

The Tachinid Times

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The online version of **The Tachinid Times** moved to a new location last summer. It has relocated to the new website of the North American Dipterists Society (NADS) at: <http://www.nadsdiptera.org/Tach/TTimes/TThome.htm>. This new location permits ready access to other Tachinidae online resources as well as other resources on the Diptera, such as *Fly Times* and *Directory of North American Dipterists*. For the first time, all previous issues of **The Tachinid Times** are available online. Issues 1–4 are available as image-based PDFs (scanned from hardcopies) and issues 5 to the present are available as searchable-text PDFs (prepared from WordPerfect® documents). You can visit the NADS website at: <http://www.nadsdiptera.org>.

If you wish to contribute to **The Tachinid Times** next year, then please send me your article, note or announcement before the end of January 2005. 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 from 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 files apart from the text.

The Tachinid Times is purposely not peer-reviewed to retain its status as a newsletter and avoid attracting articles that are more properly published in recognized journals. However, I personally review and edit all submissions, and the newsletter as a whole is reviewed internally within my organization before it is posted on the Internet and distributed in hardcopy. Articles in **The Tachinid Times** are cited in *Zoological Record*.

A research programme on the possible side effects of *Bacillus thuringiensis* Berliner on *Exorista larvarum* (L.), a tachinid parasitoid of forest defoliating Lepidoptera (by M.L. Dindo)

One of the advantages of the use of *Bacillus thuringiensis* (Bt)-based preparations for the control of harmful insects is that their action is almost exclusively restricted to the target species. Numerous studies have shown that preparations containing *B. thuringiensis* *kurstaki* (Btk) or other Bt-strains (subsp. *galleriae*, subsp. *thuringiensis*), which are active towards Lepidoptera larvae, have no adverse effects on hymenopterous and dipterous parasitoids (Shiryaeva and Savin 1988). In some cases, the few adverse effects on the parasitoids so far reported are not for certain ascribable to the direct action of Bt on the non-target organisms, but rather to indirect effects, such as a dramatic reduction in the host population in the treatment blocks (Reardon *et al.* 1979).



Figure 1. Adult female of *Exorista larvarum* (L.).

A research programme aimed at assessing the effects of a Bt-based commercial product (Foray48B) and a Bt strain (*Bt galleriae* Cry9A) on the tachinid *Exorista larvarum* (L.) was carried out in Italy. This programme

was developed as part of a project aimed at evaluating the use of *Bt* and epiphytic bacteria modified with *Bt* genes for the control of the pine processionary caterpillar *Thaumetopoea pityocampa* (Denis & Sciffermüller). The project was co-ordinated by A. Battisti (University of Padova) and included A. Squartini (University of Padova), P. Baronio and M.L. Dindo (University of Bologna) as partners.

E. larvarum (Fig. 1), a polyphagous parasitoid of lepidopterous defoliators including the processionary moth (Montoya, 1970), was selected as a model non-target species because it and several other dipterous parasitoids play an important role in the control of the processionary moth in a forest environment. A study was made on the effects of Foray48B and *Bt galleriae* Cry9A on the post-embryonic development of this parasitoid cultured in the factitious host *Galleria mellonella*. The host larvae were fed on artificial diet which had been previously dipped in Foray or *Bt galleriae* suspensions. Different dilutions were tested. After 24 hours the larvae were exposed to *E. larvarum* females for the time required (10 to 30 minutes) for the oviposition of 3 to 4 eggs per host. The effects on parasitoid development were evaluated according to the following parameters: percentages of hatched eggs and of the puparia obtained, puparial weight and adult yields. No significant difference was found for any of the parameters examined among the treated individuals and the controls. It can be concluded that, even at the highest concentrations, neither Foray 48B nor *Bt galleriae* Cry9A had detrimental effects on the post-embryonic development of *E. larvarum* under laboratory conditions.

An evaluation of the effects of Foray 48B and *Bt galleriae* Cry9A on *E. larvarum* adults was then made. The flies were fed on Foray or *Bt galleriae* suspensions which had been pipetted on lump sugar. The treatments did not adversely affect adult longevity or female fecundity.

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Identification handbook to the Fennoscandian Tachinidae (by C. Bergström)

I started a project in January 2004 to prepare an identification handbook with keys in Swedish to the Fennoscandian Tachinidae, comprising approximately 400 species. This project is part of the Swedish Taxonomy

Initiative and will be published in the Swedish Flora and Fauna Encyclopedia. I hope, perhaps a little optimistically, to finish this project during 2006.

Included below is a summary of the Swedish Taxonomy Initiative and Swedish Flora and Fauna Encyclopedia. More complete information can be found on the Internet at: http://www.artdata.slu.se/Svenska_artprojektet_Eng.htm

The Swedish Taxonomy Initiative

ArtDatabanken, the Swedish Species Information Centre, was appointed to direct and co-ordinate the Swedish Taxonomy Initiative, one of the most fundamental components of which is a thorough taxonomic investigation of hitherto poorly known organism groups. The aim is to develop keys for the identification of all Swedish multicellular organisms, approximately 50,000 species. This project, designed to run for 20 years, will result in a considerable improvement of the infrastructure of Swedish taxonomy. The series of identification handbooks to the Swedish plant and animal species will be called the Swedish Flora and Fauna Encyclopedia. The project is part of a large scale venture concerning biodiversity and sustainable development with the overall heading “Inventories and studies of current Swedish species, their requirements, natural behaviour and roles in the ecosystem. Implications for conservation and environmental control”.



The Swedish Flora and Fauna Encyclopedia

The Encyclopedia will constitute a series of identification handbooks in Swedish, which will be published in both paper and electronic editions. The 30,000 species which can be identified without highly advanced equipment will be described in detail, including information on distribution and biology. For most of them, distribution maps as well as illustrations (watercolours or photos plus detail drawings) will also be provided. The groups containing the remaining 20,000 species will be presented down to a suitable taxonomic level (e.g. families), with the species presented as checklists. In order to make the Encyclopedia attractive and useful to non-professionals, a great number of species will be illustrated with beautiful watercolour illustrations.

Visit to Itaquaquacetuba (Brazil) and the old homestead of C.H.T. Townsend (by D.E. Hansen and R. Toma)

Dr. Charles Henry Tyler Townsend (CHTT; Fig. 1), 1863–1944, was the 20th Century’s most prolific describer of tachinid diversity. He was responsible for publishing more than 3000 names of muscoid Diptera, about half of which were generic and the other half specific (Arnaud 1958). Most of CHTT’s names apply to New World taxa and, of the generic names, about 75% are in the Tachinidae. Where did CHTT get the material to describe so many species? It is evident from a perusal of the regional catalogues of the world that his chosen scope for study of the Tachinidae was global. However, there is a very strong locality bias in the latter part of his career for flies of the Neotropical region. Some select examples of CHTT’s new genera from the 1920s and 1930s, all chosen among the A’s (of which there are 134!; Guimarães 1971), show off one of his dearest collecting localities in the latter half of his working life – Itaquaquacetuba (Fig. 2).

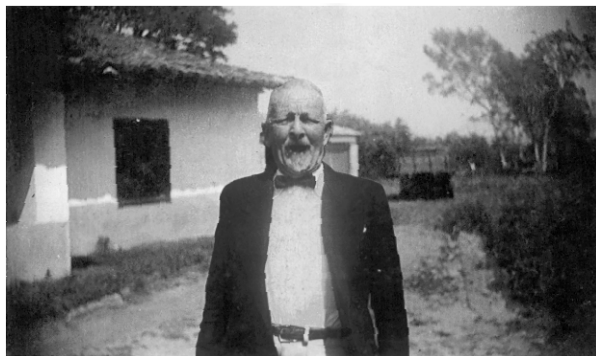


Figure 1. CHTT with corner of Casa Grande Velha in background. Photo courtesy of Suzana Rockhold.

Itaquaquacetuba, São Paulo, Brazil, was not only a collecting locality for CHTT, it was his home town. According to Gloria Townsend (pers. comm.), one of CHTT’s granddaughters (who still lives in Itaquaquacetuba), CHTT moved with his family to Itaquaquacetuba in 1918, into his newly purchased, Fazenda Casa Grande Velha – ‘Old Great House Farm’ (Fig. 3). He is reported to have shouted, “ISTO É UM PARAÍSO! [This is a paradise!]”, probably for the natural beauty and diversity of the area during that time but also because his house was glorious! Built around 1600, Casa Grande Velha belonged to the Jesuit Order and served them in their effort to convert the Indians to christianity in the formative years of São Paulo. There remained the relic of a stanchion for punishment at the entrance to the great-house grounds well into the Townsend stewardship of the property.

<i>Abolodoria abdominalis</i> , sp. nov. 1 female, Itaquaquacetuba, June 9, on flowers of <i>Baccharis</i> .
<i>Actinactia latea</i> spn Cco 4; caz 3.5. 1 ♀, Itaquaquacetuba, S. P., 6 de Dez., em flores de <i>Sapium</i> .
<i>Actinoprosopa jaciãis</i> spn Cco 7-8 caz 6-7, 6 ♂ e 4 ♀, Itaquaquacetuba, S. P., 23 de Ag. até 2 de Oct., em folhagem; in copula 2 de Set.
<i>Alophorellopsis capitata</i> spn Cco 4,75-6; caz 4,5-5. 2 ♀, Itaquaquacetuba, S. P., 29 de Maio até 3 de Junho, em flores de <i>Baccharis genistelloides</i> .
<i>Anticrotichomima orbitalis</i> spn Cco 7,5-8; caz 6,5-7. 1 ♂ e 2 ♀, Itaquaquacetuba, S. P., 18 de Jan., 15 de Junho e 18 de Set., em flores de <i>Baccharis genistelloides</i> e em folhagem.
<i>Anaphorinia aurata</i> spn Cco 6,75-8; caz 6-7. 2 ♂ e 1 ♀, Itaquaquacetuba, S. P., 7 de Abril. 5 de Junho e 30 de Set. em folhagem.
<i>Anhangabahuia analis</i> , sp. nov. 1 male, Itaquaquacetuba, Brazil (Townsend).
<i>Antistaseopsis brasiliensis</i> , sp. nov. 2 females, Itaquaquacetuba, Nov. 29 to Feb. 8, on foliage.

Figure 2. Some of CHTT’s species described in genera beginning with the letter ‘A’ from material collected in Itaquaquacetuba.

Based out of one of the front rooms of Casa Grande Velha, CHTT produced his self-published and monumental *Manual of Myiology* between 1934 and 1942. This work comprises 3760 pages and 94 plates in 12 Parts and represents the cumulative experiences and notes from his lifetime of study of calyptrate Diptera. This work was the culmination of more than 500 entomological papers between 1884 and the year of his death, 1944 (Arnaud 1958). It is an apparently simple arrangement of tribal and family units which, from the typological perspective common during his time, could probably have been considered functional. Between the dozens of type specimens he took from the Fazenda environs and as the site of his writing of *Manual of Myiology*, Fazenda Casa Grande Velha and the locality of Itaquaquacetuba are among the very few non-University or Research Institution historic sites and localities for tachinidology.

The following is a narrative-style account of our trip to Itaquaquacetuba to see Townsend’s Olaria and Fazenda Casa Grande Velha on the morning and early afternoon of January 17, 2004. The visit corresponded with the last full day of Dan Hansen’s two-week visit to the Diptera collections at Universidade de São Paulo and the Museu Nacional in Rio de Janeiro funded jointly by the Williston Fund at USNM and the Dayton-Wilkie Natural History Fund.



Figure 3. From left to right: Nelly Sodéro Townsend holding Tancredo Sodéro Townsend (Edward's wife and boy), CHTT, Margareth Townsend, Ondina Townsend holding Mabel Townsend (Nathaniel's wife and daughter) in front of Casa Grande Velha. The window to the left of Nelly is CHTT's office/lab where he produced his *Manual of Myiology*. Photo courtesy of Suzana Rockhold.

Loaded into the Volkswagen station wagon of Dr. Chica do Val, the three of us set off at about 8:50 a.m., unsure of what we would find, but with directions to the town of Itaquaquecetuba and the name 'Fazenda Casa Grande Velha' provided to us by Dr. Norm Woodley from some old Townsend correspondence. To our knowledge, the last visit by a dipterist to CHTT's former home was by Dr. Guimarães in the 1970s when he visited with Edward Townsend (Charles' 2nd son with Margareth) and secured CHTT's card-files, other draft-bits of his manuscripts and some copies of his *Manual of Myiology* Parts (much of which were sent to USNM according to Dr. Guimarães).



Figure 4. Map of part of Itaquaquecetuba. Arrows point to the Olaria [= tile factory] and Casa Grande Velha. Top of map points north.

We were concerned that the close proximity of Casa Grande Velha to Guarulhos International Airport, and the constant development of the megalopolis of São Paulo, might have obliterated the Townsend home. However, according to the six-centimeter thick São Paulo street atlas which we pulled

from the glove compartment as we approached the Itaquaquecetuba exit, our chances seemed good because we found Fazenda Casa Grande Velha right on the map (Fig. 4). We were delighted and surprised to have such a clear lead in our effort to find the home. Even though the map was several years old and such convenience seemed too good to be true, we did promptly find our first hint of success – the Escola Dr. Charles Henry Tyler Townsend, an elementary school (Fig.5). Presumably among the optional curricula, at least, is dipterology?!



Figure 5. Sign for the Dr. Charles Henry Tyler Townsend Municipal elementary school on Estrada do Mandi.

After finding the school we were directed by a passerby to the remains of the Olaria Americana (American(s) tile factory; Fig. 6) which was down the hill about 50 m from the school.



Figure 6. Map of key remains of CHTT's Itaquaquecetuba domain.

There, just opposite the old Olaria, we met the caretakers for the Townsend Family grounds, Sueli and Gustavo. They had been associated with the family from the mid 1970s until about 2002 when the last part of the property, including the last ¼ share in the house, was sold (¾ of the house and grounds were sold in 1995 – Suzana

Rockhold and Gloria Townsend, pers. comm.). The Olaria building nearest to Sueli and Gustavo's house is a very simple and well-built structure that has been converted into indoor/outdoor storage space and garage. It is roofed with ceramic tiles, each of which bears the name TOWNSEND & VIANNA, ITAQUAQUECETUBA (Figs. 7–8).



Figure 7. Foremost of the Olaria buildings.



Figure 8. Roofing tile from Townsend & Vianna Co.

Apparently CHTT started his business enterprise in 1926 and at some point thereafter passed it on to his second son, Nathaniel (Fig. 9), who directed the Olaria with a partner (Gloria Townsend, pers. comm.). Between 1919 (the year after he purchased the Fazenda) and 1929, CHTT held several distinguished posts in Brazil and Peru. His list of positions was long and varied with little job continuity up to 1929, but in that year he reached what is now the traditional retirement age of 65 and was probably not receiving a pension. He later (Townsend 1943) identified his principal position from 1929 to 1943 as “Head [of] Charles Townsend & Filhos of S. Paulo”, so he presumably supported his family from the Olaria during the 1930s and early 1940s when he was working on his *Manual*. According to Martin Townsend (pers. comm.), one of CHTT's grandsons, Charles Townsend & Filhos, “...was multifaceted in its endeavors. The company was in business to produce bricks, French roofing tiles, harvesting of honey, raising of pigeons and the harvesting of moss (musgo)...

[and] ... at least for a period of time, they also tried their hand at wine making.”



Figure 9. From left; Nathaniel “Uncle Bat” Townsend, CHTT, Edward and Nelly Townsend, ???. Photo courtesy of Suzana Rockhold.

One part of the enterprise which Martin did not mention was the publishing of dipterological literature. It is unclear if this aspect of Charles Townsend & Filhos generated any income but it seems unlikely, since copies of the *Manual* were not *printed* by the company but by Escolas Profissionais Salesianas in São Paulo. Regardless, CHTT's foray into the tile, bee, pigeon and moss industry may have been a business decision that provided him the flexibility to tackle such a synthetic project as *Manual of Myiology*!



Figure 10. Old entrance and disused driveway to Fazenda Casa Grande Velha on Estrada do Mandi and Gustavo, ‘caretaker’ of Townsend property of 25 years.

So, after passing some time with Sueli and her family by the Olaria, we jumped in the car and headed for Casa Grande Velha. It is very close to the Olaria but about three years ago a two-lane highway was constructed between it and the Olaria (Gustavo, pers. comm.). This is a heavy-use road which is invisible from Sueli and Gustavo's house because of heavy vegetation and the two long and narrow Olaria buildings (all tiled with Townsend & Vianna tiles). The present entrance to the house is still about 50m off the

new highway with about 100m more of the original entrance on the other side (see Fig. 6). The old entrance arch to the property (Fig. 10) is now conceptually remote from the rest of the grounds. The piece of land which has the bulk of the driveway is still wooded with 25 to 30 year-old pines and eucalyptus (Gustavo, pers. comm.), and remains unsettled.



Figure 11. Main part of Casa Grande Velha – door behind porch opened to main living room. Roof damage on left side of image was from a tree that recently fell on CHTT's office (Suzana Rockhold, pers. comm.). Roof damage at far right was caused by fire.

Since its recent sale to Antero Saraiva of Itaquareia (Suzana Rockhold, pers. comm.), Casa Grande Velha has become part of a landscape and plant sales business. Though the grounds are still quite intact with what is certainly some original vegetation from CHTT's time and only mildly invaded by other species, there is now also a mini-greenhouse, numerous potted plants sitting around, decorative monolithic stones, piles of landscape rock, etc. In the middle of all this is Casa Grande Velha which was, until a year ago (or so), a beautiful sprawling ranch house slightly damaged by disuse and a fallen tree. Unfortunately, since then this glorious place seems to have become the victim of recent land-political circumstances and was also partly burned (Figs. 11–14).



Figure 12. Carriage ports with walk through to backyard and rear of house.

In a circuitous way, the recent fire seems to have been in the interest of a mining company that has been rapidly buying property in the area. The extensive sand deposits in the Rio Tieté valley bed and underlying the Fazenda are easy to mine and thus valuable (Mabel Townsend and Gustavo, pers. comm.). The only significant obstacle to using this resource is the possible granting of historic status to Casa Grande Velha. Historic status seems reasonable considering the antiquity of the house (São Paulo was established in 1554 and Casa Grande Velha only about 50 years later), and that the community has high regard for its former stewards, the Townsends, and especially their eclectic patriarch. Within recent times, Edward Townsend donated the land upon which the abovementioned school is located (Suzana Rockhold, pers. comm.). The fire was undoubtedly a setback for this effort to preserve the house, which has been led by the local Itaquaquecetuba museum director. Neither Mabel nor Gustavo think there are funds or political will to rebuild Casa Grande Velha and they expect it to be demolished in the near future.



Figure 13. Ronaldo Toma on backyard patio with gravity feed 'water tower' in background.



Figure 14. Ronaldo in the living room.

While we were walking around the grounds and inside what remains of the house, taking images and looking for

flies (I saw lots of sarcs but not a single tachinid!), Chica learned from the family of Sueli that they had found some books from CHTT's time. So, we hiked back to the house of Sueli and Gusavo and there, in a big cardboard box, were more than two dozen volumes of *Manual of Myiology* (Fig. 15)!



Figure 15. Nearly two full sets of *Manual of Myiology* from Gustavo and Sueli's house.

We quickly sorted through the 'Parts' and discovered that there was one complete set, another set lacking Part I and Part VII, one extra copy of Part VIII and five extra copies of Part IX. After inspecting and carefully stacking the books by the house for later pick-up, we set off up the hill to the house of Mabel Townsend. Mabel is the daughter of Nathaniel Townsend – granddaughter of CHTT (Fig. 16, see also Fig. 3).



Figure 16. Mabel Townsend being interviewed by Ronaldo.

Mabel was born in 1942, two years before CHTT's death, so her recollections were from stories told about her grandfather. Perhaps her most revealing anecdote about CHTT concerned his intolerance of noise. Apparently he often said that "women were noisy in their chatter and in their cooking preparations". Because of this, his office was at one end of the building and the kitchen at the other, and often the people involved in food preparation did this work

outside so as not to disturb him. Chica got the distinct sense that CHTT was almost neurotic on this issue. On this same point, he was apparently pleased with Casa Grande Velha because of its remoteness from the main road (>150m). Apparently too, he was quite vital until the end, when he died peacefully in his sleep one night with his head in his hand (Barbiellini 1944). He would regularly dive into the Rio Tieté to bathe up to the year of his death, at age 80 (Mabel Townsend, pers. comm.).

Further insights into CHTT's personal life were told by Gloria Townsend (daughter of Nathaniel) in a telephone conversation. She had heard that her grandfather owned a banjo and liked to play it and sing along. He liked whole foods and he couldn't do without beans with manioc flour, with raw garlic! Although she had not lived with CHTT, Gloria heard from people in his household that her grandfather was a very solemn person, strict but fair.

With a fond farewell, we said goodbye to Mabel and headed back down to Sueli's house where the books were (Fig. 15). Sueli and Gustavo offered the books to us for free, but we eventually gave them a modest sum of money for the whole lot. Another fond farewell and off we went to find the 'Townsend exhibit' in the local museum. By now it was about 2:30 p.m. and we were tired out. The museum was closed for the weekend and its director, Angelo, was unreachable. So, nearly entirely satisfied, we left Itaquaquecetuba – a nice town still, with a fantastic attraction for dipterists – and headed back to the megapolis of São Paulo.



Figure 17. Ronaldo Toma and Dan Hansen near CHTT's favorite place to play the banjo.

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A reappraisal of tachinid diversity in Carnarvon N.P., Australia, and estimation of the size of the Australian Tachinidae fauna (by J.E. O’Hara, J.H. Skevington and D.E. Hansen)

Last year, one of us (O’Hara 2003) discussed the tachinid fauna of Carnarvon National Park in Queensland, Australia, based on three days of hilltopping in the Mt. Moffatt section of the Park during 11–13 October 2002. Three different hilltops were sampled by JEOH, Mt. Sugarloaf (1150m), Fly Hill (900m) and Mt. Moffatt (1100m). The tops of these conical mountains differ physically in size and vegetative cover, but all three mountains are located within the Eucalypt woodland zone of the Park.

The results of JEOH’s hilltop collecting in Carnarvon N.P. were presented in a table (O’Hara 2003, Table 1). A total of 110 species were recognized from 422 specimens collected. JEOH inferred that the actual tachinid fauna of Carnarvon N.P. must be at least 300 species and that of Australia at least 2000 species. Both figures were rough estimates based on limited data. In this paper we re-examine tachinid diversity in Carnarvon N.P. and Australia based on additional hilltopping data and somewhat more rigorous methods of analysis.

Estimation of tachinid hilltopping fauna in Carnarvon N.P.

The original tachinid data presented by O’Hara (2003) was based on three collecting events: three hilltops visited on three consecutive days, 11–13 October 2002. To these data we have added six more collecting events: specimens collected by JHS on the same hilltops and dates as JEOH, and specimens collected by DEH on Mt. Moffatt on 10 & 12 October 2002 and Fly Hill on 13 October 2002. The data from these nine collecting events are presented in Table 1 along with the original data of O’Hara (2003). All specimens were sorted by JEOH. The low number of specimens collected on Mt. Sugarloaf by JEOH and JHS was due in large measure to the overcast conditions that prevailed on that day (tachinids being more prevalent on hilltops on warm and sunny days).

We recorded 1116 specimens representing 167 species of Tachinidae from the three hilltops (Table 1). The number of species increased greatly over the 110 recorded by

O’Hara (2003). Though many of the species recorded by O’Hara from only one hilltop or one specimen were found on more hilltops or in greater numbers on a single hilltop by the three collectors, the new data also added many rare species (those represented by one or two specimens; Table 2).

Table 1. Results of tachinid collecting by the three authors on three hilltops in Carnarvon N.P., Queensland, Australia, 10–13 October 2002. For comparison, the results of O’Hara (2003) are shown in parentheses.

	Mt. Sugarloaf	Fly Hill	Mt. Moffatt
Species unique to each hilltop	9 (9)	49 (43)	48 (26)
Species collected on all 3 hilltops	18 (8)		
Species shared with Mt. Sugarloaf	--	5 (5)	10 (7)
Species shared with Fly Hill	--	--	28 (12)
Number of species collected on each hilltop	43 (29)	100 (68)	104 (53)
Number of specimens collected on each hilltop	133 (84)	581 (219)	402 (119)
Total number of species collected	167 (110)		
Total number of specimens collected	1116 (422)		

There are many statistical methods for estimating species richness from samples. They are all based on the premise that the higher the number of rare species found in a series of samples, the greater the number of additional rare species that have gone uncollected. Usually the number of singletons (species with only one individual), doubletons (species with only two individuals) and uniques (species that occur in only one sample) figure prominently in the equations of species richness. We analyzed our data using five statistical estimators of true species richness: ACE (Abundance-based Coverage Estimator of species richness), Chao2, first-order Jackknife, second-order Jackknife, and bootstrap. The relative merits of these estimators can be found elsewhere (e.g. Colwell and Coddington 1994, Hellmann and Fowler 1999, Anderson and Ashe 2000, Colwell 2000). We used the

program EstimateS 6.0b1 (Colwell 2000) to calculate our results, which are shown in Table 2 and plotted in Fig. 1. [Click here](#) to view data matrix.

Table 2. Diversity measures and estimates of species richness for hilltopping Tachinidae in Carnarvon N.P. See text for explanation of terms.

Number of species observed	167
Singletons	58
Doubletons	21
Uniques	73
ACE	228.20
Chao2	238.05
Jack1	231.88
Jack2	264.16
Bootstrap	196.78

Species richness on the three hilltops in Carnarvon N.P. at the time of our sampling is estimated at 197 to 264 species according to the five estimators used (Table 2, Fig. 1). We will use **230 species** as our estimate of species richness on the hilltops sampled, which we rounded to the nearest 10 from the mean (232) of the values obtained by the five estimators. This number is lower than Chao2 (238 species), that is generally thought to be a good estimator of species diversity in places with high numbers of rare species (Colwell and Coddington 1994).

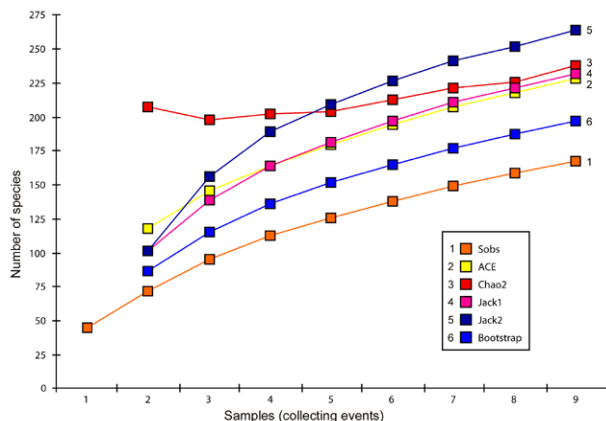


Figure 1. Cumulative number of Tachinidae species observed (Sobs) and five estimators of species richness for three hilltops in Carnarvon N.P. Data from EstimateS (Colwell 2000) using 50 replications.

Estimation of Carnarvon N.P. Tachinidae

One of us (JHS) collected extensively for Pipunculidae in the Brisbane area of southeast Queensland from April 1997 to September 1999. Pipunculids were collected from a variety of habitats, including hilltops. Of the 34 species recorded, 19 (56%) hilltopped regularly and 15 (44%) were rarely or never encountered on a hilltop (Skevington 2000).

Several days of collecting on hilltops at the right time of year could yield a high percentage of the total yearly fauna of hilltopping pipunculid species (Skevington 2000).

O'Hara (2003) conservatively estimated the number of Tachinidae in Carnarvon N.P. at 300 species, based on double his estimate of the number of species frequenting hilltops. We now have better evidence for suggesting that the total Carnarvon N.P. fauna is approximately double the hilltopping fauna by extrapolation from JHS's pipunculid data. Australian tachinids and pipunculids are similar in several ways – their parasitic way of life, dependence on honeydew (particularly Pipunculidae) as an adult food source, and propensity for hilltopping – so we expect that the data for Pipunculidae in the SE Queensland area applies reasonably well to Tachinidae in Carnarvon N.P. If this is the case, more than half of the Tachinidae in our sampled area of Carnarvon N.P. hilltop, and a high percentage of the total number of species in that area were present as adults during our sampling period. Since we sampled only in the Mt. Moffatt section of Carnarvon N.P., we conclude that the doubling of our estimated 230 hilltopping species to **460 species** of Tachinidae for Carnarvon N.P. is reasonable and perhaps conservative.

Estimation of Australian Tachinidae

O'Hara (2003) concluded that the tachinid fauna of Australia must be greater than 2000 species, even though the number of described species is closer to 500. He based his estimate on the large number of species collected by himself during three days of hilltopping in Carnarvon N.P. and Crosskey's (1973) prediction of 1500–2000 species.

Table 3. Number of species of mammals and reptiles recorded from Carnarvon N.P. and Australia with an extrapolation of these data to the estimated number of species of Tachinidae in Australia. The Increase Factor equals the Australian fauna divided by the Carnarvon fauna. The extrapolated number of species of Australian Tachinidae equals the estimated number of Carnarvon Tachinidae (460) times the Increase Factor.

	Carnarvon N.P.	Australia	Increase Factor	Extrapolation to Australian Tachinidae
Mammals	52	378 ^a	7.3	3358
Reptiles	87	836 ^b	9.6	4416

^a Data from ABRS (2004).

^b Data from Wilson and Swan (2003).

We estimated the Australian tachinid fauna by comparing the number of species of mammals and reptiles in Carnarvon N.P. with the number of species of these groups in Australia (Table 3). We discarded available bird data from our analysis because birds are better dispersers

than mammals and reptiles and, we suspect, tachinids. If tachinids follow similar patterns of diversity and distribution in Australia as mammals and reptiles, then we estimate the total Tachinidae fauna of Australia to be roughly in the order of **3500-4000 species**.

The Neotropical Region has a described fauna of nearly 3000 tachinid species, far surpassing the described fauna of any other zoogeographic region. The actual diversity of the Neotropical Region is difficult to estimate but likely contains thousands of undescribed species and is universally regarded as the most diverse region for Tachinidae. It now appears possible that the region with the fewest described Tachinidae in the world, the Australian (or Australasian) region, may have the second richest Tachinidae fauna.

We thank Craig Eddie (Natural Resource Ranger, QPWS, Roma, QLD, Australia) for providing us with a copy of the "Carnarvon National Park Vertebrate Fauna Checklist" and for his assistance during our visit to the Park, and Patrice Bouchard (Agriculture and Agri-Food Canada, Ottawa) for advice on species richness estimators and for reviewing our manuscript. Australian Tachinidae collected by JEOH and JHS are in the Canadian National Collection of Insects (Ottawa) and those collected by DEH are retained in his personal collection.

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A species of *Pseudochaeta* Coquillett from Mexico lacking an anterior ocellus (by D.E. Hansen)

I received a parcel in early December 2003 with a series of 11 tachinids of both sexes from Federico Castrejon Ayala of ECOSUR (El Colegio de la Frontera Sur) in Chiapas, Mexico. The specimens were collected 5km south of the city of Tapachula in Chiapas.

Federico is working on a doctorate degree in Chiapas. His dissertation is about tritrophic interactions between a pyralid bud borer (*Zamagiria dixolophella*), its host plant chicozapote (*Manilkara sapota*), and a tachinid parasitoid which he was unable to identify.

After narrowing the possibilities to *Pseudochaeta* or an odd, hairy-eyed *Drino*, and after noting the peculiar absence of the anterior ocellus (Figs. 1–3), I sent two of the specimens to Jim O'Hara in Ottawa for identification. I also had e-mail correspondence with Monty Wood (in Costa Rica at the time) on the matter, and sent him a couple of images too.

Jim O'Hara confirmed the generic identity of the series as *Pseudochaeta* and wrote that, "They agree in the essential characteristics, and there is nothing else that is quite the same." Monty Wood encouraged me to look really closely at the ocellar triangle for a vestige of an anterior ocellus because, in his recollection, he had not seen an exoristine tachinid without an anterior ocellus. I was unable to find comments in the literature regarding this character state for any tachinid taxon other than certain Ormiini.

Among the Tachininae, some species of Ormiini have strong reduction or absence of ocelli. Sabrosky (1953: 168) wrote that, "...if ocelli are present (*Ormia*), the ocellar area is distinctly raised above the eye level as an ocellar tubercle. If ocelli are absent (*Euphasiopteryx*), the front is depressed at the vertex, there is no raised tubercle...". Sabrosky and Arnaud (1965) maintained *Euphasiopteryx* and *Ormia* as separate genera mainly because of the absence of ocelli in the former. However, more recently Crosskey (1976: 62) wrote about two Oriental genera of Ormiini, *Homotrixia* Villeneuve and *Phasioormia* Townsend, noting that "[*Homotrixia*] differs from *Phasioormia* by the possession of ocelli, but it is questionable whether in the Ormiini (in which reduction or total obliteration of ocelli occurs widely) this is to be regarded as a valid generic character." Wood (1987), doubting the generic significance of missing ocelli in the

Ormiini, synonymized *Euphasiopteryx* with *Ormia*. This classification has been followed by O'Hara and Wood (2004) in their recent catalogue of Tachinidae of America north of Mexico. Hence, recent authors do not automatically regard missing ocelli as grounds for generic status.

With the present evidence of this probably new species (Monty Wood, pers. comm.), the *Pseudochaeta* lineage seems to provide another example of a tachinid genus with a multi-state number of ocelli (Figs. 1–3). The male terminalia of this Mexican species are shown in Fig. 4.

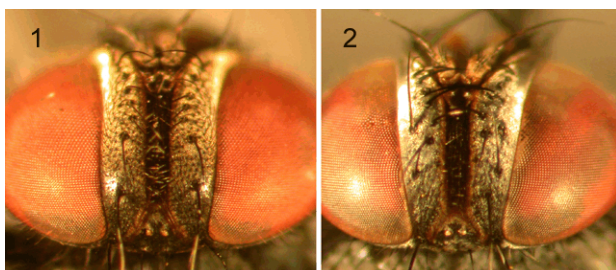


Figure 1. Male; frons, dorsal view.

Figure 2. Female; frons, dorsal view.

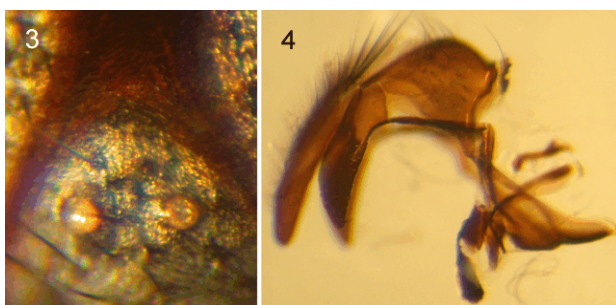


Figure 3. Male; close-up of ocelli showing total lack of anterior ocellus.

Figure 4. Male terminalia, lateral view.

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Report on a January 2004 visit to the tachinid collections of MZUSP (São Paulo) and the National Museum (Rio de Janeiro), Brazil (by D.E. Hansen) São Paulo

The Museu de Zoologia (MZUSP – also called Museu de História Natural), where the bulk of the entomological holdings of the University of São Paulo (USP) are located, is remote from the Cidade Universitária (main campus) and abuts the Museu Paulista (also called Museu do Ipiranga). Both museums are associated with the Parque da Independência and can be reached very conveniently from the Metrô (subway), Linha Azul (Blue Line), to Estação Vila Mariana (Vila Mariana Station) and boarding a bus with the stated destination of Jardim Maria Estrella II. It takes about 15 minutes by bus (should be 10–15 min. by taxi) to reach the museum which is flanked on the west by Avenida Nazaré.

Most (if not all) of the entomological holdings are on the top (3rd) floor of the building. In the east wing, the bulk of the collections are Lepidoptera, Diptera and Hemiptera but there are only two manual compactor systems – one for Diptera and one for Lepidoptera. According to Dra. Francisca Carolina do Val (USP professor, retired), the Diptera compactor was the first of its kind installed in the museum. The tracks are mounted over wood parquet flooring and though the system is perfectly serviceable, it 'binds' at one point.

There are 14 open-faced 'walls' of Diptera drawers in seven moveable units. Each 'wall' is 29 drawers tall and 8 stacks deep making for a total storage capacity for the system of $14 \times 29 \times 8 = 3248$ drawers. There is no system for alcohol preserved specimens according to Dra. do Val (i.e. no specimens) and slide mounted specimens, or parts, are curated among the pinned material. As far as I could tell, no types of any families are segregated from the bulk holdings. All Tachinidae types are kept with their non-type counterparts, and the entire collection is arranged taxonomically. Families are arranged in the traditional Tipulidae-through-calyptrates fashion with a great range of curatorial resolution – from none to nearly total.

In the last three 'walls' there is a great deal of room for expansion – about 600 drawer slots. Besides this, in many groups material is quite spread apart. Many drawers hold only a few small unit trays or are entirely empty. At the end of the family-level holdings there are about 150 drawers of unsorted specimens and even about 60 drawers of un-mounted and dried specimens! Many of these specimens are arranged in piles, separated in unit trays,

with a single data label for each pile and others are in paper triangles.

For Tachinidae, there is approximately one entire wall (29x8 = 232) of loosely-packed drawers arranged alphabetically by subfamily, tribe and genus. Material undetermined to genus occupies about ¼ of the total number of drawers. Dr. Ronaldo Toma (who will soon be leaving the Museu and moving to Venezuela) has prepared a listing for all type specimens of Tachinidae (primary types, paratypes, etc.), which is nearly publication-ready though he has made no current effort to have it published. The types of many Brazilian species described by Dr. José H. Guimarães are deposited in the collection.

Contact information: Dra. Sonia Casari (Entomology director and coleopterist; e-mail: casari@usp.br) or Dra. Francisca Carolina do Val (professor in Entomology; Diptera, retired; e-mail: racdval@usp.br). Address: Museu de Zoologia da Universidade de São Paulo, Avenida Nazaré, 481, Ipiranga, Cep 04263-000, São Paulo, SP, Brazil.

Rio de Janeiro

The Museu Nacional is located in the former residence of Dom Pedro II, the first 'king' of Brazil. This museum is also remote from a University campus and is centered in a park complex called Quinta da Boa Vista. The museum is easily reached from the Metrô by disembarking at Estação São Cristóvão on Linha 2 and walking 15 minutes into the park toward the royal house.

I arrived via bus from São Paulo and was very happy to be met at the Rodoviária (bus station) by Dr. Carlos Lamas (Bombyliidae) though a taxi from the station would have been pretty quick and convenient too. The Diptera holdings and lab space are separate from collections of other taxa. While the bulk of entomological collections are housed in the 'palace' of Dom Pedro II, the Diptera unit enjoys a separate facility adjacent to it. The collection is very compactly arranged in one small room off a spacious and pleasant lab area in this 'newer' building 20 paces from the principal staff entrance. The custom drawers and unit trays are not spatially efficient but the careful organization of the tachinid holdings made surveying for *Zaira* and relatives quite easy. I was easily able to photo-document the entire collection of determined tachinids because of the way determination labels are pinned flat into the bottom of each unit tray.

In all, there are 21 drawers of determined tachinid specimens, arranged alphabetically by genus, and 22 drawers of unsorted specimens. All type material is housed in a separate cabinet. For tachinids, there are currently only five specimens among the type material: *Acaulona brasiliensis* T. 1937 (cotype); *Moreiria maura* T. 1932 (status?); *Archytas lanei* Guimarães 1961 (status?); *Gigantachinosoma giganteum* T. 1932 (status?); *Borgmeiermyia*

brasiliensis T. 1935 (holotype).

Contact information: Dra. Sonia Casari (Director of Diptera; e-mail: casari@usp.br), Dra. Denise Pamplona (professor in Entomology; Diptera, retired; e-mail: fracdval@usp.br) or Dr. Carlos Lamas (postdoc in Bombyliidae; e-mail: einicker@acd.ufrj.br). Address: Museu Nacional, Quinta da Boa Vista, São Cristóvão, Cep 20940-040, Rio de Janeiro, Brazil.

Announcement of new catalogue of Tachinidae of America north of Mexico (by J.E. O'Hara)

A new regional catalogue of Tachinidae was published in early January 2004:

O'Hara, J.E. and Wood, D.M. 2004. Catalogue of the Tachinidae (Diptera) of America north of Mexico. *Memoirs on Entomology, International* **18**. 410 pp.

The catalogue can be purchased as a hardbound book for US\$75.00 from Associated Publishers in Florida, USA (e-mail: assopubl@yahoo.com; telephone: 352-371-4071). [Click here](#) to view several pages of the catalogue.

Abstract

This taxonomic catalogue lists the Tachinidae (Diptera) of America north of Mexico, including Bermuda and Greenland but not Hawai'i and the West Indies. The classification is changed significantly from the last regional Tachinidae catalogue published in 1965 and recognizes 4 subfamilies, 46 tribes, 303 genera and 1345 species. New synonyms, new generic combinations and new records are cited in the introduction and noted in the catalogue. Full nomenclatural information is given for nominal genera and species, including primary type data for the latter. Updated distributions are provided for valid species. Taxonomic and nomenclatural literature pertaining to taxa at all hierarchical levels from subspecies to subfamily is referenced under valid names. An index to the names listed in the catalogue is included.

Checklist of the Tachinidae of America north of Mexico

The classification of the aforementioned catalogue has been converted into a checklist that can be accessed on the Internet as a PDF at:

<http://www.nadsdiptera.org/Tach/Cklist/cathom.htm>

The checklist can be cited as:

O'Hara, J.E. and Wood, D.M. 2004. Checklist of the Tachinidae (Diptera) of America north of Mexico. PDF document, 42 pp. Published on the North American Dipterists Society website at: <http://www.nadsdiptera.org/Tach/Cklist/Cktach.pdf>. Accessed [date].

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Each year I include here tachinid references I have found during the past year for the period 1980 to the

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