



## Twenty years of Dipterology through the pages of *Zootaxa*

DANIEL WHITMORE<sup>1\*</sup>, STEPHEN D. GAIMARI<sup>2</sup>, SILVIO S. NIHEI<sup>3</sup>, NEAL L. EVENHUIS<sup>4</sup>, OLAVI KURINA<sup>5</sup>, CHRISTOPHER J. BORKENT<sup>2</sup>, BRADLEY J. SINCLAIR<sup>6</sup>, JAMES E. O'HARA<sup>7</sup>, ZHI-QIANG ZHANG<sup>8,9</sup>, JOHN K. MOULTON<sup>10</sup>, GUILHERME CUNHA RIBEIRO<sup>11</sup>, DANIEL J. BICKEL<sup>12</sup>, WOJCIECH GILKA<sup>13</sup>, TROND ANDERSEN<sup>14</sup>, BRUNO ROSSARO<sup>15</sup>, ANDREW E. WHITTINGTON<sup>16</sup>, CARLOS JOSÉ EINICKER LAMAS<sup>17</sup>, KAI HELLER<sup>18</sup>, CHRISTIAN KEHLMAIER<sup>19</sup>, GREGORY W. COURTNEY<sup>20</sup>, PETER H. KERR<sup>2</sup> & VLADIMIR BLAGODEROV<sup>21,22</sup>

<sup>1</sup>Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, 70191 Stuttgart, Germany.

✉ [daniel.whitmore@smns-bw.de](mailto:daniel.whitmore@smns-bw.de); <https://orcid.org/0000-0002-6051-5925>

<sup>2</sup>California State Collection of Arthropods, Plant Pest Diagnostics Branch, California Department of Food & Agriculture, 3294 Meadowview Road, Sacramento, California 95832-1448, USA.

✉ [stephen.gaimari@cdfa.ca.gov](mailto:stephen.gaimari@cdfa.ca.gov) (SDG); <https://orcid.org/0000-0002-4240-7154> (SDG);

✉ [chris.borkent@gmail.com](mailto:chris.borkent@gmail.com) (CJB); <https://orcid.org/0000-0001-9573-1663> (CJB);

✉ [peter.kerr@cdfa.ca.gov](mailto:peter.kerr@cdfa.ca.gov) (PHK); <https://orcid.org/0000-0002-3599-9606> (PHK)

<sup>3</sup>Department of Zoology, Institute of Biosciences, University of São Paulo, Rua do Matão, Travessa 14, n. 101, São Paulo, SP, 05508-090, Brazil.

✉ [silvionihei@ib.usp.br](mailto:silvionihei@ib.usp.br); <https://orcid.org/0000-0002-6887-6282>

<sup>4</sup>J. Linsley Gressitt Center for Research in Entomology, Bishop Museum, 1525 Bernice Street, Honolulu, Hawaii 'i 968127-2704, USA.

✉ [neale@bishopmuseum.org](mailto:neale@bishopmuseum.org); <https://orcid.org/0000-0002-1314-755X>

<sup>5</sup>Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Kreutzwaldi st 5D, 51006 Tartu, Estonia.

✉ [olavi.kurina@emu.ee](mailto:olavi.kurina@emu.ee); <https://orcid.org/0000-0002-4858-4629>

<sup>6</sup>Canadian National Collection of Insects (CNC), Canadian Food Inspection Agency, K.W. Neatby Bldg., 960 Carling Ave., Ottawa, Ontario, K1A 0C6 Canada.

✉ [bradley.sinclair@canada.ca](mailto:bradley.sinclair@canada.ca); <https://orcid.org/0000-0001-6413-1606>

<sup>7</sup>Canadian National Collection of Insects (CNC), Agriculture and Agri-Food Canada, K.W. Neatby Bldg., 960 Carling Ave., Ottawa, Ontario, K1A 0C6 Canada.

✉ [james.ohara@canada.ca](mailto:james.ohara@canada.ca); <https://orcid.org/0000-0001-6837-9035>

<sup>8</sup>Landcare Research, Private Bag 92170, Auckland, New Zealand.

✉ [zhangz@landcareresearch.co.nz](mailto:zhangz@landcareresearch.co.nz); <https://orcid.org/0000-0003-4172-0592>

<sup>9</sup>School of Biological Sciences, The University of Auckland, Auckland, New Zealand

<sup>10</sup>Department of Entomology and Plant Pathology, University of Tennessee, 370 Plant Biotechnology Building, 2505 E J Chapman Drive, Knoxville, TN 37996-4560 USA.

✉ [jmoulton@utk.edu](mailto:jmoulton@utk.edu); <https://orcid.org/0000-0001-8760-3274>

<sup>11</sup>Universidade Federal do ABC, Centro de Ciências Naturais e Humanas, Av. dos Estados, 5001. Bairro Bangu, 09210-580, Santo André, SP, Brazil.

✉ [guilherme.ribeiro@ufabc.edu.br](mailto:guilherme.ribeiro@ufabc.edu.br); <https://orcid.org/0000-0003-3604-2651>

<sup>12</sup>Australian Museum, 1 William Street, Sydney, NSW 2010 Australia.

✉ [Dan.Bickel@austmus.gov.au](mailto:Dan.Bickel@austmus.gov.au); <https://orcid.org/0000-0003-4756-3882>

<sup>13</sup>University of Gdańsk, Faculty of Biology, Department of Invertebrate Zoology and Parasitology, Laboratory of Systematic Zoology; Wita Stwosza 59, 80–308 Gdańsk, Poland.

✉ [wojciech.gilka@ug.edu.pl](mailto:wojciech.gilka@ug.edu.pl); <https://orcid.org/0000-0002-8403-5432>

<sup>14</sup>Department of Natural History, University Museum of Bergen, University of Bergen, P.O. Box 7800, NO-5020 Bergen, Norway.

✉ [trond.andersen@uib.no](mailto:trond.andersen@uib.no); <https://orcid.org/0000-0003-2201-1870>

<sup>15</sup>Department of Agricultural and Environmental Sciences, University of Milan, Via Celoria 2, 20133 Milan, Italy.

✉ [bruno.rossaro@unimi.it](mailto:bruno.rossaro@unimi.it); <https://orcid.org/0000-0001-6154-1191>

<sup>16</sup>FlyEvidence, Conway House, 27 Stoke Gabriel Road, Galmpton TQ5 0NQ, UK.

✉ [awhittington@flyevidence.co.uk](mailto:awhittington@flyevidence.co.uk); <https://orcid.org/0000-0002-0465-1172>

<sup>17</sup>Museu de Zoologia da Universidade de São Paulo, Avenida Nazaré, 481, Ipiranga, São Paulo, SP, 04263-000, Brazil.

✉ [einicker@usp.br](mailto:einicker@usp.br); <https://orcid.org/0000-0002-7750-590X>

<sup>18</sup>Stückenberg 58, 24226 Heikendorf, Germany.

✉ [kaiheller@gmx.de](mailto:kaiheller@gmx.de); <https://orcid.org/0000-0003-4813-5302>

<sup>19</sup>Senckenberg Natural History Collections Dresden, Museum of Zoology, Dresden, Germany.

✉ [christian.kehlmaier@senckenberg.de](mailto:christian.kehlmaier@senckenberg.de); <https://orcid.org/0000-0001-9622-0566>

<sup>20</sup>Department of Entomology, 401 Science II, Iowa State University, Ames, IA 50011 USA.

## Abstract

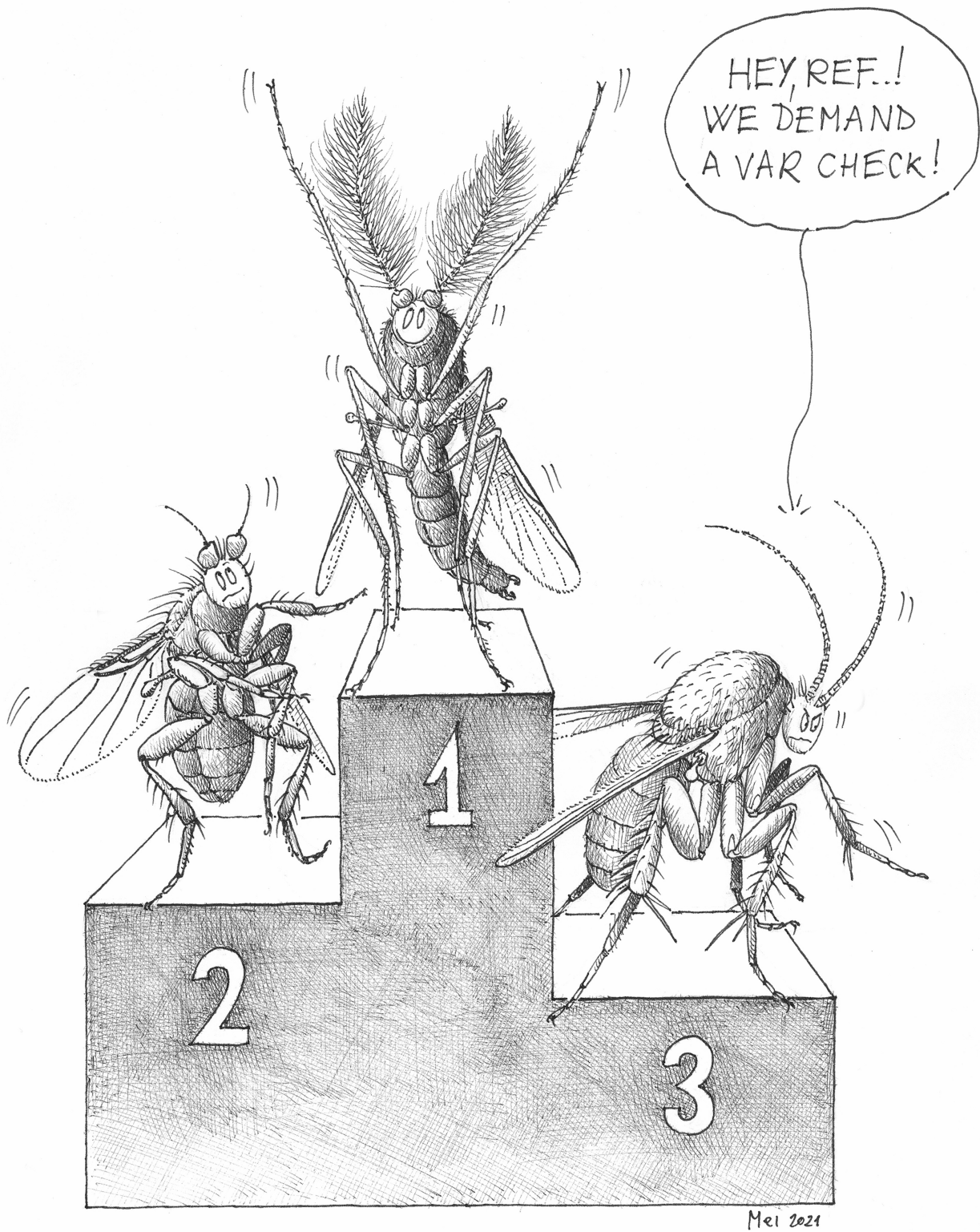
We present a summary and analysis of the Diptera-related information published in *Zootaxa* from 2001 to 2020, with a focus on taxonomic papers. Altogether, 2,527 papers on Diptera were published, including 2,032 taxonomic papers and 1,931 papers containing new nomenclatural acts, equivalent to 22% of all publications with new nomenclatural acts for Diptera. The new nomenclatural acts include 7,431 new species, 277 new genera, 2,003 new synonymies, and 1,617 new combinations. A breakdown by family of new taxa and new replacement names proposed in the journal during the last two decades is provided, together with a comparison of *Zootaxa*'s output to that of all other taxonomic publications on Diptera. Our results show that the journal has contributed to 20% of all biodiversity discovery in this megadiverse insect order over the last 20 years, and to about 31% in the last decade.

**Key words:** biodiversity, insects, taxonomy, true flies

## Introduction

As one of the four megadiverse clades of animal life, Diptera (true flies) are among the most successful lineages of terrestrial animals, with more than 165,000 valid species described to date (Courtney *et al.* 2017; Evenhuis & Pape 2021), representing 10% or more of all animal diversity on Earth. One of the drivers of their evolutionary success has been their ecological plasticity, which makes them the most ecologically diverse insect order (Grimaldi & Engel 2005). Their great plasticity consists of being able to occupy nearly every conceivable ecological niche; being found in nearly all habitable areas on earth, flies represent the greatest diversity of lifestyles of any insect order (Marshall 2012; Marshall & Kirk-Spriggs 2017). Although many of the lifestyles displayed by flies are known in other insect orders, only Diptera display the full range of specialisations, including saprophages, fungivores, predators, internal and external parasites of invertebrate and vertebrate animals, parasitoids, aquatic filter feeders, pollen and nectar feeders, leaf and stem miners, frugivores, gall-formers, herbivores, blood feeders, dung and carrion feeders, disease vectors, and more. Besides their generally broad array of lifestyles, flies also include many extremophiles with unique habits and habitats; e.g., at up to 6 mm, the midge species *Belgica antarctica* Jacobs is the largest purely terrestrial free-living animal and only insect known to live its life entirely in Antarctica (the flea species *Glaciopsyllus antarcticus* Smit & Dunnet is a parasite of sea birds that breed in Antarctica), and to withstand (rather than avoid) freezing using cryoprotectant compounds (Usher & Edwards 1984). From a human perspective, some flies can be extremely beneficial, while others can be devastating. For example, certain flies are among our great model organisms for understanding genetics and development (e.g., *Drosophila*), while others vector microorganisms that cause the deadliest diseases in humans and other animals. Although some families of Diptera seem relatively well known, particularly in species-poor and better-explored regions such as Europe (Pape *et al.* 2015), a large proportion of dipteran diversity is still to be discovered, in both temperate and tropical areas (Hebert *et al.* 2016; Santos *et al.* 2017; Brown *et al.* 2018).

We provide an overview of all papers on Diptera published by *Zootaxa* in its first 20 years (2001 through 2020), with a focus on taxonomic papers, i.e., all papers containing at least one nomenclatural act (e.g., the description of a new taxon or the proposal of a new replacement name, new synonymy or new combination). We present a family-level breakdown of all new taxa and replacement names, highlighting the impact of certain authors or research labs on the taxonomy of some families. We compare the overall taxonomic output of the journal with that of other taxonomic journals during the same period. Finally, we provide a summary of the editorial work of the 33 subject editors who have handled Diptera submissions since 2001, as well as a selection by the editors of short reviews of interesting or important papers and anecdotes related to editorial work.



**FIGURE 1.** The *Zootaxa* 2001–2020 Diptera podium: 1. Chironomidae (723 new species); 2. Phoridae (536 new species); 3. Mycetophilidae (410 new species). Pen drawing by Maurizio Mei.



## Methods

The data used in this paper were mostly obtained by searching the *Zoological Record's* database (<https://clarivate.com/webofsciencegroup/solutions/webofscience-zoological-record/>), using the search terms “Diptera”, “Fam nov”, “Subfam nov”, “Tribe nov”, “Gen nov”, “Subgen nov”, “Sp nov”, “Subsp nov”, “Nom nov”, “Comb nov”, and “Syn nov”. Raw data were downloaded as text files, which were either searched manually or uploaded to a FileMaker Pro database; searches were performed directly in the database or in exported Excel files. An additional search of the complete dataset of *Zootaxa* Diptera papers was performed using the key words “redescription”, “review”, “holotype”, “lectotype”, “neotype”, “syntype”, and “key”, for a more accurate assessment of the proportion of papers of taxonomic nature. However, comparisons between the taxonomic output in *Zootaxa* versus all other publications (Figs 5–6) were made using only the numbers from the initial search, i.e., only between datasets of papers containing at least one nomenclatural act. The timeline of subject editors and edited taxa (Appendix 2) was reconstructed using the “Wayback Machine” (<https://archive.org>) and is based exactly on information found on successive versions of the journal’s webpage for Diptera subject editors. Even though the information for each snapshot may not represent the situation at that time with 100% accuracy, the timeline can be considered a good approximation of the succession of subject editors and edited taxa over the 20-year period. Citation data were obtained from *Google Scholar* (<https://scholar.google.com/>) using the Publish or Perish v. 7.30 software (Harzing 2007), and from *Web of Science* (<https://webofknowledge.com>). Data for country of affiliation of corresponding authors (Fig. 3) were obtained from *Web of Science*. The word cloud in Fig. 2 was created on the *WordArt* web platform (<https://wordart.com>). The graphs of Figs 3–5, 7 were created with the open source software R (R Core Team 2021).

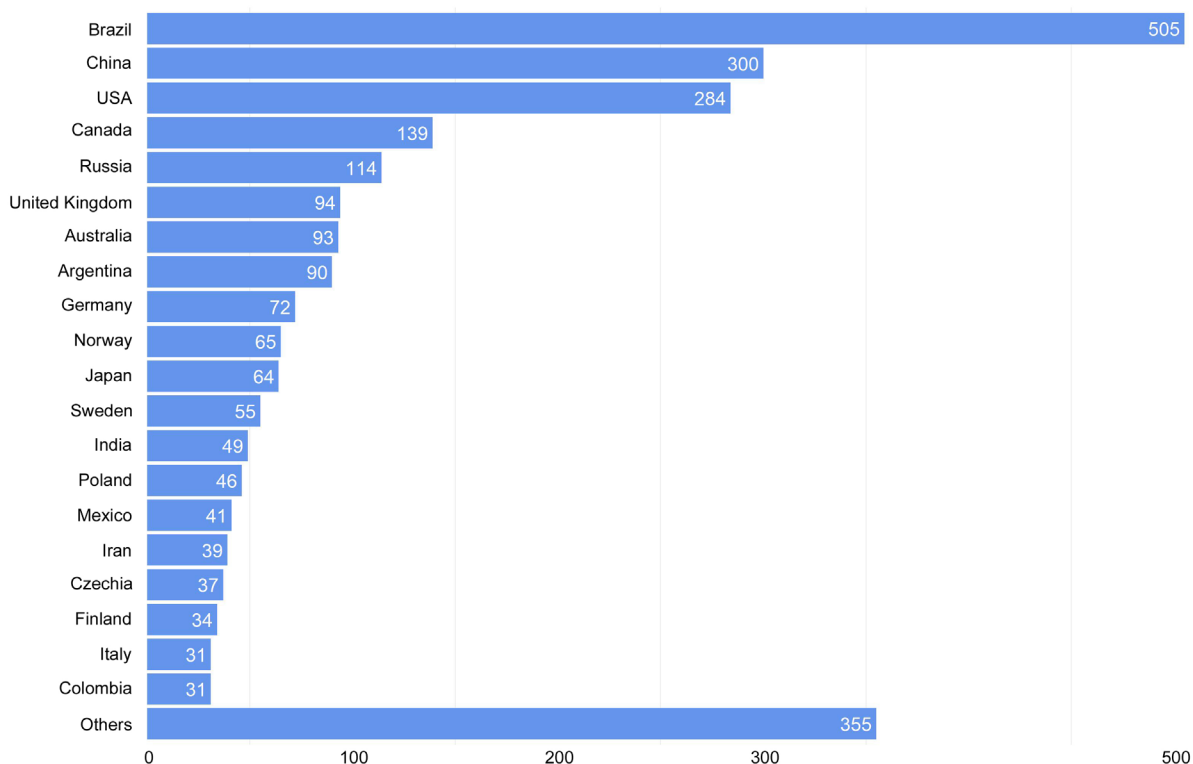


**FIGURE 2.** Word cloud of Diptera families. The size of the text is determined by the number of species described in *Zootaxa* from 2001 to 2020.

## Crunching the numbers

From 2001 to 2020, 2,527 papers on Diptera were published in *Zootaxa*, 2,032 (80%) of which contain new taxonomic information and 1,931 (76%) of which contain new nomenclatural acts. Altogether, these papers contain the descriptions of 7,431 new species in 121 families (one unplaced to family), 277 new genera in 58 families, 21 new subgenera in 10 families, eight new subfamilies, four new subspecies, two new families and two new tribes. In addition, a total of 2,003 new synonymies, 1,617 new combinations and 67 new replacement names were proposed. A breakdown at the family level of all new taxa and names is presented in Appendix 1. The new species are distributed biogeographically as follows: Neotropical (38.4%), Oriental (19.3%), Palearctic (19.2%), Australasian/

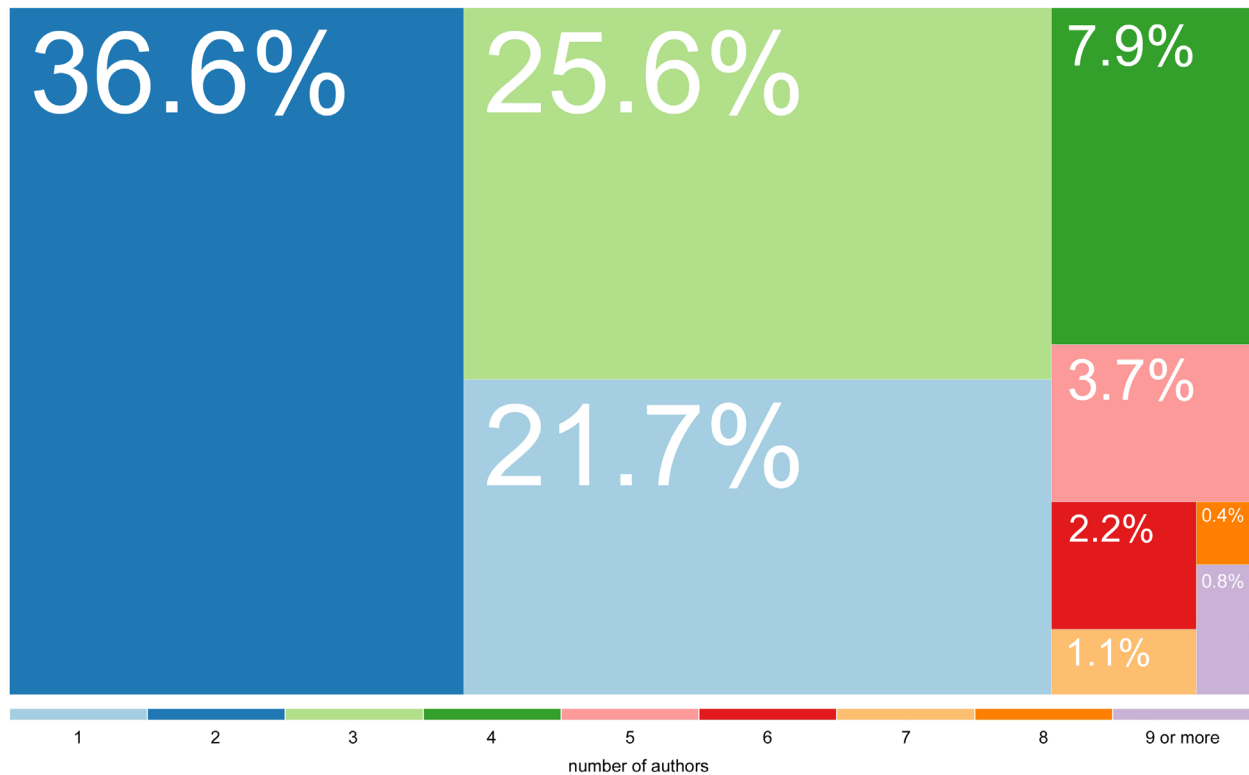
Oceanian (9.0%), Afrotropical (7.4%), and Nearctic (6.7%). The families with the greatest numbers of new species described are Chironomidae (723), Phoridae (536) and Mycetophilidae (410) (Fig. 1), followed by Sciaridae (387), Dolichopodidae (289) and by 18 families with over 100 new species described in each (Fig. 2, Table 1). The genus with the greatest number of new species described is *Manota* (Mycetophilidae) with 257. Altogether, 130 of the 186 extant and extinct families considered as valid (see Courtney *et al.* 2017; Evenhuis & Pape 2021) have been treated in *Zootaxa* articles. Papers on Diptera published in *Zootaxa* over the last two decades were authored by 2,351 unique authors from at least 64 countries (Fig. 3), highlighting the global reach of the journal. Brazil leads with 505 corresponding authors, followed by China (300) and the USA (284)—see Santos *et al.* (2017) for an analysis across all journals. Over 85% of all papers were published by one to three authors, with single-author papers accounting for about 22% of the total (Fig. 4). Overall, about 15% of the papers were published open access, with varying rates over the years and a peak in 2010 (24%).



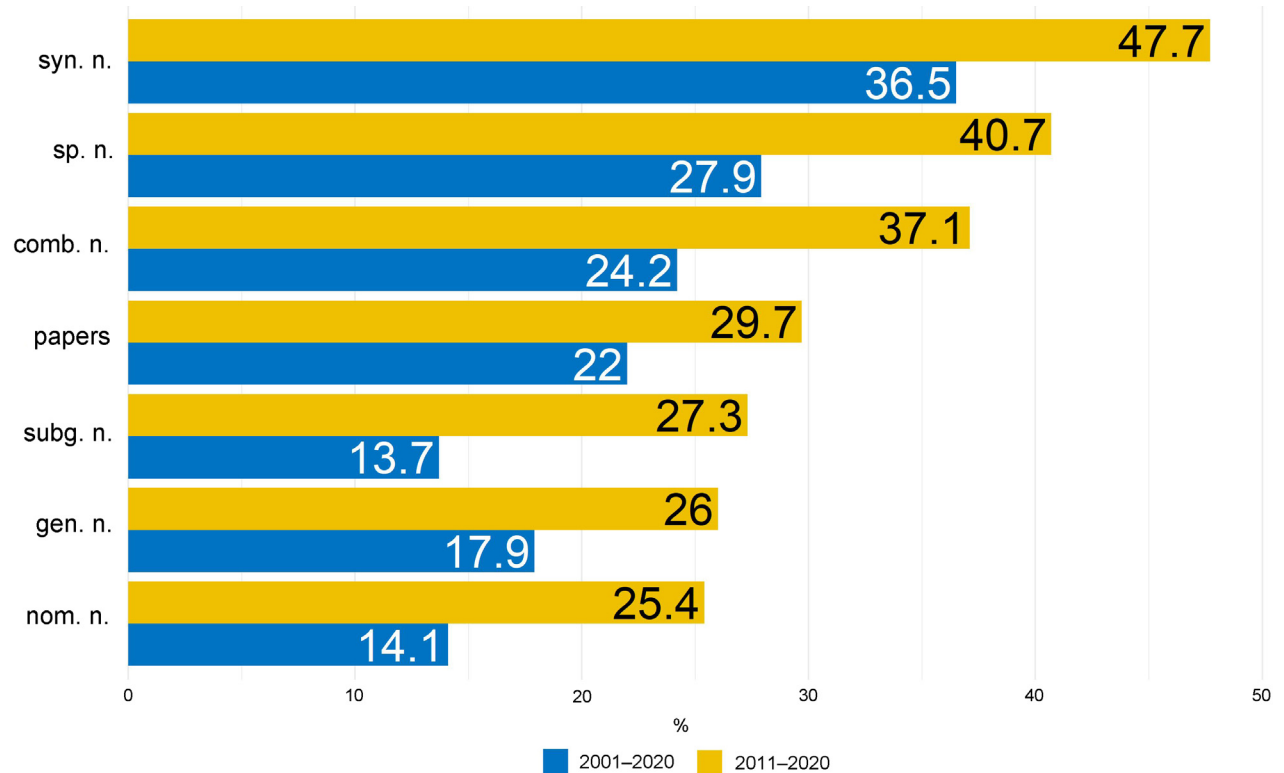
**FIGURE 3.** Published papers on Diptera in *Zootaxa* by country of affiliation of corresponding author. “Others” includes Lithuania (25), Belgium (24), Denmark (23), Egypt (21), Malaysia (21), Chile (20), France (20), Spain (15), Slovakia (14), Thailand (14), Estonia (13), Serbia (13), South Korea (13), Israel and Switzerland (12), The Netherlands (10), Hungary, South Africa and Ukraine (9), Turkey (8), Bulgaria and Croatia (6), Saudi Arabia (4), Portugal and Romania (3), Algeria, Belarus, Ecuador, Kenya, Morocco, Peru, Republic of Ireland, Singapore and Taiwan (2), Costa Rica, Dominican Republic, East Timor, El Salvador, Jordan, Madagascar, New Zealand, North Korea, Tunisia and Uruguay (1).

### **Zootaxa vs. The World**

An analysis of all taxonomic information on Diptera published in the years 2001–2020 (Fig. 5) shows that about 22% of taxonomic papers, 28% of new species and 18% of new genera were published in *Zootaxa*. In addition, 34% of new synonymies, 24% of new combinations and 14% of new replacement names were proposed in the journal. The same analysis for the decade 2011–2020 shows a clear increase in these percentages, with new species described in *Zootaxa* increasing to almost 41% (Fig. 5). Perhaps unsurprisingly, only two of the 27 new families validly described over the 20-year period were published in *Zootaxa*. This low proportion can be explained by the fact that over 60% of the recently described families are extinct and many were described in palaeontological journals, whereas some of the new extant families were described in a phylogenetic context in journals such as *Systematic Entomology*, which have a higher impact factor. Two of the 27 families have since been sunk into synonymy.

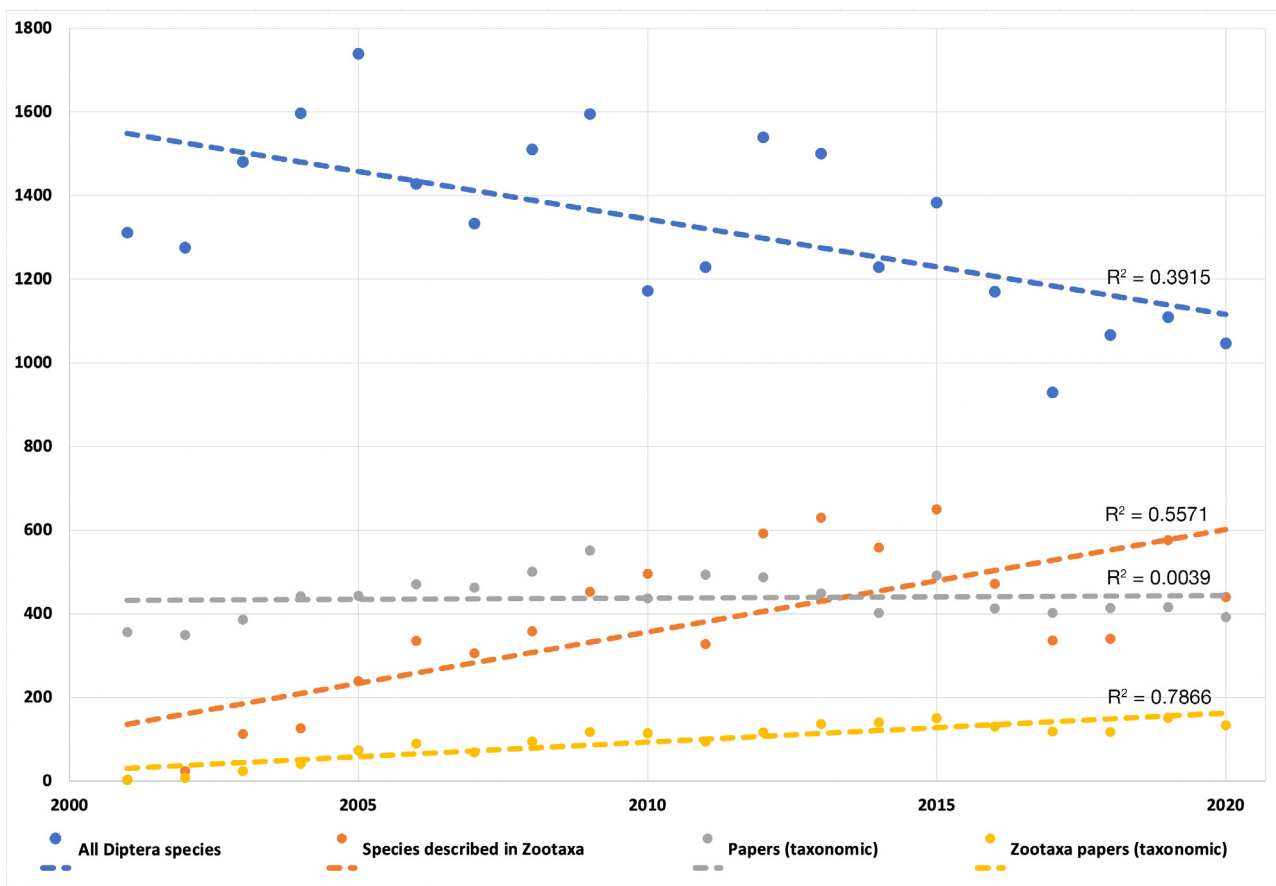


**FIGURE 4.** Percentages of Diptera papers published in *Zootaxa* from 2001 to 2020, by number of authors (rounded to the nearest decimal). The “9 or more” box includes 10 papers with nine authors (0.4%), two papers with 10 authors (0.08%), six papers with 11 authors (0.24%), one paper with 15 authors (0.04%), one paper with 50 authors (0.04%), and one paper with 59 authors (0.04%).



**FIGURE 5.** Percentages of papers, new taxa and other nomenclatural acts published in *Zootaxa* vs. other publications during the whole analysed period (2001–2020) and during the last decade (2011–2020). Abbreviations: comb. n. = new combinations; gen. n. = new genera; nom. n. = new replacement names; sp. n. = new species; subgen. n. = new subgenera; syn. n. = new synonymies.

Table 1 shows a comparison across 40 families of taxonomic papers and numbers of new species and other nomenclatural acts proposed in *Zootaxa* vs. other journals from 2001 to 2020. Within these families, the percentage of taxonomic papers published in *Zootaxa* varied between a minimum of 14.8% (Sarcophagidae) and a maximum of 55.3% (Therevidae), whereas the percentage of new species described varied between a minimum of 13.3% (Ceratopogonidae) and a maximum of 91.8% (Corethrellidae). In Fig. 6, we plotted 1) total numbers of new Diptera species described vs. new Diptera species described in *Zootaxa* and 2) total numbers of taxonomic papers on Diptera vs. taxonomic papers on Diptera published in *Zootaxa*. The linear trend lines show a gradual overall decrease in new species descriptions in a relatively stable number of taxonomic papers, with percentages of species described (and papers published) in *Zootaxa* increasing over time; this is the case despite the creation of several large taxonomic journals (i.e., *ZooKeys*, *European Journal of Taxonomy*, *Biodiversity Data Journal*) since 2009. From 2009 to 2020, more than five times more species of Diptera were described in *Zootaxa* than in those three journals combined, demonstrating that it remains the most popular journal for publication of taxonomic papers. Indeed, all *Zootaxa* contributions have been greater in the last decade compared to the total examined period (Fig. 5). For further comparison, almost eight times as many new species were described in *Zootaxa* from 2001 to 2020 as in *Studia Dipterologica*, a well-established taxonomic journal entirely dedicated to dipterology.



**FIGURE 6.** Total number of taxonomic papers on Diptera and total new species of Diptera vs. those published by *Zootaxa* from 2001 to 2020. Dotted lines represent linear trends.

**TABLE 1.** Comparison of numbers of taxonomic papers, new taxa and new replacement names proposed in *Zootaxa* vs. all other publications from 2001 to 2020 in the top 40 Diptera families (ranked by number of new species described in *Zootaxa*), with data from other publications in parentheses. \* = including Lygistorrhinidae. Abbreviations: gen. n. = new genera; nom. n. = new replacement names; sp. n. = new species; ssp. n. = new subspecies; subfam. n. = new subfamilies; subgen. n. = new subgenera; tribe n. = new tribes.

	subfam. n.	tribe n.	gen. n.	subgen. n.	sp. n.	ssp. n.	nom. n.	papers	% sp. n.	% papers
Chironomidae	(1)	(8)	29 (119)	2 (4)	723 (1724)	1 (4)	6 (27)	266 (810)	41.9%	32.8%
Phoridae	(1)		10 (47)	(1)	536 (1416)		2 (9)	58 (322)	37.9%	18.0%
Mycetophilidae	(1)	(1)	4 (36)	1 (1)	410 (914)		4 (25)	69 (249)	44.9%	27.7%
Sciaridae	1 (3)		2 (2)	1 (7)	387 (761)	(1)	1 (10)	57 (163)	50.9%	35.0%
Dolichopodidae	(5)	(10)	10 (83)	(3)	289 (1915)	(3)	2 (22)	100 (544)	15.1%	18.4%
Clusiidae	(1)		(2)		271 (319)		(4)	9 (25)	85.0%	36.0%
Hybotidae	(2)	2 (2)	3 (7)	(1)	269 (791)		1 (14)	47 (202)	34.0%	23.3%
Sphaeroceridae			17 (52)	(5)	267 (560)	(1)	(9)	20 (108)	47.7%	18.5%
Drosophilidae			1 (2)	(3)	249 (987)	(10)	3 (14)	42 (246)	25.2%	17.1%
Empididae	(3)		(16)	(1)	236 (1008)		(16)	63 (304)	23.4%	20.7%
Tephritidae		(2)	8 (32)	(3)	229 (765)	2 (2)	(137)	72 (274)	29.9%	26.3%
Syrphidae			13 (22)	1 (15)	212 (940)	(6)	2 (16)	76 (344)	22.6%	22.1%
Cecidomyiidae		(12)	32 (261)	(11)	207 (1430)		1 (43)	59 (395)	14.5%	14.9%
Psychodidae			10 (37)	3 (13)	201 (664)	(2)	5 (6)	76 (327)	30.3%	23.2%
Tachinidae			5 (28)	(1)	196 (621)	(2)	8 (42)	56 (221)	31.6%	25.3%
Ceratopogonidae			1 (18)	2 (15)	157 (1182)	(1)	4 (14)	61 (367)	13.3%	16.6%
Lauxaniidae	(4)	(7)	15 (21)	(2)	139 (403)		4 (14)	29 (103)	34.5%	28.2%
Asilidae		(2)	5 (37)	1 (1)	137 (744)	(1)	(51)	46 (255)	18.4%	18.0%
Muscidae		(1)	3 (3)	(1)	135 (967)	(1)	2 (12)	72 (343)	14.0%	21.0%
Simuliidae			4 (7)	(1)	132 (615)		1 (2)	62 (323)	21.5%	19.2%
Therevidae			14 (31)		130 (336)		2 (5)	42 (76)	38.7%	55.3%
Agromyzidae			(2)		128 (376)		(15)	21 (130)	34.0%	16.2%
Limoniidae			(2)	5 (0)	105 (480)		1 (26)	49 (234)	21.9%	20.9%
Chloropidae		(3)	5 (2)	(1)	95 (250)	(2)	(1)	44 (144)	38.0%	30.6%
Bombyliidae	(1)	(5)	2 (49)		94 (386)		(3)	62 (152)	24.4%	40.8%
Milichiidae			1 (3)	(1)	87 (165)			6 (36)	52.7%	16.7%
Micropezidae			1 (4)		82 (129)		(1)	18 (34)	63.6%	52.9%
Lonchaeidae			1 (1)		80 (157)		(1)	15 (41)	51.0%	36.6%
Sarcophagidae			(66)	2 (4)	70 (444)		2 (10)	42 (284)	15.8%	14.8%
Conopidae	1 (1)	(7)	8 (12)	(2)	68 (150)		(5)	15 (56)	45.3%	26.8%
Corethrellidae					67 (73)			4 (12)	91.8%	33.3%
Mythicomyiidae	(1)		8 (15)		64 (119)			20 (41)	53.8%	48.8%
Stratiomyidae			8 (29)		60 (249)	(2)	(24)	36 (136)	24.1%	26.5%
Pipunculidae			(3)		55 (177)		(3)	15 (62)	31.1%	24.2%
Ephydriidae			4 (22)	(4)	52 (322)		(1)	28 (128)	16.1%	21.9%
Tabanidae		(1)	1 (14)		49 (175)	(1)	(5)	26 (103)	28.0%	25.2%
Keroplastidae*	(2)		7 (31)	(1)	45 (153)			23 (82)	29.4%	28.0%

...Continued on the next page



**TABLE 1.** (Continued)

	subfam. n.	tribe n.	gen. n.	subgen. n.	sp. n.	ssp. n.	nom. n.	papers	% sp. n.	% papers
Fanniidae			(1)		44 (132)		(2)	18 (72)	33.3%	25.0%
Ulidiidae		(1)	(4)		43 (81)			16 (42)	53.1%	38.1%
Culicidae	1 (1)		3 (27)	3 (24)	40 (224)	(1)	1 (1)	37 (167)	17.9%	22.2%
<b>Totals</b>	<b>3 (27)</b>	<b>2 (62)</b>	<b>236 (1,153)</b>	<b>21 (126)</b>	<b>6,840 (23,557)</b>	<b>3 (40)</b>	<b>54 (598)</b>	<b>1,899 (8,042)</b>	<b>29.0%</b>	<b>23.6%</b>

### The record breakers

The top 50 most cited Diptera papers in *Zootaxa* according to *Google Scholar* are shown in Table 2, with a comparison of citations and ranks in *Web of Science*. The most cited paper on both citation platforms was the 2013 paper by Maureen Coetzee (University of the Witwatersrand, Johannesburg, South Africa) and co-authors reviewing the *Anopheles gambiae* complex (Coetzee *et al.* 2013), with, respectively, 482 citations in *Google Scholar* and 292 citations in *Web of Science* as of 6 March 2021. Notwithstanding the notorious omission of citations of the outstanding monographs on pupae of Culicomorpha (Borkent 2012) and on the phylogeny and classification of Rhagionidae (Kerr 2010) in the *Web of Science* database, there is a reasonable match between the two datasets. Of the 50 most-cited Diptera papers in *Web of Science*, four are also among the 50 most-cited *Zootaxa* papers of all time: Coetzee *et al.* (2013) (4th), Carvalho *et al.* (2005) (22nd), Rueda (2004) (34th), and Azari-Hamidian & Harbach (2009) (38th).

The most prolific author over the first 20 years of the journal has been Ding Yang (China Agricultural University, Beijing, China), who co-authored 115 papers, chiefly on Empidoidea and Acalyptratae; the second most prolific author has been Neal Evenhuis (Bishop Museum, Honolulu, USA) with 74 papers, followed by Xinhua Wang (Nankai University, Tianjin, China) with 54 and Heikki Hippa (University of Turku, Finland) with 52.

The paper with the greatest number of authors was Borkent *et al.*'s (2018) inventory of the Diptera fauna of the Zurquí de Moravia cloud forest in Costa Rica, which was the result of a collaboration among 59 dipterists. Coincidentally, the longest paper was also authored by Art Borkent (Canada; Research Associate, American Museum of Natural History, New York, USA), this time as the sole author of his 367-page *magnum opus*—and winner of the second J.O. Westwood Medal awarded by the Royal Entomological Society—“The Frog-Biting Midges of the World” (Borkent 2008). A paper on the type specimens of species described by Camillo Rondani, which is currently being edited by Neal Evenhuis, will significantly surpass this page count.

**TABLE 2.** Top 50 most highly cited Diptera papers published in *Zootaxa* in 2001–2020 according to *Google Scholar*, with *Web of Science* citations and corresponding rank with respect to other Diptera papers in *Zootaxa*. An asterisk (\*) denotes a significant difference in rank between the two indexing platforms.

GS citations	Paper	WoS citations	WoS rank
482	Coetzee, M. <i>et al.</i> (2013) <i>Anopheles coluzzii</i> and <i>Anopheles amharicus</i> , new members of the <i>Anopheles gambiae</i> complex. <i>Zootaxa</i> , 3619, 246–274.	292	1
418	Pape, T. <i>et al.</i> (2011) Order Diptera Linnaeus, 1758. In: Zhang, Z.-Q.(ed.), Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. <i>Zootaxa</i> , 1180, 3–172.	49	19*
382	Rueda, L.M. (2004) Pictorial keys for the identification of mosquitoes (Diptera: Culicidae) associated with dengue virus transmission. <i>Zootaxa</i> , 598, 1–60.	107	7
293	Sinclair, B.J. & Cumming, J.M. (2006) The morphology, higher-level phylogeny and classification of the Empidoidea (Diptera). <i>Zootaxa</i> , 1180, 3–172.	205	2
288	Harbach, R.E. (2007) The Culicidae (Diptera): a review of taxonomy, classification and phylogeny. <i>Zootaxa</i> , 1668, 591–638.	111	5
178	Yeates, D.K. <i>et al.</i> (2007) Phylogeny and systematics of Diptera: two decades of progress and prospects. <i>Zootaxa</i> , 1668, 565–590.	92	8

...Continued on the next page

**TABLE 2.** (Continued)

GS citations	Paper	WoS citations	WoS rank
176	Carvalho, C.J.B. de <i>et al.</i> (2005) A catalogue of the Muscidae (Diptera) of the Neotropical Region. <i>Zootaxa</i> , 860, 1–253.	163	3
165	Azari-Hamidian, S. & Harbach, R.E. (2009) Keys to the adult females and fourth-instar larvae of the mosquitoes of Iran (Diptera: Culicidae). <i>Zootaxa</i> , 2078, 1–33.	110	6
112	Brooks, S.E. (2005) Systematics and phylogeny of Dolichopodinae (Diptera: Dolichopodidae). <i>Zootaxa</i> , 857, 1–158.	71	11
108	O’Hara, J.E. <i>et al.</i> (2009) Annotated catalogue of the Tachinidae (Insecta: Diptera) of China. <i>Zootaxa</i> , 2190, 1–217.	89	8
105	Amorim, D.S. & Rindal, E. (2007) Phylogeny of the Mycetophiliformia, with proposal of the subfamilies Heterotrichinae, Ohakuneinae, and Chiletrichinae for the Rangomaramidae (Diptera). <i>Zootaxa</i> , 1535, 1–92.	68	12
95	Whitworth, T. (2010) Keys to the genera and species of blow flies (Diptera: Calliphoridae) of the West Indies and description of a new species of <i>Lucilia</i> Robineau-Desvoidy. <i>Zootaxa</i> , 2663, 1–35.	49	20
90	Spies, M. & Sæther, O.A. (2004) Notes and recommendations on taxonomy and nomenclature of Chironomidae (Diptera). <i>Zootaxa</i> , 752, 1–90.	60	16
85	Borkent, A. (2008) The frog-biting midges of the world (Corethrellidae: Diptera). <i>Zootaxa</i> , 1804, 1–367.	62	14
79	Huang, Y.-M. (2004) The subgenus <i>Stegomyia</i> of <i>Aedes</i> in the Afrotropical Region with keys to the species (Diptera: Culicidae). <i>Zootaxa</i> , 700, 1–120.	41	28
73	Borkent, A. (2012) The pupae of Culicomorpha—morphology and a new phylogenetic tree. <i>Zootaxa</i> , 3396, 1–98.	9	316*
71	Carvalho, C.J.B. de <i>et al.</i> (2003) A catalogue of the Fanniidae (Diptera) of the Neotropical Region. <i>Zootaxa</i> , 219, 1–32.	31	40*
68	Takaoka, H. (2012) Morphotaxonomic revision of <i>Simulium</i> ( <i>Gomphostilbia</i> ) (Diptera: Simuliidae) in the Oriental Region. <i>Zootaxa</i> , 3577, 1–42.	56	17
66	Borkent, A. & Grogan, W.L. Jr. (2009) Catalog of the New World biting midges north of Mexico (Diptera: Ceratopogonidae). <i>Zootaxa</i> , 2273, 1–48.	49	21
65	Mengual, X. <i>et al.</i> (2006) Integrative taxonomy of Iberian <i>Merodon</i> species (Diptera, Syrphidae). <i>Zootaxa</i> , 1377, 1–26.	48	23
61	Borkent, A. (2014) The pupae of the biting midges of the world (Diptera: Ceratopogonidae), with a generic key and analysis of the phylogenetic relationships between genera. <i>Zootaxa</i> , 3879, 1–327.	53	18
62	David, K.J. & Ramani, S. (2011) An illustrated key to fruit flies (Diptera: Tephritidae) from Peninsular India and the Andaman and Nicobar Islands. <i>Zootaxa</i> , 3021, 1–31.	35	33*
60	Whitworth, T. (2014) A revision of the Neotropical species of <i>Lucilia</i> Robineau-Desvoidy (Diptera: Calliphoridae). <i>Zootaxa</i> , 3810, 1–76.	36	31*
59	Radenković, S. <i>et al.</i> (2011) Three new cryptic species of the genus <i>Merodon</i> Meigen (Diptera: Syrphidae) from the island of Lesbos (Greece). <i>Zootaxa</i> , 2735, 35–56.	48	22
57	Stur, E. & Ekrem, T. (2011) Exploring unknown life stages of Arctic Tanytarsini (Diptera: Chironomidae) with DNA barcoding. <i>Zootaxa</i> , 2743, 27–39.	39	29
57	Sæther, O.A. <i>et al.</i> (2010) The problems with <i>Polypedilum</i> Kieffer (Diptera: Chironomidae), with the description of <i>Probolum</i> subgen. n. <i>Zootaxa</i> , 2479, 1–36.	43	25
57	Borkent, A. <i>et al.</i> (2018) Remarkable fly (Diptera) diversity in a patch of Costa Rican cloud forest: why inventory is a vital science. <i>Zootaxa</i> , 4402, 53–90.	42	27
55	Magnacca, K.N. <i>et al.</i> (2008) A review of the endemic Hawaiian Drosophilidae and their host plants. <i>Zootaxa</i> , 1728, 1–58.	43	26
52	Hartop, E.A. <i>et al.</i> (2015) Opportunity in our ignorance: urban biodiversity study reveals 30 new species and one new Nearctic record for <i>Megaselia</i> (Diptera: Phoridae) in Los Angeles (California, USA). <i>Zootaxa</i> , 3941, 451–484.	32	37
52	Buenaventura, E. & Pape, T. (2013) Revision of the New World genus <i>Peckia</i> Robineau-Desvoidy (Diptera: Sarcophagidae). <i>Zootaxa</i> , 3622, 1–87.	36	32

...Continued on the next page

**TABLE 2.** (Continued)

GS citations	Paper	WoS citations	WoS rank
50	Mulieri, P.R. <i>et al.</i> (2010) Review of the Sarcophaginae (Diptera: Sarcophagidae) of Buenos Aires Province (Argentina), with a key and description of a new species. <i>Zootaxa</i> , 2575, 1–37.	30	44*
46	Kerr, P.H. (2010) Phylogeny and classification of Rhagionidae, with implications for Tabanomorpha (Diptera: Brachycera). <i>Zootaxa</i> , 2592, 1–133.	3	1122*
47	Cheng, X.-Y. & Thompson, F.C. (2008), A generic conspectus of the Microdontinae (Diptera: Syrphidae) with the description of two new genera from Africa and China. <i>Zootaxa</i> , 1879, 21–48.	31	38
47	Norrbom, A.L. & Korytkowski, C.A. (2011) New species of and taxonomic notes on <i>Anastrepha</i> (Diptera: Tephritidae). <i>Zootaxa</i> , 2740, 1–23.	30	49*
46	Navarro, J.C. <i>et al.</i> (2007) Biogeographic area relationships in Venezuela: a parsimony analysis of Culicidae—Phytotelmata distribution in national parks. <i>Zootaxa</i> , 1547, 1–19.	31	42
45	Sun, X. & Marshall, S.A. (2003) Systematics of <i>Phasia</i> Latreille (Diptera: Tachinidae). <i>Zootaxa</i> , 276, 1–320.	31	39
43	Harbach, R.E. <i>et al.</i> (2007) Formal taxonomy of species C of the <i>Anopheles minimus</i> sibling species complex (Diptera: Culicidae). <i>Zootaxa</i> , 1654, 41–54.	38	30*
42	Ricarte, A. <i>et al.</i> (2012) Syrphidae (Diptera) from the Greek island of Lesbos, with description of two new species. <i>Zootaxa</i> , 3175, 1–23.	28	47
42	Ferrington, L.C. Jr. & Sæther, O.A. (2011) A revision of the genera <i>Pseudosmittia</i> Edwards, 1932, <i>Allocladius</i> Kieffer, 1913, and <i>Hydrosmittia</i> gen. n. (Diptera: Chironomidae, Orthoclaadiinae). <i>Zootaxa</i> , 2849, 1–314.	0	-*
41	Hippa, H. <i>et al.</i> (2010) Review of the Holarctic <i>Corynoptera</i> Winnertz, 1867, s. str. (Diptera, Sciaridae). <i>Zootaxa</i> , 2695, 1–197.	15	136*
40	Evenhuis, N.L. <i>et al.</i> (2010) Nomenclatural studies toward a world list of Diptera genus-group names. Part I: André-Jean-Baptiste Robineau-Desvoidy. <i>Zootaxa</i> , 2373, 1–256.	29	46
40	O’Hara, J.E. <i>et al.</i> (2011) Nomenclatural studies toward a world list of Diptera genus-group names. Part II: Camillo Rondani. <i>Zootaxa</i> , 3141, 1–268.	44	24*
38	Bellis, G. <i>et al.</i> (2014) Revision of the <i>Culicoides</i> ( <i>Avaritia</i> ) <i>imicola</i> complex Khamala & Kettle (Diptera: Ceratopogonidae) from the Australasian region. <i>Zootaxa</i> , 3768, 401–427.	34	34
37	Skevington, J.H. <i>et al.</i> (2007) DNA Barcoding: mixed results for big-headed flies (Diptera: Pipunculidae). <i>Zootaxa</i> , 1423, 1–26.	30	43
37	Hernandez-Triana, L.M. <i>et al.</i> (2012) DNA barcodes reveal cryptic genetic diversity within the blackfly subgenus <i>Trichodagmia</i> Enderlein (Diptera: Simuliidae: <i>Simulium</i> ) and related taxa in the New World. <i>Zootaxa</i> , 3514, 43–69.	35	36
37	Bellis, G.A. <i>et al.</i> (2013) Revision of the Immaculatus Group of <i>Culicoides</i> Latreille (Diptera: Ceratopogonidae) from the Australasian Region with description of two new species. <i>Zootaxa</i> , 3680, 15–37.	34	35
36	Takaoka, H. <i>et al.</i> (2017) The black flies (Diptera: Simuliidae) of Vietnam. <i>Zootaxa</i> , 4261, 1–165.	24	62*
35	Loewenberg-Neto, P. & Carvalho, C.J.B. de (2013) Muscidae (Insecta: Diptera) of Latin America and the Caribbean: geographic distribution and check-list by country. <i>Zootaxa</i> , 3650, 1–147.	26	54*
35	Patitucci, L.D. <i>et al.</i> (2013) Muscidae (Insecta: Diptera) of Argentina: revision of Buenos Aires province fauna, with a pictorial key to species. <i>Zootaxa</i> , 3702, 301–347.	0	-*
35	Versteirt, V. <i>et al.</i> (2012) Confirmation of <i>Aedes koreicus</i> (Diptera: Culicidae) in Belgium and description of morphological differences between Korean and Belgian specimens validated by molecular identification. <i>Zootaxa</i> , 3191, 21–32.	22	75*

The greatest number of species described in a single paper was 171 by Owen Lonsdale (Canadian National Collection of Insects, Ottawa, Canada) and Steve Marshall (University of Guelph, Canada) in their 2012 revision of the New World species of *Sobarocephala* (Clusiidae) (Lonsdale & Marshall 2012); the number of new species was so high that even the authors lost count, mentioning a “meagre” 170 in the abstract. This number was surpassed in the last two decades only by Yu *et al.* (2005), who described 176 new species of biting midges in their book “Ceratopogonidae of China”. A series of papers on Diptera genus-group names by Neal Evenhuis and colleagues has so far reviewed and revised the nomenclature of 3,524 available genus-group names authored by Coquillett, Macquart, Meigen, Robineau-Desvoidy, Rondani, Townsend and Wiedemann. They possibly established a world record when they proposed a mind-boggling 300 new synonymies based on their revision of Rondani’s genus-group names (O’Hara *et al.* 2011); in second place, with 79 new synonymies, is their revision of Macquart’s names (Evenhuis *et al.* 2016). Altogether, the first seven papers in that series contain proposals for 474 new generic synonymies.

## David vs. Goliath

Looking more closely at the results of biodiversity discovery research published in *Zootaxa* from 2001 to 2020, differences emerge across families with, in some cases, a clear “David versus Goliath”-like effort by a handful of taxonomists in their quest to describe the seemingly endless diversity of species in their groups. For example, a comparison between Chironomidae and Phoridae, the top two families for new species described over the last two decades, shows that a much larger number of authors has contributed to the former than to the latter. The 723 new species of Chironomidae were described in 241 papers (average of three new species per paper) by 70 different first (or only) authors; in contrast, the 536 new species of Phoridae were described in just 56 papers (average of 9.6 species per paper) by 24 different first (or only) authors, with 86% (461) of the new species being described in papers led or co-authored by Brian Brown (Natural History Museum of Los Angeles, USA) or Henry Disney (University of Cambridge, England). Biodiversity discovery in some families has essentially been carried forward by a single author or working group, as is the case, for example, of the Clusiidae, with 95% (257) of the 271 new species described by Owen Lonsdale, either as a sole author or in collaboration with Steve Marshall. Similarly, 92% of the 267 new Sphaeroceridae species were described by Steve Marshall and collaborators, whereas Mathias Jaschhof (Station Linné, Sweden) almost single-handedly described 76% of the 207 new species of Cecidomyiidae proposed in *Zootaxa* in its first twenty years. In another diverse family, Mycetophilidae, over 60% (258) of the newly described species were authored or co-authored by Heikki Hippa, 253 in the sole genus *Manota*. On a smaller scale, Art Borkent described 93% of the 67 new species of Corethrellidae, a monogeneric family, and Neal Evenhuis was the main author or a co-author on the papers describing 58 of the 64 new species in the small, bee fly-related family Mythicomyiidae.

If, as suggested by the data presented here, *Zootaxa* can be used as a good proxy for biodiversity description in the order Diptera, the above examples do a good job of illustrating the central role of a handful of experienced and productive taxonomists in tackling the so-called “taxonomic impediment”. With many of them already retired or close to retirement, it is difficult to imagine their shoes being filled by an incoming generation of new taxonomists without a serious, long-term investment in taxonomic training, infrastructure, and fieldwork (see also Santos *et al.* 2017).

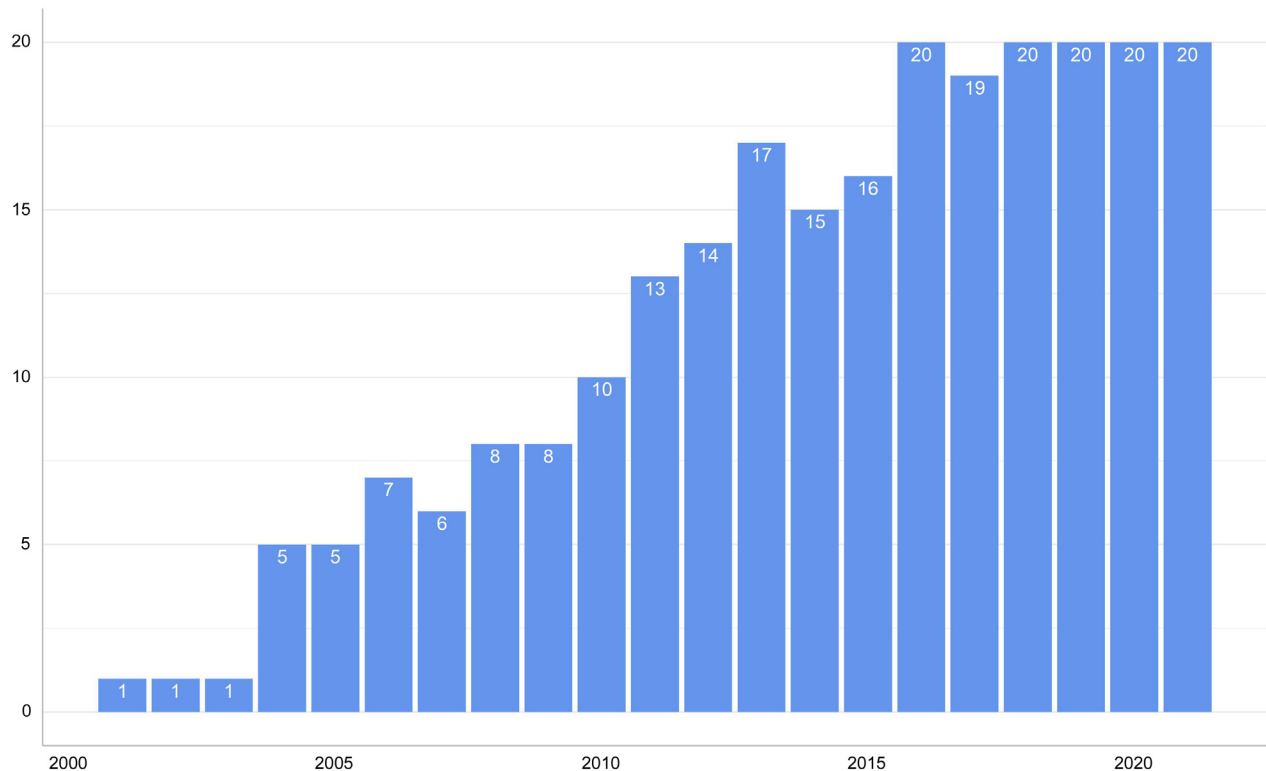
## An editorial team of taxonomists

One of the reasons behind the success of *Zootaxa*, as recognised by Zhang (2014), has been the contribution of a growing team of taxonomic experts as subject editors for taxa within their area of specialisation. From the launch of the journal in 2001 to December 2020, a total of 33 Diptera taxonomists have worked as subject editors for Diptera, with 20 still in the role at the time of writing this paper in April 2021; four additional editors, including editor-in-chief Zhi-Qiang Zhang, handled Diptera papers under special circumstances or as part of special issues (Table 3). The number of subject editors has steadily increased over the years from a minimum of one (2001–2003) to a maximum of 20 (2018–present) (Fig. 7), as a response to an overall increase in submitted manuscripts and increased demand on individual subject editors. Of the current team of Diptera editors, Neal Evenhuis was the only member of the *Zootaxa* team of founding editors and was responsible for all Diptera submissions during 2001–2003 apart from his own, which were handled by Z.-Q. Zhang. A complete timeline showing the succession of subject editors and taxa edited is given in Appendix 2.



**TABLE 3.** *Zootaxa* Diptera subject editors ordered by total number of published editor records, based on all available information (published and unpublished). a = includes 68 records for special issue “Catalogue of the Diptera of Colombia” (2016); b = contributions for special issue “Research on the Terrestrial Arthropods of Sardinia”; c = contributions for special issue “Catalogue of the Diptera of Colombia”.

Subject editor	Years active	Years as editor	Editor records
Daniel J. Bickel	2004–present	18	352
Neal L. Evenhuis	2001–2008, 2011, 2013–present	18	222
Stephen D. Gaimari	2012–present	10	168
Bradley J. Sinclair	2009–present	13	167
Bruno Rossaro	2013–present	9	158
Silvio S. Nihei	2010–present	12	140 <sup>a</sup>
James E. O’Hara	2004–2014	11	109
John K. Moulton	2006–2012, 2015–present	14	108
Carlos J. E. Lamas	2014–present	8	102
Luis M. Hernandez-Triana	2012–present	10	90
Wojciech Gilka	2008–2013	6	75
Peter H. Adler	2004–2007	4	72
Gregory W. Courtney	2006–2016	11	71
Peter H. Kerr	2008–2013	6	58
Kai Heller	2016–present	6	57
Shaun L. Winterton	2007–2012	6	54
Gregory R. Curler	2010–present	12	51
Vladimir Blagoderov	2010–present	12	50
Daniel Whitmore	2015–present	7	50
Christopher J. Borkent	2013–2019	7	42
Christian Kehlmaier	2013–2017, 2020	6	36
Trond Andersen	2006–2009	4	35
Antonio Ricarte	2016–present	6	31
Ralph E. Harbach	2017–present	5	31
Danilo Pacheco Cordeiro	2015–present	7	27
Patrycja Dominiak	2016–present	6	16
Andrew E. Whittington	2003–2004, 2019–present	5	13
Olavi Kurina	2018–present	4	12
Sigitas Podenas	2016–present	6	11
Guilherme Cunha Ribeiro	2014–2016	3	11
Jeffrey H. Skevington	2011–2013	4	6
Shelah Morita	2011–2013	4	5
Darlene D. Judd	2005	1	0
<b>Additional editors</b>			
Zhi-Qiang Zhang	2001–present		19
Pierfilippo Cerretti	2009		8 <sup>b</sup>
Claudio C.J.B. de Carvalho	2016		3 <sup>c</sup>
Franco Mason	2009		1 <sup>b</sup>



**FIGURE 7.** Number of subject editors for Diptera in *Zootaxa* from 2001 to 2021, showing the gradual increase from the initial one (2001–2003) to the current 20.

Table 3 summarises years of activity and total numbers of edited papers that reached publication for each of the 33 editors from 2001 to 2020. In terms of edited papers, Dan Bickel leads with 352 papers during 17 years of service, followed by Neal Evenhuis (222 in 17 years), Steve Gaimari (168 in 9 years), Brad Sinclair (167 in 12 years) and Bruno Rossaro (158 in 8 years). An additional 54 papers, treating Diptera but with a different group as their main focus (e.g., Hymenoptera or Nematoda), were edited by other subject editors. Data on total numbers of handled submissions as well as rejection rates were not available for all editors; however, based on near-complete data from 10 editors, the average rejection rate was 21%.

Only three women have occupied the role of subject editor for Diptera in *Zootaxa*, with only Patrycja Dominiak (UiT Norges Arktiske Universitet, Tromsø, Norway) on the current team. This severe and unfortunate imbalance likely reflects past and existing inequalities in professional taxonomy, which should be recognised and addressed.

### Stories on flies, papers and people

In this section, we provide mini reviews of landmark papers on Diptera that appeared in *Zootaxa* during 2001–2020, as well as recollections about authors who published in the journal and other reflections or anecdotes from past and current subject editors.

**The Chironomidae primacy (by W. Gilka, T. Andersen and B. Rossaro).** During the first 20 years of activity of *Zootaxa*, no less than 723 new species of Chironomidae have been described, i.e., almost 42% of all Chironomidae species named during the period (Tab. 1). The first place of Chironomidae in this ranking, which places the family at the centre of the word cloud of Diptera families (Fig. 2), can be explained by its extraordinary species richness (it is probably the largest family of aquatic insects), worldwide distribution and the growing number of researchers interested in the family. One may ask whether there are historical explanations for these results. Since Cranston (1995) estimated the probable richness of extant Chironomidae at 15,000 species, knowledge on taxa delimitation has been enhanced with molecular methods. Nevertheless, in the relatively short period of time from 2001 to 2020,

nearly 10% of all Chironomidae known to date, and perhaps 5% of all extant species, have been described in *Zootaxa* alone. This huge number is the result of the activities of a large group of chironomid workers from around the world. It would take too long to mention them all, but the most productive researchers have been Ole Sæther and Torbjørn Ekrem (Norway), Humberto F. Mendes, Susana Trivinho-Strixino, Fabio Laurindo da Silva and Luiz Carlos Pinho (Brazil), Xinhua Wang (China), Peter S. Cranston (Australia), Len Ferrington, Jr. (USA), and Eugenyi Makarchenko (Russian Far East). The keen interest of successive generations of Chironomidae researchers, the still high expected number of undiscovered taxa, including fossils, and the possibilities offered by *Zootaxa* allow us to assume that the primacy of this family will continue for the next 20 years.

**Crane fly morphology: immatures and adults (by G. Cunha Ribeiro).** When I was invited to become the subject editor for Tipuloidea in *Zootaxa* during the 8th International Congress of Dipterology in Potsdam in 2014, I was really concerned: in what way could I help improve dipterology in general, and the quality of the research on my favourite group in particular? As an author, many of my own favourite papers were published in *Zootaxa*, and after thinking about why I considered them nice, I decided that it was due to my detailed treatment of the morphology. I always thought that the taxonomy of Tipuloidea in general, perhaps following the school of Charles Paul Alexander, the great world expert of Tipuloidea, was poor in the morphological treatment of the species. What do these flies look like? This was my main question when I started studying the group. So, I decided to incentivise authors to provide the best possible treatment of the morphology of the species, with good and detailed illustrations (either photographs or drawings) and consistent terminology. After all, a good taxonomic paper should be useful to a wider audience, including those interested in scoring characters for wider analyses. Two papers in particular provided me with great joy as editor in charge of the group. The first is a paper about the last instar larvae and pupae of *Hexatoma* (*Eriocera*) and *Hexatoma* (*Hexatoma*), by Podeniene & Gelhaus (2015). The second is a paper describing new *Dicranoptycha* craneflies (Diptera: Limoniidae) from North and South Korea, by Podenas *et al.* (2015). The first paper is an extremely detailed and fine study on a group for which the immature stages are very poorly known. The more than 60 accompanying illustrations of larvae and pupae are not only very informative, but also very beautiful. In similar terms, the descriptions of the adults of the two new *Dicranoptycha* species were accompanied by such beautiful and useful illustrations of the general morphology that they will always be of great utility to other students, who probably will not need to look for additional specimens, for example to score characters for wider comparative studies. I was happy to have contributed to two papers that can be used as a model by future researchers.

**Blurring boundaries: Wallace, VNDM and crane flies (by V. Blagoderov).** Throughout my professional career I have often done things that others are unwilling or unable to do, but which I believe to be important. For many years, I have been editing manuscripts on a seemingly random set of Lower Diptera families, which have included Tipuloidea. One paper definitely stands out, and a lot of work was needed for the reviewers and authors to come to a consensus. The result, in my opinion, was excellent. The seminal work of Wallace (1876), in which a global scheme of biogeographical regionalisation was based mostly on vertebrates, was never tested using insect distributional datasets. Ribeiro *et al.* (2014) asked a question: would the distributional patterns of an entire, worldwide-distributed family of Diptera support Wallace's scheme? To answer it, they explored the distributional data of 4,224 Tipulidae species to search for worldwide endemism patterns, using the grid-based method known as VNDM (Szumik *et al.* 2002; Szumik & Goloboff 2004). Since the VNDM method had never been used on a worldwide scale before, a whole data set of analytical parameters had to be developed by the authors, which has since been used in many other studies. Ribeiro *et al.* (2014) demonstrated that there were limitations in applying biogeographical classifications proposed mostly for vertebrate distribution datasets to other taxonomic groups, such as Tipulidae. Although there was a general congruence of the broad-scale areas of endemism of crane flies with the previously-proposed regionalisation schemes, for some areas, the distinctiveness of boundaries between traditional regions was not so clear, probably because insects utilise microhabitats, thus creating an overlap between biotic elements. I believe the paper is somewhat underrated, and I'm glad it sparked a discussion.

**Fungus gnats may seem *Manotanus*, but they aren't for some (by O. Kurina).** Among the contributions on Sciaroidea published in *Zootaxa*, a series of papers dealing with the mainly tropical genus *Manota* is undoubtedly worth accentuating. During the last two decades, until the end of 2020, the number of described *Manota* species has increased from 28 to 314. Of the new species, 257 were described in 21 different *Zootaxa* papers, with twelve involved authors altogether, dominated by the contribution of Heikki Hippa from Turku (Finland). Nonetheless, if I had to highlight a single spectacular Sciaroidea paper, that would be the top-quality monograph of the world species of *Leptomorphus* by Borkent & Wheeler (2012), which resulted from Chris Borkent's Ph.D. project. As is typical

for most systematic papers, it has not been blessed with a high citation rate, but it will serve as a baseline for further study for centuries. In this monograph of 117 pages, the authors revised the known world fauna at that time, with 37 valid species including 12 newly described. All species were diagnosed, described, and illustrated in great detail and a phylogenetic reconstruction was provided that supported the monophyly of *Leptomorphus*. This is the only world monograph of a rather speciose fungus gnat genus in this millennium so far.

**How one of the fastest papers in *Zootaxa* from submission to publication came to be (by N. L. Evenhuis).** In October 2001, I became the first *Zootaxa* editor for Diptera papers and the novelty of speed of publication (*Zootaxa* was originally advertised as such to attract papers) was a heady thing for many authors who submitted papers to the journal. No longer did they need to wait months, or even years from submission to print. One of those early submittals was a paper by Mark Metz and collaborators on Proratinae (Scenopinidae) morphology in September 2002 (Metz *et al.* 2002). It was a relatively short manuscript and the timing was just right for this to speed through, I believed. The result was better than I had imagined. From submission to publication, the process took only 8 days! There were many contributing factors involved. The early years of *Zootaxa* had few papers being submitted, so the editorial team at *Zootaxa* was not as busy with typesetting and correcting proofs as they are now. Review was also quick (due to the paper being short). Also, e-mail and time zones played a big part. Luckily, my being in the middle of the Pacific allowed me to be in contact at the same time with reviewers in Europe as well as the publisher in New Zealand (and I normally stay up late for that purpose). Here is how it happened: the manuscript was submitted on 25 September 2002 at 2:55am Hawaiian Standard time (HST). I acknowledged receipt that morning and immediately sent it out to two reviewers. Reviews were completed and returned to me the same day. I sent the reviews to Mark, and Mark returned the manuscript to me the same day (5:05 pm HST on 25 September). I accepted it for publication and sent it on to *Zootaxa* the following morning (the 27 September date of acceptance on the paper is the NZ date—26 September in Hawai‘i). After typesetting and correcting proofs, the paper was published as *Zootaxa* 76 on 3 October (NZ time; 2 October HST), so the total time from submission to publication was 8 days.

**An exemplary modern-day revision of Nearctic long-legged flies (by B. J. Sinclair).** Among the Empidoidea papers published in *Zootaxa*, a notable outstanding contribution would be the monograph on the Nearctic species of *Parathalassius* by Scott Brooks and Jeff Cumming (Brooks & Cumming 2017). The spectacular illustrations in this taxonomic revision elevate its impact to much higher levels. The incredible live images, first discovered on photo-sharing websites, provide extraordinary habitus details unavailable with preserved specimens. In addition, photos of the habitat, heads, antennae, legs, and wings further bring to life these tiny flies. This monograph of 64 pages provides descriptions of 12 Nearctic species (including nine new species), including lengthy details of the female terminalia and the wonderfully complex and asymmetrical male terminalia. Very few empidoid workers have attempted to fully illustrate the complex male terminalia of these basal Dolichopodidae, let alone provide such details and identification of homologous structures. The impact of this publication is further augmented by DNA barcode sequence data, distribution maps, and the expansion of this Nearctic revision to the world fauna in a key to species and reconstructed morphological phylogeny. This paper should be the model for all revisions by Diptera systematists.

**The hidden biodiversity of cities (by D. J. Bickel).** One of the most interesting papers I have edited for *Zootaxa* is that by Hartop *et al.* (2015). This paper reported the results of a Malaise trap survey across metropolitan Los Angeles, revealing the hidden diversity that exists even in urban areas. The study involved setting up long-running Malaise traps throughout the greater Los Angeles area, including fairly undisturbed habitats, backyards, and even the tops of tall buildings. The project was publicised and received a lot of community interest, combining citizen science with local involvement. With its endless freeways, Los Angeles has been regarded as the archetypal modern urban jungle, yet nevertheless it harbours a rich fauna with many undescribed species. Of course, this result might be expected for small, poorly-studied Diptera families and genera, especially in open-ended taxa like *Megaselia*. What might similar surveys reveal from urban areas in biodiverse regions of the tropics and Southern Hemisphere? Biotic surveys in Singapore, for example, have revealed an astonishing diversity (Shamshev & Grootaert 2007). Similar surveys where community interest and volunteer help can be organised would be ideal for many urban areas. The Los Angeles study had three experts interested primarily in results for the family Phoridae—one can only speculate on the taxonomic riches remaining in those trap residues. Interestingly, Hartop *et al.* (2015) is also the only collaborative paper in *Zootaxa* among the two “phorid giants”, Brian Brown and Henry Disney.

**The legacy of Johann Wilhelm Meigen and the complexities of Zoological Nomenclature (by S. D. Gaimari).** Although broader in scope than the acalyprates for which I am editor, two contributions on genus-group names of Johann Wilhelm Meigen by Neal Evenhuis and Thomas Pape (Evenhuis & Pape 2017, 2019) stand out



as my favourites due to their historically interesting content and analysis, taxonomic significance, and the level of challenge presented to me as an editor. In the former work, the authors dealt with the Meigen (1800) work suppressed for purposes of zoological nomenclature by the International Commission on Zoological Nomenclature (ICZN) in 1963. But this suppression did not “suppress” the names from being used again. Rather, this only served to make the names unavailable from that 1800 work. Other works using Meigen (1800) were appropriately referring to it as “a source of information relevant to zoological nomenclature,” which made those names available by subsequent usage. Each of the 63 names was treated individually to determine their status relative to this idea, with 55 being synonymised with existing names, and with four found to be senior synonyms of more commonly used genus-group names. For these names, the authors suggested that applications to the ICZN could be warranted to request their suppression in favour of their junior synonyms if they were thought to threaten stability of nomenclature. Treatment of the Meigen (1800) names was a great setup for Evenhuis & Pape (2019), the seventh paper in the “Nomenclatural Studies Toward a World List of Diptera Genus-Group Names” series started in 2010 by Evenhuis and colleagues (see above). This work (and in fact all of these works) deserves as full a discussion here as the 2017 paper, but suffice it to say that the monumental 2019 work was reviewed by 8 individual referees (twice by some), resulting in a 193-page tome containing extensive biographical information, discussions of Meigen’s collections, a full annotated catalogue of his Diptera genus-group names, an index of his proposed species-group names, and a full bibliography of his works.

**A quartet that is worth a hundred (by S. S. Nihei).** Over the first 20 years of *Zootaxa*, 67 of 113 papers (60%) on the families Anthomyiidae, Fanniidae and Muscidae were authored by Claudio J. B. de Carvalho (Universidade Federal do Paraná, Brazil), Marcia S. Couri (Museu Nacional, Rio de Janeiro, Brazil), Verner Michelsen (Natural History Museum of Denmark, Copenhagen) and Adrian C. Pont (Oxford Museum of Natural History, England)—referred to collectively hereafter as CCMP—either as single authors or with different co-authors, including several publications authored together. Only the family Scathophagidae so far has no contribution by the CCMP quartet in *Zootaxa*, although they have published on this family in other journals. CCMP were responsible for the description of four new genera and 142 new species of Anthomyiidae, Fanniidae and Muscidae, which impressively represent 100% and 63%, respectively, of the new genera and species described in *Zootaxa* for those three families. Unsurprisingly, they have mostly contributed with studies of taxa from their home regions: Carvalho and Couri from the Neotropics, and Michelsen and Pont from the Palaearctic. Nevertheless, they also have been prominent in the study of taxa from other regions, including the outstanding series of eight papers by Couri and Pont on African Muscidae and an additional four papers on Australasian Muscidae. Carvalho, Couri and Pont have been also responsible for four of the 50 most cited papers on *Google Scholar*, among which it is worth mentioning the Neotropical catalogues of Muscidae (Carvalho *et al.* 2005) and Fanniidae (Carvalho *et al.* 2003), respectively the 7th and 17th most cited (Table 2). Thirteen authors have contributed to the study of Anthomyiidae with 23 papers, and the outstanding contribution of Michelsen is undeniable, with 14 authored papers (61%) and 24 new species (51%). In Fanniidae, where 30 different authors have contributed 18 papers and 44 new species, it is remarkable that 11 authors from South America (Argentina, Brazil and Colombia) were responsible for 50% of the papers and 84% of the new species, all from the Neotropics.

**Blow and cluster fly taxonomy at the greatest level of detail (by D. Whitmore).** The paper by Knut Rognes (2019) on the Calliphoridae of Armenia provided a list of species collected by Adrian C. Pont, including a new species of *Pollenia* dedicated to Agnete, Knut’s wife and “companion for more than 40 years of fly work.” In the summer of 2019, Knut told me in an e-mail that he had “given up all entomological work for health reasons” and that his collection of 12,000 calliphorids and other flies had just been shipped by plane to the Oxford Museum of Natural History. The sad news of his passing reached us in October 2020, and his 2019 paper on Armenian blow flies and cluster flies, which I edited, turned out to be his last first-author contribution to the knowledge of these flies [see Rognes (2020) for a full list of his publications]. Rognes, who was a former professor at the Department of Early Childhood Education, University of Stavanger (Norway), published 13 papers in *Zootaxa* between 2009 and 2019, and I had the pleasure to be the editor for his last five. Knut was second to none in his attention to detail, but he met his equal when submitting his works to me. Revision of his manuscripts often turned into a series of mini-battles around one point or another: some lost, some won. Knut Rognes’s papers will remain an excellent example of how morphological revisionary work should be conducted. From the detailed description of specimens and labels and the meticulous documentation of minute characters to the resolution of difficult nomenclatural problems, nothing escaped his attention.

## Conclusions

Our analysis of the data from 2001 to 2020 highlights the global reach of *Zootaxa* and shows that it is the preferred journal for publishing results of taxonomic and biodiversity discovery research on Diptera, despite competition from new or previously-established journals. This state of affairs can only partly be explained by the publishing model of the journal, which is free for the authors, relatively fast from acceptance to publication and has no page limit for articles. The large and dedicated volunteer editorial team of Diptera experts must still be considered one of the driving forces behind the numbers presented here. Our data also highlight the fact that the weight of biodiversity discovery in several of the megadiverse Diptera families lies almost exclusively on the shoulders of a very few specialists. A long-term vision for a more complete knowledge of this diverse and important insect order must rely on both the traditional tools and techniques of taxonomic study and on new technological advances, in order to train a new generation of taxonomists. *Zootaxa* stands ready to continue as an important and encouraging resource for dissemination of dipteran discoveries well into the future.

## Acknowledgements

Our sincerest thanks to Maurizio Mei (Sapienza University, Rome, Italy) for the artwork of Fig. 1, Natalie Dale-Skey (Natural History Museum, London, UK) for help with an Excel query, and Giulio Mela (Ricerca sul Sistema Energetico—RSE SpA, Milan, Italy) for help with Figs. 3–5 and 7. We are also grateful to our fellow Diptera subject editors who could not contribute to this article, for their hard editorial work. Special thanks to the hundreds of reviewers for contributing their time and expertise to the peer review process of over 2,500 papers (and counting...).

## Author contributions

VB and DW collected and analysed the data, with contributions from ZQZ, SSN, SDG, NLE, OK, BJS, JEO, JKM, CJEL, KH and GWC. DW wrote the paper, with contributions from SDG, NLE, VB, SSN, CJB, OK, BJS, JEO, GCR, DJB, WG, TA, BR, ZQZ, AEW, CK and PHK.

## References

- Azari-Hamidian, S. & Harbach, R.E. (2009) Keys to the adult females and fourth-instar larvae of the mosquitoes of Iran (Diptera: Culicidae). *Zootaxa*, 2078, 1–33.  
<https://doi.org/10.11646/zootaxa.2078.1.1>
- Borkent, A. (2008) The frog-biting midges of the world (Corethrellidae: Diptera). *Zootaxa*, 1804 (1), 1–367.  
<https://doi.org/10.11646/zootaxa.1804.1.1>
- Borkent, A. (2012) The pupae of Culicomorpha—morphology and a new phylogenetic tree. *Zootaxa*, 3396, 1–98.  
<https://doi.org/10.11646/zootaxa.3396.1.1>
- Borkent, A., Brown, B.V., Adler, P.H., Amorim, D.D., Barber, K., Bickel, D., Boucher, S., Brooks, S.E., Burger, J., Burington, Z.L., Capellari, R.S., Costa, D.N.R., Cumming, J.M., Curler, G., Dick, C.W., Epler, J.H., Fisher, E., Gaimari, S.D., Gelhaus, J., Grimaldi, D.A., Hash, J., Hauser, M., Hippa, H., Ibanez-Bernal, S., Jaschhof, M., Kameneva, E.P., Kerr, P.H., Korneyev, V., Korytkowski, C.A., Kung, G.A., Kvifte, G.M., Lonsdale, O., Marshall, S.A., Mathis, W.N., Michelsen, V., Naglis, S., Norrbom, A.L., Paiero, S., Pape, T., Pereira-Colavite, A., Pollet, M., Rochefort, S., Rung, A., Runyon, J.B., Savage, J., Silva, V.C., Sinclair, B.J., Skevington, J.H., Stireman, J.O.III, Swann, J., Vilkamaa, P., Wheeler, T., Whitworth, T., Wong, M., Wood, D.M., Woodley, N., Yau, T., Zavortink, T.J. & Zumbado, M.A. (2018) Remarkable fly (Diptera) diversity in a patch of Costa Rican cloud forest: why inventory is a vital science. *Zootaxa*, 4402 (1), 53–90.  
<https://doi.org/10.11646/zootaxa.4402.1.3>
- Borkent, C.J. & Wheeler, T.A. (2012) Systematics and phylogeny of *Leptomorphus* Curtis (Diptera: Mycetophilidae). *Zootaxa*, 3549, 1–117.  
<https://doi.org/10.11646/zootaxa.3549.1.1>
- Brooks, S.E. & Cumming, J.M. (2017) Revision of the Nearctic *Parathalassius* Mik (Diptera: Dolichopodidae: Parathalassiinae), with a review of the world fauna. *Zootaxa*, 4314 (1), 1–64.  
<https://doi.org/10.11646/zootaxa.4314.1.1>
- Brown, B.V., Borkent, A., Adler, P.H., Amorim, D.D., Barber, K., Bickel, D., Boucher, S., Brooks, S.E., Burger, J., Burington,

- Z.L., Capellari, R.S., Costa, D.N.R., Cumming, J.M., Curler, G., Dick, C.W., Epler, J.H., Fisher, E., Gaimari, S.D., Gelhaus, J., Grimaldi, D.A., Hash, J., Hauser, M., Hippa, H., Ibanez-Bernal, S., Jaschhof, M., Kameneva, E.P., Kerr, P.H., Korneyev, V., Korytkowski, C.A., Kung, G.A., Kvitte, G.M., Lonsdale, O., Marshall, S.A., Mathis, W.N., Michelsen, V., Naglis, S., Norrbom, A.L., Paiero, S., Pape, T., Pereira-Colavite, A., Pollet, M., Rochefort, S., Rung, A., Runyon, J.B., Savage, J., Silva, V.C., Sinclair, B.J., Skevington, J.H., Stireman, J.O.III, Swann, J., Thompson, F.C., Vilkkamaa, P., Wheeler, T., Whitworth, T., Wong, M., Wood, D.M., Woodley, N., Yau, T., Zavortink, T.J. & Zumbado, M.A. (2018) Comprehensive inventory of true flies (Diptera) at a tropical site. *Communications Biology*, 1 (21), 1–8.  
<https://doi.org/10.1038/s42003-018-0022-x>
- Carvalho, C.J.B. de, Couri, M.S., Pont, A.C., Pamplona, D. & Lopes, S.M. (2005) A catalogue of the Muscidae (Diptera) of the Neotropical Region. *Zootaxa*, 860, 1–253.  
<https://doi.org/10.11646/zootaxa.860.1.1>
- Carvalho, C.J.B. de, Pont, A.C., Couri, M.S. & Pamplona, D. (2003) A catalogue of the Fanniidae (Diptera) of the Neotropical Region. *Zootaxa*, 219, 1–32.  
<https://doi.org/10.11646/zootaxa.219.1.1>
- Coetzee, M., Hunt, R.H., Wilkerson, R., Della Torre, A., Coulibaly, M.B. & Besansky, N.J. (2013) *Anopheles coluzzii* and *Anopheles amharicus*, new members of the *Anopheles gambiae* complex. *Zootaxa*, 3619 (3), 246–274.  
<https://doi.org/10.11646/zootaxa.3619.3.2>
- Courtney, G.W., Pape, T., Skevington, J.H. & Sinclair, B.J. (2017) Biodiversity of Diptera. In: Footitt, R.G. & Adler, P.H. (eds.), *Insect Biodiversity: Science and Society. Vol. 1, 2nd Edition*. Wiley-Blackwell, Chichester, pp. 229–278.
- Cranston, P.S. (1995) Introduction. In: Armitage, P.D., Cranston, P.S., Pinder, L.C.V. (eds.), *The Chironomidae. Biology and Ecology of Non-biting Midges*. Chapman and Hall, London, Glasgow, Weinheim, New York, Melbourne, Madras, pp. 1–7.
- Evenhuis, N.L. & Pape, T. (2017) Battling the un-dead: the status of the Diptera genus-group names originally proposed in Johann Wilhelm Meigen's 1800 pamphlet. *Zootaxa*, 4275 (1), 1–74.  
<https://doi.org/10.11646/zootaxa.4275.1.1>
- Evenhuis, N.L. & Pape, T. (2019) Nomenclatural studies toward a world list of Diptera genus-group names. Part VII: Johann Wilhelm Meigen. *Zootaxa*, 4703 (1), 1–193.  
<https://doi.org/10.11646/zootaxa.4703.1.1>
- Evenhuis, N.L. & Pape, T. (eds.) (2021) *Systema Dipterorum*. Version 3.0. Available from: <http://diptera.org/> (accessed 26 April 2021).  
<https://doi.org/10.11646/zootaxa.4703.1.1>
- 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), 1–211.  
<https://doi.org/10.11646/zootaxa.4172.1.1>
- Grimaldi, D. & Engel, M.S. (2005) *Evolution of the Insects*. Cambridge University Press, New York, xv + 755 pp.
- Hartop, E., Brown, B.V. & Disney, R.H.L. (2015) Opportunity in our ignorance: urban biodiversity study reveals 30 new species and one new Nearctic record for *Megaselia* (Diptera: Phoridae) in Los Angeles (California, USA). *Zootaxa*, 3941 (4), 451–484.  
<https://doi.org/10.11646/zootaxa.3941.4.484>
- Harzing, A.W. (2007) Publish or Perish. Available from <https://harzing.com/resources/publish-or-perish> (accessed April 2021).
- Hebert, P.D.N., Ratnasingham, S., Zakharov, E.V., Telfer, A.C., Levesque-Beaudin, V., Milton, M.A., Pedersen, S., Jannetta, P. & deWaard, J.R. (2016) Counting animal species with DNA barcodes: Canadian insects. *Philosophical Transactions of the Royal Society B*, 371: 20150333.  
<https://doi.org/10.1098/rstb.2015.0333>
- Kerr, P.H. (2010) Phylogeny and classification of Rhagionidae, with implications for Tabanomorpha (Diptera: Brachycera). *Zootaxa*, 2592, 1–133.  
<https://doi.org/10.11646/zootaxa.2592.1.1>
- Lonsdale, O. & Marshall, S.A. (2012) *Sobarocephala* (Diptera: Clusiidae: Sobarocesphalinae)—subgeneric classification and revision of the New World species. *Zootaxa*, 3370 (1), 1–307.  
<https://doi.org/10.11646/zootaxa.3370.1.1>
- Marshall, S.A. (2012) *Flies. The Natural History and Diversity of Diptera*. Firefly Books, Buffalo, Richmond Hill, 616 pp.
- Marshall, S.A. & Kirk-Spriggs, A.H. (2017) 4. Natural history of Diptera. In: Kirk-Spriggs, A.H. & Sinclair, B.J. (eds.), *Manual of Afrotropical Diptera. Vol. 1. Introductory Chapters and Keys to Diptera Families*. Suricata 4. South African National Biodiversity Institute, Pretoria, pp. 135–152.
- Meigen, J.W. (1800) *Nouvelle classification des mouches à deux ailes (Diptera L.) d'après un plan tout nouveau. Par J.G. Meigen*. “An VIII (1800 v.s.)”. J.J. Fuchs, Paris, 40 pp.
- Metz, M.A., Winterton, S.L. & Irwin, M.E. (2002) Notes on the functional morphology of terminalia from *Prorates ballmeri* Nagatomi and Liu (Diptera: Scenopinidae: Proratinae) collected while in copula, with a description of the previously unknown female. *Zootaxa*, 76, 1–12.  
<https://doi.org/10.11646/zootaxa.76.1.1>
- O'Hara, J.E., Cerretti, P., Pape, T. & Evenhuis, N.L. (2011) Nomenclatural studies toward a world list of Diptera genus-group

- names. Part II: Camillo Rondani. *Zootaxa*, 3141 (1), 1–268.  
<https://doi.org/10.11646/zootaxa.3141.1.1>
- Pape, T., Beuk, P., Pont, A.C., Shatalkin, A.I., Ozerov, A.L., Woźnica, A.J., Merz, B., Bystrowski, C., Raper, C., Bergström, C., Kehlmaier, C., Clements, D.K., Greathead, D., Kameneva, E.P., Nartshuk, E., Petersen, F.T., Weber, G., Bächli, G., Geller-Grimm, F., Van de Weyer, G., Tschorsnig, H.-P., de Jong, H., van Zuijlen, J.W., Vaňhara, J., Roháček, J., Ziegler, J., Majer, J., Hürka, K., Holston, K., Rognes, K., Greve-Jensen, L., Munari, L., de Meyer, M., Pollet, M., Speight, M.C.D., Ebejer, M.J., Martinez, M., Carles-Tolrá, M., Földvári, M., Chvála, M., Barták, M., Evenhuis, N.L., Chandler, P.J., Cerretti, P., Meier, R., Rozkošný, R., Prescher, S., Gaimari, S.D., Zatwarnicki, T., Zeegers, T., Dikow, T., Korneyev, V.A., Richter, V.A., Michelsen, V., Tanasijtshuk, V.N., Mathis, W.N., Hubenov, Z. & de Jong, Y. (2015) Fauna Europaea: Diptera – Brachycera. *Biodiversity Data Journal*, 3: e4187.  
<https://doi.org/10.3897/BDJ.3.e4187>
- Podenas, S., Byun, H.-W. & Kim, S.-K. (2015) New *Dicranoptycha* Osten Sacken, 1859 crane flies (Diptera: Limoniidae) of North and South Korea. *Zootaxa*, 3925 (2), 257–270.  
<https://doi.org/10.11646/zootaxa.3925.2.7>
- Podeniene, V. & Gelhaus, J.K. (2015) Review of the last instar larvae and pupae of *Hexatoma* (*Eriocera*) and *Hexatoma* (*Hexatoma*) (Diptera, Limoniidae, Limnophilinae). *Zootaxa*, 4021 (1), 93–118.  
<https://doi.org/10.11646/zootaxa.4021.1.4>
- R Core Team (2021) *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. Available from: <https://www.R-project.org/> (accessed May 2021)
- Ribeiro, G.C., Santos, C.M.D., Olivieri, L.T., Santos, D., Berbert, J.M. & Eterovic, A. (2014) The world's biogeographical regions revisited: global patterns of endemism in Tipulidae (Diptera). *Zootaxa*, 3847 (2), 241–258.  
<https://doi.org/10.11646/zootaxa.3847.2.4>
- Rognes, K. (2019) The Calliphoridae (Diptera) of Armenia. *Zootaxa*, 4576 (2), 375–391.  
<https://doi.org/10.11646/zootaxa.4576.2.11>
- Rognes, K. (2020) *Publications in zoology (PIZ filen)*. Available from: <http://www.knut-rognos.no/PIZ.html> (Last update: 21 February 2020).
- Rueda, L.M. (2004) Pictorial keys for the identification of mosquitoes (Diptera: Culicidae) associated with dengue virus transmission. *Zootaxa*, 598, 1–60.  
<https://doi.org/10.11646/zootaxa.589.1.1>
- Santos, D., Sampronha, S. & Santos, C.M.D. (2017) Advances on dipterology in the 21st century and extinction rates. *Papéis Avulsos de Zoologia*, 57 (33), 433–444.
- Shamshev, I.V. & Grootaert, P. (2007) Revision of the genus *Elaphropeza* Macquart (Diptera: Hybotidae) from the Oriental Region, with a special attention to the fauna of Singapore. *Zootaxa*, 1488, 1–164.  
<https://doi.org/10.11646/zootaxa.1488.1.1>
- Szumik, C.A., Cuezco, F., Goloboff, P.A. & Chalup, A.E. (2002) An optimality criterion to determine areas of endemism. *Systematic Biology*, 51, 806–816.  
<https://doi.org/10.1080/10635150290102483>
- Szumik, C.A. & Goloboff, P.A. (2004) Areas of endemism: an improved optimality criterion. *Systematic Biology*, 53, 968–977.  
<https://doi.org/10.1080/10635150490888859>
- Usher, M.B. & Edwards, M. (1984) A dipteran from south of the Antarctic Circle: *Belgica antarctica* (Chironomidae), with a description of its larva. *Biological Journal of the Linnean Society*, 22, 19–31.  
<https://doi.org/10.1111/j.1095-8312.1984.tb00803.x>
- Wallace, A.R. (1876) *The geographical distribution of animals*. Vols. 1 & 2. Macmillan, London, 574 & 650 pp.
- Yu, Y.X., Liu, J.H., Liu, G.P., Liu, Z.J., Hao, B.S., Yan, G. & Zhao, T.S. (2005) *Ceratopogonidae of China, Insecta, Diptera*. Vol. 1. Military Medical Science Press, Beijing, viii + 814 pp. [In Chinese.]
- Zhang, Z.-Q. (2014) Sustaining the development of world's foremost journal in biodiversity discovery and inventory: *Zootaxa* editors and their contributions. *Zootaxa*, 3753 (6), 597–600.  
<https://doi.org/10.11646/zootaxa.3753.6.6>



**APPENDIX 1.** Numbers of new taxa and new replacement names published in *Zootaxa* from 2001 to 2020, ordered by family in alphabetical order. \* = Sciaroidea, genus *Cabamofa* Jaschhof; \*\* = including Lygistorrhinidae; \*\*\* = as Calliphoridae. Abbreviations: fam. n. = new families; gen. n. = new genera; nom. n. = new replacement names; sp. n. = new species; ssp. n. = new subspecies; subfam. n. = new subfamilies; subgen. n. = new subgenera; tribe n. = new tribes.

	fam. n.	subfam. n.	tribe n.	gen. n.	subgen. n.	sp. n.	ssp. n.	nom. n.
Acroceridae						3		
Agromyzidae						128		
Anisopodidae						8		
Anthomyiidae				1		28		2
Anthomyzidae				1		6		
Apioceridae						7		
Apsilocephalidae				1		1		
Archisargidae						7		
Asilidae				5	1	137		
Atelestidae		1						
Athericidae				3		4		
Aulacigastridae				1		3		
Austroleptidae						3		
Axymyiidae				1		2		
Bibionidae						8		1
Blephariceridae				1		4		
Bolitophilidae						5		
Bombyliidae				2		94		
Brachystomatidae						1		
Calliphoridae				1		18		
Canacidae						8	1	1
Carnidae						10		
Cecidomyiidae				32		207		1
Ceratopogonidae				1	2	157		4
Chamaemyiidae				3		8		
Chimeromyiidae	1			1		5		
Chironomidae				29	2	723	1	6
Chloropidae				5		95		
Chyromyiidae						5		
Clusiidae						271		
Conopidae		1		8		68		
Corethrellidae						67		
Ctenostylidae						2		
Culicidae		1		3	3	40		1
Curtonotidae						31		1
Diadocidiidae						4		
Diopsidae						4		
Ditomyiidae						6		
Dixidae						14		

...Continued on the next page

**APPENDIX 1.** (Continued)

	fam. n.	subfam. n.	tribe n.	gen. n.	subgen. n.	sp. n.	ssp. n.	nom. n.
Dolichopodidae				10		289		2
Drosophilidae				1		249		3
Empididae						236		
Ephydriidae				4		52		
Eremochaetidae						1		
Fanniidae						44		
Fergusoninidae						4		
Heleomyzidae						4		
Hennigmatidae				1		1		
Hybotidae			2	3		269		1
<i>Incertae sedis*</i>						1		
Keroplastidae**				7		45		
Lauxaniidae				15		139		4
Limoniidae					5	105		1
Lonchaeidae				1		80		
Lonchopteridae						2		
Mesembrinellidae						17		
Micropezidae				1		82		
Milichiidae				1		87		
Muscidae				3		135		2
Mycetophilidae				4	1	410		4
Mydidae				2		13		
Mythicomyiidae				8		64		
Nemestrinidae						1		
Neriidae						10		
Nothybidae						4		
Nycteribiidae						4		
Nymphomyiidae						1		
Odiniidae				6		14		
Pallopteridae						1		
Paraleucopidae	1					6		
Pediciidae						7		
Pelecorhynchidae						2		
Periscelididae						14		
Perissommatidae				1		3		
Phoridae				10		536		2
Piophilidae				1		4		1
Pipunculidae						55		
Platypezidae						3		
Platystomatidae						12		2
Polleniidae***						2		
Protapioceridae						1		

...Continued on the next page

**APPENDIX 1.** (Continued)

	fam. n.	subfam. n.	tribe n.	gen. n.	subgen. n.	sp. n.	ssp. n.	nom. n.
Protobrachyceridae						1		
Protopleciidae						2		
Pseudopomyzidae						2		
Psychodidae				10	3	201		5
Ptychopteridae						17		
Pyrgotidae						2		
Rangomaramidae		3		1		6		
Rhagionemestriidae				1		1		
Rhagionidae				3		24		7
Rhiniidae						2		
Rhinophoridae						6		
Richardiidae				1		8		
Ropalomeridae				1		5		
Sarcophagidae					2	70		2
Scathophagidae						9		
Scatopsidae				2		28		
Scenopinidae				2		9		
Sciaridae		1		2	1	387		1
Sciomyzidae				1		19		
Sepsidae						3		
Simuliidae				4		132		1
Spaniidae						1		
Sphaeroceridae				17		267		
Stratiomyidae				8		60		
Strebliidae				1		12		
Strongylophthalmyiidae						25		
Syringogastridae						14		
Syrphidae				13	1	212		2
Tabanidae				1		49		
Tachinidae				5		196		8
Tanyderidae				1		2		
Tephritidae				8		229	2	
Teratomyzidae				1		12		
Thaumaleidae						4		
Therevidae				14		130		2
Tipulidae				1		31		
Trichoceridae		1		1		6		
Ulidiidae						43		
Vermileonidae						2		
Xylophagidae						1		
<b>Totals</b>	<b>2</b>	<b>8</b>	<b>2</b>	<b>277</b>	<b>21</b>	<b>7,431</b>	<b>4</b>	<b>67</b>

**APPENDIX 2.** Complete timeline of Diptera subject editors and edited taxa, based on information published on the *Zootaxa* website and retrieved via the “Wayback Machine” (<https://archive.org>).

