

## Potamogeton taxa proposed by J. F. Wolfgang and his collaborators

Zdenek Kaplan<sup>1</sup> & Joanna Zalewska-Gałosz<sup>2</sup>

<sup>1</sup> Department of Taxonomy and Biosystematics, Institute of Botany, Academy of Sciences, Zámek 1, CZ-252 43 Pruhořnice, Czech Republic. kaplan@ibot.cas.cz (author for correspondence)

<sup>2</sup> Department of Plant Taxonomy and Phytogeography, Institute of Botany, Jagiellonian University, Kopernika 31, PL-31-501 Kraków, Poland. zalewska@fagus.ib.uj.edu.pl

In the first half of 19<sup>th</sup> century Jan Fryderyk Wolfgang (1775–1859) was the outstanding expert on *Potamogetonaceae*. Twelve of the names he proposed in a manuscript of a monograph on *Potamogeton* were validly published by Schultes & Schultes (1827). Of these, four names are now the correct names for the respective taxa, one for a species (*P. rutilus* Wolfg.) and three for hybrids (*P. ×nerviger* Wolfg., *P. ×salicifolius* Wolfg. and *P. ×undulatus* Wolfg.). Ten names of *Potamogeton* taxa described by Wolfgang are typified in this paper, together with two names proposed by his collaborators, Besser and Gorski. The identity of these names is discussed.

**KEYWORDS:** herbarium, history of botany, Lithuania, nomenclature, *Potamogeton*, typification.

### INTRODUCTION

In the first half of 19<sup>th</sup> century, the University in Vilna (now Vilnius in Lithuania) and the high school at Krzemieniec (now Kremenets in the Ukraine) were the most dynamic centres of Polish botanical research (Köhler, 1994). The scientists at these centres were involved, among other things, in taxonomic and floristic studies of the local flora, and the gathering of rich herbarium collections. They co-operated with the botanical research centres of contemporary Europe, exchanging letters, seeds and specimens. Some collections from these herbaria survive and contain floristic and taxonomic material of great importance (Babicz & Grebecka, 1988).

One of the leading figures at that time was Jan Fryderyk Wolfgang (sometimes cited as Johann Friedrich Wolfgang; 1775–1859). Wolfgang was a Professor of Pharmacy and between 1810 and 1831 occupied the Chair in Pharmacy and Pharmacology at Vilna University (Głowacki, 1960). He was a pharmacist with a keen interest in botany and chemistry. Wolfgang was a specialist in pharmacognosy—that part of pharmacy interested in utilizing wild plants in medicine. For many years he studied the flora of Lithuania, especially that of the Vilna region. Apart from this he also carried out taxonomic studies, described a number of species, which were unfortunately not published. One of his most important taxonomic works was an unpublished monograph of 33 species of *Potamogeton* (Głowacki, 1960). This work contained a Latin text and the detailed water colour illustrations by the artist Antoni Jankiewicz of all the species. Wolfgang presented the manuscript to the

Moscow Society of Naturalists (Trautvetter, 1880). Unfortunately, because of the high cost of printing, the monograph was never published (Głowacki, 1960). In 1945 Bolesław Hryniewiecki saw this manuscript in the collection of the Society (Hryniewiecki, 1952). Our recent attempt to determine whether the manuscript was still in the library of the Society was unsuccessful. The majority of the papers published by Wolfgang were concerned with pharmacognosy and appeared in *Pamiętnik Farmaceutyczny Wileński* [*Vilna Pharmaceutical Memoirs*], of which Wolfgang was co-editor, *Pamiętnik Towarzystwa Lekarskiego* [*Memoirs of Medical Society*] and *Dziennik Medycyny, Chirurgii i Farmacji* [*Journal of Medicine, Surgery and Pharmacy*]. Głowacki (1960) presents a list of his published papers. When the University was closed in 1831, Wolfgang retired. To the end of his life he lived in Połuknie (now Paluknys, Distr. Traku, Lithuania) where he continued his taxonomic and floristic research. He died at an advanced age in 1859 and was buried in the evangelical cemetery in Vilnius (Głowacki, 1960).

Some of the original descriptions and diagnoses of *Potamogeton* taxa proposed by Wolfgang in the manuscript of his monograph were formally published by Schultes & Schultes (1827) who attributed both the names and the descriptions to Wolfgang by explicitly citing their source, e.g., as “Wolfg. Ms. n. 28. Besser in litt.” under *P. rutilus* Wolfg. As is obvious from this example, these diagnoses were sent to them by Wilibald Besser (1784–1842), a Professor at the high school in Krzemieniec and a distinguished botanist. He was a plant taxonomist, talented gardener and founder of the Krzemieniec Botanical Garden. Besser engaged in floris-

tic research, especially in the regions of Volhynia and Podolia, and accumulated a rich herbarium (Mowszowicz, 1957–1959). Wolfgang co-operated with Besser, and many of the specimens collected by Wolfgang were kept in Besser's personal herbarium. Many of the duplicates in these collections ultimately were widely distributed.

Another important botanist in Vilna at that time was Stanisław Batys Gorski (1802–1864), a student and successor of Wolfgang. Like the latter, he lectured on botany, pharmacy and pharmacology at the Medical-Surgery Academy (established in 1832, after Vilna University was closed) and at the same time did floristic and taxonomic research. Gorski exchanged letters and plant material with the outstanding botanists of his time, notably Heinrich Gottlieb Reichenbach (1824–1889), a son of Heinrich Gottlieb Ludwig Reichenbach (1793–1879). Gorski's collection of orchids was used by Reichenbach for his monograph on this family (Reichenbach 1854–1900). Some of the plants collected by Gorski were included in Reichenbach's *Flora Exsiccata Germanica* (Mowszowicz, 1973). He, like Wolfgang, studied the taxonomy of *Potamogeton* and prepared a work entitled *Icones Potamogetonearum, Characearum, Cyperacearum et Graminearum Novas vel Minus Cognitas Species Lithuaniae Illustrantes* (Gorski, 1849). According to Głowacki (1960) this work was based on Wolfgang's manuscript on *Potamogeton*. Unfortunately the entire edition was destroyed and only one set of plates without any text survived, which were kept in the library of the Polish Academy of Sciences and Letters (Polska Akademia Umiejętności) in Kraków, where they were seen by Hryniewiecki (Hryniewiecki, 1952). Currently the whereabouts of this publication is unknown and attempts to locate it in other important botanical libraries, including BM and K, failed. According to Hryniewiecki (1952) the surviving copy of Gorski's work consisted of 20 plates with drawings by Anna Gzowska. The first plate, entitled *Tabula Carpographica Potamogetonum Lithuaniae*, illustrated fruits, sections of fruits and flowers of 16 species and varieties of *Potamogeton*. The other plates showed natural size drawings of seven *Potamogeton* species and other aquatic plants.

The manuscripts of floristic accounts by Gorski were utilized in the publications of Eichwald (1830) and Baliński (1835). When the Medical-Surgery Academy was closed in 1842, Gorski lived in Postawy and Polesie, Distr. Świeciany (nowadays Pastawy and Poles'ye, respectively, Prov. Vitsyeb'skaya, Belarus), where he continued his botanical studies (Mowszowicz, 1957–1959). At that time Polish people in that region suffered from Russian repression and on hearing of new persecutions Gorski committed suicide (Hryniewiecki, 1952).

## COLLECTIONS

For many years, the herbarium material collected by Wolfgang, Gorski and Besser was moved and stored in various scientific centres, and partly also widely distributed. Some of the duplicates were lost or destroyed during wars. Eventually, these originally personal herbaria were broken up and incorporated into various collections. A collection from Besser's herbarium consisting of 54 000 sheets is reported to be in the herbarium of the National Academy of Sciences of the Ukraine (formerly N. G. Kholodny Institute of Botany), Kiev (KW) (Köhler, 1994; also cited by Galinis, 1969). Unfortunately, this material is not available for loan at present. The rest of the historical material gathered by the Vilna researchers was possibly included in the main collection of the local herbarium. In Vilnius, at the Department of Botany and Genetics of the Vilnius University (WI), there are 1922 sheets collected by Gorski, four by Wolfgang, and 1262 by Besser (Köhler, 1994). We have located specimens of these collectors in B, BM, BP, BR, BRNM, C, CGE, G, H, K, KRA, KRAM, L, LE, M, P, PRC, S, UPS, W, WAG, WU-Hal, Z, and ZT. Most of Wolfgang's specimens from Besser's herbarium are in the *Potamogeton* collection in St. Petersburg's herbarium (LE).

We located altogether more than 120 authentic specimens of 12 names proposed by Wolfgang, Gorski or Besser. In most cases, the data given on herbarium labels is poor, as was usual in the early 19<sup>th</sup> century. Often only the taxon name, place or country of origin and name of the collector or of the personal herbarium involved are given. More or less full information is only exceptionally provided (e.g., "*Potamogeton undulatus* Wolfg., E fluvio Waka, Lithuania, legit Wolfgang, Herb. W. Besser"). In some duplicates, the record is very space-saving and abbreviated to taxon name, country and herbarium owner (e.g., "*Potamogeton undulatus* Wolfgang, E Lithuania, Herb. W. Besser"). In a few cases, Wolfgang indicated the authenticity of his specimen instead of giving a description of the plant's origin (e.g., "*Potamogeton undulatus* mihi!, J. W[olfgang]."). The majority of the labels are written in the same, easily recognizable and legible handwriting, in black ink. Date of collecting of the material is rarely given. In a few cases, the dates on the labels indicate the year the specimen was acquired by an institution (e.g., "*Potamogeton nervigerus* Wolfg., com. Besser a. 1824, e fl. Waka, Lithuan."). These dates are usually written in a different handwriting and in a different coloured (blue, violet) ink.

Even though the arrangement of the text on herbarium labels sometimes differ between herbarium sheets of a single taxon, we believe that most, if not all, authentic specimens of each of Wolfgang's taxa were all collected at the same time and place. Specimens in each of these

collections are similar in general habit and basic features such as shape and length of leaves, length of internodes, stage of development of generative organs, etc., and in the coloration change caused by drying, which suggests they were prepared simultaneously. Plants of *Potamogeton* show marked phenotypic plasticity in morphology, not only between localities but also seasonally at one site (Kaplan, 2002). It is unlikely that almost identical phenotypes of a rare taxon could be found and collected within the limited area around Vilnius repeatedly over a few years or even from different sites. We therefore think that all specimens of each taxon belong to a single gathering made from one locality at one time. This assumption is supported by the account of Lithuanian plants by Gorski (in Eichwald, 1830), who records most of Wolfgang's taxa only from their type locality still several years after the specimens were collected.

## TYPIFICATIONS

***Potamogeton fasciculatus*** Wolfg. in Schult. et Schult. fil., Mant. 3: 364. 1827. = *P. filiformis* var. *fasciculatus* (Wolfg.) Baagöe, Bot. Tidsskr. 20: 324. 1896 ('*fasciculata*'). = *P. filiformis* f. *fasciculatus* (Wolfg.) Tiselius, Potamog. Suec. Exs., fasc. 3: [sched.] no. 116. 1897 ('*fasciculata*').

[= *P. filiformis* Pers.]

Type citation: "In lacubus circa Daugierdziszki et Solkieniki Lithuaniae, Wolfg. fil." [nowadays Daugirdiškės and Salkininkai, Distr. Traku, Lithuania].

Lectotype (designated here): "*Potamogeton fasciculatus* Wolfg., In lacubus Lithuan., Herb. W. Besser" (LE; isolectotypes: BM, G, K, KRA, LE, P). Variations in the label data are: "*Potamogeton fasciculatus* Wolfg., in inundatis Lithuan., [Herb.] Besser" (KRA); "ex Hb. Fischer, Ex herbario horti Petropolitani, *Potamogeton fasciculatus* Wolfg., In lacubus Lithuan. leg. Wolfg." (BM); "*Potamogeton fasciculatus*, Wolfgang" (P); "*Potamogeton fasciculatus* Wolfg., Lithuania, leg. Wolfgang, com. Dr. Woloszczak" (G). Syntypes: "*Potamogeton fasciculatus* mihi, tab. 33., Prof. Wolfg., In Lithuan. rivo Waka" (LE); "*Potamogeton fasciculatus* Wolfg., E fluv. Waka Lith., Herb. W. Besser" (BRNM, G).

The specimens are a small, low-growing form of *Potamogeton filiformis* Pers., but not juvenile plants as most are fertile, bearing mature fruits. The identity of *P. fasciculatus* with this species was probably first recognized by Bennett (1890), and his synonymy was followed in many works including those of Ascherson & Graebner (1897), Graebner (1907), Hagström (1916), Yuzepczuk (1934) and Wiegleb & Kaplan (1998).

***Potamogeton gracilis*** Wolfg. in Schult. et Schult. fil., Mant. 3: 355. 1827. = *P. wolfgangii* Kihlm. in A. T. Saelán, Kihlm. et Hjelt, Herb. Mus. Fenn. ed. 2. 1: 128. 1889, nom. illeg. ('*Wolfgangii*') [cf. ICBN Art. 52.1; Greuter & al. 2000]. = *P. gramineus* var. *fluvialis* f. *wolfgangii* Hagstr. in Neuman, Sverig. Fl. 796. 1901 ('*Wolfgangii*'). = *P. gramineus* proles *wolfgangii* (Hagstr.) Graebn. in Engl., Pflanzenr. 31 (IV.11): 89. 1907 ('*Wolfgangii*').

[= *P. gramineus* L.]

Type citation: "In fluvio Kawa Sibiriae. Merck. Herb. Stev."

Lectotype (designated here): "ex Sibiria ulteriora, ad fluvio Kawa, Merk [C. Merck], Herb. Steven" (H).

The type sheet bears a single stem of *Potamogeton gramineus*, with only submerged leaves and a young inflorescence, and several labels including one with a diagnosis written by Wolfgang himself. The plants are the morphotype with relatively long and narrow submerged leaves and without floating leaves, which is found particularly in deep clear waters of lakes throughout the range of the species. We do not think the recent attempt to distinguish this form as a separate species under the illegitimate name *P. wolfgangii* (Galinis, 1963a; Papchenkov, 1997) is justifiable. *Potamogeton gramineus* shows a wide range of phenotypic plasticity so it is unwise to split it into several species based on a few morphological features (Hagström, 1916: 208; Kaplan, 2002).

***Potamogeton macrophyllus*** Wolfg. in Schult. et Schult. fil., Mant. 3: 358. 1827. = *P. lucens* subsp. *macrophyllus* (Wolfg.) Nyman, Consp. Fl. Eur. 4: 682. 1882, nom. illeg., non Wallr. 1822. = *P. lucens* f. *macrophyllus* (Wolfg.) Hagstr. in Neuman, Sverig. Fl. 797. 1901, nom. illeg., non Wallr. 1822. = *P. lucens* var. *macrophyllus* (Wolfg.) Glück in Pascher, Süßwasserflora 15: 53. 1936, nom. illeg., non Wallr. 1822.

[= *P. lucens* L.]

Type citation: "In fluviis Wilia et Waha [sic!] prope Wilnam, Wolfg." [nowadays Neris (Viliya) and Voke (Vaka) rivers, in Vilnius, Distr. Vilnius, Lithuania].

Lectotype (designated here): "*Potamogeton macrophyllus* mihi, tab. 16., [leg. J. F. Wolfgang] com. Besser a. 1824." (LE; isolectotypes: BM, BRNM, G, K, LE, M, P, S, UPS, WU-Hal, Z). Variations in the label data are: "*Potamogeton macrophyllus* mihi, J. W." (BM, P); "*Potamogeton macrophyllus* Wolfg., E rivis Lithuan., Herb. W. Besser" (BM, LE); "*Potamogeton macrophyllus* Wolfg., Lithuania, Wolfg." (LE); "*Potamogeton macrophyllus* Wolfg., In aquis fluent. Lithuan., Herb. W. Besser" (LE, P); "*Potamogeton macrophyllus* mihi, w rzece Wace i w Wilii pod Werkiami, Mis[it]. Wolfgang" (LE); "ex Hb. Fischer, Ex herbario horti Petropolitani,

*Potamogeton macrophyllus* Woflg., In fluv. Lithuan. leg. Woflg.” (BM); “*Potamogeton macrophyllus* Woflg., In fluv. Lithuan., Herb. W. Besser” (BM, K); “*Potamogeton macrophyllus* Woflg., In aquis fluentibus Lithuaniae, Herb. W. Besser” (M, Z); “*Potamogeton macrophyllus* Woflg., Lithauen, [Herb.] Besser” (M); “*Potamogeton macrophyllus* Woflg., Lithuania, leg. Wolfgang, com. Dr. Woloszczak” (G, S); “*Potamogeton macrophyllus* Woflg., E Lithuania, Herb. W. Besser” (BRNM, G, S); “Ex herbario horti Petropolitani, *Potamogeton macrophyllus* Woflg., In aquis stagn. Lithuan., Besser” (WU-Hal); “*Potamogeton macrophyllus* Wolfgang, ad Vilnam, Horaninow dedit” (UPS). Possible syntypes: “*Potamogeton macrophyllum*. Woflg., ... Woflg. mon. ined. icon. n. 16., In fluvio Waka et Wilia (circa Werki) prope Vilnam, 1826”. (KRA); “*Potamogeton macrophyllus* Woflg., In fluvio Waka et Wilia prope Vilnam, legit Gorski, 1826” (KRA).

The plants belong to a form of *Potamogeton lucens* L. with exceptionally long leaves. Such phenotypes, found in rivers throughout most of the range of the species, are sometimes also designated *P. longifolius* J. Gay. In the literature, the name *P. macrophyllus* is commonly synonymized with *P. lucens*.

***Potamogeton microstachys*** Woflg. in Schult. et Schult. fil., Mant. 3: 360. 1827. = *P. alpinus* proles *microstachys* (Woflg.) Graebn. in Engl., Pflanzenr. 31 (IV.11): 74. 1907.

[= *P. alpinus* Balb.]

Type citation: “Specimina nostra, a cel. Eschscholtz in Unalaska lecta” [Unalaska Island, Aleutian Islands, Alaska, United States].

Lectotype (designated here): “*P. microstachys* Woflg., Ex Unalaska. Eschscholtz” (LE; isolectotypes: LE, W). Variations in the label data are: “Unalaska, Eschscholtz” (LE); “*P. rufescens* ex Unalaska, Hb. Cham.” (LE); “*Potamogeton rufescens* Schrad.! Unalaska, [leg. Eschscholtz] [Herb.] Cham.” (W).

This name was given to plants of *Potamogeton alpinus* Balb. with long narrow submerged leaves and no floating leaves. Phenotypes like this have sometimes been considered as an infraspecific taxon of this species (e.g., *P. alpinus* var. *tenuifolius* in Ogden, 1943; *P. alpinus* subsp. *tenuifolius* in Hultén, 1960). However, the concept of an infraspecific subdivision in *P. alpinus* was abandoned and the name *P. microstachys* fully synonymized with *P. alpinus* in recent revisions (e.g., Reveal, 1977; Wiegleb & Kaplan, 1998; Haynes & Hellquist, 2000). The cultivation experiments proved that leaf shape and size are dependent on environmental conditions and cannot be used for delimiting of taxa (Kaplan, 2002).

***Potamogeton ×nerviger*** Woflg. in Schult. et Schult. fil., Mant. 3: 359. 1827, pro sp. = *P. alpinus* var. *nerviger* (Woflg.) G. Fisch., Mitt. Bayer. Bot. Ges. 4(10): 153. 1930. = *P. alpinus* var. *purpurascens* subvar. *nerviger* (Woflg.) Aschers. et Graebn., Synops. Mitteleur. Fl. 1: 311. 1897.

[= *P. alpinus* Balb. × *P. lucens* L.]

Type citation: “In fluvio Wierzchnia circa Lelany Lithuaniae, Wolfgang”.

Lectotype (designated here): “Herb. Ledebour, *Potamogeton nervigerus* mihi, Lithuania, J. Woflg.” (LE; isolectotypes: BM, K, LE, UPS, W, ZT). Variations in the label data are: “*Potamogeton nervigerus* Woflg., com. Besser a. 1824, e fl. Waka, Lithuan.” (LE); “*Potamogeton nervigerus* mihi, J. W.” (BM, W); “*Potamogeton nervigerus* Woflg., In fluv. Lithuan., Herb. W. Besser” (K); “*Potamogeton nervigerus* Wolfgang, ad Vilnam, Horaninow dedit” (UPS); “*Potamogeton nervosus* [sic!] Woflg., E Lithuan” (ZT). Possible syntype: “*Potamogeton nervigerus*. Woflg., ... Woflg. monogr. ined. ic. n. 7., In flumine Wierzchnia circa Lelany distr. Trocensi guber. Vilnensi legit M. M. Gorski ubi insimul cum Potam. Vaillantii copiosissimus, 1826”. (KRA).

Application of this name has been unclear. Earlier authors associated it with *Potamogeton alpinus*, either as its synonym (Bennett, 1889) or an infraspecific taxon (as *P. alpinus* var. *purpurascens* subvar. *nerviger* by Ascherson & Graebner, 1897; and Graebner, 1907). Fischer (1907) was the first to suggest that it might actually be the hybrid between *P. alpinus* and *P. lucens*. Hagström (1916) considered Lithuanian plants to be identical with British *P. ×griffithii*, which is the hybrid *P. alpinus* × *P. praelongus*. The affinity with *P. alpinus* is obvious. However, the minutely denticulate margins of submerged leaves and the broadly acute leaf apex clearly show the influence of *P. lucens*. We therefore follow Dandy (1958; 1975), Dandy & Taylor (1967), Preston (1995) and Wiegleb & Kaplan (1998) and consider the name *P. ×nerviger* Woflg. as the correct name for the hybrid between *P. alpinus* and *P. lucens*.

***Potamogeton petiolatus*** Woflg. in Schult. et Schult. fil., Mant. 3: 352. 1827. = *P. besseri* Steud., Nomencl. Bot. ed. 2. 2: 384. 1841 (*Besseri*), *nom. illeg.* [cf. ICBN Art. 52.1; Greuter & al. 2000].

[= *P. nodosus* Poir.]

Type citation: “In Borysthene in Gubernio Chersonensi, Andrzejowsky” [in Dnieper River, prov. Kherson, Ukraine].

Lectotype (designated here): “*Potamogeton petiolatus*. Woflg., ... Woflg. monogr. icon. ined. n. 4., In flumine Borysthenes (Dniepr.) legit Andrzejowsky ...” (KRA). Syntype or isolectotype: “*Potamogeton petiola-*

*tus mihi, J. W[olfgang]*". (BM). Authentic specimen: "*Potamogeton petiolatus* Wlfg., Wilna, leg. Wolfgang" [Vilnius, Distr. Vilnius, Lithuania] (BM, S). Possible authentic specimen: "Herb. Fischer, *Potamogeton petiolatus* Wlfgan [sic!], In fluv. Niemen, Lithuan [sic!] [Neman (Nemunas) River, Lithuania], Herb. W. Besser" (LE).

The plants in the authentic collections belong to a widely distributed species nowadays known under the name *Potamogeton nodosus*. This view was previously expressed by, e.g., Hagström (1916), Dandy & Taylor (1939) and Wiegleb & Kaplan (1998).

***Potamogeton pumilus*** Wlfg. in Schult. et Schult. fil., Mant. 3: 354. 1827.

[= *P. epihydrus* Raf.]

Type citation: "In Philadelphiae aquis" [Philadelphia, Pennsylvania, U.S.A.].

Lectotype (designated here): "*Potamogeton fluitans*, near Philad." (LE).

The type clearly belongs to the North American and British species now called *Potamogeton epihydrus*. This identity was first suggested by Bennett (1891c), who studied another original specimen and identified it as *P. claytonii* Tuckerm. (now itself a synonym of *P. epihydrus*, see Wiegleb & Kaplan, 1998). Bennett's identification was adopted also by Fernald (1932) in his revision of this group of linear-leaved *Potamogeton* species.

***Potamogeton rutilus*** Wlfg. in Schult. et Schult. fil., Mant. 3: 362. 1827. = *P. pusillus* var. *rutilus* (Wlfg.) Wiedem. et E. Weber, Beschr. Phan. Gew. Esth-, Liv-Curl. 94. 1852.

Type citation: "In lacubus et stagnis circa Wilnam, Wlfg." [Vilnius, Distr. Vilnius, Lithuania].

Lectotype (designated here): "*Potamogeton rutilus* Wlfg., In aquis prope Vilnam, Herb. W. Besser" (LE; isolectotypes: BM, BP, BRNM, G, LE, P, S, W). Variations in the label data are: "*Potamogeton rutilus* Wlfg., In aquis prope Vilnam, Herb. W. Besser" (LE); "*Potamogeton rutilus* mihi, tab. 28., [legit J. F. Wolfgang] com. Besser a. 1824" (LE); "*Potamogeton rutilus* Wlfg., Lithuania, m: Wlfg; Lindemannio; 1825" (LE); "*Potamogeton rutilus* Wlfg., E Lithuan., Herb. W. Besser" (G); "*Potamogeton rutilus* Wlfg., E lacubus prope Vilnam, Herb. W. Besser" (BRNM, S); "*Potamogeton rutilus* mihi, J. W." (BM, P, W); "ex Hb. Fischer, Ex herbario horti Petropolitani, *Potamogeton rutilus* Wlfg., In aquis pr. Vilnam, Lithuania, leg. Wolfgang" (BM); "Herb. Fischer, *Potamogeton rutilus* mihi, tab. 28., Prof. Wolfgang" (BP); "*Potamogeton rutilus* Wlfg., [Herb.] v. Besser, In lacubus Lithuan." (BP). Possible syntype: "*Potamogeton rutilus* Wlfg., ... Wlfg. mon. ined. icon. 28, Circa Połuknie, Papiszki,

Daugierdziszki et Gobsta in lacubus et stagnis distr. Trocensis et Vilmensis, 1826" (KRA).

This is the correct name for the species related to *Potamogeton pusillus* L. s. str. that differs among other features in its rather rigid leaves, more robust turions and coarsely fibrous stipules that are whitish and opaque when dry. Soon after its first description, the species was adopted by Reichenbach (1845) and since then has generally been accepted.

***Potamogeton ×salicifolius*** Wlfg. in Schult. et Schult. fil., Mant. 3: 355. 1827, pro sp.

[= *P. lucens* L. × *P. perfoliatus* L.]

Type citation: "In fluvio Wilia non procul a Wilna" [Neris (Viliya) River, near Vilnius, Distr. Vilnius, Lithuania].

Lectotype (designated here): "Herb. Ledebour, *Potamogeton salicifolius* Wlfg., In fluv. Willia, Lithuan, Herb. W. Besser" (LE; isolectotypes: BM, G, K, L, LE, P, S). Variations in the label data are: "*Potamogeton salicifolius* Wlfg., in fluvio Wilia, Lithuania, Herb. W. Besser" (BM, K, LE, P); "*Potamogeton salicifolius* Wlfg., in fluv. Wilia prope Vilnam, Herb. W. Besser" (P); "Herb. Fischer, *Potamogeton salicifolius* Wlfg., Prope Vilnam" (LE); "*Potamogeton salicifolius* mihi, tab. 13., com. Besser m. 1824" (LE); "*Potamogeton salicifolius* Wlfg., E rivis prope Vilna, Herb. W. Besser" (L); "*Potamogeton salicifolius* Wlfg., Wilna, leg. Wolfgang" (BM, S); "*Potamogeton salicifolius* Wlfg., Wilna, leg. Wolfgang, comm. H. W. Reichardt, orig. specimen" (BM); "*Potamogeton salicifolius* mihi, J. W. [J. F. Wolfgang]" (BM, P); "ex Hb. Fischer, Ex herbario horti Petropolitani, *Potamogeton salicifolius* Wlfg., In fluv. Wilia pr. Vilnam, Lithuania, Hb. Besser" (BM); "*P. salicifolius* Wlfg., Lithuania, [herb.] Besser" (K); "*Potamogeton salicifolius* Wlfg., In fluv. Lithuan., Hb. W. Besser, Besser misit 9br. 1826" (K); "*Potamogeton salicifolius* Wolfgang, E Lithuan., Herb. W. Besser" (G); "*Potamogeton salicifolius* Wlfg., Lithuania, leg. Wolfgang!!!, com. Dr. Woloszczak" (S).

This rich collection consists of *Potamogeton lucens*-like plants with markedly elongate, sessile and semi-amplexicaul submerged leaves. Some of the specimens are robust mature plants whereas others are less so being characterised by slender side branches with small leaves. These extremes are connected by intermediate forms that may be seen among the numerous specimens cited above.

The specimens clearly belong to a hybrid between a member of *Potamogeton lucens*-group (sensu Wiegleb, 1988) and a species with leaves clasping the stem. The identity of the parental species remained unclear for a long time. First Bennett (1891a), commenting on Richter's account of European plants, noticed that "*P.*

*salicifolius* Woflg. belongs rather to *decipiens* than to *macrophyllus*". Soon after, Ascherson & Graebner (1897) and Graebner (1907) indicated that *P. salicifolius* was similar to their *P. lithuanicus*, which they regarded as the hybrid involving *P. alpinus* and *P. lucens*.

Hagström (cited by Bennett, 1908, and later in Hagström, 1916) considered the collections from Vilnius as consisting of two different hybrids: *Potamogeton* × *nitens* Weber (= *P. gramineus* × *P. perfoliatus*) and *P. decipiens* (= *P. lucens* × *P. perfoliatus*). The original *P. salicifolius* was restricted to the synonymy of *P. nitens*. Hagström's view has been widely followed by Russian and Baltic authors (Yuzepczuk, 1934; Galinis, 1969; Mäemets, 1979; Czerepanov, 1995). At that time Bennett (1908) stated that the original *P. salicifolius* was "the same as *lithuanicus* Gorski ... [which] are certainly not *nitens* Web., nor *decipiens* Nolte (sensu stricto)" but "*lucens* × *alpinus*".

In 1958, Dandy rather surprisingly reinstated the name *Potamogeton* × *salicifolius* for the hybrid *P. lucens* × *P. perfoliatus*. Unfortunately, he left no detailed discussion of why he chose this name. From his note on the variation of this hybrid in his account of British hybrids (Dandy, 1975) it may be deduced that he had the relatively narrow-leaved river phenotypes, from among the specimens gathered by Wolfgang in his mind when writing "this hybrid ... varies greatly in leaf-shape according to the type of water in which it is growing, being narrower-leaved in stronger currents".

The type collection shows a great deal of morphological variation, which we consider is a result of phenotypic plasticity and/or different stages of development of the different parts of the plant body (main stem vs. side branches). We therefore believe the type collection is taxonomically uniform, most likely consisting of plants from a single clone. We agree with Dandy that it is a hybrid between *Potamogeton lucens* and *P. perfoliatus*. This view was adopted also in the *Flora Europaea* (Dandy, 1980), a recent world-wide account of *Potamogeton* species and hybrids (Wiegleb & Kaplan, 1998), and in some regional revisions (e.g., Preston, 1995; Zalewska-Gałosz, 2002). This view is supported by the fact that unlike *P. nitens*, well-developed mature plants in the type collection of *P. salicifolius* have robust stipules that are slightly winged on the two dorsal ribs towards the base, more robust inflorescences with thick peduncles, and leaves up to 14.5 cm long. In contrast to the hybrid *P. alpinus* × *P. lucens*, with the correct binomial *P. nerviger* (see above), *P. salicifolius* has acute to shortly mucronate leaf apices, broadly acute to semiamplexicaul leaf bases, midribs only narrowly bordered by lacunae just near the base, and leaves that lack a copper tinge when dry. Finally, the identity of the parental species is supported by the fact that both *P.*

*lucens* and *P. perfoliatus* have repeatedly been collected in the type locality.

The somewhat unusual narrow-leaved phenotype seen in the type collection of *Potamogeton* × *salicifolius* may be the result of it being encountered in running water. Also collections of *P. lucens* from the Neris (Viliya) River in Vilnius have markedly narrow and prolonged leaves, see, e.g., collections by T. Symonowiczówna (in E. Wołoszczak, Fl. Polon. Exs. no. 677), in BM, G, K, LE, S, WU-Hal; or S. B. Gorski (in H. G. L. Reichenbach, Fl. Germ. Exs. no. 2501) in BM, BR, CGE, G, K, LE, P, PRC, S, UPS, W, WAG, ZT. River phenotypes like these are known to occur in many *Potamogeton* taxa. They usually revert to the ordinary form when cultivated in standing water (Kaplan, 2002).

***Potamogeton* × *undulatus*** Woflg. in Schult. et Schult. fil., Mant. 3: 360. 1827, pro sp.

[= *P. crispus* L. × *P. praelongus* Wulf.]

Type citation: "In fluvio Waha [sic!] prope Wilnam, Woflg." [Voke (Vaka) River, near Vilnius, Distr. Vilnius, Lithuania].

Lectotype (designated here): "Herb. Fischer, *Potamogeton undulatus* Woflg., e fluvio Waka, Lituania [sic!], Herb. W. Besser" (LE; isolectotypes: BM, BRNM, C, G, K, LE, P, S, UPS, W†). Variations in the label data are: "*Potamogeton undulatus* Woflg., E fluvio Waka, Lithuania, Herb. W. Besser" (BRNM, LE); "*Potamogeton undulatus* mihi, tab. 22., com. Besser a. 1824." (LE); "*Potamogeton undulatus* Woflg., In fluv. Waka Lithuaniae, Herb. W. Besser" (BM, K, LE); "*Potamogeton undulatus* mihi!, Wilna, legit Wolfgang" (W†, photo C); "*Potamogeton undulatus* Woflg., E Lithuania in fluvio Waka, Herb. W. Besser" (BM); "*Potamogeton undulatus* Wolfgang, E Lithuania, Herb. W. Besser" (K); "ex Hb. Fischer, Ex herbario horti Petropolitani, *Potamogeton undulatus* Woflg., fl. Waka Lithuania. Hb. Besser" (BM); "*Potamogeton undulatus* mihi!, J. W." (BM, P); "*Potamogeton undulatus* Woflg., Wilna, leg. Wolfgang" (S); "*Potamogeton undulatus* Wolfgang., ad Vilnam, Horaninow dedit" (UPS); "Herbarium I. Baagöe, *P. crispus* L. × *P. praelongus* Wulf., *P. undulatus* Woflg., Forma: typicus, Wilna, Determ. Wolfgang, leg. Wolfgang, comm. G. Tiselius." (C); "*Potamogeton undulatus* Woflg., Lithuania, leg. Wolfgang, com. Dr. Wołoszczak" (G); "*Potamogeton undulatus* Woflg., E Lithuania in fluvio Waka, Herb. W. Besser" (G).

An important contribution to the acceptance of *Potamogeton* × *undulatus* as a hybrid involving *P. crispus* and *P. praelongus* was made by Baagöe (1897) who studied both fresh Danish material and Wolfgang's herbarium specimens. Baagöe provided a detailed analysis of the morphology and stem anatomy of this plant, a descrip-

tion of its habitats, a list of the studied specimens and literature records, and an analysis of the literature dealing with its name.

The Baagöe's interpretation, even when still only personally communicated, was promptly adopted by his contemporaries: Raunkiaer (1896), Fryer (1897) and Ascherson & Graebner (1897). Since then, the name has been widely used in the literature and adopted, e.g., by Graebner (1907), Hagström (1916), Dandy & Taylor (1967), Dandy (1980), Preston (1995), Wiegleb & Kaplan (1998) and Zalewska-Gałosz (2002).

***Potamogeton divaricatus*** Wofg. in Schult. et Schult. fil., Mant. 3: 355. 1827.

Type citation: origin not given but indicated as being preserved "in herb. Gilibert" as "*P. setaceus*".

We failed to locate any authentic material of this name in studied herbaria. The identity of the name is unclear; it has never been adopted since its first introduction and there is practically no mention of it in modern literature.

***Potamogeton rigidus*** Wofg. in Schult. et Schult. fil., Mant. 3: 359. 1827.

[= ? *P. natans* L. × *P. lucens* L. = *P. ×fluitans* Roth]

Type citation: "In fluvio Niemen circa Szczorse. D. Jos. Jundzill" [Neman (Nyoman) River, Szczorse, Distr. Navahrudak, Prov. Hrodzjenskaya, Belarus].

Possible authentic material: "*Potamogeton praelongus*, S[z]czorse" [1823].

We failed to locate any unequivocal type material of this name in studied herbaria. No specimen under this name is preserved in the Jundzill Herbarium in KRAM (see also Köhler, 1995). The identity of the name is doubtful (Bennett, 1893; Hagström, 1916). According to the description, the plant may have been *Potamogeton nodosus* or *P. ×fluitans*. Galinis (1963a) included the name in the synonymy under *P. nodosus*, which is at least in part *P. ×fluitans*, as is obvious from the stem anatomy given in her separate paper (Galinis, 1963b).

There is a specimen in the Jundzill Herbarium in KRAM, originally identified as *Potamogeton praelongus*, which is in fact *P. ×fluitans*, and which was collected at the same locality as that indicated in the protologue of *P. rigidus*. The morphology of this specimen agrees with the original description, and it may well be a duplicate of the original collection studied and used for the description of *P. rigidus* by Wolfgang. However, there is no direct evidence to support this assumption, as the name *P. rigidus* is not attached to the specimen preserved in KRAM.

***Potamogeton volhynicus*** Besser ex Roem. et Schult., Syst. Veg. ed. 16. 3: 509. 1818.

[= *P. lucens* L.]

Type citation: "in Volhynia" [historic region, now in WNW Ukraine].

Lectotype (designated here): "*Potamogeton lucens* L., In aqu. Volhyn., Herb. W. Besser" (LE).

The type specimen is a plant with somewhat bigger and slightly longer leaves than most common forms of *Potamogeton lucens* from standing water. Otherwise, it shows all the diagnostic features of this species and we agree with Bennett (1891b) and Hagström (1916) who synonymized *P. volhynicus* under *P. lucens*.

***Potamogeton ×lithuanicus*** Gorski ex Aschers. et Graebn., Synops. Mitteleur. Fl. 1: 328. 1897 ('Lithuanicus'). = *P. ×decipiens* var. *brevifolius* f. *lithuanicus* (Gorski ex Aschers. et Graebn.) Hagstr., Kongl. Svenska Vetenskapsakad. Handl. 55(5): 244. 1916.

[= *P. lucens* L. × *P. perfoliatus* L. = *P. ×salicifolius* Wofg.]

Type citation: "Russisch-Littauen: bei Wilna, Gorski" [Vilnius, Distr. Vilnius, Lithuania].

Lectotype (designated here): "2401. ... *P. lithuanicus* Gorski, Inter lucentem et praelongum medius, Im Flusse Vilia (Nevis [sic!, recte: Neris] Lithuanorum) bei Wilna, Prof. S. B. Gorski, Reichenb. Fl. germ. exsicc., Nov. 1844" [S. B. Gorski (in H. G. L. Reichenbach, Fl. Germ. Exs. no. 2401)] (K; isolectotypes: BM, BR, CGE, L, LE, PRC, S, UPS, WAG). Syntypes: "*P. lithuanicus* Mihi, e flumine Vilia Lithuaniae, 1847 S. B. Gorski proff." (BM); "*Potamogeton lithuanicus* mihi, e flumine Vilia in Lithuania, 1847, Prof. S. B. Gorski" (K); "*Potamogeton lithuanicus* Mihi, In flumine Vilia Lithuaniae, 1847, Prof. S. B. Gorski" (B, S); "*Potamogeton lithuanicus* Mihi, Icon. pl. Lithuan. Pl. crit., In flumine Vilia prope Vilnam et Michaliszki, Herb. Prof. S. B. Gorski" (KRAM).

The name "*P. lithuanicus* Gorski" first appeared in the literature in Reichenbach (1845) who did not adopt it but cited as a synonym of his misapplied "*P. lanceolatus* Smith". The accompanying illustration agrees with the plants in authentic collections. The name was first adopted and validated by Ascherson & Graebner (1897) and soon after by Zapałowicz (1906), as "*P. alpinus* × *P. lucens*". Ascherson and Graebner almost certainly studied a duplicate preserved in B. This authentic specimen, however, was destroyed during World War II. No other duplicate designated by either Ascherson or Graebner is available. That is why we selected a lectotype from among other duplicates of the original collection.

The history of the name *Potamogeton ×lithuanicus* is similar to that of *P. ×salicifolius* (see above). In fact, plants of authentic specimens of these names are morphologically similar. Both sets of specimens originate

from the Neris (Viliya) River in Vilnius, and their close similarity suggests they came from the same clone. The influence of *P. lucens* is obvious and the slightly yellowish tinge of leaves led authors to believe that the second parent was *P. alpinus*. However, the markedly acute leaf apex and broadly acute to semiamplexicaul leaf base favours the origin of *P. ×lithuanicus* as *P. lucens* × *P. perfoliatus*. The type collection consists of the river phenotype of *P. ×salicifolius* with prolonged leaves. *Potamogeton ×lithuanicus* was synonymized with this hybrid (under the name *P. ×decipiens*) by Hagström (1916), Yuzepczuk (1934) and Mäemets (1979).

## CONCLUSIONS

Altogether 14 of the *Potamogeton* names originally proposed by Wolfgang, Besser and Gorski are discussed, and 12 of them typified and interpreted. The names *P. rutilus* Wulfg., *P. ×nerviger* Wulfg., *P. ×salicifolius* Wulfg. and *P. ×undulatus* Wulfg. are the correct names for the respective entities. In spite of an extensive search in 54 European herbaria and loan requests sent to many others, we have not been able to locate authentic material of two of the names, namely *P. divaricatus* Wulfg. and *P. rigidus* Wulfg. We would appreciate any supplementary information from readers or herbarium curators on the whereabouts of authentic specimens of these names and of the originals of Wolfgang's or Gorski's illustrations.

## ACKNOWLEDGEMENTS

We would like to thank curators of the above-mentioned herbaria who allowed us to study their plant material. We are grateful to Tony Dixon for language correction of the manuscript. ZK was supported by grants no. 206/02/0773 from the Grant Agency of the Czech Republic and no. AV0Z6005908 from the Academy of Sciences of the Czech Republic. Visit of ZK to the collections and libraries of The Natural History Museum, London, was partly supported by European Community - Access to Research Infrastructure Action of the Improving Human Potential Programme.

## LITERATURE CITED

- Ascherson, P. & Graebner, P. 1897. *Synopsis der mitteleuropäischen Flora*, vol. 1. Wilhelm Engelmann, Leipzig.
- Baagöe, J. 1897. *Potamogeton undulatus* Wolfgang. *Bot. Tidsskr.* 21: 221–236, plate 7.
- Babicz, J. & Grebecka, W. (eds.) 1988. *Wkład Wileńskiego Ośrodka Naukowego w Przyrodnicze Poznanie Kraju (1781–1842)* [Explorations of the country's nature at Vilna scientific centre (1781–1842)]. [Monografie z dziejów nauki i techniki, vol. 141] Zakład Narodowy imienia Ossolińskich, Wydawnictwo Polskiej Akademii Nauk, Wrocław, Warszawa, Kraków, Gdansk, Łódź. [In Polish.]
- Balinski, M. 1835. *Opisanie Statystyczne Miasta Wilna* [Statistical description of the Vilnius town]. Wilno. [In Polish.]
- Bennett, A. 1889. The synonymy of *Potamogeton rufescens* Schrad. *J. Bot. (London)* 27: 242–244.
- Bennett, A. 1890. The nomenclature of *Potamogetons*. *J. Bot. (London)* 28: 297–302.
- Bennett, A. 1891a. Notes on *Potamogeton*. *J. Bot. (London)* 29: 75–76.
- Bennett, A. 1891b. The nomenclature of *Potamogetons*. *J. Bot. (London)* 29: 150–152.
- Bennett, A. 1891c. The nomenclature of *Potamogetons*. *J. Bot. (London)* 29: 307.
- Bennett, A. 1893. Notes on *Potamogetons*. *J. Bot. (London)* 31: 132–134.
- Bennett, A. 1908. Notes on *Potamogeton*. *J. Bot. (London)* 46: 247–251.
- Czerepanov, S. K. 1995. *Sosudistye Rasteniya Rossii i Sopredel'nykh Gosudarstv* [Vascular plants of Russia and adjacent states]. Mir i semya, St. Petersburg.
- Dandy, J. E. 1958. *List of British Vascular Plants*. British Museum (Natural History) & Botanical Society of the British Isles, London.
- Dandy, J. E. 1975. *Potamogeton* L. Pp. 444–459 in: Stace, C. A. (ed.), *Hybridization and the Flora of the British Isles*. Academic Press, London.
- Dandy, J. E. 1980. 1. *Potamogeton* L. Pp. 7–11 in: Tutin, T. G., Heywood, V. H., Burges, N. A., Moore, D. M., Valentine, D. H., Walters, S. M. & Webb, D. A. (eds.), *Flora Europaea*, vol. 5. Cambridge Univ. Press, Cambridge.
- Dandy, J. E. & Taylor, G. 1939. Studies of British *Potamogetons*. IV: the identity of *Potamogeton Drucei*. *J. Bot. (London)* 77: 56–62.
- Dandy, J. E. & Taylor, G. 1967. *Potamogeton alpinus* × *lucens* = *P. ×nerviger* Wulfg. in: Sell, P. D. (ed.), Taxonomic and nomenclatural notes on the British flora. *Watsonia* 6: 314–317.
- Eichwald, E. 1830. *Naturhistorische Skizze von Lithauen, Volhynien und Podolien in geognostisch-mineralogischer, botanischer und zoologischer Hinsicht*. Joseph Zawadzki, Wilno.
- Fernald, M. L. 1932. The linear-leaved North American species of *Potamogeton*, section Axillares. *Mem. Amer. Acad. Arts Sci.* 17: 1–183.
- Fischer, G. 1907. Die bayerischen *Potamogetonen* und *Zannichellien*. *Ber. Bayer. Bot. Ges.* 11: 20–162.
- Fryer, A. 1897. *Potamogeton undulatus*, Wolf. = *P. perfoliatus* × *crispus*. *Rep. Bot. Soc. Exch. Club Brit. Isles* 1: 497.
- Galinis, V. 1963a. 1 šeima. Pludiniai - *Potamogetonaceae* Engl. Pp. 35–84 & 677 in: Natkevicaite-Ivanauskienė, M. (ed.), *Lietuvos TSR Flora* [Flora of Lithuania], vol. 2. Lietuvos TSR Mokslu Akademija Botanikos Institutas, Vilnius.
- Galinis, V. 1963b. Keletas nauju *Potamogeton* formu ir hibridu Lietuvos TSR floroje [Several new forms and hybrids of *Potamogeton* in the flora of Lithuania]. *Lietuvos T.S.R. Auks. Mokyklu Mokslu Darbai, Biol.* 3: 97–108.
- Galinis, V. 1969. Novae formae *Potamogetonum* in flora RSS

- Lituaniae. Lietuvos T.S.R. Mokslu Akad. Biol. Inst. Darb., Biol. 9: 43–60.
- Głowacki, W. W.** 1960. *Jan Fryderyk Wolfgang 1775–1859*. Państwowy Zakład Wydawnictw Lekarskich, Warszawa. [In Polish.]
- Gorski, S. B.** 1849. *Icones Potamogetonum, Characearum, Cyperacearum et Graminearum Novas vel Ninus Cognitas Species Lithuaniae Illustrantes*. Berlin. [20 plates in folio edition. Not seen.]
- Graebner, P.** 1907. 4. *Potamogeton* (Tourn.) L. Pp. 39–142 & 161–162 in: Engler, A. (ed.), *Das Pflanzenreich, Regni Vegetabilis Conspectus*, vol. 31 (IV.11). W. Engelmann, Berlin.
- Greuter, W., McNeill, J., Barrie, F. R., Burdet, H. M., Demoulin, V., Filgueiras, T. S., Nicolson, D. H., Silva, P. C., Skog, J. E., Trehane, P., Turland, N. J. & Hawksworth, D. L.** (eds.). 2000. *International Code of Botanical Nomenclature (Saint Louis Code)* adopted by the Sixteenth International Botanical Congress, St Louis, Missouri, July–August 1999. Koeltz Scientific Books, Königstein. [Regnum Veg. 138.]
- Hagström, J. O.** 1916. Critical researches on the potamogetons. *Kongl. Svenska Vetenskapsakad. Handl.* 55: 1–281.
- Haynes, R. R. & Hellquist, C. B.** 2000. 195. *Potamogetonaceae* Dumortier. Pp. 47–74 in: Flora of North America Editorial Committee (eds.), *Flora of North America*, vol. 22. Oxford Univ. Press, New York.
- Hryniewiecki, B.** 1952. Stanisław Batys Gorski (1802–1864) życiorys i prace [Stanisław Batys Gorski (1802–1864) biography and publications]. *Prace Kom. Hist. Med. Nauk Mat. Przyr.* 4(2): 1–26, 3 plates. [In Polish.]
- Hultén, E.** 1960. *Flora of the Aleutian Islands and westernmost Alaska Peninsula, with Notes on the Flora of Commander Islands*, ed. 2. J. Cramer, Weinheim.
- Kaplan, Z.** 2002. Phenotypic plasticity in *Potamogeton* (*Potamogetonaceae*). *Folia Geobot.* 37: 141–170.
- Köhler, P.** 1994. Zielniki botaników ośrodka Wileńskiego z lat 1780–1840 w Kijowie, Krakowie i Wilnie [Herbaria in Kiev, Kraków and Vilnius collected by botanist from the Vilnius University between 1780–1840]. *Kwartalnik Historii Nauki i Techniki* 39: 109–116. [In Polish.]
- Köhler, P.** 1995. Zielnik Józefa Jundziłła [Herbarium of Józefa Jundziłł]. *Polish Bot. Stud., Guidebook Series* 13: 3–154. [In Polish.]
- Mäemets, A. A.** 1979. Rod 2. Rdest - *Potamogeton* L. Pp. 176–192 in: Fedorov, A. A. (ed.), *Flora Evropeiskoi Chasti SSSR* [Flora of the European part of the USSR], vol. 4. Nauka, Leningrad.
- Mowszowicz, J.** 1957–1959. *Conspectus Florae Vilnensis, Przegląd Flory Wileńskiej* [A review of the Vilnius flora]. Part 1–3. Łódzkie Tow. Nauk. Wydz. III, Łódź. [In Polish.]
- Mowszowicz, J.** 1973. Stanisław Batys Gorski (1802–1864). *Wiadom. Bot.* 17: 141–143. [In Polish.]
- Ogden, E. C.** 1943. The broad-leaved species of *Potamogeton* of North America north of Mexico. *Rhodora* 45: 57–105, 119–163, 171–214.
- Papchenkov, V. G.** 1997. Zаметки о *Potamogeton gramineus* s. l. (*Potamogetonaceae*). [Notes on *Potamogeton gramineus* s. l. (*Potamogetonaceae*).] *Bot. Zhurn.* 82: 65–76.
- Preston, C. D.** 1995. *Pondweeds of Great Britain and Ireland*. Botanical Society of the British Isles, London.
- Raunkiaer, C.** (1896). *De Danske Blomsterplanters Naturhistorie*, vol. 1(1). Copenhagen.
- Reichenbach, H. G. L.** 1845. *Icones Florae Germanicae et Helveticae*, vol. 7, Isoeteae – Gramineae. Lipsiae.
- Reichenbach, H. G.** 1854–1900. *Xenia Orchidaceae: Beiträge zur Kenntniss der Orchideen*. Leipzig.
- Reveal, J.** 1977. Family *Potamogetonaceae*, the Pondweed family. Pp. 24–42 in: Cronquist, A., Holmgren, A. H., Holmgren, N. H., Reveal, J. L. & Holmgren, P. K. (eds.), *Intermountain Flora, Vascular Plants of the Intermountain West, U.S.A.*, vol. 6 (The Monocotyledons). Columbia Univ. Press, New York.
- Schultes, J. A. & Schultes, J. H.** 1827. *Mantissa in Volumen tertium Systematis Vegetabilium Caroli a Linné*. Stuttgartiae.
- Trautvetter, E. R.** 1880. *Florae Rossicae Fontes*. Petropoli.
- Wiegleb, G.** 1988. Notes on pondweeds—outlines for a monographical treatment of the genus *Potamogeton* L. *Feddes Repert.* 99: 249–266.
- Wiegleb, G. & Kaplan, Z.** 1998. An account of the species of *Potamogeton* L. (*Potamogetonaceae*). *Folia Geobot.* 33: 241–316.
- Yuzepczuk, S. V.** 1934. Sem. XVII. Rdestovye - *Potamogetonaceae* Engl. Pp. 224–265 in: Komarov, V. L. (ed.), *Flora SSSR [Flora URSS]*, vol. 1. Izdatelstvo Akademii Nauk SSSR, Leningrad & Moskva.
- Zalewska-Gałosz, J.** 2002. Occurrence and distribution of *Potamogeton* hybrids (*Potamogetonaceae*) in Poland. *Feddes Repert.* 113: 380–393.
- Zapałowicz, H.** 1906. *Krytyczny Przegląd Roślinności Galicyi. Conspectus Florae Galiciae criticus*, vol. 1. Nakładem Akademii Umiejętności, Kraków. [In Polish.]