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Stanisław Batys Gorski's botanical research in the Białowieża Primeval Forest during the 1820s

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ABSTRACT: The first scientific description of the flora of the Białowieża Primeval Forest (Puszcza Białowieska) was published in 1829 in Stanisław Batys Gorski's paper "O roślinach żubrom upodobanych, jakoteż innych w puszczy Białowiezkiey [About preferred plants of the European bison and other plants from the Białowieża Primeval Forest]". This publication comprised the first critical evaluation of the plant species present in the forest based on several field surveys during 1822, 1823 and 1826 by Gorski, and it dismissed the popular hypothesis that the European bison (*Bison bonasus*) survived there because some of its preferred forage plants were exclusively found in the forest. To assess the importance of Gorski's contribution to studies on the flora of the Białowieża Primeval Forest, we critically evaluated all his materials on the topic, including manuscripts, plant specimens collected by Gorski now preserved in Vilnius University Herbarium and his published works, and also traced all mentions and references to Gorski's studies in later botanical works devoted to the Białowieża Primeval Forest.

KEYWORDS: Belarus – Belovezhskaya Pushcha – *Bison bonasus* – European bison – Grand Duchy of Lithuania – Poland – Puszcza Białowieska – UNESCO World Heritage Site – Vilnius University Herbarium – Johan Fridrich Wolfgang.

The Białowieża Primeval Forest (BPF) (Figure 1) – Puszcza[1] Białowieska in Polish – straddling the borders of Poland and Belarus, has unique fauna and flora that have attracted the attention of poets, artists and scientists since early modern times.[2] This forest is one of the best-preserved old-growth temperate woodlands within the Central European lowlands and is home to the European bison (*Bison bonasus*) as well as wolves, lynxes, and rare owls. Until recently, the forest has had little human intervention resulting in a diverse ecology, its undisturbed land with abundant dead and decaying trees enabling natural processes to drive the ecology of the forest. In 1976, the Bialowieza National Park in Poland was designated a UNESCO Biosphere Reserve and in 2004 was also classified as an EU Natura 2000 Special Area of Conservation. Belovezhskaya Pushcha State National Park, Belarus, was designated a UNESCO Biosphere Reserve in 1993. The entire Białowieża Forest was designated as a transboundary UNESCO World Heritage Site in 1992 (Jędrzejewska and Jędrzejewski 1998; Kavalenia *et al.* 2009). In 2014, the BPF was extended to include most of the remaining natural tree stands of the Białowieża Primeval Forest in both Poland and Belarus, and now covers an area of 141,855 ha, with a buffer zone of 166,708 ha highlighting the importance of the old-growth forests and the undisturbed nature (Debonnet and Ossola 2019).

Figure 1. Białowieża Primeval Forest, UNESCO World Heritage site (2014) that extends across the borders of Poland and Belarus. © Tomasz Samojlik.

Formerly the royal property of the Polish-Lithuanian Commonwealth, until the nineteenth century, the BPF was mainly mentioned in the context of royal hunts and the European bison (*Bison bonasus)*, that had survived until the end of the eighteenth century only in the Białowieża Forest. The first detailed overview of the forest with descriptions of its physiography, flora and fauna was presented in Brincken's *Mémoire descriptif sur la forêt impériale de Białowieza, en Lithuanie* (1826). Juliusz Brinken (1789–1846) was head forester of the Kingdom of Poland, then a puppet state of the Russian Empire. His *Mémoire* was full of mistakes and that, paradoxically, contributed to the extension of scientific knowledge about the BPF, as many papers and books were subsequently published to correct those errors. One of the most important of these was written by Stanisław Batys Gorski (1802–1864), a pharmacist, botanist and entomologist of the Imperial University of Vilnius (Imperatoria Universitas Vilnensis) and Vilnius Imperial Medical and Surgical Academy (Caesarea Medico-Chirurgica Academia Vilnensis). In 1822, 1823 and 1826 Gorski went on scientific expeditions to the BPF

where he collected plant specimens, and the results of his expeditions were presented in special reports (letters), including "O roślinach żubrom upodobanych, jakoteż innych w puszczy Białowieskiey [About preferred plants of the European bison and other plants from the Białowieża Primeval Forest]"[3] (Gorski 1829). This was the first scientific publication devoted strictly to the flora of the BPF. Its importance lies in Gorski's critical evaluation of the botanical information presented by Brincken (1826), and in Gorski's rebuttal of the hypothesis on the existence of plants on which the European bison foraged which were assumed to be a deciding factor behind that species' survival in this particular forest; for information about Gorski's botanical work, see Błoński *et al*. 1888; Błoński and Drymmer 1889; Grębecka 1998; Galinis 1968a, 1968b; Hryniewiecki 1952; Mowszowicz 1957, 1973; Sławiński 1922). Błoński *et al*. (1888), Hryniewiecki (1952) and Grębecka (1998) stressed the importance of Gorski's work for the clarification of plant species growing in the BPF and the European bison's preferred plants (Daszkiewicz *et al.* 2004). However, Gorski's unpublished notes have never been studied and only part of his herbarium collection (Dubovik *et al.* 2011, 2012).

To assess the importance of Gorski's botanical work, we have evaluated all extant materials relating to his studies in the Białowieża Forest (unpublished manuscripts, published publications and specimens in Vilnius University Herbarium (**WI**)).

STANISŁAW BATYS GORSKI

Stanisław Batys Gorski's (1802–1862)[4] research in the natural sciences is recognized as a significant contribution to studies of the regional flora and fauna of the former Grand Duchy of Lithuania (the European state that lasted from the thirteenth century to 1795). Two plants, *Copaifera gorskiana* Benth. (now *Guibourtia conjugata* (Benth.) J. Léonard: Leguminosae) and *Tragopogon gorskianus* Rchb. f. (Compositae), as well as an insect, *Tryphon gorskii* Ratzeb. (Hymenoptera), were named in his honour (Galinis 1968a, 1968b; Hryniewiecki 1952; Jukonienė *et al*. 2018; Podbielkowski 1987).

Born on 6 May 1802 in Dvurce, a village in the province of Grodno, Gorski received his primary and secondary education in Grodno and Svislach (in the western part of the present-day Belarus). Between 1820 and 1825, he attended the university in Vilnius where he studied natural sciences, medicine and pharmacy and also assisted the Professor of Pharmacy, Johan Fridrich Wolfgang (1776–1859). Under Wolfgang's guidance, Gorski investigated the flora of the Vilnius region and the Svislach and Białowieża forests. In 1830, Gorski was appointed as head of the Imperial Vilnius University Botanical Garden and, from 1831, he started lecturing on botany. In 1832, he became a lecturer on botany, pharmacology and pharmacognosy and continued to head the botanical garden at the Vilnius Medical and Surgical Academy. In 1842, the Academy was closed, after which Gorski twice travelled abroad and visited botanical gardens and museums of natural history in Austria, Italy, Switzerland, and Germany. Having returned, Gorski settled in the Sventiany (Święciany: Švenčionys) district in present day Lithuania, where he practiced medicine. Gorski died on 3 April (according to the Gregorian calendar) 1864 (Galinis 1968a, 1968b; Hryniewiecki 1952; Jukonienė *et al*. 2018; Podbielkowski 1987).

As a student and later as a lecturer, Gorski took particular interest in plants and insects. His botanical publications were not numerous (Gorski 1829, 1834, 1835, 1848, 1849; Eichwald 1830), yet are of importance for European floristic studies. Among his publications on zoological topics (for example, Gorski 1852; Kumelski and Gorski 1836, 1837) were more

than a hundred articles in *Encyklopedja powszechna* (Chlebowicz and Rogalski 1835–1840). His research in the Białowieża forest, leading to the earliest reliable account of the flora of the Białowieża Primeval Forest, is the most notable of his works.

GORSKI'S INVESTIGATIONS OF FLORA OF THE BIAŁOWIEŻA PRIMEVAL FOREST

Johan Fridrich Wolfgang was the first to attempt to give an overview of the natural history and, specifically, the botany of the BPF (Grębecka 1980, 1998). In a manuscript written in 1822 (Grębecka 1998), Wolfgang summarized questions to be covered in research in the BPF including 13 botanical topics with special recommendations on how to collect herbarium specimens and transport these to Vilnius University, as well as 31 queries relating to the forest physiography. Wolfgang's memorandum included recommendations on collecting information about the forest's geography (for example, longitude, latitude, terrain, soil, rivers), its botany (for example, species of trees, grasses, economically useful plants) and its zoology with particular attention to the European bison. Interviews with local residents were a significant source of information about the places where bison lived, where they over-wintered, where they could be found in summer, what kinds of plants they ate, what diseases they suffered from, and more. Data were gathered about the number of districts and villages that existed in the Białowieża Forest and about the old traditions and various monuments which had survived there. Wolfgang's plan to investigate the plants was implemented by Gorski who visited the BPF three times, in 1822, 1823 (while still a student) and in 1826, by which year he was an assistant in Vilnius University. Gorski's first brief visit to Białowieża was in the summer of 1822.[5] In his first report, dated 19 July 1822, from the villages of Teremiski[6] and Budy in the Hajnówka forest district, he listed the following plants:[7] *Hedera helix*, *Ranunculus repens* from around the village of Pacewo, *Gymnadenia odoratissima* (as *Orchis odoratissimum*), *Dianthus superbus*, *Adenophora liliifolia* (as *Campanula lilifolia*) from around the village called Hajnówka, and common pine, spruce, birch, species of *Ribes*, *Vailantia, Circaea*, *Carex*, *Geranium*, *Cirsium*, *Viburnum* and *Rubus* from the Leśna forest district. The second report, dated 1 August 1822 and also written from Teremiski and Budy, contained no information about collecting localities apart from some plants obtained in the environs of Svislach, namely species of *Dianthus*, *Genista* and *Cytisus.* Gorski also noted that species of *Centaurea*, *Adenophora* (as *Campanula*), *Lilium* and *Cypripedium* occurred around three miles from Białowieża. *Hierochloe* as well as *Ranunculus repens*, he reported, were the preferred forage plants of *Bison bonasus*.

Gorski travelled to the BPF several times in 1823 and 1826. No manuscript relating to the 1823 expedition has been traced. However, reports written by Gorski on 3 July, 5 July, 10 July and 31 July 1826 are extant.[8] According to his letter to Wolfgang dated 3 July 1826 from Straż Stołpowicka, Gorski had spent four days (27–30 June) in the forest district Stołpowicka. Gorski recorded *Gymnadenia odoratissima* (as *Orchis odoratissima*) and indicated that species was new to the Lithuanian flora. Then he recorded *Thalictrum majus* and *Carex remota* as well as species of *Athamanha*, *Serapias*, *Cervaria*, *Tofieldia*, *Thalictrum*, *Calamagrostis* and *Salix.* The report, dated 5 July 1826, contained descriptions of plants detected near Grodno and in "Wulmeri" forest,[9] while that written on 10 July from Teremiski listed the following plants: *Potentilla* sp. (as *Potentilla ruthenica*), *Gentianella amarella* (as *Gentiana amarella*), *Astrantia major*, *Pedicularis* sp. (as *Pedicularis foliosa*), *Carlina acaulis*, *Adenophora liliifolia* (as *Campanula lilifolia*) and *Orobanche caryophyllacea*. In his report dated 31 July

from Leśna, Gorski indicated the forest districts he had explored – Okólnicka, Browska, Narewska, Hajnówska, Leśniańska and Augustowska – and such plants as *Abies alba* (as *Pinus picea*) at the village of Cisówka in Okólnicka forest district, and *Actacea cimicifuga* (as *Cimicifuga foetida*) around the villages called Bartnicka buda and Sacharszewo in Hajnówska forest district and Głęboki Kąt in Leśna forest district, *Galeopsis pubescens* in Narewska forest district, and *Rosa villosa* in Hajnówska forest district (Figure 2).

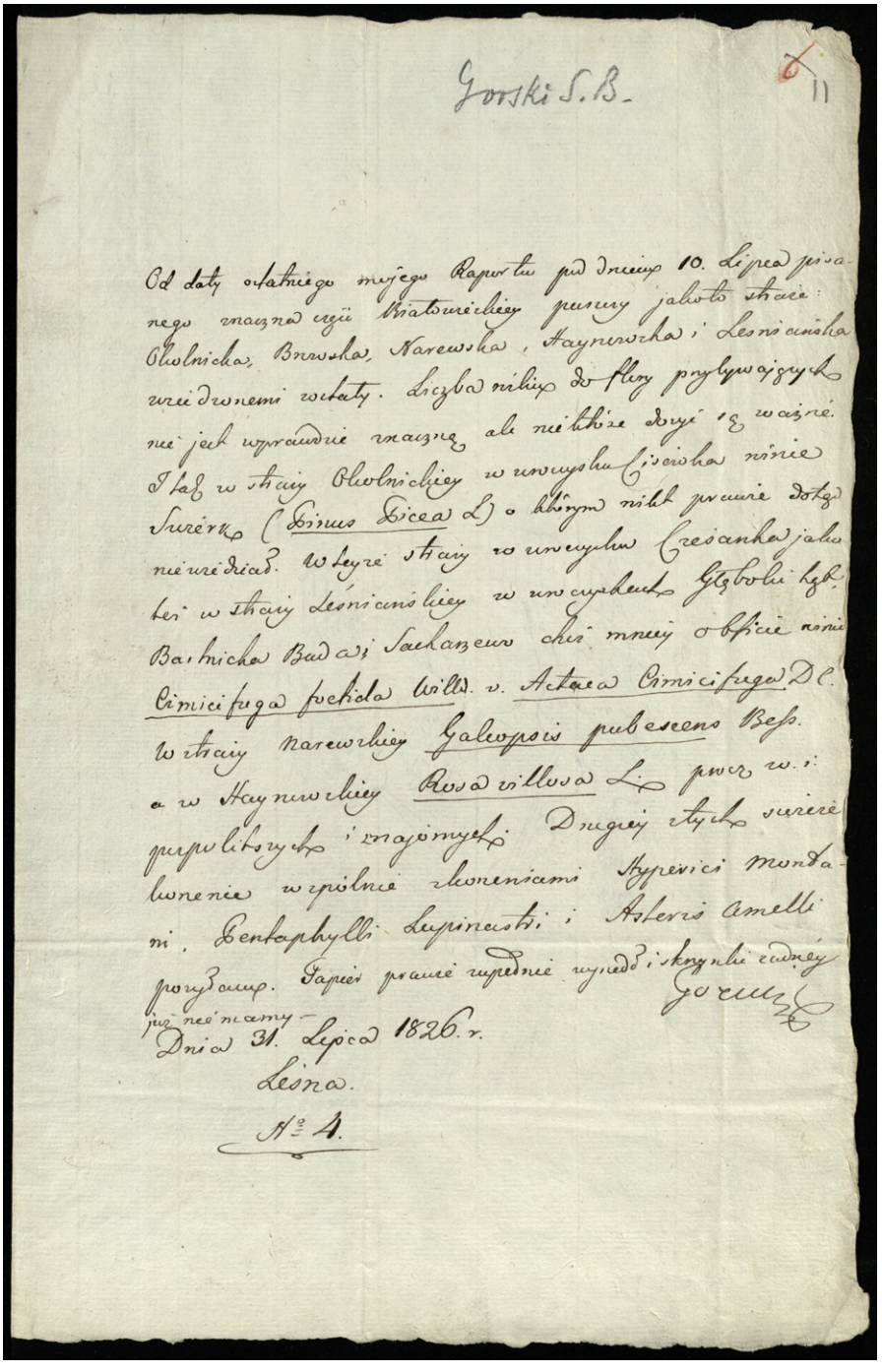
More detailed information about plants was provided by Gorski (1829) when he summarized the results of all his expeditions and gave a critical evaluation of the floristic description of the BPF by Brincken (1826). Correcting Brincken's mistakes, and assessing his own data, Gorski determined that:

- *Pinus sylvestris* was common in Białowieża.
- *Abies alba* (as *Pinus picea*), detected only in one locality, Cisówka, was rare.
- *Tilia platyphyllos* and *Acer campestre* did not grow in Białowieża, contrary to Brincken (1826).
- *Quercus robur* was rarer than *Q. petraea* not only throughout Grand Duchy of Lithuania but also in the BPF.
- *Lonicera xylosteum* was the only species of *Lonicera* in BPF: Brincken (1826) reported several species.
- Neither *Lonicera periclymenum* nor *Vinca minor* occurred as wild plants in Poland: Brincken (1826) reported them to be common.
- *Cytisus scoparius* (as *Spartium scoparium*), *Ononis spinosa* and *Genista germanica* were not in Białowieża, contrary Brincken (1826).
- *Cytisus hirsutus* (as *Cytisus supinus*) and *Lembotropis nigricans* (as *C. nigricans*) were frequent in Białowieża but had not been mentioned by Brincken (1826).
- *Campanula thyrsoides, C. pyramidalis, Veronicastrum sibiricum* (as *Veronica sibirica*), *Pseudolysimachion longifolium* (as *Veronica maritima*) and *V. alpina* were, according to Gorski (1829), highly questionable for Białowieża.
- *Hierochloe australis* (żubrówka południowa, called dąbrówka by locals), *Ranunculus repens* (jaskier rozesłany, called żeruża by locals) and *Cirsium oleraceum* (ostrożeń warzywny, called chrabust by locals) were identified as the plants preferred by the European bison.
- 40 species confirmed to occur in the BPF (see Table A1).

The Polish vernacular name for *Hierochloe odorata* is żubrówka (żubr is the European bison). Today it is a rare and protected plant in the Białowieża forest, and has no important role in the bison's diet. *H. australis* is the more common species in the forest (Krasińska and Krasiński 2013). It is difficult to say which of these species was called żubrówka or dąbrówka by local people at the beginning of the nineteenth century. However, given Gorski's proficiency in botany, it may be assumed that he correctly identified *H. australis* as a preferred food-plant of the bison.

SIGNIFICANCE OF GORSKI'S INFORMATION

Gorski's botanical research was significant because of the publication (Gorski 1829) of the list of plants with their localities and sometimes their habitats indicated; this was an important


Gorski S. B.

Od daty ostatniego mojego Raportu pod dniem 10. Lipca pisanego znaczne części Białowieskiey puszczy jakoto stacie: Olwlnicha, Browska, Narewska, Haynowska i Leśnicznika zwiedzonemi zostały. Liczba miliy do fury przyległych nie jest wprawdzie znaczną, ale niektóre drzewa są ważne. Stoi w stacyi Olwlnickiey w uroczysku Cisowka niżej Świerku (Pinus Picea L.) o którym nikt prawie dotąd nie wiedział. W tymże stacyi w uroczysku Grzesanka jakoteż w stacyi Leśniczniciey w uroczysku Głęboki Łęg, Barnicha Buda, Sachanzew chci mnieyi o bliscie niżej Cimicifuga foetida Willd. v. Actaea Cimicifuga D C. w stacyi narewskiey Galeopsis pubescens Besp. a w Haynowskiey Rosa villosa L. prócz w. i pospolitszych i znajomszych. Drugiey stycznie świerk lwnienie wspólnie złoneniami Hypevici montani, Lentaphylli Lepinecstri, i Asteris Amelli porzucamy. Zapieś prawie zupełnie wyciął i skrzynki zadney już nie znamy.

Dnia 31. Lipca 1826. r.

Leśna.

No 4.

Figure 2. The final page of S. B. Gorski's letter dated 31 July 1826 from the district of Leśna in the Białowieża Forest. © Reproduced by courtesy of The Wroblewski Library of the Lithuanian Academy of Sciences, Vilnius, Department of Manuscripts and Rare Books, code no. F7–272.

milestone in the scientific recognition of the forest of Białowieża. Compared to Brincken (1826), who indicated just the presence of plant species without specifying their localities (not to mention the numerous mistakes he had made), Gorski presented relatively-accurate information on the flora of the BPF. Moreover, he commented on the distribution of plant species within the BPF and compared it with other localities of the former Grand Duchy of Lithuania, showing that the species found in the BPF were also frequent in other forests of Lithuania.

Secondly, Gorski's research into the European bison's preferred food plants greatly contributed to the elucidation of the real reasons behind this ungulate's survival in the BPF. Specific plants were often used in the eighteenth and nineteenth centuries by naturalists to explain the fact that the BPF was the last refuge for the bison. It was hypothesized that it was particular plants that formed an indispensable component of the bison's diet that kept them in the area because the same plants occurred nowhere else. This theory was investigated by such naturalists as Jean Emanuel Gilibert (1781), Juliusz Brincken (1826) and Karl Eduard Eichwald (1830). In his publication, Gilibert, who had investigated the behaviour, diet and morphology of the European bison, did not indicate any specific plants that were essential in the bison's diet. Both Brincken, whose findings were based on the information provided by foresters, and Eichwald indicated that the bison selected the same plants as noted by Gorski (1829). What was most important, he also stated that all these species are also widespread in the territories of Lithuania that he had explored.

Thus, Gorski's findings about the wide distribution of the European bison's preferred plants rebutted the hypothesis that they did not migrate eastwards because some particular plant was exclusively found in this forest. Survival of the species in the BPF must have been determined by different factors, including the royal status that the forest had had since the fourteenth century, high-level protection of the bison as royal game, and also the indirect positive influence of the centuries-long traditional use of the BPF area. For example, continuous traditional haymaking in forest meadows and river valleys that opened the forest, created favourable foraging conditions for bison and offered easily-accessible supplementary winter fodder in the form of haystacks. From 1700, the unintentional feeding of bison changed into a regular practice, with some hay being deliberately left on meadows as winter fodder. Furthermore, in the second half of the eighteenth century, a system of population monitoring was launched with the annual winter counting of bison in the forest. Protection, traditional utilization and planned conservation of the species continued after the third partition of the Polish-Lithuanian Commonwealth, when the forest became the possession of Tsarist Russia (Samojlik 2005; Samojlik *et al*. 2019).

PLANT SPECIMENS IN VILNIUS UNIVERSITY HERBARIUM (**WI**)

According to Sławiński (1922) and Mowszowicz (1957), the most likely repositories of Gorski's plant specimens were the universities in Kiev or Vilnius (Uniwersytet Stefana Batorego w Wilnie**)** but neither possesses Gorski's personal collection. There are some specimens collected by Gorski within the collections assembled by Wilibald Besser (1784–1842) and Ivan Schmalhausen (1849–1894) now in the Ukraine National Herbarium (**KW**) (Galinis 1968a) but none of these originated in Białowieża.

According to Köhler (1994), Vilnius University Herbarium (Vilniaus universiteto herbariumas; **WI**) holds the greatest number of Gorski's specimens. Dubovik *et al.*

Figure 3. The labels on a herbarium specimen of *Taxus baccata* L. (yew; called Europinis kukmedis or paprastasis kukmedis in Lithuanian, and cis pospolity in Polish) collected by S. B. Gorski near Nieznanów in the Białowieża Primeval Forest ("In magna sylva Lithuaniae Białowieska puscza") on 28 July 1826. The handwritten labels are in Gorski's neat script. © Reproduced by courtesy of Vilnius University Herbarium.

(2011, 2012) noted 32 specimens of rare and protected species from the BPF dating back to the nineteenth century that were believed to have been collected by Gorski. Comparison of the plants listed by Gorski (1829) with those listed by Dubovik *et al.* (2011, 2012) showed 19 species in common (Table A1). A search in **WI** for approximately one hundred species mentioned by Gorski in his manuscripts as well as his paper (Gorski 1829) yielded 67 specimens from Białowieża dating from 1823, 1824, 1826 and 1844; the majority were dated 1826. These represent 43 species (Table S1), of which 25 correspond with those listed by Dubovik *et al.* (2011, 2012). Nineteen species (26 specimens) were "new" (Table S1), ten (*Actacea cimicifuga* (as *Cimicifuga foetida*), *Brachypodium sylvaticum* (*as Festuca sylvatica*), *Galium sylvaticum* (*as Galium linifolium*), *Gladiolus imbricatus* (*as Gladiolus neglectus*), *Pedicularis* sp. (as *Pedicularis foliosa*), *Ranunculus repens*, *Salix livida*, *Aruncus dioicus* (*as Spiraea aruncus*), *Taxus baccata* and *Ulmus suberosa*) corresponding with names in Gorski's list (1829). Specimens representing eleven of the species noted by Gorski have not been traced.

Entries on the labels were made in black ink (Figure 3). Some of the labels contain information on species distribution not only in the BPF but also in other parts of the former Grand Duchy of Lithuania.[10] Some of the labels were signed "m. m. Gorski; S. B. G." or "mm. Gorski". We have concluded that most of these labels (except those dated 1844) were written by Gorski himself, having compared the handwriting in Gorski's manuscripts with that on specimen labels and having juxtaposed specimen sampling dates and localities with Gorski's

itineraries in Białowieża. Similar practice was used to identify Gorsky's script when preparing a paper about his bryological collection (Jukonienė *et al*., 2018). This particular set of plant specimens is part of the common heritage of Poland and Lithuania and represents a valuable milestone in natural history and history of science.

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NOTES

[1] "Puszcza" in Polish and "Sengirė" in Lithuanian are translated into English as "primeval forest". Puszcza/Sengirė means a special forest with special characteristics: the trees are not felled for several centuries, and these forests include areas without management, as well as special plant and animal species, and plant communities. There are no such forests (sengirė) in modern Lithuania yet the lowland Białowieża Forest survived in the former territory of the Grand Duchy of Lithuania.

[2] The period between the end of the Middle Ages and the beginning of the Industrial Revolution, that is the late fifteenth to the late eighteenth century.

[3] An extract from the longer manuscript "Wycieczka do puszczy Białowiezkiey, w celu botanicznym odbyta" (A trip to the Białowieża Primeval Forest with the botanical purpose), about his botanical excursion to the Białowieża Forest, that was mentioned in a footnote on the first page of the published paper (Gorski 1829: 207.) This manuscript has not been traced.

[4] In Lithuanian, Gorski's last name is spelled Gorski, and that is how he signed all his letters (manuscripts). However, Polish authors have spelled his name Górski (for example, Daszkiewicz *et al.* 2004). Gorski and Górski have different pronunciations.

[5] S. B. Gorski to J. F. Wolfgang, 19 July 1822 (3ff.), 31 August 1822 (3ff.). Original MSS in Vilnius University Library, Department of Manuscripts, code no. F26–2295. Both manuscripts were written from the villages named Teremiski and Buda in Hajnówka forest district. Descriptive information (but not images of these manuscripts) is available at: https://virtualibiblioteka.vu.lt/permalink/f/gi1gc3/VUB01000941184 (accessed 26 May 2021).

[6] Original spelling of place names employed by Gorski are followed by modern orthography; in case of historical names of parts of the BPF, we follow Hedemann (1939).

[7] Names of plant species and genera are presented in original form as in the manuscript.

[8] S. B. Gorski to J. F. Wolfgang, 3 July 1826 (from Stołpowiska; 3ff.), 5 July 1826 (without locality; 3ff.), 10 July 1826 (from Teremiski; 3ff.), 31 July 1826 (from Leśna; 2ff.). Original MS is in the Wroblewski Library of the Lithuanian Academy of Sciences, Vilnius, Department of Manuscripts and Rare Books, code no. F7–272.

[9] This forest does not exist nowadays; it was mentioned by Gilibert (1781).

[10] The species name (sometimes a few names) in Latin was, as a rule, written in the central part of a label, along with other information. Some labels contained references to species identification. All specimen labels had information about species distribution. According to the information on specimen labels, all of them were from "magna sylva Białowiezka puszcza". Some of the labels contained precise information about localities of collection in Polish: for

example, Ciesanka, Cisówka, Douhe, Hacisk Dworzyszcze, Stara Białowieża, Grabowiec, Obołonie, Królowy-Mośc, Głęboki kąt, Bartnicka buda, Browsk, Hajnówka, Nieznanów, Teremiski (Table A1) (Table S1). Sometimes, however, only a forest district (for example, Stołpowiski bor) and habitat (such as spruce forest) were mentioned. Some specimen labels indicated only one precise sampling locality (for example, Nieznanów) while others had several ("Ciesanka, Głęboki kąt etc.") indicating the species wider distribution. The first locality usually referred to the exact place where the specimen was collected (sampling location), whereas the other place names indicated where the plant species was also found.

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APPENDIX

Table A1. Plants of the BPF with locations and/or habitats as reported in Gorski (1829). Modern equivalents of botanical names are based on the online resource http://www.plantsoftheworldonline.org/ (accessed 22 August 2021). Names of locations are in modern Polish. * indicates species recorded by Dubovik *et al.* (2011, 2012).

Gorski's name	**Modern equivalent**	**Location and/or habitat within BPF**
Asprella oryzoides *	*Leersia oryzoides*	along the river Biała
Aster elegans	*Eurybia spectabilis*	everywhere in coniferous forests
Astrantia major *	*Astrantia major*	Stara Białowieża, Teremiski forest, Hacisk dworzyszcze, Ciesanka
Atriplex microspermum	*Atriplex prostrata*	forest section Straż Stołpowicka
Calamagrostis stricta	*Calamagrostis stricta*	in the wet fields
Campanula lilifolia *	*Adenophora liliifolia*	Ciesanka, Głęboki kąt, Douhe, Bartnicka buda, Sadek, Hacisk dworzyszcze, Obołonie
Carex davalliana	*Carex davalliana*	in the marshes
Carex pilosa	*Carex pilosa*	Sacharzewo
Carlina acaulis *	*Carlina acaulis*	Obołonie, alongside river Łutownia
Centaurea austriaca *	*Centaurea phrygia*	everywhere in dry forests
Cimicifuga foetida	*Actaea cimicifuga*	forest section Straż Okólnicka, forest section Straż Leśniańska
Cirsium oleraceum	*Cirsium oleraceum*	alongside rivers, in wet places
Cuscuta epilinum	*Cuscuta epilinum*	Czerowka
Cytisus nigricans *	*Lembotropis nigricans*	frequent in coniferous forests

Continued

Table A1. *Continued*

Gorski's name	Modern equivalent	Location and/or habitat within BPF
Cytisus supinus *	*Cytisus hirsutus*	frequent in coniferous forests
Dentaria bulbifera	*Cardamine bulbifera*	forest section Straż Augustowska, frequent in coniferous forests
Elymus europaeus	*Hordelymus europaeus*	Szmojdzin, Gnilec
Festuca aspera	*Bromus erectus*	Szmojdzin, Gnilec
Festuca sylvatica	*Brachypodium sylvaticum*	Szmojdzin, Gnilec
Galeopsis pubescens *	*Galeopsis pubescens*	forest section Straż Browska
Galium linifolium	*Galium sylvaticum*	Hajduckie
Gladiolus imbricatus	*Gladiolus imbricatus*	Obołonie
Gymnadenia odoratissima *	*Gymnadenia odoratissima*	Straż Krukowska
Hierochloe autralis *	*Hierochloe autralis*	everywhere in mixed forest with oaks (*Quercus* spp) and birches (*Betula* spp.), together with *Calamagrostis sylvatica* and *Agrostis arundinacea*, and in some places with *Molinia caerulea*.
Lycopus exaltatus	*Lycopus exaltatus*	Nieznanów
Monotropa hypoxys	*Monotropa hypoxys*	on spruce (*Picea* spp.) roots
Orobanche caryophyllacea *	*Orobanche caryophyllacea*	frequent everywhere
Orobus laevigatus *	*Lathyrus laevigatus* subsp. *laevigatus*	forest section Straż Augustowska
Pedicularis foliosa	*Pedicularis* sp.	Obołonie
Pentaphyllum lupinaster *	*Pentaphyllum lupinaster*	frequent in coniferous forest
Pinus picea *	*Abies alba*	Cisówka
Polycnemum arvense	*Polycnemum arvense*	forest section Straż Stołpowicka
Ranunculus repens	*Ranunculus repens*	everywhere in the shadow in wet places
Ribes alpinum *	*Ribes alpinum*	Nieznanów, Sacharzewo
Rosa ciliatopetala *	*Rosa villosa*	Sacharzewo
Salix starkeana	*Salix starkeana*	Teremiski
Scabiosa inflexa *	*Succisella inflexa*	along the river Biała
Selinum cervaria *	*Peucedanum cervaria*	Grabowiec
Serapias rubra	*Cephalanthera rubra*	in the birch forest
Spiraea Aruncus	*Aruncus sylvester*	Pacewo, Ogród Królewski, forest section Straż Krukowska
Taxus baccata	*Taxus baccata*	Nieznanów
Tofieldia palustris *	*Tofieldia calyculata*	forest section Straż Stołpowicka, in the fields
Ulmus suberosa	*Ulmus minor*	rare, growing in mixed forests

SUPPORTING INFORMATION

Additional Supporting Information may be found on the online version of this article at the publisher's website available at: https://www.euppublishing.com/doi/suppl/10.3366/anh.2021.0725.

Table S1. Nineteenth-century plant specimens from Białowieża Primeval Forest in Vilnius University Herbarium (WI), arranged alphabetically by current scientific name, probably collected by Gorski, with data from labels (scientific name, date of collection and locality of collection). Name of locality is in modern Polish. Current species names follow http://www.plantsoftheworldonline.org/ (accessed 22 August 2021).