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Authors: Malekmohammadi, Maryam, Lack, H. Walter, Lomonosova, Maria, and Akhani, Hossein

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Willdenowia
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MARYAM MALEKMOHAMMADI[1], H. WALTER LACK[2*], MARIA LOMONOSOVA[3] & HOSSEIN AKHANI[1]

The discovery, naming and typification of *Limonium gmelini* (*Plumbaginaceae*)

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Abstract: An account is given of the early reports of *Limonium gmelini* and the pre-Linnaean names attached to this extremely widespread plant. The uncertainties created by Carl Ludwig Willdenow when validating the name *Statice gmelini* are clarified and the earlier lectotypification of this name modified because the herbarium sheet cited has been found to represent more than one taxon. One of the elements is selected as the new lectotype and an epitype is designated. Sequences of one nuclear and three plastid markers have been submitted to GenBank.

Key words: *Plumbaginaceae*, *Limonium*, *Limonium gmelini*, nomenclature, lectotype, epitype, Russia, Siberia, Johann Georg Gmelin, Carl Ludwig Willdenow

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Introduction

Limonium gmelini is a perennial species with an extremely wide Eurasian distribution belonging to *L.* sect. *Limonium* sensu Boiss. (1848). Together with *L. hirsuticalyx* Pignatti, *L. meyeri* (Boiss.) Kuntze, *L. narbonense* Mill. and *L. vulgare* Mill. it forms a species complex, currently under study, characterized by large basal leaves and panicle-like inflorescences (Akhani & al. 2013; Malekmohammadi & al. submitted). Because of the several names for *L. gmelini* involved and the fact that the species has spread recently along motorways in the Czech Republic, Hungary and Austria (Hohla & al. 2015; Kocián & al. 2016), it seems necessary to analyse the discovery and naming of this taxon and clarify its nomenclature, before the whole group is critically reviewed over its wide range. In addition, the species is properly lectotypified, an epitype is designated and sequences of one nuclear and three plastid markers have been submitted to GenBank.

Uncertain early reports

Considering the fact that *Limonium gmelini* occurs from Slovakia, Hungary and Serbia in the west (Domina 2011; Vestek & al. 2016) to the province of Xinjiang in China (Peng & Kamelin 1996) and Mongolia (Grubov 1982) in the east, with numerous reports for the regions in between (e.g. Linczevskij 1952; Rechinger & Schiman-Czeika 1974; Kovtonjuk 1997), it may come as no surprise that the first reports of this species seem to refer to specimens gathered in Siberia. What is outstanding is the very early

1 Halophytes and C4 Plants Research Laboratory, Department of Plant Sciences, School of Biology, College of Sciences, University of Tehran, PO Box 14155–6455, Tehran, Iran.
2 Botanischer Garten und Botanisches Museum Berlin, Freie Universität Berlin, Königin-Luise-Str. 6–8, 14195 Berlin, Germany; *e-mail: h.w.lack@bgbm.org (author for correspondence).
3 Central Siberian Botanical Garden, Siberian Branch of the Russian Academy of Sciences, 630090 Novosibirsk, Russia.

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date of the findings. Since these pre-Linnaean reports are directly relevant to fully understand the proper interpretation of the name *Statice gmelini* they are dealt with here in some detail.

On the orders of Peter the Great, Emperor of all the Russias, Daniel Gottlieb Messerschmidt (Novljanskaja 1970) travelled in 1719–1727 in Siberia and collected in marshy fields near the fortress of Jalutorowsk a plant which was later interpreted by Johann Georg Gmelin in his *Flora Sibirica* (Gmelin 1752: 220–221) as belonging to his *Statice caule nudo ramoso*, *floribus panniculatis*, *corollis minimis*. The respective specimen is untraceable: Messerschmidt's plant material deposited in the Kunstkamera in St. Petersburg seems to have been destroyed by fire in 1747 (Novlyanskaja 1970), the respective specimen is not listed among the few kept in the Sloane Herbarium at BM (Bryce 2005) and in the Linnaean Herbarium at LINN (Jarvis 2007; herbarium codes according to Thiers 2017+). Surprisingly Messerschmidt did not mention the locality Jalutorowsk in his extensive diary (Winter & Figurovskij 1962–1977), but there is no doubt about its geographical position in W Siberia. A few years later and even further west – on the river Ural near the newly founded town of Orenburg (51°46'N, 55°06'E) – Johann Gottfried Heinzelmann collected a specimen of *Limonium*, which was included in Amman's *Limonium elatius*, *floribus parvis dense congestis azureis* and described by the latter in his *Stirpium rariorum* (Amman 1739: 96–97), the first comprehensive Flora of the Russian Empire (Koroloff 2016). The identity and fate of this specimen remains unknown; apparently it was not included in the plants sent by Amman to Sir Hans Sloane in London (Dandy 1958: 82). Furthermore it was not illustrated by Amman, then the chair of botany at the Imperial Academy of Sciences (Koroloff 2016) and the assistant director of the Kunstkamera (Sokoloff & al. 2002). It addition, is not among the material sent by Amman to Linnaeus (Jarvis 2007) and seems not to have been cultivated in the botanical garden of the Imperial Academy of Sciences on Vasilevsky Island, St. Petersburg. However, the two specimens collected by Messerschmidt and Heinzelmann, respectively, were later associated with names given to what we now understand as *L. gmelini*.

Johann Georg Gmelin and Linnaeus

In addition to the obscure Heinzelmann specimen, Amman's *Limonium elatius*, *floribus parvis dense congestis azureis* is based on (1) a gathering from the river Don in S Russia, of which no further information is available, and (2) a collection by Gmelinus from "Sibiria" (Amman 1739: 97). Clearly Gmelinus (see below) stands for Johann Georg Gmelin, professor of chemistry and natural history at the Imperial Academy of Sciences in St. Petersburg and one of the three professors leading the academic group of the famous Second Kamchatka Expedition, though he himself did not reach Kamchatka (e.g. Bryce 2008). This expedition had been sent out on the orders of Anna Ivanovna, Empress of all the Russias, in 1733 and was to end only in 1743, i.e. after the publication of Amman's text. Clearly the respective specimen must have been sent from Siberia to St. Petersburg for inclusion.

When he was finally back in the capital of the Russian Empire, Gmelin studied his botanical collections and started to publish the results in his *Flora Sibirica*, of which the first volume appeared in 1747 and the second in 1752. In the latter, Gmelin's name *Statice caule nudo ramoso*, *floribus paniculatis*, *corollis minimis* (see above) was published with the provenance of the material given as "nascitur a Iaico ad Angaram usque ad lacus salsos e nonnumquam etiam in locis montosis, non valde a lacubus remotis" [grows from the river Ural to the river Angara as far as the salt lakes and sometimes even in the mountains not far away from these lakes], indeed a very appropriate piece of information on its wide distribution in Siberia. Gmelin's entry was accompanied by a copper engraving (t. 90; Fig. 1) based on a plant illustration prepared by one of the natural history illustrators of the expedition, i.e. Johann Cornelius Decker or Johann Wilhelm Lürsenius (Rees 2015). It is of good quality for the time and gives a relatively clear impression of the plant described; however, it remains unclear if Gmelin's or Messerschmidt's specimen was the basis of this illustration. Remarkably Gmelin cited Amman's earlier *Limonium elatius floribus parvis dense congestis azureis* in synonymy (Gmelin 1752: 220). Gmelin's herbarium was deposited in 1757 in the Kunstkamera, but later parts of this collection were reported lost due to negligent management (Roskov 2004), while other specimens were passed together with the herbarium of Peter Simon Pallas to Aylmer Bourke Lambert at Boyton House, Wiltshire, England (Miller 1970). As a matter of fact, the latter stated that he possessed "the greatest part of the plants figured in the *Flora Sibirica* of Gmelin … and of those figured in Amman's *Stirp. Rarior* …" (Lambert 1809). Subsequently Lambert donated parts of the Pallas herbarium to Sir Joseph Banks in London (now in the Natural History Museum, London, BM) and Jacques Julien Houtton de Labillardière in Paris (now in the Museo di storia naturale, Firenze, FI) while upon Lambert's death the rest of it was auctioned in London in two lots and was further dispersed (Miller 1970; Sytin 2014).

The rest of Gmelin's herbarium conserved in the Kunstkamera was later transferred to what is now the herbarium of the Komarov Institute of the Russian Academy of Sciences in St. Petersburg (Lipšic & Vasil'čenko 1968). However, the Siberian and Far East section of this collection does not contain Gmelin's specimen of *Statice caule nudo ramoso*, *floribus paniculatis*, *corollis minimis* (Geltman 1998). The herbarium of Alexander Wilhelm Martini, who had accompanied Gmelin in the years 1740–1743 in Siberia, kept in the Staatliches Museum für Naturkunde in Stuttgart, also does not house the respective specimen

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Fig. 1. *Limonium gmelini*. Anonymous copper engraving based on a plant drawing by Decker or Lürsenius. J. G. Gmelin, *Flora Sibirica* 2: t. 90, Petropoli, 1752. – Göttingen, Niedersächsische Staats- und Universitätsbibliothek.

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(Sebald 1983). Gmelin was a correspondent of Linnaeus and sent no less than 29 letters and various herbarium specimens to Uppsala, a transfer that was not without problems (Sokoloff & al. 2002). The latter included material of a few *Limonium* species, e.g. of *L. suffruticosum* (L.) Kuntze (Jarvis 2007), but Gmelin's *Statice caule nudo ramoso*, *floribus paniculatis*, *corollis minimis* was not among them. Neither this polynomial and the respective copper engraving, both published in *Flora Sibirica*, nor Amman's polynomial were ever cited by Linnaeus (Richter 1840), with the consequence that this plant from Siberia did not receive a binomial from him.

Due to Willdenow's muddle and in particular the subsequent lectotypification in *Flora of Turkey*, albeit problematic (see below), locating the respective specimen collected by Gmelin and clarifying its identity are not relevant in the context of typification.

Carl Ludwig Willdenow's muddle

When Carl Ludwig Willdenow sat down to write the account of *Statice* for the fourth edition of Linnaeus's *Species plantarum* (Willdenow 1798), he possessed among others three herbarium specimens that he erroneously regarded as belonging to a single taxon. Later, these were mounted on two herbarium sheets, i.e. B-Willd. 6174/1 carrying specimens 1 and 2 and B-Willd. 6174/2 carrying specimen 3. For these, Willdenow provided the diagnosis "Statice scapo paniculato angulato, foliis oblongo-obovatis emarginatis planis cartilagineo-marginatis subtus mucronatis", the description "Simillima praecedenti [*Statice limonium*], sed folia firmiora margine non plicato-undulata, forma eorum obovata, mucro magis dissitus, flores duplo minores magis conferti, et habitus totius scapi diversus, distinctam suadent esse speciem" and attached the name *Statice gmelini* to them (Willdenow 1798: 1524). Due to a prior lectotypification (Bokhari & Edmondson 1982; see below), only specimens 1 and 2 are relevant in our context. They clearly differ: whereas specimen 1 is a totally glabrous inflorescence, specimen 2 consists of a rosette of leaves and the basal portion of a stem, both possessing hairs, albeit admittedly very few – the stem glochids, the leaves long stiff hairs.

Otherwise almost nothing is known about this material. No geographical information and collector's name are available for the two herbarium sheets and what is given on the inner side of the blue folders for B-Willd. 6174 consists of two notes – (1) "*Statice gmelini* Wolga" and (2) "[Christian Friedrich] Stephan" – and is inconclusive. The two labels refer either to the contents of the folder, i.e. B-Willd. 6174/1 and 6174/2, or to one of the two herbarium sheets. In addition, these notes are not in the hand of Willdenow but have been written by Diederich Friedrich Carl von Schlechtendahl, i.e. Schlechtendahl the father, and must be regarded as later interpretations of the specimens. In short, it is impossible to find out who actually collected B-Willd. 6141/1. However, it is absolutely clear that Willdenow possessed this herbarium material, since he added the abbreviation "v. s." (vidi siccum) to the respective entry in his account, meaning "I saw it", i.e. the plant, as a dried specimen (Willdenow 1798: 1524). At least part of this material may have come from Stephan, who is known to have sent specimens to Willdenow (Hiepko 1972). A key figure in Moscow botany, Stephan was professor of chemistry and botany at the Medical-Surgical School in Moscow, scientific director of the Moskovskij Aptekarskij ogorod (the Moscow Apothecary garden), re-established in 1786, and since 1798 also the first director of the extensive private botanical garden of Count Alexey Kirillovich Razumovsky in Gorenki near Moscow (Sokoloff & al. 2002).

The situation was made more complicated by Willdenow adding two references to his entry of *Statice gmelini* (Willdenow 1798: 1524): (1) "*S. caule nudo ramoso*, *floribus paniculatis*, *corollis minimis Gmel. sib.* 2 *p.* 220. *T.* 90*", i.e. the polynomial taken from Gmelin, with Willdenow's asterisk standing for a particularly detailed description (Willdenow 1797: viii) and (2) "*Limonium elatius*, *floribus parvis dense congestis azureis*. *Amm. Ruth*. 123", i.e. the polynomial from Amman (see above). Furthermore, Willdenow (1798: 1524) quoted the locality information given by Gmelin (1752: 221) for his own collections by adding "Habitat in Sibiria locis salsis a Jaico [Ural river] ad Angaram usque".

In short, Willdenow combined information taken from literature largely referring to Siberian plants (Amman 1739; Gmelin 1752) with his three herbarium specimens of doubtful origin, which possibly were not from Siberia, thereby creating a muddle that is difficult to resolve. In addition, it should be noted that Willdenow, in contrast to Linnaeus, is not known to have received any specimens collected by Gmelin (Hiepko 1972). In the first comprehensive commentary to Gmelin's *Flora Sibirica*, Willdenow's complex association of *Statice caule nudo ramoso*, *floribus paniculatis*, *corollis minimis* and t. 90 with the name *Statice gmelini* was confirmed (Ledebour 1841) and this interpretation was followed by subsequent authors.

Edmond Boissier annotated the sheet B-Willd. 6174/1 "Fol 1. *Statice gmelini* W Fol. 2 [i.e. B-Willd. 6174/2] *St. ovalifolia* Poiret." but did not realize that the two specimens on Fol. 1 (i.e. B-Willd. 6174/1) differ and refrained from any further note (Boissier 1848). Later the sheet B-Willd. 6174/1 was annotated "*S. Gmelini*, Willd. α. *genuina*, Boiss. C. E. Salmon" and referred to in a note (Salmon 1909) without the author realizing the difference in the hair cover between the two elements.

Amended lecto- and epitypification

Further problems were caused by the lectotypification of the name *Statice gmelini* Willd. in *Flora of Turkey* (Bokhari & Edmondson 1982), the authors stating

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"Type: [USSR] in Siberia locis salsis a Jaico ad Angaram usque, J. G. Gmelin (holo. B-Willd. 6174 [sheet 1], photo!)", i.e. the herbarium sheet B-W 06174-010 (http://herbarium.bgbm.org/object/BW06174010) carrying two specimens differing in their indumentum (see above). Therefore we conclude that the lectotype chosen in *Flora of Turkey* represents more than one taxon. In addition, the assertion that the selected lectotype was collected by Gmelin in Siberia (Bokhari & Edmondson 1982) is false.

Following *ICN* Art. 9.14 (McNeill & al. 2012), the name *Statice gmelini* must remain attached to that part which corresponds most nearly to the original description or diagnosis, i.e. either the right-hand or the left-hand specimen of B-Willd. 6174/1. When undertaking a careful examination of the diagnosis and description in the protologue (see verbatim quotations above), it becomes evident that both specimens correspond equally to what Willdenow stated.

A pragmatic approach to solve this problem takes into account the asterisk added by Willdenow to the Gmelin reference (Willdenow 1798: 1524), since the asterisk was used in this context as Linnaeus had done before – as an indication of a particularly detailed description that is helpful for providing additional information (see above). As a matter of fact, Gmelin (1752: 220) clearly described a specimen with a naked stem "caule nudo" and Willdenow (1798: 1524) repeated Gmelin's locality information. Consequently, it seems acceptable to regard the left-hand specimen of B-Willd. 6174/1 as the lectotype. However, its fragmentary nature precluded determination; in addition, it is impossible to look for an isolectotype, since no locality information for B-Willd. 6174/1 is available.

As a consequence, the selection of an interpretative guide to the lectotype is necessary. The present authors follow current usage of the name *Statice gmelini* (= *Limonium gmelini*) as in modern Floras (e.g. Rechinger & Schiman-Czeika 1974; Kovtonjuk 1997) and have considered Gmelin's travel routes in Siberia (Gmelin 1751–1752; Dahlmann 2009: map 3). We choose as epitype the specimen *V. Chepinoga 12486* (IRKU), collected on 17 July 2003 in Irkutsk Oblast, Russia (see below).

Limonium gmelini (Willd.) Kuntze, Revis. Gen. Pl. 2: 395. 1891 ≡ *Statice gmelini* Willd., Sp. Pl. 1: 1524. 1798. – **Lectotype (designated here):** Herb. Willdenow No. 6174/1, left-hand (flowering) specimen (B-W 06174-010). – **Epitype (designated here):** Russia, Irkutsk oblast, Ust-Orda Buryat okrug, Alarsky district, 8 km SE of Alyaty settlement, vicinity of Shaloty village, around road to Zhalgai, 17 Jul 2003, *V. Chepinoga 12486* (IRKU; isoepitypes: B 10 0673697 [Fig. 2], IRAN, IRK).

Description — *Herbs* perennial, 35–50 cm tall, glabrous except on calyces. *Leaves* obovate-oblong, 7–11 cm long, 2–3 cm wide, margin entire. *Inflorescence* a panicle-like cyme, congested. *Spikes* curved, 0.4–1(–2) cm long, with 4–8 spikelets per cm. *Spikelets* (3.5–)4 mm long, 2(or 3)-flowered. *Outer bract* triangular-semicircular, c. 1.5 mm long, c. 1.5 mm wide, margin broadly membranous, central part thickened, apex acute. *Middle bract* elliptic, c. 2 mm long, 1.7–2 mm wide, membranous, with 2 narrow, light brown nerves, apex asymmetrically emarginate. *Inner bract* orbicular-elliptic, 2.5–2.7 mm long, c. 3 mm wide, margin broadly membranous, central part thickened, apex retuse to emarginate. *Calyx* obconic, 3–3.5(–4) mm long; *calyx tube* hairy proximally, nerves ending near base of lobes; *calyx lobes* triangular-semicircular, c. 0.5 mm long. *Corolla lobes* bluish purple, obovate, 4–5 mm long.

GenBank accession numbers — The following nuclear and plastid sequences of the epitype have been submitted to GenBank: internal transcribed spacer (nrITS); *petD* intron with *petB-petD* spacer (*petD*); *trnL* intron with *trnL-trnF* spacer (*trnL-F*); *trnK* intron with *matK* gene. The accession number for nrITS is MF041919; the other accession numbers have not yet been received.

Orthographical note

A final note on the orthography of the epithet "*gmelini*", as deliberately chosen by Willdenow in the protologue, seems necessary. Johann Georg Gmelin is known to have latinized his name in his Latin contributions to the *Commentarii Academiae Scientiarum imperialis Petropolitanae* (Belkovec 1990), where he appeared as "auctore G. Gmelin." (in which the second dot abbreviates "Gmelino"). He was known under this variant to his contemporaries, e.g. Amman (see above), while in other publications he used the name Gmelin, e.g. in *Flora Sibirica* (Gmelin 1747, 1752) and in his travelogue *Reise durch Sibirien* (Gmelin 1751–1752). After his death the latinized form "Ioannes Georgius Gmelinus" seems to have become more firmly established, e.g. it is found on the mezzotint by Johann Jacob Haid showing Gmelin's portrait, with the print kept, e.g., in the archives of the Russian Academy of Sciences in St. Petersburg (shelf mark: R. X, op. 1–6, d. 74). Willdenow may well have had the latinized name in mind when coining the name *Statice gmelini*. The authors therefore refrain from changing the orthography of the epithet to "*gmelinii*" and in accordance with Recommendation 60C.2 of the *ICN* regard Gmelinus as an already established latinized form.

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Fig. 2. *Statice gmelini* (≡ *Limonium gmelini*), isoepitype specimen: *V. Chepinoga 12486* (B 10 0673697).

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