

---

AI translation · View original & related papers at  
[chinaxiv.org/items/chinaxiv-202206.00094](https://chinaxiv.org/items/chinaxiv-202206.00094)

---

## Current Status and Analysis of Type Specimens at Guangxi Herbarium: Postprint

**Authors:** Lin Chunrui, Xu Weibin, Chen Hailing, Lu Zhaocen, Yusong Huang, Liu Yan

**Date:** 2022-06-07T00:00:00+00:00

### Abstract

Type specimens serve as the basis and voucher for plant classification and nomenclature, and constitute essential fundamental data for plant resource conservation and sustainable utilization. To enhance the management level of type specimens and promote their full utilization and reciprocal sharing, this paper conducted statistical analyses on the taxonomic composition, collection localities, collection periods, and collectors of type specimens housed in the Guangxi Herbarium (IBK). The results indicate: (1) A total of 4,645 accession numbers (5,736 specimens) have been digitized, belonging to 2,128 species (including infraspecific taxa) within 619 genera and 170 families. The dominant families in the type specimen collection include Lauraceae, Gesneriaceae, Rubiaceae, Theaceae, Orchidaceae, Urticaceae, Liliaceae, Actinidiaceae, Euphorbiaceae, Ebenaceae, and Ericaceae, while the dominant genera include Begonia, Aspidistra, Aristolochia, Ardisia, and Ilex. (2) The type specimens were collected from 20 provinces (autonomous regions, municipalities) in China and two other countries, with the provinces yielding the most specimens being Guangxi (48.19%), Hainan (24.14%), and Guangdong (11.63%). (3) The peak collection periods for type specimens occurred in the 1930s and 1950s, while the peak nomenclature period was in the 1980s, which is associated with the rise of plant taxonomy in China and the compilation and research of Flora of China. The average herbarium cabinet time (time interval from specimen collection to nomenclature) is 21 years, with the maximum being 82 years. This paper also discusses and provides prospects regarding the current status of type specimen collections and digitization efforts.

## Full Text

### Abstract

Type specimens serve as the fundamental basis and voucher for plant classification and nomenclature, representing critical foundational data for plant resource conservation and sustainable utilization. To enhance the management of type specimens and promote their comprehensive utilization and reciprocal sharing, this study conducted a statistical analysis of the taxonomic composition, collection localities, collection dates, and collectors of type specimens housed at the Guangxi Institute of Botany Herbarium (IBK). The results indicate: (1) A total of 4,645 collections comprising 5,736 type specimens have been digitized, representing 2,128 species (including infraspecific taxa) across 619 genera and 170 families. Dominant families in the collection include Lauraceae, Gesneriaceae, Rubiaceae, Theaceae, Orchidaceae, Urticaceae, Liliaceae, Actinidiaceae, Euphorbiaceae, Ebenaceae, and Ericaceae, while dominant genera include *Begonia*, *Aspidistra*, *Aristolochia*, *Ardisia*, and *Ilex*. (2) Specimens were collected from 20 Chinese provinces (autonomous regions, municipalities, and special administrative regions) and two other countries, with the majority originating from Guangxi (48.19%), Hainan (24.14%), and Guangdong (11.63%). (3) Collection peaks occurred in the 1930s and 1950s, while nomenclatural activity peaked in the 1980s, coinciding with the rise of plant taxonomy in China and the compilation of *Flora Reipublicae Popularis Sinicae*. The average shelf time (interval between collection and publication) for type specimens is 21 years, with the longest reaching 82 years. This paper also discusses the current status of type specimen curation and digitization efforts.

**Keywords:** IBK, type specimen, vascular plants, collection-dominant groups, digital analysis

### Introduction

The Guangxi Institute of Botany Herbarium (IBK) was established in 1935 concurrently with the founding of the Guangxi Institute of Botany. Since its inception, the herbarium has engaged in plant specimen collection, preservation, and research. Through the dedicated efforts of several generations of botanists, the herbarium now houses over 500,000 vascular plant specimens, approximately 10,000 bryophyte specimens, and about 5,000 macrofungal specimens. The collection primarily originates from South and Southwest China, with additional specimens from East and North China as well as Vietnam and Laos. The collection is particularly notable for its karst flora specimens. These extensive holdings provide not only the scientific foundation for compiling important biodiversity inventories and floras at regional and national levels but also constitute essential infrastructure for research, conservation, and sustainable utilization of plant resources in Guangxi, neighboring regions, and Southeast Asia.

Type specimens constitute indispensable scientific evidence for plant taxonomic

research. A fundamental principle of the *International Code of Nomenclature for algae, fungi, and plants* is that each plant name must have a type (Turland et al., 2018), permanently linking the name to its type specimen. In this sense, type specimens function as the “personnel files” of plants, with herbaria serving as the archival repositories. The collection and management of type specimens and associated literature have long been prioritized by botanists worldwide (Wang, 2011; Yang, 2012). Chinese scholars began organizing type specimens in the 1920s, and in 2006, the National Specimen Information Infrastructure launched a digitization initiative for plant type specimens. To date, this effort has compiled over 40,000 data entries for vascular plant type specimens from more than 10 major Chinese herbaria, supplemented with data from foreign collections, yielding over 50,000 data entries for Chinese vascular plant type specimens (Xie et al., 2021). Numerous publications and catalogs related to type specimens have been compiled (Jin, 1994–2007; Fang, 2012; Institute of Botany, Chinese Academy of Sciences, 2015; Qian et al., 2017; Ouyang et al., 2019; Xie et al., 2019), effectively promoting data verification, standardization, and organization. These efforts are significant for specialized taxonomic research, flora compilation, plant resource surveys, and conservation initiatives.

Type specimens represent the most treasured assets of a herbarium. The IBK collection includes historically significant specimens such as *Biondia hemsleyana* collected in 1886—the oldest specimen in the collection—and the renowned “living fossil” relict gymnosperm *Cathaya argyrophylla* (Chun & Kuang, 1958). The herbarium houses type specimens for over 70 nationally protected wild plant species, more than 140 type specimens of Gesneriaceae representing a significant component of South China’s karst plant diversity, and nearly 60 type specimens of Actinidiaceae representing important wild fruit germplasm resources. Additionally, the herbarium preserves microfilm photographs of Chinese type specimens taken abroad by pioneering botanists including Ching Ren-Chang, Wang Fa-Zuan, and Tang Jin.

Biodiversity digitization represents the developmental direction for modern herbaria (Ma, 2017; Chen & Xu, 2021). IBK initiated digitization efforts in 2003 and serves as a core co-construction unit of the Chinese Virtual Herbarium (CVH) (Liu et al., 2017). Currently, over 80% of the collection has been digitized and made available for online sharing, with IBK consistently ranking among the most accessed herbaria in the national digital herbarium network. To facilitate botanical research, strengthen academic exchanges with domestic and international institutions, and enhance the scientific management, utilization, and research value of plant specimens, this paper presents a comprehensive analysis and synthesis of digitized information for type specimens housed at IBK.

## 1. Materials and Methods

IBK has consistently prioritized the collection and preservation of type specimens and associated literature. Type specimens are stored separately in a dedi-

cated type collection arranged by taxonomic system. In 1993, with support from Li Shugang, Zhong Shuhua, Liang Huifang, and Qin Zuhong compiled and organized the type specimen collection, documenting 779 species across 112 families of vascular plants. From 2003 to the present, supported by the National Plant Specimen Resource Center under the National Science and Technology Resource Sharing Service Platform, IBK has progressively implemented digitization and sharing of its collections. To facilitate both management and research accessibility, a specialized task for type specimen digitization and sharing was conducted in 2006–2007, with Mao Zongzheng commissioned to verify and curate the type specimens. However, due to the vast size of the collection and limited access to type literature at the time, comprehensive organization required sustained long-term effort, further complicated by annual additions of newly published taxa. Consequently, another round of type specimen organization and digitization was initiated in 2018. This paper synthesizes the results of these efforts, with all statistical data obtained from the IBK Plant Specimen Information System database.

Verification and digitization of type specimen information and literature followed the methodology established by the National Specimen Resource Sharing Platform for plant type specimen digitization (Lin, 2017). Type specimens include holotypes, isotypes, paratypes, syntypes, and lectotypes. Topotypes previously recognized in the type collection are no longer considered type specimens under current botanical nomenclature (Turland et al., 2018). Specimen information is recorded faithfully and comprehensively according to original labels, with data fields including herbarium code, specimen number, barcode, type category, storage location, specimen condition, collector/team, collection number, collection date, country, province, county, locality, habitat, longitude, latitude, elevation, plant characteristics, leaf, flower, fruit, family, genus, species, author, Chinese name, identifier, identification date, remarks, and historical identification information. The current taxonomic arrangement follows the Ching (1978) system for ferns, the Zheng Wanjun (1978) system for gymnosperms, and the Hutchinson system for angiosperms (dicots and monocots).

## 2.1 Overview of Type Specimen Taxa

As of October 2021, the IBK specimen information system database contains 4,645 collections comprising 5,736 type specimens. These include 147 collections (158 specimens) of ferns (2.75% of total), 34 collections (44 specimens) of gymnosperms (0.77%), and 4,464 collections (5,534 specimens) of angiosperms (96.48%). Six collections (seven specimens) originate from Vietnam and Laos, while the remaining 4,639 collections (5,729 specimens), accounting for 99.89% of the total, were collected domestically across 20 provinces, autonomous regions, municipalities, and special administrative regions.

The type specimens represent 2,128 species (including subspecies, varieties, and forms) across 619 genera and 170 families. Specifically, fern type specimens comprise 116 species in 50 genera and 27 families; gymnosperm type specimens

comprise 17 species in 8 genera and 5 families; and angiosperm type specimens comprise 1,994 species in 561 genera and 138 families . Among these, 467 specimens are holotypes and 1,658 are isotypes. At the family level, 83 families are represented by fewer than 10 specimens, with 17 families represented by only a single specimen. At the genus level, 483 genera have fewer than 10 specimens, and 163 genera are represented by only a single specimen. In terms of species diversity, 33 families (19.41% of total families) are monotypic, and 310 genera (50.08% of total genera) are monotypic.

Specimen condition records indicate the presence of flowers, fruits, or sporangia. Among digitized specimens, 5,024 specimens (87.59% of the total) bear flowers, fruits, or sporangia, with the largest category being specimens with flowers but no fruits (2,641 specimens, 46.04% of the total).

Among fern type specimens, the most represented families are Dryopteridaceae (29 species, 35 specimens), Polypodiaceae (16 species, 22 specimens), Thelypteridaceae (6 species, 9 specimens), Aspidiaceae (6 species, 7 specimens), Athyriaceae (6 species, 6 specimens), Aspleniaceae (5 species, 7 specimens), and Hymenophyllaceae (5 species, 5 specimens). The most represented genera include *Polystichum* (10 species, 14 specimens), *Arachniodes* (10 species, 10 specimens), *Dryopteris* (4 species, 5 specimens), *Neolepisorus* (4 species, 5 specimens), and *Plagiogyria* (4 species, 5 specimens).

For gymnosperm type specimens, the most represented families are Pinaceae (6 species, 26 specimens) and Cycadaceae (6 species, 11 specimens). The most represented genera are *Cycas* (6 species, 11 specimens) and *Gnetum* (3 species, 5 specimens).

Among angiosperm type specimens, 32 families contain 20 or more species [Figure 1: see original paper] (Leguminosae is treated as a single family in this analysis despite being divided into three families in the Hutchinson system). Lauraceae, Gesneriaceae, Rubiaceae, and Theaceae each contain over 100 species. Twenty-four genera contain 15 or more species [Figure 2: see original paper], with *Rhododendron*, *Actinidia*, *Camellia*, *Aspidistra*, *Ilex*, and *Machilus* each represented by more than 35 species. The richness of these families and genera reflects the long-term dedicated research by generations of plant taxonomists, particularly Guangxi botanists, and highlights IBK' s collection strengths in groups such as Lauraceae, Gesneriaceae, Rubiaceae, Theaceae, Orchidaceae, Urticaceae, Liliaceae, Actinidiaceae, Euphorbiaceae, Ebenaceae, Ericaceae, *Begonia*, *Aspidistra*, *Aristolochia*, and *Ardisia*.

## 2.2 Geographic Distribution of Type Specimens

Domestic type specimens in the collection originate from 20 provinces, autonomous regions, municipalities, and special administrative regions . The majority were collected in Guangxi (48.19%), Hainan (24.14%), and Guangdong (11.63%), each contributing over 500 collections and collectively accounting for 86.96% of all type specimens. Hainan specimens primarily come from Baoting

Li and Miao Autonomous County, Yazhou (now Yazhou District of Sanya City), Gan' en (now Dongfang City), and Lingshui Li Autonomous County. Guangdong specimens mainly originate from Xinyi County, Ruyuan Yao Autonomous County, Lechang County, and Yingde County. In contrast, provinces such as Fujian, Anhui, Chongqing, Hebei, Henan, Gansu, Liaoning, and Jiangsu contributed fewer than 10 collections each. Most specimens from outside Guangxi, aside from the substantial donations of over 40,000 specimens from the Sun Yat-sen University Agricultural and Forestry Plant Research Institute (now South China Botanical Garden) in 1946 and a large batch of southwestern specimens from Sichuan University in the 1970s, were acquired through exchange or donation.

Specimens with type localities in Guangxi constitute approximately half of the total collection. Their distribution across Guangxi is illustrated in [Figure 3: see original paper], with major contributions from several national nature reserves: Nonggang Nature Reserve (Longzhou County: 256 collections, 317 specimens), Huaping Nature Reserve (Longsheng Various Nationalities Autonomous County: 167 collections, 238 specimens; Lingui County: 62 collections, 90 specimens), Jiawan Mountain Nature Reserve (Rongshui Miao Autonomous County: 190 collections, 214 specimens), Mao' er Mountain Nature Reserve (Xing' an County: 110 collections, 148 specimens), Dayao Mountain Nature Reserve (Jinxiu Yao Autonomous County: 100 collections, 119 specimens; Pingnan County: 35 collections, 43 specimens), and Shiwandashan Nature Reserve (Shangsi County: 67 collections, 75 specimens; Fangchenggang City: 31 collections, 41 specimens; Dongxing City: 15 collections, 22 specimens). Additionally, Baise Region contributed numerous specimens from Jingxi City (82 collections, 132 specimens), Napo County (53 collections, 63 specimens), Longlin Various Nationalities Autonomous County (57 collections, 78 specimens), Tianlin County (44 collections, 55 specimens), and Lingyun County (44 collections, 50 specimens). These counties are located in the karst regions of southwestern Guangxi, with Jingxi and Napo situated along the Sino-Vietnamese border in a global biodiversity hotspot (Myers et al., 2000), reflecting the rich species diversity of karst ecosystems.

Taxonomically, fern type specimens were collected from 10 domestic provinces, autonomous regions, and special administrative regions, with Hainan (54 collections, 54 specimens), Guangxi (28 collections, 33 specimens), Guangdong (19 collections, 22 specimens), Yunnan (14 collections, 16 specimens), and Sichuan (12 collections, 12 specimens) each contributing more than 10 collections. Hunan, Jiangxi, Guizhou, Hong Kong, and Fujian contributed fewer than 10 specimens each. Gymnosperm type specimens were collected from five domestic provinces and autonomous regions, with Guangxi contributing the most (22 collections, 31 specimens), primarily from Pinaceae and Cycadaceae, while Guangdong, Hunan, Hainan, and Sichuan each contributed fewer than five collections. The geographic distribution of angiosperm type specimens mirrors the overall collection pattern, with major contributions from Guangxi (2,188 collections, 2,958 specimens), Hainan (1,064 collections, 1,229 specimens), Guangdong (517 collections, 587 specimens), Yunnan (221 collections, 230 specimens), Sichuan (173

collections, 181 specimens), and Hunan (140 collections, 153 specimens), while other provinces, municipalities, and special administrative regions contributed relatively few specimens.

### 2.3 Collection Date, Publication Date, and Shelf Time Statistics

The earliest collection in the type specimen collection dates to the late nineteenth century: a specimen collected by A. Henry (collection number 5606) in Sichuan in 1889, later published in 1910 as an isotype of *Gongronema hemsleyana* Warb. (Apocynaceae). This represents both the earliest collected and earliest published type specimen in the collection, preserved for over 130 years. Another early specimen collected by A. Henry (collection number 11862) in Simao, Yunnan in 1896 serves as an isotype of *Aganosma schlechteriana* Lévl. var. *breviloba* Tsiang (Apocynaceae).

The chronological collection record of IBK type specimens reflects the herbarium's collecting history [Figure 4: see original paper]. Early collections from the 1920s include specimens collected by Ching Ren-Chang (30 collections) from Guangxi in 1928, and specimens collected by Jiang Ying (15 collections), Zuo Jinglie (13 collections), and Chen Huanyong (11 collections) from Guangdong and Hong Kong between 1927 and 1929. Two distinct peaks in collection activity are evident: the 1930s, with 1,770 collections, and the 1950s, with 1,612 collections. The 1930s peak coincided with the establishment of the Guangxi Institute of Botany, which acquired a substantial collection from South China Institute of Botany and conducted extensive botanical surveys across Guangxi (Li, 1985), yielding numerous type specimens primarily from Hainan (985 collections), Guangdong (372 collections), and Guangxi (325 collections). The 1950s peak reflects intensive botanical surveys in Guangxi (1,108 collections), Sichuan (165 collections), and Hainan (117 collections), including investigations of medicinal plants for traditional Chinese veterinary medicine and comprehensive surveys of the Guangfu forest region, Shiwandashan, the Hongshui River basin, and southwestern Guangxi.

Recent intensification of field surveys, combined with morphological, micro-morphological, and molecular systematic evidence, has continued to yield new species discoveries (Du et al., 2021). Since 2000, nearly 400 new type specimens have been accessioned, predominantly from Guangxi (327 collections), with new taxa continuously described in Gesneriaceae, *Actinidia*, *Begonia*, *Aristolochia*, *Aspidistra*, and other groups.

The chronology of new taxa described based on IBK type specimens shows continuous publication since 1910, with numbers increasing from the 1930s and reaching a first minor peak in the 1950s. The most significant peak occurred around 1980, with 1,422 new taxa published between 1978 and 1984—averaging over 200 new taxa annually. This surge corresponded to the compilation of *Flora Reipublicae Popularis Sinicae*, which began in the late 1950s and entered

a period of rapid development from 1978 onward (Flora Reipublicae Popularis Sinicae Editorial Committee, 1959–2004). Concurrently, compilation of *Flora of Guangxi* commenced in 1978, leading to the description of numerous new taxa.

The interval between specimen collection and taxonomic publication is termed “shelf life” (Fontaine et al., 2012). Analysis of IBK type specimens reveals an average shelf life of 21 years, consistent with the reported average for all biological groups but at least nine years shorter than the average for plants (over 30 years). Only 23% of specimens were described within five years of collection, approximately 50% within 20 years, and about 6% had shelf lives exceeding 50 years. The longest shelf life recorded is 82 years: a specimen collected by Chen Liqing (collection number 92623) in Lingyun County, Guangxi in 1939 was described in 2021 as a paratype of *Phyllagathis impressinervia* Y. L. Su, Yan Liu & Ying Liu (Su et al., 2021; [Figure 6: see original paper]). This exemplifies how herbarium collections, while documenting extensive fieldwork, also represent treasure troves of undescribed species awaiting discovery.

## 2.4 Major Collectors and Authors

Statistical analysis of major collectors reveals Huang Zhi as the most prolific contributor (390 collections), followed by Chen Shaoqing (333 collections), Liang Xiangri (320 collections), and Hou Kuanchao (291 collections). These specimens predominantly originated from Guangdong, Hainan, and Guangxi. Collectors active in the 1930s included Chen Nianqu, Liu Xinqi, Gao Xipeng, and Chi-Hsin Tsoong from Guangxi, and C. W. Wang from Yunnan. Major collectors from the 1950s–1960s included Liang Choufen, Li Yinkun, Li Zhongti, Chen Zhaozhou, Qin Haofu, Li Zhiji, and the Guangfu Forest Zone Collection Team from Guangxi; Xin-Lin Jiang and Xui-Shi Zhang from Sichuan; the Diaoluoshan and East Road collection teams from Hainan; and P. X. Tam from Hunan. Collectors from the late 1970s to 1990s included Liang Choufen, Li Guangzhao, and the Nonggang Comprehensive Survey Team from Guangxi. Since 2000, the primary collectors have been Yan Liu and Wei-Bin Xu from Guangxi.

Based on IBK type specimens, 2,128 taxa have been described by over 500 authors, with approximately 50% of authors publishing only a single name and about 30 authors publishing 20 or more names. The most prolific author is Chen Huanyong (W. Y. Chun), founder of the Guangxi Institute of Botany and a pioneer of modern plant taxonomy in China, who described 274 taxa. Other major contributors include Elmer Drew Merrill (E. D. Merr.) of Harvard University’s Arnold Arboretum (151 taxa) and Ching Ren-Chang (Ching), pioneer of Chinese pteridology (98 taxa).

## 4. Discussion and Outlook

The IBK type specimen collection exhibits rich taxonomic diversity. Like other major Chinese herbaria, it includes early specimens exchanged with South China Botanical Garden and Sichuan University. However, IBK uniquely possesses an

extensive collection of new species type specimens from Guangxi, particularly from recent comprehensive surveys of nature reserves and large-scale investigations such as the fourth national survey of traditional Chinese medicine resources and the second national survey of key protected plants, as well as specialized collections focusing on Gesneriaceae, Begoniaceae, Ebenaceae, *Aspidistra*, *Aristolochia*, and other groups. Nevertheless, the collection shows clear deficiencies in geographic coverage outside protected areas and in non-priority taxa lacking local expertise. Future efforts should address these gaps through expanded collection or collaborative research with specialized taxonomists from other institutions. Recent collaborative work with domestic experts on Melastomataceae, Asteraceae, and Styracaceae has successfully published new taxa from Guangxi, further enriching and distinguishing the IBK collection.

As the basis for establishing botanical names, proper preservation of type specimens is paramount. However, curating, verifying, and digitizing type specimens is a lengthy and arduous process. IBK frequently encounters challenges in type specimen verification, such as early specimens labeled “Typus” without specification of type category, or new taxa citing multiple collection numbers without designation of a holotype, or simultaneously designating multiple specimens as types. These require further detailed verification. For example, *Asarum longerhizomatosum* C. F. Liang et C. S. Yang was originally published with two specimens designated as type (Zhang Chaoliang 001 at BCMM and Zhang Chaoliang 002 at IBK) (Liang, 1975). Subsequent studies by Cheng & Yang (1983), Huang et al. (2003), Jiang et al. (2011), and Deng & Yu (2014) eventually designated Zhang Chaoliang 001 (BCMM) as the holotype, demonstrating that type verification is far from trivial and requires sustained long-term effort.

Rapid digitization and convenient online access have created new opportunities for type specimen information collection and integration, effectively transforming the previously difficult-to-access information landscape (Xie et al., 2021). However, herbaria face challenges in acquiring type specimens, as some newly described taxa designate a repository but fail to deposit the actual specimens, leaving them scattered outside institutional collections—what the academic community terms “pseudo-deposition.” This practice is detrimental to both specimen preservation and reciprocal data sharing. We therefore urge authors to deposit type specimens promptly after publication to ensure their permanent preservation and full realization of their scientific and societal value.

We sincerely thank Professor Wei Fanan of the Guangxi Institute of Botany for his valuable suggestions on this manuscript.

## References

- CHEN JP, XU ZP, 2021. Digitalization construction and sharing development trend of global specimen [J/OL]. *Guihaia*, <https://kns.cnki.net/kcms/detail/45.1134.Q.20210526.1912.010.html>
- CHENG CY, YANG CS, 1983. A synopsis of the Chinese species of *Asarum* (Aristolochiaceae) [J]. *J Arnold Arboret*, 64: 565–597.

- CHUN WY, KUANG KR, 1958. Genus Novum Pinacearum ex Sina Australi et Occidentali [J]. *Bot Mag (USSR)* 43(4): 461-470.
- DENG YF, YU WB, 2014. Nomenclatural notes on the name *Asarum longirhizomatosum* (Aristolochiaceae) [J]. *Phytotaxa*, 172 (1): 57-58.
- DU C, LIU J, YE W, et al., 2021. Annual report of new taxa and new names for Chinese plants in 2020 [J]. *Biodivers Sci*, 29(8): 1011-1020.
- FANG D, 2017. The pictorial collection of type specimens of vascular plants in the herbarium of Guangxi Institute of Chinese Medical & Medicine Sciences (GXMI) [M]. Nanning: Guangxi Science & Technology Publishing House.
- FLORA REIPUBLICAE POPULARIS SINICAE EDITORIAL COMMITTEE, 1959-2004. *Flora Reipublicae Popularis Sinicae* [M]. Beijing: Science Press.
- FONTAINE B, PERRARD A, BOUCHET P, 2012. 21 years of shelf life between discovery and description of new species [J]. *Curr Biol*, 22: R943-R944.
- HUANG SM, KELLY LM, GILBERT MG, 2003. Aristolochiaceae[M]// WU ZY, RAVEN P, HONG DY. *Flora of China*, 5 [M]. Beijing: Science Press; St. Louis: Missouri Botanical Garden Press: 246-269.
- INSTITUTE OF BOTANY, CHINESE ACADEMY OF SCIENCES, 2015. Type specimens in China National Herbarium (PE) [M]. Zhengzhou: Henan Science and Technology Press.
- JIANG N, PENG XM, YU WB, 2011. Valid publication of *Asarum longirhizomatosum* (Aristolochiaceae) [J]. *Novon*, 21: 190-191.
- JIN SY, 1994-2007. *A Catalogue of Type Specimens (Cormophyta) in the Herbaria of China* [M]. Beijing: Science Press.
- LEE SK, 1985. Modern Botanical Explorations in Guangxi, China [J]. *Guihaia*, 5(3): 151-156.
- LIANG CF, 1975. The Aristolochiaceae of Kwangsi Flora [J]. *Acta Phytotaxon Sin* 13(2): 10-28.
- LIN Q, YANG ZR, BAO BJ, et al., 2017. Textual research and digitization of plant type specimens: A case study of the National Herbarium of China[J]. *E-Sci Technol Appl*, 8(4): 63-76.
- LIU HY, QIN HN, LI M, 2017. Plant specimen resource sharing platform and specimen digitization capacity construction[J]. *E-sci Technol Appl*, 8(4): 13-23.
- MA KP, 2017. Mapping Asia Plants: a cyberinfrastructure for plant diversity in Asia [J]. *Biodivers Sci*, 25(1): 1-2.
- MYERS N, MITTERMEIER RA, MITTERMEIER CG, et al., 2000. Biodiversity hotspots for conservation priorities [J]. *Nature*, 403: 853-858.

OU Y, SONG ZQ, FAN ZJ, et al., 2019. Content analysis of holotype specimens collected from Dinghushan National Nature Reserve of Guangdong, China [J]. *J Trop Subtrop Bot*, 27(1): 90–98.

QIAN CJ, DU Y, ZHANG HY, et al., 2017. Study on the arrangement of type specimens species of pteridophytes in Guizhou[J]. *Seed*, 36(8): 63–68.

SU YL, LIU Y, LIU Y, 2021. A new species of *Phyllagathis* (Melastomataceae, Sonerileae) from Guangxi, China [J]. *Phytotaxa*, 500(2): 11.

TURLAND NJ, WIERSEMA JH, BARRIE FR, et al., 2018. *International code of nomenclature for algae, fungi, and plants (Shenzhen Code)*: Adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159. Glashutten: Koeltz Botanical Books.

WANG WT, 2011. Significance of herbaria in plant taxonomy [J]. *Life World*, 263: 1.

XIE D, LIU HY, QIN HN, 2021. New opportunities and challenges in data integration of plant type specimens [J/OL]. *Guohaia*, <https://kns.cnki.net/kcms/detail/45.1134.Q.20210525.1725.00>

XIE D, WANG YQ, ZHANG XS, et al., 2019. A catalogue of plant type specimens and history of plant collecting in Shennongjia National Park [J]. *Biodivers Sci*, 27 (2): 211–218.

YANG Y, 2012. Collections of plant type specimens in China [J]. *Biodivers Sci*, 20(4): 512–516.

*Note: Figure translations are in progress. See original paper for figures.*

*Source: ChinaXiv –Machine translation. Verify with original.*