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Twenty years, eight legs, one concept: describing spider biodiversity in *Zootaxa* (Arachnida: Araneae)

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Dedicated to Norman I. Platnick (1951–2020)

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Abstract

Zootaxa published more than a thousand papers on Araneae from 2002 to the present, including descriptions of 3,833 new spider species and 177 new genera. Here we summarise the key contributions of *Zootaxa* to our current knowledge of global spider diversity. We provide a historical account of the researchers that have actively participated as editors, and recognize the more than 1,000 reviewers without whom none of this would have been possible. We conduct a simple analysis of the contributions by authors and geographic region, which allows us to uncover some of the underlying trends in current spider taxonomy. In addition, we examine some of the milestones in twenty years of spider systematic research in *Zootaxa*. Finally, we discuss future prospects of spider taxonomy and the role that *Zootaxa* and its younger sister journal Megataxa will play in it. We would like to dedicate this contribution to the memory of Norman I. Platnick, a crucial figure in the advancement of spider systematics.

Key words: Arachnology, biodiversity, taxonomy, systematics, new species, new genera, scientific journal

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FIGURES 1A–BB. Habitus photographs of some spider species treated in *Zootaxa* publications, indicating volume and page numbers of the papers, with photographers in square brackets: A *Liphistius isan* Schwendinger (Liphistiidae), 3702: 51–60 [P. Schwendinger]. B *Cteniza sauvagesi* (Rossi) (Ctenizidae), 4550: 499–524 [P. Rizzo]. C *Stenoterommata gugai* Indicatti *et al.* (Nemesiidae), 4254: 435–456 [R. Indicatti]. D *Sahastata nigra* (Simon) (Filistatidae), 4899: 215–246 [M. Stockmann]. E *Nops guanabacoae* MacLeay (Caponiidae), 4427: 1–121 [A. Sanchez-Ruiz]. F *Ariadna mollis* (Holmberg) (Segestriidae), 4400: 1–114 [R. Indicatti]. G *Loxosceles troglobia* Souza & Ferreira (Sicariidae), 4438: 575–587 [R. Ferreira]. H *Sicarius tropicus* (Mello-Leitão) (Sicariidae), 3599: 101–135 [I. Magalhaes]. I *Panjange thomi* Huber (Pholcidae), 4546: 1–96 [B. Huber]. J *Archoleptoneta schusteri* Gertsch (Leptonetidae), 2391: 1–32 [J. Ledford]. K *Meotipa sahyadri* Kulkarni *et al.* (Theridiidae), 4291: 504–520 [S. Kulkarni]. L *Symphytognatha milleri* Lin (Symphytognathidae), 4638: 291–295 [Y. Lin]. M *Oaphantes cryophilus* Paquin *et al.* (Linyphiidae), 4819: 349–363 [J. Krejca]. N *Desis jiaxiangi* Lin *et al.* (Desidae), 4755: 593–597 [Z. Lin]. O *Cebrennus rambodjavani* Moradmand *et al.* (Sparassidae), 4121: 187–193 [M. Moradmand]. P *Sinopoda scurion* Jäger (Sparassidae), 3415: 37–57 [P. Jäger]. Q *Oxyopes sushilae* Tikader (Oxyopidae), 4927: 58–86 [Y.-Y. Lo]. R *Dendrolycosa duckitti* Jäger (Pisauridae), 3046: 1–38 [P. Jäger]. S *Halocosa cereipes* (L. Koch) (Lycosidae), 4629: 555–570 [G. Azarkina]. T *Epicadus heterogaster* (Guérin-Méneville) (Thomisidae), 4147: 281–310 [anonymous]. U *Philisca huapi* Ramírez (Anyphaenidae), 3443: 1–65 [M. Ramírez]. V *Apopyllus suavis* (Simon) (Gnaphosidae), 4178: 301–327 [P. Martins]. W *Coenoptychus pulcher* Simon (Corinnidae), 4413: 163–172 [K. Nafin]. X *Myrmecium bolivari* Candiani & Bonaldo (Corinnidae), 4230: 1–95 [D. Llavaneras]. Y *Selenops muehlmannorum* Jäger & Praxaysombath (Selenopidae), 2883: 65–68 [P. Jäger]. Z *Lessertina mutica* Lawrence (Cheiracanthiidae), 3873: 82–92 [C. Haddad]. AA *Psellonus planus* Simon (Philodromidae), 4543: 442–450 [J. Paul]. BB *Oviballus vidae* Azarkina & Haddad (Salticidae), 4899: 15–92 [V. van der Walt].

Introduction

Spiders (Arachnida: Araneae) are one of the megadiverse arthropod orders, with almost 50,000 species described to date (World Spider Catalog 2021). They are considered the most important group of terrestrial true invertebrate predators, playing a critical function in ecosystems as regulators of prey populations, particularly insects (Nyffeler & Birkhofer 2017). Their success as organisms can be attributed to their occupation of almost all terrestrial ecosystems and the evolution of a broad range of prey capture strategies, including diverse web structures, as well as a wide array of body forms (Figs 1A–BB).

Twenty years ago, *Zootaxa* was founded as a new journal focused on animal taxonomy and systematics. Since 2002, when the first paper on spiders was published in this venue, the araneological community has seen a steady growth of publications over the years until 2013. Since then, the number of papers has turned into an average of 78 papers per year, with a slight increase in the last four years (Fig. 2).

Zootaxa was initiated at a time when the rate of new spider species descriptions per year was already very high (Fig. 3: red bar). It was also the time when the journal impact factor (IF) and other citation metrics became important, for example, to assess job applicants for scientific positions or to gain research funding. The so-called H-factor (Hirsch 2005), has been used to compare individual performances of scientific publications. PDFs as favourite format to distribute scientific publications became increasingly more important, and replaced the traditional paper printed format and reprint collections. Online journals were founded and the International Code of Zoological Nomenclature was amended to accommodate all these new developments (International Commission on Zoological Nomenclature 2012). At the same time, some traditional journals faced problems to survive, since they could not get into the "IF-zone". The journal *Senckenbergiana biologica*, for instance, starting with its first volume in 1834 under the name *Museum Senckenbergianum*, was discontinued by the Senckenberg Society due to this problem in the year 2008, with its last issue 88 (2).

Initially, *Zootaxa* attracted at least some articles from such journals, but did not distinctly increase the number of species or papers published. However, *Zootaxa* was founded at the right time, when the spirit and landscape of publishing taxonomic research was changing dramatically and new tools and techniques were developed and applied by taxonomists. Importantly, the journal had (and still has) the explicit objective of speeding up the process of animal species description, adopting a decentralized editorial system and a strategy of continuous publication, in which the articles of a given volume are published immediately after processing.

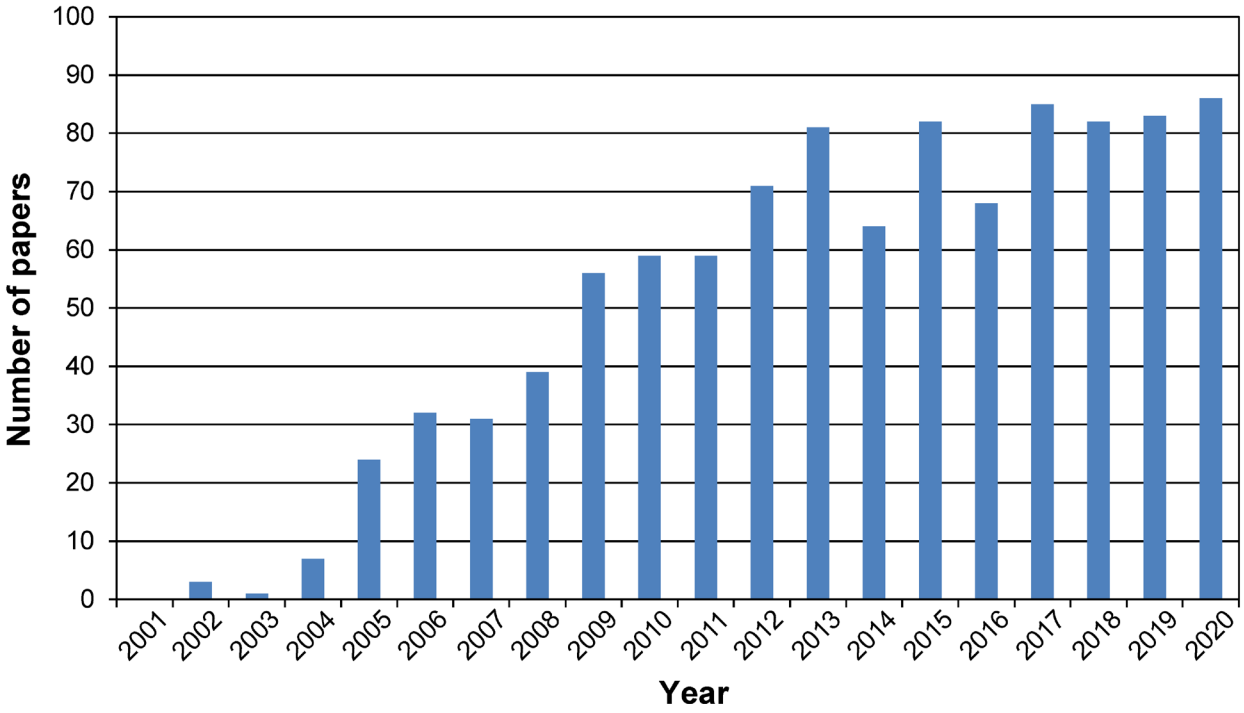

FIGURE 2. Papers per year on Araneae published in *Zootaxa* since 2001.

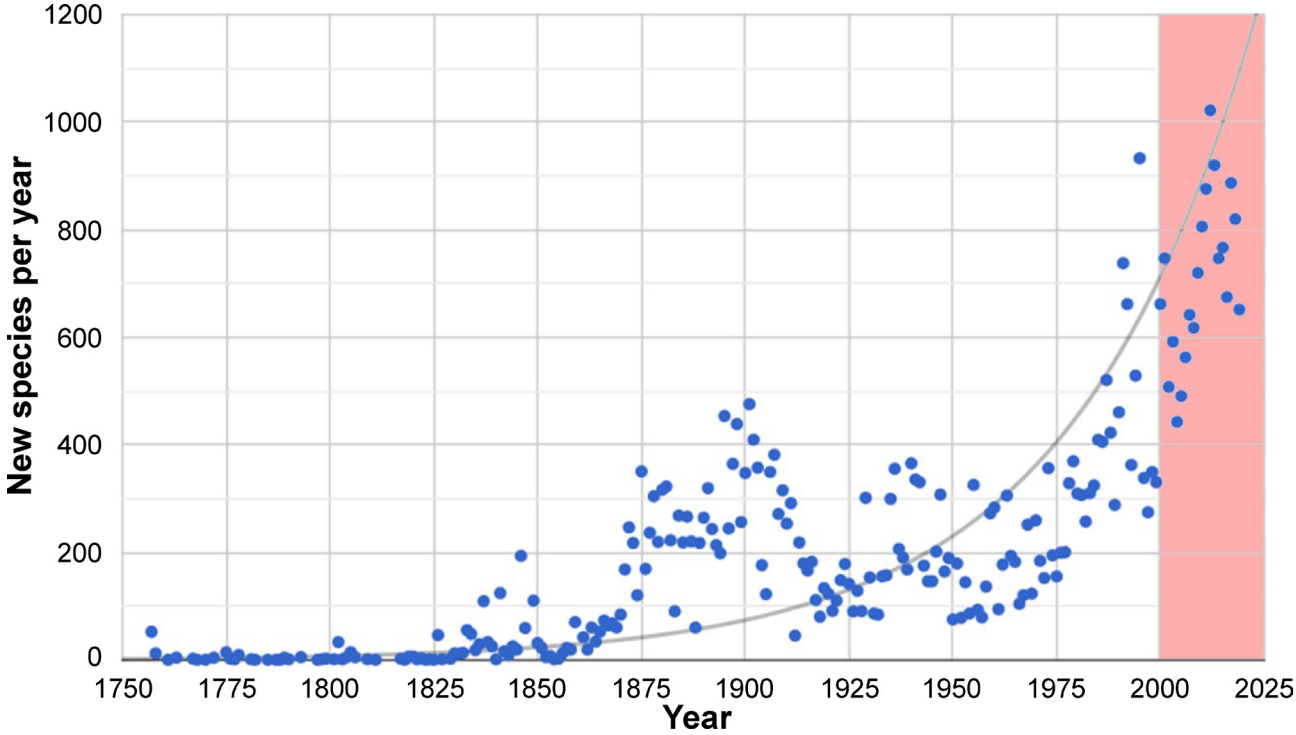

FIGURE 3. Number of valid spider species described each year between 1757 and 2020. The red bar indicates the period with *Zootaxa* as journal (modified after World Spider Catalog 2021).

In the present article, we compile numbers and facts about true spiders (Araneae) relative to the papers published in *Zootaxa* over the past 20 years. It may well be that in this important year for *Zootaxa* the 50,000th spider species will be described (World Spider Catalog 2021; current number: 49,356 on April 19th, 2021).

Zootaxa and editors: a history of growth

The first paper ever published in *Zootaxa* was about a new species of Arachnida (Acari) and came out on May 28th, 2001 (Moraes & Freire 2001). It took 20 more publications on Acari before the first paper on another arachnid order, namely the spiders (Araneae), was published (Martins *et al*. 2002). In 2002, the chief editor, Zhi-Qiang Zhang, invited several editors to join the newly established journal, with the aim of covering various animal groups through academic expertise. Peter Jäger took over for Arachnida (excluding Acari) and the first manuscript processed by him was submitted on June, 10th 2002. In 2005, more colleagues were invited to join as associate editors, because *Zootaxa* flourished and a single editor could not cope with the ever-increasing number of submitted manuscripts. The following lists show not only the growth of *Zootaxa* since 2001 and its impact in the biblio-scientific landscape but also the importance of a functioning network of specialists offering their time and acting as associate editors to support the vision of *Zootaxa* and the team behind it.

Arachnida (excl. Araneae)
Peter Jäger (2002–2005: Arachnida excl. Acari)
Lorenzo Prendini (2005–present: Scorpiones, Amblypygi, Thelyphonida, Schizomida and Solifugae)
Peter Schwendinger (2005–present: Opiliones; present taxon treated: Cyphophthalmi)
Mark L.I. Judson (2006–2019: Pseudoscorpiones, Palpigradi [until 2017], Ricinulei [until 2014])
Abel Pérez González (2009–present: Laniatores; 2016–present: Laniatores: non-Gonyleptoidea)
Axel Schönhofer (2010–2014: Opiliones: Dyspnoi & Eupnoi)
Ricardo Pinto-da-Rocha (2014—present: Ricinulei)
Jeffrey W. Shultz (2014–present: Opiliones: Dyspnoi & Eupnoi)
Luis E. Acosta (2016–present: Gonyleptoidea; 2019–present: Laniatores: Gonyleptidae and other Gonyleptoidea)
Jaime G. Mayoral (2017–present: Palpigradi)
Danilo Harms (2019–present: Pseudoscorpiones)
Daniel N. Proud (2020–present: Laniatores: Cosmetidae and other Gonyleptoidea)

Araneae
Peter Jäger (2002–present: Arachnida, later: various groups of Araneae, present: Dictynoidea)
Robert Raven (2005–present: Mygalomorphae and Mesothelae)
Christoph Muster (2006–present: Dionycha excl. Gnaphosoidea; since 2011 Dionycha ad part: Laterigradae: Philodromidae, Selenopidae, Sparassidae, Thomisidae)
Martín Ramírez (2006–2018: Dionycha ad part: Gnaphosoidea s.l.)
Volker Framenau (2006–2009: Lycosoidea)
Barbara Baehr (2006–present: Entelegynae reliquae)
Christian Kropf (2006–2008: Synspermiata)
Nikolaj Scharff (2006–2008: Araneoidea)
Michael Rix (2006–present: Eresoidea, Palpimanoidea)
Gustavo Hormiga (2008–present: Araneoidea, Deinopidae, Uloboridae)
Jeremy Miller (2008–2016: Amaurobioidea)
Milan Rezac (2009–2013: Synspermiata, from 2010 Dysderoidea)
Cor Vink (2009–2016: Lycosoidea)
Wouter Fannes (2010–2013: Synspermiata excl. Dysderoidea)
Tamas Szuts (2011–2015: Salticidae)
Miquel Arnedo (2013–present: Hypochilidae; Synspermiata: Dysderidae, Oonopidae, Orsolobidae, Segestriidae, Tetrablemmidae, Caponiidae, Ochyroceratidae, Lepotonetidae, Telemidae)
Facundo M. Labarque (2013–present: Synspermiata: Diguetidae, Drymusidae, Filistatidae, Periegopidae, Pholcidae, Plectreuridae, Scytodidae, Sicariidae, Trogoloraptoridae)
Alexandre B. Bonaldo (2014–present: Cheiracanthiidae, Anyphaenidae, Clubionidae)
Charles Haddad (2014–present: Dionycha ad part: Gnaphosoidea: Corinnidae, Liocranidae, Phrurolithidae, Trachelidae)
Adalberto J. Santos (2014–2019: Neotropical Lycosoidea; 2019–present: Lycosoidea worldwide: Lycosidae,

Pisauridae, Trechaleidae, Oxyopidae, Psechridae, Ctenidae, Miturgidae, Zoropsidae, Tengellidae, Senoculidae, Zoridae)
Gustavo Ruiz (2014–2020: Salticidae)
Danilo Harms (2017–present: Amaurobioidea: Agelenidae, Amaurobiidae, Titanoecidae, Amphinectidae)
Guilherme Azevedo (2018–present: Dionycha: Gnaphosoidea: Ammoxenidae, Cithaeronidae, Gallieniellidae, Gnaphosidae, Lamponidae, Prodidomidae, Trochanteriidae)
Jason Bond (2020–present: Araneae: Mygalomorphae)
Junxia Zhang (2020–present: Salticidae)

Reviewers: backbone of every journal and imperative for scientific quality

For each paper, two or more reviewers are asked by the associate editor to assess its academic quality, and the article may be accepted without changes, subjected to minor or major revision, or rejected before or after peer review. The peer review process is single blind, although reviewers are given the option of revealing their name to the authors. Rejections may occur due to poor scientific standards, but also by simply not fitting the journal's aim and scope. A common reason for rejection is the description of single species in speciose and largely unrevised genera, which is discouraged by the journal's guidelines. The overall rejection rate across all Araneae over the period of twenty years was on average 25.5 percent. Included in this number are those manuscripts that were withdrawn by the authors after the review process was initiated.

The enormous number of referees for the over 1,000 papers published in the past twenty years makes it impossible to list all of the names here. We wish to thank all of them for their efforts, time, consideration, and enthusiasm to ascertain an acceptable scientific standard for species descriptions in *Zootaxa*. For most families and regions, there are only a few specialists that are able to adequately assess the quality of the submitted work, and numerous referees have supported the journal faithfully for many years. Without their specialized knowledge of various spider families, it would have been impossible to achieve what *Zootaxa* is today, and what has been achieved for the field of arachnological taxonomy and biodiversity research more generally.

Papers, authors, taxa, countries: numbers and statistics

From November 5th, 2002 through February 5th, 2021 a total of 1,021 papers on Araneae were published in *Zootaxa*, adding up to 21,537 pages and an average of 21 pages per paper, ranging from one page to 327 pages (Fig. 4). In 816 of the 1,021 papers (≈80 %) at least one new species was described. Conversely, the remaining 205 papers (≈20%) did not provide new species descriptions, but included, amongst others, papers publishing redescriptions of poorly known species and descriptions of unknown sexes (mainly papers in the Correspondence category), new country or regional records, national checklists of particular groups (e.g., Zonstein & Marusik 2013), catalogues, or discussed general issues in the taxonomy or biodiversity of arachnids (e.g., Platnick & Raven 2013; Haddad & Marusik 2019; Kropf *et al*. 2019).

A total of 2,522 authorships were involved in the above-mentioned 1,021 papers. Of the 731 authors involved, 411 published just a single paper whereas 99 and 66 authors published two and three papers, respectively. Beyond three papers per author, the curve flattens distinctly (Fig. 5). The authors with the highest number of publications in *Zootaxa* in the past twenty years are Shuqiang Li (91 papers), Antonio Brescovit (80), and Yuri Marusik (68) with their co-authors.

The number of authors per araneological paper in *Zootaxa* ranged from one to thirteen. The article with the exceptionally high number of thirteen authors was a position paper on the delimitation of higher taxa in jumping spiders (Kropf *et al*. 2019). The highest number of co-authors in taxonomic papers describing new taxa (species and genera) was eight. The average is 2.47 authors per paper, with a general trend of a slightly increasing number of authors over the past twenty years from roughly two to three authors (Fig. 6).

A total of 3,833 new spider species were described in *Zootaxa* over the past twenty years. At the same time, 9,986 spider species were published in other journals, adding up to a total of 13,819 spider species. This means that approximately 27 percent of all newly described species of the order Araneae were covered by *Zootaxa* (Fig. 7). Further, this number indicates that 28 % of the currently known spider species were described in the last two decades

(7.8 % in *Zootaxa*), an impressive effort facilitated by improved microscopy equipment, electronic resources, funding and human resources in the modern age (Fig. 3).

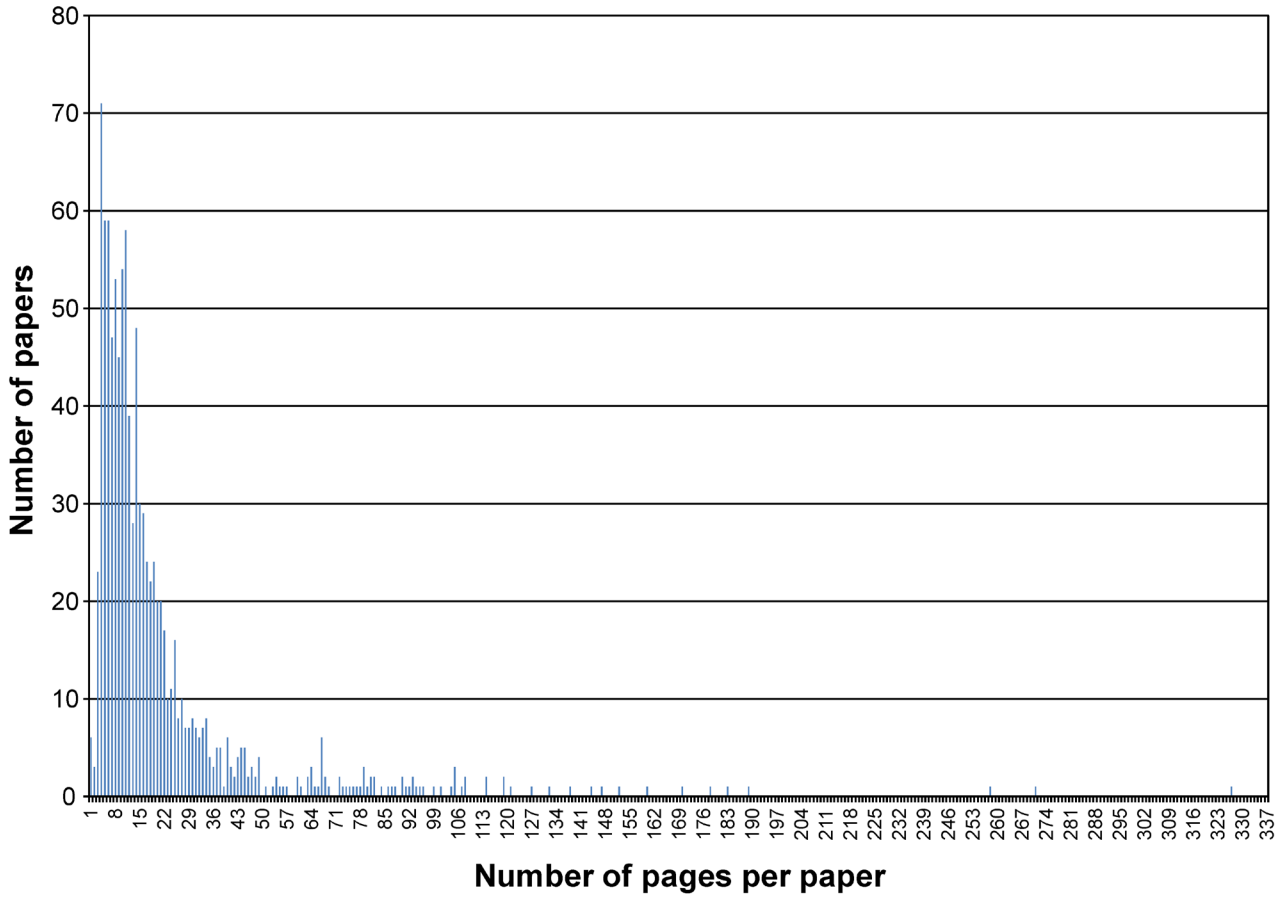

FIGURE 4. Frequency of various sizes (expressed in the number of published pages per paper) of *Zootaxa* papers on Araneae. The average size of papers is 21 pages (n=1,021 papers).

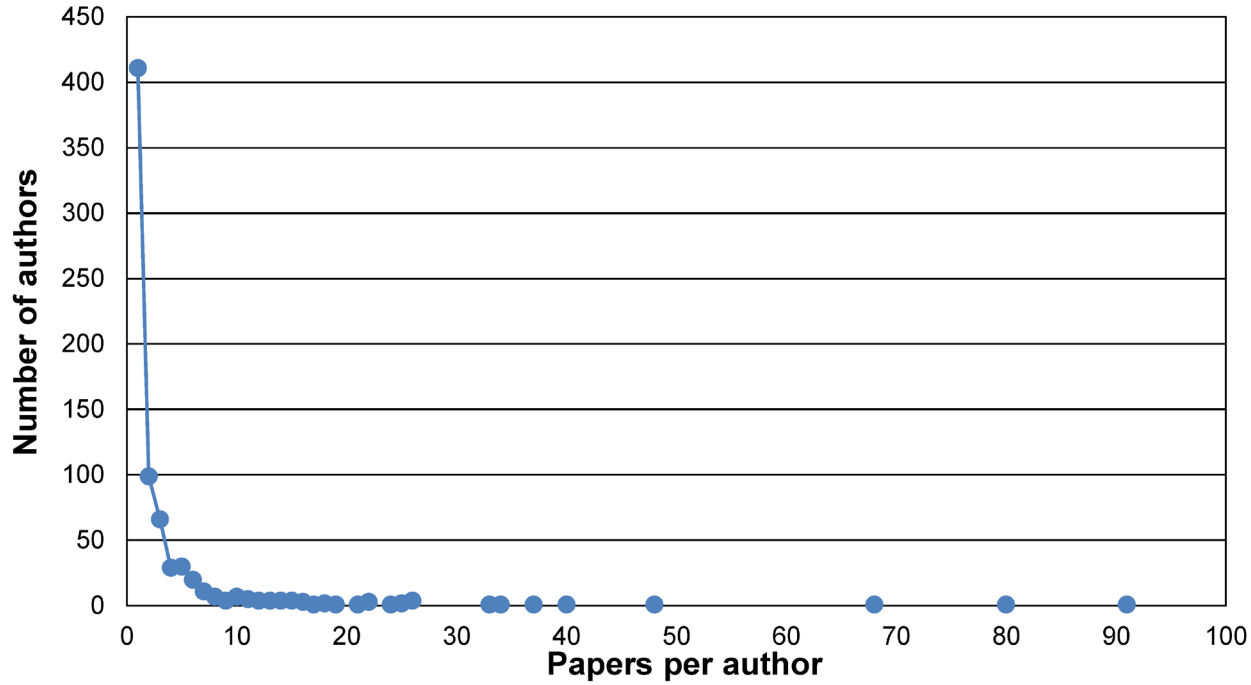

FIGURE 5. Number of *Zootaxa* papers on Araneae per author. The average number is 3.45 papers per author (n=1,021 papers).

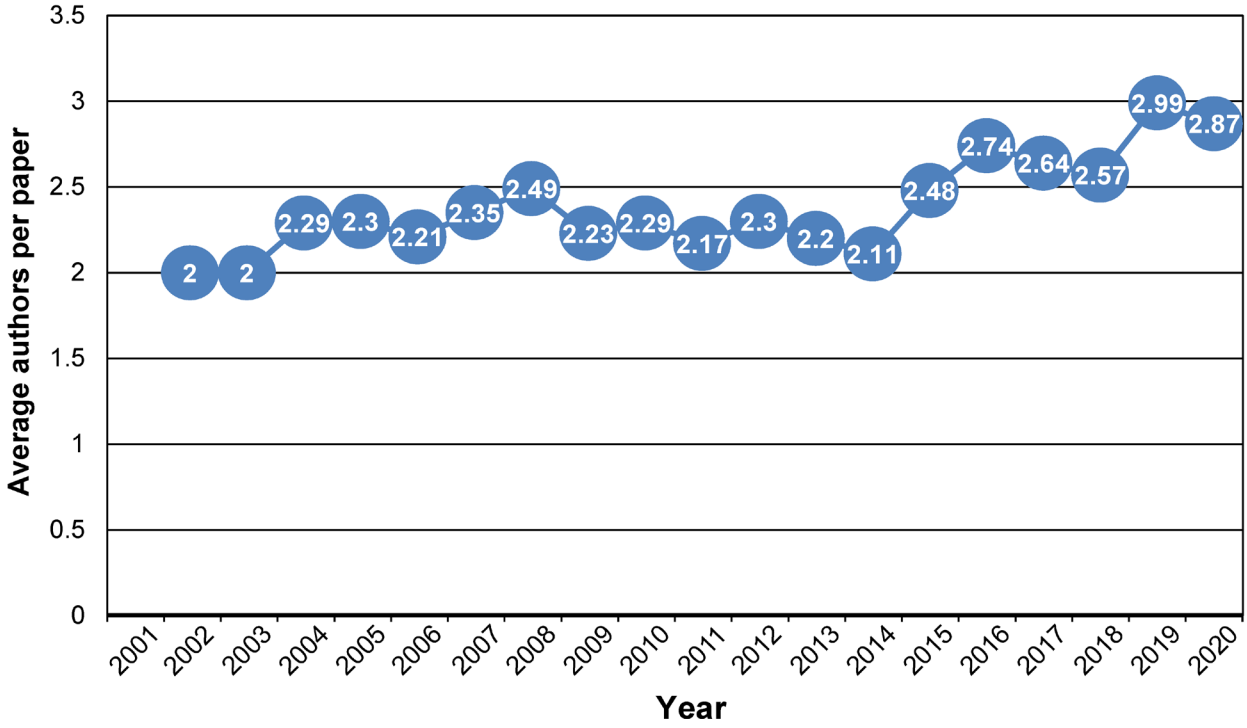

FIGURE 6. Number of authors per *Zootaxa* paper on Araneae listed as average number for each year.

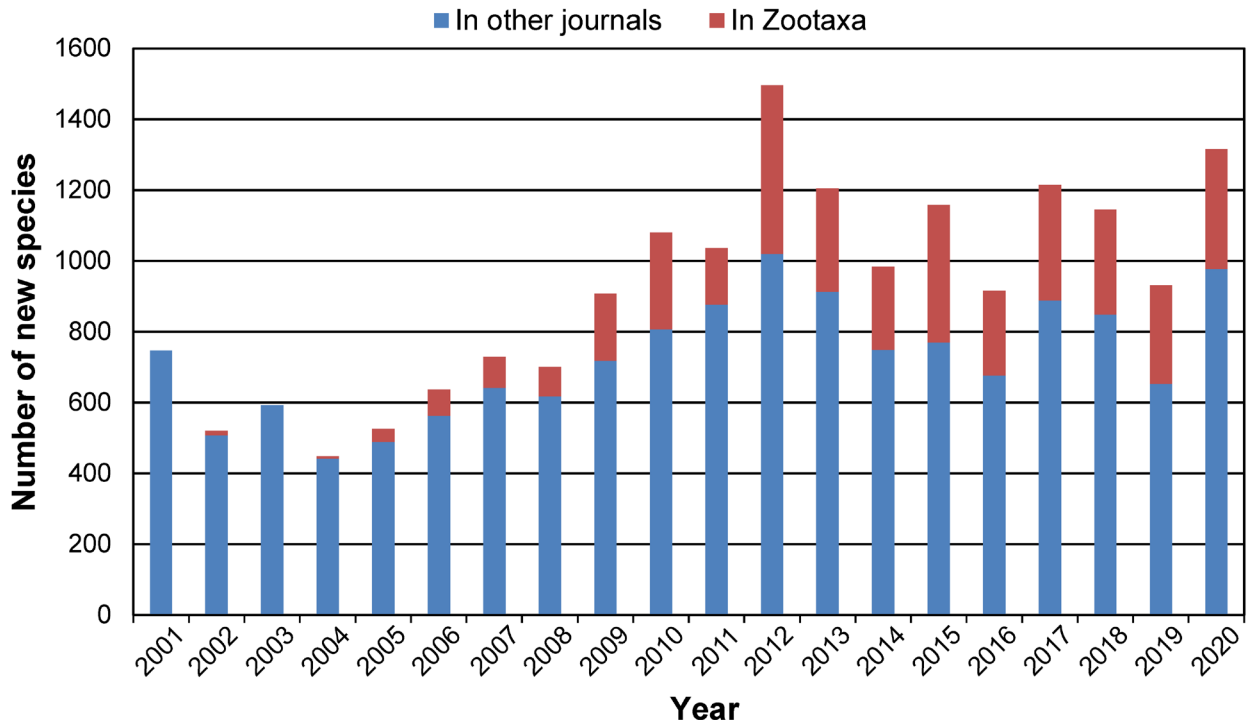

FIGURE 7. New spider species described per year in *Zootaxa* (orange) and in journals other than *Zootaxa* (blue). The average percentage of species described in *Zootaxa* is 27.7 percent.

For new genera, the picture is similar: of a total of 885 new spider genera described between 2002 and 2020, 177 were published in *Zootaxa* (≈20%; Fig. 8). No new spider families have been described in *Zootaxa*, whereas 30 families have been newly described or re-erected in other journals over the past two decades. This latter figure includes both newly described families, such as Trogloraptoridae Griswold, Audisio & Ledford, 2012, and taxa that received the family status as a change in their Linnaean rank, such as the Arkyidae Koch, 1872 (Dimitrov *et al*. 2017).

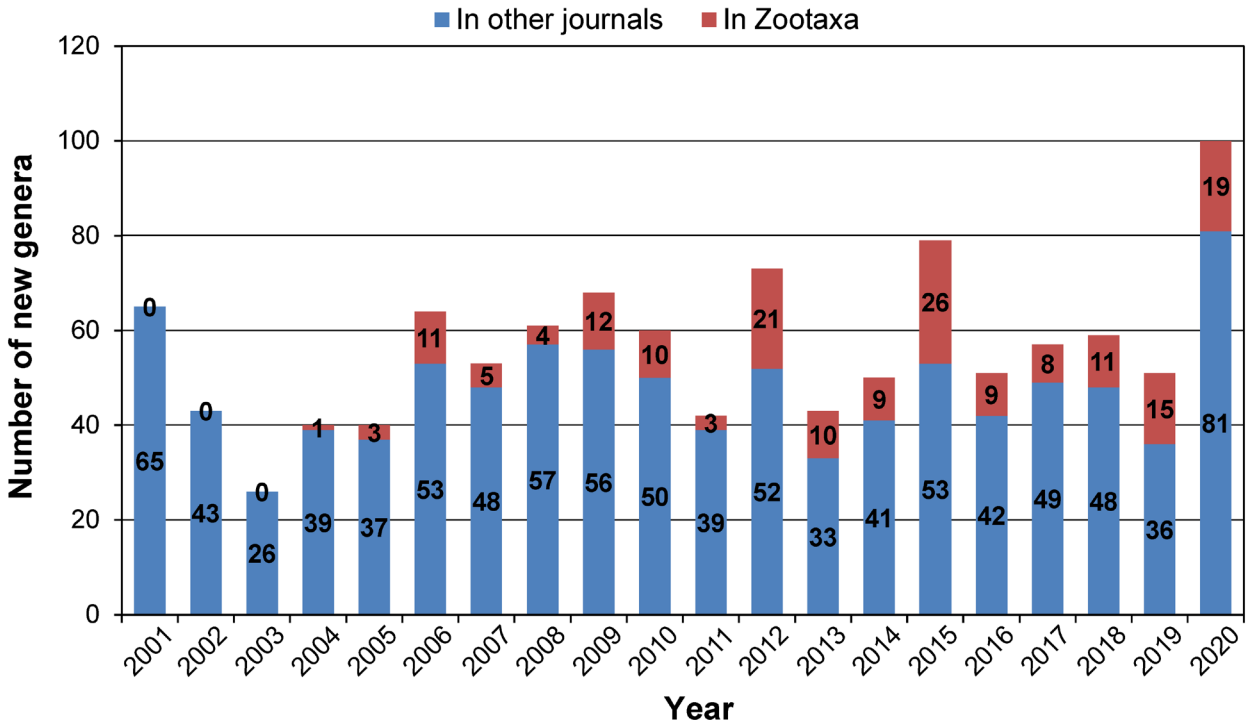

FIGURE 8. New spider genera described per year in *Zootaxa* (orange) and in journals other than *Zootaxa* (blue). The average percentage of genera described in *Zootaxa* is 20.0 percent.

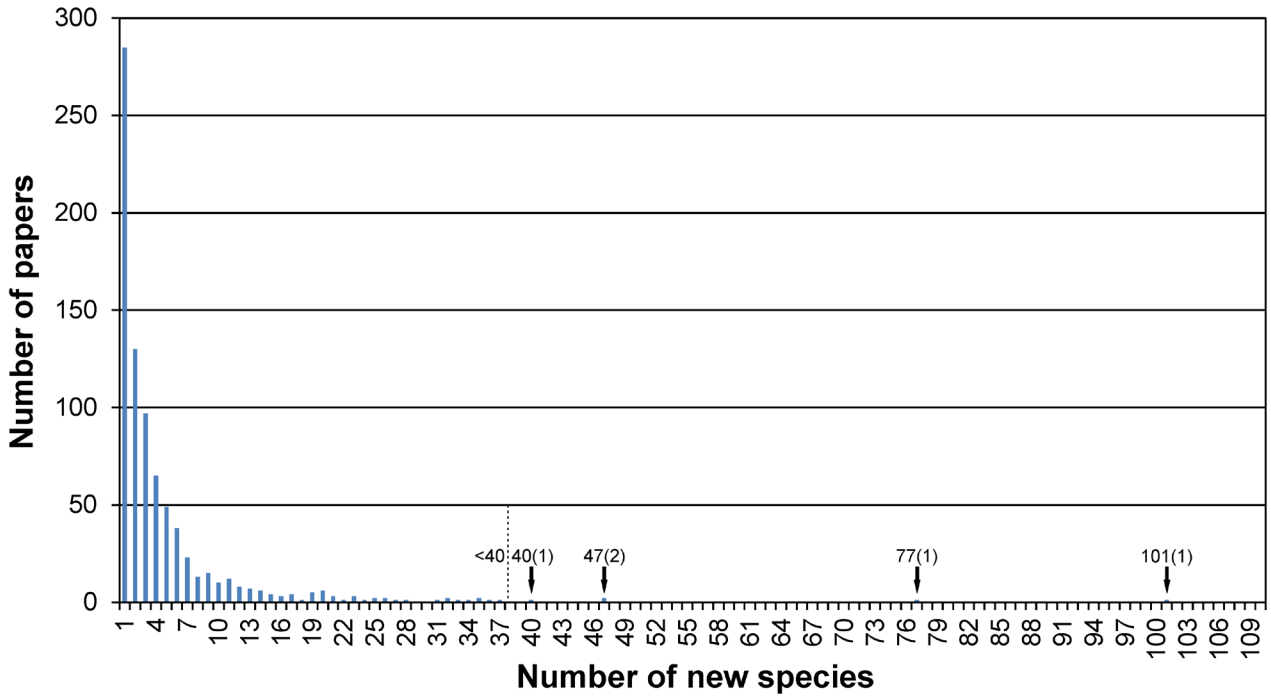

FIGURE 9. Number of newly described spider species per paper. Average number is 4.74 species per paper (n=816 papers).

Of the 816 papers including new spider species (irrespective of whether additional species were treated or redescribed), 285 papers (34.9 %) described one species, 130 papers (15.9 %) included the description of two species, and 401 papers (49.2 %) described three or more species (Fig. 9). The average number of new species described per paper is 4.74. The papers with the highest number of newly described species included 101 species (Dankittipakul *et al.* 2012), 77 species (Raven 2015), and 47 species (Grall & Jäger 2020; Huber 2018).

Zootaxa explicitly discourages manuscripts with isolated descriptions of a single species, especially for taxa

with a large number of undescribed species, but in cases of a preceding revision, monotypic genera, or lack of material in poorly accessible regions, single species descriptions can be the only way to move forward. In the above-mentioned 285 papers with only one new species described, there are also several species that were described in the context of larger revisionary works. However, it is important to mention that comprehensive revisions that include the study of type material of previously described species and use an integrative, overarching approach is the sort of taxonomic work that is recommendable and that every author should try to pursue. It should be noted here that the discouragement of single-species descriptions also has practical reasons. The time and efforts spent by both editors and reviewers to assess such manuscripts is considerable and outweighs the often-limited value of isolated descriptions. Usually there are only a few experts in a given group who can adequately assess the scientific quality of a manuscript, but they are often burdened with too many review requests and need to put their focus on larger works.

Which continents or countries are most diverse Araneae-wise? Where is the highest number of taxa described from? The known spider diversity from a specific country is the product of a complex combination of country size, climatic and vegetation heterogeneity and its accumulated sampling effort throughout the years (Santos *et al*. 2017). In fact, it seems that country representation in *Zootaxa* spider papers is largely a product of its existing species diversity, but also of the country's research infrastructure, including the scientific workforce and number of active taxonomists. Other factors such as political stability, accessibility, or feasibility of scientific research and export permits, also play a role in determining the rate at which a country's biodiversity is described (Amano *et al*. 2013).

Most *Zootaxa* papers dealt with spiders from Asia (Fig. 10): a total of 455 papers, almost half of all papers (Central Asia: 18, Eastern Asia: 217 [China: 204], Northern Asia: 14, South Asia: 83 [India: 47], Southeast Asia: 102, Western Asia: 22). In second place was the Americas with a total of 357 publications (Central America: 28, North America: 67, South America: 262 [Brazil: 148]). Other continents were almost equally treated with Africa: 78 papers (Afrotropics: 24, East Africa: 9, Northern Africa: 9, Southern Africa: 27, Western Africa: 3), Australia: 59, and Europe: 77.

China and Brazil are outstanding in respect of their araneo-taxonomic output: scientists published more than one third of all papers of this period on spiders from these two countries. Assuming that the majority of these papers were published by Chinese and Brazilian researchers respectively, the question arises why of all countries were these two so productive? Simply, both have a high biodiversity and a long tradition in taxonomic research.

China had in the recent past three centres of arachnology: Beijing (Daxiang Song, Shuqiang Li), Baoding (Mingsheng Zhu, Feng Zhang) and Changsha (Changmin Yin, Xianjin Peng, Xiang Xu). Recently, Chongqing (Zhisheng Zhang) joined these initial research groups. The multitude of students and future researchers intensified the interest in arachnological studies on the diversity of Chinese spiders. Since 1935, the number of spider species known from China increased from 566 to 5,084, i.e. presently more than ten percent of the world fauna (Li 2020). A good example of the strategic exploration of the spider fauna is the "All Species Inventory" of the Xishuangbanna Tropical Botanical Garden (XTBG) over the last 15 years: 782 species were recorded so far (400 new species), and the number of species is still increasing, approaching 1,000 (Li 2020). That means that in an area of only 1,125 ha, more species were found than in most of European countries (e.g., United Kingdom with 684 spider species; Nentwig *et al*. 2020). Representative for a productive new generation of araneological scientists may be Shuqiang Li from the Chinese Academy of Sciences in Beijing, authoring more than 340 papers on Araneae and having more than 1,500 spider taxa described so far.

The relatively high number of papers about spiders from Brazil, the Neotropical country with the highest spider diversity (World Spider Catalog 2021), can be explained by the country´s considerable tradition in taxonomy, allied to the recent implementation of nationwide research programs. These programmes have been funding Brazilian spider taxonomy through support of national and international collaborations, purchasing of equipment, digitalization of databases, and training of systematists (Brescovit *et al.* 2010). Three long-term governmental initiatives are highlighted here: the Biota/FAPESP programme (1999 to present), which allows São Paulo based arachnologists to develop nationwide projects in systematics, the "Programa de Pesquisas em Biodiversidade" (2004 to present), which supported the modernization of biological collections and yielded faunistic inventories from under-sampled locations, and the PROTAX programme (2005 to present), focused on securing masters, doctoral and post-doctoral fellowships for students in taxonomy.

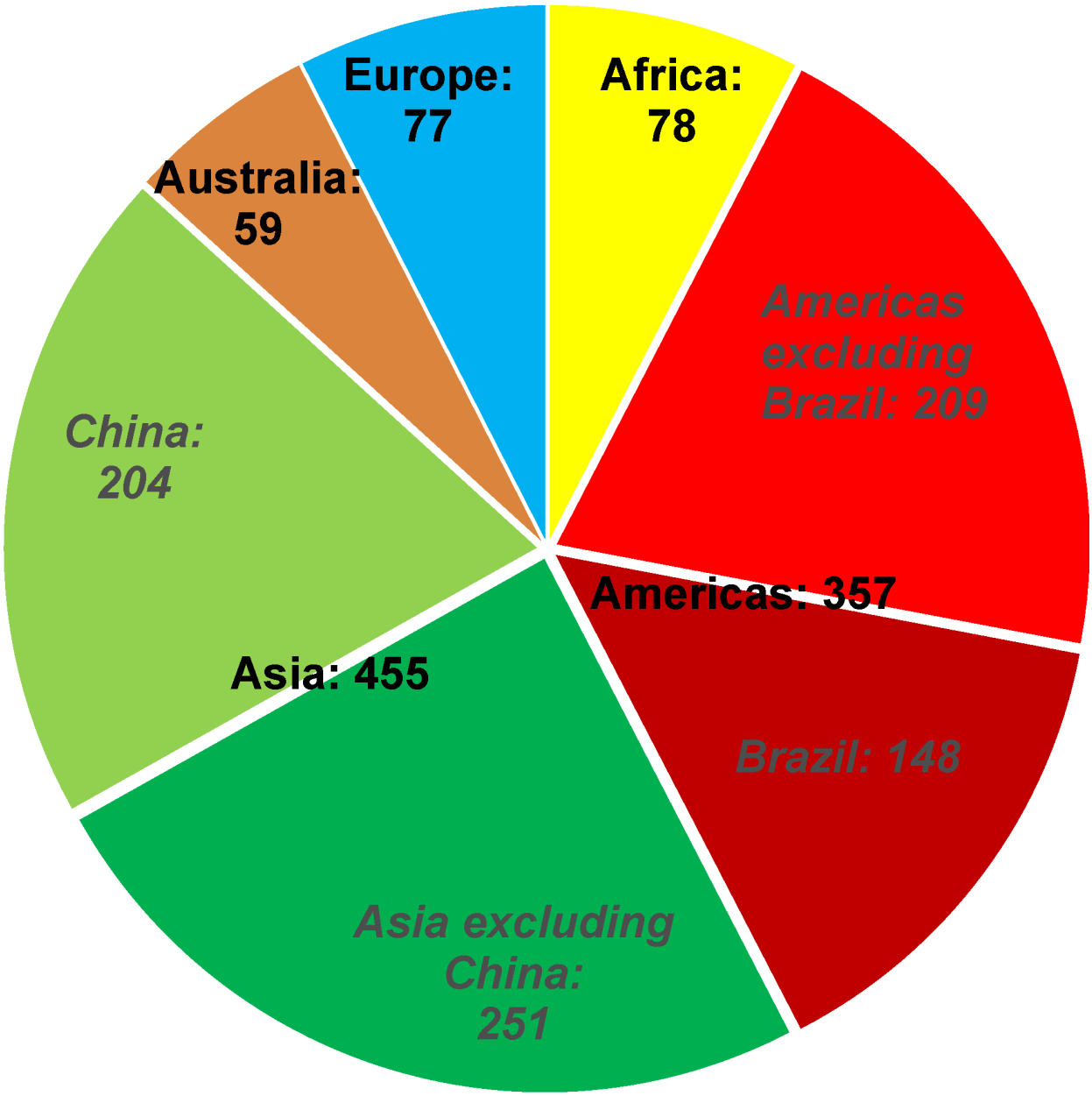

FIGURE 10. Portion of continents and countries in taxa dealt with in araneological papers published in *Zootaxa* from 2002 until 2020. Multiple entries have been considered, not all papers could be included.

Africa offers a prime example of a continent with certainly higher biodiversity than what is reflected in the publication activity. It might be that new taxa are described in other journals, such as the European Journal of Taxonomy, ZooKeys or African Invertebrates, probably combined with a lack of scientists working on the African taxa, a scarcity of established and functional natural history collections in the continent, and continued inaccessibility to large parts of the continent due to infrastructural challenges, expensive collecting permits and political instability. Certainly, there are fewer active arachnologists in Africa relative to other continents, in particular in central and western Africa that has a highly diverse fauna. Sadly, this has not changed in the past two decades.

FIGURES 11A–E. Photographs of spider species described in *Zootaxa*, popularized in the media. A *Cebrennus rechenbergi* Jäger (Sparassidae), the fastest-moving spider in the world, series of photographs demonstrating its unique flic-flacking locomotion on sand dunes. B–E Peacock spiders of the genus *Maratus* (Salticidae) from Australia, demonstrating the distinct colouration and (in most cases) courtship display of males: *M. azureus* Schubert (B), *M. constellatus* Schubert (C), *M. laurenae* Schubert (D) and *M. suae* Schubert (E). Photographs by I. Rechenberg (A) and J. Schubert (B–E).

Special species with striking stories

One of the most influential Araneae papers in *Zootaxa* (though not necessarily in terms of citations) was the revision of the huntsman spider genus *Cebrennus* Simon, 1880 by Jäger (2014), which included the description of the flic-flac spider *C. rechenbergi* Jäger, 2014 from the Moroccan desert. This species was discovered by Ingo Rechenberg, a German researcher and professor working in the field of bionics. The species became famous for its unique locomotory behaviour (flic-flacking over sand dunes; Fig. 11A). It is listed as the fastest spider in the compendium of records in the world of spiders (Mammola *et al*. 2017). The running-rolling movement of this spider inspired the construction of a robot with a similar form of locomotion, called "Tabbot the saltomobil". A 328-page book is dedicated to the detection of this species and the development of the robot (Rechenberg 2019).

The Australian endemic peacock spiders belonging to the genus *Maratus* Karsch, 1878 (Salticidae) have attracted considerable taxonomic interest recently, with 77 of the 92 valid species described in the last decade alone (e.g., Schubert 2020; Otto & Hill 2021; World Spider Catalog 2021). The captivating courtship behaviours and vibrant colours of the males of most species (Figs 11B–E) have evoked this interest, and led peacock spiders to prevalence in popular media, including a number of documentaries, popular articles (e.g., Daley 2019; Weisberger 2021), YouTube videos (e.g. https://www.youtube.com/watch?v=v3HlwwJG85c; https://www.youtube.com/watch?v=5qkzwG2lLPc), etc. Recent developments in social media engagement and practical, portable camera technology have resulted in greater exposure of these spiders to amateur naturalists or "citizen scientists". Several species have been described through such avenues of discovery, including the species described by Schubert (2020) in Figs 11 B–E, which were brought to his attention via photographs of these spiders posted on social media.

Another example of public perception concerns the newly erected Neotropical sparassid genus *Extraordinarius*. Rheims (2019) named four new species in honour of hard rock band musicians. Most notable, *E. andrematosi* was published just a few weeks after the sudden death of Andre Matos, lead singer of the popular Brazilian heavy metal bands Viper, Angra, and Shaman. Thereupon in an Email, Cristina Rheims reported as follows: "It came out in time for the events honouring Andre Matos, and his family was really, really happy with the new species name - especially his ten-year-old son. His family is very discreet and they haven't said much since his death, but his brother sent me a message saying that of everything that was happening the new species name would be the honour he would have liked the most." Also, Klaus Meine, lead singer of the German hard rock band Scorpions, was apparently happy about a spider species bearing his name. On the official Facebook page of the Scorpions, he wrote: "They named a New Species after me…that´s a very Special Honour…Thank you so much Brazil…*Extraordinarius klausmeinei*…I Love it…Ha!!!".

The role of *Zootaxa* as a future outlet to expand spider taxonomic research

Taxonomy is widely perceived to be a scientific discipline under intense threat (Wägele *et al*. 2011) although there are initiatives by some governments (e.g., the Taxon-omics initiative of the German Research Council; Begerow 2021), academic societies and even industry to improve this situation. Nevertheless, the importance of taxonomy can never be understated, irrespective of the organisms that are under study. It provides the resources with which organisms can be accurately identified, laying the foundation for all forms of biological and applied research. Without taxonomy, species cannot be accurately identified and no reliability can be placed in research results. But more fundamentally, taxonomy is a science in its own right, generating and answering questions with profound impact in all fields of biology. Phylogenetic hypotheses, often depicted as trees, provide the empirical basis to circumscribe taxa and to build classifications.

The current lack of recognition of the central role of taxonomy in biological sciences was aptly highlighted by the 2020 removal of *Zootaxa* from the Journal Citation Reports™ (JCR) Science Edition metrics of Clarivate due to "excessive self-citations" ("self-citation" refers to citations of publications in the same journal), a move that was vehemently opposed by the taxonomic community as well as other biologists, which rapidly lead to its reinstatement (Pinto *et al.* 2021; Zepellini *et al.* 2021). This move by Clarivate was underlined by a misunderstanding of how taxonomy works and serves other communities, the role that *Zootaxa* plays as a publishing outlet, and the inevitability of high levels of "self-citations" that would occur when a single journal serves as the dominant outlet for the publication of research results, in any discipline for that matter.

Zootaxa's success has largely been a result of a publication policy that negated the need for authors to pay article processing charges or page fees. Certainly, this made it particularly attractive for taxonomists that often function under severe financial constraints, particularly in developing countries. It is therefore not surprising that *Zootaxa* has published the lion's share of taxonomic papers for most faunal groups during the last decade, with spiders as a prime example (Fig. 7). As such it is free from elitism and promotes research and the dissemination of basic biodiversity data in the areas most in need, in particular tropical countries with a high biodiversity but very limited resources to study it.

Despite restrictions and pressure imposed by the workforce and financial constraints, spider taxonomists have been highly productive and have continued to play an increasingly important role in the description of the planet's biodiversity (Platnick & Raven 2013; Fig. 3). It is very likely that *Zootaxa* will continue to serve as the dominant outlet for the publication of spider taxonomic papers for the foreseeable future, considering its publication policy, rapid processing of manuscripts, and the inputs and quality control of a competent team of dedicated subject editors.

It has been argued (e.g., Wheeler 2008) that the gold standard of taxonomic work is the monograph, an in-depth systematic revision of all the species in a natural group. For example, in the United States, this approach provided a significant boost to spider taxonomy, as illustrated by two programs that were based on the premise of monographic research and funded by the National Science Foundation (the "Partnerships Enhancing Expertise in Taxonomy [PEET]" and the "Planetary Biodiversity Inventories [PBI]" program). The revisionary approach also fostered international collaboration and training of the future generations of systematists, and the research on the Oonopidae of the world, led by the late Norman Platnick, provides a successful example: around 1,300 new species described, which represents a 300 percent increase in the number of species of the spider family Oonopidae from the starting point of the project in 2006.

As noted by Platnick & Raven (2013), "About 50 years ago, spider systematics moved from being largely faunistic to largely revisionary, so that the best (and most productive) taxonomists turned their attention to doing comprehensive studies of particular taxa, throughout their distribution" and "By its nature, revisionary work is far more likely to discover synonyms than to create them, so we do not expect the percentages of valid taxa described by the recent, monographic workers to decrease significantly in the future." One must reflect then on why the vast majority of spider species descriptions in *Zootaxa* are published outside such a laudable revisionary context. As reported above, regional taxonomic treatments and single (or few) species description papers outside a monographic context abound.

A detailed analysis of the reasons why so much of the spider taxonomic research published in *Zootaxa* is far from the aforementioned gold standard falls beyond the scope of this article, but it suffices to say that in part the explanation for this pattern may be the diversity of authors (and editors) themselves. Such diversity includes a broad spectrum of taxonomic philosophies (e.g., overall similarity as the criterion to circumscribe higher taxa, as opposed to synapomorphies), the available scientific infrastructure (e.g., the industrialized countries' resources stand in stark contrast with those of most tropical countries) and, very importantly, many variations in how scientific merit and accomplishments are recognized in different countries (in some cases it is the number, rather than the content, of publications what matters the most and is thus rewarded) and how this research is funded (e.g., small grants with short project durations versus large-scale funding programmes such as those mentioned above).

Platnick & Raven (2013) made some very explicit and bold recommendations on what it would take to fully document all extant spider species, estimating that at the current (that is, 2013) rates, and if synonymy rates do not improve, it would take about 150 years to fully describe spider diversity. The numbers reported here show that as of today *Zootaxa* is the journal that is currently publishing more spider taxonomic papers than any other journal. Indeed, there is much to celebrate about our accomplishments over the last two decades. Hopefully looking into such accomplishments will shed some light on how to build an ever-brighter future, and how to circumvent some of the many challenges that lie ahead.

It is likely that with the recent establishment of the sister journal Megataxa, *Zootaxa*'s role in publishing large monographs may become slightly reduced once the new journal becomes more established. However, Megataxa's intent and aim are essentially the same as *Zootaxa* – to promote taxonomic research to alleviate the Global Taxonomic Impediment by providing an avenue for the publication of species' (re)descriptions without cost to authors, except Open Access fees when authors choose this option (mandatory in Megataxa). As such, the role of the two journals should be seen as complementary, and not competitive.

Acknowledgements

This paper is dedicated to the late Norman I. Platnick (1951–2020), in recognition of his immense contributions to spider taxonomy describing thousands of species, including the description of over 2,000 new species. He was the second most productive arachnologist of all times, after Eugène Simon, meaning, he was the most productive contemporary arachnologist. Additionally, he established the World Spider Catalog, meanwhile THE online resource on which all spider taxonomists are dependant.

We are deeply indebted to Zhi-Qiang Zhang for not only having the idea of founding *Zootaxa*, but carrying this concept with his team throughout the past two decades and helping to describe the biodiversity on our planet. We are immensely grateful to the team of the World Spider Catalog, but especially to Daniel Gloor and Theo Blick, for providing reports and analyses of the paper concerning spider taxonomy. Moreover, we would like to thank all authors and reviewers for their tremendous contributions: they made us stand where we are.

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