachinids are arthropod parasitoids that play an important role in regulating host populations. Despite this ecological importance, most dipterists have been deterred from studying Afrotropical Tachinidae because of the large fauna and difficulty in identifying specimens to generic and species levels. The Tachinidae are the largest family of Afrotropical Brachycera with more than 1010 described species and 215 described genera, yet are poorly studied in comparison with other well-known and less species-rich regions; e.g., the Nearctic with 303 genera and 1345 species and the Palaearctic with some 410 genera and more than 1700 species. It is not possible to estimate reliably the diversity of Afrotropical Tachinidae but an important clue jumps to the eye of a specialist: about half of the unidentified specimens housed in examined collections are not attributable to any known species. Another topic requiring attention is the systematic arrangement of Afrotropical Tachinidae proposed by Crosskey in the 1980s and still in use but badly outdated. The classification needs revision along the lines of the more recent regional catalogues, and also many 'artificial' genera and tribes require careful revision. The development of modern and accurate keys to dipteran genera is one of the main goals of the Manual of Afrotropical Diptera. In preparing such a key for Afrotropical tachinids it would be useful to better define, albeit empirically, at least the more speciose genera. We therefore plan to re-describe all genera following a strict protocol based on 100 characters and 420 states. The resulting data matrix will be used to comparatively evaluate diagnostic features, and to eventually develop an online and open access illustrated interactive key. This approach is expected to improve communication among specialists and may result in more interest in tachinids and greater global taxonomic expertise in the family.

MOSCHWEB – An open access interactive key to the Palaearctic genera of Diptera: Tachinidae

Oral presentation by P. Cerretti¹, H.-P. Tschorsnig² and M. Lopresti³

¹ Dipart. di Biologia e Biotecnologie, Sapienza Università di Roma, Rome, Italy

² Staatliches Museum für Naturkunde, Stuttgart, Germany

³ Centro Nazionale Università Forestale, Verona, Italy

E-mail: pierfilippo.cerretti@uniroma1.it

The main purpose of an analytical key is specimen identification. In other words, placing a specimen, after close examination, within a pre-existing classification. Thus, identification is undoubtedly the main and ineluctable problem of taxonomy ever since its origins. With more than 1,500 valid genera, the Tachinidae represent an excellent model to which diagnostic systems alternative to the traditional, dichotomic one, can be applied. Hence the idea of working out an original software that fulfilled the double function of a) helping a beginner to familiarize with

a very complex and diverse group and b) assist the taxonomic activity of even a well established specialist, by giving immediate access to an enormous amount of information about the genera of the whole Palaearctic fauna. MOSCHWEB is an original interactive key based on a morphological (made up of 421 terminal taxa, 98 characters and 416 states), biological, faunistic and iconographic database. In MOSCHWEB, characters and states appear simultaneously and can be consulted and used in any order: no character is propaedeutic to others and the states can be selected or deselected in any possible order. A character of difficult interpretation or missing due to a damage or lack of entire body parts can be ignored, since many others will compensate its absence. The possibility to proceed in spite of the incompleteness of a specimen is due to the high redundancy of the data in the matrix, and can be of aid, for instance, wherever faecal or stomachal material need identifying, in nutrition studies or in the case of sub-fossil material from archaeological excavations. We think that tools of this type can increase the reliability of identifications thanks to the traceability of the selected characters.

Overview of the Neotropical Dexiinae (Tachinidae)

Poster presentation by R.R. Figueiredo and S.S. Nihei
Dept. Zoologia, Instituto de Biociências - USP, São Paulo, SP, Brazil
E-mail: robertafigueiredo@gmail.com

The cosmopolitan family Tachinidae is one of the largest families of Diptera, with ca. 10,000 species. Currently, the family is catalogued for all biogeographical regions, but the Neotropical catalog is the most outdated, published by J.H. Guimarães in 1971. At the time, he classified Tachinidae in six subfamilies, 69 tribes, 970 genera and 2,827 species. In the last few decades, the status, delimitation and placement of the suprageneric taxa have been frequently modified, and current proposals of classification recognize only four subfamilies: Dexiinae, Exoristinae, Phasiinae, and Tachiniinae. Furthermore, genera and type-genera of many tribes have been allocated in different taxa by previous authors, but without any phylogenetic support. In this context, the present study aims to update the classification of Neotropical Dexiinae, by discussing the placement and generic composition of the tribes and indicating problematic groups that need to be revised under a phylogenetic perspective. By reconciling the classification in the most recent regional catalogs, a Dexiinae classification is suggested here with 18 tribes of world distribution: Campylochitini, Dexiini, Doleschallini, Dufouriini, Ebeniini, Epigrimyini, Eutherini, Freraeini, Imitomyini, Palpostomatini, Rutillini, Sophiini, Telothyriini, Thelairini, Trichodurini, Trichopropini, Uramyini and Voriini. Among the 13 Neotropical tribes, only seven (Dexiini, Ebeniini, Sophiini, Telothyriini, Thelairini, Trichodurini and Uramyini) remain valid and allocated in Dexiinae as originally proposed in 1971. In

order to propose a classification containing natural groups, a cladistic analysis of the Dexiinae is in progress as a Ph.D. project research by the senior author.

Importance of visual and olfactory cues for foraging in the parasitoid *Exorista japonica*

Oral presentation by R.T. Ichiki¹, Y. Kainoh², Y. Yamawaki³ and S. Nakamura¹

¹ Japan International Research Center for Agricultural Sciences, Tsukuba, Japan

² University of Tsukuba, Ibaraki, Japan

³ Kyushu University, Fukuoka, Japan

E-mail: s.nakamura@affrc.go.jp

Exorista japonica females respond to odours emanating from maize leaves infested with larvae of the common armyworm. We examined the effects of visual stimuli as well as olfactory stimuli for attracting females to host-infested plants. Paper plant models of four colours (blue, green, red or yellow) were separately placed in front of a host-infested plant hidden behind a mesh screen in a wind tunnel. Females landed at significantly higher rates on the green coloured model than on the other coloured models. However, few females landed even on the green coloured model when an infested maize plant was not placed behind the screen. When achromatic plant models of four different grey scales (white, light grey, dark grey or black) were examined in the wind tunnel with an infested plant as described above, the response rate of females was significantly higher toward the white model and decreased as the brightness of the model decreased.

When the four colour models were placed together in a cage filled with odours of host-infested plants, females stayed significantly longer on the green model than on the other three coloured models. These results indicated that *E. japonica* females prefer a green colour when odours of the host-infested plants are present and suggest that flies use visual as well as olfactory cues to locate the host habitat.

Revision of the Neotropical genus *Erythromelana* (Diptera: Tachinidae)

Oral presentation by D.J. Inclan and J.O. Stireman III

Wright State University, Dayton, OH, USA

E-mail: inclanluna.2@wright.edu

The Neotropics probably harbor the greatest diversity of tachinids of any biogeographic realm, yet it remains one of the most poorly known faunas. The Exoristine tribe Blondeliini is particularly species rich in this region and is in desperate need of taxonomic attention. Here, I present preliminary results of a revision of the Neotropical genus *Erythromelana* Townsend including the redescription of *E. jaena* Townsend, *E. nigrothorax* (Wulp) and the description of seven new species. In addition, *Myiodoriops marginalis* Townsend and *Hypostena obumbrata* Wulp, which were previously assigned to this genus, are resurrected as distinct genera. Members of this genus are distributed over

much of northern South America and Central America, North to Mexico. A collection of 570 museum specimens and 29 specimens reared from Geometridae were used to construct a detailed morphological and morphometric database (n=220), including female (n=40) and male genitalia (n=70). The nine currently known species form two major species groups, which are separated by the presence/absence of a pair of long bristles on the 5th sternite of males. A principal component analysis of 72 characters separates the species of *Erythromelana* from the non-*Erythromelana* species, *M. marginalis* and *H. obumbrata*, and supports the two major species groups. In addition, the tri-trophic associations between *Erythromelana*, their geometrid hosts in the genus *Eois*, and the hosts food plants in the genus *Piper* are described and analyzed.

Taxonomy and phylogeny of Ormiini (Tachinidae): diversity and evolution of cricket parasitoid flies

Oral presentation by S.S. Nihei

Dept. Zoologia, Instituto de Biociências - USP, São Paulo, SP, Brazil

E-mail: silvionihei@gmail.com

Members of Ormiini are characterized by a prosternum strongly inflated, bilobed and anteriorly projected as the prothorax is internally modified as an auditory organ. This unusual acoustic system allows female flies to locate singing male hosts (crickets, mole-crickets and katydids; Grylloidea and Tettigonioidea) and then deposit endoparasitoid planidia larvae, which will penetrate and develop inside the host until pupation. Therefore, the adults have preferably crepuscular and nocturnal habits. The tribe Ormiini comprises 64 species in 7 genera: *Aulacephala* Macquart, 1851 (2 spp; Afrotropical/Palaeartic/Oriental); *Homotrixa* Villeneuve, 1914 (3 spp; Australasian/Oriental); *Mediosetiger* Barraclough, 1983 (1 species; Afrotropical); *Ormia* Robineau-Desvoidy, 1830 (27 spp; Nearctic/Neotropical); *Ormiophasis* Townsend, 1919 (9 spp; Neotropical); *Phasioormia* Townsend, 1933 (2 spp; Oriental); *Therobia* Brauer, 1862 (20 spp; Afrotropical/Australasian/Oriental/Palaeartic). The systematic position of Ormiini is controversial. Previous authors placed it within Dexiinae (as 'Proseninae'), Phasiinae, or even in Oestridae, although recent classifications are consensual about Ormiini within Tachininae. The present research project is composed by two parts. First, a phylogenetic study includes a cladistic analysis based on morphological characters in order to: 1) examine the monophyly of the tribe and genera, 2) generate an hypothesis of the phylogenetic relationships among the seven genera and other supraspecific taxa, and 3) to support a systematic placement of Ormiini. Members of Glaurocarini are included in the analysis to test its close relationship with Ormiini as suggested by some authors. And, finally, a taxonomic study includes: 1) revision of all 34 Neotropical species in *Ormia* (25 spp) and *Ormiophasis*

(9 spp), 2) an identification key to species of *Ormia* and *Ormiophasia*, and 3) a key to world genera of Ormiini.

Building a unified classification of the Tachinidae (Diptera) of the world

Oral presentation by J.E. O'Hara¹, D.M. Wood¹, V.A. Richter², H. Shima³ and S.J. Henderson¹

¹ Agriculture and Agri-Food Canada, Ottawa, Canada

² Russian Academy of Sciences, St. Petersburg, Russia

³ Kyushu University, Fukuoka, Japan.

E-mail: james.ohara@agr.gc.ca

The Tachinidae are among the largest families of Diptera with almost 10,000 described species. These species are currently assigned to an unmanageable and oversplit 1500+ genera. The existing and in some cases disparate classifications of the Tachinidae are delimited by biogeographic region and were established between 1971 and 2009, with the classification of the huge Neotropical fauna being the oldest and most in need of revision. Two major initiatives are underway to address problems in tachinid systematics: 1) morphological and molecular studies to investigate tachinid relationships at the generic, tribal and subfamilial levels, and 2) a world catalogue of the Tachinidae to reflect the state of knowledge about tachinid relationships and to establish a unified global classification scheme. The latter involves an authoritative re-appraisal of all names in Tachinidae to provide the most accurate and Code-compliant information possible about original names, name-bearing types (as reinterpreted to comply with Recommendation 73F, "Avoidance of assumption of holotype"), type depositories, type localities (in original and modern forms), and distributions. Original descriptions of 15,000+ generic and specific names, as published in ca. 3000 works, form the basis for the name and type data. All name, type and distributional data are managed in a custom-designed FileMaker Pro database and references are managed in a separate EndNote library. Distributions are recorded first by biogeographic region and then by finer divisions at or below the country level according to the best fit of available data. Distributions based on the old triangulation system formerly used for the tachinids of America north of Mexico have been converted into a databasable format that recognizes 18 divisions in Canada, United States, Greenland, and Bermuda. The division between the Palearctic and Oriental Regions in China has been studied in particular detail in light of the topographical and ecological complexities involved.

An overview of Afrotropical Oestroidea

Oral presentation by T. Pape

Natural History Museum of Denmark, University of Copenhagen, Denmark

E-mail: tpape@snm.ku.dk

The Afrotropical Oestroidea comprise a rich fauna of the families Calliphoridae, Oestridae, Rhiniidae, Rhinophor-

idae, Sarcophagidae and Tachinidae. The Rhinophoridae seem to have their greatest species richness in the southern part of the continent, but this may be at least partly due to lack of collecting and/or attention to this family in other parts of the region. New taxa are continuously being discovered, including records from Madagascar, and generic definitions are improving but still needs to take full advantage of phylogenetic methodology. The Oestridae have their center of diversity in the Afrotropics, and the origin and early evolution of stomach bot flies probably took place in humid African forests. The Afrotropical Rhiniidae have diversified considerably and are in many ways comparable to those of the Oriental Region. In the Calliphoridae, there is a marked lack of several subfamilies (Ameniinae, Aphyssurinae, Helicoboscinae, Melanomyiinae, Mesembrinellinae, Polleniinae, Toxotarsinae), but the subfamily Bengaliinae seems to have undergone a significant diversification, probably taking advantage of the rich termite fauna with which many species are associated. In the Sarcophagidae, the Miltogramminae are richly diversified in the semi-desert and savanna biomes, and the particularly diverse phylloteline clade would be a promising target for biological studies as they are expected to show numerous examples of associations with termites, ants, and buried carrion. The Afrotropical Tachinidae are diverse, although apparently less so than those of the Oriental and Australasian regions, and far less diverse than those of the Neotropical Region.

Host-associated differentiation in Diptera: contrasting plant parasites and insect parasitoids

Oral presentation by J.O. Stireman III

Wright State University, Dayton, OH, USA

E-mail: john.stireman@wright.edu

There is growing realization of the importance of ecological interactions in fostering population divergence and speciation. These affects are most evident when populations diverge in resource use, such as in host-parasite systems, where parasites experience strong selective pressures associated with host use. Here, I contrast host ranges and host associated genetic differentiation in two groups of dipteran parasites, plant galling Cecidomyiidae (*Asteromyia*) and insect attacking Tachinidae. The gall midge genus *Asteromyia* exhibits striking levels of morphologically cryptic host-associated differentiation in an apparent adaptive radiation onto their goldenrod (*Solidago* sp.) hosts. Host-associations in this group are remarkably conserved with few shifts to unrelated host groups and significant phylogenetic signal, suggesting strong physiological constraints. There is also mounting evidence of cryptic host-associated lineages in Tachinidae, revealing finer levels of host-specialization than previously appreciated. However, shifts among unrelated host taxa are frequent, and physiological constraints appear to be weak

or absent. Contrasting host-associated selective pressures and differing models of evolutionary divergence for these two taxa are compared.

Diversity and host use patterns of Lepidoptera attacking Tachinidae in the Ecuadorian Andes

Oral presentation by J.O. Stireman III¹, H.F. Greeney² and L.A. Dyer³

¹ Wright State University, Dayton, OH, USA

² Yanayacu Biological Station, Ecuador

³ University of Nevada, Reno, USA

E-mail: john.stireman@wright.edu

The family Tachinidae is the most diverse and ecologically important group of parasitoid insects outside of the parasitoid Hymenoptera. They are also among the most species rich families of flies, with the Neotropics likely harboring more species than any other geographic region. Here we describe and analyze the richness of Tachinidae reared from Lepidoptera as part of a biological survey of Lepidoptera and their parasitoids in a mid-elevation (~2000 m) tropical montane forest in the Ecuadorian Andes. Two hundred and five separable tachinid “morpho-species” were reared from approximately 230 species of Lepidoptera in 16 families. Tachinid species accumulation and rarefaction curves exhibit little sign of reaching an asymptote and richness estimators indicate that the community likely consists of at least twice this number of species. Most tachinid species were reared infrequently, with about 50% of species represented by a single rearing event. In contrast to previous studies of temperate Tachinidae, most species appeared to be relatively specialized on one or a few related hosts, but sampling remains insufficient to make strong conclusions regarding host range. The fauna is dominated by the tribes Blondeliini and Goniini, known to primarily attack Lepidoptera, but other Lepidoptera attacking groups such as Tachinini and Winthemiini were poorly represented. The estimates of tachinid species richness derived here support the hypothesis that the Northern Andes of the Neotropics is a geographic epicenter of tachinid species richness and a cradle for their diversification.

Response of the uzi fly *Exorista sorbillans* to silkworm-infested mulberry in a wind tunnel

Poster presentation by A. Tanaka¹, Y. Kainoh¹, J. Tabata², H. Sugie², R.T. Ichiki³ and S. Nakamura³

¹ University of Tsukuba, Tsukuba, Japan

² National Institute of Agro-Environmental Sciences, Japan

³ Japan International Research Center for Agricultural Sciences, Tsukuba, Japan

E-mail: s.nakamura@affrc.go.jp

Host-foraging behavior of the female uzi fly *Exorista sorbillans* (Diptera: Tachinidae) in response to a herbivore-damaged mulberry plant was examined in a wind tunnel bioassay. *Bombyx mori* was used as the host for this fly and as the herbivore to infest mulberry plants. Mated female

flies (58%) took off from a release site and 23% landed on infested mulberry without hosts, whereas 10-20% took off from a release site and <5% landed on artificially damaged or intact mulberry. When a filter paper treated with a solution of headspace volatiles collected from infested mulberry was attached to intact mulberry, 57% of the flies took off from a release site. Analysis of headspace volatiles from infested and intact mulberry revealed that some chemicals ((E)- β -ocimene, (E)-2-hexenal, (E)-4,8-dimethyl-1,3,7-nonatriene, α -farnesene) were emitted in greater amounts from infested mulberry. These results indicate that *E. sorbillans* responds to and is attracted to volatiles from infested mulberry.

New views on the taxonomy of *Tachina* spp. (Tachinidae): West Palaearctic species

Poster presentation by J. Vaňhara, A. Tóthová, N. Muráriková, H. Novotná and J. Havel

Faculty of Science, Masaryk University, Brno, Czech Republic

E-mail: vanhara@sci.muni.cz

The male postabdominal structures of several species of the genus *Tachina* were described, and identification keys, illustrated with pen drawings and micrographs, were provided. Molecular analyses based on 4 mitochondrial gene markers were done and supervised feed-forward Artificial Neural Networks (ANN) methodology was applied to morphometric and qualitative characters. This parallel application of three alternative methods based on genotypic and phenotypic inputs used in parallel has enabled the principle of “Polyphasic Taxonomy” to solve some taxonomic discrepancies (see references to*Novotná et al. 2009, and **Muráriková et al. 2010, below). All approaches resolved taxonomic doubts with identical results: 1) the four presently recognized subgenera of the genus *Tachina* were confirmed and the description of a new subgenus was recommended; 2) the validity of a new boreo-alpine species (sp.n.) was confirmed; 3) the previously supposed presence of *T. casta* in central Europe was not supported; 4) West Palaearctic *T. nupta* was contrasted with East Palaearctic specimens from Japan, but the latter seems to represent a valid species not conspecific with central European specimens, therefore *T. nupta* needs detailed further study; and 5) *T. nigrohirta*, resurrected recently from the synonymy of *T. ursina*, was confirmed as a valid species. Extending this project to include more of the Eastern Palaearctic fauna of the genus should be a matter of further study.

*Muráriková, N., Vanhara, J., Tóthová, A. & Havel J., 2010: Polyphasic approach applying Artificial Neural Networks, molecular analysis and postabdomen morphology to West Palaearctic *Tachina* spp. (Diptera, Tachinidae). Bull. Ent. Res., accepted.

**Novotná, H., Vanhara, J., Tóthová, A., Muráriková, N., Bejdák, P., Tkoc M. & Rozkošný R., 2009: Identification and taxonomy of the West Palaearctic species of *Tachina* Meigen (Tachinidae, Diptera)

based on male terminalia and molecular analyses. Ent. Fenn. 20: 1–31.



Figure 2. Monty Wood speaks about “Tachinidae in the era of molecular systematics” during ICD7.

Tachinidae in the era of molecular systematics

Oral presentation by D.M. Wood (Fig. 2)

Canadian National Collection of Insects, AAFC, Ottawa, ON, Canada
E-mail: mgwood@mac.com

The monophyletic family Tachinidae, one of the largest families of flies, is woefully unprepared for the molecular revolution of the 21st century. Our database already has over 7400 valid species, and genetic analyses of reared specimens from recent studies in Guanacaste suggest that the actual number of tropical species may be 30% higher, in addition to the hundreds, probably thousands, of unnamed species already in collections worldwide.

Classifications vary from 7 families in over 80 tribes comprising well over 1000 genera proposed by Townsend in his Manual of Myiology, to 4 subfamilies (Dexiinae, Exoristinae, Phasiinae, and Tachininae) in 33 tribes, proposed for the Palaearctic Region by Herting in 1984, building on the classification of Mesnil in *Die Fliegen der Palaearktischen Region*. More recent catalogues have been based on Mesnil’s and Herting’s classifications. However, many genera are so strange or aberrant that placing them in a tribe or subfamily is still a matter of guesswork, and detailed studies of immature stages and genitalia remain unknown for most genera outside of the Holarctic Region.

All four of the subfamilies, and most of the tribes, have a world-wide distribution, and none appears to be the sister group of another, so that the basic divisions in the family remain unresolved. If capability of retaining eggs to full embryonation has happened more than once in the family, as seems to be the case, perhaps molecular studies may be the only way to determine how often and where these changes took place.

The purpose of this talk is to expose some apparent discrepancies in our existing classification that need further study, both morphological and molecular, using examples from each of the four subfamilies, to show that morpho-

logical observations can still contribute to a better understanding of tachinid phylogeny, even as these same taxa are being sequenced.

TACHINID BIBLIOGRAPHY

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

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

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

- Ahmad, M. and Khan, D.N. 2009. Family Tachinidae. Pp. 385–386. In: Ahmad, M., Kabir, S.M.H., Ahmed, A.T.A., Rahman, A.K.A., Ahmed, Z.U., Begum, Z.N.T., Hassan, M.A. and Khondker, M., eds., Encyclopedia of flora and fauna of Bangladesh. Volume 21. Arthropoda: Insecta III. Pterygota (part). Asiatic Society of Bangladesh, Dhaka. 460 pp.
- Aruna, A.S. and Manjunath, D. 2010. Reproductive performance of *Nesolynx thymus* (Hymenoptera: Eulophidae) as influenced by host (*Musca domestica*) size. *BioControl* **55**: 245–252.
- Assefa, Y., Conlong, D.E., Berg, J. van den and Mitchell, A. 2010. Distribution of sugarcane stem borers and their natural enemies in small-scale farmers’ fields, adjacent margins and wetlands of Ethiopia. *International Journal of Pest Management* **56**: 233–241.
- Bansude, V., Berde, V. and Chaphalkar, S. 2010. Emergence potential of *Nesolynx thymus* Girault and environmental impact. *Karnataka Journal of Agricultural Sciences* **23**: 115–117.
- Bentley, H. and Raper, C. 2010. *Linnaemya picta* (Meigen, 1824) (Diptera, Tachinidae) new to Britain. *Dipterists Digest* (2nd Series) **17**: 77–78.
- Berta, D.C., Colomo, M.V., Valverde, L., Sueldo, M.R. and Dode, M. 2009. Aportes al conocimiento de los parasitoides de larvas de Noctuidae (Lepidoptera) en el cultivo de soja en Tucumán, Argentina. *Acta Zoológica Lilloana* **53**: 16–20.

- Billiard, H.E., Straw, N.A. and Stewart, A.J.A. 2010. Adult fecundity, host plant preferences, field activity and parasitism in the leaf weevil *Phyllobius pyri* (L.) (Coleoptera: Curculionidae). *Bulletin of Entomological Research* **100**: 303–314.
- Bixby-Brosi, A.J. and Potter, D.A. 2010. Evaluating a naturally occurring baculovirus for extended biological control of the black cutworm (Lepidoptera: Noctuidae) in golf course habitats. *Journal of Economic Entomology* **103**: 1555–1563.
- Breidenbaugh, M.S. and Szalay, F.A. de. 2010. Effects of aerial applications of naled on nontarget insects at Parris Island, South Carolina. *Environmental Entomology* **39**: 591–599.
- Burns, J.M., Janzen, D.H. and Hallwachs, W. 2010. Of many similar species in the Neotropical genus *Porphyrogenes* (Lepidoptera: Hesperidae), a new one, repeatedly reared in Costa Rica, is relatively distinct. *Proceedings of the Entomological Society of Washington* **112**: 32–42.
- Buschini, M.L.T. and Fajardo, S. 2010. Biology of the solitary wasp *Trypoxylon (Trypargilum) agamemnon* Richards 1934 (Hymenoptera: Crabronidae) in trap-nests. *Acta Zoologica* **91**: 426–432.
- Bustillo Pardey, A.E. 2009. Acciones para reducir las poblaciones de *Diatraea*. *Carta Trimestral. CENICAÑA* **31** (3/4): 10–15.
- Bystrowski, C. and Owieśny, M. 2009. New data on tachinid flies (Diptera: Tachinidae) of the Bieszczady Mountains. *Dipteron (Wroclaw)* **25**: 2–7. [In Polish with English abstract.]
- Byun, H.-w. and Han, H.-y. 2009. A taxonomic revision of the genus *Metadrinomyia* Shima (Diptera: Tachinidae) with descriptions of two new species. *Zootaxa* **2311**: 55–65.
- Cantrell, B.K. and Burwell, C.J. 2010. The tribe Dufouriini (Diptera: Tachinidae: Dexiinae) recorded from Australia with the description of two new species. *Memoirs of the Queensland Museum* **55**: 119–133.
- Caron, V., Myers, J.H. and Gillespie, D.R. 2010. The failure to discriminate: superparasitism of *Trichoplusia ni* Hübner by a generalist tachinid parasitoid. *Bulletin of Entomological Research* **100**: 255–261.
- Cerretti, P. 2010. I tachinidi della fauna italiana (Diptera Tachinidae) con chiave interattiva dei generi ovest-paleartici. Volumi I & II. Centro Nazionale Biodiversità Forestale, Verona. 573 pp. (Vol. I) + 339 pp. (Vol. II) + CD ROM.
- Cerretti, P. and Dindo, M.L. 2010. I tachinidi nella conservazione della natura e nella lotta biologica. Pp. 59–60. *In*: Cerretti, P., I tachinidi della fauna italiana (Diptera Tachinidae) con chiave interattiva dei generi ovest-paleartici. Volume I. Centro Nazionale Biodiversità Forestale, Verona. 573 pp. + CD ROM.
- Cerretti, P., Dindo, M.L. and Mei, M. 2010. Biologia, ecologia, evoluzione. Pp. 17–44. *In*: Cerretti, P., I tachinidi della fauna italiana (Diptera Tachinidae) con chiave interattiva dei generi ovest-paleartici. Volume I. Centro Nazionale Biodiversità Forestale, Verona. 573 pp. + CD ROM.
- Cerretti, P., O'Hara, J.E., Wood, D.M. and Stireman, J.O. 2010. Over 200 genera and counting – megadiverse fauna of Afrotropical Tachinidae. P. 47. *In*: Zumbado, M.A., ed., Abstracts Volume, 7th International Congress of Dipterology, San José. 296 pp. [Electronic publication.]
- Cerretti, P. and Tschorsnig, H.-P. 2010. Annotated host catalogue for the Tachinidae (Diptera) of Italy. *Stuttgarter Beiträge zur Naturkunde A (Biologie), N. Ser.* **3**: 305–340.
- Cerretti, P., Tschorsnig, H.-P. and Lopresti, M. 2010. MOSCHWEB – An open access interactive key to the Palaearctic genera of Diptera: Tachinidae. P. 48. *In*: Zumbado, M.A., ed., Abstracts Volume, 7th International Congress of Dipterology, San José. 296 pp. [Electronic publication.]
- Cha, D.-j. and Han, H.-y. 2009. Two species of the genus *Phasia* Latreille (Insecta: Diptera: Tachinidae) new to Korea. *Korean Journal of Systematic Zoology* **25**: 309–316.
- Chao, C.-m., Liang, E.-y. and Zhou, S.-x. 2009. Diptera: Tachinidae. Pp. 555–818 + 820. *In*: Yang, D., ed., Fauna of Hebei. Diptera. China Agricultural Science and Technology Press, Beijing. 11 + 863 pp. [In Chinese with English summary.]
- Chi, Y., Hao, J. and Zhang, C.-t. 2010. Taxonomic study of the subgenus *Servillia* Robineau-Desvoidy (Diptera, Tachinidae) from North China. *Journal of Shenyang Normal University (Natural Science)* **28**: 86–89. [In Chinese with English summary.]
- Chi, Y., Wang, S.-d. and Zhang, C.-t. 2010. Advance of Diptera based on mitochondrial COI gene. *Entomotaxonomia* **32**: 71–77. [In Chinese with English summary.]
- Cho, Y.-h., Kim, Y.-j., Han, Y.-g., Kang, Y.-k., Choi, M.-j., Lim, H.-y., Park, Y.-j. and Nam, S.-h. 2010. Ecological and morphological characteristics of endoparasitoids on *Elcysma westwoodii* (Vollenhoven) (Lepidoptera: Zygaenidae). *Entomological Research* **40**: 270–276.
- Colomo, M.V., Berta, C., Valverde, L., Romero Sueldo, M. and Dode, M. 2009. Incidencia de parasitoides en larvas de lepidópteros noctuidos en el cultivo de soja, en Tucumán, Argentina. *Boletín de Sanidad Vegetal, Plagas* **35**: 563–569.
- Connahs, H., Rodríguez-Castañeda, G., Walters, T., Walla, T. and Dyer, L. 2009. Geographic variation in host-specificity and parasitoid pressure of an herbivore (Geometridae) associated with the tropical genus *Piper* (Piperaceae). *Journal of Insect Science* **9** (Article 28): 11 pp. Available online: insectscience.org/9.28
- Cortez-Mondaca, E., Armenta-Cárdenas, I. and Bahena-Juárez, F. 2010. Parasitoides y porcentaje de parasitismo sobre el gusano cogollero (Lepidoptera: Noctuidae) en el sur de Sonora, México. *Southwestern Entomologist* **35**: 199–203.
- Depalo, L., Marchetti, E., Baronio, P., Martini, A. and Dindo, M.L. 2010. Location, acceptance and suitability of *Spodoptera littoralis* and *Galleria mellonella* as hosts for the parasitoid *Exorista larvarum*. *Bulletin of Insectology* **63**: 65–69.
- Dindo, M.L. 2010. [online pre-view] Tachinid parasitoids: are they to be considered as koinobionts? *BioControl*. Available online at <http://www.springerlink.com/content/102853>.
- Dindo, M.L., Stangolini, L. and Marchetti, E. 2010. A simplified artificial medium for the *in vitro* rearing of *Exorista larvarum* (Diptera: Tachinidae). *Biocontrol Science and Technology* **20**: 407–410.

- Divya, S.H., Aruna, A.S. and Prasad, K.S. 2009. Role of photoperiod on the progeny production of an ecto-pupal parasitoid, *Nesolynx thymus* Girault (Hymenoptera: Eulophidae). *Uttar Pradesh Journal of Zoology* **29**: 305–309.
- Draber-Moňko, A. and Nowakowski, E. 2010. The tachinid *Euthera fascipennis* (Loew, 1854) (Diptera, Tachinidae) new to the fauna of the Tunisia, with a description of the female and the puparium. *Fragmenta Faunistica* **52** [2009]: 197–205.
- Farrar, N., Askary, H., Golestaneh, S.R., Alich, M. and Sadeghi, S.M. 2009. Factors affecting host finding ability of *Pales murina* (Diptera: Tachinidae), a parasitoid of *Thiacidas postica* on jujube trees. *Iranian Journal of Forest and Range Protection Research* **7**: 1–8. [In Persian with English abstract.]
- Fening, K.O., Kioko, E.N. and Raina, S.K. 2009. Effect of parasitoids' exit and predators' ingress holes on silk yield of the African wild silkworm, *Gonometa postica* Walker (Lepidoptera: Lasiocampidae). *International Journal of Industrial Entomology* **19**: 265–268.
- Figueiredo, R.R. and Nihei, S.S. 2010. Overview of the Neotropical Dexiinae (Tachinidae). P. 82. *In*: Zumbado, M.A., ed., Abstracts Volume, 7th International Congress of Dipterology, San José. 296 pp. [Electronic publication.]
- Gangadhar, B. and Manjunath, D. 2009. Influence of host age on the reproductive performance of *Tetrastichus howardi* (Olliff) (Hymenoptera: Eulophidae) and morphometric characteristics of its progeny. *Indian Journal of Sericulture* **48**: 138–144.
- Gangadhar, B. and Manjunath, D. 2010. Impact of host size on the progeny production and progeny fitness in *Tetrastichus howardi* (Olliff) (Hymenoptera: Eulophidae). *Indian Journal of Sericulture* **49**: 44–49.
- García-Gutiérrez, C., González-Maldonado, M.B., Chaírez-Hernández, I. and Bautista-Martínez, N. 2009. Parasitismo natural de las principales plagas del repollo en Nombre de Dios, Durango. *Southwestern Entomologist* **34**: 193–195.
- Gheibi, M. and Ostovan, H. 2009. Preliminary investigation on the fauna of tachinid flies (Diptera: Tachinidae) in Fars Province, Iran. *Plant Protection Journal* **1**: 140–166.
- Gheibi, M., Ostovan, H., Kamali, K. and Gilasian, E. 2009. The first report of six tachinid flies from Iran (Diptera: Tachinidae). *Journal of Entomological Society of Iran* **29**: 53–55. [In Persian with English abstract.]
- Gil-Santana, H.R. and Forero, D. 2010. Taxonomical and biological notes on Neotropical Apiomerini (Hemiptera: Heteroptera: Reduviidae: Harpactorinae). *Zootaxa* **2331**: 57–68.
- Gómez-Gómez, A., Martín-Vega, D., Tschorsnig, H.-P., Baz, A., Cifrián, B. and Díaz-Aranda, L. 2010. Tachinids associated with carrion in the centre of the Iberian Peninsula (Diptera: Tachinidae). *Entomologia Generalis* **32**: 217–226.
- Gözüaçik, C., Mart, C. and Kara, K. 2009. Parasitoids of several lepidopterous pests in maize plantations in the Southeast Anatolian Region of Turkey. *Turkish Journal of Zoology* **33**: 475–477.
- Heard, T.A., Elliott, L.P., Anderson, B., White, L., Burrows, N., Mira, A., Zonneveld, R., Fichera, G., Chan, R. and Segura, R. 2010. Biology, host specificity, release and establishment of *Macaria pallidata* and *Leuciris fimbriaria* (Lepidoptera: Geometridae), biological control agents of the weed *Mimosa pigra*. *Biological Control* **55**: 248–255.
- Hubenov, Z. 2008. Composition and zoogeographical characteristics of the family Tachinidae (Diptera: Insecta) in Serbia and Bulgaria. Pp. 375–394. *In*: Makarov, S.E. and Dimitrijević, R.N., eds., *Advances in arachnology and developmental biology. Papers dedicated to Professor Božidar P.M. Čurčić*. University of Belgrade, Serbian Academy of Sciences and Arts in Belgrade, University of Vienna in Vienna and UNESCO MAB Committee Serbia in Belgrade, Belgrade, Vienna, Sofia. Monographs **12**. 517 pp.
- Ichiki, R.T., Kainoh, Y., Yamawaki, Y. and Nakamura, S. 2010. Importance of visual and olfactory cues for foraging in the parasitoid *Exorista japonica*. P. 115. *In*: Zumbado, M.A., ed., Abstracts Volume, 7th International Congress of Dipterology, San José. 296 pp. [Electronic publication.]
- Inclan, D.J. and Stireman, J.O. 2010. Revision of the Neotropical genus *Erythromelana* (Diptera: Tachinidae). P. 116. *In*: Zumbado, M.A., ed., Abstracts Volume, 7th International Congress of Dipterology, San José. 296 pp. [Electronic publication.]
- Jang, S.-a., Cho, J.-h., Park, G.-m., Choo, H.-y. and Park, C.-g. 2011. Attraction of *Gymnosoma rotundatum* (Diptera: Tachinidae) to different amounts of *Plautia stali* (Hemiptera: Pentatomidae) aggregation pheromone and the effect of different pheromone dispensers. *Journal of Asia-Pacific Entomology* **14**: 119–121.
- Jang, S.-a. and Park, C.-g. 2010. *Gymnosoma rotundatum* (Diptera: Tachinidae) attracted to the aggregation pheromone of *Plautia stali* (Hemiptera: Pentatomidae). *Journal of Asia-Pacific Entomology* **13**: 73–75.
- Jiang, M.-c. and Zheng, P. 2010. Preliminary study on biological characteristics and control of *Diprion nanhuaensis* Xiao. *Journal of Jiangsu Forestry Science & Technology* **37**: 28–30, 40. [In Chinese.]
- Kara, K., Kormaz, Y. and Kirikoğlu, S. 2010. New records for Turkish Tachinidae (Diptera) fauna. *Turkish Journal of Zoology* **34**: 275–277.
- Karban, R. and Valpine, P. de. 2010. Population dynamics of an arctiid caterpillar-tachinid parasitoid system using state-space models. *Journal of Animal Ecology* **79**: 650–661.
- Kemal, M., Koçak, A.O., Akin, K., Yalçın, M., Bakan, B. and Çelikkaya, D. 2010. Spring aspect of the pterygot insect fauna of Mutki (Bitlis province, South East Turkey). *CESA News* **58**: 1–78.
- Kishani Farahani, H., Goldansaz, S.H. and Sabahi, G. 2009. Report of two fly parasitoids of carob moth, *Ectomyelois ceratoniae* (Lepidoptera: Pyralidae). *Journal of Entomological Society of Iran* **29**: 57–58. [In Persian with English abstract.]
- Koçak, A.O. and Kemal, M. 2009. Notes on the nomenclature of some generic names of the order Diptera. *Miscellaneous Papers, Centre for Entomological Studies Ankara* **150**: 7–8.
- Koçak, A.Ö. and Kemal, M. 2010. Nomenclatural notes on the genus group names of some families (Diptera). *Priamus* **12**: 156–160.
- Kumari, N. and Chandla, V.K. 2010. Save parasites and microbes of cutworms, *Agrotis segetum* (Schiff) pest of

- potato in Shimla Hills. Uttar Pradesh Journal of Zoology **30**: 21–25.
- Kutty, S.N., Pape, T., Wiegmann, B.M. and Meier, R. 2010. Molecular phylogeny of the Calypttratae (Diptera: Cyclorhapha) with an emphasis on the superfamily Oestroidea and the position of Mystacinobiidae and McAlpine's fly. Systematic Entomology **35**: 614–635.
- Lahiri, A.R. and Mitra, B. 2010. Insecta: Diptera: Tachinidae. Pp. 479–489. In: Director, Zoological Survey of India, ed., Fauna of Uttarakhand (Part–2) Insects. State Fauna Series 18. Zoological Survey of India, Calcutta. iv + 748 pp.
- Lee, J.-h. and Pemberton, R.W. 2010. Pupal parasitoids of *Yponomeuta malinellus* (Lepidoptera: Yponomeutidae) in northeast Asia. Florida Entomologist **93**: 45–51.
- Liu, X.-l., Ding, Y.-z., Gao, Q.-f., Gu, Y.-x., Xu, W.-y., Ding, G.-y. and Su, Y.-d. 2010. Structure and dynamics of insect pests and its natural enemies in poplar stand in Hefei, Anhui Province. Journal of Anhui Agricultural University **37**: 135–140. [In Chinese.]
- Lutovinovas, E. 2009. Tachinidae (Diptera) from the Dūkštų Ažuolynas forest (Neris Regional Park). Dipteron (Wrocław) **25**: 38–45.
- Macdonald, M. 2010. *Thereva handlirschi* Kroeber, 1912 (Diptera, Therevidae) and other notable Diptera in N Scotland. Dipterists Digest (Second series) **17**: 47–49.
- Maharramova, S.M. 2010. Characteristics of parasitoids of Tortricidae (Lepidoptera) in Azerbaijan Republic. Linzer Biologische Beiträge **42**: 757–780.
- Mailafiya, D.M., Le Ru, B.P., Kairu, E.W., Calatayud, P.-A. and Dupas, S. 2010. Factors affecting stem borer parasitoid species diversity and parasitism in cultivated and natural habitats. Environmental Entomology **39**: 57–67.
- Martin, C.M. and Wagner, W.E., Jr. 2010. Female field crickets incur increased parasitism risk when near preferred song. PLoS ONE **5** (3): 1–7 [e9592, doi:10.1371/journal.pone.0009592].
- Mitra, B. and Sharma, R.M. 2010. Checklist of Indian tachinid flies (Insecta: Diptera: Tachinidae). PDF document, 18 pp. Available from: <http://zsi.gov.in/checklist/Indian%20Tachinid%20flies.pdf>.
- Miyano, A. 2009. Record of a larva of tachinid fly (Diptera, Tachinidae) found in the abdomen of *Simplicia nippona* (Noctuidae). Japan Heterocerists' Journal **253**: 60. [In Japanese.]
- Moreau, J., Villemant, C., Benrey, B. and Thiéry, D. 2010. Species diversity of larval parasitoids of the European grapevine moth (*Lobesia botrana*, Lepidoptera: Tortricidae): the influence of region and cultivar. Biological Control **54**: 300–306.
- Muráriková, N., Vaňhara, J., Tóthová, A. and Havel, J. 2010. [FastView Article] Polyphasic approach applying artificial neural networks, molecular analysis and postabdomen morphology to West Palaearctic *Tachina* spp. (Diptera, Tachinidae). Bulletin of Entomological Research **100**: 1–11.
- Murphy, S.M., Lill, J.T. and Smith, D.R. 2009. A scattershot approach to host location: uncovering the unique life history of the trigonalid hyperparasitoid *Orthogonalys pulchella* (Cresson). American Entomologist **55**: 82–87.
- Muruges, K.A. and Bhaskar, R.N. 2009. Bio-prospecting of plant products for eco-friendly management of silkworm uzi fly, *Exorista bombycis* (Louis) (Tachinidae: Diptera). Mysore Journal of Agricultural Sciences **43**: 169–172.
- Muruges, K.A., Bhaskar, R.N. and Shanmugam, R. 2010. Ovipositional deterrent and ovicidal activities of few plant products on *Exorista bombycis* (Louis). Karnataka Journal of Agricultural Sciences **23**: 10–13.
- Naeem, M., Compton, S.C. and Shah, H. 2010. Arthropod communities in different agroforestry landscapes. Pakistan Journal of Zoology **42**: 233–240.
- Nihei, S.S. 2010. Taxonomy and phylogeny of Ormiini (Tachinidae): diversity and evolution of cricket parasitoid flies. P. 177. In: Zumbado, M.A., ed., Abstracts Volume, 7th International Congress of Dipterology, San José. 296 pp. [Electronic publication.]
- Nihei, S.S. and Toma, R. 2010. Taxonomic notes on *Borgmeiermyia* Townsend (Diptera, Tachinidae) with the first host record for the genus. ZooKeys **42**: 101–110.
- Nishio, N. 2009. *Compsilura concinnata* parasitic on *Argyreus hyperbius* (Linnaeus). New Entomologist **58**: 18. [In Japanese.]
- Nishio, N. 2009. A new host record for *Winthemia cruentata* (Rondani) (Diptera, Tachinidae): *Catocala agitatrix* Graeser (Noctuidae). Yugato **198**: 129. [In Japanese.]
- O'Hara, J.E. 2010. World genera of the Tachinidae (Diptera) and their regional occurrence. Version 5.0. PDF document, 74 pp. Available online: <http://www.nadsdiptera.org/Tach/Genera/generahom.htm>.
- O'Hara, J.E., Wood, D.M., Richter, V.A., Shima, H. and Henderson, S.J. 2010. Building a unified classification of the Tachinidae (Diptera) of the world. P. 180. In: Zumbado, M.A., ed., Abstracts Volume, 7th International Congress of Dipterology, San José. 296 pp. [Electronic publication.]
- Ohwaki, A. and Nakamura, K. 2010. Population persistence of the parasitoid fly *Zaira cinerea* (Fallén) (Diptera: Tachinidae) utilizing multiple host carabid beetles with different seasonality and quality. Entomological Science **13**: 280–287.
- Owieśny, M. 2009. Informations about new localities of *Phasia aurigera* (Egger, 1860) (Diptera: Tachinidae) in Poland. Dipteron (Wrocław) **25**: 46–49. [In Polish with English abstract.]
- Özbek, H. and Çalmaşur, Ö. 2010. Spotted ash looper, *Abraxas pantaria* (L.) (Lepidoptera: Geometridae), a new ash pest in Turkey. Turkish Journal of Zoology **34**: 351–358.
- Özbek, H., Tozlu, G. and Çoruh, S. 2009. Parasitoids of the small poplar longhorn beetle, *Saperda populnea* (L.) (Coleoptera: Cerambycidae), in the Aras Valley (Kars and Erzurum Provinces), Turkey. Turkish Journal of Zoology **33**: 111–113.
- Özdikmen, H. 2010. *Brasilomyia* nom. nov., a new name for the preoccupied tachinid genus *Platyphasmia* Townsend, 1935 (Diptera: Tachinidae). Munis Entomology & Zoology **5**: 293–294.
- Pape, T. 2010. An overview of Afrotropical Oestroidea. P. 183. In: Zumbado, M.A., ed., Abstracts Volume, 7th International

- Congress of Dipterology, San José. 296 pp. [Electronic publication.]
- Péllissié, B., Ponsard, S., Tokarev, Y.S., Audiot, P., Péllissier, C., Sabatier, R., Meusnier, S., Chaufaux, J., Delos, M., Campan, E., Malysh, J.M., Frolov, A.N. and Bourguet, D. 2010. Did the introduction of maize into Europe provide enemy-free space to *Ostrinia nubilalis*? Parasitism differences between two sibling species of the genus *Ostrinia*. *Journal of Evolutionary Biology* **23**: 350–361.
- Pluciennik, Z. and Olszak, R.W. 2010. The role of parasitoids in limiting the harmfulness of leafrollers in apple orchards. *Journal of Plant Protection Research* **50**: 1–8.
- Pollock, J.N. 2010. Bot flies (Insecta: Oestridae, part) and Glossinidae-Hippoboscidae derive from basal Ephydroidea, not Calyptratae. *Journal of Natural History* **44**: 1929–1952.
- Prakash, B.M., Keshava Murthy, B.C. and Puttaraju, H.P. 2009. Exploring heterogeneity in the tachinid uzi fly, *Exorista sorbillans*. *Cytologia* **74**: 259–266.
- Prasad, N.R. and Reddy, Y.S. 2009. Spectral sensitivity of uzi fly *Exorista sorbillans* (Wed) during oviposition behaviour. *Bulletin of Indian Academy of Sericulture* **13**: 54–64.
- Rice Smyth, R. and Hoffmann, M.P. 2010. Seasonal incidence of two co-occurring adult parasitoids of *Acalymma vittatum* in New York State: *Centistes* (*Syrrhizus*) *diabroticae* and *Celatoria setosa*. *BioControl* **55**: 219–228.
- Richter, V.A. 2010. On the fauna of tachinids (Diptera, Tachinidae) of Yakutia. *Entomologicheskoe Obozrenie* **89**: 789–801. [In Russian.] Note: English translation in *Entomological Review* 90 [2010]: 1202–1214, 2011.
- Rosen, M.J., Levin, E.C. and Hoy, R.R. 2009. The cost of assuming the life history of a host: acoustic startle in the parasitoid fly *Ormia ochracea*. *Journal of Experimental Biology* **212**: 4056–4064.
- Saghaei, N., Hayat, R., Ostovan, H. and Fallahzadeh, M. 2010. Prey of some robber flies (Diptera: Asilidae) in Fars Province, Iran. *Journal of the Entomological Research Society* **12**: 17–26.
- Santos, V. and Ávila, C.J. 2009. Ocorrência de parasitismo em larvas de *Liogenys suturalis* Blanchard, 1851 (Coleoptera: Melolonthidae) por *Ptilodexia* Brauer & Bergenstamm, 1889 (Diptera: Tachinidae). *Arquivos do Instituto Biológico* **76**: 745–748.
- Sarma, K.K., Borah, B.K., Debnath, M.C. and Das, B. 2010. Natural enemies of jute pests in Nagaon, Assam. *Insect Environment* **15**: 157–158.
- Sarvary, M.A., Nyrop, J. and Reissig, H. 2010. Effects of natural enemies and host plants in wild and orchard habitats on obliquebanded leafroller (Lepidoptera: Tortricidae) larval survival. *Biological Control* **55**: 110–117.
- Shima, H. 2010. Addenda and corrigenda to “A Host-parasite Catalog of Tachinidae (Diptera) of Japan” (Shima, 2006). *Makunagi/ Acta Dipterologica* **22**: 7–12.
- Shima, H. 2010. Tachinidae (Diptera) collected with Malaise traps and yellow pan traps in Amami-ôshima and Okinawa-jima, the Ryukyus, Japan. *Makunagi/ Acta Dipterologica* **23**: 1–8.
- Shima, H., Han, H.-y. and Tachi, T. 2010. Description of a new genus and six new species of Tachinidae (Diptera) from Asia and New Guinea. *Zootaxa* **2516**: 49–67.
- Sinclair, B.J. and Dorchin, N. 2010. Isoptera, Embioptera, Neuroptera, Mecoptera, Raphidioptera and Diptera types in ZFMK. *Bonn Zoological Bulletin* **58**: 49–88.
- Skuhrová, M., Martinez, M. and Roques, A. 2010. Diptera. Chapter 10. Pp. 553–602. *In*: Roques, A., Kenis, M., Lees, D., Lopez-Vaamonde, C., Rabitsch, W., Rasplus, J.-Y. and Roy, D.B., eds., *Alien terrestrial arthropods of Europe*. *BioRisk* (Special Issue) **4**. 555 pp.
- Stefanescu, C., Planas, J. and Shaw, M.R. 2009. The parasitoid complex attacking coexisting Spanish populations of *Euphydryas aurinia* and *Euphydryas desfontainii* (Lepidoptera: Nymphalidae, Melitaeini). *Journal of Natural History* **43**: 553–568.
- Stireman, J.O. 2010. Host-associated differentiation in Diptera: Contrasting plant parasites and insect parasitoids. P. 236. *In*: Zumbado, M.A., ed., *Abstracts Volume, 7th International Congress of Dipterology, San José*. 296 pp. [Electronic publication.]
- Stireman, J.O., Greeney, H.F. and Dyer, L.A. 2010. Diversity and host use patterns of Lepidoptera-attacking Tachinidae in the Ecuadorian Andes. P. 237. *In*: Zumbado, M.A., ed., *Abstracts Volume, 7th International Congress of Dipterology, San José*. 296 pp. [Electronic publication.]
- Tachi, T. 2009. A new host record of *Carcelia* (*Senometopia*) *prima* (Diptera: Tachinidae). *Pulex* **88**: 520. [In Japanese.]
- Tanaka, A., Kainoh, Y., Tabata, J., Sugie, H., Ichiki, R.T. and Nakamura, S. 2010. Response of the uzi fly *Exorista sorbillans* to silkworm-infested mulberry in a wind tunnel. P. 245. *In*: Zumbado, M.A., ed., *Abstracts Volume, 7th International Congress of Dipterology, San José*. 296 pp. [Electronic publication.]
- Tillman, P.G., Aldrich, J.R., Khirmian, A. and Cottrell, T.E. 2010. Pheromone attraction and cross-attraction of *Nezara*, *Acrosternum*, and *Euschistus* spp. stink bugs (Heteroptera: Pentatomidae) in the field. *Environmental Entomology* **39**: 610–617.
- Toma, R. 2010. Contribuição ao conhecimento de espécies venezuelanas de *Lespesia* Robineau-Desvoidy (Diptera, Tachinidae, Exoristinae), com descrições de novas espécies. *Revista Brasileira de Entomologia* **54**: 165–172.
- Tóth, S. 2009. Data to the fly fauna (Diptera) of Gyűrfű in the framework of the Biodiversity Days. *Natura Somogyiensis* **13**: 179–190. [In Hungarian with English abstract.]
- Vañhara, J., Tóthová, A., Muráriková, N., Hovotná, H. and Havel, J. 2010. New views on the taxonomy of *Tachina* spp. (Tachinidae): West Palearctic species. P. 259. *In*: Zumbado, M.A., ed., *Abstracts Volume, 7th International Congress of Dipterology, San José*. 296 pp. [Electronic publication.]
- Verdugo, A. 2010. *Microphthalma europaea* Egger, 1860 (Diptera: Tachinidae), un díptero endoparásito de *Calicnemis obesa* (Erichson, 1841) (Coleoptera: Scarabaeidae: Dynastinae) en Cádiz. España. *Revista Gaditana de Entomología* **1**: 5–8.

- Vincent, C.M. and Bertram, S.M. 2009. The parasitoid fly *Ormia ochracea* (Diptera: Tachinidae) can use juvenile crickets as hosts. *Florida Entomologist* **92**: 598–600.
- Vincent, C.M. and Bertram, S.M. 2010. Collection and laboratory culture of *Ormia ochracea* (Diptera: Tachinidae). *Journal of Entomological Science* **45**: 1–7.
- Vincent, C.M. and Bertram, S.M. 2010. Crickets groom to avoid lethal parasitoids. *Animal Behaviour* **79**: 51–56.
- Vincent, C.M. and Bertram, S.M. 2010. Reproductive compensation: a review of the *Gryllus* spp.—*Ormia ochracea* host-parasitoid system. *Journal of Insect Behavior* **23**: 340–347.
- Wood, D.M. 2010. Tachinidae in the era of molecular systematics. P. 278. *In*: Zumbado, M.A., ed., Abstracts Volume, 7th International Congress of Dipterology, San José. 296 pp. [Electronic publication.]
- Wood, D.M. and Zumbado, M.A. 2010. Tachinidae (tachinid flies, parasitic flies). Pp. 1343–1417. *In*: Brown, B.V., Borkent, A., Cumming, J.M., Wood, D.M., Woodley, N.E. and Zumbado, M.A., eds., *Manual of Central American Diptera*. Volume 2. NRC Research Press, Ottawa. xvi + 715–1442 pp.
- Yao, Z.-y., Zheng, G. and Zhang, C.-t. 2010. Notes on species of the tribe Exoristini from China (Diptera, Tachinidae). *Journal of Shenyang Normal University (Natural Science)* **28**: 530–533.
- Zeegers, T. 2009. Tachinidae, Calliphoridae and Oestridae (Diptera) collected in Siberia by Dutch expedition. *Evraziatskii Entomologicheskii Zhurnal* [also as *Euroasian Entomological Journal*] **8**: 431–436.
- Zeegers, T. 2010. Order Diptera, family Tachinidae. Pp. 673–686. *In*: Harten, A. van, ed., *Arthropod fauna of the UAE*. Volume 3. Dar Al Ummah, Abu Dhabi. 700 pp.
- Zeegers, T. 2010. Second addition to the checklist of Dutch tachinid flies (Diptera: Tachinidae). *Nederlandse Faunistische Mededelingen* **34**: 55–66. [In Dutch with English summary.]
- Zhang, C.-t. 2010. Tachinidae. Pp. 302–305. *In*: Wang, X.-p. and Yang, G.-j., eds., *Insects in Helan Mountain of Ningxia Hui Autonomous Region*. Ningxia People's Press, Yinchuan. 472 pp. + 49 pls. [In Chinese.]
- Zhang, C.-t. and Hao, J. 2010. One new species of *Tachina* Meigen from China (Diptera, Tachinidae). *Acta Zootaxonomica Sinica* **35**: 334–337.
- Zhang, C.-t., Liu, J.-y., Yao, Z.-y. and Chi, Y. 2010. Family Tachinidae. Pp. 427–452. *In*: Ren, G.-d., ed., *Fauna of Invertebrata from Liupan Mountain*. Hebei University Publishing House, Baoding. 12 + 681 pp. + 8 pls. [In Chinese with English summary on pp. 604–608.]
- Zhang, C.-t., Shima, H. and Chen, X.-l. 2010. A review of the genus *Dexia* Meigen in the Palearctic and Oriental Regions (Diptera: Tachinidae). *Zootaxa* **2705**: 1–81.
- Zhang, C.-t., Zhao, Z. and Wang, Q. 2011. New species and new records of Tachinidae from Liaoning Laotudingzi National Nature Reserve of China (Insecta, Diptera). *Acta Zootaxonomica Sinica* **36**: 63–73.
- Zhang, C.-t., Zhou, Y.-y., Fu, C. and Zhao, Z. 2010. A list of tachinid flies (Diptera, Tachinidae) from Xiaowutai Shan Nature Reserve, Hebei, China. *Chinese Bulletin of Entomology* **47**: 1225–1230. [In Chinese.]
- Ziegler, J. 2010. Revision of the genus *Germaria* Robineau-Desvoidy (Diptera, Tachinidae) from Greece, with descriptions of two new species. *Deutsche Entomologische Zeitschrift* **57**: 43–57.

MAILING LIST

Telephone numbers, FAX numbers and E-mail addresses are included where known.

Acquisitions Section, Department of Library Services, Natural History Museum, Cromwell Road, London, SW7 5BD, UK
Entomology Library, Peabody Museum, Yale University, New Haven, Connecticut 06511, USA

Dr. Peter Adler, Department of Entomology, Clemson University, Long Hall, Box 340365, Clemson, South Carolina 29634-0365, USA [Tel: 864-656-5044, ext. 5070; Fax: 864-656-5069; E-mail: padler@clemson.edu]

Dr. Paul H. Arnaud, Jr., Curator Emeritus, Department of Entomology, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118, USA [Tel: 415-750-7233; Fax: 415-750-7106; E-mail: parnaud@calacademy.org]

Dr. Susana Avalos, Zoología Agrícola, Facultad de Ciencias Agropecuarias, Avda Valparaíso, s/n Ciudad Universitaria, Universidad Nacional de Córdoba, Córdoba, ARGENTINA [E-mail: d-avalos@agro.unc.edu.ar]

Prof. Piero Baronio, Dipartimento di Scienze e Tecnologie Agroambientali, Viale Fanin, 42, I-40127 Bologna, ITALY [Tel: +39 051 2096702; Fax: +39 051 2096281; E-mail: piero.baronio@unibo.it]

Dr. David Barraclough, School of Biological and Conservation Sciences, George Campbell Building, University of KwaZulu-Natal, Durban 4041, SOUTH AFRICA [Tel: 031-260-1612; E-mail: barracloughd@ukzn.ac.za]

Mr. Christer Bergström, Säves väg 10, S-752 63 Uppsala, SWEDEN [E-mail: christer.bergstrom@zeta.telenordia.se]

Mr. Jeff Boettner, Department of Plant, Soil and Insect Sciences, Fernald Hall, University of Massachusetts, Amherst, Massachusetts 01003, USA [E-mail: boettner@psis.umass.edu]

Karel Bolckmans, International Production and R&D Manager, Koppert Biological Systems, P.O. Box 155, Veilingweg 17, 2650 AD, NETHERLANDS [Tel: +31-10-514.04.44; E-mail: kbolckmans@koppert.nl]

Mr. Cezary Bystrowski, Forest Research Institute, ul. Bitwy Warszawskiej 1920 r. nr 3, 00-973 Warsaw, POLAND [E-mail: C.Bystrowski@ibles.waw.pl]

Mr. Hye-Woo Byun, Invertebrates Research Division, National Institute of Biological Resources, Environmental Research Complex, Gyoungseo-dong, Seo-gu, Incheon, 404-170, SOUTH KOREA [Tel: 82-32-590-7154; E-mail: hwbyun@korea.kr]

Dr. Bryan K. Cantrell, 3 Wingarra Street, Yeerongpilly, Queensland, 4105 AUSTRALIA [Tel: 61 7 3848 7904; E-mail: bjkcantrell@ozemail.com.au]

Dr. Ronald D. Cave, Indian River Research & Education Center, University of Florida, 2199 South Rock Road, Ft. Pierce, Florida 34945, USA [Tel: 772-468-3922 x 145; Fax: 772-460-3673; E-mail: rdcave@ifas.ufl.edu]

Dr. Pierfilippo Cerretti, Dipartimento di Biologia Animale e dell'Uomo, Università degli Studi di Roma "La Sapienza", Viale

- dell'Università, 32, 00185, Roma, ITALY [E-mail: pierfilippo.cerretti@yahoo.it]
- Dr. D.E. Conlong, SASA Experiment Station, Private Bag X02, Mount Edgecombe, 4300, Natal, SOUTH AFRICA [Tel: (031) 593205; Fax: (031) 595406; E-mail: xentdc@sugar.org.za or conlong@iafrica.com]
- Dr. Joan Cossentine, Summerland Research Centre, Agriculture and Agri-Food Canada, Highway 97, Summerland, British Columbia VOH 1Z0, CANADA [E-mail: joan.cossentine@agr.gc.ca]
- Dr. Roger W. Crosskey, Department of Entomology, Natural History Museum, Cromwell Road, London, SW7 5BD, UK [Tel: 071-938-9123; Fax: 071-938-8937; E-mail: rwc@nhm.ac.uk]
- Dr. Michael L. Cox, CAB International Institute of Entomology, c/o Department of Entomology, Natural History Museum, Cromwell Road, London, SW7 5BD, UK
- Dr. Maria Luisa Dindo, Dipartimento di Scienze e Tecnologie, Agroambientali, via Fanin, 42, 40127 Bologna, ITALY [Tel: +39 051 2096280 2096288; Fax: +51 051 2096281; E-mail: marialuisa.dindo@unibo.it]
- Dr. Agnieszka Draber-Monko, Instytut Zoologii, Polska Akademia Nauk, 00-679 Warszawa, ul. Wilcza 64, P.O. Box 1007, POLAND [Tel: 29-32-21; E-mail: draber@miiz.waw.pl]
- Mr. John S. Dugdale, Manaaki Whenua-Landcare Research NZ Ltd., c/o Private Bag 6, Nelson 7001, NEW ZEALAND [E-mail: jsdugdale@Xtra.co.nz; dugdale@landcare.co.nz]
- Professeur Claude Dupuis, Entomologie, Muséum National d'Histoire Naturelle, 45, rue de Buffon, 75005 Paris, FRANCE [Tel: 40.79.34.05]
- Ms. Stephanie Erb, Lethbridge Research Centre, Agriculture and Agri-Food Canada, P.O. Box 3000, Lethbridge, Alberta T1J 4B1, CANADA [E-mail: stephanie.erb@agr.gc.ca]
- Dr. Neal L. Evenhuis, Chairman, Department of Natural Sciences, Bishop Museum, 1525 Bernice Street, Honolulu, Hawaii 96817-2704, USA [Tel: 808-848-4138; Fax: 808-847-8252; E-mail: neale@bishopmuseum.org]
- Ms. Roberta R. Figueiredo, Departamento de Zoologia, Instituto de Biociências, Universidade de São Paulo, Rua do Matão, trav. 14, nº 321, Cidade Universitária, São Paulo-SP, CEP 05508-900, BRAZIL [E-mail: robertafigueiredo@gmail.com]
- Dr. Sheila Fitzpatrick, Agriculture and Agri-Food Canada Research Station, 6660 N.W. Marine Drive, Vancouver, British Columbia, V6T 1X2, CANADA [Tel: 604-224-4355; Fax: 604-666-4994; E-mail: sheila.fitzpatrick@agr.gc.ca]
- Mr. John P. Flynn, 274 Hainton Avenue, Grimsby, North East Lincolnshire, DN32 9LS, UNITED KINGDOM [E-mail: jpf@sheltie.co.uk]
- Dr. Amnon Freidberg, Department of Zoology, The George S. Wise Faculty of Life Sciences, Tel Aviv University, Tel Aviv 69978, ISRAEL [Tel: +972-3-640-8660; E-mail: afdipter@post.tau.ac.il]
- Dr. Serge Gaponov, Voronezh State University, Universitetskaya pl. 1, 394000 Voronezh, RUSSIA [Tel: (0732) 566595; Fax: (0732) 566551; E-mail: gaponovs@hotmail.com]
- Dr. Mehdi Gheibi, Department of Plant Protection, Faculty of Agricultural Sciences, Shiraz Islamic Azad University, P.O. Box: 71993-4, Shiraz, Fars Province, IRAN [Telefax: +98 711 6410047; E-mail: mehghheibi@yahoo.com]
- Mr. David J. Girling, Information Officer, IIBC, Silwood Park, Buckhurst Road, Ascot, Berks SL5 7TA, UK
- Dr. Simon Grenier, 6 rue des Mésanges, 69680 Chassieu, FRANCE [Tel: (0)4 78 90 46 51; E-mail: simon-grenier@orange.fr]
- Dr. Horacio Grillo Ravelo, Laboratorio de Taxonomía, Centro de Investigaciones Agropecuarias, Universidad Central de Las Villas, Santa Clara, Villa Clara, CUBA [Tel: 53 042 281520; E-mail: hgrillo@agronet.uclv.edu.cu]
- Dr. Ho-Yeon Han, Department of Life Science, Yonsei University, 234 Maeji-ri, Wonju-si, Gangwon-do 220-710, SOUTH KOREA [E-mail: hyhan@yonsei.ac.kr]
- Mr. Håkon Haraldseide, Ålavikvegen 4, 4250 Kopervik, NORWAY [E-mail: hharaldseide@gmail.com]
- Shannon Henderson, Invertebrate Biodiversity, Agriculture and Agri-Food Canada, 960 Carling Avenue, Ottawa, Ontario K1A 0C6, CANADA [Tel: 613-759-1794; Fax: 613-759-1927; E-mail: shannon.henderson@agr.gc.ca]
- Dr. Zdravko Hubenov, Institute of Zoology, Bulgarian Academy of Sciences, Boul. "Tsar Osvoboditel" 1, 1000 Sofia, BULGARIA [E-mail: zhubenov@zoology.bas.bg]
- Dr. Ryoko Ichiki, Japan International Research Center for Agricultural Sciences, 1-1, Ohwashi, Tsukuba, Ibaraki 305-8686, JAPAN [E-mail: richiki22@gmail.com]
- Mr. Diego J. Inclan, Department of Biological Sciences, 3640 Colonel Glenn Highway, 235A, BH, Wright State University, Dayton, Ohio 45435, USA [E-mail: inclanluna.2@wright.edu]
- Dr. Daniel H. Janzen, Department of Biology, University of Pennsylvania, Philadelphia, PA 19104, USA [Tel: 215-898-5636; Fax 215-898-8780; E-mail: djanzen@sas.upenn.edu]. When in Costa Rica, Dan can be reached at Guanacaste Conservation Area: tel and Fax 506-695-5598, best to call at night or on weekends.
- Dr. Kenan Kara, Gazi Osman Pasa University, Ziraat Fakültesi Bitki, Koruma Bölümü, Tokat, TURKEY [E-mail: kkara@gop.edu.tr]
- Dr. Ulrich Kuhlmann, Head Agricultural Pest Research, CABI Bioscience Centre Switzerland, Rue des Grillons 1, CH-2800 Delémont, SWITZERLAND [Tel: +41-32-421 4882; Fax: +41-32-421 4871; E-mail: u.kuhlmann@cabi.org]
- Mr. A.R. Lahiri, Asst. Zoologist, Diptera Section, Zoological Survey of India, Prani Vigyan Bhavan, 'M' Block, New Alipur, Calcutta - 700 053, INDIA
- Dr. Gerlind U.C. Lehmann, Freie Universität Berlin, Institut für Zoologie, Königin-Luise-Straße 1-3, D-14195 Berlin, GERMANY [E-mail: gerlind.lehmann@t-online.de]
- Dr. Gerardo Liljesthrom, Museo de La Plata, Paseo del Bosque S/N, 1900 La Plata, ARGENTINA [E-mail: gerardo@cepave.edu.ar]
- Dr. John T. Lill, George Washington University, Department of Biological Sciences, 2023 G Street, NW, Suite 340, Washington, DC 20052, USA [Tel: 202-994-6989; Fax: 202-994-6100; E-mail: lillj@gwu.edu]
- Dr. Richard L. Lindroth, Department of Entomology, 1630 Linden Drive, University of Wisconsin, Madison, Wisconsin 53706, USA [Tel: 608-263-6277; Fax: 608-262-3322 [E-mail: lindroth@entomology.wisc.edu]
- Dr. Jean-Michel Maes, Museo Entomologico, AP 527, Leon, NICARAGUA [Tel: 505-3116586; Fax: 505-3110126; E-mail: jmmaes@ibw.com.ni]
- Dr. Steve Marshall, Department of Environmental Biology, University of Guelph, Guelph, Ontario N1G 2W1, CANADA [Tel: 519-824-4120, ext. 2720; Fax: 519-837-0442; E-mail: samarsha@uoguelph.ca]
- Dr. Peter G. Mason, Invertebrate Biodiversity, Agriculture and Agri-Food Canada, 960 Carling Avenue, Ottawa, Ontario K1A 0C6, CANADA [Tel: 613-759-1908; Fax: 613-759-1927; E-mail: peter.mason@agr.gc.ca]

- Dr. Bernhard Merz, Département d'Entomologie, Muséum d'Histoire naturelle, C.P. 6434, CH-1211 Genève 6, SWITZERLAND [Tel: ++41 (0)22 418 6312; Fax: ++41 (0)22 418 6301; E-mail: bernhard.merz@ville-ge.ch]
- Dr. Kevin Moulton, Department of Entomology and Plant Pathology, University of Tennessee, 2431 Joe Johnson Drive, 205 Ellington Plant Sciences Bldg., Knoxville, Tennessee 37996-4560, USA [Tel: 865-974-7950; Fax: 865-974-4744; E-mail: jmoulton@utk.edu]
- Dr. Satoshi Nakamura, Japan International Research Centre for Agricultural Sciences, 1-2 Ohwashi, Tukuba, Ibaraki, 305, JAPAN [Tel: 0298-38-8318; Fax: 0298-38-6316; E-mail: tachinid@jircas.affrc.go.jp]
- Dr. Vincent Nealis, Pacific Forestry Centre, Forestry Canada, 506 West Burnside Road, Victoria, British Columbia V8Z 1M5, CANADA [Tel: 250-363-0663; Fax: 250-363-0775; E-mail: vnealis@pfc.cfs.nrcan.gc.ca]
- Dr. Fathi H. Negm, Plant Protection Research Institute, Nadi El Seid St., Dokki-Giza, EGYPT
- Dr. William C. Nettles, Jr., 25 Admiral Lane, Salem, South Carolina 29676, USA [Tel: 864-944-8401; E-mail: bill29676net@yahoo.com or wcnettles@earthlink.net]
- Dr. Silvio S. Nihei, Departamento de Zoologia, Instituto de Biociências, Universidade de São Paulo, Rua do Matão, trav. 14, nº 321, Cidade Universitária, São Paulo-SP, CEP 05508-900, BRAZIL [E-mail: silvionihei@gmail.com]
- Mr. Enio Nunez, Departamento de Entomologia, Museu Nacional do Rio de Janeiro, 20940-040, Rio de Janeiro, BRAZIL [E-mail: enionunez@mn.ufjr.br]
- Dr. James E. O'Hara, Invertebrate Biodiversity, Agriculture and Agri-Food Canada, 960 Carling Avenue, Ottawa, Ontario K1A 0C6, CANADA [Tel: 613-759-1795; Fax: 613-759-1927; E-mail: james.ohara@agr.gc.ca]
- Dr. Michael Orazo, National Biological Control Institute, USDA, APHIS, OA, 4700 River Road, Unit 5, Riverdale, Maryland 20737-1229, USA [Tel: 301-734-4329; E-mail: moraze@aphis.usda.gov]
- Dr. Imre Otvos, Pacific Forestry Centre, Forestry Canada, 506 West Burnside Road, Victoria, British Columbia V8Z 1M5, CANADA [Tel: 250-363-0620; Fax: 250-363-0775; E-mail: iotvos@pfc.cfs.nrcan.gc.ca]
- Marcelo Pansonato, Coleção de Entomologia – Diptera, Museu de Zoologia, Universidade de São Paulo, Avenida Nazaré, 481, Ipiranga, São Paulo-SP, CEP 04263-000, BRAZIL [E-mail: marcelopansonato@hotmail.com]
- Dr. Thomas Pape, Entomology Department, Zoological Museum, Universitetsparken 15, DK-2100 Copenhagen Ø, DENMARK [Tel: +45 3532 1106; Fax: +45 3532 1010; E-mail: tpape@snm.ku.dk]
- Dr. Jaakko Pohjoismäki, Bornagasse 15a, 61169 Friedberg, GERMANY [E-mail: jaakko.pohjoismaki@snowchange.org]
- Dr. Bandekodigenahalli M. Prakash, Evolutionary Biology Laboratory, Evolutionary and Organismal Biology Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Jakkur, Bangalore-560 064, INDIA [E-mail: prakashbm@gmail.com]
- Dr. Dnyaneshwar Shinde, Department of Sericulture, Division of Biological Sciences, School of Natural Sciences, Bangalore University, Bangalore-560 056, INDIA [E-mail: puttarajuhp@hotmail.com]
- Dr. F. Wolfgang Quednau, Laurentian Forestry Centre, P.O. Box 3800, 1055 PEPS Street, Sainte-Foy, Quebec G1V 4C7, CANADA [Tel: 418-648-5804; Fax: 418-648-5849; E-mail: fquednau@exchange.cfl.forestry.ca]
- Dr. S. Ramani, Project Directorate of Biological Control, Hebbal, Bangalore - 560 024, INDIA [Tel: 3511982; Fax: 341 1961; E-mail: s_ramani@vsnl.net]
- Mr. Chris Raper, c/o Tachinid Recording Group, <http://tachinidae.org.uk/> [E-mail: chris.raper@tachinidae.org.uk]
- Dr. Stuart Reitz, USDA-ARS Center for Biological Control, Florida A&M University, Tallahassee, Florida 32307, USA [Tel: 850-412-7062; Fax: 850-412-7263; E-mail: sreitz@netally.com]
- Dr. Vera A. Richter, Zoological Institute, Russian Academy of Sciences, St. Petersburg, 199034, RUSSIA [Tel: 812 218 0011; Fax: 7 812 1140444; E-mail: ciala@zin.ru]
- Dr. Knut Rognes, Havørnbrautene 7a, N-4049 Hafsløfjord, NORWAY [Home tel: (+47) 51 59 06 96; Home E-mail: knut@rognes.no; Office tel: (+47) 51 83 35 43; Office Fax: (+47) 51 83 35 50; Office E-mail: knut.rognes@uis.no]
- Dr. Jens Roland, Department of Biological Sciences, University of Alberta, Edmonton, Alberta T6G 2E9, CANADA [Tel: 403-492-1180; Fax: 403-492-9234; E-mail: jroland@gpu.srv.ualberta.ca]
- Luiz Antonio B. Salles, EMBRAPA, Centro de Pesquisa Agropecuária de Clima Temperado, Caixa Postal 403, CEP 96001-970 Pelotas, RS, BRASIL [Tel: (0532) 212122; Fax: (0532) 212121]
- Dr. Vicente Sánchez, USDA, Center for Biological Control of Northeastern Forest Insects and Diseases, Northern Research Station, 51 Mill Pond Road, Hamden, CT 06514, USA [Tel: 203-773-2021; Fax: 203-773-2183]
- Mr. Rudi Schnitzler, Plants Risk Analysis, MAF Biosecurity New Zealand, Level 13, Wellington – Pastoral House, 25 The Terrace, PO Box 2526, Wellington, NEW ZEALAND [DDI: +64 (04) 894 0311; Fax: +64 (04) 894 0733; E-mail: Rudi.Schnitzler@maf.govt.nz]
- Prof. Dr. Ulrich Schulz, Fachhochschule Eberswalde, Fachbereich Landschaftsnutzung und Naturschutz, Fachgebiet Angewandte Tierökologie und Zoologie, Friedrich Ebertstr. 28, 16225 Eberswalde, GERMANY [E-mail: usschulz@fh-eberswalde.de]
- Mr. Peter Sehna, Internationales Forschungsinstitut für Insektenkunde, Naturhistorisches Museum Wien, Burgring 7, A-1014 Wien, AUSTRIA [E-mail: peter.sehna@nhm-wien.ac.at]
- Dr. Hiroshi Shima, 2-11-1-406 Kusagae, Chuo-ku, Fukuoka 810-0045, JAPAN [E-mail: shimarcb@kyudai.jp]
- Mr. Dnyaneshwar Shinde, Bhogawati College, Kurukali, Kolhapur, Maharashtra, INDIA [E-mail: dragonfly.2009@rediffmail.com]
- Mr. Liekele E.N. Sijstermans, Poppelenburgerstraat 7, NL-4191 ZS Geldermalsen, NETHERLANDS [E-mail: liekele@wxs.nl]
- Dr. Ana Maria M. Ávila Simões, Departamento de Ciências Agrárias, Secção da Protecção das Plantas, Terra-Chã, 9702 Angra, Terceira, PORTUGAL [Tel: 351 95 31111; Fax: 351 95 32605; E-mail: asimoes@angra.uac.pt]
- Dr. Mike Singer, Department of Biology, Wesleyan University, Hall-Atwater Labs, Rm.259, Middletown, Connecticut 06459, USA [Tel: 860-685-2548; E-mail: msinger@wesleyan.edu]
- Dr. Jeffrey Skevington, Invertebrate Biodiversity, Agriculture and Agri-Food Canada, 960 Carling Avenue, Agriculture and Agri-Food Canada, Ottawa, Ontario K1A 0C6, CANADA [Tel: 613-759-1647. Fax: 613-759-1927; E-mail: jeffrey.skevington@agr.gc.ca]

- Dr. Cecil L. Smith, Museum of Natural History, University of Georgia, Athens, Georgia 30602, USA [E-mail: clsmith@arches.uga.edu]
- Dr. John O. Stireman III, Associate Professor, Department of Biological Sciences, 3640 Colonel Glenn Highway, 235A, BH, Wright State University, Dayton, Ohio 45435, USA [Tel: 1-937-775-3192; E-mail: john.stireman@wright.edu; <http://www.wright.edu/~john.stireman>]
- Dr. John Strazanac, Plant and Soil Sci. / Entomology, West Virginia University, P.O. Box 6108, Morgantown, West Virginia 26506-6108, USA [Tel: 304-293-6023, ext. 4345; Fax: 304-293-2960; E-mail: jstrazan@wvu.edu]
- Dr. Xuekui Sun, 26 Courtney Cres, Richmond Hill, Ontario L4E 4B9, CANADA [Tel: 905-237-0240; E-mail: xuekuisun@hotmail.com]
- Dr. Takuji Tachi, Biosystematics Laboratory, Kyushu University, Motoooka, Fukuoka 819-0395, JAPAN [E-mail: tachi@scs.kyushu-u.ac.jp]
- Dr. Ronaldo Toma, Universidad de Carabobo, Facultad de Ciencias y Tecnología, Departamento de Biología, Bárbula, antiguo Decanato de Ciencias de la Salud, Valencia, Carabobo, C.P. 2005, VENEZUELA [E-mail: rtkunal@gmail.com]
- Dr. Hans-Peter Tschorsnig, Staatliches Museum für Naturkunde, Rosenstein 1, D-70191 Stuttgart, GERMANY [Tel: (0711) 8 93 60; Fax: 49 711 8936100; E-mail: tschorsnig.smns@naturkundemuseum-bw.de]
- Mr. Godard Tweehuysen, Librarian, Library Netherlands Entomological Society, Plantage Middenlaan 64, NL-1018 DH Amsterdam, NETHERLANDS [Tel: + 31(0)20 5256246; Fax: + 31(0)20 5256528; E-mail: biblio@nev.nl]
- Prof. Jaromír Vaňhara, Department of Botany and Zoology, Faculty of Science, Masaryk University, Kotlářská 2, 611 37 Brno, CZECH REPUBLIC [Tel: +420 532 146 323; Fax: 420 541 211 214; E-mail: vanhara@sci.muni.cz]
- Dr. Philippe Vernon, UMR 6553, CNRS, Université de Rennes 1, Station Biologique, 35380, Paimpont, FRANCE [Tel: +33 (0)2.99.61.81.69; Fax: +33 (0)2.99.61.81.87; E-mail: philippe.vernon@univ-rennes1.fr]
- Dr. Robert A. Wharton, Department of Entomology, Texas A&M University, College Station, Texas 77843-2475, USA [Tel: 409-845-7972; Fax: 409-845-7977; E-mail: rawbaw2@tamu.edu]
- Dr. Terry A. Wheeler, Department of Natural Resource Sciences, McGill University, Macdonald Campus, Ste-Anne-de-Bellevue, Quebec H9X 3V9, CANADA [Tel: 514-398-7937; Fax: 514-398-7990; E-mail: terry.wheeler@mcgill.ca]
- Mr. Nik Wiman, Department of Entomology, Washington State University, Tree Fruit Research and Extension Center, 1100 N. Western Ave, Wenatchee, Washington 98801, USA [Tel: 509-663-8181, ext. 277; E-mail: nwiman@wsu.edu]
- Dr. D. Monty Wood, Invertebrate Biodiversity, Agriculture and Agri-Food Canada, 960 Carling Avenue Agriculture and Agri-Food Canada, Ottawa, Ontario K1A 0C6, CANADA [Tel: 613-996-1665; Fax: 613-947-5974; E-mail: mgwood@mac.com]
- Dr. Norman E. Woodley, Systematic Entomology Laboratory, SEA, U.S. Department of Agriculture, c/o U.S. National Museum NHB 168, Washington, D.C. 20560, USA [Tel: 202-382-1802; Fax: 202-786-9422; E-mail: norman.woodley@ars.usda.gov]
- Mr. Nigel Wyatt, Department of Entomology, Natural History Museum, Cromwell Road, London, SW7 5BD, UK [Tel: 071-938-9123; Fax: 071-938-8937; E-mail: npw@nhm.ac.uk]
- Dr. Erick Yabar L., P.O. Box 115, Cusco, PERU [E-mail: e_yabar@yahoo.com]
- Dr. Stephen P. Yanoviak, Department of Biology, University of Arkansas at Little Rock, 2801 S. University Avenue, Little Rock, AR 72204-1099, USA [Tel: 501.569.8342; Fax: 501.569.3271; E-mail: spyanoviak@ualr.edu]
- Mr. Dekang You, No. 58 North Yellow River Street, Shenyang, 110034, P.R. CHINA [Tel: 0086 24 6800330]
- José Cola Zanuncio, Pró-Reitor de Planejamento e Orçamento, Universidade Federal de Viçosa, 36571-000 Viçosa - Minas Gerais, BRAZIL [Tel: OXX 31 3899 2140/1476; E-mail: zanuncio@ufv.br]
- Mr. Theo Zeegers, Eikenlaan 24, NL 3768 EV Soest, THE NETHERLANDS [Tel: + 35 5885858; E-mail: th.zeegers@xs4all.nl]
- Dr. Chuntian Zhang, Liaoning Key Laboratory of Evolution and Biodiversity, Shenyang Normal University, 253 North Huanghe Street, Shenyang 110034, P.R. CHINA [Tel: 86 (24) 86578950; Fax: 86 (24) 86579052; E-mail: zhangct2003@yahoo.com.cn]
- Dr. Joachim Ziegler, Humboldt-Universität zu Berlin, Museum für Naturkunde, Institut für Systematische Zoologie, Invalidenstrasse 43, 10115 Berlin, GERMANY [Tel: 049 / (0)30 / 2093-8509; E-mail: joachim.ziegler@mfn-berlin.de]
- Mr. Manuel A. Zumbado, Unidad de Atrópodos, Instituto Nacional de Biodiversidad (INBio), 22-3100, Santo Domingo, Heredia, COSTA RICA. [Tel: 506-507-8222; Fax: 506-507-8274; E-mail: mzumbado@inbio.ac.cr]