

A bibliographic review of the history of Dexiinae (Diptera, Tachinidae) taxonomy in the Neotropical Region with bibliographic notes on Dominik Bilimek and Fritz Plaumann

Marcelo Domingos de Santis¹

¹ Universidade de São Paulo (USP), Instituto de Biociências (IB-USP), Departamento de Zoologia. São Paulo, SP, Brasil.
ORCID: <https://orcid.org/0000-0003-4949-6433>. E-mail: mrclsantis@gmail.com

Abstract. The knowledge of Dexiinae and Tachinidae diversity in the Neotropical Region, in contrast to other regions, *e.g.*, the Palaearctic Region, is in a poor condition. The history of these taxa has gradually increased since the 18th Century from the works of European and North American authors such as Johan C. Fabricius, Christian R.W. Wiedemann, Jean B. Robineau-Desvoidy, Pierre J.-M. Macquart, Jacques M.F. Bigot, Francis Walker, Victor von Röeder, Ermanno Giglio-Tos, Friedrich M. Brauer and Julius E. Bergenstamm, Frederik M. van der Wulp, Charles H. Curran, John M. Aldrich, Charles H.T. Townsend, Henry J. Reinhard and William R. Thompson. It was only in the first half of the 20th Century that scientists born or established in South America began to enter tachinidology. Dipterists like Jean Brèthes and Everardo E. Blanchard from Argentina, Rául E. Cortés Peña from Chile and José H. Guimarães from Brazil, are the most memorable names for, not only to Neotropical Dexiinae, but, indeed for the whole family. Herein, a brief chronological review of tachinidology, with emphasis on Dexiinae and based on a literature review, is given. The history is divided into four periods: the pre-Linnaean period of the 16th and 17th Centuries, the 18th Century, the 19th Century and the first half of the 20th Century. After the first half of 20th Century, the emphasis is focused on European and North American dipterists with an overview of their contributions on Dexiinae taxonomy. Later, with presence of the South American dipterists, the emphasis is directed to them. Then a few notes are given on the Czech Dominik Bilimek, a poorly known collector from the 19th Century and Fritz Plaumann, a well-known German immigrant who collected in Brazil during the earlier 20th Century. Finally, some notes and perspectives about the 21st Century dexiinidology from the Neotropics is briefly discussed.

Keywords. Flies; Neotropics; History; South America.

“NEVER does nature seem more beautiful than in the tropics. Anyone with a passion for natural history must try and visit the tropics and experience Earth’s most diverse ecosystems firsthand . . . Alexander von Humboldt, Henry Walter Bates, Charles Darwin, Alfred Russel Wallace, Louis Agassiz, Thomas Belt, Charles Waterton, William Beebe, Frank M. Chapman, and other eminent naturalists have each been profoundly influenced in their beliefs about natural history by visits to the Neotropics”.

John C. Kricher, in *A Neotropical companion: an introduction to the animals, plants and ecosystems of the New World tropics*. Princeton University Press, Princeton, New Jersey. 436p. 1989.

INTRODUCTION

The Neotropical Region comprises South America, Central America, southern and central Mexico, Caribbean Islands, and the Andean subregion (Morrone, 2014). The taxonomic study of the Neotropical Diptera began, naturally, from contributions by Carolus Linnaeus, especially throughout the various editions of his *Systema Naturae*, and as soon as these works were published, the shortfalls and obstacles appeared for future Latin American scientists. As an example, beginning

with Linnaeus, in the course of the long history of collections and descriptions made mostly by Europeans in the Neotropics, the determination of the type localities of material described especially during the 18th and 19th Centuries were imprecise, often only “America Meridionalis”¹ (South America) being informed. These problems were discussed in, for instance, Nelson Papavero’s (1971, 1973) *Essays on the history of Neotropical dipterology*. In these books, the rich and poorly known history of Neotropical dipterology in the 18th and 19th Centuries were described, including

Arq. Zool., 53(4): 53-72, 2022
<http://doi.org/10.11606/2176-7793/2022.53.04>
<http://www.revistas.usp.br/azmz>

ISSN On-Line: 2176-7793
ISSN Printed: 0066-7870
ISNI: 0000-0004-0384-1825

Edited by: Carlos José Einicker Lamas
Received: 30/05/2021
Accepted: 30/07/2022
Published: 01/12/2022



the field trips of early collectors, which can help solve a number of problems on the exact type localities for some species described in the older literature.

The historical and ongoing expeditions to the Neotropics has resulted in huge collections and subsequent descriptions, such that there are now about 115 families, 2,500 genera and 25,000 described species of Diptera recorded from the Neotropical region (Amorim *et al.*, 2002). The first catalogue of the Neotropical Diptera was published as individually-authored fascicles during the years 1966 to 1984 under the direction of Papavero (1966-1984). In contrast, the first catalogue of North American Diptera was published by Osten-Sacken (1858); thus, more than 100 years before the first catalogue of Neotropical Diptera. Even if the amount of investigation in those regions is highly disproportionate, the Neotropical catalogue, although outdated now, established a groundbreaking advance for the studies of the Neotropical Diptera with its 102 published fascicles and 2,877 printed pages. As argued by Amorim & Papavero (2008), this catalogue provided a significant contribution to the study of the systematics and taxonomy of the Neotropical Diptera that is still relevant for new generations of dipterists. Thus, the 21st Century saw a great increase in the number of described species and genera (and even families) being published by native workers, aligned with the development of Diptera collections and the increase in the number of specialists, mainly in Brazil. The importance of the knowledge of the Neotropical fauna is straightforward in another way: due to habitat destruction, environmental change, and invasive species (Cardinale *et al.*, 2012), species are going extinct so rapidly that many believe we are on the brink of a sixth mass extinction event (Barnosky *et al.*, 2011). At the estimated current rate of extinction, 70% of species may be gone in just 300 years (Wheeler, 2020). This loss of biodiversity is a huge problem for taxonomists, as a great deal of biodiversity, that constitutes their primary data, will remain hidden. For instance, we will be missing a large number of species for most groups, taking with them irreplaceable evidence of their uniqueness and phylogenetic history, besides their potential applicability to human health and the economy. This trend, enhanced by the "taxonomic impediment" (mainly due to this biodiversity crisis), is currently occurring with the Neotropical Diptera.

One of the families of Diptera that is well known for its diversity in the Neotropics is Tachinidae. This family has 1,053 genera that are endemic to a single biogeographic region of the world, of which 595 are from the Neotropical Region (corresponding to 76%) (O'Hara & Henderson, 2020). Four subfamilies have traditionally been recognized in Tachinidae: Exoristinae, Phasiinae, Tachininae and Dexiinae (O'Hara *et al.*, 2020a). The last one is composed of 1,394 species with worldwide distribution, of which 584 species occur at the Neotropical Region, thus corresponding to 41.9% of the total diversity. Hence, the Neotropics are a great source of study for dexiines. As a way to overcome the difficulties imposed by the historical constraints (*e.g.*, poor descriptions with

type material deposited in foreign institutions), and the present taxonomic impediment, the theme underlying the present brief historical review is understanding that to know the future one must know the past¹. Somewhat aligned with this idea, in an optimistic view of history, is that the truth of today has emerged from the mistakes of yesterday. Thus, in order to put these thoughts to work, the priority that the European scientists had in the 17th and 18th Centuries came from adequate and advanced economic resources, communications, social motivation and technology, all of them absent in the countries of the Neotropical Region. Furthermore, the apparent clear mistakes made by those earlier authors must be seen within the time frame of their own time. As Pont put it (1996: p. 65): "We all blame the past for what we dislike in the contemporary world – whether it be in Dipterology or in science or in society in general. But there is much that we can admire in the past and much that we can learn from the past, and some basic insights into how the great Dipterists lived and worked, set against contemporary political and social conditions and their own personal circumstances, goes a long way towards explaining why they operated as they did and how features that we perceive as shortcomings entered into their work".

Given this context, the present work provides a bibliographic review on the history of Dexiinae taxonomy in the Neotropical Region. By its synthetic nature, not all taxonomists that, at least once, worked on these flies will be mentioned, but only those deemed to be of greater importance. Even if limited in scope, there is an excellent historical perspective on the Tachinidae of Chile given by O'Hara *et al.* (2021); more details of collectors and taxonomists not mentioned here (*e.g.*, Luis Enrique Peña) can be consulted in the aforementioned work. The subfamily Dexiinae, as is common to all Tachinidae, suffers from a taxonomic disharmony in relation to the other five biogeographic regions of the world, because of an excess of genera, and, on the other hand, to a high number of undescribed species. To reach an approximation of the motives behind these trends is the objective of this essay.

METHODOLOGY

The present work is the result of a literature review. The story is divided into four periods. These correspond to the pre-Linnaean period of the 16th and 17th Centuries, the earlier 18th Century, the 19th Century and the first half of the 20th. Before the 20th Century the emphasis will be on the European and North American Dipterists. Later, with the South American Dipterists, the emphasis will be directed on them. The following acronyms are used in the text: AMNH – American Museum of Natural History, New York, USA; MACN – Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina; MCMC – Museo de Historia Natural de la Ciudad de Mexico, Mexico City, Mexico; MNHN – Muséum National d'Histoire Naturelle, Paris, France; MRSN –

¹ Phrase attributed to George Santayana, 1863-1952, American philosopher and poet.

Museo Regionale di Scienze Naturali, Turin, Italy; MZSP, Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil; NHMUK, Natural History Museum, London, UK; NHMW, Naturhistorisches Museum Wien, Vienna [Wien], Austria; USNM, Smithsonian National Museum of Natural History, Washington, D.C., USA.

RESULTS AND DISCUSSION

Brief history of study of Neotropical Dexiinae

Knowledge on Dexiinae diversity in the Neotropical Region has gradually increased since the 18th Century. Early taxonomic efforts came from European and North American authors such as Johan C. Fabricius (Denmark), Christian R.W. Wiedemann (Germany), Jean B. Robineau-Desvoidy (France), Pierre J.M. Macquart (France), Jacques M.F. Bigot (France), Francis Walker (England), Victor von Röeder (Germany), Ermanno Giglio-Tos (Italy), Friedrich M. Brauer (Austria) and Julius E. Bergenstamm (Austria), Frederik M. van der Wulp (Netherlands), John M. Aldrich (USA), Charles H. Curran (Canada), Charles H.T. Townsend (USA), Henry J. Reinhard (USA) and William R. Thompson (Canada). Only in the first half of the 20th Century that authors, born or established in South American, became to appear. Dipterists like Argentineans Jean Brèthes (1871-1928) and E.E. Blanchard (1895-1971), Chilean R.E. Cortés Peña (1915-2001) and Brazilian J.H. Guimarães (1937-2008), are the most relevant names for, not only to Neotropical Dexiinae, but, indeed for the whole family. Hence, I will make a brief chronological review of Dexiinae that were described by those European authors of the 18th and 19th Centuries in order to, finally, discuss the appearance of the Latin American scientists in the 20th Century who worked with the fauna of Dexiinae of their own region.

Neotropical Diptera before Linnaeus: the 16th and 17th Centuries

The beginning of study of the natural history in the Neotropics started with the most calamitous event in human history (Cornelius De Pauw in Elliott, 1992), the “discovery” of the New World by Columbus in 1492. A few years after the period of initial settlement by Europeans, a new time period collectively considered as ‘natural histories of the New World’, together with an overview of the work on the animals of New Spain (Mexico), inaugurated the interest of the Spanish for the potential benefits that could be derived from the knowledge of the plants and animals of the Neotropics (Asúa & French, 2005). One of these works is the *General and Natural History of the Indies* (Oviedo, 1851 [1535]), which consists of 50 books written by Francisco Fernández de Oviedo (1478-1557); he was one of the most famous writers and early chroniclers of what is today Central America (Asúa & French, 2005). The first part of his monumental work dealt mostly with the island of Hispaniola (now comprising Haiti and Dominican

Republic) and included zoological data, was published in Seville (Spain) in 1535. As with most of the people from his time, Oviedo employed the fauna of Spain as a term of comparison for describing the appearance and qualities of New World animals. He was responsible for one of the first reports of flies of the New World, in Hispaniola; in it (Book XV, Chapter 3), Oviedo made brief observations about the resemblance with the flies of Spain, and noted their behavior and that they could be found in great numbers: “... so many types and varieties that one could go on writing about them forever”. Later, most of the references to Diptera were related to attacks of blood-thirsty dipterans (e.g., Culicidae, Ceratopogonidae), as told, mainly, by the second half of the 16th Century Jesuit missionaries sent to Brazil (Papavero & Couri, 2012a). For instance, the oldest citation of Diptera in Brazil was made for mosquitoes (in 1552) by Father Francisco Pires (Papavero & Couri, 2012a).

It was only in the 17th Century that a new view of insects began to develop. Not only the importance of medical and economic aspects of insects were dealt with, but scientists began to study other species as well; for curiosity and better knowledge of the natural history of their New World colonies. According to Papavero & Couri (2012b), the works of Piso and Marcgrave, as scientists working for Johan Maurits van Nassau in Brazil, represent the third oldest publications including illustrations of insects, and many of their descriptions and information were not exclusively based on the beneficial or disadvantageous properties of insects towards man. The earliest scientific drawings of insects were of a bee by Francesco Stelluti in 1625, in a short treatise on bees entitled *Apiarium*, written by Federico Cesi. However, Stelluti in 1630 (Bardell, 1983) made a drawing of a weevil, this being the second oldest illustration. The next work that presents an illustration of an insect, this time a dipteran, is the *Locchio della mosca* (The Eye of the Fly) by Gioanbatista Battista Hodierna (1597-1660), published in 1644 (Bardell, 1993), and it constitutes the description and drawing of the microscopic structure of the eye of a fly using a microscope. Thereby, the work contained at the *Historia Naturalis Brasiliae* is the fourth oldest scientific publication including illustrations of insects, and the first from the Neotropical Region. These drawings (Fig. 1A, B) were done with the help of a microscope (Papavero & Couri, 2012b), and it includes, among other insects, the first description and illustration of two fly specimens: a dolichopodid (Marcgrave, 1648, p. 253) and a culicid (Marcgrave, 1648, p. 257). It would take almost 200 years for the first dexiine to be drawn by Macquart (1846).

Early days of Linnaeus and post-Linnaean era: the 18th and 19th Century and the first Neotropical Dexiinae

Binominal nomenclature for scientific names of animals is deemed to have started on January 1, 1758, with the 10th edition of Linnaeus’ *Systema Naturae*. As a natural

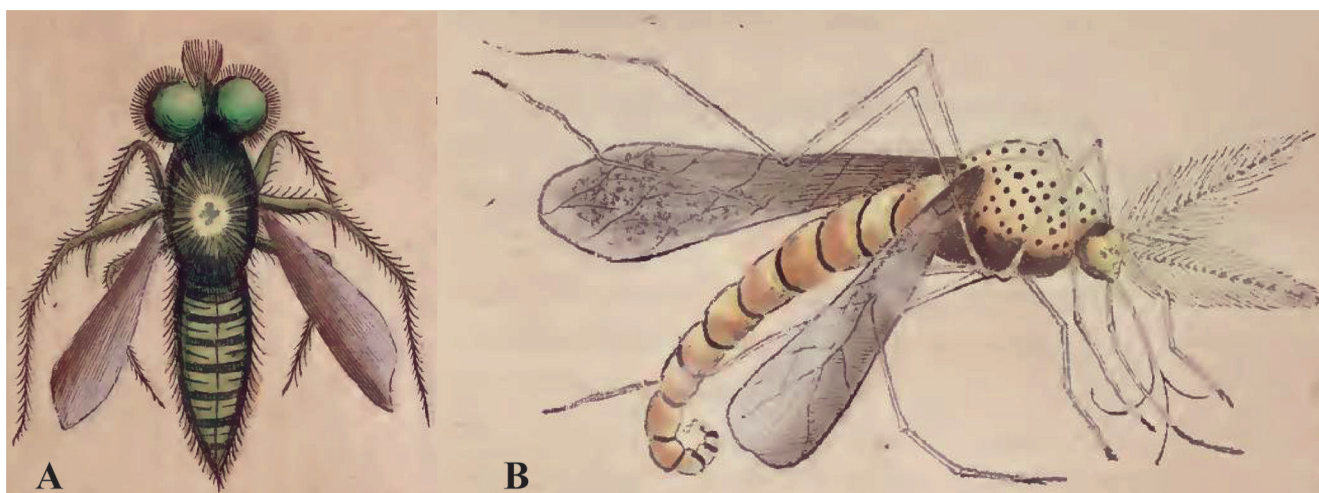


Figure 1. (A) Dolichopodidae; (B) Culicidae, from *Historia Naturalis Brasiliae* (1648).

consequence, this publication was the official start of the modern understanding of flies and their classification. Linnaeus divided nature into three kingdoms and many classes, orders, genera, and species; flies were placed in the order Diptera in the class Insecta. Linnaeus divided the order into 10 genera and 191 species, and of those species, only eight were from the Neotropical Region (Suriname and Venezuela). Those species were collected by two of his disciples: the Swedish naturalists Pehr Löfving (1729-1756) and Daniel Rolander (ca. 1722-1795). Löfving was the first naturalist with a scientific background to collect Diptera in South America (Papavero, 1971), and spent almost two years in Venezuela. He was one of Linnaeus' students and as a result of this expedition, that ended abruptly with his death in 1756, he contributed to the 10th edition of *Systema Naturae* with one species of Diptera: the tabanid *Tabanus occidentalis* Linnaeus, 1758. Rolander was viewed as an entomologist by Linnaeus (Evenhuis *et al.*, 2010), and was the collector of eighty-five species, of which four are dipterans. These species were a result of his seven-month expedition in Suriname and 10 days in Sint Eustatius (an island in the Caribbean). The following species were described by Linnaeus from Rolander's collecting: *Tabanus antarcticus* Linnaeus, 1758, *Tabanus exaestuans* (currently *Leucotabanus exaestuans* (L.)), *Tabanus fervens* Linnaeus, 1758 (currently *Phaeotabanus fervens* (L.)), *Tabanus mexicanus* Linnaeus, 1758 (currently *Chlorotabanus mexicanus* (L.)) in Tabanidae; and *Musca leprae* Linnaeus, 1758 (currently *Hippelates leprae* (L.)), a *nomen dubium* in Chloropidae. Two additional species were doubtfully collected by Rolander: *Musca aequinoctialis* Linnaeus, 1758, a *nomen dubium* in Stratiomyidae and *Musca illucens* Linnaeus, 1758 (currently *Hermetia illucens* (L.)) in Stratiomyidae, both collected by Dahlberg or Rolander according to Papavero (1971).

The best-known student of Linnaeus was Johann Christian Fabricius (1745-1808), being responsible for continuing Linnaeus' work with insects. He dealt with Diptera in his *Systema Antliatorum* (Fabricius, 1805), which contained 1.151 species of flies distributed among 78 genera (Evenhuis *et al.*, 2010); including the first dexi-

ines to be described from the Neotropical Region. A peculiarity is that this early work was made before the description of the type genus of Dexiinae, *Dexia* Meigen, 1826, and the definition of the group Dexiariae by Macquart (1835), the Dexiinae of today. Hence, almost all of the early Dexiinae were described in other genera, with the majority of them, including the following, in *Musca* Linnaeus, 1758: *Rhamphinina pica* (Fabricius, 1805), *Scotiptera venatoria* (Fabricius, 1805), *Trichodura anceps* (Fabricius, 1805), *Comatacta variegata* (Fabricius, 1805), *Comatacta tricincta* (Fabricius, 1805) and *Zelia lateralis* (Fabricius, 1805). Just one Neotropical Dexiinae was described in another genus: *Dictya uncana* Fabricius, 1805, currently *Oestrophasia uncana*. As was common at the time, all of these species were described from the vague location of "America meridionali" (South America), and collected by Smidt (an almost entirely unknown collector). According to Papavero (1971), those Neotropical species could be from the West Indies or some mainland country like Guyana. Thus, the lack of precision of these type localities is noteworthy.

The 19th Century as two trends: the inflation of *Dexia* and the beginnings of the recognition of the uniqueness of Neotropical genera of Dexiinae

The first species described in *Dexia* that, although not described from the Neotropics but present in the Neotropical Region, was only described in 1829 by Thomas Say (1787-1834), considered as the father of *American Entomology*; in addition, he wrote the first book published in America on insects, *American Entomology* (1824-1828). Say described *Dexia vertebrata* Say, 1829 from Indiana (USA), now a species in the genus *Zelia* Robineau-Desvoidy, 1830, distributed from Guatemala to Mexico (O'Hara *et al.*, 2020a). The following year marked the publication of two revolutionary works on Tachinidae and Diptera: the *Aussereuropäische zweiflügelige Insekten* by Wiedemann (1830) and the *Essai sur les Myodaires* by Robineau-Desvoidy (1830) – the work of Wiedemann having priority by about three months over Robineau-

Desvoidy's (Evenhuis & Pont, 2013). Wiedemann (1830) described 24 species of *Dexia*, of which 16 were collected in the Neotropics. Within those 16 species, seven are currently valid species in Dexiini or Sophiini within Dexiinae; *Cordyligaster petiolata* (Wiedemann, 1830) in Sophiini; *Zelia plumosa* (Wiedemann, 1830) in Dexiini; *Zelia potens* (Wiedemann, 1830) in Dexiini; *Zelia limbata* (Wiedemann, 1830) in Dexiini; *Yahuarmayoia phaeoptera* (Wiedemann, 1830) in Dexiini and *Euantha aucta* (Wiedemann, 1830) in Sophiini, all species from Brazil; and *Tromodesiana thomae* (Wiedemann, 1830), from West Indies, St. Thomas, *incertae cedis* in Dexiinae (O'Hara *et al.*, 2020a; Santis, 2021). Although the type localities were more precise, with some cited as Brazil, there was no information about the collector or the Region of Brazil where specimens were collected; an exception is *Dexia melaleuca* Wiedemann, 1830 (= *Musca venatoria* Fabricius, 1805), now in *Scotiptera* Macquart, 1835, which was collected in Rio de Janeiro state, Brazil. Papavero (1971) affirmed that Wiedemann's collection from his first paper on Brazilian material (1819) included material from Eschscholtz (that collected in Santa Catarina state), Sieber, Gomes and Feijó (from Amazonas, Ceará, Pernambuco and Bahia states) and Freyreiss and Westin and von Olfers, Sellow, Bescke and Lund (indefinite regions of Brazil). Indeed, none of his Neotropical species originally described in *Dexia* survived the passage of time: not a single one of them is still placed in its original genus. Actually, only two of his 24 species are still placed in *Dexia*, *i.e.*, *Dexia lugens* Wiedemann, 1830 from South Africa and *Dexia lepida* Wiedemann, 1830 from Indonesia.

The first author who began to realize that the tachinid fauna, mainly from the Neotropics, is unique and tried to accommodate his species in various new genera was Robineau-Desvoidy (1830). For instance, he erected 16 genera for his group of Macropodea (Dexiinae, in part), of which six are still valid within Dexiinae (*Estheria*, *Dinera*, *Zelia*, *Sophia*, *Rutilia* and *Billaea*). *Sophia* and *Uramya* Robineau-Desvoidy, 1830 were the first genera created for species exclusively found in the Neotropics, more precisely from Brazil. Of these, *Sophia*, however, is problematic (Santis, 2018) since of the four species originally described in it, only *S. filipes* Robineau-Desvoidy, 1830 still remains in the genus; the other three were moved to *Scotiptera* Macquart, 1835 [Dexiini]: *Scotiptera gagatea* (Robineau-Desvoidy, 1830) and *Scotiptera pelucida* (Robineau-Desvoidy, 1830), both unrecognized by Guimarães (1971), and the last one, *Sophia punctata* Robineau-Desvoidy, 1830, in synonymy with *Scotiptera venatoria* (Fabricius, 1805). The type of the type species of *Sophia*, *S. filipes*, is probably lost and the species is considered within Sophiini (Guimarães, 1982). On the other hand, *Uramya*, originally with a single species, *Uramya producta* Robineau-Desvoidy, 1830, was also described from material collected in Brazil, alongside *Olinda brasiliensis* Robineau-Desvoidy, 1830, now placed in *Uramya*, in addition to the others 32 species currently placed in this genus (O'Hara *et al.*, 2020a). *Uramya brasiliensis* was collected by Saint-Hilaire who, according to Papavero (1971), took journeys to the following states of Brazil

from 1816 to 1822 (any of these possibly being the type locality): Rio de Janeiro, Espírito Santo, Goiás, Minas Gerais, São Paulo, Paraná, Santa Catarina and Rio Grande do Sul. The last valid Dexiinae species derived from the Neotropical Region described by Robineau-Desvoidy (1830) was *Zelia strenua* Robineau-Desvoidy, 1830 from Haiti, Port-au-Prince, now placed in *Ptilodexia* Brauer & Bergenstamm, 1889 (O'Hara *et al.*, 2020a).

Species continued to be named by a few other European dipterists, like Pierre-Justin-Marie Macquart (1778-1855), Ermanno Giglio-Tos (1865-1926) and in the collaborative works of Friedrich Moritz Brauer (1832-1904) and Julius Edler von Bergenstamm (1837-1896) in the latter half of the 19th Century. Giglio-Tos was an Italian entomologist who studied at the University of Turin and was hired at the then Museo Zoologico di Torino, current MRSN, in which he worked with the Diptera collection built by many collectors, like Eugenio Truqui, Henri de Saussure, Adrien Sumichrast and Luigi Bellardi (Papavero, 1973). All of them made extensive collections in Mexico and gathered a considerable number of specimens of Mexican Diptera that is deposited at the MRSN and was worked on by Giglio-Tos. Bellardi began to work with this material with the publication of his "Essay of Mexican Dipterology" (1859, 1961, 1862), but sometime later he left the study of Diptera to work with fossil molluscs, and died before he could resume his studies on the Mexican Diptera (Giglio-Tos, 1892). Hence, Giglio-Tos took the responsibility to finish the work began by Bellardi. Giglio-Tos published, in short² and concise papers (his "Diagnosis of new genera and new species of Diptera" that began in 1890 and ended in 1893) the descriptions of his new species, to later give more detailed and useful descriptions in his "Diptera of Mexico", published from 1892 to 1895. In total, Giglio-Tos described one new genus – *Myioscotiptera* Giglio-Tos, 1893 – and 14 new species with only two current synonyms. Of those 12 valid species, six are still placed in their original genus. He never gave keys or diagnosis for his new species; thus, the recognition of his taxa can be problematic, for instance the species *Myioscotiptera cincta* Giglio-Tos, 1893, *Scotiptera cyanea* Giglio-Tos, 1893 and *Hystrichodexia mellea* Giglio-Tos, 1893 are difficult to identify by relying only on his descriptions. However, Giglio-Tos based his descriptions and papers on material exclusively from the Neotropical Region (Mexico), and is thus the first author to work exclusively on Neotropical Tachinidae.

The next name in this essay, considered as one of France's greatest dipterists (Evenhuis *et al.*, 2016), is Macquart³. When he was hired by the Muséum d'Histoire Naturelle in Paris he began to study the exotic, *i.e.*, non-European, species of Diptera collected by a number of collectors, including the following from the Neotropics: Gay and Fontaine in Chile and Peru, Sylveira, Gaudichaud and Vauthier in Brazil, Leprieur, Leschenault, Doumerc

2 Giglio-Tos just gave a very brief description in Latin, without any information about the localities within Mexico.

3 An extensive literature from his life and work can be found in his autobiography (Macquart, 1849) and in the work of Evenhuis *et al.* (2016).

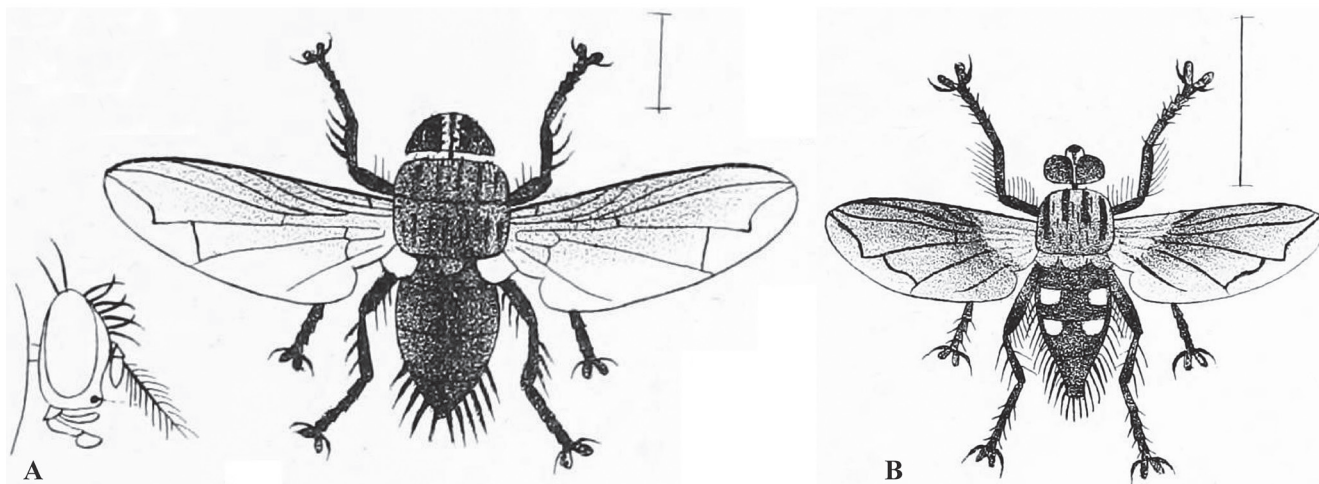


Figure 2. (A) *Ebenia claripennis* Macquart, 1846; (B) *Uramya quadrimaculata* (Macquart, 1846).

and M.me Rivoire in Guyana; Lebas in Colombia; Richard, Lacordaire and Banon in Cayenne; Plée in the Antilles; De La Sagra and Poey in Cuba; Hogard in Santo Domingo and Beupertuis in Guadeloupe (Macquart, 1838). As a result of these studies, he published his *Diptères exotiques nouveaux ou peu connus* from 1838 to 1855, in two volumes and five supplements, including 2,390 new species and 219 new genera from almost every family of Diptera known at the time (Evenhuis *et al.*, 2016). His *Diptères exotiques* is considered, for its time, one of the most prestigious taxonomic works on Diptera ever published (Evenhuis *et al.*, 2016). In this great work, almost all of his Neotropical Dexiinae can be found (just one taxon, *Scotiptera* Macquart, 1835, was described in his *Histoire naturelle des insectes*). In total, he described eight genera, of which two were later synonymized (*Aporia* Macquart, 1846 = *Uramya* Robineau-Desvoidy, 1830 and *Megistogaster* Macquart, 1851 = *Cordyligaster* Macquart, 1844). Robineau-Desvoidy proposed 12 new species, of which two are unrecognized in Dexiinae; but none have been synonymized in the many years since their description. Thus, as argued by Crosskey (1971), Macquart provided keys and diagnoses for all of his tribes and genera, and his work can be considered very advanced and of great quality for his time. Finally, as a historical note, Macquart (1846) was responsible for the first two drawings of Neotropical Dexiinae, namely: *Uramya quadrimaculata* (Macquart, 1846) (Fig. 2B), *Ebenia claripennis* Macquart, 1846 (Fig. 2A) and *Ptilodexia rubriventris* (Macquart, 1846).

In the only cooperative work discussed herein, the contributions of the Austrians Friedrich Brauer and Julius von Bergenstamm will be briefly reviewed. Their partnership began in 1861, when Brauer accepted a position at the Kaiserlichen Museums zu Wien, now NHMW and was named curator of the entomological section in 1876. Beginning in 1880, he started publishing his monumental work on the Diptera of the Museum of Vienna (*Die Zweiflügler des Kaiserlichen Museums zu Wien*). Later, continuing with this work, he began a series co-authored with Julius von Bergenstamm on the higher Diptera excluding the Anthomyiidae [his *Muscaria Schizometopa*

(exclusive *Anthomyiidae*)]. Four parts of this series on higher Diptera were published, constituting parts IV-VII, from 1889 to 1894. In preparing for this work, they examined a great number of types of Schiner, Egger, Wiedemann and Meigen present at the NHMW, as well as Robineau-Desvoidy, Macquart and Rondani types that were in von Bergenstamm's private collection and that of Bigot. Handlirsch (1905) wrote that this partnership was much a matter of necessity, as Julius von Bergenstamm had these valuable types that could then be used by Brauer, that considered this material as invaluable to finish his work. Consequently, Handlirsch (1905) regarded this work, both in merit and intellectually, as belonging to Brauer only.

Brauer & Bergenstamm (1889-1895) described over 250 genera and subgenera of Tachinidae, of which 99 are currently valid (O'Hara, 2013). In relation to Neotropical Dexiinae, a peculiar trend can be found: they described 20 new genera and 16 new species. Of those 20 genera, three are invalid, and of those 16 species, five are invalid; a high number, consisting of about ¼ of their new species. This is surprising, because they had access to the aforementioned types, and yet made constant mistakes when describing new species. A number of them were synonymous with species that they, very probably, had seen; for instance, synonymies with Wiedemann's and Bigot's species are a particular trend found in Brauer and Bergenstamm's work. Finally, in relation to the type localities mentioned in their work, a recurrent collector, in a recurrent country, is found for various taxa. The name is Bilimek and the country is Mexico⁴, so much so that two species were named after him: *Prorhynchops bilimeki* Brauer & Bergenstamm, 1891 and *Ormia bilimeki* (Brauer & Bergenstamm, 1889). Considering that there are only some scattered and very brief records of Bilimek's life and travels (see, for instance, Papavero, 1973, p. 291-292), a few notes and records of his life as a naturalist are given here.

⁴ In relation to the Neotropical dexiines, four species were collected by Bilimek from Mexico (in Mazatlan or Takubaya).

Brief biographical overview of Dominik Bilimek

Dominik Bilimek (Fig. 3), who was first named Adolph Joseph Bilimek, was born in 1813 in Nový Jičín, a town in the Moravian-Silesian region of the current Czech Republic. In 1832 he entered the Cistercian monastery of Wiener Neustadt, where he took the name of his father Dominik (Polách, 2013), and was ordained a priest in 1837. Even as a young priest, Bilimek always found time for the natural sciences; soon, entomology and speleology became his new passions. His interest in science grew to a high professional level; for instance, in 1851 he attended the inaugural meeting of the Zoological and Botanical Society in Vienna (Polách, 2013) and, in the same period, he came in contact with naturalists, including the important Viennese geologist Eduard Suess (Roth, 2019). Later, he was a teacher at the Military Academy from 1854 to 1864 in Cracow, Hainburg, Strasbourg, Eisenstadt and Wiener Neustadt. During this period, he worked on archaeological research and excavations and made the acquaintance of Austrian Archduke Ferdinand Maximilian Joseph (1832-1867), a contact that would change his life. Ferdinand Maximilian invited him, in 1865, to go to



Figure 3. Photograph of Dominik Bilimek. Available: [http://www.zisterzienserlexikon.de/wiki/Bilimek, Dominik](http://www.zisterzienserlexikon.de/wiki/Bilimek,_Dominik).

Mexico, where Ferdinand was declared Emperor of the Second Mexican Empire (1864-1867), leading to the foundation of the Imperial Mexican Museum's natural history collection. Bilimek accepted the adventurous invitation and was appointed curator of a Department of Natural History of the National Museum, currently the MCMC, where he was in charge of supervising the organization of archaeological and ethnographic objects and books, in addition to the fauna and flora specimens (Polách, 2013).

In May of 1865, Dominik Bilimek arrived in the Mexican port of Veracruz, from where he traveled to Mexico City (Polách, 2013). Immediately upon his arrival, he took on duties at the museum and began his first research surveys around the royal Chapultepec Castle (residence of Archduke Ferdinand Maximilian and his Empress Charlotte). On his collecting trips around the city and near the Chapultepec Castle, Bilimek was often accompanied by the Empress Charlotte and her ladies-in-waiting (Polách, 2013), together collecting natural history material for the museum. On January of 1866, together with Emperor Maximilian, Bilimek visited the famous Cacahuamilpa caves (in Guerrero State, south of Cuernavaca), one of the largest cave complexes in the world, which is still visited by speleologists from around the world (Gómez-Aguado *et al.*, 2016). From their speleological surveys, the first biological investigation of a cave in Mexico (Palacio-Vargas *et al.*, 2015), Bilimek (1867) prepared an article called "Fauna der Grotte Cacahuamilpa in Mexiko" [Fauna of the Cacahuamilpa cave in Mexico], in which he described animals living within it. Even though he was not able to explore the entire cave on his single visit on the 14th of January 1867, he could find "under the stones and on the stalagmites" 11 animals, of which 10 were described as new by him, including: Coleoptera (Carabidae and Catopidae), Lepidoptera (Gracillariidae), Diptera⁵ (Milichiidae), Orthoptera (Rhaphidophoridae), Blattaria (Polyphagidae), Thysanura (Nicoletiidae), Amblypygi (Phrynidae), Araneae (Gnaphosidae and Pholcidae) and Isopoda (Armadillidae). For this scientific publication, Bilimek received the Emperor's Golden Medal for Civil Merit (Polách, 2013).

However, everything changed within a few months after his article. A civil war broke in Mexico, with the Mexican republican forces, along the aid of the United States, expelling the French troops in 1866, so that finally, the Empire came to an end on June 19, 1867 when Emperor Maximilian was executed and the government restored the Mexican Republic. In the middle of this, Dominik Bilimek had to organize, very quickly, his departure from now dangerous Mexico, including the transport of his collections, notebooks and notes. As a precaution, Emperor Maximilian appointed Bilimek as director of the Natural History Museum of the Miramare Castle in Austria (that was built by Maximilian and his wife), by decree, so that he obtained civil servant status (Roth, 2019). The emperor's death occurred while Bilimek was hiding

5 This species is *Pholeomyia leucozona* Bilimek, 1867. Bilimek found specimens "Swarming around on stalagmites in the Cacahuamilpa cave in Mexico".

in Orizaba (Polách, 2013), but thanks to an English ship, part of the collections traveled to Europe from Veracruz. Thus, when Bilimek returned to Europe he fulfilled the wish of Maximilian and became the director of the museum at the imperial residence in Miramar near Trieste (Italy). As the custodian of the museum, Bilimek undertook scientific trips to Sweden, Norway, Italy, Palestine, Egypt and Algeria (Polách, 2013). The collections of Dominik Bilimek are scattered throughout many museums and countries around the world. Bilimek's botanical collections are kept at NHMUK and Kew Royal Botanic Gardens in London (UK), and in the natural history museums of Paris and Lyon; there are also specimens in the United States, such as the herbarium of the USNM, and at Harvard University, Cambridge; and in St. Petersburg (Polách, 2013). His invertebrate collections, mainly insects, are deposited in Vienna (NHMW). Due to his age, Bilimek finally retired to Vienna and lived in the monastery of his Cistercian order in Neukloster, where he died on August 3, 1884 from a stroke. His grave is in the forest cemetery near Heiligenkreuz (Roth, 2019).

Multiplicity of *Dexia* species

During the same period, British entomologist Francis Walker (1809-1874) – (for an overview of Walker's life and entomological contributions, see Evenhuis, 2018) – in opposition to the approach of Robineau-Desvoidy, tried to include a wide range of species within his broad definitions of *Dexia* and other tachinid genera. As a straightforward example, of 74 species of *Dexia* described by Walker throughout his career, only 38 are still valid species placed in various genera and tribes of Dexiinae (some species were incorrectly considered as Tachinidae, and are now placed in Calliphoridae, Mesembrinellidae and Sarcophagidae). Of those 38, only eight are still placed in *Dexia*. Considering the Neotropical taxa, of the species described in *Dexia*, 18 species were from that region, six of which are still valid and placed in various tribes of Dexiinae, e.g., Dexiini, Doleschaliini, Rutiliini, Sophiini, Voriini and Uramyini. Walker's descriptions and species concepts are known for being very problematic (Crosskey, 1974), for he described almost all of his species based on only one specimen and nearly every specimen was a different species for him (Austen, 1907). As for the other species of Dexiinae described by Walker in other genera, only six are valid and still placed in this subfamily.

Another dipterist from France who was important for the Neotropical Tachinidae and Dexiinae was Jacques-Marie-Frangile Bigot (1818-1893). He had a long and productive career in dipterology, describing 1.596 species in 76 families and 210 genera in 44 families, including 19 genus-group names in Tachinidae (Evenhuis & Pont, 2004); having a lifelong interest in Diptera. At the age of 26, he became a member of the Société entomologique de France (Crosskey, 1971), and in the following year (1845) he published the first of his long series of papers on Diptera in the Annales (and associated Bulletin des Séances) of that Society (Anonymous, 1893). The large

series *Diptères nouveaux ou peu connus* that began in 1874 and had 37 "parts", concluded in 1892, was one of his main works. The species described by him were from all parts of the world; however, he is notable for having described various Neotropical genera (mainly for Mexico), exceeding in number those from other parts of the world. As Crosskey (1971) argued, Bigot toyed with descriptive work at a very superficial level, causing the near impossibility to recognize any of his genera or species without access to his type material⁶. In the end, Bigot described six genera and 20 species of valid Neotropical taxa of Dexiinae. Even with these criticisms, a great advance was provided by Bigot: none of his species was placed in the genus *Dexia*, as was common practice by his predecessors. Thus, overcoming his superficial and poor descriptions, usually based on single specimens, usually only by seeing his types, the great work that he did for the Neotropical Dexiinae can be better appreciated. The type localities were a problem, however, as for the majority of his species only the country of collection was given without any mention of the collector.

The last great contribution to the Neotropical Dexiinae from the 19th Century came from a work named *Biologia Centrali-Americana* and subtitled as *Contributions to the knowledge of the fauna and flora of Mexico and Central America*. This work covered various aspects and groups of animals and plants, including a section on archeology. The importance of this work is so great that Selander & Vaurie (1962: p. 3) considered that "The '*Biologia Centrali-Americana*,' [is] unquestionably one of the most monumental and important faunal works ever published ...". This work was organized, directed and edited by two eminent British naturalists, Frederick DuCane Godman and Osbert Salvin (Selander & Vaurie, 1962). It was issued on a subscription basis in 257 parts, the first of which appeared in September, 1879, and the last in June, 1915, thus over 36 years, during which time more material was constantly being added to the collections (Godman, 1915). One remarkable result of *Biologia-Centrali Americana* was the precision of the type localities given for all the species, as these materials were carefully labeled with the name of the settlement or physiographic feature at or near which collections were made (Selander & Vaurie, 1962).

By 1906 there were 17,525 specimens of Diptera deposited at the NHMUK, then the British Museum (Natural History) (Godman, 1915) directly from collectors for the *Biologia-Centrali Americana*, that appeared in 3 volumes and one supplement (to Vol. I). What is of interest here is the portion dealt with by Dutch Dipterist Frederik Maurits van der Wulp (1818-1899), who wrote Volume II (1888-1900) on the calyptrates⁷. Van der Wulp was a civil officer in the Dutch Audit Office, from which he retired after 50 years' service, when he was nominated Knight of the Order of Orange-Nassau. In 1845, Wulp was one of the founders of the Nederlandse Entomologische

⁶ All Neotropical Tachinidae described by Bigot are now deposited at the NHMUK (Crosskey, 1971), and I could see all the holotypes from Dexiinae and could confirm the views of Crosskey (1971).

⁷ This volume was left incomplete after Wulp's death in 1899.

Verening (Dutch Entomological Society). During this time, he began his studies with Diptera, as the majority of entomologists in the Netherlands devoted their attention to Coleoptera and Lepidoptera. From 1870 to 1894 he was secretary of the Society and from 1867 to 1894 the editor of its journal, *Tijdschrift voor Entomologie* [Journal of Entomology], founded in 1858. In 1894 he was elected Honorary Member of the Society (Snellen, 1900). According to Papavero (1973), the greatest part of the syntypes described by Wulp are deposited at the NHMUK. Additionally, this type material is problematic, because, as noted by Wood (1985: 4): "... for many of these species, Wulp had mixed series, often representing more than 1 genus in the present sense". Wulp described in total 65 species and 12 genera in Dexiinae, of which 62 species are still valid and only one genus has been synonymized (*Melaleuca* van der Wulp, 1891 = *Zelia* Robineau-Desvoidy, 1830). Of those species, only 18 are still placed in their original genus, thus showing some problems with his generic delimitations. As already mentioned, never before has so much detailed information on type localities been given for Dexiinae, and *Biologia* went much further than merely citing the countries from which the new species originated; Wulp gave plenty and useful information on various species of Dexiinae for Mexican and Costa Rican⁸ specimens. All the species from Mexico were collected by Hebert Huntington Smith (1851-1919), as quoted by Wulp throughout his contribution to *Biologia* (for more details and a biographic overview of Smith, see Papavero, 1973), while those from Costa Rica were collected by H. Rogers. Besides his contribution to the Mexican fauna, Smith had an immense influence on the dipterans and tachinids from Brazil. Hebert Smith participated in five expeditions to Brazil between the years 1870 to 1886; from those trips he published two books, one describing his voyage to the Amazon (Smith, 1879) and another on his trips to the Centre-west and Southeast Regions of Brazil, or, as the title tell us *Do Rio de Janeiro a Cuyabá* (Smith, 1922). Smith's last and enduring voyage to Brazil was between May 1881 and September 1886, in this occasion he was hired by the Museu Nacional of Rio de Janeiro at the end of 1881. The contract financed Smith to take voyages in the poorly known regions of Brazil and also included collecting extensive natural history materials; It is worth mentioning that during this time, he collected extensively at the Chapada dos Guimarães (Mato Grosso state). His trip ended with thousands of specimens of reptiles, birds, mammals and insects. The insects were estimated at 288,500 and the dipterans alone to be around 25,000. While the other collections of natural history were fulfilled according to the contract (one part would be owned by the museum and the other by the collector), because of the lack of resources the whole insect collection was returned to the United States at the hands of Smith. Smith's Diptera collection reached the hand of renowned dipterists, for instance, Samuel Williston (1888: 243) who write

the following about this collection: "More than a year ago Mr. Herbert H. Smith, who is well known to zoologists for his writings on Brazil, placed in my hand for study a collection of Diptera made by him during the past few years in Southern Brazil. The collection is one of great importance, both on account of its size and excellent preservation. It is, I believe, the largest local collection that has ever been made, or at least studied, of South American Diptera". Additionally, this collection was also used by Townsend (e.g., 1916), who described new tachinid species and genera.

The 20th Century and the age of multiplication of new genera

The first half of the 20th Century marked the decline of the dominance of European dipterists and the increase of North Americans who studied Neotropical Dexiinae. The most important names being Charles Howard Curran (1894-1972), John Merton Aldrich (1866-1934), Charles Henry Tyler Townsend (1863-1944), Henry Jonathan Reinhard (1892-1976) and William Robin Thompson (1887-1972). Curran (for an extensive biography, see Arnaud & Owen, 1981) was Canadian but worked from 1928 to 1960 at the AMNH. Throughout his career, he described 650 species of Tachinidae, of which 19 are Neotropical Dexiinae. His major contribution to the knowledge of Neotropical Tachinidae came from his monograph *The Diptera of Kartabo, Bartica District, British Guiana* (Curran, 1934). In this work, he provided keys to tachinids from this region, in addition to keys and good descriptions of his new species; thus, this was a reliable source to identify the species of Tachinidae worked by him (without consultation of type material). As for new genera, he described 19 for Dexiinae from the Neotropics, of which only six were not synonymized (O'Hara *et al.*, 2020a), evidence that, like Wulp and Bigot, most of Curran's new genera did not survive the end of the 20th Century. As for Neotropical Dexiinae, of the seven new genera described by Curran, only three are still valid today, i.e., *Zonalia* Curran, 1934, *Heliaeae* Curran, 1934 and *Jamacaria* Curran, 1928.

The next great dipterist that will be considered is the American John Aldrich. From 1918 until his death in 1934, he was the Custodian of Diptera and Associate Curator of Insects at the USNM. During his time working at the Smithsonian, Aldrich made great contributions to the Neotropical Dexiinae. A huge contribution to anyone working with Neotropical Tachinidae were his papers on the types of the New World taxa described by Wiedemann and Brauer & Bergenstamm. Published in five papers between 1924 and 1929, the objectives of Aldrich were to redescribe poorly known taxa that could not be properly recognized from those old works. Hence, by giving a detailed and exceptional redescription, sometimes accompanied by synonymies and invaluable taxonomic notes, to this date the only information for those 22 species of Neotropical Dexiinae was that provided by him. Guimarães (1971), in his Neotropical catalog, rec-

8 Just two species of Dexiinae were collected from Costa Rica: *Hystriochodexia echinata* van der Wulp, 1891 and *Bathydexia albolineata* van der Wulp, 1891.

ognized the high relevance of these works by Aldrich, and for each cataloged species he referred to the redescrptions by Aldrich. Just two months before Aldrich died, his most comprehensive and remarkable contribution on the Neotropical Tachinidae was published; the Tachinidae part of *Diptera of Patagonia and South Chile based mainly on material in the British Museum (Natural History)* (Aldrich, 1934). Cortés & Campos (1971) considered this work as canonical for the tachinids from Chile and Argentina; in it, Aldrich described 140 species in 70 genera. Later, the authors emphasized that the great value of his work came from the descriptions and keys for the Dexiini of this southern part of the Neotropics. Poorly known genera like *Dasyuomyia* Bigot, 1885, *Psecacera* Bigot, 1880 and *Trichodischia* Bigot, 1885 had their species keyed (sometimes with the type species re-described), including newly described species, thus contributing greatly to future work on this fauna, like that by Raul Cortés (who will be discussed later). His nine new genera of Dexiinae (Aldrich, 1934) from Patagonia, none of which is invalid to this day, are evidence of Aldrich's incredible work. Finally, from 1924 through 1934, Aldrich described 15 new genera of Dexiinae, of which only one was later synonymized, i.e., *Opsophagus* Aldrich, 1926 = *Cyrtophloebe* Rondani, 1856 (O'Hara *et al.*, 2020a). He achieved great results in relation to his new species as well: in total, he described 39 new Neotropical Dexiinae, none of which has been synonymized; of those, only six species were moved from their original placement. But perhaps Aldrich's most noteworthy achievement was his preoccupation with revising previously described species, not just adding new taxa to an already inflated group. Therefore, he was the first author who worked with Neotropical Dexiinae to have published revisionary works in addition to describing new taxa.

Nevertheless, all these advances were partially lost when the American dipterist Charles Townsend, the most productive author to publish about the Neotropical Region, entered the scene. From his first Neotropical dexiine described in 1892 – *Microchaetina valida* (Townsend, 1892) from Peru – to his last in 1940 – *Trochilochaeta transcendens* Townsend, 1940 from Brazil – he ended up describing 90 species in addition to 62 genera. One of the main problems, if not created, then at least increased by Townsend, was the description of an excessive number of monotypic genera. Several of his genera were later synonymized, sometimes with multiple genera considered as a single genus; for instance, Townsend proposed six genera (*Eutheresia* Townsend, 1912; *Paratheresia* Townsend, 1915; *Theresiopsis* Townsend, 1916; *Amphiboliopsis* Townsend, 1926; *Bathytheresia* Townsend, 1928; *Philotrhostylum* Townsend, 1933) later synonymized with *Billaea* Robineau-Desvoidy, 1830 and erected eight genera (*Phasiodexia* Townsend, 1925; *Eoptilodexia* Townsend, 1926; *Eomyocera* Townsend, 1926; *Sumatrodexia* Townsend, 1926; *Calotheresia* Townsend, 1926; *Eomyoceroopsis* Townsend, 1926; *Asbellopsis* Townsend, 1928; *Barydexia* Townsend, 1928) later synonymized with *Dexia*. In addition, there was not, as is the case today, a single and workable identi-

fication key for supraspecific (and specific) taxa; the keys proposed by Townsend (1927), for instance, for all Neotropical Tachinidae known until the year 1927, are unworkable and almost useless. Adding to the excess of artificial monotypic genera, another problem with Townsend's approach was his descriptions. The combination of a brief and unimportant description of characters with his unique and confusing system of nomenclature (Townsend, 1928), created and used by him in his later descriptions, caused difficulties in the interpretation and identification of his taxa. This system of nomenclature and abbreviations was used in his largest contribution to Tachinidae: his *Manual of Myiology*, a 12-volume series on the "Oestromuscaria" published between 1934 and 1942. In this work, he produced a classification system for the world tachinids, including all the taxa then known from the Neotropical Region. To this date, this is still the only reference for various genera of Neotropical Dexiinae. However, for such a huge (over 3,000 pages) and comprehensive (all oestroid Diptera known at that time) work, it was highly criticized and considered incomprehensible and confusing (Mesnil, 1980) or unmanageable and artificial (O'Hara, 2013). On the other hand, even though we can consider Townsend's contribution to Tachinidae and Neotropical Dexiinae as lower in quality in relation to his contemporaries (mainly Aldrich), there were also some clear advances. The knowledge of Neotropical diversity of Dexiinae increased, as of the 158 genera currently considered as valid and belonging to the Neotropical Dexiinae, 62 were proposed by Townsend (about 39%). A large part of the new species were collected by Townsend himself during a long-term stay in Peru, divided into two periods: one from 1909 to 1914 and the other from 1923 to 1929; and in Itaquaquetuba (Brazil), where he lived from 1929 until his death in 1944 (Evenhuis *et al.*, 2015). Itaquaquetuba, located at São Paulo state, became a collecting locality for Townsend, and a special place for dipterists and tachinologists (Hansen & Toma, 2004), as, for instance, there are almost two hundred entries (including valid and invalid names) for "Itaquaquetuba" at the Neotropical catalogue of tachinids (Guimarães, 1971). Thus, he described some rarely collected Neotropical taxa, for instance, *Itamintho erro* Townsend, 1931 (allied to *Phyllomyia*) and *Exodexia uruhuasi* Townsend, 1927 (allied to *Prophorostoma* Townsend, 1927), which were not found in various collections in Brazil. At one hand, it will be many years until Neotropical tachinologists will be freed from consulting the *Manual of Myiology* for their identifications. However, at the other hand, Townsend was meticulous about his types – designating and preserving them – and researchers today can examine most of them, mainly at the USNM, and evaluate them regardless of his descriptions and species concepts.

The last American dipterist who will be briefly discussed herein is Henry Reinhard. He was an entomologist who joined, in 1919, the Department of Entomology at Texas A&M University and worked at this institution until his retirement in 1960 (Burke, 1977). Reinhard began his career working with biological control of insects, but soon became interested in the taxonomy of

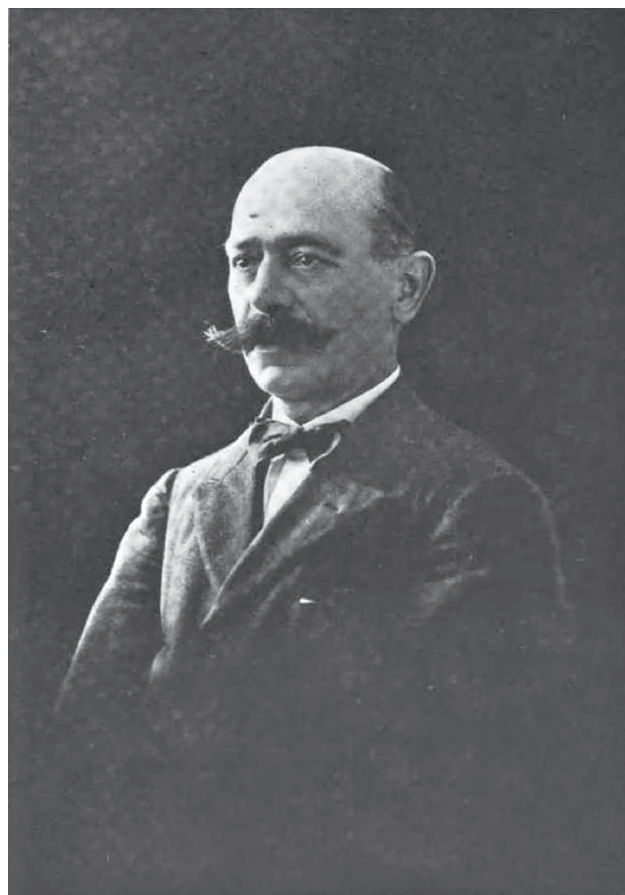
flies throughout his professional career (Burke, 1977). Additionally, Reinhard was a tremendous collector, describing many of his taxa from the College Station area in Texas (O'Hara *pers. comm.*). Reinhard published 107 scientific papers spanning a period of 55 years, describing 94 new genera and 529 new species of Tachinidae and Sarcophagidae (Burke, 1977); the CNC purchased Reinhard's collection (O'Hara *pers. comm.*). Of those taxa, 10 genera and 40 species were Neotropical Dexiinae (mainly from Mexico). From his taxonomic revision of *Chaetophlepsis* Townsend, 1915 (= *Campylocheta* Rondani, 1859) (Reinhard, 1952), *Prosenoides* Brauer & Bergenstamm, 1891 (Reinhard, 1954) and *Mochlosoma* Brauer & Bergenstamm, 1889 (Reinhard, 1958), the first ever revisions including Neotropical species of Dexiinae, the knowledge of this group was significantly enhanced. His workable keys, in addition to his accurate and detailed descriptions, which have always accompanied his works, contributed greatly to the work of future generations of tachinidologists, mainly by providing easy recognition of his taxa. Of the 10 new genera of Neotropical Dexiinae, all from Mexico, nine are still valid, with just one synonymized: *Parcipromus* Reinhard, 1958 = *Neosolieria* Townsend, 1927.

Before introducing the Latin American dipterists, the contributions of the Canadian William Thompson will be briefly shown. Although first introduced to tachinids by Townsend (Thorpe, 1973), Thompson developed a very different approach to their study. Instead of describing more and more species and genera, he focused on making redescrptions, keys and discussions about the biology of the first instar larvae of tachinids. We could see this approach in his most significant contribution to tachinid taxonomy, the *Tachinids of Trinidad* (Thompson, 1961, 1963a, 1963b, 1963c, 1963d, 1964, 1966, 1968). This work, which was published in various journals based in North and South America over seven years and totalized 827 pages, marked the end of his work as a scientist (Thorpe, 1973). Two works dealt with dexiines: his first on "the Voriines" and (Thompson, 1961) his other on "Echinomyiines, Dexiines, and allies" (Thompson, 1963a). In addition to giving one of the more workable and clearest keys for Neotropical Dexiinae, some of the most complete and detailed redescrptions (and descriptions) were delivered by him. Another highlight from these works is the section "Taxonomic Relationships", given for the genera that constituted Townsend's tribes; by discussing these groups with reference to the Nearctic and Palearctic faunas, he discussed the affinities of those taxa and pointed to new arrangements. For instance, by studying the larvae of some Iceliini, he suggested that their placement as Dexiinae by Townsend does not agree with the larval characters, and then suggested that they would be better placed in Tachininae, a suggestion later confirmed by Guimarães (1976). The 25 species, distributed in 19 genera, discussed by him have become a reference for anyone working with the Neotropical fauna. Hence, in the same way as what happened to Aldrich, all the species worked by Thompson in the *Tachinids of Trinidad* were referred to by Guimarães (1971). Just three

years separate the last contribution of Thompson and the publication of the Neotropical catalogue of Tachinidae by Guimarães (1971), a groundbreaking contribution for the tachinids and dexiines. In the next section, we will discuss this contribution and others made by Latin American scientists.

Latin American Dipterists enter the scene: Brèthes, Blanchard, Cortés and Guimarães

The first person to contribute to the knowledge of the dexiines from the Neotropics was Jean Brèthes (Fig. 4) (1871-1928). He was born in Saint-Sever, France and at the age of 19 traveled to Argentina, where he spent the rest of his life. Self-educated in entomology, he was designated in 1902 as the curator of the entomological section at MACN, and later became a professor of Applied Zoology at the University of La Plata (Dallas, 1928). He studied all insect orders, but he specialized in Hymenoptera and Diptera, described in excess of 1,100 species and published more than 200 works (Dallas, 1928). Among his new species, he described four species of Dexiinae. For the first time, types of Neotropical Dexiinae (those described by Brèthes) were deposited in



JUAN BRÈTHES
1871 – 1928

Figure 4. Jean Brèthes. Photograph from Ducloux (1928).

institutions in the Neotropics, mainly at MACN (Mulieri *et al.*, 2013). Brèthes' descriptions were somewhat brief and his new species were never compared with allied genera or given some kind of a diagnosis, thus causing some problems with the recognition of his new taxa. One of his main contributions to the knowledge of the Diptera fauna of Argentina, Paraguay and Uruguay was his *Catálogo de los dípteros de las Repúblicas del Plata* (Brèthes, 1908). This work was an update of the last catalog published by Enrique Lynch Arribálzaga (1882)⁹, which covered the Diptera of parts of Argentina and Uruguay. Brèthes (1908) listed eight species of Dexiinae – none described by a Latin American author – of which only two (*Zelia plumosa* (Wiedemann, 1830) and *Ptilodexia argentina* (Bigot, 1889)) are still valid, with one species (*Melanophora americana* Macquart, 1843 = *Melanophora roralis* (Linnaeus, 1758)) in Rhinophoridae and the remainder being unrecognized species of Dexiinae or unplaced Tachinidae (Guimarães, 1971).

Although he was not so important for the dexiines, Brèthes contributed largely to entomology in Argentina, where he was a founder member of the Entomological Society of Argentina. In addition, he received the title of *Doctor Honoris Causa* from the University of San Marcos in Peru (Dallas, 1928). Indeed, he was deeply attached to his origins, as most of his descriptions were written in French. However, this fact does not diminish his influence in Argentina, as emphasized by Ducloux (1928: 6), who wrote: "... la fauna argentina le proporcionó los temas de sus investigaciones ... no dudo en llamarlo con justo título entomólogo argentino, profesor nuestro, colaborador valioso en la obra de nacionalidad, en la formación de nuestra propia cultura". ["... the Argentine fauna provided the subjects of his research ... I do not hesitate to call him with a fair title of Argentine entomologist, our teacher, valuable collaborator in the work of our nationality, in the formation of our own culture".]

The Argentine Everard Blanchard (Fig. 5) (1895-1971) was also a distinguished entomologist in his country. This view is confirmed by Pirán (1972: 29), who considered him "... indiscutiblemente una de las figuras señeras de la entomología argentina". ["... indisputably one of the leading figures of Argentine entomology".] Although born in Argentina (Buenos Aires), he concluded his studies in the United States, at the University of Maine, where he graduated as an entomologist (Pirán, 1972). Blanchard worked for more than 30 years at the "División de Zoología Agrícola, Ministerio de Agricultura y Ganadería" in Buenos Aires and later was the director of the "Instituto de Patología Vegetal" in Córdoba (Pirán, 1972). Like Brèthes, he studied various insect orders, but mainly specialized in Diptera. He described numerous species of flies, mostly in the families Tachinidae and Sarcophagidae, and published more than 150 articles (Cortés, 1973a). One of the main contributions made by him was the description of the first genus of Neotropical Dexiinae: *Parabillaea* Blanchard, 1937, which was later synonymized with *Billaea* (Guimarães, 1971). The



Figure 5. Everard Blanchard. Photograph from Pirán (1972).

second (and third) oldest valid genera of Dexiinae are *Actinoplagia* Blanchard, 1940 and *Prosenactia* Blanchard, 1940. These are poorly-known genera that have never been comparatively studied and, as a result, some authors changed their placement: *Actinoplagia* was first described as belonging to Actiini (Siphonini in part), then Guimarães (1971) transferred it to Germariini, and finally O'Hara *et al.* (2020a) placed it in the problematic tribe Voriini; *Prosenactia* was also first described as belonging to Actiini, then Guimarães (1971) transferred it to Siphonini, and finally O'Hara *et al.* (2020a) once again placed it in Voriini. *Neopaedarium* Blanchard, 1943, on the other hand, is a less problematic genus that has been placed in Voriini since its description. In total, Blanchard described six genera in Dexiinae, with five still valid to this date (O'Hara *et al.*, 2020a), in addition to nine new species, just one of which has been doubtfully placed in synonymy¹⁰. Blanchard's descriptions are among the clearest and most detailed found for the Neotropical Dexiinae, comparable to those of Thompson. Another clear advancement, similarly to Brèthes, was that he gave tribal placements and discussed differences with

⁹ According to Amorim (2009), this was the first regional catalog of Diptera from South America.

¹⁰ *Voria ayersai* Blanchard, 1943 was tentatively placed in synonymy with *Voria ruralis* (Fallen, 1810) by Guimarães (1971). Fleming *et al.* (2017) kept this synonymy with *Voria ruralis*. However, the status of a doubtful synonymy with *Voria ruralis*, as pointed by Guimarães (1971), is better to be maintained as it seems premature to confirm this synonymy without further studying this species.

close genera in his descriptions, which formed the basis for his diagnosis. An unprecedented novelty was that most of his new species presented host records, perhaps due to Blanchard's interests in agriculture and because he worked for an institution that encouraged research in this area. On the flip side, a clear disadvantage were his close relation to and use of Townsend's works. The confusing nomenclature and abbreviations used by Townsend were also used by Blanchard in his descriptions. In addition, he was a "splitter", following the same (or even worse) "philosophy" as Townsend. Hence, as happened to Townsend, many of his genera were probably unnecessarily created and most will likely end up in synonymy. Nevertheless, he had three species described in his honor, including the dexiine *Ateloglutus (Ateloglutus) blanchardi* Cortés, 1979.

The next dipterist to be dealt with is the renowned Dr. Raúl Cortés (Fig. 6) from Chile (see O'Hara et al., 2021 for a complementary account). Between his first article on tachinids in 1944a, *Sinópsis histórica de los estudios sobre Taquínidos Chilenos (Dipt., Tachinidae)*, and his last article in 1992, *Nuevas sinonimias de taquinidos chilenos (Diptera: Tachinidae)*¹¹, he completed 48 years of study of Tachinidae. Cortés had a very productive career that brought the knowledge of Chilean tachinids to a level never reached for any other country of South America. After graduating as an agricultural engineer at the University of Chile (1940), he developed an interest on the biological and taxonomic aspects of tachinids because these insects are well known for being important for biological control. Thus, this intersection in his research led him to study the Tachinidae (Artigas, 2013). Cortés was a teacher at the Universidad de Chile in Santiago, Instituto de Agronomía at the Universidad de Tarapacá in Santiago and at the Instituto de Entomología of the Universidad Metropolitana de Ciencias de la Educación in Santiago, in which he advised various entomologists and carried out important agricultural research (Coscarón, 2002).

The dexiines from Chile and southern Argentina were extensively studied by him. Of the 29 new genera of Tachinidae described by Cortés, the first was the vorriine *Dischotrichia* Cortés, 1944b whose type species, *D. caelibata* Cortés, 1944b, was described from Valparaíso (Chile). A few years later, he published the Tachinidae part (Cortés, 1946) of the *Catálogo de los Dípteros de Chile* (Stuardo, 1946), an update of the older catalogue published in 1888 (Reed, 1888)¹². During his active years, Cortés described five new genera of Dexiinae, all valid to this day, in addition to 10 new species, all of which are valid and placed in their original genus. Hence, the great knowledge and work done by Cortés while studying these taxa is clear. A clear advantage he had, compared to Brèthes and Blanchard, was the knowledge of various Chilean tachinids types from foreign museums. As stated by him (Cortés, 1963), in 1957 he was able to

visit the USNM (types of Aldrich and Townsend), the NHMUK (types of Walker and Bigot) and the MNHN (majority of types of Macquart). In addition, he developed a close communication with the late Curtis W. Sabrosky (USNM) during the many years of his studies, who assisted him by identifying or comparing material with types in Washington (Cortés, 1986). As a result, his taxonomy was of the greatest quality. Two examples illustrate this clearly: his *Taquínidos de Tarapacá y Antofagasta* (Cortés & Campos, 1971) and *Taquínidos de Aysén (XI Región) y Magallanes (XII Región) Chile* (Cortés, 1986). The first work dealt with the knowledge of the Tachinidae of the Chilean desert that corresponds to the provinces of Tarapacá and Antofagasta; he gave new distribution information, presented workable keys for all the taxa found in this region and described some new species and genera. The second work dealt with some of the world's southernmost tachinids from the austral territories of Aysen and Magallanes in southern Chile, the southernmost tip of the Neotropical Region (or Andean Region). In all of these works, Cortés provided information about morphology, distribution, taxonomy, collector(s) and any host records available for the treated species.

One of Cortés's greatest contributions on Dexiinae was his work on the Dexiini of Chile and southern Argentina,



Figure 6. Photograph of Raúl Cortés (Courtesy of Christian R. González).

¹¹ Cortés's last contribution to tachinidology was a brief note about a case of multiparasitism in *Euphorocera* Townsend (Cortés, 1993).

¹² This was the second oldest catalogue of Diptera from South America (Amorim & Papavero, 2008).

namely: *Dasyuromyia* Bigot, 1885, *Hyadesimyia* Bigot, 1888, *Morphodexia* Townsend, 1931, *Pelycops* Aldrich, 1934, *Notodytes* Aldrich, 1934, which form a peculiar group within Dexiini because of their unique morphology, e.g., a bare arista and a very robust body. Cortés, as a recognition of his efforts and great accomplishments on the tachinids of Chile, had four species named in his honor: *Dasyuromyia cortesi* Gramajo, 2011, *Cyrtophleba cortesi* (Caltagirone, 1966), *Chaetocnephalia cortesi* González in González & Vergés, 2004 and *Leschenaultia cortesi* Toma & Guimarães, 2002. Finally, by invitation of Drs. Nelson Papavero and José Henrique Guimarães from the MZSP, Cortés had two opportunities (in 1979 and in 1983) to work on and identify Chilean and Argentinean Tachinidae in the MZSP collection (Cortés, 1986).

The last name to be treated in this essay is that of José Henrique Guimarães (Fig. 7), one of the greatest dipterists from Brazil, considered a worldwide authority on Neotropical Tachinidae. Throughout his career, from his first article, *Contribuição ao conhecimento do gênero Archytas Jaennicke, 1867 (Diptera, Tachinidae)*, (Guimarães, 1960) to his last, *Redescrição de Chrysotachina Brauer & Bergenstamm, 1889 (Diptera, Tachinidae) e re-descrição de seis espécies novas das Américas Central e do Sul*, (Nunez et al., 2002), he consolidated 42 years of experience as a reference for tachinids. He obtained an undergraduate degree as a veterinary doctor at the former Universidade Rural do Brasil (currently Universidade Federal Rural do Rio de Janeiro) in Rio de Janeiro in 1962, a Master of Sciences degree in Entomology at the University of California (USA) in 1969 and PhD in Zoology at Universidade de São Paulo in 1973. Since his undergraduate studies¹³, he showed great promise in his earlier taxonomic publications on tachinids; for instance, his aforementioned revision of *Archytas*, published in five parts over three years. This promise was fulfilled when Guimarães was admitted as a biologist in the then Department of Zoology of the Secretary of Agriculture of the State of São Paulo (current MZUSP). In the years 1966-1967, he received a grant from the "John Simon Guggenheim Memorial Foundation" for research on Diptera at the Systematic Entomology Laboratory, USDA, Washington, D.C., under the guidance of Dr. Curtis W. Sabrosky. There, he studied Townsend's types and the notes of other dipterists (mainly Aldrich and Sabrosky) who knew the tachinid types from other museums around the world, e.g., Aldrich's notes on the occasion of his visit to the NHMUK. At the same time, he started his tachinid contribution to *A Catalogue of the Diptera of the Americas South of the United States*, which resulted, in addition to other contributions, in publication of his Tachinidae catalog (Guimarães, 1971) and, later, of his host-parasite catalog for South American Tachinidae (Guimarães, 1977b). The Diptera catalog was the first ever for the entire Neotropical Region and took almost 20 years to complete (Papavero, 1966-1984). The formidable task of cataloguing the Tachinidae was delegated



Figure 7. Photograph of José Guimarães during his one-year (1966-1967) fellowship at the Systematic Entomology Laboratory, USDA (USA). Available: <https://www.gf.org/fellows/all-fellows/jose-henrique-guimaraes>.

to Guimarães, initiated in 1966 and published in 1971, resulting in an incredible number of 2,864 species in 944 genera; Guimarães (1971: 1) himself wrote that: "The family Tachinidae is one of the largest, most difficult, and the most challenging of the families of the Oestroidea complex". In face of the long-lasting taxonomic confusion (mainly created by Townsend), he chose to classify the species according to Townsend's views, with the modifications proposed by the authors of the tachinid chapter of *A catalog of the Diptera of America north of Mexico* (Sabrosky & Arnaud, 1965). Cortés (1973b: 260) published a review of Guimarães's work, and while stating that: "... catalogar los Taquínidos neotropicales lleva en sí el carácter de frustración y desaliento de una empresa que casi con seguridad no dejará a nadie satisfecho". ["... cataloging the Neotropical Tachinidae carries with it the character of frustration and discouragement of an enterprise that will almost certainly leave no one satisfied"]. he later praised Guimarães (Cortés, 1973b: 260): "El catálogo del Dr. Guimarães es, sin embargo, um esfuerzo encomiable y meritorio, y una útilísima herramienta para todos quienes en el Hemisferio Americano están dedicados o deseen dedicarse al estudio y taxonomía de este apasionante grupo de moscas multiformes, y por eso todos debemos estar reconocidos por tan importante aporte". ["The catalogue of Dr. Guimarães is, however, a commendable and meritorious effort, and a very useful tool for all those in the American hemisphere who are dedicated or wish to dedicate themselves to the study and taxonomy of this fascinating group of multiform flies, and for that reason we all must recognize such an important contribution"]. Guimarães' contribution to the knowledge of Neotropical Dexiinae can be compared to that of the greatest dipterists who worked on this fauna,

¹³ He was advised by Dr. Hugo de Souza Lopes, a renowned scientist who worked mainly with Sarcophagidae at Instituto Oswaldo Cruz in Rio de Janeiro state.

like Cortés, Townsend and Aldrich; however, differently from Townsend, his efforts were directed to developing revisions of genera and tribes. He revised the dexiine genera *Trichodura* Macquart (Guimarães, 1972) and *Paratheresia* Townsend (Guimarães, 1977c) (= *Billaea*); the tribes Oestrophiini (Guimarães, 1977a), Uramyini (Guimarães, 1980) and Sophiini (Guimarães, 1982); finally, he described the following new genera: *Aldrichiopa* Guimarães, 1971, *Neozelia* Guimarães, 1975, *Thelairaporia* Guimarães, 1980, *Neosophia* Guimarães, 1982 and *Sophiella* Guimarães, 1982. In total, Guimarães described 11 genera and 149 species of Tachinidae, of which five genera and 30 species (all valid) of Dexiinae. As a natural consequence, the first dexiines described by a Brazilian author were described by Guimarães. These species were a direct result of the revision of *Trichodura*: *T. amazonensis* Guimarães, 1972, *T. friburguensis* Guimarães, 1972, *T. longicauda* Guimarães, 1972, *T. sabroskyi* Guimarães, 1972 and *T. townsendi* Guimarães, 1972.

Later, Guimarães moved to the Department of Parasitology of the University of São Paulo (São Paulo). At this institution, he developed studies in the areas of urban entomology and veterinary entomology, retiring in 1993 to later return to MZUSP, where he continued his research, curation and supervision activities (Lamas *et al.*, 2008). Guimarães' legacy will remain intact, as the tribes and genera reviewed by him are the tachinids most prone for studies on evolution and the most indicated to further develop their potential as biological control, as they are readily recognized and all of their names and identities are clear and resolved. For instance, *Diatraea* spp. (Lepidoptera) are considered the most important pests of sugarcane in Colombia, and one of the tachinids used for their biological control is *Billaea claripalpis* (Wulp) (Bustillo, 2013); for the identification of this species, the revision of *Paratheresia* (= *Billaea*) by Guimarães (1977c), with its keys and descriptions, is extensively used to this day. By reestablishing the tribe Oestrophiini (Guimarães, 1971) and revising all of its genera and species (Guimarães, 1977a), Guimarães made open new researches that made it possible to assess that the possession of microtype eggs (Grillo & Alvarez, 1984) is the most distinguishing trait of this group, leading Santis & Nihei (2022) to recover this tribe as a monophyletic tribe. As a recognition of the importance of his work, Guimarães had had, until now, five species named after him: *Eucelatoria guimaraesi* Sabrosky, 1981, *Thysanopsis guimai* Toma, 2001, *Neosophia guimaraesi* Santis & Nihei, 2019, *Zelia guimaraesi* Dios & de Santis, 2019 and *Ormiophasia guimaraesi* Gudin & Nihei, 2019. It is important to note that the last three species were named after him by new Brazilian authors that are working with Neotropical Tachinidae and are collecting the fruits of Guimarães's work, which provides a solid ground and space for the new generation of tachinidologists to work with these insects in the Neotropics.

Finally, the type localities given by Guimarães will be briefly discussed. For six species of Dexiinae described by him, the type locality Muri, a city of Nova Friburgo in Santa Catarina state, is quoted. This place reflects

the collections that he and his wife, Gred Girid Koster Mueller Guimarães, carried out in the Muri district in the mountainous region of the state of Rio de Janeiro (Lamas *et al.*, 2008). Another type locality frequently seen in Guimarães's works is Nova Teutônia in Santa Catarina state, for specimens collected by a single person: Fritz Plaumann. A few bibliographic notes will be given hereafter in appreciation of the importance of this German-born and self-taught entomologist and naturalist who collected in Brazil for more than 60 years and sold parts of his collection to museums in Brazil and abroad.

Brief biography of Fritz Plaumann

Fritz Plaumann (Fig. 8) (1902-1994) was a German immigrant who arrived in Brazil, with his family, in 1924 and settled in the then German colony of Nova Teutônia, located in the western region of Santa Catarina, today the district of Nova Teutônia, city of Seara, Santa Catarina state (Lubenow, 2016). The practice of collecting was Fritz Plaumann's main source of income throughout his life, and this led to an intense commercialization of specimens and other biological materials for scientists and museums around the world (Lubenow, 2016), including CNC, USNM and the NHMUK. The majority of his collections were made at Alto Uruguai Catarinense in the district of Nova Teutônia, a semi-deciduous forest of western Santa Catarina. He was a collector in an isolated area,

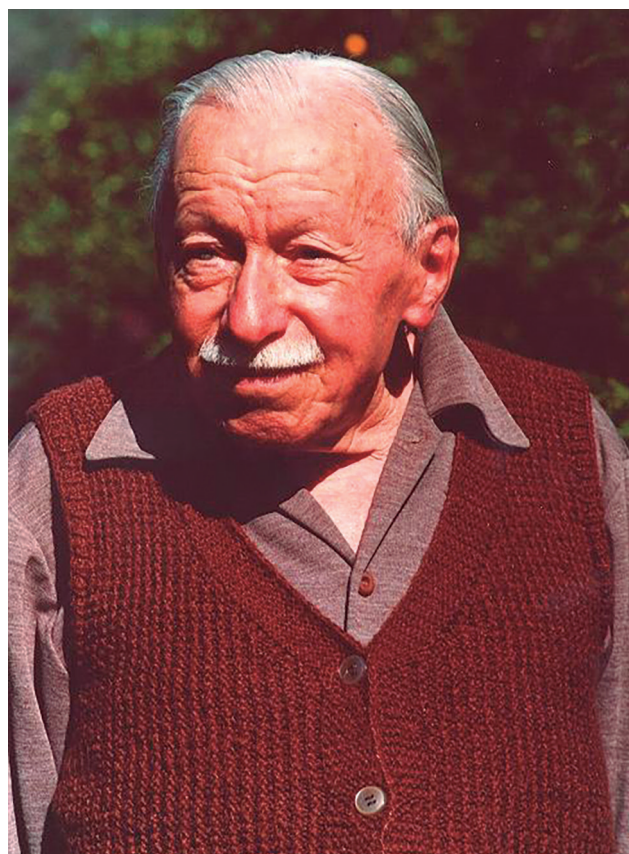


Figure 8. Fritz Plaumann. Available: http://www.museufritzplaumann.ufsc.br/galeria_fotos/photos/042.html.

who lived in the small German colony of Nova Teutônia, surrounded by the forests of the Santa Catarina backlands, an inhospitable, distant place far from civilization. However, he was in permanent contact with several researchers, entomologists, zoologists and scientific institutions (Lubenow, 2016).

Plaumann always searched for untouched forests in which to carry out his scientific collections. He knew that he would find many rarities in the closed forests that had not yet been affected by agricultural modernization and deforestation. One of his objectives was to work hard to increase knowledge of the Brazilian fauna and increase the regional collection to be used by other contemporary and future scientists (Plaumann *in* Spessatto, 2001). Thus, despite the many difficulties obtaining the literature and collecting tools, and despite being far from urban and scientific centers (Lubenow, 2016), Plaumann managed to form a collection of significant relevance for various areas of knowledge. He was also aware of the quality and rarity required for these insects to be used by scientists, and this can be seen in the following quote from his diaries (Plaumann *in* Spessatto, 2001: 99): “Muito dependia, naturalmente, também do bom estado do material enviado. Na ciência a avaliação do material não depende do tamanho do objeto, mas sim da raridade. Em se tratando de espécies novas, antes desconhecidas e não descritas, tais espécies existiam há muito tempo, porém não foram encontradas e registradas cientificamente”. [“Much, of course, also depended on the good condition of the material sent. In science, the evaluation of the material does not depend on the size of the object, but rather on its rarity. In the case of new species, previously unknown and not described, these species have existed for a long time, but they were not previously found and scientifically registered”]. However, in 1967, the Law on the protection of the fauna, which restricted the act of collecting specimens, came into force in Brazil. Over the following years, Plaumann had many problems in obtaining authorization to collect insects and send insect packages abroad (Lubenow, 2016). This, in addition to his old age, led Fritz Plaumann to sell his collection to the city of Seara in 1982, culminating in the foundation of the “The Fritz Plaumann Entomological Museum” in the same year. Construction ended in 1988, when the museum was finally opened. He continued to work on expanding the collection, in addition to being hired by Seara City Hall to be responsible for the museum (Lubenow, 2016). The collector and the collection were only separated by Plaumann’s death in 1994. According to Silva (1998), the museum contains a collection of more than 73.036 specimens and 9.601 species, which represents 19 insect orders, 318 families and 2.219 genera. Diptera are represented by 218 identified species, mostly Stratiomyidae (125), Asilidae (85), Tabanidae (61) and Sarcophagidae (30) (Silva, 1998). A very important fact is that of the 73.036 specimens, 55% are determined only to family, and for Diptera there are 2.215 undetermined specimens in the collection (Silva, 1998). In the face of this information, and considering the various museums that bought Plaumann’s collections, there is plenty of un-

determined material¹⁴; I wonder what remains to be discovered in this material, to which Plaumann dedicated his entire life, and which was collected with so much care and passion. As a keen observer, great naturalist and careful collector, Fritz Plaumann contributed one of the most detailed inventories of the local insect fauna ever carried out in the Neotropical Region (Silva, 1998). As a proof of his influence, three species of Dexiinae were named after Plaumann by Guimarães: *Billaea plaumanni* (Guimarães, 1977), *Euoestrophasia plaumanni* Guimarães, 1977 and *Uramya plaumanni* Guimarães, 1980, in addition to three more species belonging to other groups of Tachinidae. In total, Plaumann had 77 species of Diptera named in his honor and in recognition of his work. Furthermore, he received the highest award in the field of science in Germany: The Grand Cross of Scientific Merit.

Before ending this brief biographical overview of Plaumann, I think it is appropriate to quote the views and passion of Fritz Plaumann, as this is, was, and will be, the motive behind all entomological studies. The following excerpt came from the message written by Plaumann and read publicly at the Museum’s opening ceremony: “Que meu trabalho entomológico possa contribuir para incentivar a admiração e o amor à natureza e estimular a reflexão sobre a mesma”. [“May my entomological work contribute to encourage admiration and love for nature and stimulate reflection on it”].

Conclusion and the 21st Century

To end this limited and brief historical overview of Dexiinae at the Neotropics, it is noteworthy that in recent times some Brazilian scientists working from South American institutions have been revising Neotropical dexiines and enhancing their knowledge, *e.g.*, Nihei & Pansonato, 2006; Santis & Nihei, 2016; Santis, 2018; Dios & Santis, 2019; Santis, 2021; Alvarez-Garcia & Santis, 2021. Moreover, some dozens of new species – allied with some synonymies – based on morphology and COI sequences from the Area de Conservación Guanacaste in northwestern Costa Rica is being published in an effort to name and catalog all of the tachinid species reared by Dan Janzen’s team from this region by the Canadians Alan J. Fleming and D. Montgomery Wood in various works (*e.g.*, Fleming *et al.*, 2015, 2017, 2020). The great influence and knowledge of Wood (1933-2020), sadly recently deceased (O’Hara *et al.*, 2020b), about tachinids was also fundamental for the better circumscription of Neotropical Dexiinae. Wood’s (1985) “Taxonomic conspectus of the Blondeliini of North and Central America and the West Indies”, is a masterful revision of a difficult tribe of Tachinidae in which (Wood, 1985: 3) “One hundred and seventy-seven new generic-level synonyms, 67 new species-level synonyms, and 321 new combinations are proposed”. Although this does not concern the Dexiinae, it is one of the rare attempts to reverse

¹⁴ Even with eight type localities given in Guimarães’ works on Neotropical Dexiinae, there are still hundreds of undetermined specimens of Tachinidae collected by Plaumann at MZSP.

the over-split genera of Neotropical Tachinidae and sort out mixed type series of Wulp. Additionally, another of Wood's greatest legacy was his contribution to The Manual of Central American Diptera for a chapter on the Tachinidae (Wood & Zumbado, 2010) in which 232 tachinid genera, including 48 dexiines, were reviewed, keyed, and illustrated; this work constitutes one of the main advances for the identification of Neotropical Dexiinae to date. Lastly, the world checklist of world Tachinidae by O'Hara *et al.* (2020a) is a noteworthy advance for dexiines in general, as this work puts the poorly known genera of Neotropical Dexiinae in a more modern classification that reflects the findings of the phylogenetic analyses of Cerretti *et al.* (2014) and Stireman *et al.* (2019).

The 21st Century also witnessed the first phylogenetic studies of tachinids. For instance, the Exoristinae were the subject of Stireman's (2002) and Tachi & Shima's (2010) molecular studies; while Blaschke *et al.* (2018) dealt with the molecular phylogeny of Phasiinae. From these studies, only the one by Blaschke *et al.* (2018) included, even with only four species, Neotropical species. Somewhat the opposite happened with Lopes' *et al.* (2019) morphological phylogeny of Winthemiiini (Exoristinae) and Santis & Nihei (2022) phylogeny of Dufouriini, in which Neotropical taxa were the main sampling for these phylogenetic studies, the first ones to be authored by South American workers. More recently, the phylogenetic analysis of Tachinidae based on molecular data by Stireman *et al.* (2019) was the only one to use members of Dexiinae from the Neotropics. They sampled 504 taxa from around the world, including only 13 Neotropical dexiines, resulting in a monophyletic Dexiinae. Finally, in the only morphological phylogeny of the whole Tachinidae, Cerretti *et al.* (2014) recovered a paraphyletic Dexiinae, but with no Dexiinae (nor any other tachinid) from the Neotropics. The morphological homologies of tachinids are still very poorly explored, being a rich and open research theme to be further studied as it holds much promise in illuminating phylogenetic relationships. Additionally, the need for phylogenetic hypothesis incorporating immature stages is immensely lacking in the tachinid literature, being thoroughly considered only recently by Santis & Nihei (2022), which included data from larvae, puparia and eggs. This is a topic that has much potential to uncover reliable phylogenetic hypotheses of many difficult groups within Tachinidae. In summary, the Neotropical taxa of Dexiinae are in a much more comfortable position this Century than any before in its history: of the 285 genera of world Dexiinae, 159 occur in the Neotropics, and of these, 82 genera (or $\approx 52\%$) are still monotypic. This scenario is still problematic, however, with all these advances provided by these scientists, mainly from South America, that are delivering taxonomic stability and phylogenetic classification to these taxa, the overall understanding of Neotropical Dexiinae is going through a kind of taxonomic revolution never seen before.

CONFLICTS OF INTEREST: Author declare that there is no conflicts of interest.

FUNDING INFORMATION: This work was supported by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – process number 88882.333078/2019-01 for a Phd scholarship and by the Conselho Nacional de Desenvolvimento Tecnológico e Científico – process number 150141/2022-0 for a Postdoctoral Fellowship.

ACKNOWLEDGMENTS: This essay was part of my doctoral thesis. I would like to kindly thank Drs. Silvio Nihei (Universidade de São Paulo, Brazil), Carlos Lamas (MZSP), Leandro de Assis (Universidade Federal de Minas Gerais, Brazil) and Gustavo Caponi (Universidade Federal de Santa Catarina, Brazil) for their constructive and encouraging discussion of the thesis. Thanks to Pablo Mulieri (MACN), Rodrigo Dios (Universidade de São Paulo, Brazil) and Filipe Gudin (Universidade de São Paulo, Brazil) for many constructive criticisms that greatly enhanced the first draft of this essay. I also wish to express my gratitude to reviewer Daniel Whitmore (Staatliches Museum für Naturkunde, Germany) and James O'Hara (CNC) for their detailed and thoughtful revision on the submitted manuscript. Thanks also to Christian R. González (Universidad Metropolitana de Ciencias de la Educación, Chile) for kindly providing Cortés' photograph.

REFERENCES

- Aldrich, J.M. 1934. Tachinidae. In: *Diptera of Patagonia and South Chile based mainly on material in the British Museum (Natural History)*. London, British Museum. v. 7, fasc. 1.
- Alvarez-García, D.M. & Santis, M.D. 2021. Redescription of the Neotropical species *Trichodischia soror* Bigot, 1885 (Diptera: Tachinidae), with a new generic synonymy. *Papéis Avulsos de Zoologia*, 61(64): 1-7, e20216164. <https://www.scielo.br/j/paz/a/TqRnPLsFD7mdWmMmn5mDgCJ/?format=pdf&lang=en>.
- Amorim, D.S. 2009. Neotropical Diptera diversity: richness, patterns, and perspectives. In: Pape, T.; Bickel, D. & Meier, R. (Eds.). *Diptera diversity: status, challenges and tools*. Copenhagen, Brill Press. p. 71-97.
- Amorim, D.S. & Papavero, N. 2008. A journal for the systematics and biogeography of Neotropical Diptera, 250 years after the publication of the tenth edition of the *Systema Naturae*. *Neotropical Diptera*, 1: 1-5.
- Amorim, D.S.; V.C. Silva & Balbi, M.I.P.A. 2002. Estado do conhecimento dos Diptera neotropicales. In: Costa, C.; Vanin, S.A.; Lobo, J.M. & Melic, A. (Eds.). *Proyecto de Red Iberoamericana de Biogeografía y Entomología Sistemática, PRIBES 2002* (pp. 29-36). [Sociedad Entomológica Aragonesa y CYTED]. (Monografías Tercer Milenio, Zaragoza, 2).
- Anonymous. 1893. Obituary: J.-M.-F. Bigot. *The Entomologist's Monthly Magazine*, 29: 145.
- Arnaud, P.H. & Owen, T.C. 1981. Charles Howard Curran (1894-1972). *Myia*, 2: 1-393.
- Artigas, J.N. 2013. Historia de la entomología en Chile. In: Dr. J.N. Artigas, Coach. <http://jorgeartigas.cl/documentos/conferencias/historia-de-la-entomologia-en-chile>.
- Asúa, M. & French, R. 2005. *A new world of animals: early modern europeans on the creatures of Iberian America*. Aldershot/Burlington, VT, Ashgate.
- Austen, E.E. 1907. The synonymy and generic position of certain species of Muscidae (*sens. lat.*) in the collection of the British Museum, described by the late Francis Walker. *Annals and Magazine of Natural History, Serie 7*, (19): 326-347.

- Bardell, D. 1983. The first record of microscopic observations. *BioScience*, 33(1): 36-38.
- Bardell, D. 1993. Hodierna's "The eye of the fly": the first book of microscopic observations. *BioScience*, 43(8): 570-573.
- Barnosky, A.D.; Matzke, N.; Tomiya, S.; Wogan, G.O.; Swartz, B.; Quental, T.B.; Marshall, C.; McGuire, J.L.; Lindsey, E.L.; Maguire, K.C.; Mersey, B. & Ferrer, E.A. 2011. Has the Earth's sixth mass extinction already arrived? *Nature*, 471(7336): 51-57. <https://www.nature.com/articles/nature09678>.
- Bellardi, L. 1859. Saggio di Ditterologia Messicana. Torino, Dalla Stamperia Reale. Parte I, 80p., 2 pls.
- Bellardi, L. 1861. Saggio di Ditterologia Messicana. Torino, Dalla Stamperia Reale Parte II, 99 pp., 2 pls.
- Bellardi, L. 1862. Saggio di Ditterologia Messicana. Appendice, Saggio di Ditterologia Messicana. Appendice Saggio di Ditterologia Messicana. Appendice v. 2, 28p., 1 pl., (Memorie della Reale Accademia delle Scienze di Torino, Serie 2, Tomo 21, p. 103-225). <https://www.biodiversitylibrary.org/page/36388584#page/294/mode/1up>.
- Bilimek, D. 1867. Fauna der Grotte Cacahuamilpa in Mexiko. *Verhandlungen der Zoologisch-botanischen Gesellschaft in Wien*, 17(4): 901-908.
- Blanchard, E.E. 1937. Dípteros argentinos nuevos o pocos conocidos. *Revista de la Sociedad Entomológica Argentina*, 9: 35-58.
- Blanchard, E.E. 1940. Apuntes sobre muscoideos argentinos. *Anales de la Sociedad Científica Argentina*, 129: 224-246.
- Blanchard, E.E. 1943. Los dípteros muscoideos del Museo de La Plata. Primera parte: Tachinidae. [Concl.] *Revista del Museo de La Plata (Nueva Serie), Sección Zoología*, 3: 123-161.
- Blaschke, J.S.; Stireman III, J.O.; O'Hara, J.E.; Cerretti, P. & Moulton, J.K. 2018. Molecular phylogenetics and piercer evolution in the bug-killing flies (Diptera: Tachinidae: Phasiinae). *Systematic Entomology*, 43: 218-238.
- Brauer, F. & Bergenstamm, J.E. von. 1889-1895. *Die Zweiflügler des Kaiserlichen Museums zu Wien*. IV-VII. Vorarbeiten zu einer Monographie der *Muscaria Schizometopa (exclusive Anthomyidae)*. Partes I-IV. F. [Denkschriften der Kaiserlichen Akademie der Wissenschaften, Wien, 56]
- Brèthes, J. 1908. *Catálogo de los dípteros de las Repúblicas del Plata*. *Anales del Museo Nacional de Buenos Aires, Ser. 3*, 9: 277-305.
- Brèthes, J. 1918. Description d'une nouvelle "Dexiinae" argentine. *Physis*, 4(16): 115.
- Burke, H.R. 1977. Henry Jonathan Reinhard 1892-1976. *Journal of Economic Entomology*, 70: 272.
- Bustillo, P.A.E. 2013. *Insectos plaga y organismos benécos del cultivo de la caña de azúcar en Colombia*. Bogotá. (Document No. 26501)
- Cardinale, B.J.; Duffy, E.; Gonzalez, A.; Hooper, D.U.; Perrings, C.; Venail, P.; Narwani, A.; Mace, G.M.; Tilman, D.; Wardle, D.A.; Kinzig, A.P.; Daily, G.C.; Loreau, M.; Grace, J.B.; Larigauderie, A.; Srivastava, D. & Naeem, S. 2012. Biodiversity loss and its impact on humanity. *Nature*, 486(7401): 59-67.
- Cerretti, P.; O'Hara, J.E.; Wood, D.M.; Shima, H.; Inclan, D.J. & Stireman III, J.O. 2014. Signal through the noise? Phylogeny of the Tachinidae (Diptera) as inferred from morphological evidence. *Systematic Entomology*, 39(2): 335-353.
- Cortés, R.P. 1944a. Sinopsis histórica de los estudios sobre Taquinidos Chilenos (Dipt., Tachinidae). *Boletín de Sanidad Vegetal*, Chile, 3(1): 5-11.
- Cortés, R.P. 1944b. *Trichodischia* Bigot y *Dischotrichia* n. gen., generos nuevos de taquinidos para Chile (Dipt. Tachinidae). *Revista Universitaria (Universidad Católica de Chile)*, 29: 49-58.
- Cortés, R.P. 1946. Tachinidae. In: Stuardo, C. (Ed.). *Catálogo de los Dípteros de Chile*. Santiago do Chile, Ministerio da Agricultura. p. 172-185.
- Cortés, R.P. 1963. Tipos de Tachinidae (Diptera) chilenos en algunos museos extranjeros. *Revista Universitaria, Universidad Católica de Chile*, 47: 241-252.
- Cortés, R.P. 1973a. Dr. Everard E. Blanchard. *Revista Chilena de Entomología*, 7: 261-263.
- Cortés, R.P. 1973b. Comentarios Bibliográficos: Dr. J.H. Guimarães, A Catalogue of the Diptera of the Americas South of the United States, 104, Tachinidae. *Revista Chilena de Entomología*, 7: 259-260.
- Cortés, R.P. 1986. Taquinidos de Aysen (XI Región) y Magallanes (XII Región) Chile (Diptera: Tachinidae). *Acta Entomológica Chilena*, 13: 133-160.
- Cortés, R.P. 1993. An extraordinary case of multiparasitism in tachinid flies. *The Tachinid Times*, 6: 2.
- Cortés, R.P. & Campos, L.E. 1971. Taquinidos de Tarapacá y Antofagasta (Diptera: Tachinidae). *Anales U. del Norte*, 8: 1-104.
- Coscarón, S. 2002. Raúl E. Cortés Peña (1915-2001). *Revista de la Sociedad Entomológica Argentina*, 61(1-2): 56.
- Crosskey, R.W. 1971. The type-material of Australasian, Oriental and Ethiopian Tachinidae (Diptera) described by Macquart and Bigot. *Bulletin of the British Museum (Natural History)*. *Entomology*, 25: 251-305 + 1 pl.
- Crosskey, R.W. 1974. The British Tachinidae of Walker and Stephens (Diptera). *Bulletin of the British Museum (Natural History)*. *Entomology*, 30: 267-308.
- Curran, C.H. 1934. *The Diptera of Kartabo, Bartica district, British Guiana*, with descriptions of new species from other British Guiana localities. *Bulletin of the American Museum of Natural History*, 66: 287-532.
- Dallas, E.D. 1928. Dr. Juan Brèthes. Bio-bibliografía. *Revista de la Sociedad Entomológica Argentina*, 7: 103-107.
- Dios, R. de V.P. & Santis, M.D. 2019. A new synonym for *Zelia* Robineau-Desvoidy, 1830 (Diptera, Tachinidae), the genus *Opsozelia* Townsend, 1919, with the description of three new species. *ZooKeys*, 880: 113-133.
- Ducloux, E.H. 1928. Profesor Juan Brèthes, 1871-1928. *Revista de la Facultad de Agronomía*, 18: 5-12.
- Elliott, J.H. 1992. *The Old World and the New, 1492-1650*. Cambridge, Cambridge University Press.
- Evenhuis, N.L. 2018. The life and work of Francis Walker (1809-1874). *Fly Times, Supplement 2*: 1-101.
- Evenhuis, N.L. & Pont, A.C. 2004. The Diptera genera of Jacques-Marie-Frangile Bigot. *Zootaxa*, 751: 1-94.
- Evenhuis, N.L. & Pont, A.C. 2013. Nomenclatural studies toward a world catalog of Diptera genus-group names. III. Christian Rudolph Wilhelm Wiedemann. *Zootaxa*, 3638: 1-75.
- Evenhuis, N.L.; Pape, T. & Pont, A.C. 2016. Nomenclatural studies toward a world list of Diptera genus-group names. Part V: Pierre-Justin-Marie Macquart. *Zootaxa*, 4172(1): 001-211.
- Evenhuis, N.L.; Pape, T.; Pont, A.C. & Thompson, F.C. 2010. Flying after Linnaeus: Diptera names since *Systema Naturae* (1758). In: Polaszek, A. (Ed.). *Systema Naturae 250 – The Linnaean Ark*. CRC Press, p. 75-82.
- Evenhuis, N.L.; Pont, A.C. & Whitmore, D. 2015. Nomenclatural studies toward a world list of Diptera genus-group names. Part IV: Charles Henry Tyler Townsend. *Zootaxa*, 3978: 1-362.
- Fleming, A.J.; Wood, D.M.; Janzen, D.; Hallwachs, W. & Smith, M.A. 2015. Seven new species of *Spathidexia* Townsend (Diptera: Tachinidae) reared from caterpillars in Area de Conservación Guanacaste, Costa Rica. *Biodiversity Data Journal*, 3(e4597): 1-97.
- Fleming, A.J.; Wood, D.M.; Smith, M.A.; Dapkey, T.; Hallwachs, W. & Janzen, D.H. 2017. A new species of *Voria* Robineau-Desvoidy (Diptera: Tachinidae) from Area de Conservación Guanacaste in northwestern Costa Rica. *Biodiversity Data Journal*, 5 (e20123): 1-19. <https://doi.org/10.3897/BDJ.5.e20123>.
- Fleming, A.J.; Wood, D.M.; Smith, M.A.; Dapkey, T.; Hallwachs, W. & Janzen, D.H. 2020. Revision of *Telothyria* van der Wulp (Diptera: Tachinidae) and twenty-five new species from Area de Conservación Guanacaste in northwestern Costa Rica with a key to Mesoamerican species. *Biodiversity Data Journal*, 8: (e47157): 1-142. <https://doi.org/10.3897/BDJ.8.e47157>.
- Giglio-Tos, E. 1892. Ditteri del Messico. Part I. Stratiomyidae – Syrphidae. *Carlo Clausen, Torino*, 1-72.

- Godman, F.D. 1915. Introductory volume. In: Godman, F.D. & Salvin, O. (Eds.). *Biologia Centrali-Americana*. London. v. 1, viii + 149p., 2 pls., 8 maps. London.
- Gómez-Aguado, de A.; Guadalupe C. & Palacio Prieto, J.L. 2016. La gruta de Cacahuamilpa: un siglo de historia (1835-1936). *Secuencia*, 94: 110-147.
- Grillo, H. & Alvarez, M. 1984. Estudios biológicos de *Cenosoma* n. sp. (Diptera; Tachinidae; Oestrophasiini) parásito de los adultos de *Pachneus litus* Germar (Coleoptera: Curculionidae). *Agris Science*, 11: 95-118. <https://agris.fao.org/agris-search/search.do?recordID=CU2011100450>.
- Guimarães, J.H. 1960. Contribuição ao conhecimento do gênero *Archytas* Jaenicke, 1867 (Diptera, Tachinidae). *Memórias do Instituto Oswaldo Cruz*, 58: 115-124.
- Guimarães, J.H. 1971. Family Tachinidae (Larvaevoridae). In: *A catalogue of the Diptera of the Americas South of the United States. Vol. 104*. São Paulo, Departamento de Zoologia, Secretaria da Agricultura. 1-333.
- Guimarães, J.H. 1972. A review of the genus *Trichodura* Macquart (Diptera, Tachinidae). *Arquivos de Zoologia*, 22: 1-25.
- Guimarães, J.H. 1975. *Neozelia alini*, gen. et sp. n. (Diptera: Tachinidae), a parasite of cerambycids (Coleoptera), with a listing of Tachinidae parasite of Cerambycidae. *Papéis Avulsos de Zoologia*, 29: 37-44.
- Guimarães, J.H. 1976. A review of the tribe Iceliini (Diptera, Tachinidae) with descriptions of one new genus and two new species from Brazil. *Studia Entomologica*, 19: 173-186.
- Guimarães, J.H. 1977a. A review of the tribe Oestrophasiini Brauer & Bergenstamm (Diptera, Tachinidae). *Papéis Avulsos de Zoologia*, 30(15): 215-238.
- Guimarães, J.H. 1977b. Host-parasite and parasite-host catalogue of South American Tachinidae (Diptera). *Arquivos de Zoologia*, 28: 1-131.
- Guimarães, J.H. 1977c. A revision of the genus *Paratheresia* Townsend (Diptera: Tachinidae, Theresiini). *Papéis Avulsos de Zoologia*, 30(18): 267-288.
- Guimarães, J.H. 1980. Revision of the South American Uramyini (Diptera, Tachinidae). *Papéis Avulsos de Zoologia*, 33(10): 191-219.
- Guimarães, J.H. 1982. A study of the South American Sophiini, with the description of new genera and species from Brazil (Diptera, Tachinidae). *Revista Brasileira de Entomologia*, 26(2): 163-171.
- Handlirsch, A. 1905. Friedrich Moritz Brauer. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien*, 55: 129-166 + 1 pl.
- Hansen, D.E. & Toma, R. 2004. Visit to Itaquaquecetuba (Brazil) and the old homestead of C.H.T. Townsend. *The Tachinid Times*, 17: 3-8.
- Lamas, C.J.E.; Nihei, S.S. & Papavero, N. 2008. Necrológio. José Henrique Guimarães (08.10.1937-14.10.2008). *Revista Brasileira de Entomologia*, 52(4): 674-676.
- Lopes, A.C.; Carvalho, C.J.B. de & Nihei, S.S. 2019. Morphological phylogeny and classification of Winthemini (Diptera: Tachinidae: Exoristinae). *Systematic Entomology*, 45: 48-59.
- Lubenow, A.M. 2016. Um alemão em Santa Catarina: A coleção entomológica Fritz Plaumann. *Museologia e Interdisciplinaridade*, 5(9): 109-119.
- Lynch Arribáizaga, E. 1882. Catálogo de los dípteros hasta ahora descritos que se encuentran en las repúblicas del Río de La Plata. *Boletín de la Academia Nacional de Ciencias en Córdoba*, 4: 109-152.
- Macquart, P.-J.-M. 1835. *Histoire naturelle des insectes. Diptères*. Tome deuxième. Paris, N.E. Roret.
- Macquart, P.-J.-M. 1838. *Diptères exotiques nouveaux ou peu connus*. Paris, Roret. v. 1, pt. 1, p. 5-221, 25 pls.
- Macquart, P.-J.-M. 1846. *Diptères exotiques nouveaux ou peu connus*. Supplément. *Mémoires de la Société Royale des Sciences, de l'Agriculture et des Arts de Lille*, 1844: 133-364 + 20 pls.
- Macquart, P.-J.-M. 1850. *Facultés intérieures des animaux invertébrés*. Paris, Roret, lxxxii + 272p. <https://www.biodiversitylibrary.org/item/104193#page/9/mode/1up>.
- Marcgrave, G. 1648. *Historiae rerum naturalium Brasiliae, Auspicio et beneficio Illustriss. I. Mauritii Com. Nassau illius Provinciae et Maris summi Praefecti adornata. In qua non tantum Plantae et Animalia, sed et Indigenarum morbi, ingenia et mores describuntur et iconibus supra quingentas illustrantur*. Lugdun. Batavorum [= Leyden] et Amstelodami [= Amsterdam], Franciscum Hackium & Lud. Elzevirium, [x] + 122 + [iv] + [iv] + 293 + [13]p.
- Mesnil, L.P. 1980. 64f. *Dexiinae. Die Fliegen der Palaearktischen Region 9 (Lieferung 323)*. Stuttgart. 52p.
- Morrone, J.J. 2014. Biogeographical regionalization of the Neotropical region. *Zootaxa*, 3782(1): 1-110.
- Mulieri, P.R.; Patitucci, L.D.; Bachmann, A.O. & O'Hara, J.E. 2013. The type specimens of Tachinidae (Diptera) housed in the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires. *Zootaxa*, 3670(2): 157-176.
- Nihei, S.S. & Pansonato, M.P. 2006. Revision of *Prophorostoma* Townsend, 1927 (Diptera, Tachinidae, Dexiinae), with the description of a new species. *Papéis Avulsos de Zoologia*, 46(21): 239-244.
- Nunez, E.; Couri, M.S. & Guimarães, J.H. 2002. Redescricao de *Chrysotachina* Brauer & Bergenstamm, 1889 (Diptera, Tachinidae) e redescricao de seis espécies novas das Américas Central e do Sul. *Boletim do Museu Nacional, Rio de Janeiro*, 478: 1-23.
- O'Hara, J.E. 2013. History of tachinid classification (Diptera, Tachinidae). *ZooKeys*, 316: 1-34.
- O'Hara, J.E. & Henderson, S.J. 2020. *World genera of the Tachinidae (Diptera) and their regional occurrence. Version 11.0*. PDF document, 90p. Available: <http://www.nadsdiptera.org/Tach/WorldTachs/Genera/Worldgenera.htm>.
- O'Hara, J.E.; Henderson, S. & Wood, D.M., 2020a. *Preliminary checklist of the Tachinidae (Diptera) of the world. Version 2.1*. PDF document, pp. 1039. Available: <http://www.nadsdiptera.org/Tach/WorldTachs/Checklist/Worldchecklist.html>. Access: 01/09/2020.
- O'Hara, J.E.; Cumming, J.M. & Borkent, A. 2020b. *In memory. Donald Montgomery (Monty) Wood (22 December 1933 – 24 August 2020)*. *Bulletin of the Entomological Society of Canada*, 52: 206-210.
- O'Hara, J.E.; Wood, D.M. & González, C.R. 2021. Annotated catalogue of the Tachinidae (Insecta, Diptera) of Chile. *ZooKeys*, 1064: 1-200.
- Osten-Sacken, C.R. 1858. Catalogue of the described Diptera of North America. *Smithsonian Miscellaneous Collections*, 3(1)1-92.1862.
- Oviedo, G.F. de. 1851 [1535]. *Historia general y natural de las Indias, islas y tierra firme del mar océano*. Ed. José Amador de los Ríos. Madrid, Imprenta de la Real Academia Española.
- Palacio-Vargas, J.G.; Juberthie, C. & Reddell, J. 2015. Encyclopedia Biospeologica, Vol. IIa, México. *Mundos Subterráneos*, 25-26: 1-101.
- Papavero, N. (Ed.). 1966-1984. *A catalogue of the Diptera of the Americas South of the United States*. Departamento de Zoología, Secretaria de Agricultura, São Paulo. [102 separate fascicles]
- Papavero, N. 1971. *Essays on the history of Neotropical Dipterology*, with special reference to collectors (1750-1905). Vol. 1. São Paulo, Museu de Zoologia, Universidade de São Paulo.
- Papavero, N. 1973. *Essays on the history of Neotropical Dipterology*, with special reference to collectors (1750-1905). Vol. 2. São Paulo, Museu de Zoologia, Universidade de São Paulo.
- Papavero, N. & Couri, M.S. 2012a. Essays on the History of Brazilian Dipterology I. The first notices about Brazilian Diptera. *Revista Brasileira de Entomologia*, 56(1): 1-6.
- Papavero, N. & Couri, M.S. 2012b. Essays on the history of Brazilian Dipterology II. Notices about Brazilian Diptera (17th Century). *Revista Brasileira de Entomologia*, 56(2): 133-141.
- Pirán, A.A. 1972. Everardo E. Blanchard. *Revista de la Sociedad Entomológica Argentina*, 34: 29-30.

- Polách, R. 2013. Dominik Bilimek: Z Nového Jičína do Mexika [Dominik Bilimek: From Nový Jičín to Mexico]. Available: https://novojičinsky.denik.cz/zpravy_region/dominik-bilimek-z-noveho-jicina-do-mexika-20130214.html.
- Pont, A.C. 1996. Some reflections on the history of systematic Dipterology. *Dipterists Digest, Series 2*, 2: 49-70.
- Reed, E.C. 1888. Catalogo de los insectos dipteros de Chile. *Anales de la Universidad de Chile*, 73: 1-46.
- Reinhard, H.J. 1952. Muscoid flies of the genus *Chaetophlepsis* (Diptera). *Journal of the Kansas Entomological Society*, 25: 13-21.
- Reinhard, H.J. 1954. Parasitic flies of the genus *Prosenoides* (Tachinidae, Diptera). *Canadian Entomologist*, 86: 408-413.
- Reinhard, H.J. 1958. Parasitic flies of the genus *Mochlosoma* (Tachinidae, Diptera). *Canadian Entomologist*, 90: 98-110.
- Robineau-Desvoidy, J.B. 1830. Essai sur les myodaires. *Mémoires présentés par divers savans à l'Académie Royale des Sciences de l'Institut de France*, 2: 1-813.
- Roth, H.J. 2019. Bilimek, Dominik, In: Biographia Cisterciensis (Cistercian Biography), version from October 16, 2019. Available: http://www.zisterzienserlexikon.de/wiki/Bilimek,_Dominik.
- Sabrosky, C.W. & Arnaud-Jr., P.H. 1965. Family Tachinidae (Larvaevoridae). In: Stone, A.; Sabrosky, C.W.; Wirth, W.W.; Foote, R.H. & Coulson, J.R. (Eds.). *A catalog of the Diptera of America north of Mexico*. Washington, United States Department of Agriculture. p. 961-1108.
- Santis, M.D. 2018. A new genus and species of Sophiini Townsend, 1936 (Diptera: Tachinidae) from Brazil, with an updated key to the genera of the tribe. *Zootaxa*, 4500: 433-442.
- Santis, M.D. 2021. A review of *Ophirodextia* Townsend, 1911 (Diptera: Tachinidae). *Journal of Natural History*, 55 (3-4): 151-161.
- Santis, M.D. & Nihei, S.S. 2016. Review of the New World genus *Cholomyia* (Diptera, Tachinidae), with a new species from Costa Rica. *Revista Brasileira de Entomologia*, 60(3): 217-226.
- Santis, M.D. & Nihei, S.S. 2022. Phylogenetic analysis of the tribe Dufouriini (Diptera, Tachinidae) using a total evidence approach based on adult and immature stages. *Arthropod Systematics & Phylogeny*, 80: 1-38.
- Selander, R.B. & Vaurie, P. 1962. A gazetteer to accompany the "Insecta" volumes of the "Biologia centrali-americana". *American Museum Novitates*, 2099: 1-70.
- Silva, R.R. 1998. A coleção entomológica do Museu Fritz Plaumann. *Biotemas*, 11(2): 157-164.
- Smith, H.H. 1879. *Brazil: the Amazons and the coast*. New York, Charles Scribner's Sons.
- Smith, H.H. 1922. *Do Rio de Janeiro a Cuyabá*. São Paulo, Melhoramentos.
- Snellen, P.C.T. 1900. Ter herinnering aan F.M. van der Wulp. *Tijdschrift voor Entomologie*, 43: 1-11.
- Spessatto, M.B. (Org.). 2001. *O diário de Fritz Plaumann*. Chapecó, Argos.
- Stireman III, J.O. 2002. Phylogenetic relationships of tachinid flies in subfamily Exoristinae (Tachinidae: Diptera) based on 28S rDNA and elongation factor-1a. *Systematic Entomology*, 27(4): 409-435.
- Stireman III, J.O.; Cerretti, P.; O'Hara, J.E.; Blaschke, J.D. & Moulton, J.K. 2019. Molecular phylogeny and evolution of world Tachinidae (Diptera). *Molecular Phylogenetics and Evolution*, 139: 106358. <https://doi.org/10.1016/j.ympev.2018.12.002>.
- Stuardo, C. 1946. *Catálogo de los Dípteros de Chile*. Santiago de Chile, Ministério de Agricultura. Dirección general de Agricultura, Imprenta Universitaria.
- Tachi, T. & 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.
- Thompson, W.R. 1961. The tachinids (Diptera) of Trinidad. I. The Voriines. *Transactions of the American Entomological Society*, 87: 21-44.
- Thompson, W.R. 1963a. The tachinids of Trinidad. II. Echinomyiines, Dexiines, and allies. *Canadian Journal of Zoology*, 41(3): 335-576.
- Thompson, W.R. 1963b. The tachinids of Trinidad. III. The goniines with microtype eggs (Dipt. Tachinidae). *Studia Entomologica*, 6: 257-404.
- Thompson, W.R. 1963c. The tachinids of Trinidad. IV. Winthemiines. *Canadian Entomologist*, 95: 953-995.
- Thompson, W.R. 1963d. The tachinids of Trinidad. V. Siphosturmiines and masiphysiines. *Canadian Entomologist*, 95: 1292-1320.
- Thompson, W.R. 1964. The tachinids of Trinidad. VI. The larviparous goniines of the carceliine type (Diptera, Tachinidae). *Studia Entomologica*, 7: 97-151.
- Thompson, W.R. 1966. The tachinids of Trinidad. VII. The larviparous goniines with broad cheeks (Dipt. Tachinidae). *Studia Entomologica*, 8: 353-434.
- Thompson, W.R. 1968. The tachinids of Trinidad. VIII. Phorocerines. *Memoirs of the Entomological Society of Canada*, 56: 1-207.
- Thorpe, W.H. 1973. William Robin Thompson: 1887-1972. *Biographical Memoirs of Fellows of the Royal Society of London*, 19: 655-678.
- Townsend, C.H.T. 1916. New and noteworthy Brazilian Muscoidea collected by Herbert H. Smith. *Bulletin of the American Museum of Natural History*, 35: 15-22.
- Townsend, C.H.T. 1927. Synopse dos generos muscideos da região humida tropical da America, com generos e especies novas. *Revista do Museu Paulista*, 15: 203-385 + 4 pls. + addenda; + errata.
- Townsend, C.H.T. 1928. A system of abbreviations for use in muscoid description. *Journal of the New York Entomological Society*, 36(2): 169-174.
- Townsend, C.H.T. 1934-1942. *Manual of myiology* in twelve parts. São Paulo, Itaquaquecetuba, Privately published by Charles Townsend & Filhos.
- Wheeler, Q.D. 2020. A taxonomic renaissance in three acts. *Megataxa*, 1: 4-8. <https://www.mapress.com/mt/article/view/megataxa.1.1.2>.
- Wiedemann, C.R.W. 1819. Brasilianische Zweiflügler. *Zoologisches Magazin (Kiel)*, 1(3): 40-56.
- Wiedemann, C.R.W. 1830. *Aussereuropäische zweiflügelige Insekten*. Zweiter Theil. Hamm, Schulz.
- Williston, S.W. 1888. Diptera Brasiliana, Ab H.H. Smith Collecta. Part I: Stratiomyidæ, Syrphidæ. *Transactions of the American Entomological Society and Proceedings of the Entomological Section of the Academy of Natural Sciences*, 15(4): 243-292.
- Wood, D.M. 1985. A taxonomic conspectus of the Blondeliini of North and Central America and the West Indies (Diptera: Tachinidae). *Memoirs of the Entomological Society of Canada*, 132: 1-130.
- Wood, D.M. & Zumbado, M.A. 2010. Tachinidae (tachinid flies, parasitic flies). In: Brown, B.V.; Borkent, A.; Cumming, J.M.; Wood, D.M.; Woodley, N.E. & Zumbado, M.A. (Eds.). *Manual of Central American Diptera*. Ottawa, NRC Research Press. v. 2. p. 1343-1417.