

Species Discovery in Time: An Example from Gesneriaceae in China*

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Abstract: China has seen an increasing number of new species being described in recent years. The present study likes to put these efforts into a historical perspective and investigates trends in species discovery rates over time with the Gesneriaceae as an example. At this point in time, 44 Gesneriaceae genera exist in China, *Deinostigma* being the latest added. At least 647 Gesneriaceae species in China have been reported by the end of 2018. The rate of species discovery in the past was relatively steady with three species described per year, however, there was a distinct peak in the 1980s, when an average of 17–18 new species were described and reported each year, predominantly due to the work of Wang Wen-Tsai. Another, more recent increase in species discovery occurred over the last 10 years and is seemingly still ongoing with an average of 17 species per year, though this was an effort of more than 60 different authors. This study demonstrates that the present time witnesses a greatly accelerated rate of species discovery in China that might reflect an increased awareness by botanists of the great plant diversity that exists in this country.

Key words: biodiversity, China, Gesneriaceae, species discovery

0 Introduction

Species discovery is the cornerstone for many aspects of biology ranging from species inventories, conservation to cataloguing the planet's diversity. With an increasing pressure on natural habitats from a growing global population and threats from climate change, understanding the depth of biological diversity is an important prerequisite for devising effective conservation measures. With these adverse forces in

mind, time is crucial in cataloguing the existing diversity.

On the other hand, increased interest in the natural world through education and initiatives, awareness of the natural diversity may lead to an increase in the number of new discoveries of species. Such boosts in species discoveries may be noticeable by tracing the number of new species over time. Over the last few decades, a great number of plant species in the family Gesneriaceae Rich. & Juss. in DC. have been de-

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scribed from China. However, is there an acceleration in species discovery discernible?

The family Gesneriaceae has around 150 genera globally, with at present 71 genera in the predominantly Old World subfamily Didymocarpoideae Arn.^[1] Forty three of these occur in China, spread across tribes Trichosporeae Nees (37 out of 64 genera), and Epithemateae C.B. Clarke (5 out of 7 genera). A phylogenetic oddity is the genus *Titanotrichum* Soler. that occurs in Japan, the island of Taiwan and mainland China but has a new world phylogenetic association and is grouped in tribe Titanotricheae Yamaz. in subfamily Gesnerioideae Burnett^[2].

China is very rich and diverse in Gesneriaceae and harbours species from 9 out of 14 subtribes of subfamily Didymocarpoideae (and tribe Titanotricheae)^[2]. Xu et al.^[3-4] provided a recent account of the species in China where they focussed on the levels of endemism.

In the present paper, trends in species discovery rates are investigated, by plotting species discoveries against a timescale. Such study might indicate whether there is an accelerated rate of species discovery in recent years. Some comparisons of China are drawn with other areas where Gesneriaceae occur.

1 Material and Methods

Several databases were interrogated for baseline information for each species. These were primarily *The International Plant Index* (IPNI) (<http://www.ipni.org/index.html>, last accessed end of 2018) and the *Smithsonian Gesneriaceae checklist* (<http://botany.si.edu/gesneriaceae/checklist/>, last accessed October 2018), amended with recent publications of protologues (see Table 1) and systematic realignments at genus level^[2,5-8].

The most recent delineations at genus level were used to define genera and cited in relevant sections^[2,9-11]. For the total number of Gesneriaceae species published up to the end of 2018 of those genera, the publication year of the species' protologue was taken, irrespective of which genus the species was

first described in. This was contrasted with only those species occurring in China. Varieties were not considered here. The label 'species' in the graphs was used for those species that never changed genus affiliation, i. e. remained in the genus they were first described in. The pattern of genus affiliation change per genus was traced and labelled 'renamed'.

The counts included came only from those genera that occurred on China mainland and island of Taiwan. Since *Cyrtandra* J.R.Forst. & G.Forst. has over 800 species^[10] and only one occurs on the island of Taiwan, the species counts for this genus were omitted here.

2 Results and Discussion

2.1 Number of genera in China

The genera of Gesneriaceae underwent extensive restructuring from 2011 onwards resulting in new concepts for some for example *Chirita* Buch.-Ham. ex D. Don that was split into 5 genera^[9-11]. For those occurring in China the number changed from 56 to 43^[2]. Recently the genus *Deinostigma* W.T.Wang & Z.Y.Li, a monotypic genus with one species occurring in Vietnam was revised and expanded to include 7 species, two of which [*D. cicatricosa* (W.T.Wang) D.J.Middleton & Mich.Möller, and *D. cyrtocarpa* (D.Fang & L.Zeng) Mich.Möller & H.J.Atkins] occurred in China^[6]. This brings the number of genera in China to 44.

2.2 Overall species numbers

The Gesneriaceae genera occurred on mainland China and island Taiwan at the end of 2018 harbour 648 species (Table 1). This is an increase of around 65 species compared to an estimate made only two years ago^[2]. The difference in species number provided by Xu et al.^[3-4] of 671 and here is mainly due to their inclusion of the 55 varieties in China as 'species', and the absence of 34 newly described species post-publication of their work in July 2017 (e.g. 15 species of *Primulina*, 8 *Oreocharis*; see also Table 1).

Among those genera the most enlarged ones since Möller^[2-3,5-6,12] include *Primulina* Hance (+ 30 species) and *Oreocharis* Benth. (+ 14 species), with

others expanding by just under half a dozen species (*Didymocarpus* Wall.: 3 species; *Hemiboea* C. B. Clarke: 5 species; *Petrocodon* Hance: 4 species; *Petrocosmea* Oliv.: 5 species; *Paraboea* (C. B. Clarke) Ridl.: 4 species) (Table 1). The increase did not necessarily reflect the species-richness of the genera, although for several larger ones with over 30 species in China, the increase in species number was with a 10% to 19% range, such as *Didymocarpus* (10% increase to now 33 species in China and 100 overall), *Hemiboea* (16.1% increase to now 36 species in China and overall), *Paraboea* (15.4% increase to now 30 species in China and 143 overall), *Petrocodon* (14.3% increase to now 32 species in China and 34 overall) and *Petrocosmea* (14.7% increase to now 39 species in China and 47 overall).

Interestingly, a similar proportioned increase was found for the very large genera in China such as *Oreocharis* (13.7% increase to now 116 species in China and 125 overall) and *Primulina* (19.5% increase to now 184 species in China and 195 overall). On the other hand, for some genera, such as *Aeschynanthus* Jack^[13-14] and *Epithema* Blume^[15] taxonomic revisions resulted in reduced species numbers (Table 1).

2.3 Effect of genus delineation on species numbers over time

Taxonomic changes have an effect not only on genus size, but also on the species number over time. Not every species is necessarily described in the genus it resides in today. The taxonomic history has thus an effect on the pattern of species accumulation at the genus level. A few examples of distinct patterns are provided below.

In *Petrocosmea*, for example, very little taxonomic changes, i.e. two, were made since the genus was established in 1887. Hence, the line for *Petrocosmea* species number and protologues are virtually overlapping and the line plotting name changes is low and very flat (Fig. 1a). Its species occur predominantly in China, i.e. 39 out of 47, thus the Chinese species

line is slightly below the one for total species (Fig. 1a).

Didymocarpus has a similar taxonomic history compared to *Petrocosmea*, but only a third of its species (33 out of 100 species) occur in China. Hence, the line for Chinese species is well below the line for the total *Didymocarpus* species number (Fig. 1b).

Oreocharis is a predominantly Chinese genus (Table 1). Until its delineation in 2011 it comprised 34 species. In 2011, species of another 10 Chinese genera were added bringing the species number to around 90^[7]. Since then, over 35 additional species have been newly described. For the above reasons, the lines for *Oreocharis* species and species in China overlap and are both well below the total *Oreocharis* species line. Because of the great expansion of the genus in 2011, the line tracing renamed species jumped at this point in time (Fig. 1c).

An example for another pattern is *Primulina*, also predominantly of Chinese origin (Table 1). However, until 2011 it was monotypic. In this year, it was enlarged to around 130 species, predominantly by the inclusion of species of *Chirita* section *Gibbosaccus*^[9-11]. This resulted in a very low and flat *Primulina* species line with a steep peak at 2011. Since then, additional species were newly described at a relatively steady rate of around a dozen per year to a total of 195 overall. Because of this history, the *Primulina* species line, Chinese species line and renaming lines overlap. The protologue line showed a steady increase in species from 1980 onwards, though these were described in other genera and later sunk into *Primulina* (Fig. 1d).

2.4 Rate of species discovery over time

The rate of species discovery over time showed some interesting patterns (Fig. 2). This showed a relatively constant increase over time with an average 5.9 species described per year across the 44 Old World Gesneriaceae genera, of which more than half, 3.2, came from China alone (Table 2).

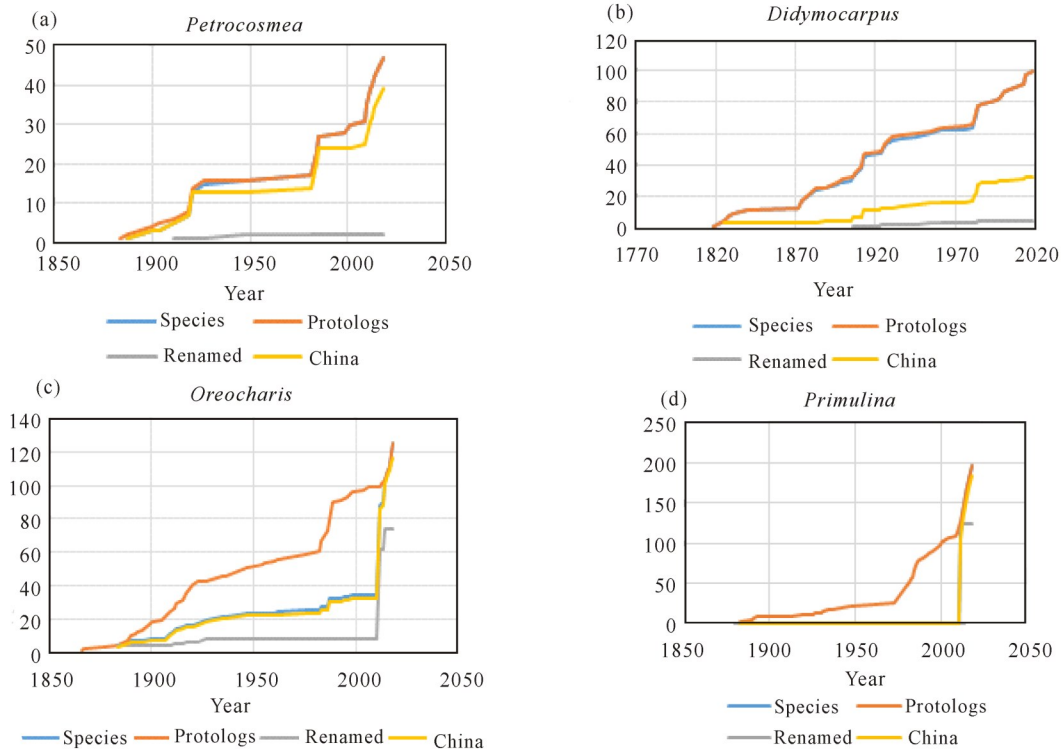


Fig.1 The species history of *Petrocosmea* (a), *Didymocarpus* (b), *Oreocharis* (c), and *Primulina* (d). Legend below the graph explain different line colours.

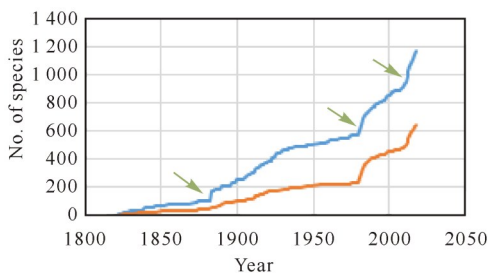


Fig.2 Cumulative values of the number of species described (as based on the date of protologues) across the 44 genera occurring in China (excluding *Cyrtandra*). Blue line = total; red line = only from China. Arrows indicate accelerating rates of species discoveries.

The chart in Fig.3 showed a striking parallel development of species descriptions between all species and those occurring in China. It also showed some distinct accelerations in species discovery, which might be due to particular activities by taxonomists. For instance, a small peak in the 1879–1888 period could be traced back to the early monographic work by Clarke^[16], though that was mainly covering species

outside China. At this point in time, the rate of species description was 8.5 per year, with 3 species described from China per year (Table 2).

An even more prominent peak in the period between 1979–1988, which was to >90% due to work carried out in China that could be attributed to a large degree to the pioneering work of Wang Wen-Tsai (and co-workers) who lead the Gesneriaceae work for the Flora of China^[17], with more than 200 names to his credit. During this period, a maximum of 41 species were described in 1983 from China, mostly by Wang Wen-Tsai, with an average of 17.4 per year for this decade (Fig.3; Table 2). A third peak of alpha-taxonomic activity was discernible for the most recent decade, 2009–2018, with around 2/3 (173) of the 271 new species coming from China (Figs 2, 3; Table 2). A year-by-year breakdown indicated a relatively even spread across the decade with an average of 27.1 species per year overall and 17.3 from China (66.2%) (Table 3). Unlike the Wang Wen-Tsai era, here the species in-

crease was based on the contribution of a wide range of botanists. This increase in botanical interest in the family resulted in the inclusion of no less than 67 different authors for species names over the last four years alone, with Fang Wen in particular highly prolific with an involvement in 25 species from China alone (Table 4).

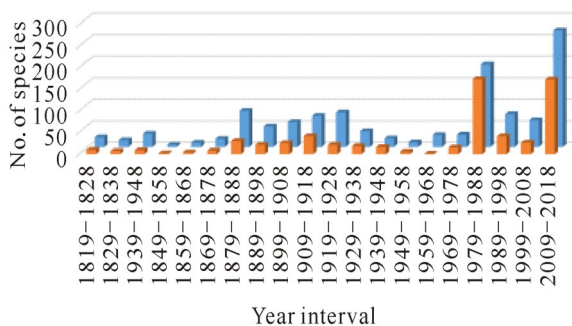


Fig.3 Species discoveries in 10 year intervals since the first Gesneriaceae species was described until the end of 2018. The numbers were based on the date of protologues across the 44 genera occurring in China (excluding *Cyrtandra*). Blue bars = total; red bars = only from China.

2.5 Update on species number over last four years in China

The increase in species names in China over the last four years up to the end of the year 2018 was in total 80, relatively evenly spread between the years 2015 (23 species), 2016 (21 species), 2017 (22 species) and 2018 (14 species) (Table 4). All but seven were newly described taxa, while the two *Deinostigma* species and only species of *Damrongia* Kerr ex Craib, *Deinostigma*, *Glabrella* Mich. Möller & W.H. Chen and *Middletonia* C.Puglisi in China were recombinations, and *Hemiboea pterocaulis* (Z. Yu Li) Jie Huang, X.G.Xiang & Q.Zhang and *Petrocosmea leiandra* (W.T.Wang) Z.J.Qiu raised from variety to species status. Among the newly described species over this time period were 36 species in *Primulina*, 15 in *Oreocharis*, 6 in *Paraboea*, 6 in *Petrocodon*, and 5 in *Petrocosmea* (Table 4).

3 Conclusions and Outlook

The present study investigated patterns of spe-

cies discovery in China over time to investigate trends in the species description rate with the family Gesneriaceae as an example. With the addition of *Deinostigma*, currently species of 44 Gesneriaceae genera exist in China. The additional genus occurrence in China, however, was the result of the re-circumscription of a genus rather than species discovery. At the end of 2018, there were around 648 species (and around 55 varieties) of Gesneriaceae known in China, with many more in the process of being published. In fact in January 2019 there already was a new species published, *Primulina anisocymosa* F.Wen, Xin Hong & Z. J.Qiu^[18] (The publication date of 4 January 2018 in IPNI was seemingly an error). It was quite a challenge to keep a tally on the number of species in China since there was such an active community with > 60 botanists involved in the family Gesneriaceae. This was also reflected in the more than 30 species newly published species since the last review less than 2 years ago by Xu et al.^[3-4].

A note of caution should be inserted here with view to the high rate of new species emergence in recent years, and whether this indeed reflected the high species diversity of Gesneriaceae in China. The fast-increasing species number in this family may be affected by 'taxonomic inflation', especially in the genus *Primulina*. For this genus, a species inflation has been strongly suggested in the complex around *P. hochiensis* (C.C.Huang & X.X.Chen) Mich.Möller & A.Weber^[19]. This can cause particular problems in macroecology and conservation^[20]. Approaches to circumvent this bias could include the application of population level sampling in molecular-based species delimitation^[19], rather than the often exercised inclusion of a single sample per new species, or to employ population-level sampling combined with morphological-molecular approaches^[21]. The often found approach to describe a single species per publication is a further unhelpful habit that, while inflating the publication record, scatters species information and a synthesis of the genus is difficult to obtain. Here, a proper revision at genus level particularly for the large and almost ex-

clusive Chinese genera *Primulina* and *Oreocharis* would be most welcome to place the many species into context.

In the present survey it was found that the species were described with a relatively steady rate over time with about 3 species per year for China though with several peaks of activity in the 1980s when the average of new species per year increased to 17–18 species. Most of this could be attributed to the work of Wang Wen-Tsai. A further acceleration of species discovery had been revealed for the last ten years, with on average 17 new species per year. In this case however, it was an effort of over 60 different authors. As this trend seemed to persist to date, it might suggest that there would be many new species to be discovered in the near future, as it is unlikely that the entirety of China can be surveyed any time soon.

Nonetheless, the findings here should be an encouragement for botanists in China to keep up their floristic surveying, particularly in the light of increased pressures from agriculture and urban developments on natural habitats, and then, perhaps more difficult task, prevention of biodiversity loss in the light of global climate change. The wide basis of taxonomically interested botanists as illustrated in this survey is an excellent positive omen that this special expertise is on the rise in China. This skill is essential for inventorying the high diversity of natural diversity existing in China.

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References

- [1] WEBER A, CLARK J L, MÖLLER M. A new formal classification of Gesneriaceae [J]. *Selbyana*, 2013, 31(2): 68-94.
- [2] MÖLLER M, WEI Y G, WEN F, et al. You win some you lose some: Updated generic delineations and classification of Gesneriaceae-implications for the family in China [J]. *Guihaia*, 2016b, 36(1): 44-60.
- [3] XU W B, GUO J, PAN B, et al. Diversity and distribution of Gesneriaceae in China [J]. *Guihaia*, 2017b, 37(10): 1219-1226.
- [4] XU W B, GUO J, PAN B, et al. Three new species of *Paraboea* (Gesneriaceae) from limestone karsts of China based on morphological and molecular evidence [J]. *Botanical Studies*, 2017a, 58: 56.
- [5] PUGLISI C, YAO T L, MILNE R I, et al. Generic recircumscription in the Loxocarpaceae (Gesneriaceae), as inferred by phylogenetic and morphological data [J]. *Taxon*, 2016b, 65(2): 277-292.
- [6] MÖLLER M, NISHII K, ATKINS H J, et al. An expansion of the genus *Deinostigma* (Gesneriaceae) [J]. *Gardens' Bulletin Singapore*, 2016a, 68(1): 145-172.
- [7] MÖLLER M, MIDDLETON D, NISHII K, et al. A new delineation for *Oreocharis* incorporating an additional ten genera of Chinese Gesneriaceae [J]. *Phytotaxa*, 2011, 23: 1-36.
- [8] MIDDLETON D J. A new genus of Gesneriaceae in China and the transfer of *Briggsia* species to other genera [J]. *Gardens' Bulletin Singapore*, 2014, 66(2): 195-205.
- [9] WEBER A, WEI Y G, PUGLISI C, et al. A new definition of the genus *Petrocodon* (Gesneriaceae) [J]. *Phytotaxa*, 2011c, 23: 49-67.
- [10] ATKINS H J, BRAMLEY G L C, CLARK J R. The taxonomy of *Cyrtandra* (Gesneriaceae): Current knowledge, future directions [C]// CLARK J R (ed). *Proceedings of the World Gesneriad Research Conference 2010*. Selbyana, 2013.
- [11] WEBER A, MIDDLETON D J, FORREST A, et al. Molecular systematics and remodelling of *Chirita* and associated genera (Gesneriaceae) [J]. *Taxon*, 2011a, 60(3): 767-790.
- [12] LIN Q W. *Beccarinda baolianis*, A new species of Gesneriaceae from Fujian Province [J]. *Bulletin of Botanical Research*, 2016, 36(5): 650-652.
- [13] MIDDLETON D J. A revision of *Aeschynanthus* (Gesneriaceae) in Thailand [J]. *Edinburgh Journal of Botany*, 2007, 64(3): 363-429.
- [14] MIDDLETON D J. A revision of *Aeschynanthus* (Gesneriaceae) in Cambodia, Laos and Vietnam [J]. *Edinburgh Journal of Botany*, 2009, 66(3): 391-446.
- [15] BRANSGROVE K, MIDDLETON D J. A revision of *Epi-*

- thema* (Gesneriaceae) [J]. The Gardens' Bulletin Singapore, 2015, 67(1): 159-229.
- [16] CLARKE C B. Cyrtandreae [M]// DE CANDOLLE A C (ed). Monographie Phanerogamarum. Vol 5. Paris: G. Masson, 1883.
- [17] WANG W C, PAN K Y, LI Z Y. Gesneriaceae [M]// WANG W C (ed). Flora reipublicae popularis sinicae: Vol.69. Beijing: Science Press, 1990: 125-581.
- [18] HONG X, KEENE J, QIU Z, et al. *Primulina anisocymosa* (Gesneriaceae), a new species with a unique inflorescence structure from Guangdong, China [J]. Peer J, 2019, 7: e6157.
- [19] YANG L H, KONG H H, HUANG J P, et al. Different species or genetically divergent populations? Integrative species delimitation of the *Primulina hochiensis* complex from isolated karst habitats [J]. Molecular Phylogenetics and Evolution, 2019, 132: 219-231.
- [20] ISAAC N J B, MALLET J, MACE G M. Taxonomic inflation: Its influence on macroecology and conservation [J]. Trends in Ecology and Evolution, 2004, 19(9): 464-469.
- [21] RANASINGHE S, MILNE R, JAYASEKARA R, et al. *Henckelia wijesundarae* (Gesneriaceae), a new endemic species from Sri Lanka, and lectotypification of *Chirita walkerae* and *C. walkerae* var. *parviflora* [J]. Willdenowia, 2016, 46(2): 213-224.
- [22] CAI L, CAI J, SHUI Y M. *Didymocarpus anningensis* (Gesneriaceae), a new species from Yunnan, China [J]. Phytotaxa, 2016, 255(3): 292-296.
- [23] WEN F, WEI Y G, MÖLLER M. *Glabrella leiophylla* (Gesneriaceae), a new combination for a former *Briggsia* species from Guizhou, China [J]. Phytotaxa, 2015c, 218(2): 193-194.
- [24] CHEN W H, ZHANG Y M, LI Z Y, et al. *Hemiboea crystallina*, a new species of Gesneriaceae from karst regions of China and Vietnam [J]. Phytotaxa, 2018a, 336(1): 95-99.
- [25] HUANG J, XIANG X G, LU Y B, et al. *Hemiboea pterocaulis* comb. et stat. nov. (Gesneriaceae), a new critically endangered species segregated from *H. subcapitata* [J]. Nordic Journal of Botany, 2018, 36(1/2). DOI: 10.1111/njb.01468.
- [26] LI S W, HAN M Q, LI X J, et al. *Hemiboea suiyangensis* (Gesneriaceae): A new species from Guizhou, China [J]. Phyto Keys, 2018(99): 99-106.
- [27] CAI L, ZHANG G L, ZHANG G S, et al. *Loxostigma hekouensis* (Gesneriaceae), a new species from Yunnan Province, China [J]. Annales Botanici Fennici, 2017a, 54(4/5/6): 429-433.
- [28] LJ J M, LI Z M. *Oreocharis brachypodus* (Gesneriaceae), a new taxon from Guizhou, China [J]. Phytotaxa, 2015, 204(4): 296-299.
- [29] CHEN R Z, CHEN W H, WEI Y G, et al. *Oreocharis crispata*, a new species of *Oreocharis* (Gesneriaceae) from Guangxi, China [J]. Phytotaxa, 2017, 311(2): 195-199.
- [30] WEI J J, XIONG G C, ZOU C Y, et al. *Oreocharis curviflora*, a new species of Gesneriaceae from northeastern Guangxi, China [J]. Phytotaxa, 2016, 280(2): 190-194.
- [31] GUO Z Y, LI Z Y, XIANG X G. *Oreocharis duyunensis* (Gesneriaceae), a new species from Guizhou, China [J]. Nordic Journal of Botany, 2018, 36(9): e01514.
- [32] MÖLLER M. Transfer of *Tremacron hongheense* to *Oreocharis* (Gesneriaceae) [J]. Phytotaxa, 2015, 239(3): 295-296.
- [33] CHEN W H, CHEN R Z, MÖLLER M, et al. *Oreocharis ninglangensis*, a showy new species of Gesneriaceae from northwestern Yunnan in China [J]. Phytotaxa, 2016, 261(3): 282-286.
- [34] YANG L H, ZHOU L X, KANG M. *Oreocharis ovata* (Gesneriaceae), a new species from Guangdong, China [J]. Nordic Journal of Botany, 2018b, 36(11): e01764.
- [35] CAI L, HUANG H, DAO Z L, et al. *Oreocharis parviflora*, a new species of Gesneriaceae from northwestern Yunnan, China [J]. Phytotaxa, 2017b, 329(2): 167-172.
- [36] HAN M Q, PAN B, ZOU L L, et al. *Oreocharis purpurata*, a new species of Gesneriaceae from Hunan, China [J]. Phytotaxa, 2017a, 32(2): 183-188.
- [37] YANG L H, ZHOU J G, XU P, et al. *Oreocharis pilosopetiolata*, a new species of Gesneriaceae from southeastern Guangdong, China [J]. Phytotaxa, 2015, 239(3): 287-292.
- [38] YANG C Z, CAI D L, WEN F. *Oreocharis striata* (Gesneriaceae), a new species from Fujian, China [J]. Annales Botanici Fennici, 2015, 52(5): 369-372.
- [39] CHEN W H, MÖLLER M, CHEN R Z, et al. *Oreocharis synergia*, a new species of Gesneriaceae from northwestern Yunnan, China [J]. Phytotaxa, 2015b, 233(1): 90-93.
- [40] TAN Y H, LI J W, YIN J T. *Oreocharis tsaii*, a new species of Gesneriaceae from southern Yunnan, China [J]. Phytotaxa, 195(2): 188-192.

- [41] YANG L H, HUANG J Z, DDENG F D, et al. *Oreocharis uniflora*, a new species of Gesneriaceae from Guangdong, China [J]. Phytotaxa, 2017c, 295(3):292-296.
- [42] LI J M, WANG T, ZHANG Y G. *Oreocharis zhenpingensis* (Gesneriaceae), a new species from Shaanxi, China [J]. Phytotaxa, 2017, 307(4):292-296.
- [43] GUO J, LU Z C, LIU J, et al. *Paraboea crassifila*, a new species of Paraboea (Gesneriaceae) from Danxia landform in Guangxi, China [J]. Taiwan, 2016b, 61(1): 8-12.
- [44] HE D M, FENG Y F, PAN F Z, et al. *Paraboea wenshanensis*, a new species of Gesneriaceae from Yunnan, China [J]. PhytoKeys, 2018(95):83-91.
- [45] WEN F, WEI Y G. *Paraboea yunfuensis*: A new calcicolous species of Gesneriaceae from Yunfu, Guangdong Province, China [J]. Telopea, 2016, 19: 125-129.
- [46] ZHANG R L, FU L F, LI S, et al. *Petrocodon asterocalyx*, a new species of Gesneriaceae from Guangxi, China [J]. Phytotaxa, 2018, 343(3):259-268.
- [47] LI H Q, WANG Y Q. *Petrocodon confertiflorus* (Gesneriaceae), a new species from Guangdong, China [J]. Annales Botanici Fennici, 2015, 52(1/2):27-32.
- [48] YU X L, LI M, ZHOU J J, et al. *Petrocodon hunanensis* (Gesneriaceae), a new species identified by both morphological and molecular evidence from limestone area in Hunan, China [J]. Phytotaxa, 2015, 195(1):65-72.
- [49] LU Y B, PAN B, HUANG J, et al. *Petrocodon pulchriflorus* sp. nov. (Gesneriaceae) from Guangxi, China [J]. Phytotaxa, 2017, 291(1):81-88.
- [50] GUO J, MENG T, PANG H B, et al. *Petrocodon retroflexus* sp. nov. (Gesneriaceae) from a karst cave in Guizhou, China [J]. Nordic Journal of Botany, 2016a, 34(2): 159-164.
- [51] CEN H F, FU L F, WEN F. *Petrocodon urceolatus* sp. nov. (Gesneriaceae) from Zhangjiajie city, northwestern Hunan Province, China [J]. Nordic Journal of Botany, 2017, 35(3):334-338.
- [52] HAN M Q, YUAN Q, LÜ T F, et al. *Petrocosmea chrysotricha* sp. nov. (*Petrocosmea*, Gesneriaceae), a species previously mistaken for *P. begoniifolia* on marlstone cliffs in Yunnan, China [J]. Nordic Journal of Botany, 2018: e01664. DOI: 10.1111/njb.01666.
- [53] Qiu Z J, LI C Q, WANG Y Z. *Petrocosmea glabristoma* Z. J. Qiu & Yin Z. Wang. plant diversity and resources [J]. 2015, 37(5): 551-556.
- [54] QIU Z J. *Petrocosmea leiandra* (W. T. Wang) Z. J. Qiu [M]// Pl. Petrocosmea China 116. 2015.
- [55] HAN M Q, LÜ T F, LIU Y. *Petrocosmea magnifica* (Gesneriaceae): A new species from limestone caves in Yunnan, China [J]. Phytotaxa, 2017c, 319(3):283-288.
- [56] HAN M Q, LÜ T F, LIU Y. *Petrocosmea viridis* sp. nov. of *Petrocosmea* (Gesneriaceae) from Guizhou, China and a supplementary and revised description of *P. mino* [J]. Nordic Journal of Botany, 2018b, 36(3). DOI: 10.1111/njb.01566.
- [57] YANG L H, PAN B. *Primulina albicalyx* (Gesneriaceae), a new species from a karst area in Guangxi, China [J]. Willdenowia, 2017, 47: 311-316.
- [58] PAN B, WANG B M, HE J Y, et al. *Primulina versicolor* and *P. alutacea* spp. nov. (Gesneriaceae), two new species with yellow flowers from northern Guangdong, China [J]. Edinburgh Journal of Botany, 2016, 73(1):25-37.
- [59] LI Q K, ZHANG Q, DENG T, et al. *Primulina bobaiensis*, a new species of Gesneriaceae from Guangxi, China and its phylogenetic placement revealed by the chloroplast matK gene [J]. Guihaia, 2015, 35(2):143-150.
- [60] HONG X, PAN F Z, ZHOU S B, et al. *Primulina cangwuensis* (Gesneriaceae), a new species from the karst limestone area in Guangxi, China [J]. Annales Botanici Fennici, 2018a, 55(1/2/3):37-42.
- [61] LAI B D, WANG B M, WEN F. *Primulina cordistigma*, a new species of Gesneriaceae from Guangdong, China and supplementary and emended description of floral morphology of *P. yangchunensis* [J]. Phytotaxa, 2016, 244(3):283-288.
- [62] YANG L H, PAN B, KANG M. *Primulina curvituba* sp. nov. (Gesneriaceae) from a limestone area in Guangxi, China [J]. Nordic Journal of Botany, 2017b, 35(5): 578-581.
- [63] HONG X, LI Z L, LIU J Z, et al. Two new species of *Primulina* (Gesneriaceae) from limestone karsts of China [J]. PeerJ, 2018b, 6: e4946.
- [64] WU H T, ZHOU S B, MA W, et al. *Primulina dichroantha* (Gesneriaceae), a new species from a karst cave from Guangxi, China [J]. Annales Botanici Fennici, 2017, 54(1/2/3):95-98.
- [65] PAN B, ZOU LL, ZHANG R L, et al. *Primulina effusa* F. Wen & B. Pan, a new species of Gesneriaceae from limestone areas of South China [J]. Guihaia, 2017, 37(10): 1250-1256.
- [66] NING Z L, PAN B, KANG M. *Primulina fengkaiensis* (Gesneriaceae), a new species from limestone areas in

- western Guangdong, China [J]. *Phytotaxa*, 2015a, 197(4): 296-300.
- [67] WEN F, XI S L, WANG Y, et al. *Primulina fengshanensis* (Gesneriaceae), a new species from Guangxi, China [J]. *Annales Botanici Fennici*, 2015b, 49(2): 103-106.
- [68] LUO W H, PAN B, WEN F. *Primulina gigantea* (Gesneriaceae), a new species from Guangxi, China [J]. *Annales Botanici Fennici*, 2016, 53(5/6): 426-430.
- [69] TTAN J, LIU L, XIAO S Y, et al. *Primulina hengshanensis* (Gesneriaceae), a new species from Danxia landform in Hunan, China [J]. *Phytotaxa*, 2018, 333(2): 293-297.
- [70] WEN F, LAI B D, ZHAO Z G, et al. *Primulina heterochroa* (Gesneriaceae), a new species from a tropical limestone area in Guangxi, China [J]. *Willdenowia*, 2015a, 45(1): 45-51.
- [71] XIN Z B, LI S, ZHANG R L, et al. *Primulina zhoui* and *P. huangii* (Gesneriaceae), two new species from limestone areas in Guangxi, China [J]. *Taiwania*, 2018, 63(1): 54-60.
- [72] CAI X Z, TIAN J, XIAO S Y, et al. *Primulina hunanensis* sp. nov. (Gesneriaceae) from a limestone area in southern Hunan, China [J]. *Nordic Journal of Botany*, 2015, 33(5): 576-581.
- [73] WEN F, LAI B D, ZHAO Z G, et al. *Primulina linearicalyx* (Gesneriaceae), a new species from Guangxi, China [J]. *Phytotaxa*, 2016b, 269(1): 41-46.
- [74] MA H S, PAN B, XU W B. *Primulina lutescens* sp. nov. (Gesneriaceae) from southern Guangxi, China [J]. *Nordic Journal of Botany*, 2017, 35(6): 687-691.
- [75] ZHANG R L, MA W, WEN F, et al. *Primulina maciejewskii* sp. nov. (Gesneriaceae) from Guangdong, China [J]. *Nordic Journal of Botany*, 2016, 34(6): 722-727.
- [76] GUO J, PAN B, LIU J, et al. Three new species of *Primulina* (Gesneriaceae) from limestone karsts of China based on morphological and molecular evidence [J]. *Botanical Studies*, 2015, 56: 34.
- [77] YANG L H, CHEN J L, WEN F, et al. *Primulina mali-poensis* (Gesneriaceae), a new species from Sino-Vietnamese border area [J]. *PhytoKeys*, 2018a(94): 107-116.
- [78] LIU Y, SU LY, ZHENG K W, et al. *Primulina melanoflamenta* sp. nov. (Gesneriaceae) from Guangxi, China [J]. *Nordic Journal of Botany*, 2018a, 34(1): 38-42.
- [79] ZHOU S B, HONG X, WEI Y G, et al. *Primulina moi* sp. nov. (Gesneriaceae) from a limestone area in northern Guangdong, China [J]. *Nordic Journal of Botany*, 2015, 33: 446-450.
- [80] LI M, YU X L. *Primulina porphyrea* (Gesneriaceae), a new species from southern Hunan, China [J]. *Phytotaxa*, 2015, 208(2): 157-162.
- [81] NING Z L, PAN B, WEN F, et al. *Primulina yingdeensis*, a new species from Guangdong, China, and *P. rosulata*, a new combination (Gesneriaceae), based on morphological and molecular evidence [J]. *Willdenowia*, 2016, 46: 399-409.
- [82] YANG L H, NING Z L, KANG M. *Primulina rubella* sp. nov. (Gesneriaceae) from a limestone area in Guangdong, China [J]. *Nordic Journal of Botany*, 2017a, 35(4): 506-512.
- [83] NING Z L, LI D M, PAN B, et al. *Primulina rubribracteata*, a new species of Gesneriaceae from southern Hunan, China [J]. *Phytotaxa*, 2015b, 239(1): 55-64.
- [84] ZHOU D S, ZHOU J J, LI M, et al. *Primulina suichuanensis* sp. nov. (Gesneriaceae) from Danxia landform in Jiangxi, China [J]. *Nordic Journal of Botany*, 2016, 34(2): 148-151.
- [85] LI J, CHEN X, LI S, et al. *Primulina wenii* (Gesneriaceae), a new species from China [J]. *Bangladesh Journal of Plant Taxonomy*, 2017, 24(2): 173-182.
- [86] LI S, XIN Z B, HONG X, et al. *Primulina wuae* (Gesneriaceae), a new species from southern China [J]. *Gardens' Bulletin Singapore*, 2017, 69(2): 307-313.
- [87] CHEN W H, CHEN R Z, YU Z Y, et al. *Raphiocarpus jinpingensis*, a new species of Gesneriaceae in Yunnan, China [J]. *Plant Diversity and Resources*, 2015a, 37(6): 727-732.
- [88] WEN F, DO T V, HONG X, et al. *Boeica ornithocephalanthia* (Gesneriaceae), a new species from northern Vietnam [J]. *The Gardens' Bulletin Singapore*, 2016a, 68(1): 139-144.
- [89] VADAKKOOT S H, ALFRED J, MAMIYIL S, et al. *Boeica clarkei* sp. nov. (Gesneriaceae) from northeastern India [J]. *Nordic Journal of Botany*, 2018: e01551.
- [90] HONG X, LI Z L, MACIEJEWSKI S, et al. *Didymocarpus puhoatensis* (Gesneriaceae), a new species from Vietnam [J]. *PhytoKeys*, 2018c, 94: 87-93.
- [91] PUGLISI C, MIDDLETON D J. A revision of *Dorcoeras* (Gesneriaceae) in Thailand [J]. *Thai Forest Bulletin: Botany*, 2017a, 45(1): 10-17.
- [92] KUMAR E S S. A new combination in *Henckelia* (Gesneriaceae) [J]. *Polish Botanical Journal*, 2014, 59(1): 149.
- [93] JANEESHA A P, NAMPY S. *Henckelia bracteata*, a new

- species of Gesneriaceae from S Western Ghats, India, and lectotypification of *Didymocarpus humboldtianus* (*H. humboldtiana*) [J]. Willdenowia, 2015, 45(1): 53-59.
- [94] BORAH D, JOE A. A new species of *Lysionotus* (Gesneriaceae) from northeastern India [J]. Taiwania, 2018, 63(3): 232-234.
- [95] PUGLISI C, MIDDLETON D J, SUDDEE S. Four new species of *Microchirita* (Gesneriaceae) from Thailand [J]. Kew Bulletin, 2016a, 71: 2.
- [96] PUGLISI C, MIDDLETON D J. A revision of *Microchirita* (Gesneriaceae) in Thailand [J]. Gardens' Bulletin Singapore, 2017b, 69(2): 211-284.
- [97] PUGLISI C, MIDDLETON D J. A revision of *Middletonia* (Gesneriaceae) in Thailand [J]. Thai Forest Bulletin: Botany, 2017c, 45(1): 35-41.
- [98] CHEN W H, MIDDLETON D J, NGUYEN H Q, et al. Two new species of *Oreocharis* (Gesneriaceae) from northwest Vietnam [J]. Gardens' Bulletin Singapore, 2017, 69(2): 295-305.
- [99] CHEN W H, NGUYEN Q H, CHEN R Z, et al. Two new species of *Oreocharis* (Gesneriaceae) from Fan Si Pan, the highest mountain in Vietnam [J]. PhytoKeys, 2018b, 94: 95-106.
- [100] DO T V, WEI Y G, WEN F. *Oreocharis caobangensis* (Gesneriaceae), a new species from Cao Bang Province, northern Vietnam [J]. Phytotaxa, 2017, 302(1): 65-70.
- [101] MÖLLER M, ATKINS H J, BRAMLEY G L C, et al. Two new species of *Oreocharis* (Gesneriaceae) from northern Vietnam [J]. Edinburgh Journal of Botany, 2018, 75(3): 309-319.
- [102] MIDDLETON D J, PUGLISI C, SUDDEE S. Two new taxa of *Ornithoboea* (Gesneriaceae) from Thailand [J]. Edinburgh Journal of Botany, 2017, 74(2): 229-243.
- [103] ANDERSON B M, MIDDLETON D J. A revision of *Rhynchotechum* Blume (Gesneriaceae) [J]. Edinburgh Journal of Botany, 2013, 70(1): 121-176.

Table 1 Alphabetical list of new Gesneriaceae species names established over the last four years in China published up to the end of 2018

No.	Taxon	Reference
1	<i>Beccarinda baolianis</i> Q.W.Lin	[12]
2	<i>Damrongia clarkeana</i> (Hemsl.) C.Puglisi Basionym: <i>Boea clarkeana</i> Hemsl.	[5]
3	<i>Deinostigma cicatricosa</i> (W.T.Wang) D.J.Middleton & Mich.Möller Basionym: <i>Chirita cicatricosa</i> W.T.Wang	[6]
4	<i>Deinostigma cyrtocarpa</i> (D.Fang & L.Zeng) Mich.Möller & H.J.Atkins Basionym: <i>Chirita cyrtocarpa</i> D.Fang & L.Zeng	[6]
5	<i>Didymocarpus anningensis</i> Y.M.Shui, Lei Cai & J.Cai	[22]
6	<i>Glabrella leiophylla</i> (F.Wen & Y.G.Wei) F.Wen, Y.G.Wei & Mich.Möller Basionym: <i>Briggsia leiophylla</i> Fang Wen & Y.G. Wei	[23]
7	<i>Hemiboea crystallina</i> Y.M.Shui & W.H.Chen	[24]
8	<i>Hemiboea pterocaulis</i> (Z.Yu Li) Jie Huang, X.G.Xiang & Q.Zhang Basionym: <i>Hemiboea subcapitata</i> C.B. Clarke var. <i>pterocaulis</i> Z.Yu Li	[25]
9	<i>Hemiboea suiyangensis</i> Z.Y.Li, S.W.Li & X.G.Xiang	[26]
10	<i>Loxostigma hekouensis</i> Lei Cai, Gui L.Zhang & Z.L.Dao	[27]
11	<i>Middletonia multiflora</i> (R.Br.) C.Puglisi Basionym: <i>Boea multiflora</i> R. Brown	[5]
12	<i>Oreocharis brachypodus</i> J. M. Li & Z. M. Li	[28]
13	<i>Oreocharis crispata</i> W.H.Chen & Y.M.Shui	[29]
14	<i>Oreocharis curvituba</i> J.J.Wei & W.B.Xu	[30]
15	<i>Oreocharis duyunensis</i> Z.Y. Li, X.G. Xiang et Z.Y. Guo	[31]
16	<i>Oreocharis hongheensis</i> (W.H.Chen & Y.M.Shui) Mich.Möller	[32]

Continued table 1

No.	Taxon	Reference
17	<i>Oreocharis ninglangensis</i> W.H.Chen & Y.M.Shui	[33]
18	<i>Oreocharis ovata</i> L.H.Yang, L.X.Zhou & M.Kang	[34]
19	<i>Oreocharis parviflora</i> Lei Cai & Z.K.Wu	[35]
20	<i>Oreocharis purpurata</i> B.Pan, M.Q.Han & Yan Liu	[36]
21	<i>Oreocharis pilosopetiolata</i> Li H.Yang & M.Kang	[37]
22	<i>Oreocharis striata</i> Fang Wen & C.Z.Yang	[38]
23	<i>Oreocharis synergia</i> W.H.Chen, Y.M.Shui & Mich.Möller	[39]
24	<i>Oreocharis tsaii</i> Y. H. Tan & J. W. Li	[40]
25	<i>Oreocharis uniflora</i> Li H. Yang & M. Kang	[41]
26	<i>Oreocharis zhenpingensis</i> J.M.Li, Ting Wang & Y.G.Zhang	[42]
27	<i>Paraboea crassifila</i> W.B.Xu & J.Guo	[43]
28	<i>Paraboea dushanensis</i> W.B.Xu & M.Q.Han	[4]
29	<i>Paraboea sinovietnamica</i> W.B.Xu & J.Guo	[4]
30	<i>Paraboea wenshanensis</i> Xin Hong & F.Wen	[44]
31	<i>Paraboea xiangguiensis</i> W.B.Xu & B.Pan	[4]
32	<i>Paraboea yunfuensis</i> F.Wen & Y.G.Wei	[45]
33	<i>Petrocodon asterocalyx</i> F.Wen, Y.G.Wei & R.L.Zhang	[46]
34	<i>Petrocodon confertiflorus</i> Hui Qin Li & Y.Q.Wang	[47]
35	<i>Petrocodon hunanensis</i> X. L. Yu & Ming Li	[48]
36	<i>Petrocodon pulchriflorus</i> Y.B.Lu & Q.Zhang	[49]
37	<i>Petrocodon retroflexus</i> Qiang Zhang & J.Guo	[50]
38	<i>Petrocodon urceolatus</i> F.Wen, H.F.Cen & L.F.Fu	[51]
39	<i>Petrocosmea chrysotricha</i> M.Q.Han, H.Jiang & Yan Liu	[52]
40	<i>Petrocosmea glabristoma</i> Z.J.Qiu & Yin Z.Wang	[53]
41	<i>Petrocosmea leiandra</i> (W.T.Wang) Z.J.Qiu Basionym: <i>Petrocosmea martinii</i> var. <i>leiandra</i> W.T.Wang	[54]
42	<i>Petrocosmea magnifica</i> M.Q.Han & Yan Liu	[55]
43	<i>Petrocosmea viridis</i> M.Q.Han & Yan Liu	[56]
44	<i>Primulina albicalyx</i> B.Pan & Li H. Yang	[57]
45	<i>Primulina alutacea</i> F.Wen, B.Pan & B.M.Wang	[58]
46	<i>Primulina bobaiensis</i> Q.K.Li, Q.Zhang & W. L.Li	[59]
47	<i>Primulina cangwuensis</i> Xin Hong & F.Wen	[60]
48	<i>Primulina cordistigma</i> F.Wen, B.D.Lai & B.M.Wang	[61]
49	<i>Primulina curvituba</i> B.Pan, L.H.Yang & M.Kang	[62]
50	<i>Primulina davidioides</i> F.Wen & Xin Hong	[63]
51	<i>Primulina dichroantha</i> F.Wen, Y.G.Wei & S.B.Zhou	[64]

Continued table 1

No.	Taxon	Reference
52	<i>Primulina effusa</i> F.Wen & B.Pan	[65]
53	<i>Primulina fengkaiensis</i> Z.L.Ning & M.Kang	[66]
54	<i>Primulina fengshanensis</i> F.Wen & Yue Wang	[67]
55	<i>Primulina gigantea</i> F.Wen, B.Pan & W.H.Luo	[68]
56	<i>Primulina hengshanensis</i> L.H.Liu & K.M.Liu	[69]
57	<i>Primulina heterochroa</i> F.Wen & B.D.Lai	[70]
58	<i>Primulina hiemalis</i> Xin Hong & F.Wen	[63]
59	<i>Primulina huangii</i> F.Wen & Z.B.Xin	[71]
60	<i>Primulina hunanensis</i> K.M.Liu & X.Z.Cai	[72]
61	<i>Primulina linearicalyx</i> F.Wen, B.D.Lai & Y.G.Wei	[73]
62	<i>Primulina lutescens</i> B.Pan & H.S.Ma	[74]
63	<i>Primulina maciejewskii</i> F.Wen, R.L.Zhang & A.Q.Dong	[75]
64	<i>Primulina maculata</i> W.B.Xu & J.Guo	[76]
65	<i>Primulina malipoensis</i> Li H.Yang & M.Kang	[77]
66	<i>Primulina melanofilamenta</i> Y.Liu & F.Wen	[78]
67	<i>Primulina moi</i> F.Wen & Y.G.Wei	[79]
68	<i>Primulina pengii</i> W.B.Xu & K.F.Chung	[76]
69	<i>Primulina porphyrea</i> X.L.Yu & Ming Li	[80]
70	<i>Primulina rosulata</i> (F.Wen & Y.G.Wei) Z.L.Ning & X.Y.Zhuang	[81]
71	<i>Primulina rubella</i> L.H.Yang & M.Kang	[82]
72	<i>Primulina rubribracteata</i> Z.L.Ning & M.Kang	[83]
73	<i>Primulina suichuanensis</i> X.L.Yu & J.J.Zhou	[84]
74	<i>Primulina versicolor</i> F.Wen, B.Pan & B.M.Wang	[58]
75	<i>Primulina wenii</i> Jian Li & L.J.Yan	[85]
76	<i>Primulina wuae</i> F.Wen & L.F.Fu	[86]
77	<i>Primulina yangshanensis</i> W.B.Xu & B.Pan	[76]
78	<i>Primulina yingdeensis</i> Z.L.Ning, M.Kang & X.Y.Zhuang	[81]
79	<i>Primulina zhoui</i> F.Wen & Z.B.Xin	[71]
80	<i>Raphiocarpus jinpingensis</i> W.H.Chen & Y.M.Shui	[87]

Note: For recombinations, the basionyms are provided. Full references are given in the list of references

Table 2 List of Gesneriaceae genera by tribe and numbers of species development between 2016 and 2018

No.	Genus	Chinese name	Species in total	Species in China	Prop. in China (%)	Differ. to 2016 in China	Differ. to 2016 in China (%)	Notes	Relevant references
Tribe Epithemateae C.B.Clarke									
1	<i>Epithema</i> Blume	盾座苣苔属	20	2	10.0	0	0.0	2 new, others synonymised	[15]
2	<i>Gyrogyne</i> W.T.Wang	圆果苣苔属	1	1	100.0	0	0.0	No change	
3	<i>Rhynchoglossum</i> Blume	尖舌苣苔属	16	2	12.5	0	0.0	No change	

Continued table 2

No.	Genus	Chinese name	Species in total	Species in China	Prop. in China (%)	Differ. to 2016 in China	Differ. to 2016 in China (%)	Notes	Relevant references
4	<i>Stauranthera</i> Benth.	十字苣苔属	7 ⁺	1	14.3	0	0.0	No change	
5	<i>Whytockia</i> W.W.Sm.	异叶苣苔属	8	8	100.0	0	0.0	No change	
Tribe Titanotricheae Yamaz.									
6	<i>Titanotrichum</i> Soler.	台闽苣苔属/ 俄氏草属	1	1	100.0	0	0.0	No change	
Tribe Trichosporeae Nees									
7	<i>Aeschynanthus</i> Jack	芒毛苣苔属	166	30	18.1	-4	-11.8	Synonymised	[13-14]
8	<i>Allocheilos</i> W.T.Wang	异唇苣苔属	2	2	100.0	0	0.0	No change	
9	<i>Allostigma</i> W.T.Wang	异片苣苔属	1	1	100.0	0	0.0	No change	
10	<i>Anna</i> Pellegr.	大苞苣苔属	4	4	100.0	0	0.0	No change	
11	<i>Beccarinda</i> Kuntze	横蒴苣苔属	8	6	75.0	1	20.0	New species	Table 1
12	<i>Boeica</i> C.B.Clarke	短筒苣苔属	15	7	46.7	0	0.0	New species	[88-89]
13	<i>Briggsiopsis</i> K.Y.Pan	筒花苣苔属	1	1	100.0	0	0.0	No change	
14	<i>Cathayanthe</i> Chun	扁蒴苣苔属	1	1	100.0	0	0.0	No change	
15	<i>Conandron</i> Sieb. & Zucc.	苦苣苔属	1	1	100.0	0	0.0	No change	
16	<i>Corallodiscus</i> Batalin	珊瑚苣苔属	5	3	60.0	0	0.0	No change	
17	<i>Cyrtandra</i> J.R. Forst. & G.Forst.	浆果苣苔属	818 [*]	1	0.1	0	0.0	No change	
18	<i>Damrongia</i> Kerr	套唇苣苔属(曾用 属名:丹氏苣苔属)	11	1	9.1	0	0.0	No change	
19	<i>Deinostigma</i> W.T. Wang & Z.Y.Li	奇柱苣苔属	7	2	28.6	2	na	Recircum- scribed	[6]
20	<i>Didymocarpus</i> Wall.	长蒴苣苔属	100	33	33.0	3	10.0	New species	[90]
21	<i>Didymostigma</i> W.T. Wang	双片苣苔属	3	3	100.0	0	0.0	No change	
22	<i>Dorcoceras</i> Bunge	旋蒴苣苔属(曾用 属名:羚角苣苔属)	6	2	33.3	0	0.0	New species	[5,91]
23	<i>Glabrella</i> Mich. Möller & W.H.Chen	光叶苣苔属	3	3	100.0	0	0.0	No change	
24	<i>Gyrocheilos</i> W.T. Wang	圆唇苣苔属	5	4	80.0	0	0.0	No change	
25	<i>Hemiboea</i> C.B.Clarke	半蒴苣苔属	36	36	100.0	5	16.1	New species	Table 1

Continued table 2

No.	Genus	Chinese name	Species in total	Species in China	Prop. in China (%)	Differ. to 2016 in China	Differ. to 2016 in China (%)	Notes	Relevant references
26	<i>Henckelia</i> Spreng.	汉克苣苔属(曾用属名:南洋苣苔属/汉克丽亚花属)	59	23	39.0	0	0.0	New species	[21, 92-93]
27	<i>Leptoboea</i> Benth.	细蒴苣苔属	2	1	50.0	0	0.0	No change	
28	<i>Litostigma</i> Y.G.Wei, F.Wen & Mich.Möller	凹柱苣苔属	2	2	100.0	0	0.0	No change	
29	<i>Loxostigma</i> C.B. Clarke	斜柱苣苔属(新拟)(曾用属名:紫花苣苔属/斜片苣苔属)	12	12	100.0	1	9.1	New species	[35]
30	<i>Lysionotus</i> D.Don	吊石苣苔属	30	26	86.7	0	0.0	New species	[94]
31	<i>Metapetrocosmea</i> W. T.Wang	盾叶苣苔属	1	1	100.0	0	0.0	No change	
32	<i>Microchirita</i> (C.B. Clarke) Y.Z.Wang	钩序苣苔属	38	2	5.3	0	0.0	New species	[95-96]
33	<i>Middletonia</i> C.Puglisi	粉毛苣苔属	6	1	16.7	0	0.0	New species	[97]
34	<i>Oreocharis</i> Benth.	马铃薯苣苔属	125	116	92.8	14	13.7	New species	Table 1 [98-101]
35	<i>Ornithoboea</i> Parish ex C.B. Clarke	喜鹊苣苔属	18	5	27.8	0	0.0	New species	[102]
36	<i>Paraboea</i> (C.B. Clarke) Ridl.	蛛毛苣苔属	143	30	21.0	4	15.4	New species	Table 1
37	<i>Petrocodon</i> Hance	石山苣苔属	34	32	94.1	4	14.3	New species	Table 1
38	<i>Petrocosmea</i> Oliv.	石蝴蝶属	47	39	83.0	5	14.7	New species	Table 1
39	<i>Platystemma</i> Wall.	堇叶苣苔属	1	1	100.0	0	0.0	No change	
40	<i>Primulina</i> Hance	报春苣苔属	195	184	94.4	30	19.5	New species	Table 1
41	<i>Pseudochirita</i> W.T. Wang	异裂苣苔属	1	1	100.0	0	0.0	No change	
42	<i>Raphiocarpus</i> Chun	漏斗苣苔属	14	9	64.3	1	12.5	New species	Table 1
43	<i>Rhabdothamnopsis</i> Hemsl.	长冠苣苔属	1	1	100.0	0	0.0	No change	
44	<i>Rhynchothecum</i> Blume	线柱苣苔属	15	6	40.0	0	0.0	Synonymised	[103]
		Sums	1 990	648		66			

Note: Full references are given in the list of references. * — approximation from Atkins et al. (2013); + — revision by Weber (in prep.)

Table 3 Pattern of species descriptions over time for Gesneriaceae genera occurring in China (excluding *Cyrtandra*), overall, and separate for species occurring outside China or in China

Year range	Species overall (protologs)	Species per year	Species outside China (protologs)	Species per year	Species inside China (protologs)	Species per year	Prop. species in China (%)
1819-1828	23	2.3	13	1.3	10	1.0	43.5
1829-1838	16	1.6	9	0.9	7	0.7	43.8
1939-1948	31	3.1	22	2.2	9	0.9	29.0
1849-1858	5	0.5	3	0.3	2	0.2	40.0
1859-1868	10	1.0	6	0.6	4	0.4	40.0
1869-1878	19	1.9	11	1.1	8	0.9	47.4
1879-1888	85	8.5	55	5.5	30	3.0	35.3
1889-1898	48	4.8	27	2.7	21	2.1	43.8
1899-1908	58	5.8	33	3.3	25	2.5	43.1
1909-1918	73	7.3	32	3.2	41	4.1	56.2
1919-1928	81	8.1	60	6.0	21	2.1	25.9
1929-1938	37	3.7	19	1.9	18	1.8	48.6
1939-1948	20	2.0	4	0.4	16	1.6	80.0
1949-1958	11	1.1	5	0.5	6	0.6	54.5
1959-1968	28	2.8	27	2.7	1	0.1	3.6
1969-1978	29	2.9	14	1.4	15	1.5	51.7
1979-1988	192	19.2	18	1.8	174	17.4	90.6
1989-1998	77	7.7	36	3.6	41	4.1	53.2
1999-2008	63	6.3	37	3.7	26	2.6	41.3
2009-2018	271	27.1	98	9.8	173	17.3	63.8
Sum	1 177		529		648		
Average		5.9		2.6		3.2	46.8

Table 4 List of new Gesneriaceae species names (protologs excluding *Cyrtandra*) by year for the last 10 years

Year	Species overall	Species outside China	Species inside China	Prop. of species in China (%)
2009	10	5	5	50.0
2010	21	5	16	76.2
2011	13	1	12	92.3
2012	47	25	22	46.8
2013	34	14	20	58.8
2014	32	10	22	68.8
2015	30	7	23	76.7
2016	24	7	17	70.8
2017	38	16	22	57.9
2018	22	8	14	73.6
Sum	271	98	173	
Average	27.1	9.8	17.3	66.2

物种的及时发现: 以中国苦苣苔科植物为例

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摘要:近年来, 中国发现了越来越多的新物种。本研究以苦苣苔科为例, 从历史的角度和调查的动态趋势来探讨这些工作, 进一步研究物种发现率随时间的变化趋势。目前已知中国分布的苦苣苔科植物有44属, 其中最后新增加的一个属是奇柱苣苔属 *Deinostigma*, 而中国至少约有647种苦苣苔科植物被报道。过去, 新物种的发现率相对稳定, 平均每年约有3个新分类群被描述, 但在20世纪80年代出现明显峰值, 当时平均每年有17~18个新物种被描述和报道, 这主要归功于王文采的工作。另外, 最近新分类群的猛增发生在过去10年里, 而且这个趋势似乎仍在继续, 在60多位不同学者的努力下, 平均每年有17个新种被发现和报道。这项研究表明, 目前中国新种发现和报道的速度大大加快, 这可能反映出植物学家对中国存在的巨大植物多样性的认识有了进一步的提升。

关键词:生物多样性 中国 苦苣苔科 物种发现

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