

How many type specimens can be stored in old lesser-known herbaria with turbulent histories? – A *Juncus* case study reveals their importance in taxonomy and biodiversity research

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Abstract

Many herbarium sets in Europe are still being catalogued and it is likely that many old-type collections are yet to be discovered. This research has the potential to facilitate the study of the biodiversity of many regions, especially regions for which collections are extremely scarce. This has been confirmed by a case study using *Juncus* (Juncaceae) examining the turbulent history of botanical collections at the WRS� herbarium and the evaluation of its importance to the study of taxonomy and biodiversity since 1821. The analysis revealed that the WRS� collection is rich in types (ca. 3.6%) and we identified 76 (of 78) new, historically and nomenclaturally important specimens (types, original material and so-called “topotypes”). Some of these type specimens represent duplicates of these that were stored in Berlin and destroyed during World War II. Many of the type specimens are from the United States of America, South Africa, India, and Canada. The largest number of *Juncus* type specimens stored at WRS� originate from South Africa (42.3% of all type specimens), even though *Juncus* is rare in Africa. Our study highlights that uncatalogued old collections that are under-explored and under-exploited have the potential to facilitate the discovery of specimens important for the study of biodiversity, conservation, taxonomy and nomenclature.

Keywords

biodiversity, conservation, historical collections, Juncaceae, *Juncus*, plant taxonomy

Introduction

The Natural History Museum of Wrocław University (Muzeum Przyrodnicze Uniwersytetu Wrocławskiego) is the oldest natural history museum in Poland and its history dates back to 1814, when it was founded by Prof. Johann Ludwig Christian Gravenhorst as the Zoological Museum. Currently, it houses both the botanical and zoological collections. The beginning of the herbarium in its present form was the Herbarium Horti Botanici Universitatis Wratislaviensis, which was established by Prof. Ludolph Christian Treviranus in 1821 (Wiktor 2002; Wanat 2013). The Herbarium Silesiacum was independently founded by the Silesian Association of Native Culture (Schlesische Gesellschaft für Vaterländische Cultur) and, until 1945, it was housed on Tamka Island, Wrocław. It developed independently from the other botanical collections, but following the Second World War, it was merged with the main part of the herbarium.

Many distinguished botanists have worked in the WRS� herbarium (Museum of Natural History, University of Wrocław, Poland, in Polish: Zielnik WRS�), including the directors or curators of Wrocław's botany collections, for example, Ludolf Christian Treviranus (1821–1830), Christian Gottfried Nees von Esenbeck (1830–1852), Heinrich Robert Goeppert (1852–1884), Heinrich Gustav Adolf Engler (1884–1889), Ferdinand Cohn (1884–1893) and Ferdinand Pax sen. (1893–1927). The Herbarium Silesiacum was curated by Julius Milde (1865–1870), Gustav Wilhelm Körber (1871–1885), Rudolf von Uechtritz (1886), Theodor Schube (1890–1929) and Emil Schalow (1930–1944) (Wiktor 2002).

Professor H.R. Goeppert expanded the botany collections and established the Botanical Museum (Botanisches Museum) in 1853 (Wanat 2013). The first known catalogue of the Museum (Goeppert 1884) included 26 different collections, including the Herbarium of the World, the Herbarium Silesiacum, the Herbarium Mycologicum, a wood collection and several fruit and seed sets. Goeppert also opened another museum in 1878 – The Museum of the Botanical Garden (Mularczyk 1998). In 1888, all these several botanical collections belonging to the University were moved to a building that is today located at 6/8 Kanonia Street. However, they still consisted of two separate collections (the Botanical Museum in charge of Prof. Cohn and collections of the Herbarium and the Museum of the Botanical Garden in charge of Prof. Engler). Due to the efforts of Prof. Engler, a private Silesian plant collection assembled by Rudolf von Uechtritz was purchased at this time and M. Winkler donated his herbarium to the Museum, which he had compiled for 30 years (Wiktor 2002).

At the end of nineteenth century, Ferdinand Pax (the elder) merged all the University botanical collections under the name of the Botanical Museum. His own collections were also included in the Museum at this time. Before merging, von Uechtritz's herbarium of Silesian plants was handed over to the Herbarium Silesiacum (then still independent) on his initiative. In exchange for Uechtritz's herbarium, the Botanical Museum later received the Herbarium Henschelianum (part of the Herbarium Silesiacum) with ca. 100,000 sheets.

As a result of these mergers and gifts, the Wrocław herbarium had acquired an extensive and significant collection of specimens from Europe (especially the Mediter-

ranean) and the rest of the world. These were collected by botanists such as Hubert Winkler (a student of F. Pax the elder) in East Africa, Cameroon, Java, Sumatra and Borneo. In 1938, a collection of ca. 50,000 herbarium sheets (including numerous types) was donated to the Museum by Carl Adolf Georg Lauterbach, who travelled extensively in New Guinea and Melanesia. By 1914, the Herbarium had 540,000 sheets which, by 1939, had grown to ca. 600,000 sheets (Wiktor 2002; Wanat 2013). The oldest and most valuable collections of the Herbarium Silesiacum were those made by H.G. Mattuschka (1776 and 1779), A.J. Krockner (1787, 1790, 1814, 1823), A. Henschel (1830), a herbarium of fungi assembled by W.G. Schneider and an old herbarium of Paolo (Silvio) Boccone, a Cistercian monk, who moved to Wrocław in 1694 and donated his herbarium that consisted mainly of Mediterranean plants (Treviranus 1831; Rostański 1963). This herbarium is not mentioned by Stafleu et al. (1976), but is the oldest plant collection of a scientific nature in Poland. In 1935, the Herbarium Silesiacum housed over 80,000 sheets (Wanat 2013).

In autumn 1944, during the Second World War, German authorities evacuated all university botanical collections from Wrocław. The Herbarium Generale (combination of the various merged herbaria) was then located in Piotrowice castle near Kąty Wrocławskie (ca. 43 km S.W. of Wrocław), the Herbarium Lauterbachii in Siedlęcín near Jelenia Góra (ca. 95 km W. of Wrocław) and the other botanical sets in the garrison church in Oleśnica near Wrocław (ca. 27 km N.E. of Wrocław), which were unfortunately lost in a fire. The Herbarium Silesiacum was lodged, in turn, in the attic of one of the primary schools in south Wrocław (in the Tarnogaj district); however, it was not protected from destruction and the dusty and damp collection was rediscovered after the war unbound, mixed together with litter and broken glass (Wiktor 2002; Wanat 2013).

Shortly after the war, Polish authorities failed to discover traces of herbarium sets in the dilapidated buildings – these were found in the Piotrowice castle, Siedlęcín and south Wrocław only in 1946–1947, but only the Herbarium Lauterbachii was salvaged undamaged. The recovered collections were entrusted to Prof. Józef Maǰalski, who was invited to Wrocław from Lviv (former Poland, now in the Ukraine). The war had damaged many of the specimens and repairs were successfully undertaken by Polish botanists. Rostański (1963) assessed the war damage in both herbaria (i.e. Herbarium Generale and Herbarium Silesiacum) as, after the war, only 200,000 herbarium sheets were discovered out of 600,000 that belonged to the University in 1939, together with 30,000 herbarium sheets from the former Herbarium Silesiacum which, in 1939, housed 80,000 sheets (it was confirmed then that the oldest Silesian flora sets of H.G. Mattuschka and A.J. Krockner had been destroyed).

Currently, the collections are estimated to contain over 515,000 sheets, including ca. 410,000 vascular plants, 27,000 bryophytes, 38,400 fungi and myxomycetes, 27,000 lichens and 12,600 algae (Mirek et al. 1997; K. Świerkosz, pers. comm., 2019). The herbarium WRSL has had a turbulent history and has enormous importance in the botanical history of Poland.

The aim of this investigation was to assess the value of the WRSL botanical collection using the genus *Juncus* as a case study. Type and other nomenclaturally and

historically important specimens “hiding” in such under-appreciated collections are important for taxonomy, nomenclature and biodiversity studies. Using the WRS� herbarium, we address the importance of collections like WRS� as reservoirs of valuable data that are relevant to experts who are involved in taxonomic revision.

Methods

Assessing the significance of the WRS� collection

The WRS� herbarium is currently divided into three parts: the Herbarium Generale, the Herbarium Lauterbachi and the Herbarium Silesiacum. The Herbarium Generale (about 375,000 specimens including about 75,000 spore-bearing organisms) holds the plant and fungal material from around the world, excluding Lower Silesia, Poland, the Herbarium Lauterbachi (about 50,000 sheets) contains plants from New Guinea and Melanesia and the Herbarium Silesiacum (about 90,000 specimens) (K. Świerkosz, pers. comm., 2019) houses plants from Lower Silesia, Poland.

Generally, the importance of particular natural collections depends not only on their size, but also can be measured on the percentage or the absolute share of type specimen types (Sutory 1997). In 2017, digitalisation of the WRS� collection was initiated and was subsequently able to be accessed via GBIF.org (Świerkosz 2017); this work is on-going but only 25,000 specimens (4.9%) are currently listed in a database (K. Świerkosz, pers. comm., 2019). Therefore, we decided to assess the importance of using specimens of the genus *Juncus* (Juncaceae) stored in the Herbarium Generale (to date, no *Juncus* specimens from WRS� are included in GBIF.org database to facilitate this task). The reasons for this choice were: 1) type specimens of *Juncus* have never previously been assessed in the WRS� Herbarium; 2) the genus *Juncus* is rich in species from regions where the herbarium has geographical strengths, 311 are listed by Kirschner et al. (2002a, b) and 3) the first author of this paper is a specialist in *Juncus* taxonomy, which considerably aided the analysis of specimen status.

We evaluated the following factors (Sutory 1997): 1) the originality of the collection, including the number of types and other historically-important specimens; 2) the size of the collection, i.e. the total number of specimens; 3) the geographical scope of the collection; 4) the length of the period represented by the collection; 5) the number of duplicates and 6) the physical condition of the collection (well-prepared, well-preserved and undamaged and well-stored material with appropriate labels). Herbarium sheets with plants representing a single taxon that were gathered in the same locality and on the same date by the same collector, were regarded as duplicates. Additionally, we analysed the specimens with respect to: 1) the person who collected the material in the field; 2) the collection from which they came (i.e. to whom they belonged before accession in WRS�) and 3) the floras/exsiccatae from which they came.

We catalogued all *Juncus* specimens ourselves, paying particular attention to all types and other historical material, which we identified, based on the latest mono-

graph (Kirschner et al. 2002a, b), from which we took the current nomenclature of the genus. The localities and dates of sets for historical collections, especially those of C.F. Ecklon & C.L.P. Zeyher and J.F. Drège, were deciphered from literature (Meyer 1832; Drège 1847, 1848; Buchenau 1875, 1890, 1906), which enabled us to recognise many *Juncus* types.

The *Juncus* sets are stored in seven herbarium boxes indexed as separate fascicles, numbered 151–157 and an extra 43 herbarium sheets were kept in a separate folder. We analysed 2,192 herbarium sheets in total. We treated a separate collection with its own label as a separate herbarium sheet, as specimens from three different localities could have been mounted on one herbarium sheet (we treated these as three separate herbarium sheets). We identified 2,222 taxonomic records, since part of the material represents mixed sets. We conducted our research from scratch, since only two *Juncus* types identified in the Herbarium Generale had been previously labelled using a red label. Thus, no other *Juncus* types stood out from other herbarium sheets. Our results were also compared with those within the Global Plants Database (plants.jstor.org, accessed on 16 Apr 2020) and additional herbaria, not mentioned by Kirschner et al. (2002a, 2002b) that store other type specimens/duplicates of names we assessed, are added to the last column of Table 1 and marked with an asterisk (*). Duplicates of selected type specimens stored at WRS� were also compared with those stored in other herbaria (present in the Global Plants Database). When comparisons were made, we considered the physical condition of specimens, quantity of materials, different annotations, kinds of labels and plant parts.

Results

Type and other historically-important material

We found 78 specimens that are historically or nomenclaturally important (Table 1): two holotypes, 20 isoelectotypes, 14 isotypes, 29 syntypes (including one probable syntype of *Juncus exsertus* Buchenau (1875: 435)), three paratypes, one isoneotype, five sheets of historically-relevant material (for names not validly published) or additional material from type localities collected by the author of the name (so-called “topotypes”) and four sheets of probable original material to be analysed in the future (Fig. 1). Holotypes, isotypes and isoelectotypes constitute 46.2% of all types (and other historically- and nomenclaturally-important specimens) of *Juncus* specimens recognised at the WRS�. The most significant discovery was the identification of the three following *Juncus* types in the WRS� Herbarium (see also remarks for them in Table 1, last column of rows 46, 56, 20):

1) ISOTYPE of *Juncus lomatophyllus* Spreng. (1821: 108) [sine dato, *Bergius s.n.* (*J. lomatophyllus* Spreng., Bergius’sches Exemplar, bestimmt von K. Sprengel, 11 Jan 1875, det. Fr. Buchenau)]. – Holotype in B, destroyed. Isotype (the only duplicate known) rediscovered at WRS�.

Table 1. A list of historically- and nomenclaturally-important *Juncus* specimens identified in the Herbarium Generale at WRSL. A sequence of species alphabetically according to the basionym/*Juncus* names. No. – Successive Number; N.f. – Number of fascicle (= herbarium box) at WRSL; underline text – new findings after examination of the protologues; grey rows – indicate types that were stored in Berlin and were destroyed during the WWII; * – asterisk indicates additional herbaria where Global Plants (plants.jstor.org) records duplicates.

No.	N.f.	Kind of type and type of (basionym)	Current name	Locality (label data)	Herbarium label data (original spelling)	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronym (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.:)
1	151	Authentic/original material of <i>Juncus antoniianus</i> Steud. in W. Lechler, <i>Berberid. Amer. Austral.</i> (1857: 56), nom. inval.	<i>Juncus balticus</i> subsp. <i>andicola</i> (Hook. 1848: 8, pl. 714) Snogerup in Snogerup, Zika & Kirschner, <i>Prelia</i> 74 (2002: 258)	PERU. S. Antonio	Date Jun 1854 Leg. et det. <i>W. Lechler 1808</i> (as <i>Juncus andicola</i> , 04 Dec 1887, Fr. Buchenaus)	W. Lechler, Pl. Peruvianae ed. R. F. Hochenacker / Herbarium Henschelianum	Authentic/original material: Peru, San Antonio, Jun 1954, <i>W. Lechler 1808</i> , G. GOET, K. KW*. Rem.: After Kirschner et al. (2002b: 74) erroneous collection date of Jun 1954 to be corrected to Jun 1854.
2	151	Isotype of <i>Juncus atratus</i> Knoch., <i>Fl. Siles.</i> 1 (1787: 562)	<i>Juncus atratus</i> Knoch., <i>Fl. Siles.</i> 1 (1787: 562)	POLAND, Breslau [Wrocław], Oderdämme bet Carlowitz [Karlówice, now a settlement within Wrocław city]	10 Jul 1892 <i>A. Callier 721</i>	A. Callier Flora Silesiaca exsiccata / Herbarium Wagnerianum	T: Silesia, <i>A.J. Knoch</i> ; syn: not extant; Breslau, Oderdämme bet Carlowitz [Karlówice between Wrocław and Opole, Poland], 10 Jul 1892, <i>A. Callier [Fl. Siles. Exs.] 721</i> ; neo: S, designated by Kirschner et al. (2002a: 178); isomeo: L, PRC, W, WU. Rem.: After Kirschner et al. (2002a: 178) erroneous locality translated as 'Karlówice [village] between Wrocław and Opole, Poland' which is on the Stobrawa river [not Odra] and is ca. 55 km SE from the Karlówice [settlement] in Wrocław on the Odra river. The status of the type was corrected (iso to isomeo) in accordance with the <i>Sprengelien Code</i> .
3	154	Synype of <i>Juncus brimmius</i> Buchenau, <i>Junc. S. Amer.</i> (1879: 403)	<i>Juncus ebracteatus</i> E. Mey., <i>Syn. Junc.</i> (1822: 28)	PERU. Im paludosis prope Azangaro	Jun 1854 <i>W. Lechler 1749</i> , det. Fr. Buchenaus, 22 Jan 1879	W. Lechler, Pl. Peruvianae ed. R.F. Hochenacker / Herbarium Henschelianum	T: Bolivia, La Paz, Larecaja, 2700–3800 m, <i>G. Mamdon 1436</i> ; syn: BM, G, K, MO, NY, P; Peru, Azangaro, <i>W. Lechler 1749</i> ; syn: BR, G, GOET, K, O, P, S.
4	152	Isotype of <i>Juncus buchenanii</i> Sved., <i>Juncac. Regn. Exp. (Bih. Kongl. Svenska Vetensk.-Akad. Handl.)</i> 23(3), no 6 (1897: 9)	<i>Juncus marginatus</i> Rosik., <i>De Juncis</i> (1801: 38)	BRASILIA, Brasiliae civit. Rio Grande do Sul, Quinta	07 Dec 1892 <i>C.A.M. Lindman 857</i>	Herb. Brasil. Regnell. Musci bot. Stockholm	T: Brazil, Rio Grande do Sul, Quinta prope opp. Rio Grande, 7 Dec 1892, <i>C.A.M. Lindman 4857</i> ; holo: S; iso: GH, W [cf. <i>Juncus buchenanii</i> Dörfl. 1897. an prius?]. Rem.: After Kirschner et al. (2002a: 48) collection <i>No. 4875</i> (probably to be corrected).

No.	N.f.	Kind of type and type of (botany)	Current name	Locality (label data)	Date	Herbarium label data (original spelling)	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.:)
5	152	Probably original material of <i>Juncus biflorus</i> var. <i>halophilus</i> Buchenau & Fernald, <i>Rhodora</i> 6 (1904: 39)	<i>Juncus ranarius</i> Songon & E.P. Perrier in PC. Billot, <i>Annou. Fl. France Allemagne</i> (1859: 192)	CANADA, Rivière du Loup	Aug 1902	W.W. Eggleston 3036	Plants of the Lower St. Lawrence	T: Canada, Quebec, Rivière du Loup, 2 Aug 1902. E.F. Williams & M.L. Fernald; holo: GH; iso: CM*, K, L, P, PH*. Paratypes (see protologue): Rivière du Loup, 15 Aug 1892, G.G. Kennedy; Rivière du Loup, 8 Aug 1902, J.R. Churchill, W.W. Eggleston, M.L. Fernald. See also protologue for many other paratypes. Rem.: After Kirschner et al. (2002b: 15) collection should be of E.F. Williams & M.L. Fernald but the herbarium label is marked as 'Type'. According to the protologue the paratype should be collected by J.R. Churchill, W.W. Eggleston, M.L. Fernald (instead of W.W. Eggleston only) and with the exact collection date (8 Aug 1902).
6	152	Holotype of <i>Juncus bulbosus</i> f. <i>submicronatus</i> Pročková, <i>Ann. Bot. Fenn.</i> 47 (2010: 412)	<i>Juncus bulbosus</i> f. <i>submicronatus</i> Pročková, <i>Ann. Bot. Fenn.</i> 47 (2010: 412)	POLAND, Wrocław Leśnica, ad ripam et in aqua piscinae eutrophicae et in aqua piscinae eutrophicae, situ meridiano-occidentali lacus	31 May 1999	J. Pročková 99053/11	Herbarium J. Pročková	T: Poland, Dolny Śląsk, Wrocław Leśnica, ad ripam et in aqua piscinae eutrophicae, situ meridiano-occidentali lacus, 31 May 1999, J. Pročková; holo: WRSL; iso: WRSL; para: B, BIL, BM, BR, C, DBN, DRAPN, E, GOET, H, HAL, HBG, KRA, L, LAU, LG, LISU, M, MA, MSB, P, PBMA, POZ, S, TRN, TUB, WA, WRSL, WSRP, ZBI. Rem.: After Pročková (2010: 420–423)
7–11	152	Isotype of <i>Juncus bulbosus</i> f. <i>submicronatus</i> Pročková, <i>Ann. Bot. Fenn.</i> 47 (2010: 412)	<i>Juncus bulbosus</i> f. <i>submicronatus</i> Pročková, <i>Ann. Bot. Fenn.</i> 47 (2010: 412)	POLAND, Wrocław Leśnica, ad ripam et in aqua piscinae eutrophicae et in aqua piscinae eutrophicae, situ meridiano-occidentali lacus	31 May 1999	J. Pročková 99053/12 to 6	Herbarium J. Pročková	T: Poland, Dolny Śląsk, Wrocław Leśnica, ad ripam et in aqua piscinae eutrophicae, situ meridiano-occidentali lacus, 31 May 1999, J. Pročková; holo: WRSL; iso: WRSL; para: B, BIL, BM, BR, C, DBN, DRAPN, E, GOET, H, HAL, HBG, KRA, L, LAU, LG, LISU, M, MA, MSB, P, PBMA, POZ, S, TRN, TUB, WA, WRSL, WSRP, ZBI. Rem.: After Pročková (2010: 420–423).
12	152	Paratype of <i>Juncus bulbosus</i> f. <i>submicronatus</i> Pročková, <i>Ann. Bot. Fenn.</i> 47 (2010: 412)	<i>Juncus bulbosus</i> f. <i>submicronatus</i> Pročková, <i>Ann. Bot. Fenn.</i> 47 (2010: 412)	GERMANY, Leipzig, Dahlen, 2. Teich in Richtung Schmannewitz, Teichschlamm.	03 Aug 1984	Peter Güte 34378 (WRSL 69420)	Flora des Bezirkes Leipzig Herb. Univ. Lipsiensis, Pflanzen der DDR	T: Poland, Dolny Śląsk, Wrocław Leśnica, ad ripam et in aqua piscinae eutrophicae, situ meridiano-occidentali lacus, 31 May 1999, J. Pročková; holo: WRSL; iso: WRSL; para: B, BIL, BM, BR, C, DBN, DRAPN, E, GOET, H, HAL, HBG, KRA, L, LAU, LG, LISU, M, MA, MSB, P, PBMA, POZ, S, TRN, TUB, WA, WRSL, WSRP, ZBI. Rem.: After Pročková (2010: 420–423).

No.	N.f.	Kind of type and type of (basionym)	Current name	Locality (label data)	Herbarium label data (original spelling)	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.:)
13	152	Paratype of <i>Juncus bulbosus</i> E. submicronotatus Proćków, Ann. Bot. Fenn. 47 (2010: 412)	<i>Juncus bulbosus</i> f. <i>submicronotatus</i> Proćków, Ann. Bot. Fenn. 47 (2010: 412)	CZECH REPUBLIC. Bohemia meridionalis, distr. České Budějovice; ad margines turfosis stagnorum, prope rivulum Borovnický potok haud procul ab vico Borovnice, copiose, ca. 450 m s. m.	24 Aug 1962 <i>J. Kůrera</i> 154 (WRSL 26580)	Plantae Czechoslovacae Exsiccatae. Cura Sectionis Botanicae Musei Nationalis Pragae Editae. Centuria II	T: Poland, Dolny Śląsk, Wrocław Leśnica, ad ripam et in aqua piscinae europlicatae, situ meridiano-occidentali lacus, 31 May 1999, <i>J. Proćków</i> ; holo: WRSL; iso: WRSL; para: B, BIL, BM, BR, C, DBN, DRAPN, E, GOET, H, HAL, HBG, KRA, L, LAU, LG, LISU, M, MA, MSB, P, PBMA, POZ, S, TRN, TUB, WA, WRSL, WSRP, ZBL. Rem.: After Proćków (2010: 420–423).
14	152	Paratype of <i>Juncus bulbosus</i> E. submicronotatus Proćków, Ann. Bot. Fenn. 47 (2010: 412)	<i>Juncus bulbosus</i> f. <i>submicronotatus</i> Proćków, Ann. Bot. Fenn. 47 (2010: 412)	POLAND, distr. Siedlice, Krzymosze, na obniżonej ziemi w borze bagennym obok toru [on bare soil in marshy forest next to a railway track].	27 Jul 1974 <i>Z. Glowacki</i> s. n. (WRSL 35948)	Ziwnik Zakładu Biologii Wyzszej Szkoły Nauzycieliskiej w Siedleach	T: Poland, Dolny Śląsk, Wrocław Leśnica, ad ripam et in aqua piscinae europlicatae, situ meridiano-occidentali lacus, 31 May 1999, <i>J. Proćków</i> ; holo: WRSL; iso: WRSL; para: B, BIL, BM, BR, C, DBN, DRAPN, E, GOET, H, HAL, HBG, KRA, L, LAU, LG, LISU, M, MA, MSB, P, PBMA, POZ, S, TRN, TUB, WA, WRSL, WSRP, ZBL. Rem.: After Proćków (2010: 420–423).
15	152	Isolectotype of <i>Juncus caespiticus</i> E. Mey. in J.G.C. Lehmann, Pl. Preiss. 2 (1846: 47)	<i>Juncus caespiticus</i> E. Mey. in J.G.C. Lehmann, Pl. Preiss. 2 (1846: 47)	AUSTRALIA, ad fluvium Canning, Perth, novae Hollandiae.	02 Nov 1839 <i>Preis. (L. Preis)</i> 1733	Herbarium Schumann	T: [Western Australia, Perth, Canning R.] ad fluvium Canning (Perth) novae Hollandiae, 2 Nov 1839, <i>L. Preis</i> [Pl. Austral. Oricul.] 1733; lecto: W, designated by Kirschner et al. (2002a: 38); islector: BM, BREM, G*, K, L, LD*, MEL, NSW, P, W. Rem.: The status of the type corrected (iso to islector) in accordance with the <i>Shenzhen Code</i> .
16	155	Iso type of <i>Juncus caffer</i> Bertr., <i>Mém. Reale Acad. Sci. It. Bologna</i> 3 (1851: 253, Pl. 19, fig. 3).	<i>Juncus kraussii</i> Hochst. in C. Krauss <i>Flora</i> 28 (1845: 342) subsp. kraussii	MOZAMBIQUE. 'Inhambane Mozambici'	06 Dec 1848 <i>Fornasinio</i> s. n.		T: Mozambique, 'Inhambane Mozambici', 6 Dec 1848, <i>Fornasinio</i> , holo: BOLO.
17	152	Syn type of <i>Juncus capensis</i> subsp. <i>angustifolius</i> var. <i>ecklonii</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 485) [Abh. <i>Naturwiss. Ver. Bremen</i> 4 (1875: 485)]	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA. Paludosa ad pedem montis diaboli	19 & 28 Nov 1827 [after Buchenau 1875: 485]	Herbarium Henschelianum	T: Cape, Teufelsberg, <i>C.F. Ecklon</i> 897, <i>Unio Itin.</i> , no 35 [annotated by E. Meyer under no 18]; syn: BOL, JE*, S, W. Rem.: Additional remark by Buchenau (1875: 485): 'Un. it. No. 35'.
18	152	Syn type of <i>Juncus capensis</i> subsp. <i>angustifolius</i> var. <i>ecklonii</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 485) [Abh. <i>Naturwiss. Ver. Bremen</i> 4 (1875: 485)]	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA. Paludosa planities capensis	Dec 1827 [after Buchenau 1875: 485]	Herbarium Henschelianum	T: Cape, Teufelsberg, <i>C.F. Ecklon</i> 897, <i>Unio Itin.</i> , no 35 [annotated by E. Meyer under no 18]; syn: BOL, S, W. Rem.: Kirschner et al. (2002a: 36) did not mention this type (<i>C.F. Ecklon</i> 899) but it is listed by Buchenau (1875: 485) in the protologue of the new taxon; additionally, the specimen really seen by Buchenau (with his own handwritten label); Kirschner et al. (2002a: 36) listed var. <i>ecklonii</i> as homotypic with <i>Juncus capensis</i> var. <i>angustifolius</i> E. Mey.; syn: JE*, W*.

No.	N.f.	Kind of type and type of (botany)	Current name	Locality (label data)	Date	Herbarium label data (original spelling)	Leg. et det.	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.):
19	152	Syn type of <i>Juncus capensis</i> subsp. <i>angustifolius</i> var. <i>sphagnetorum</i> f. <i>frondescens</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 490) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 490)]	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA. Cape. Tafelberg	sine dato	<i>J.F. Drege aa</i> (det. as <i>Juncus capensis</i> var. <i>angustifolius</i> E. M.), (det. as <i>Juncus capensis</i> Thbg. subsp. <i>angustifolius</i> var. <i>sphagnetorum</i> f. <i>frondescens</i> , det. Fr. Buchenau 11 Jan 1874)	<i>J.F. Drege aa</i> (det. as <i>Juncus capensis</i> var. <i>angustifolius</i> E. M.), (det. as <i>Juncus capensis</i> Thbg. subsp. <i>angustifolius</i> var. <i>sphagnetorum</i> f. <i>frondescens</i> , det. Fr. Buchenau 11 Jan 1874)	Herbarium Henschelianum	T: Cape, Tafelberg, <i>J.F. Drege aa</i> , syn: K*, P. S. W; Gipe! des Tafelberges, <i>C.L.P. Zeyher 47</i> ; syn: B, destroyed.
20	152	Isolectro type of <i>Juncus capensis</i> subsp. <i>longifolius</i> var. <i>gracilior</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 483) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 483)]	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA. Cap. B. Spei.	05 Mar 1816	<i>C.H. Bergius s.n.</i> , det. K. Sprengel (gesamm. von Bergius, det. Fr. Buchenau 11 Jan 1875)	Herbarium Henschelianum	T: Caput bonae spei, 5 Mar 1816, <i>Bergius</i> ; lecto (as holotype) B, destroyed, <i>vide</i> A.A. Obermeyer, in A.A. Obermeyer, J. Lewis & R.B. Faden, <i>Fl. S. Afr.</i> 4/2 (1985: 83); syn: W. Rem.: There are more specimens mentioned in the protologue of a new taxon (Buchenau, 1875: 484) thus the lectotype was designated. Isolectrotype (the only duplicate known) rediscovered at WRSI (the specimen includes the collection date (i.e. 5 Mar 1816), as in the the protologue). The syntype (Bergius specimen at W) does not have the collection date. The status of the type corrected (iso to isolectro) in accordance with the <i>Shenzhen Code</i> .	
21	152	Syn type of <i>Juncus capensis</i> subsp. <i>longifolius</i> var. <i>gracilior</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 483) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 483)]	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA. [Cape] zwischen Paarl und Franschehoek	sine dato	<i>J.F. Drege b</i> (det. as <i>Juncus capensis</i> β. <i>angustifolius</i> E. M.), (det. as <i>J. capensis</i> subsp. <i>longifolius</i> var. <i>gracilior</i> Buchenau, det. Fr. Buchenau 11 Jan 1875)	Herbarium Henschelianum	T: Caput bonae spei, 5 Mar 1816, <i>Bergius</i> ; lecto (as holotype) B, destroyed, <i>vide</i> A.A. Obermeyer, in A.A. Obermeyer, J. Lewis & R.B. Faden, <i>Fl. S. Afr.</i> 4/2 (1985: 83); isolectro: W. Rem.: A specimen not mentioned by Kirschner et al. (2002a: 37), but listed by Buchenau (1875: 484), thus it is a syntype because there are more specimens within the protologue of a new taxon; syn: S*. The status of the type corrected (iso to isolectro) in accordance with the <i>Shenzhen Code</i> .	

No.	N.f.	Kind of type and type of (basonym)	Current name	Locality (label data)	Herbarium label data (original spelling)	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.:)
22	152	Holotype of <i>Juncus capensis</i> subsp. <i>parviflorus</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 491) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 491)]	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA, ad ripas fl. Zonder-Einde, Zwelendamd	Nov 1836 <i>C. Krauss s.n.</i> (det. as <i>Juncus capensis</i> Thbg. subsp. <i>parviflorus</i> Buchenau, leg. Ferd. Krauss, det. Fr. Buchenau, 11 Jan 1875; det. by C. Krauss as <i>Juncus cephalotes</i> Thunb.)	Herbarium Henschelianum	T: Cape, Swellendam, Rivier Zondereinde, Nov 1838, C. <i>Krauss s.n.</i> ; holo: WRSLS; iso: W. Rem.: Buchenau (1875: 491) listed only one specimen stored at 'Herbarium der schlesischen Gesellschaft für vaterländische Cultur und des naturhistorischen Vereines der preussischen Rheinlande und Westfalens', i.e. in Wroclaw. Thus, this holotype of the name was confirmed by the following: 1) it was observed by Buchenau on 11 Jan 1875 and 2) it is only one specimen that lacks a clearly written collection year, which was misread by Buchenau in the protologue (1875: 491) as 'Nov 1838', however, identical sheets (from Herbarium R. v. Uechtritz & Herbarium Schumann, both at WRSLS) read 'Nov 1836'. Compare also with A.A. Obermeyer, in A.A. Obermeyer, J. Lewis & R.B. Faden, <i>Fl. S. Afr.</i> 4/2 (1985: 83). The status of the type corrected (iso to holo (for WRSLS), and lecto to iso (for W)) in accordance with the <i>Shenzhen Code</i> . Rem.: see above
23	152	Isotype of <i>Juncus capensis</i> subsp. <i>parviflorus</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 491) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 491)]	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA, ad ripas fl. Zonder-Einde, Zwelendamd	Nov 1836 <i>C. Krauss s.n.</i> (det. as <i>Juncus cephalotes</i> Thunb.)	Herbarium Schumann	
24	152	Isotype of <i>Juncus capensis</i> subsp. <i>parviflorus</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 491) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 491)]	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA, ad ripas fl. Zonder-Einde, Zwelendamd (Cap. B. spei.)	Nov 1836 <i>C. Krauss s.n.</i> (det. as <i>Juncus cephalotes</i> Thunb.)	Herbarium R. v. Uechtritz	Rem.: see above
25	152	Synotype of <i>Juncus capitatus</i> var. <i>physcomitroides</i> Baen., <i>Prosp. Herb. Eur.</i> (1873: 4); <i>Schriften Königl. Phys.-Okon. Ges. Königsberg</i> 14 (1873: 16).	<i>Juncus capitatus</i> Weigel, <i>Observ. Bot.</i> (1772: 28)	POLAND, Danzig [Gdańsk], Strand bei Zoppot [Sopot]	08 Jul 1872 <i>C. Baenitz s.n.</i>	Herbarium Schumann	T: Danzig, Strand bei Zoppot [Poland, Gdańsk, Sopot], 8 Jul 1872, <i>K.G. Baenitz</i> ; sym: L; additional authentic material from the same site: 5 Jul 1876, <i>K.G. Baenitz</i> [<i>Herb. Eur.</i>] 1506 (LD, W).
26	152	Additional material from type locality (collected by the author of the name) of <i>Juncus capitatus</i> var. <i>physcomitroides</i> Baen., <i>Prosp. Herb. Eur.</i> (1873: 4); <i>Schriften Königl. Phys.-Okon. Ges. Königsberg</i> 14 (1873: 16).	<i>Juncus capitatus</i> Weigel, <i>Observ. Bot.</i> (1772: 28)	POLAND, Danzig [Gdańsk], Ad mare balticum [Zoppot [Sopot]]	05 Jul 1876 <i>C. Baenitz 1506</i>	Dr. C. Baenitz, Herbarium Europaeum	T: Danzig, Strand bei Zoppot [Poland, Gdańsk, Sopot], 8 Jul 1872, <i>K.G. Baenitz</i> ; sym: L; additional material from the same site, collected by the author of the name: 5 Jul 1876, <i>K.G. Baenitz</i> [<i>Herb. Eur.</i>] 1506 (LD, W).

No.	N.f.	Kind of type and type of (basonym)	Current name	Locality (label data)	Date	Herbarium label data (original spelling)	Leg. et det.	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.)
27	152	Additional material from type locality [collected by the author of the name] of <i>Juncus capitatus</i> var. <i>physcomitrioides</i> Baen., <i>Prosp. Herb. Eur.</i> (1873: 4); <i>Schriften Königl. Phys.-Ökon. Ges. Königsberg</i> 14 (1873: 16).	<i>Juncus capitatus</i> Weigel, <i>Observ. Bot.</i> (1772: 16)	POLAND: Danzig [Gdansk], Ad mare balticum (Zoppot [Sopot])	05 Jul 1876	<i>C. Baenitz</i> 1506	Dr. C. Baenitz, Herbarium Europaeum	T: Danzig, Strand bei Zoppot [Poland, Gdańsk, Sopot], 8 Jul 1872; <i>K.G. Baenitz</i> ; syn: L; additional material from the same site, collected by the author of the name: 5 Jul 1876, <i>K.G. Baenitz</i> [<i>Herb. Eur.</i>] 1506 (LD, W).	
28	156	Synotype of <i>Juncus cephalotes</i> var. <i>minimus</i> Hochst., <i>Flora</i> 28 (1845: 342), p.p.	<i>Juncus cephalotes</i> Thunb., <i>Prodr. Pl. Cap.</i> (1794: 66)	SOUTH AFRICA. in arenos. plan. Cap.	Nov [18]38	<i>C. Krauss</i> s.n.	Herbarium R. v. Uechtritz	T: [South Africa, Cape] 'in arenosis planitie capensis', Nov 1828, <i>C. Krauss</i> ; syn: W; K [both mixed collections]. Rem.: The material needs to be revised because W & K contain mixed collections; after Kirschner et al. (2002a: 73), the collection date was Nov 1828 (to be corrected to Nov 1838).	
29	156	Synotype of <i>Juncus cephalotes</i> var. <i>minimus</i> Hochst., <i>Flora</i> 28 (1845: 342), p.p.	<i>Juncus cephalotes</i> Thunb., <i>Prodr. Pl. Cap.</i> (1794: 66)	SOUTH AFRICA. in arenos. plan. Cap.	Nov [18]38	<i>sine coll.</i> [<i>C. Krauss</i>] s.n.	Herbarium Schumann	T: [South Africa, Cape] 'in arenosis planitie capensis', Nov 1828, <i>C. Krauss</i> ; syn: W; K [both mixed collections]. Rem.: Original material was from Krauss because the identical label is on a sheet from Herbarium R. v. Uechtritz where 'Dr. Krauss' was added; the material needs to be revised because W & K contain mixed collections; after Kirschner et al. (2002a: 73), the collection date is Nov 1828 (to be corrected to Nov 1838).	
30	152	Synotype of <i>Juncus cephalotes</i> var. <i>minimus</i> Hochst., <i>Flora</i> 28 (1845: 342), p.p.	<i>Juncus cephalotes</i> Thunb., <i>Prodr. Pl. Cap.</i> (1794: 66)	SOUTH AFRICA. in arenos. plan. Cap.	Nov [18]38	<i>sine coll.</i> [<i>C. Krauss</i>] s.n. (det. as <i>Juncus cephalotes</i> Thbg. var. <i>urius</i> Behn., Fr. Buchenau, 23 Oct 1874)	Herbarium Henschelianum	T: [South Africa, Cape] 'in arenosis planitie capensis', Nov 1828, <i>C. Krauss</i> ; syn: W; K [both mixed collections]. Rem.: Original material was from Krauss because the identical label is on a sheet from Herbarium R. v. Uechtritz where 'Dr. Krauss' was added; the material needs to be revised because W & K contain mixed collections; after Kirschner et al. (2002a: 73), the collection date is Nov 1828 (to be corrected).	
31	152	Isotype of <i>Juncus cephalotes</i> var. <i>ustulatus</i> Buchenau, <i>Monogr. Junc. Cap.</i> (1875: 451) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 451)]	<i>Juncus cephalotes</i> Thunb., <i>Prodr. Pl. Cap.</i> (1794: 66)	SOUTH AFRICA. Cape, Tafelberg	Oct 1827	<i>C.F. Ecklon</i> <i>Junc.</i> 13, 2.12 (as <i>Juncus capensis</i> var. <i>angustifolius</i> E. M., det. C.F. Ecklon)	Herbarium Schumann	T: South Africa, Cape, Tafelberg, Oct 1827, <i>C.F. Ecklon</i> 13; lector: BOL, <i>file</i> R.S. Adamson, <i>J. Linn. Soc., Bot.</i> 50 (1935: 32); isolecto: W*.	

No.	N.f.	Kind of type and type of (basonym)	Current name	Locality (label data)	Date	Herbarium label data (original spelling)	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.)
32	152	Synotype of <i>Juncus cephalotes</i> var. <i>usulidatus</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 451) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 451)] or/and var. <i>varius</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 451) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 451)].	<i>Juncus cephalotes</i> Thunb., <i>Prodr. Pl. Cap.</i> (1794: 66)	SOUTH AFRICA. Paludosa montis tabularis septentr.	Nov 1826	C.F. Ecklon 901	Herbarium Schumann	T: [South Africa, Cape] Camps Bay, C.F. Ecklon s.n. (BOL); syn: PRC*, S*. Rem.: Mixed material containing var. <i>usulidatus</i> Buchenau & var. <i>varius</i> Buchenau, mentioned in both protologues, to be analysed.
33	152	Synotype of <i>Juncus cephalotes</i> var. <i>varius</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 451) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 451)].	<i>Juncus cephalotes</i> Thunb., <i>Prodr. Pl. Cap.</i> (1794: 66)	SOUTH AFRICA. Worcester beim Waterfall	sine dato	C.F. Ecklon & C.L.P. Zeyher Junc. 8, l. 11 (as <i>Juncus capensis</i> var. <i>minimus</i> La Harpe, det. Ecklon & Zeyher)	Herbarium Schumann	T: [South Africa, Cape] Camps Bay, C.F. Ecklon s.n. (BOL). Rem.: Kirschner et al. (2002a: 73) did not mention this type, but it is listed by Buchenau (1875: 452) within the protologue of the new taxon; however Buchenau (1875: 452) indicates stamens in this material.
34	153	Synotype of <i>Juncus clausonis</i> Trab. in J.A. Battandier & L.C. Trabut, <i>Fl. Algérie</i> , ed. 2 (1895: 84).	<i>Juncus sriatiatus</i> Schousb. ex E. Mey., <i>Syn. Junc.</i> (1822: 27)	ALGERIA. Ain Taya (Alger)	Jul 1889	J.A. Battandier & L.C. Trabut 586	Battandier et Trabut, Pl. d'Algérie	T: [Algeria] Ain Taya près Alger, Jun 1888, L.C. Trabut, syn: G; Jul 1889, J.A. Battandier & L.C. Trabut 586; syn: G, L, MPU*.
35	157	Isotype of <i>Juncus delicatulus</i> Steud., <i>Syn. Pl. Glumac.</i> 2 (1855: 304)	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA. Africa australis [Cape, Grahamstown Valley]	sine dato	J.F. Drège 1604e	Herbarium Henschelianum	T: Africa australis [Cape, Grahamstown Valley], J.F. Drège 1604e, holot: P; iso: G, S, W.
36	152	Synotype of <i>Juncus dregeanus</i> var. <i>conglomeratus</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 463) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 463)].	<i>Juncus dregeanus</i> Kunth, <i>Enam. Pl.</i> 3 (1841: 344) subsp. dregeanus	SOUTH AFRICA. Cap. Bon. Spei (Hassagaibosch [Assegaibos])	sine dato	C.L.P. Zeyher (C.F. Ecklon & C.L.P. Zeyher) Junc. 10, 26.1 (det. as <i>Juncus cephalotes</i> L'Harpe var. <i>conglomerata</i> Nees, det. Zeyher)	Herbarium Schumann	T: Hassagaibosch [Assegaibos], C.F. Ecklon & C.L.P. Zeyher 10; syn: BOL, W; Albany, C.F. Ecklon; syn: n.u.
37	156	Probable synotype of <i>Juncus exsertus</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 435) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 435)]	<i>Juncus exsertus</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 435) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 435)]	SOUTH AFRICA. Worcester, Waterfall	sine dato	C.F. Ecklon & C.L.P. Zeyher 1, 11 (det. as <i>Juncus punctatorius</i> Thbg)		T: [Cape Provinces, Swartkops River] Zwartkops Rivier, C.L.P. Zeyher 103; syn: B [destroyed after having been selected as type by R.S. Adamson, <i>J. Linn. Soc. Bot.</i> 50 (1935: 15)]; BOL; Worcester, Waterfall, C.F. Ecklon & C.L.P. Zeyher [as <i>Juncus punctatorius</i> 1, 11] p.p.; syn: B [destroyed]; PRE: Zondagrivier bei Graaff-Reinet [Sundays River at Graaff-Reinet], H. Bolus 188; syn: BOL, K*; Camdebooosberg, 4–5000 Fuss, J.F. Drège [<i>Juncus oxycarpus</i> ?]; syn: W [only]. Rem.: C.F. Ecklon & C.L.P. Zeyher [as <i>Juncus punctatorius</i> 1, 11] pro parte as a syntype of the name (Kirschner et al. 2002a: 239).
38	153	Synotype of <i>Juncus glaucus</i> var. <i>acutissimus</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 417)	<i>Juncus inflexus</i> L., <i>Sp. Pl.</i> (1753: 326)	SOUTH AFRICA. Cape, Wodehouse, Klein Buffels Vallei near Gaatjie	sine dato	J.F. Drège 8796 c	Herbarium Henschelianum	T: Cape, Wodehouse, Klein Buffels Vallei near Gaatjie, J.F. Drège 8796c; syn: E*, LE*, LD, S, W.

No.	N.f.	Kind of type and type of (botonym)	Current name	Herbarium label data (original spelling)			T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.)
				Locality (label data)	Date	Leg. et det.	
39	152	Synotype of <i>Juncus inaequalis</i> var. <i>viridescens</i> Buchenau, <i>Monogr. Junc. Cap.</i> (1875: 455) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 455)]	<i>Juncus cephalotes</i> Thunb., <i>Prodr. Pl. Cap.</i> (1794: 66)	SOUTH AFRICA. Worcester beim Waterfall	sine dato	C.F. Ecklon <i>Junc. 14., 1.11</i>	T: South Africa, Capes, Swellendam, C.L.P. <i>Zeyher</i> 4319, syn: BOL, K*, W [p.p., ut <i>Juncus isolepoides</i> Nees, <i>nom. inadm.</i>]; Hortentotis-Holland, C.L.P. <i>Zeyher</i> 46; syn: BOL, W, S*; C.F. <i>Ecklon</i> 14; syn: n.u.
40	152	Probable original material of <i>Juncus ximindatus</i> Drejer, <i>Naturhist. Tidsskr.</i> 2 (1838: 181)	<i>Juncus balticus</i> Willd., <i>Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk.</i> 3 (1809: 298) subsp. balticus × <i>filiformis</i> L., <i>Sp. Pl.</i> (1753: 326)	DENMARK. Thy. Jyllandia	sine dato	<i>Drejer</i> s.n.	T: n.u. – BM*, C*, W*. Rem.: The protologue of <i>Juncus ximindatus</i> Drejer provided the following sites: Rors Klit in Thy district and at Bulbjerg (both found by Drejer) and Kollerup Klit in Vesterhauherred (found by Poulsen). However, they are cited only as geographic localities and not as specimens. Moreover, the date of collection in the protologue is July 1837. The specimen at WRSL was collected in Thy district, but no exact locality or collection date was provided; after Kirschner et al. (2002b: 141): type – n.u. [<i>non vidit</i>]. After Kirschner et al. (2002b: 141) place of publication is 'Bot. Tidsskr.', to be corrected to <i>Naturhistorisk Tidsskrift</i> (<i>Copenhagen</i>), i.e. <i>Naturhist. Tidsskr.</i> .
41	154	Isolectotype of <i>Juncus involucreatus</i> Steud. ex Buchenau, <i>Abh. Naturwiss. Vereine Bremen</i> 4 (1875: 121)	<i>Juncus microcephalus</i> Humb., <i>Boopl. & Kunth., Gen. Sp.</i> 1 (1816: 237 [Quarto]), 190 [Folio]	PERU. Tabina	Jul 1854	W. Lechler 2078	T: Peru, Tabina, 1854, <i>W. Lechler</i> 2078; lecto: GOET, <i>vide</i> H. Baskley, <i>Fl. Neotrop. Monogr.</i> 68 (1996: 106); isolecto: G*, K, KW*, LE*, MO, O, S. Rem.: The status of the type corrected (iso to isolecto) in accordance with the <i>Shenzhen Code</i> .
42	154	Isolectotype of <i>Juncus kotschyi</i> Boiss. in C.G.T. Kotschy, <i>Pl. Persiae Austar. tetracarate series</i> edited by R.F. Hohenacker, printed label description], no. 446 (1845) & Boissier, <i>Diagn. Pl. Orient.</i> , ser. 1, 7 (1846: 101)	<i>Juncus fontanesii</i> subsp. kotschyi (Boiss.) Snogerup in K.H. Rechinger, <i>Fl. Iranica</i> 75 (1971: 25)	IRAN. In paludosi ad rad. M. Sabst-Buschom, pr. U. Schiras	31 May 1842	C.G.T. <i>Kotschy</i> 446	T: [Iran] m. Sabst-Buschom pr [ope] u. [rhem] Schiras, 31 May 1842, C.G.T. <i>Kotschy</i> [Pl. Pers. Austar.] 446; lecto: G-BOISS, <i>vide</i> S. Snogerup, in K.H. Rechinger, <i>Fl. Iranica</i> 75 (1971: 25); isolecto: B*, BM, CAS*, CGE, CORD*, E*, FT*, G, GOET*, HAL*, K, KW*, MO*, P, PR, S*, UPS. Rem.: The status of the type corrected (iso to isolecto) in accordance with the <i>Shenzhen Code</i> .
43	154	Isolectotype of <i>Juncus kotschyi</i> Boiss. in C.G.T. Kotschy, <i>Pl. Persiae Austar. tetracarate series</i> edited by R.F. Hohenacker, printed label description], no. 446 (1845) & Boissier, <i>Diagn. Pl. Orient.</i> , ser. 1, 7 (1846: 101)	<i>Juncus fontanesii</i> subsp. kotschyi (Boiss.) Snogerup in K.H. Rechinger, <i>Fl. Iranica</i> 75 (1971: 25)	IRAN. In paludosi ad rad. M. Sabst-Buschom, pr. U. Schiras	31 May 1842	C.G.T. <i>Kotschy</i> 446 (det. Fr. Buchenau, 31 Jan 1875, as <i>J. kotschyi</i>)	T: [Iran] m. Sabst-Buschom pr [ope] u. [rhem] Schiras, 31 May 1842, C.G.T. <i>Kotschy</i> [Pl. Pers. Austar.] 446; lecto: G-BOISS, <i>vide</i> S. Snogerup, in K.H. Rechinger, <i>Fl. Iranica</i> 75 (1971: 25); isolecto: B*, BM, CAS*, CGE, CORD*, E*, FT*, G, GOET*, HAL*, K, KW*, MO*, P, PR, S*, UPS. Rem.: The status of the type corrected (iso to isolecto) in accordance with the <i>Shenzhen Code</i> .

No.	N.f.	Kind of type and type of (basionym)	Current name	Herbarium label data (original spelling)			T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.:)
				Locality (label data)	Date	Leg. et det.	
44	154	Isolectotype of <i>Juncus kraussii</i> Hochst. in C. Krauss <i>Flora</i> 28 (1845: 342)	<i>Juncus kraussii</i> Hochst. in C. Krauss <i>Flora</i> 28 (1845: 342)	SOUTH AFRICA, ad ripas Notsinakama R., distr. George	Jan 1839	C. Krauss s.n. (C. Kraussii Specimen authenticum, Fr. Buchenau, 11 Jan 1875)	T: South Africa, George Distr., Notsinakama R., Jan 1839, C. Krauss; lecto: G.-BOIS, <i>fade</i> S. Snogerup, <i>Willdenowia</i> 23 (1993: 57); isolecto: M. TUB*. Rem.: The status of the type corrected (iso to isolecto) in accordance with the <i>Shenzhen Code</i> .
45	154	Isolectotype of <i>Juncus kraussii</i> Hochst. in C. Krauss <i>Flora</i> 28 (1845: 342)	<i>Juncus kraussii</i> Hochst. in C. Krauss <i>Flora</i> 28 (1845: 342)	SOUTH AFRICA, ad ripas Notsinakama R., distr. George	Jan 1839	C. Krauss s.n.	T: South Africa, George Distr., Notsinakama R., Jan 1839, C. Krauss; lecto: G.-BOIS, <i>fade</i> S. Snogerup, <i>Willdenowia</i> 23 (1993: 57); isolecto: M. TUB*. Rem.: The status of the type corrected (iso to isolecto) in accordance with the <i>Shenzhen Code</i> .
46	154	Iso type of <i>Juncus lomatoxyllus</i> Spreng., <i>Neue Entdeck. Pflanzenk.</i> 2 (1821: 108)	<i>Juncus lomatoxyllus</i> Spreng., <i>Neue Entdeck. Pflanzenk.</i> 2 (1821: 108)	SOUTH AFRICA, Cap. B. Spe.	sine dato	C.H. Bergius s.n. (<i>J. lomatoxyllus</i> Spreng., Bergiusches Exemplar, bestimmt von K. Sprengel, 11 Jan 1875, det. Fr. Buchenau)	T: 'in promontorio bonae spei' [Cape Peninsula], Bergius; holo: B. destroyed. Rem.: After Kirschner et al. (2002a: 31): holotype – B. destroyed. Iso-type (the only duplicate known) rediscovered at WRSJ.
47	156	Syn type of <i>Juncus maritimus</i> Trab., <i>Bull. Soc. Bot. France</i> 34 (1887: 396)	<i>Juncus punctatorius</i> L. f., <i>Suppl. Pl.</i> (1781: 208)	ALGERIA, Ain el Hadjar [Oran]	20 Jul 1887	<i>J.A. Battandier & L.C. Trabut</i> 294	T: [Algeria, Oran] Ain el Hadjar, 1100 m, 20 Jul 1887; <i>J.A. Battandier & L.C. Trabut</i> [Pl. Alger.] 294; syn: G. L. MPU*, PR, WU; [Algeria] Batna, B. <i>Badanus</i> [Pl. Alger.] 739; syn: n.n.
48	156	Authentic/original material of <i>Juncus minae</i> Strobl ex Nyman, <i>Consp. Fl. Eur.</i> (1882: 749), <i>nom. inval.</i>	<i>Juncus pygmaeus</i> Rich. ex Thuill., <i>Fl. Env. Paris</i> , ed. 2 (1800: 178)	ITALY, Ad oram maris Tyrrheni prope Finale	11 Apr 1874	<i>P. Gabriel Strobl</i> s.n.	Authentic/original material: [Italy, Sicily] Flora Nebrodensis, prope Finale, G. Strobl (K, PR)
49	156	Authentic/original material of <i>Juncus minae</i> Strobl ex Nyman, <i>Consp. Fl. Eur.</i> (1882: 749), <i>nom. inval.</i>	<i>Juncus pygmaeus</i> Rich. ex Thuill., <i>Fl. Env. Paris</i> , ed. 2 (1800: 178)	ITALY, Ad oram maris Tyrrheni prope Finale	11 Apr 1874	<i>P. Gabriel Strobl</i> s.n. (det. Uechtritz, as <i>J. pygmaeus</i> Th.)	Authentic/original material: [Italy, Sicily] Flora Nebrodensis, prope Finale, G. Strobl (K, PR)
50	155	Isolectotype of <i>Juncus monticola</i> Steud., <i>Syn. Pl. Glumac.</i> 2 (1855: 301)	<i>Juncus wallichianus</i> J. Gay ex Laharpe, <i>Essai Monogr. Junc.</i> (1825: 51)	INDIA, In montibus Nilagiri	sine dato	<i>R.F. Hohenacker</i> 951	T: [India] in montibus Nilagiri, <i>R.F. Hohenacker</i> [Pl. Ind. Orient.] 951; lecto: P. <i>fade</i> K.L. Wilson & L.A.S. Johnson, <i>Telopea</i> 9 (2001: 364); isolecto: E. G*, JE*, K. L. MPU*, P, PR, S*, W. Rem.: The status of the type corrected (iso to isolecto) in accordance with the <i>Shenzhen Code</i> .
51	155	Isolectotype of <i>Juncus monticola</i> Steud., <i>Syn. Pl. Glumac.</i> 2 (1855: 301)	<i>Juncus wallichianus</i> J. Gay ex Laharpe, <i>Essai Monogr. Junc.</i> (1825: 51)	INDIA, In montibus Nilagiri	sine dato	<i>R.F. Hohenacker</i> 951	T: [India] in montibus Nilagiri, <i>R.F. Hohenacker</i> [Pl. Ind. Orient.] 951; lecto: P. <i>fade</i> K.L. Wilson & L.A.S. Johnson, <i>Telopea</i> 9 (2001: 364); isolecto: E. G*, JE*, K. L. MPU*, P, PR, S*, W. Rem.: The status of the type corrected (iso to isolecto) in accordance with the <i>Shenzhen Code</i> .

No.	N.f.	Kind of type and type of (botany)	Current name	Locality (label data)	Date	Leg. et det.	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.)
52	155	Isoecotype of <i>Juncus monticola</i> Steud., <i>Syn. Pl. Glumac.</i> 2 (1855: 301)	<i>Juncus multichianus</i> J. Gay ex Laharpe, <i>Essai Monogr. Junc.</i> (1825: 51)	INDIA. In montibus Nilagiri	sine dato	<i>R.F. Hohenacker 951</i>	Pl. Indiae or (M. Nilagiri) Ed. R.F. Hohenacker, 1851 / Herbarium R. v. Uechtritz	T: [India] in montibus Nilagiri, <i>R.F. Hohenacker [Pl. Ind. Orient.] 951</i> ; lecto: P. fide K.L. Wilson & L.A.S. Johnson, <i>Telopea</i> 9 (2001: 364); isolecto: E, G*, JE*, K, L, MPU*, P, PR, S*, W. Rem.: The status of the type corrected (iso to isolecto) in accordance with the <i>Shenzhen Code</i> .
53	151	Synotype of <i>Juncus multibracteatus</i> Tineo in G. Gussone, <i>Fl. Sicil. Prodr. Suppl.</i> (1832: 105)	<i>Juncus acutus</i> L., <i>Sp. Pl.</i> (1753: 325) subsp. acutus	ITALY. In humentibus Castronuovo	sine dato	<i>Todarò 556</i>	Todarò Flora Sicula exicata / Herbarium M. Winkler	T: [Italy] "In humentibus Castronuovo", <i>A. Todarò 556</i> ; <i>syn: BM, BR*, FI, K, W.</i>
54	153	Probable original material of <i>Juncus sobotritorum</i> Rothm., <i>Wis. Zeitschr. Unt. Greifswald</i> 14 (1965: 79)	<i>Juncus sobotritorum</i> Rothm. <i>Wis. Zeitschr. Unt. Greifswald</i> 14 (1965: 79) (= <i>J. balticus</i> Willd. subsp. <i>balticus</i> s. J. <i>effusus</i> L. subsp. <i>effusus</i>)	GERMANY. Prov. Mecklenburg, Dünenmoor zwischen Wüstrow und Dierhagen/ Fischland-Darß	15 Sep 1961	<i>U. Schneider s.n.</i>	Flora Germanica / Herbarium Ulrike Schneider	T: [Germany, Mecklenburg] inter Wüstrow et Dierhagen prope Ribnitz-Megalopolitanae, 16 Sep 1961, <i>W. Rothmaler & U. Schneider</i> ; <i>holo: n.u.</i> [not given in the protologue; probably JE or GFW] Rem.: After Kirschner et al. (2002b: 141) the type material was collected on 16 Sep 1961, and by <i>W. Rothmaler & U. Schneider</i> .
55	155	Probable original material of <i>Juncus obtusatus</i> Engelm., <i>Trans. Acad. Sci. St. Louis</i> 2 (1868: 495), <i>nom. illeg., non Schult.</i> (1814), <i>nom. illeg.</i>	<i>Juncus corillei</i> var. obtusatus [Engelmann] C.L. Hitchc. in C.L. Hitchcock & al., <i>Vasc. Pl. Pacif. Northw.</i> 1 (1969: 193)	USA. California	sine dato	<i>H.N. Bolander s.n., det. Fr. Buchenau</i>	Herbarium Henschelianum	T: California, Mariposa, Big Tree Grove, <i>H.N. Bolander [G. Engelmann, Herb. Junc. Bor-Amér. Norm.] 42</i> ; <i>syn: AAU, CAS*, DAO*, G*, K*, LE*, MO, NY*, PH*, PR, USCH*</i> ; <i>H.N. Bolander 6028</i> ; <i>syn: MO.</i> Rem.: A handwritten label by Fr. Buchenau.
56	155	Synotype of <i>Juncus oxycarpus</i> E. Mey. ex Kunth, <i>Enum. Pl.</i> 3 (1841: 336)	<i>Juncus oxycarpus</i> E. Mey. ex Kunth, <i>Enum. Pl.</i> 3 (1841: 336)	SOUTH AFRICA. Cap. b. spi. ((Cape Provinces) Liesbeek R)	sine dato	<i>C.H. Bergius s.n.</i> (det. Fr. Buchenau 11 Jan 1875 & remark by Buchenau: Bergiusches Exemplar mit der (fälschen) Bestimmung v. K. Sprengel; det. by K. <i>puncariatus</i>	Herbarium Henschelianum	T: [Cape Provinces] Liesbeek R., <i>C.H. Bergius</i> <i>syn: B</i> [destroyed]; Paarl, Berg Rivier, <i>J.F. Drège</i> <i>as syn: K, P</i> Rem.: A synotype at WRSL is shown according to an original publication of Kunth (1841: 337). This is a new synotype (and its only known duplicate) discovered at WRSL.
57	156	Synotype of <i>Juncus parvulus</i> E. Mey. ex Buchenau, <i>Monogr. Junc. Cap</i> (1875: 447) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1873: 447)]	<i>Juncus cephalotes</i> Thunb., <i>Prodr. Pl. Cap.</i> (1794: 66)	SOUTH AFRICA. Cape, Namaqualand, Modderfontein	05 Nov 1830	<i>J.F. Drège 2472b</i>	Herbarium Henschelianum	T: South Africa, Cape, Namaqualand, Modderfontein, 5 Nov 1830, <i>J.F. Drège 2472b</i> ; <i>syn: BM*, BOL, E*, G*, K, L, LD*, LE*, NY*, PR, S, TUB*</i> .

No.	N.f.	Kind of type and type of (basonym)	Current name	Locality (label data)	Date	Herbarium label data (original spelling)	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.)
58	156	Synotype of <i>Juncus persicus</i> Boiss., <i>Diagn. Pl. Orient.</i> , ser. 1, 7 (1846: 101)	<i>Juncus persicus</i> Boiss., <i>Diagn. Pl. Orient.</i> , ser. 1, 7 (1846: 101)	IRAN. In planitie edita Kakam m. Kuh-Daëna	17 Jul 1842	C.G.T. <i>Körschly</i> 683	Th. Korschly, Pl. Pers. aust. Ed. R.F. Hohenacker 1845 / Herbarium Schumann	T: [Iran] Kakum M Kuh-e Dinar. C.G.T. <i>Körschly</i> 683; syn: BM, CGE, E, F†, G, KW*, LE*, MO*, PR, WAG*.
59	156	Synotype of <i>Juncus persicus</i> Boiss., <i>Diagn. Pl. Orient.</i> , ser. 1, 7 (1846: 101)	<i>Juncus persicus</i> Boiss., <i>Diagn. Pl. Orient.</i> , ser. 1, 7 (1846: 101)	IRAN. In planitie edita Kakam m. Kuh-Daëna	sine dato	C.G.T. <i>Körschly</i> 683 (det. Fr. Buchenau, 04 Feb 1875)	Pers. Austr. Inl. M. / Herbarium Henschelianum	T: [Iran] Kakum M Kuh-e Dinar. C.G.T. <i>Körschly</i> 683; syn: BM, CGE, E, F†, G, KW*, LE*, MO*, PR, WAG*.
60	156	Synotype of <i>Juncus pictus</i> Steud., <i>Syn. Pl. Glomac.</i> 2 (1855: 305)	<i>Juncus pictus</i> Steud., <i>Syn. Pl. Glomac.</i> 2 (1855: 305)	SOUTH AFRICA. Cape, Namaqualand, Kamiesberg, Leliefontein	sine dato	J.F. <i>Drège</i> 2472a	Herbarium Henschelianum	T: South Africa, Cape, Namaqualand, Kamiesberg, Leliefontein, J.F. <i>Drège</i> 2472a; syn: BM*, BOL, E*, G, K, KW*, L, LD*, NY*, P, PR, S.
61	156	Synotype of <i>Juncus sikkinensis</i> var. <i>pseudocastaneus</i> Lingehsh., in W.Limpricht, <i>Repert. Spec. Nov. Regni Veg. Beih.</i> 12: 316 (1922)	<i>Juncus sikkinensis</i> Hook. f., <i>Fl. Brit. India</i> 6 (1892: 399)	CHINA/INDIA [?]. Tatsienlu [Kangding]-Dawo [Dawu], Gata (Tailing) auf der Passalm Dshaschi la ka [Tschaschilaka] (Hai tse schan) am Dshart (lara ri), 4360 m	02 Jul 1914	W. <i>Limpricht</i> 1869, det. Lingehsh., as <i>Juncus sikkinensis</i> var. <i>pseudocastaneus</i> Lingehsh. (on the additional label)	Flora von Ostr-Tibet	T: Ngata (Tailing), Tschaschilaka, zwischen Tatsienlu [Kangding] und Dawo [Dawu], Hai tse schan am Dsharta, 2 Jul 1914, W. <i>Limpricht</i> 1869; syn: WRSLS, n.v., WU. Rem.: The specimen at WRSLS is mentioned by Kirschner et al. (2002a: 126) but marked as n.v. [non vidit].
62	152	Isolectotype of <i>Juncus nanarius</i> Songeon & E.P. Perrier in P.C. Billot, <i>Ann. Fl. France Allernagne</i> (1859: 192)	<i>Juncus nanarius</i> Songeon & E.P. Perrier in P.C. Billot, <i>Ann. Fl. France Allernagne</i> (1859: 192)	FRANCE. Moutiers (Savoie)	31 Jun & 24 Aug 1858	Perrier 1787 (det. J. Seasiak, 29 Jan 1975), as <i>Juncus ambigua</i> Guss. = <i>J. nanarius</i> Song et Perrier.	Reliquiae Maillennae / Herbarium M. Winkler	T: France, Savoie, Moutiers, 31 Jun & 21 Aug 1858, A. Perrier; lecto: P. <i>fide</i> T.A. Cope & C.A. Stace, <i>Watsonia</i> 12 (1978: 123); isolecto: BM*, G, K, LD, W. Rem.: The status of this isolectotype should be validated while taking into account the following: 1) the analysis of the lectotype at P and 2) whether the lectotypification by Cope & Stace (1978: 123) is valid (the researchers did not specify which specimen at P they selected as a type and the original material of the name is usually very extensive).
63	156	Synotype of <i>Juncus rupestris</i> f. <i>robusta</i> Buchenau, <i>Monog. Junc. Cap</i> (1875: 442) [Abh. Naturwiss. Ver. Bremen 4 (1875: 442)]	<i>Juncus rupestris</i> Kunth, <i>Enam. Pl.</i> 3 (1841: 344)	SOUTH AFRICA. Cape, Kamiesberge, Eselsfontein	sine dato	J.F. <i>Drège</i> 2471a	Herbarium Henschelianum	T: South Africa, Cape, Kamiesberge, Eselsfontein, J.F. <i>Drège</i> 2471a; syn: BOL, E*, G, K, LD, PR, S.
64	156	Isolectotype of <i>Juncus schimperi</i> Hochst. ex A. Rich., <i>Tent. Fl. Abyssin.</i> 2 (1851: 338)	<i>Juncus punctatorius</i> L. f., <i>Suppl. Pl.</i> (1781: 208)	ETHIOPIA. In ripis uliginosis Adoom	01 Dec 1837	W. <i>Schimper</i> 56 (det. Fr. Buchenau, 11 Jan 1875 as <i>Juncus punctatorius</i> Thbg.)	Schimperi iter Abyssinicum, Sectio prima: planae Adoenses / Herbarium Henschelianum	T: [Ethiopia]. In ripis uliginosis prope Adoom [Adua], 1 Dec 1837, W. <i>Schimper</i> [C.F. Hochstetter, <i>Herb. Un. It. Abyss.</i>] 56; lecto: P [as 'holo'], <i>fide</i> K.A. Lye, in S. Edwards, Schsbe D. & I. Hedberg, <i>Fl. Ethiop. & Eritr.</i> 6 (1997: 389); isolecto: BR*, G*, HAL*, MP, MPU*, K, KW*, LC*, S*, TUB*, WAG*, WU. Rem.: The status of the type corrected (iso to isolecto) in accordance with the <i>Shenzhen Code</i> .

No.	N.f.	Kind of type and type of (basionym)	Current name	Locality (label data)	Date	Herbarium label data (original spelling)	Leg. et det.	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.)
65	154	Synotype of <i>Juncus schlegelii</i> Buchenau, <i>Nachr. Königl. Ges. Wiss. Göttingen Geschäfft. Mitt.</i> 13 (1869: 255)	<i>Juncus himalensis</i> Klorzsch in J.F. Klorzsch & C.A.F. Garcke, <i>Bot. Ergebn. Reise Waldemar</i> (1862: 60, tab. 97)	INDIA, Western Himalaya, prov. Gährwal, Nêlong via Mûkha across the Damdâr or Hat-ka Tsâtra Pass tu Ussilla in the Tons Valley	26 Sep to 06 Oct 1855	<i>A. & H. Schlegelii</i> 9708, det. Fr. Buchenau	Herbarium Schlagintweit from India and High Asia	T: [Kashmir] Tibet, Dras, 'Matai up to the [Soje Pass', 14 Oct 1868, <i>A. & H. Schlegelii</i> 6668; syn. W. US*; India, Garhwal, 'Nêlong via Mûkha across the Damdâr', 6 Oct 1855; <i>A. & H. Schlegelii</i> 9708; syn. <i>n.v.</i>	
66	156	Synotype of <i>Juncus schlechteri</i> Buchenau, <i>Bot. Jahrb.-Syst.</i> 24 (1898: 459)	<i>Juncus cephalotes</i> Thunb., <i>Prodr. Pl. Cap.</i> (1794: 66) <i>Juncus singularis</i> Steud., <i>Syn. Pl. Glumac.</i> 2 (1855: 302)	SOUTH AFRICA. Terra Capensis. Regio occidentalis, Bains Kloof	Nov 1896	<i>FR. Schlechter 9154</i>	Planetae Schlechterianae Austro-Africanae	T: South Africa, Cape, Bains Kloof, <i>FR. Schlechter 9154</i> ; syn. BM*, BOL, BR*, E*, G*, L, LD, LE*, PR, PRE, S, WAG*.	
67	157	Isotype of <i>Juncus singularis</i> Steud., <i>Syn. Pl. Glumac.</i> 2 (1855: 302)	<i>Juncus singularis</i> Steud., <i>Syn. Pl. Glumac.</i> 2 (1855: 302)	SOUTH AFRICA. Cape, between Vansadensberg and Betheldorp	1830	<i>J.F. Drège 1604b</i>	Herbarium Henschelianum	T: Cape, between Vansadensberg and Betheldorp 1830, <i>J.F. Drège 1604b p.p.</i> [some gatherings with <i>Juncus drageanus</i>]; holob: P; iso: B [destroyed, but picture deposited at W], G, S, W. Rem.: Mentioned by Kirschner et al. (2002a: 57) as a doubtful taxon.	
68	156	Synotype of <i>Juncus sonderianus</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 476) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 476)]	<i>Juncus sonderianus</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 476) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 476)]	SOUTH AFRICA. [Cape] Port Elizabeth	sine dato	<i>J.F. Drège e</i> (det. F. Buchenau as <i>Juncus sonderianus</i> Buchenau, 11 Jan 1875; det. J.F. Drège as <i>Junc. cap. ß. augustifol.</i> E.M.)	Herbarium Henschelianum	T: [Cape] Port Elizabeth, <i>J.F. Drège e</i> ; syn. E*, G, HBG*, K, LD, LE*, P, S*, W [J.F. Drège <i>e</i> was generally proposed as a type by Adamson, <i>J. Linn. Soc., Bot.</i> 50 (1955: 26)]; [Cape] bei Cap Recife und Port Elizabeth, <i>C.F. Ecklon & C.L.P. Zeyher 9</i> ; syn: BOL, LD*, W; S; <i>C.F. Ecklon & C.L.P. Zeyher 780</i> ; syn: <i>n.v.</i> - W*.	
69	156	Isolectotype of <i>Juncus sparganiiifolius</i> Boiss. & Kotschy ex Buchenau, <i>Krit. Verz. Juncac.</i> (1879: 88)	<i>Juncus sparganiiifolius</i> Boiss. & Kotschy ex Buchenau, <i>Krit. Verz. Juncac.</i> (1879: 88)	TURKEY. In alvei glareosis dispersa et rara supra Ursusa pagum (Hatay, Aisuz)	02 Jul 1862	<i>C.G.T. Kotschy 102</i>	Th. Kotschy, Pl. Syriae bor. ex Amano occidentali supra Arsus 1862	T: Planetae Syriae borealis ex Amano occidentali supra Arsus, supra Ursusa pagum [Turkey, Hatay, Aisuz], 2 Jun 1862, <i>C.G.T. Kotschy 102</i> ; lecto: Z, <i>file</i> S. Snogerup, in P.H. Davis, <i>Fl. Turkey</i> 9 (1986: 19); isolecto: BM, G*, JE*, K, L, LE*, P; W [One of four isotype specimens from W bears a note in Buchenau's hand: 'An excellent new species' [translated], and should be given preference]. Rem.: The status of the type corrected (iso to isolecto) in accordance with the <i>Shenzhen Code</i> .	
70	156	Isolectotype of <i>Juncus spregelii</i> Nees ex Buchenau var. <i>gracilior</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 449) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 449)]	<i>Juncus stenopetalus</i> Adamson, <i>J. S. African Bot.</i> 8 (1942: 273)	SOUTH AFRICA. Worcester; Waterfall	sine dato	<i>C.F. Ecklon & C.L.P. Zeyher 11, 1.12</i> (det. Fr. Buchenau, as <i>J. spregelii</i> N. ab. Es., 11 Jan 1875)	Herbarium Henschelianum	T: South Africa, Cape, Tulbagh Waterfall, <i>C.F. Ecklon & C.L.P. Zeyher 11</i> ; lecto: BOL, <i>file</i> A.A. Obermeyer, in A.A. Obermeyer, J. Lewis & R.B. Faden, <i>Fl. S. Afr.</i> 4/2 (1985: 88); isolecto: LD, S, W.	
71	156	Isolectotype of <i>Juncus spregelii</i> Nees ex Buchenau var. <i>gracilior</i> Buchenau, <i>Monogr. Junc. Cap</i> (1875: 449) [<i>Abh. Naturwiss. Ver. Bremen</i> 4 (1875: 449)]	<i>Juncus stenopetalus</i> Adamson, <i>J. S. African Bot.</i> 8 (1942: 273)	SOUTH AFRICA. Worcester; Waterfall	sine dato	<i>C.F. Ecklon & C.L.P. Zeyher 11, 1.12</i>	Herbarium Henschelianum	T: South Africa, Cape, Tulbagh Waterfall, <i>C.F. Ecklon & C.L.P. Zeyher 11</i> ; lecto: BOL, <i>file</i> A.A. Obermeyer, in A.A. Obermeyer, J. Lewis & R.B. Faden, <i>Fl. S. Afr.</i> 4/2 (1985: 88); isolecto: LD, S, W.	

No.	N.f.	Kind of type and type of (botonym)	Current name	Locality (label data)	Date	Leg. et det.	Flora of / Herbarium	T: Type citation from protologue, including herbaria acronyms (according to Kirschner et al. (2002a, b)) and additional remarks (Rem.)
72	152	Isolectotype of <i>Juncus sulcatus</i> Hochst. in C. Krauss, <i>Flora</i> 28 (1845: 342)	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA. Ad rivulus in Zitzikamma, Uitenhage	Mar 1839	<i>C. Krauss s.n.</i> (det. Fr. Buchenau, as subsp. <i>angustifolius</i> var. <i>flaccidus</i> Behm., f. <i>depaup.</i> , 11 Jan 1875)	Herbarium Henschelianum	T: Cape, Uitenhage, Zitzikamma, Mar 1839, <i>C. Krauss s.n.</i> ; lecto: W, <i>fide</i> Kirschner et al. (2002a: 36); isolecto: FT*.
73	152	Isolectotype of <i>Juncus sulcatus</i> Hochst. in C. Krauss, <i>Flora</i> 28 (1845: 342)	<i>Juncus capensis</i> Thunb., <i>Prodr. Pl. Cap.</i> 1 (1794: 66)	SOUTH AFRICA. Ad rivulus in Zitzikamma, Uitenhage	Mar 1839	<i>C. Krauss s.n.</i>	Herbarium Schumann	T: Cape, Uitenhage, Zitzikamma, Mar 1839, <i>C. Krauss s.n.</i> ; lecto: W, designated by Kirschner et al. (2002a: 36); isolecto: FT*.
74	157	Synotype of <i>Juncus sylvaticus</i> var. <i>multiflorus</i> Roehel, <i>Pl. Banat. Rar.</i> (1828: 31, tab. 1) & <i>Juncus roebelianus</i> Schult. & Schult. f., <i>Syst. Veg.</i> 7(2) (1830: 1658)	<i>Juncus thomasi</i> Ten., <i>App. Ind. Sem.</i> (1827: sine pag.)	SERBIA. Banatu [Banatus]	1815	<i>A. Roehel s.n.</i>	Herbarium R. v. Uechtritz	T: [Romania] Valle Kornia-Reva & ad pedes Krak-Sanozy Banatus, <i>A. Roehel</i> ; syn. <i>n.n.</i> – BM*, W*, Banatus, 1815, <i>A. Roehel</i> ; syn: W.
75	151	Isolectotype of <i>Juncus tommasinii</i> Parl., <i>Fl. Ital.</i> 2 (1852: 315)	<i>Juncus litoralis</i> C.A. Mey., <i>Verz. Pfl. Casp. Meer.</i> (1831: 34)	ITALY. [...] bog, Montfalcone Grado	sine dato	<i>M. Tommasin s.n.</i>	Ex herbario Florae Illyrico-litoralis / Herbarium R. v. Uechtritz 27	T: [Italy] 'Nei paludi presso Montfalcone, Grado', <i>M.G.S. Tommasini</i> , lecto: FI, <i>fide</i> S. Snogerup, <i>Willdenowia</i> 23 (1993: 40).
76	157	Iso-type of <i>Juncus trifloris</i> var. <i>brachystylis</i> Engelm., <i>Trans. Acad. Sci. St. Louis</i> 2 (1868: 492)	<i>Juncus kelloggii</i> Engelm., <i>Trans. Acad. Sci. St. Louis</i> 2 (1868: 494)	USA. California], Mendocino Co., Ukiah	May 1866	<i>H.N. Bolander</i> ♂ <i>Kellogg 4646</i> , det. Fr. Buchenau	Herbarium Henschelianum	T: USA, California, Mendocino Co., Ukiah, May 1866, <i>H.N. Bolander 4646</i> / <i>G. Engelmann, Herb. Junc. Bor.-Amer. Norm.</i> ; holotype: MO; iso: BM*, CAS, F*, G*, GH*, K*, MIN*, NY, PH*, PR, RM*, RSA*, US, USCH*, YU*.
77	157	Isolectotype of <i>Juncus trifloris</i> var. <i>spilophorus</i> Engelm., <i>Trans. Acad. Sci. St. Louis</i> 2 (1868: 492)	<i>Juncus trifloris</i> Engelm., <i>Trans. Acad. Sci. St. Louis</i> 2 (1868: 492)	USA. California], Yosemite Valley, De Long's ranch	10 Jun 1866	<i>H.N. Bolander</i> ♂ <i>Kellogg 4864</i> , det. Fr. Buchenau	Herbarium Henschelianum	T: California, Yosemite Valley, De Long's Ranch, 4000 ft. [ca. 1280 m], 10 Jun 1866, <i>H.N. Bolander 4864</i> / <i>G. Engelmann, Herb. Junc. Bor.-Amer. Norm.</i> 30; lecto: MO, <i>fide</i> E.J. Hermann, <i>Leaflet. W. Bot.</i> 5 (1948: 114); isolecto: CAS, DAO*, G*, ISC*, K*, LE*, MICH, NEB*, NY, PH*, RM*, RSA*, US, USCH*, YU*.
78	156	Iso-type of <i>Juncus valdiviae</i> Steud., <i>Syn. Pl. Glumac.</i> 2 (1855: 296)	<i>Juncus procerus</i> E. Mey., <i>Linnaea</i> 3 (1828: 367)	CHILE. ad ripam fluvii Valdivia	Jan 1852	<i>R.A. Philippi 43</i> (det. Fr. Buchenau, as <i>Juncus procerus</i> E. M., 3 Dec 1878)	R.A. Philippi, Pl. chilenses, W.R.F. Hohenacker / Herbarium Henschelianum	T: Chile, Valdivia, <i>R.A. Philippi 43</i> ; holotype: P, iso: FT*, G, GOET, K, KW*, MO, O, P, S.

2) SYNTYPE of *Juncus oxycarpus* E. Mey. ex Kunth (1841: 336) [sine dato, *C.H. Bergius s.n.* (det. Fr. Buchenau 11 Jan 1875 & remark by Buchenau: Bergiussches Exemplar mit der (falschen) Bestimmung v. K. Sprengel); det. by K. Sprengel as *Juncus punctorius*]. – A syntype at WRS� shown, according to the original publication of Kunth (1841: 337). This is a new syntype (and its only duplicate known) discovered at WRS�.

3) ISOLECTOTYPE of *Juncus capensis* var. *gracilior* Buchenau (1875: 483) [05 Mar 1816, *Bergius s.n.*, det. K. Sprengel (gesamm. von Bergius, det. Fr. Buchenau 11 Jan 1875), current name: *Juncus capensis* Thunb. (1794: 66)]. – Additional specimens were mentioned in the protologue of the new taxon (Buchenau, 1875: 484). Thus, the lectotype was designated (in B, destroyed). Isolectotype (the only duplicate known) was rediscovered at WRS� (the specimen includes collection date (i.e. 5 Mar 1816), which corresponds to the date included in the protologue). The syntype (Bergius specimen at W) does not include a collection date.

The origin of *Juncus* type specimens at WRS� according to country is presented in Fig. 2.

Most of the types and other historically- and nomenclaturally-important specimens come from the following collections: Herb. Henschelianum (30 sheets, i.e. 16.2% of the *Juncus* set at WRS� – see below “A Herbarium/Collection name”), Herb. Schumann (13 sheets, 16.9%), Herb. R. v. Uechtritz (7 sheets, 1.7%), Herb. J. Pročkóv (6 sheets), Herb. M. Winkler (3 sheets) and others (19 sheets). Additionally, eight paratypes of *J. bulbosus* f. *submucronatus* Pročkóv (2010: 412) are stored in the Herbarium Silesiacum at WRS� (Pročkóv 2010) and, thus, are not included in the statistics in this study that covers Herbarium Generale only (as a separate set of two ones at WRS�).

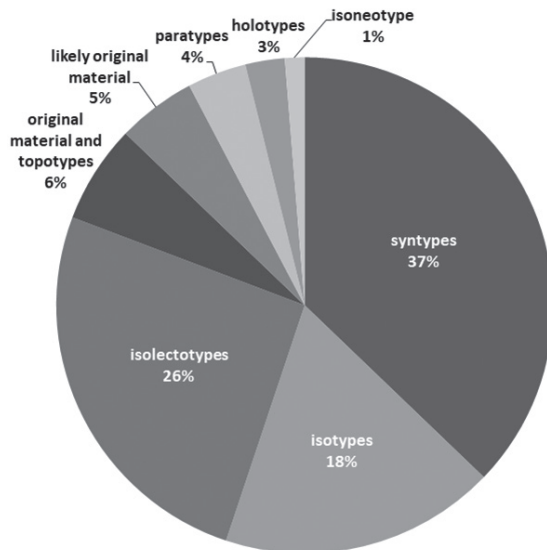


Figure 1. Percentage of different categories of *Juncus* specimens. Types, original material and specimens collected from the original type localities, by the author of the name (“topotypes”) at WRS�.

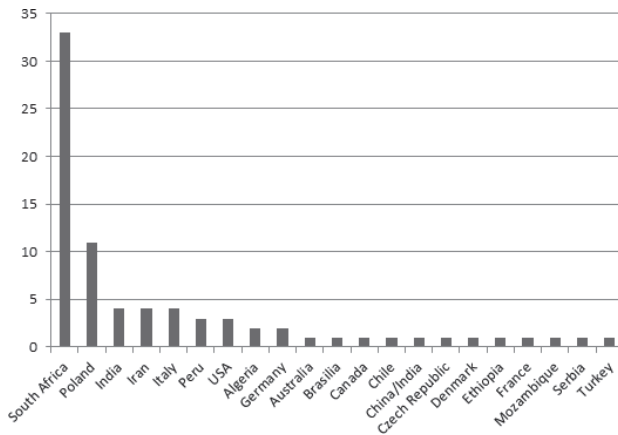


Figure 2. Origin of *Juncus* historically- and nomenclaturally-important specimens at WRS� according to country. Y-axis: number of herbarium sheets. Specimens most frequently originated from South Africa (42.3%). *Juncus* type specimens were collected by many distinguished botanists. Amongst these, the four individuals gathered 37.2% of *Juncus* specimens: C.F. Ecklon & C.L.P. Zeyher, C. Krauss and J.F. Drège.

Species

Approximately 70 *Juncus* species are represented in the collection, most of them from Europe. Species from the rest of the world are less numerous, but still relatively frequent: *J. capensis* Thunb., *J. subulatus* Forssk. (incl. *J. multiflorus* Desf.), *J. nodosus* L., *J. cephalotes* Thunb., *J. dichotomus* Elliott, *J. prismatocarpus* R. Br., *J. acuminatus* Michx., *J. xiphioides* E. Mey., *J. concinnus* D. Don, *J. wallichianus* J. Gay ex Laharpe (incl. *J. monticola* Steud.), *J. pelocarpus* E. Mey., *J. marginatus* Rostk., *J. microcephalus* Humb., Bonpl. & Kunth. and *J. punctorioides* L.f., *J. littoralis* C.A. Mey. (as *J. tommasinii* Parl.).

Date of collection

We found 2,193 herbarium labels with dates of collection recorded: 1,967 of these were collected before 1946, comprising ca. 89.7% of the *Juncus* set. The remaining 226 specimens were collected after 1945; 10.3% of the *Juncus* specimens.

Collector and herbarium collection name

In the *Juncus* set at WRS�, the sets of some individuals stand out in numbers of specimens (Fig. 3). The most outstanding collections of *Juncus* from particular included herbaria are (number of herbarium sheets are in parentheses): Herb. R. v. Uechtritz (415), Herb. M. Winkler (394), Herb. Henschelianum (185), Botanischer Tauschverein in Wien (80), Herb. Schumann (77), Herb. Wagnerianum (41), Herb. Dr. C. Baenitz (34), Herb. Emil Fiek (32), Herb. J.A. Allen (24), Reliquiae Mailleanae (24), Herb. F.

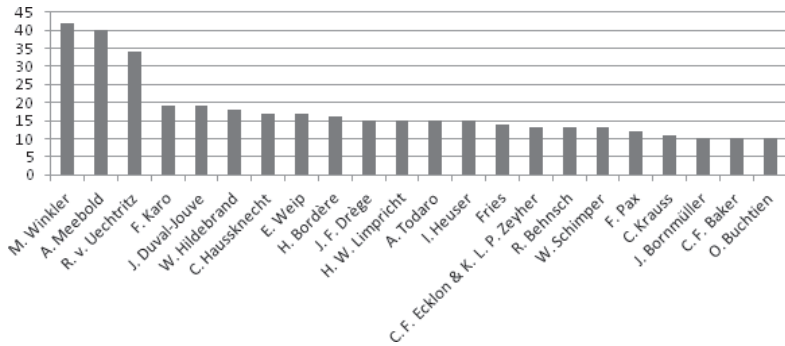


Figure 3. Collectors' names. Y-axis: number of herbarium labels analysed.

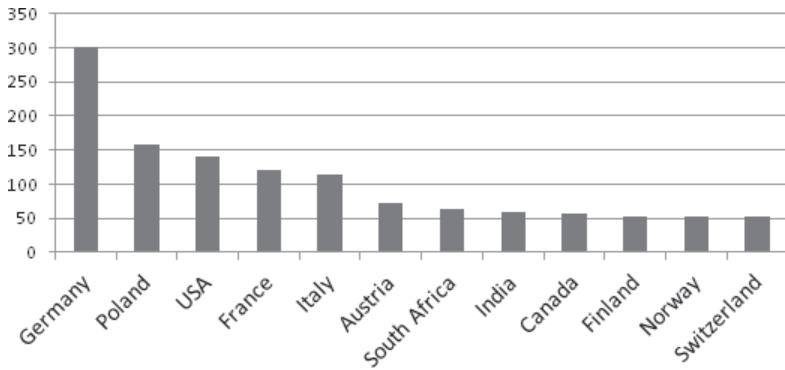


Figure 4. Country representation of *Juncus* specimens in WRSL. Y-axis: number of herbarium labels analysed. The African collection deserves particular attention (98 sheets (4.5%)), including sets from South Africa (64 sheets). The Asian collection (96 sheets) is dominated by plants from India (59). The percentage of plants from North America is as high as 10%.

Pax (21), Herbarium P. Louis-Marie (20), Herbarium A. Engler (18), Reliquiae Hildebrandianae (18), Herbarium Felsmann (15), Herbarium J. Duval-Jouve (14), Herbarium Schlagintweit from India and High Asia (12), Herbarium Hort. Bot. Calcuttensis (11) and Herbarium Henri van Heurck (10). Almost half of the *Juncus* sp. sheets come from four individual collections. All were bought for, donated to or exchanged by the Museum. The number of duplicates in the collection is not large (4.6%, i.e. 103 out of 2,222 all taxonomic records).

Country of collection

Herbarium sheets from eastern Poland and Germany (defined according to their post-war borders) dominate and are shown in Fig. 4. For 336 *Juncus* sheets (15.3%), we were unable to establish the country of origin, because no or illegible information on the locality was present on herbarium labels.

Exsiccata series

In the WRS� *Juncus* set, the following exsiccatae are particularly well-represented (the number of herbarium sheets is shown in parentheses): Rchb. Fl. germ. excurs. (incl. Rchb. Fl. Germ. n.) (37), Cyperaceae, Juncaceae, Typhaceae et Sparganiaceae Hungaricae exsiccatae (24), Reise durch das südliche Spanien 1873 (mainly of M. Winkler) (22), Flora of Sikkim (15), Pl. Indiae or [ientalis] (M. Nilagiri), ed. R.F. Hohenacker (13), Todaro Flora Sicula exiccata (11), Flora des NW. Himalaya (10).

Discussion

The Herbarium Generale of the mid-sized WRS� herbarium is rich in specimens relevant to the nomenclature of *Juncus* and contains 78 specimens (3.6% of all *Juncus* specimens examined, see Table 1), with an average of 11 sheets per fascicle (i.e. herbarium box). Seventy-six (of 78) of these historically-important specimens (types, original material and specimens collected at the type locality by the author of the name) were not identified as such before our study. This significant number of types highlights the significance of the analysed set and of WRS� more broadly, for the study of taxonomy and nomenclature (Sutory 1997). To put this into context, the approximate percentages of types stored in other historically-important herbaria are as follows: K (5%), W (3.6%), BM (2.6%) [cited from herbaria websites, which include the total number specimens stored]. Our study revealed that the *Juncus* set at WRS� is a valuable collection globally with respect to the number of historically- and nomenclaturally-relevant specimens. Often, specimens included are associated with research conducted involving a given group of plants in the academic centre housing collections. The majority of *Juncus* specimens (ca. 89.7%) date from before the Second World War and specialists studying the genus *Juncus* did not work at WRS� during that time. This suggests that the rest of the WRS� collection might also contain similarly high percentages of such historically- and nomenclaturally-relevant specimens.

As the genus *Juncus* is rich in species (311 species, Kirschner et al. (2002a, b)), we consider that extrapolation of our results to other genera is appropriate. We assume that descriptions of taxa new to science before 1946 were equally common within most taxonomic groups and specimens belonging to different plant genera/families were sent to the WRS� herbarium equally often.

Only a small fraction of global herbarium specimens had been computerised by the end of last decade (Lughadha and Miller 2009). Despite the recent acceleration of the digitisation of herbarium collections (as of early 2015, the number of scanned specimens within the world's largest virtual herbaria was 18.4 million), we are far from fully digitising all collections (Seregin 2016). Even a small percentage (1–2%) of computerised specimens can drastically reduce research costs and help scientists focus on collections that are likely to contain the most information-rich specimens (O'Connell

et al. 2004). In herbarium management, it is cheaper to produce and distribute scans than facilitate botanist visits (Seregin 2016). Digitisation is also important because young people who do not live near a natural history museum or herbarium can access natural history data and learn to use it and this early involvement in science may cultivate a love for the study of biology (Watanabe 2019). The continued digitisation of the WRSL herbarium (currently only 4.9% digitally available) will certainly reveal new material for botanists' use.

Our results reveal the usefulness of lesser-known herbaria not only from a national or local point of view (Lavoie 2013), but also as a source of important collections and type specimens that are not duplicated in larger facilities (Snow 2005). For *Juncus*, only two of 78 nomenclaturally-relevant specimens identified here were cited by Kirschner et al. (2002a, 2002b), so 76 of the specimens in Table 1 were unknown before this study. Holotypes, isotypes and isolectotypes constitute 46.2% of all types (and other nomenclaturally important specimens) of *Juncus* recognised at the WRSL, highlighting the nomenclature relevance of the collection. Three specimens are particularly worth highlighting here: the holotypes of *Juncus lomatoxyllus* Spreng. and *Juncus capensis* var. *gracilior* Buchenau and a syntype of *J. oxycarpus* E. Mey. ex Kunth were originally stored in Berlin (the herbarium of the Botanischer Garten und Botanisches Museum Berlin-Dahlem, Freie Universität Berlin). These were destroyed during the Second World War (Hiepko 1987; Kirschner et al. 2002a) and our discovery of duplicates in WRSL will help with the correct application of these names.

Duplicates of nomenclaturally relevant specimens are often considered to be less important than holotypes, lectotypes and neotypes. Duplicates, however, may differ in physical condition, material quantity, different annotations, labelling, specimen content (plant parts, for example, young fruit vs. only a flowering twig, male vs. female flowers in diclinous plants, with roots vs. without roots) or may even represent mixed gatherings (different taxa). An isotype of *Juncus singularis* Steud. (*J.F. Drège 1604b*) at WRSL, for example, is a much larger, leafy specimen with five inflorescences, as compared with other specimens at G, P, S and W, listed and pictured at plants.jstor.org (accessed on 16 Apr 2020). Annotations by specialists can be very useful in understanding taxonomic concepts: 23 WRSL *Juncus* type specimens were annotated by Franz G.Ph. Buchenau (1831–1906), a *Juncus* specialist whose work remains unsurpassed to this day (annotations included new determinations and/or 'specimen authenticum' indications and were made by him throughout 1874–1875, 1878–1879 and 1887; see the 'Leg. et det.' column in Table 1). Thus, some 'ordinary duplicates' at WRSL are helpful for understanding taxonomists' thinking.

We also found that many of the historically- and nomenclaturally-important *Juncus* specimens stored at WRSL originate from South Africa (42.3%). This over-representation might be explained by the origin of the collection. German botanists (together with the British and the Dutch) were a dominant force in the floristic exploration of Africa from the 17th to the early 20th century. The WRSL herbarium is, thus, an important resource for international researchers working on the flora of that hugely biodiverse, but still under-explored, part of the world.

Conclusions

The history of German-Polish herbaria, including WRSL, is very turbulent. A detailed examination of *Juncus*, as a case study, confirms the value of the WRSL collection in historical terms. That a significant number of historically- and nomenclaturally-important specimens at WRSL was acquired passively (*Juncus* was of no special interest to German or Polish scientists at the time) suggests that more such specimens may be found within the collection for other genera. Digitisation and taxonomic revision of material will facilitate the confirmation of the richness of the collection.

Other large type collections contain well-preserved specimens, well-prepared catalogues (often available on-line) and are well-known to scientists. However, the WRSL collection is not only unique, as confirmed here, but not well-known to date.

Some *Juncus* type specimens, listed here, can be found easily in a large number of other collections. However, some are preserved only at WRSL because many types, previously stored in Berlin, were destroyed during the Second World War. Although we researched only a few parts of the WRSL collection, we are convinced that duplicates of many type specimens destroyed in Berlin can be found in Wrocław. Uncatalogued herbaria like WRSL with turbulent histories can be a source of collections important for the study of biodiversity.

We selected *Juncus* as a case study since the collection at WRSL covers the entire distribution range of the genus. Therefore, it likely reflects the general situation in other groups of plants in the herbarium.

Currently, many herbarium sets in Europe are still being catalogued (and many remain undigitised). However, many old collections are indeed valuable and their type and other historical collections have the potential to facilitate taxonomy and nomenclature and, in addition, enhance our knowledge of biodiversity through application of correct names.

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References

- Buchenau F (1875) Monographie der Juncaceen vom Cap. Abhandlungen des Naturwissenschaftlichen Vereins zu Bremen 4: 393–512.

- Buchenau F (1890) *Monographia Juncacearum*. Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie 12: 1–495.
- Buchenau F (1906) *Das Pflanzenreich. Regni vegetabilis conspectus. Juncaceae, vol. IV.* 36. Wilhelm Engelmann, Leipzig, 284 pp.
- Cope TA, Stace CA (1978) The *Juncus bufonius* L. aggregate in western Europe. *Watsonia* 12: 113–128.
- Drège JF (1847) Vergleichungen der von Ecklon und Zeyher und von Drège gesammelten südafrikanischen Pflanzen (so weit dieselben noch vorhanden) mit den Exemplaren von Zeyher's neuesten Sammlungen, welche derselbe zum Verkauf stellt durch J. F. Drège in Borstel bei Hambur. *Linnaea* 20: 183–258.
- Drège JF (1848) Standörter-Verzeichniss der von C. L. Zeyher in Südafrika gesammelten Pflanzen. *Linnaea* 19: 583–598.
- Goeppert HR (1884) *Catalog der Botanischen Museen der Universität Breslau: Nebst e. Xylographie*. Heyn, Görlitz, 54 pp.
- Hiepmoed P (1987) The collections of the Botanical Museum Berlin-Dahlem (B) and their history. *Englera* 7: 219–252.
- Kirschner J, et al. [Eds] (2002a) *Juncaceae 2: Juncus subg. Juncus, Species Plantarum: Flora of the World (Vol. 7)*. Australian Biological Resources Study, Canberra, 336 pp.
- Kirschner J, et al. [Eds] (2002b) *Juncaceae 3: Juncus subg. Agathryon, Species Plantarum: Flora of the World (Vol. 8)*. Australian Biological Resources Study, Canberra, 192 pp.
- Kunth KS (1841) *Enumeratio Plantarum Omnium Hucusque Cognitarum, Secundum Familias Naturales Disposita, Adjectis Characteribus, Differentiis et Synonymis (Vol. 3)*. Stuttgartiae et Tubingae, 644 pp.
- Lavoie C (2013) Biological collections in an ever changing world: Herbaria as tools for biogeographical and environmental studies. *Perspectives in Plant Ecology, Evolution and Systematics* 15(1): 68–76. <https://doi.org/10.1016/j.ppees.2012.10.002>
- Lughadha EN, Miller C (2009) Accelerating global access to plant diversity information. *Trends in Plant Science* 14(11): 622–628. <https://doi.org/10.1016/j.tplants.2009.08.014>
- Meyer E (1832) *Plantae Ecklonianae. Junceae*. *Linnaea* 7: 129–131.
- Mirek Z, Musiał L, Wójcicki JJ (1997) *Polish Herbaria*. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków, 116 pp.
- Mularczyk M (1998) *Historia Ogródu Botanicznego Uniwersytetu Wrocławskiego, część 1: 1811–1945*. *Acta Universitatis Wratislaviensis* 2103. *Prace Ogródu Botanicznego Uniwersytetu Wrocławskiego* 4: 1–266.
- O'Connell AF, Gilbert AT, Hatfield JS (2004) Contribution of natural history collection data to biodiversity assessment in national parks. *Conservation Biology* 18: 1254–1261. <https://doi.org/10.1111/j.1523-1739.2004.00034.x-1>
- Proćków J (2010) *Juncus bulbosus* f. *submucronatus* (Juncaceae), a new taxon from Europe, Australia, Canada, Chile, Azores and Morocco. *Annales Botanici Fennici* 47(6): 409–424. <https://doi.org/10.5735/085.047.0601>
- Rostański K (1963) *Historia Zielnika Instytutu Botanicznego Uniwersytetu Wrocławskiego*. *Acta Universitatis Wratislaviensis. Prace Botaniczne* 14: 283–304.
- Seregin AP (2016) Making the Russian Flora Visible: Fast Digitisation of the Moscow University Herbarium (MW) in 2015. *Taxon* 65(1): 205–207. <https://doi.org/10.12705/651.29>

- Snow N (2005) Successfully curating smaller herbaria and natural history collections in academic settings. *Bioscience* 55(9): 771–779. [https://doi.org/10.1641/0006-3568\(2005\)055\[0771:SCSHAN\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2005)055[0771:SCSHAN]2.0.CO;2)
- Stafleu FA, Cowan RS, Mennega EA (1976) 94 Regnum vegetabile Taxonomic Literature: A selective guide to botanical publications and collections with dates, commentaries and types. 1: A–G (2nd ed.). Bohn, Scheltema & Holkema, Utrecht, 1136 pp. <https://doi.org/10.5962/bhl.title.48631>
- Sutory K (1997) Some notes on the quality and economics of a natural history collection. In: Nudds JR, Pettitt CW (Eds) *Value and Valuation of Natural Science Collections: proceedings of the international conference*, Manchester, 1995. Geological Society, London, 22–25.
- Świerkosz K (2017) Herbarium WRSL, Main Collection. <https://doi.org/10.15468/fsybut>
- Treviranus LC (1831) Über die Verdienste italienischer Botaniker Boccone's und Micheli's um die schlesische Flora. Übersicht der Arbeiten und Veränderungen der Schlesischen Gesellschaft für Vaterländische Kultur: 1–47.
- Wanat M (2013) Muzeum Przyrodnicze Uniwersytetu Wrocławskiego – 200 lat i co dalej? (Część 1). *Opuscula Musealia* 21: 157–168.
- Watanabe ME (2019) The Evolution of Natural History Collections: New research tools move specimens, data to center stage. *Bioscience* 69(3): 163–169. <https://doi.org/10.1093/biosci/biy163>
- Wiktor J (2002) *Museum of Natural History, Wrocław University. History and people: 1814–2000*. Bogucki Wydawnictwo Naukowe, Poznań-Wrocław, 118 pp.