Neotropical Diptera

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Editorial

A journal for the systematics and biogeography of Neotropical Diptera, 250 years after the publication of the tenth edition of the *Systema Naturae*[1]

The knowledge about the biodiversity of any region is constructed along a slow process that involves technical understanding of the taxonomic elements under scrutiny, gathering of previous information, descriptive and analytical procedures, updating of information systems, and synthetic presentation of the information to non-specialists. If this is challenging when dealing with a set of species of any single genus, for example, what to say about information systems handling with tens of thousands of species.

From a geographical point of view, the world diversity has been divided into six major regions of the biological multiplicity – none of which actually corresponds to natural biological subdivisions: Palearctic, Nearctic, Neotropical, Afrotropical, Oriental, and Australasian and Oceania. The amount of investigation on each of these areas is highly disproportionate, especially if we consider the amount of biological diversity in each of them.

The Neotropical Region, here understood as the Americas south of the United States, presents at least three main biotic elements (cf. Amorim & Tozoni 1995; Morrone 2002, 2004, Morrone *et al*. (2002): (i) tropical elements, that extend themselves from the north of Argentina to the areas of low altitude in Mexico, except areas of higher altitude along the Andes and southern Brazil; (ii) Nearctic elements, found in Mexican altiplanes, areas of higher altitudes in Central America and sometimes in northern Andes or elsewhere in South America; (iii) circumantarctic elements present especially in Chile, southern Argentina, more northern areas in the Andes, and southern Brazil (sometimes shared with southern Africa, but usually with New Zealand, southeastern Australia and Tasmania, New Caledonia, New Hebrides, and other smaller areas in southern Pacific).

The dipterans constitute one of the four largest, named megadiverse insect orders. It is now estimated that there are more than 1,500,000 described species of organisms, of which the insects perform about 60% (926,400 species) (Grimaldi & Engler 2005), the Diptera constituting about 13% of the insects, *ca*. 153,000 species (Evenhuis et al., 2007). The Neotropical share of this total diversity of dipterans is above 31,000 species (Amorim *et al.* 2002). The process of gathering, filtering, and updating with authoritative care the amount of information at such order of magnitude is up to systematics of modern times. This is much more than gathering names (as sometimes seen even by scientists). Taxon names are hypotheses, so handling taxon names demands all usual care involved in the formulation of scientific hypotheses (Thiele & Yeates 2002; Carvalho et al., 2008).

Since the publication of the 10th Edition of the *Systema Naturae* of Linnaeus (1758) to the first four years of the 20th century, 40 authors studied the taxonomy of the neotropical dipterans – C. Linnaeus, C. Linnaeus Jr., J. C. Fabricius, P. A. Latreille, K. P. Thunberg, W. F. Erichson, J. A, M. Perty, C. R. W. Wiedemann, F. E. Guérin-Méneville, G. A.Olivier, J. B. Robineau-Desvoidy, P. J. M. Macquart, C. H. Blanchard, J. A. Laboulbène, J. M. F. Bigot, J. O. Westwood, F. Walker, R. A. Philippi, C. G. Thompson, F. M. Brauer, C. E. A. Gerstaecker, H. Loew, J. Mik, V. von Roeder, E. Rübsaamen, I. R. Schiner, D. Bilimek, the brother Félix and Enrique Lynch Arribálzaga, C. Rondan, L. Bellardi, E. Giglio-Tos, H. Weyenbergh, F. M. van der Wulp, Fritz Müller, Emil A. Goeldi, E. E. Austen, C. R. Osten Sacken, S. W. Williston and J. M. Aldrich (cf. Papavero & Guimarães, 2000). The types of these species were deposited in different European and North American museums (cf. Papavero 1971, 1973).

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Access to the information dispersed in thousands of articles and books, written in a linguistic Babel, soon depended on catalogues. There are fragmentary efforts from a taxonomic or geographic approach on Diptera catalogues, *e.g.*, Enrique Lynch Arribálzaga (1883), for the republics of the Río de La Plata, Reed (1888), for Chile, and Brèthes (1908), for Argentina, or Williston (1886, 1891), for Syrphidae and Asilidae. W. D. Hunter (1900-1901) began to elaborate a new catalogue of all Neotropical Diptera, but his work remained incomplete – only the parts relative to the Nematocera and part of the Brachycera (Homeodactyla and Mydidae) came to print. Between 1902 and 1910, Kolomán Kertész, of the Budapest Museum, published seven volumen of a world catalogue of the Diptera, that unfortunately also fell incomplete. Another regional catalogue, of the Chilean fauna, was prepared by Stuardo Ortiz.

Major Diptera systematic projects in the 20th Century

Since 1925 (up to 1993), under the direction of the great German dipterist Erwin Lindner, the monumental work *Die Fliegen der paläarktischen Region* was published in Stuttgart, with keys to the genera and species of the Palearctic Diptera. Graham C.D. Griffiths took charge of a similar project for the Nearctic dipterans, beginning in 1980.

Willi Hennig brought a revolution to biology with his theory of Phylogenetic Systematics and published a number of relevant papers on the phylogeny of different dipteran groups. He was also responsible for a comprehensive study of the immatures of this group of insects in his classic *Die Larvenformen der Dipteren* (1948-1952). This work was completed (only for the Cyclorrhapha) by Ferrar (1987), who dealt with 87 families. The papers from Hennig published in 1954, 1969, and 1973 were also amazingly important for the understanding of Diptera evolution.

Another landmark in the history of dipterology was the publication of the *Catalog of the Diptera of America north of Mexico* (Stone *et al.* 1965), that by its excellence served as an inspiration for similar catalogues for the remaining biogeographical regions. Hence, from 1966 to 1984, Nelson Papavero edited the *Catalogue of the Diptera of the Americas south of the United States*, with a total of 102 published fascicles and 2877 printed pages –still with some families missing. Later on, Delfinado & Hardy (1973, 1975, 1977) published a catalogue of the Diptera of the Oriental region, Crosskey (1980) published the catalogue of the Afrotropical region, Evenhuis (1989) published the catalogue of the Australasian and Oceanian Region, and finally Soós & Papp (1984-1994) published in 14 volumes the catalogue of the Palearctic Region. This makes the Diptera the only of the megadiverse order to have catalogues to species at a worldwide basis.

Griffiths (1972) added an excellent monograph with the phylogeny of the families of Cyclorrhapha. Another outstanding contribution is the *Manual of Nearctic Diptera* (McAlpine 1981, 1987, 1989), including not only keys for the Nearctic genera and basic information for all families of Diptera, but also an extensive examination of Diptera adult and immature morphology, with a standardization of morphological nomenclature. The third volume has a great study of the phylogeny of all Diptera, with chapters from Wood & Borkent (1989) for the nematocerans, from Woodley (1989) for the basal brachycerans, and from McAlpine (1989) for the Muscomorpha. The information about all fossil Diptera has been gathered in the catalogue published by Evenhuis (1994), covering the Mesozoic and Cenozoic fossil record, allowing a temporal overview of the evolution of the order. Last, but not least, world dipterology has a golden close in the XX century with the splendid catalogue of the family-group names published by Sabrosky (1999).

A new project for the development of the Neotropical dipterology

There are other more recent efforts worth of note in the development of dipterological knowledge. One of them is the *Manual of the Diptera of Central America* (Brown, in press), to be published in two volumes (the first coming out in 2008). The other projects refer to the effort of making available electronically information in the web. There is a considerable amount of sites with technical information about dipterans.

The most notable of these projects is *The Diptera Site* (http://www.sel.barc.usda.gov/diptera/diptera.htm), coordinated by F. Christian Thompson, from the United States National Museum, Washington, D.C. The site intends to gather the totality of the systematic information on Diptera species and on nomenclature at higher levels in the order. The database is still not complete and the information is not retrieved in the form of catalogue in the site, but it has been used to support the publication of world catalogues of Diptera families (*e.g.*, Woodley 2001). Also, it has proven to be an extremely supportive tool as a database for everyday professional work on Diptera systematics.

Other electronic databases with more limited scope have been developed. Pjotr Oosterbroek developed an electronic catalogue for all Tipulomorpha of the world (http://ip30.eti.uva.nl/ccw/index.php) that locates and retrieves

information in the group using any field or combination of fields (genus name, species name, country, family, subfamily etc.). Electronic pages on other families are becoming more and more common and cover already a relevant number of families (see, e.g., Amorim & Papavero in press, Appendix II).

A synthesis of the systematic knowledge of the Neotropical Diptera was published by Amorim *et al.* (2002). It shows the presence of 115 families and about 2500 genera, with close to 25,000 described species. The large development of the study of the systematics of the Neotropical Diptera in the last decades, with changes brought up by the phylogenetic studies, the significant increase in the number of described species and genera (and even families), the development of Diptera collections and the increase in the number of specialists, especially in Brazil (see Carvalho *et al.* 2002), the Neotropical catalogue of Diptera is unfortunately outdated. There is an urge for a manual of Neotropical Diptera, since keys for the identification of the genera of the entire region (including those exclusive of temperate areas or those endemic to tropical South America) are lacking.

This led a group of Brazilian dipterists to work on the development of a major project on Diptera systematics. The long term goal is to have a *Manual of Neotropical Diptera* with chapters that would enable the identification of any dipteran species with the help of illustrated keys for all genera. Closer goals are updated catalogues for all families and keys for the identification of families and genera. The Manual chapters will be released as soon as they become available. To have the chapters of the Manual recognized as refereed publications, we are launching this new journal, *Neotropical Diptera*. The journal will work as other fast-publishing journals with electronic interface dedicated to systematic knowledge, as *Zootaxa*. The journal will also publish papers with revisions, descriptions of new Neotropical taxa, as well as phylogenetic and biogeographic studies of Diptera groups at different taxonomic levels. It will also publish the updated versions of the family catalogues.

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