



## The making of world's largest journal in systematic botany

ZHI-QIANG ZHANG<sup>1</sup>, MAARTEN J.M. CHRISTENHUSZ<sup>2</sup>, HANS-JOACHIM ESSER<sup>3</sup>, MARK W. CHASE<sup>2</sup>, MARIA S. VORONTOVA<sup>2</sup>, HEATHER LINDON<sup>2</sup>, ALEXANDRE MONRO<sup>4</sup> & H. THORSTEN LUMBSCH<sup>5</sup>

<sup>1</sup> Landcare Research & University of Auckland, Morrin Road, Auckland, New Zealand; E-mail: ZhangZ@landcareresearch.co.nz

<sup>2</sup> Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, United Kingdom; E-mail: m.christenhusz@kew.org; m.chase@kew.org, m.vorontsova@kew.org; H.Lindon@kew.org

<sup>3</sup> Botanische Staatssammlung München, Menzinger Strasse 67, 80638 München, Germany; E-mail: esser@bsm.mwn.de

<sup>4</sup> Department of Botany, The Natural History Museum, Cromwell Road, London SW7 5BD, United Kingdom; E-mail: a.monro@nhm.ac.uk

<sup>5</sup> Science & Education, The Field Museum, 1400 S. Lake Shore Drive, Chicago, IL 60605, USA; E-mail: tlumbsch@fieldmuseum.org

### Introduction

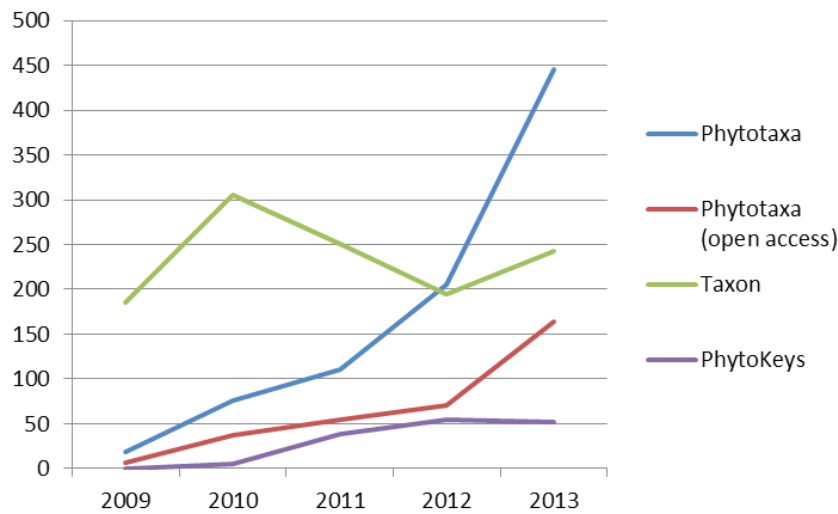
The need to document biodiversity in this era of high rates of species extinction is more urgent than ever (Zhang 2006a, Costello *et al.* 2013). Biodiversity also represents an important source of natural capital and potential source of resilience in a changing climate (Prugh *et al.* 1999). However, it has become increasingly difficult to secure funding for fundamental studies on biodiversity, and many journals have opted out of publishing descriptive taxonomic papers or inventory on plants (including algae) and fungi, prioritising analytical publications to achieve higher impact factors (Christenhusz *et al.* 2009). At the same time the World's major taxonomic institutions have adopted the metrics of grant-income, impact factor and publication number to measure staff productivity, leading to a devaluation of alpha-taxonomic outputs including monographs. This is further compounded by the tradition amongst botanical journals of citing nomenclatural publications in abbreviated form only and not including these in the reference, thereby excluding them from citation indices. In addition, delays in the processing of taxonomic publications can sometimes be in the order of years and the cost of publication, especially for large monographs, has been increasing, especially when authors have to pay charges for publication. It is against this background that *Phytotaxa* was launched in 2009 to accelerate the description of plant and fungal biodiversity and enhance the visibility of descriptive taxonomic papers (Christenhusz *et al.* 2009, 2011a).

*Phytotaxa* was modelled after its highly successful sister journal, *Zootaxa*, which was established in 2001 and quickly became the world's leading journal in zoological taxonomy in 2004—publishing 398 papers in 9581 pages in that year (Zhang 2006a). *Phytotaxa* followed a similar pattern of rapid growth from 2009 to 2012—having become a major journal in systematic and taxonomic botany by 2012 (Zhang *et al.* 2013). In 2013, *Phytotaxa* saw continued significant growth in the number of papers/pages published. Here we review its history and provide an assessment of its position among journals in systematic and taxonomic botany, especially in comparison to the eminent journal in this field—*Taxon*—and to a competing journal—*PhytoKeys*—, which was established a year after *Phytotaxa* with a similar formula in terms of rapid publication, unlimited manuscript size and indefinite issues per year. *Taxon* and *Phytotaxa* are here chosen for comparison also because they are among the biggest sources of new plant names (Table 5). We also analyse the number of manuscripts accepted by editors during 2009 to 2013 and recognize their contributions to the making of world's largest journal in systematic botany and mycology. In addition, we examine the global exposure and impact of *Phytotaxa* using the 2009–2013 data from *Web of Science Core Collection* (the data used for ISI journal impact factors and Essential Science Indicators) highlighting the top 10 papers, authors, institutions and countries. Finally, we present relative ranking of *Phytotaxa* among top ten journals in the number of new plant names published from 2011 to 2013 according to data from the *International Plant Names Index* (IPNI, <http://www.ipni.org>).

### Rapid growth in 2013

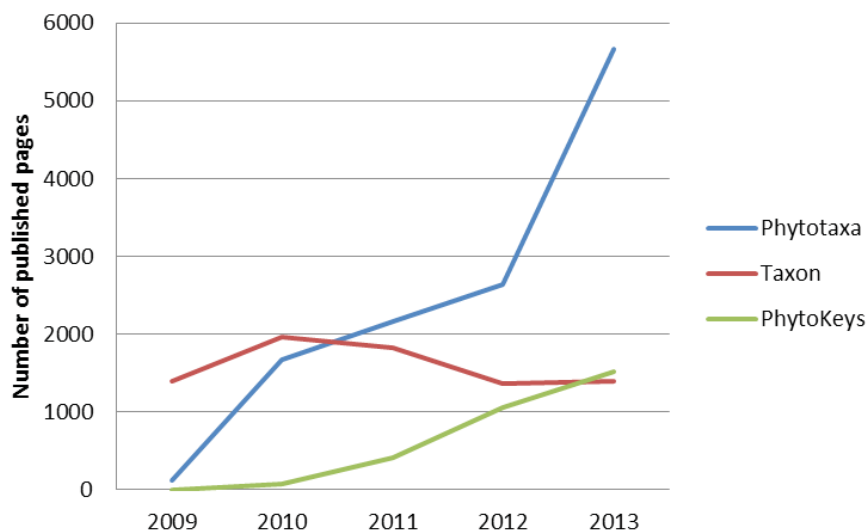
*Phytotaxa* published 446 papers in 2013 (Fig. 1), achieving 118% annual growth over the year 2012 (Zhang *et al.*

2013). The number of papers published in *Taxon* fluctuated around 250 per year during the last five years (Fig. 1), whereas that in *Phytotaxa* increased rapidly after 2011 and by 2013 *Phytotaxa* exceeded *Taxon* by a margin of over 200 papers. The gap between *Phytotaxa* and *PhytoKeys*, however, increased significantly after 2011 when the growth of the latter decreased (Fig. 1); this pattern continues in 2014 to a 15-fold difference: 724 papers in *Phytotaxa* versus 46 papers in *PhytoKeys* (data as of 18 December 2014).



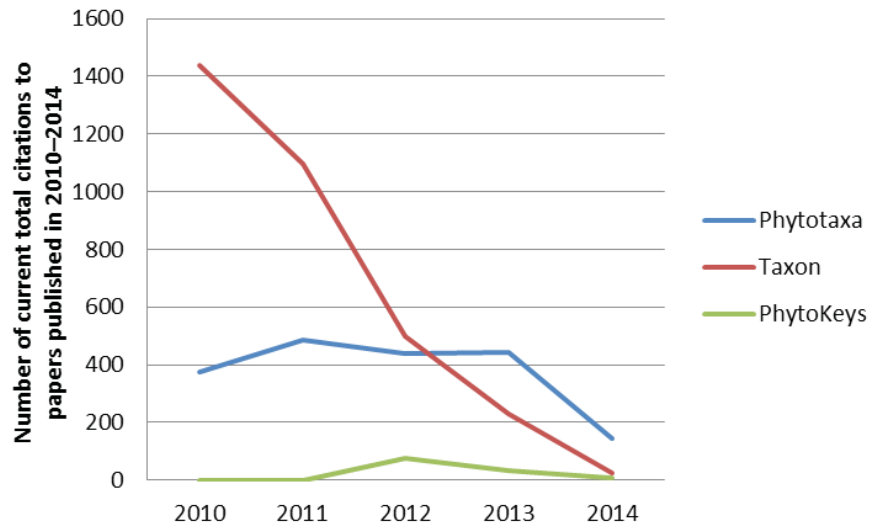
**FIGURE 1.** Comparison between *Phytotaxa*, *Taxon* and *PhytoKeys* in terms of numbers of papers (all items) published during 2009–2013 (No papers in 2009 for *PhytoKeys* because it started in 2010).

*Phytotaxa* published 5,665 pages in 2013, achieving 114% annual growth over 2012. The number of pages published in *Taxon* fluctuated between 1,300 and 2,000 per year during the last five years, whereas that of *PhytoKeys* increased to the level of *Taxon* in 2013 (Fig. 2). The increase in papers in *Phytotaxa* and *PhytoKeys* may be due to the flexible publication model without yearly page limits. *Taxon* has a limit on the number of issues and each issue has a limited number of pages, which is why *Taxon* averages around 1,600 pages annually. The widening gap between *Phytotaxa* and *PhytoKeys* in both the number of papers and number of pages may reflect a greater acceptance and recognition of *Phytotaxa* by botanical taxonomists. Both *Phytotaxa* and *PhytoKeys* have no limit on the number of papers per year, whereas the former encourages authors to opt to publish Open Access, the latter offers open access only. Open Access in *Phytokeys* requires up-front payment by authors or their institutions or payment by Encyclopedia of Life (EoL) for some authors from developing countries. *Phytotaxa* offers free of charge publication to all authors. Despite the differences in Open Access publishing between *Phytotaxa* and *PhytoKeys*, the gap in numbers of published papers also widened between *PhytoKeys* and the Open Access portion of *Phytotaxa* after 2012. In 2013, *Phytotaxa*, although still in its early years, had already evolved into the world's largest journal in systematic botany.



**FIGURE 2.** Comparison between *Phytotaxa*, *Taxon* and *PhytoKeys* in terms of numbers of pages published during 2009–2013.

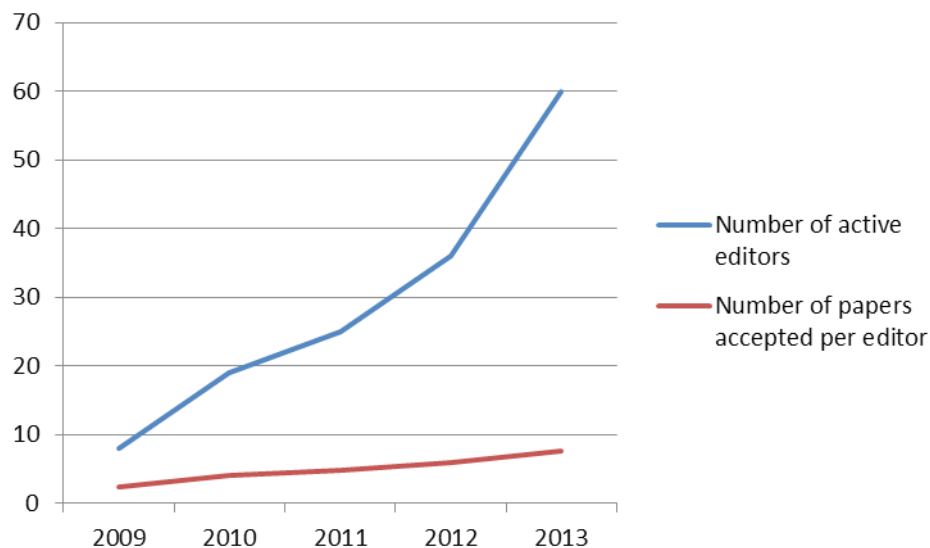
The total number of citations for a journal reflects its overall contribution to the field. Papers published by *Phytotaxa* from 2010 to 2012 were cited fewer times than those published during the same period in *Taxon* (Fig. 3). This could be due to the fact that *Phytotaxa* was not yet widely known, whereas *Taxon* has been published since 1951 and was a better known resource. It should be recognized that *Taxon* has a different scope from *Phytotaxa*. In *Taxon* descriptions of new species—the focus of *Phytotaxa*—are less important and much less prevalent than phylogenetics, evolutionary studies, papers on history, nomenclatural proposals and discussions directly linked to amendments of the *International Code of Nomenclature for algae, fungi, and plants* (ICN). In 2013 and 2014, however, the pattern in total number of citations was reversed—papers in *Phytotaxa* received more citations than those in *Taxon* (Fig. 3). This reflects the greater number of papers published in *Phytotaxa* during the last two years and its greater overall contribution to the field.



**FIGURE 3.** Comparison between *Phytotaxa*, *Taxon* and *PhytoKeys* in terms of current total citations in *Web of Science Core Collection* to papers published in 2010, 2011, 2012, 2013 and 2014 (data as of 28 Dec. 2014 when the last indexed issue is the 12-November-2014 one for *Phytotaxa*, October-2014 one for *Taxon*, and the most current one for *PhytoKeys*).

### Editors and their contributions

Editors play important roles in the development of journals through their leadership and indispensable service. For rapid journals such as *Zootaxa* and *Phytotaxa*, it is even more important to ensure that the speed of publication is not achieved at the expense of quality: a large spatially distributed team of expert editors has been shown to be critical to the success of *Zootaxa* (Zhang 2010). This model proven for *Zootaxa* was followed by *Phytotaxa* from the beginning (Christenhusz *et al.* 2009). In total, there were 65 active editors (those who accepted at least one paper per year) from 2009 to 2013. The number of active editors increased from 8 in 2009 to 60 in 2013 (Fig. 4). The average number of accepted papers per editor during each year also increased from just over 2 in 2009 to nearly 8 in 2013; the latter is close to the average number of papers per editor in *Zootaxa*, which is 9 in 2007 and 10 in 2013 (Zhang 2014). The contributions by individual editors are highly uneven, as previously seen in *Zootaxa* (Zhang 2014). A core group of 22 *Phytotaxa* editors (about a third of the total) accepted 10 or more papers per editor from 2009 to 2013 (Table 1). This group of active editors accepted over 75% of the total papers published in the last five years. Not surprisingly, two past chief editors are at the top of the list: 109 papers by Maarten Christenhusz (the highest in 2011, with 33 papers) and 93 papers by Hans-Joachim Esser (the highest in 2013, with 42 papers). The next two editors (Mark Chase and Jonathan Shaw) accepted 52 papers each. Only four editors (M. Christenhusz, H.J. Esser, R. Govaerts and ZQ. Zhang) accepted at least one paper every year during 2009–2013. Two relatively new editors joined during the last two years were exceptionally productive and reached the top 10 (Vidal Mansano accepted 29 papers and Lorenzo Peruzzi 22 papers). At the other end, seven editors accepted a single manuscript each during 2009–2013. Thus, we will need to seek a balance between very active versus relatively inactive editors. One strategy is to add more editors to cover very popular taxa so that the editing load for very busy editors will be reduced and they can be more efficient.



**FIGURE 4.** Number of active editors (editors who accepted at least one published paper) and the number of papers accepted per editor during 2009–2013 in *Phytotaxa*.

**TABLE 1.** Editors who accepted at least 10 papers from 2009 to 2013 in *Phytotaxa*, listed by the total number of papers accepted. Number of years in active service is the number of years at least one paper was accepted.

Number of accepted papers	Name of editor	Number of years in active service
109	Christenhusz MJM	5
93	Esser H-J	5
52	Chase MW	4
52	Shaw AJ	3
33	Williams DM	4
30	Vorontsova MS	3
29	Mansano VF	2
25	Govaerts RHA	5
22	Lucas E	3
22	Peruzzi L	2
21	Von Konrat MJ	3
20	Lanza SB	3
19	Sennikov AN	2
17	Iamónico D	1
16	Baker WJ	4
16	Gouda EJ	4
14	Pelser PB	4
13	Kocielek JP	2
12	Belgrano M	1
11	Lehnert M	3
11	Weigend M	4
10	Ghobad-Nejhad M	2

## Global coverage and impact of *Phytotaxa*

From 2009 to 2013, *Phytotaxa* published 857 papers by 1,587 authors from 724 institutions in 74 countries or regions in the world (data from *Web of Science Core Collection* on 6 May 2014). Although *Phytotaxa* was selected for coverage in the *Science Citation Index Expanded* in 2011, indexing of *Phytotaxa* papers started from volume 1 (2009). This allows the global exposure of all *Phytotaxa* papers in this important citation database. The top 10 papers from 2009 to 2013 are listed in Table 1, with the top paper being cited 73 times since its publication date in 2011. It is interesting to note that all three review papers (Christenhusz *et al.* 2011c, 2011d, Reveal & Chase 2011) in the special volume “Linear sequence, classification, synonymy, and bibliography of vascular plants: Lycophytes, ferns, gymnosperms and angiosperms” (Christenhusz *et al.* 2011b) are highly cited, with ranking 1, 3, and 7 (Table 2). Five review papers in 2010 (Table 2) are from the special volume on “Bryophytes: The closest living relatives of early land plants” (Von Konrat *et al.* 2010a). “Notes on Early Land Plants Today” by Söderström *et al.* (2012) is the introduction to a new series arisen from the collaboration between the Early Land Plants Today project and *Phytotaxa*. The second most-cited paper is a landmark international collaboration by over a hundred taxonomists describing one hundred new species of lichenized fungi (Lumbsch *et al.* 2011).

**TABLE 2.** Top 10 *Phytotaxa* papers published during 2009 to 2013, listed by the number of citations in *Web of Science Core Collection* on 6 May 2014.

Times cited	Title of papers	Source
73	A linear sequence of extant families and genera of lycophytes and ferns	Christenhusz <i>et al.</i> 2011d
55	One hundred new species of lichenized fungi: a signature of undiscovered global diversity	Lumbsch <i>et al.</i> 2011
35	A new classification and linear sequence of extant gymnosperms	Christenhusz <i>et al.</i> 2011c
34	Notes on Early Land Plants Today	Söderström <i>et al.</i> 2012
31	Moss diversity: A molecular phylogenetic analysis of genera	Cox <i>et al.</i> 2010
23	A synthesis of hornwort diversity: Patterns, causes and future work	Villarreal <i>et al.</i> 2010
22	APG III: Bibliographical Information and Synonymy of Magnoliidae	Reveal & Chase 2011
22	20,000 species and five key markers: The status of molecular bryophyte phylogenetics	Stech & Quandt 2010
18	The application of molecular data to the phylogenetic delimitation of species in bryophytes: A note of caution	Vanderpoorten & Shaw 2010
17	Fungal symbioses in bryophytes: New insights in the Twenty First Century	Pressel <i>et al.</i> 2010

The top 10 authors each published 9 to 49 papers (Table 3). The top three authors are members of a running series on the Early Land Plants Today project, with which *Phytotaxa* made a successful partnership in 2010 (Von Konrat *et al.* 2010b). Vana (no. 5 in Table 3) is also a co-author of some papers in the series of notes on Early Land Plants Today.

**TABLE 3.** Top 10 authors of *Phytotaxa*, listed by the number of papers published during 2009 to 2013 (either as senior authors or junior authors). Data from *Web of Science Core Collection* on 6 May 2014.

Rank	Names of authors (country)	Number papers published
1	SÖDERSTRÖM L (Norway)	49
2	HAGBORG A (USA)	47
3	VON KONRAT MJ (USA)	47
4	CHRISTENHUSZ MJM (UK)	35
5	VANA J (Czech Republic)	23
6	CHASE MW (UK)	12
7	TAKEUCHI WN (USA)	11
8	WEI YG (China)	10
9–11	DENG YF (China)	9
9–11	HYDE KD (Thailand)	9
9–11	KOCIOLEK JP (USA)	9

The top 10 institutions each had 24 or more publications to their names (Table 4). The Chinese Academy of Sciences is at the top of the list, and its staff have published over three times as many publications as the number 10 in the list (Table 4). Brazil has three institutions that are in the top 10, whereas England has two top institutions.

**TABLE 4.** Top 10 institutions of *Phytotaxa*, listed by the number of papers per institution during 2009 to 2013. Data from *Web of Science Core Collection* on 6 May 2014.

Ranking	Names of institutions	Number of papers published
1	CHINESE ACADEMY OF SCIENCES, CHINA	75
2	NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, TRONTHEIM, NORWAY	49
3	FIELD MUSEUM OF NATURAL HISTORY, CHICAGO, USA	45
4	INSTITUTO DE BOTÂNICA SÃO PAULO, BRAZIL	39
5	ROYAL BOTANIC GARDENS, KEW, UK	39
6	UNIVERSITY OF HELSINKI, FINLAND	35
7	NATURAL HISTORY MUSEUM, LONDON, UK	33
8	CHARLES UNIVERSITY, PRAGUE, CZECH REPUBLIC	31
9	UNIVERSIDADE DE SÃO PAULO, BRAZIL	28
10–11	NEW YORK BOTANIC GARDEN, USA & UNIVERSIDADE ESTADUAL FEIRA DE SANTANA, BRAZIL	24

The top 10 countries have published 35 to 197 papers each (Table 5). It is interesting to note that half of them are lower or middle income countries. Brazil, China, India and Mexico were all major contributors to manuscripts in *Phytotaxa*; these reflect increased funding for taxonomy in these biodiverse countries and show the active taxonomic research and botanical prospecting carried out there. It is encouraging to see that researchers in these former developing nations have accepted *Phytotaxa* and published their new discoveries there, so have authors from other less developed countries, as well as retired and student researchers from developed countries. We believe that this is the most important part of the success story of *Phytotaxa*: it does not levy a page charge, and it is thus barrier-free to authors of all income brackets, whatever their origin or financial standing. It enables publication of biodiversity information rapidly and makes it widely available for little cost. Many of these studies might not have been published at all before the advent of *Phytotaxa*, because submission limits in both page numbers and scope were too tight in many other journals.

**TABLE 5.** Top 10 countries of *Phytotaxa*, listed by the number of papers per country during 2009 to 2013. Data from *Web of Science Core Collection* on 6 May 2014.

Rank	Names of countries	Number of papers published
1	USA	197
2	BRAZIL	167
3	CHINA PR	109
4	ENGLAND	97
5	GERMANY	58
6	NORWAY	51
7	FINLAND	38
8	MEXICO	38
9	INDIA	37
10	CZECH REPUBLIC	35

*Phytotaxa* was launched to accelerate the publication of taxonomic papers on plants (including algae) and fungi and it succeeded. Delays after submission are usually due to the review process, which can be time-consuming, especially when it concerns larger manuscripts or plant groups with a small researcher base. Another delay can be at the editorial stage, and it is thus up to the authors to follow the journal format guidelines as precisely as possible to speed up the editors' voluntary work. Our publication method aims to reduce the delay after acceptance, which was 50 days on average during 2009 to 2010 (Christenhusz *et al.* 2011a), but has been reduced to 13 days on average in 2012 (Zhang *et al.* 2013).

### Number of new names

One of the greatest contributions of *Phytotaxa* has been the publication of new names. It ranked second among the top ten journals in the number of new plant names published in 2011 according to IPNI (Table 6), but has overtaken the leading journal (*Taxon*) in the last two years, accounting for 9.5% in 2012 and 9.8% in 2013 of all new names

indexed in IPNI (Table 6). We would like to note especially the rapid decrease in the numbers of new names published in *Taxon* and some other journals during the last three years, reflecting recent changes in focus, preferring papers of a more general nature and not publishing papers that focus on describing new species. This could be due to the pressure on many journals to achieve higher impact factors: the increasing difficulty of publishing new species in traditional journals has created a demand for a botanical taxonomy publication medium. The taxonomic community is fairly small in comparison to other biological disciplines and taxonomic literature is traditionally cited in-text rather than in the references, resulting in low impact factors for taxonomic journals and low personal citations for taxonomists in general. This might have contributed to a side-lining of taxonomy as a science and the difficulty for authors to secure competitive funding for taxonomy. Therefore, to secure citation, *Phytotaxa* insists on in-reference citation of taxonomic citations, which we believe has increased the citation rating of taxonomic papers in general (Christenhusz *et al.* 2009). Other taxonomic journals are now starting to follow this model, and the authors hope it will become standard for taxonomic publication. A proposal to amend article 41 of the ICN to permit different styles of bibliographic citations has been submitted (Sennikov *et al.* 2015).

**TABLE 6.** Top ten publications listed by the number of new plant names published from 2011 to 2013 (number of names published given in brackets), according to data in IPNI (on 2 July 2014).

2011 (6024)	2012 (6647)	2013 (5116)
<i>Taxon</i> (575)	<i>Phytotaxa</i> (632)	<i>Phytotaxa</i> (501)
<i>Phytotaxa</i> (473)	<i>Systematic Botany</i> (465)	<i>PhytoKeys</i> (248)
<i>Novon</i> (183)	<i>Phytoneron</i> (340)	<i>Biodiversity Research and Conservation</i> (199)
<i>Botanical Journal of the Linnean Society</i> (169)	<i>Kew Bulletin</i> (301)	<i>Botanical Journal of the Linnean Society</i> (196)
<i>Flora of China</i> (155)	<i>Taxon</i> (267)	<i>Willdenowia</i> (165)
<i>Systematic Botany</i> (150)	<i>Biodiversity Research and Conservation</i> (202)	<i>Orchid Review</i> (164)
<i>Orchid Review</i> (148)	<i>Bulletin de la Société Botanique du Centre-Ouest</i> (202)	<i>Flora of China</i> (151)
<i>Brittonia</i> (144)	<i>Nordic Journal of Botany</i> (119)	<i>Taxon</i> (147)
<i>Harvard Papers in Botany</i> (131)	<i>Journal of Japanese Botany</i> (102)	<i>Blumea</i> (135)
<i>Adansonia</i> (128)	<i>Harvard Papers in Botany</i> (95)	<i>Harvard Papers in Botany</i> (134)

## Concluding remarks

Since its launch in 2009 *Phytotaxa* has grown to be the leading journal in taxonomic botany, publishing the greatest number of articles, pages, and new names. It has replaced *Taxon* as the top journal by volume and total citation to current papers but not impact factor. More than just a journal, *Phytotaxa* has made it easier for authors to publish in botanical taxonomy and has improved access to publication for disadvantaged authors. This is reflected in it gaining ‘market share’ from biodiversity-rich BRIC countries, which have invested in their taxonomic capacity. It could also reflect a shift away from Europe & US as main descriptors of plant diversity. We believe that *Phytotaxa* has been well accepted by the taxonomic community because it is free at point of publication (barrier-free to authors of all income brackets), flexible (unlimited issues and pages) and rapidly indexed with an impact factor that is relatively high for a taxonomic journal. *Phytotaxa* thus meets the needs of the broadest group of taxonomists who survive based on publication number and impact factor, and who do not have access to funds to support open-access publication. We suggest that it is eminently feasible to fully describe and typify all plant diversity using the Linnean system, but that do so in a timely manner and so meet Society’s needs in the face of the mass-extinction of biodiversity and climate change. *Phytotaxa* will work with all taxonomists to continue to promote taxonomy as a scientific discipline.

## Acknowledgement

We would like to thank all *Phytotaxa* authors, reviewers and editors who have contributed to *Phytotaxa*. *Phytotaxa* was inspired by the success of its sister journal, *Zootaxa* (Zhang 2006b).

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