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Communication

Is *Groenlandia densa* (Potamogeonaceae) a native species to Lithuania?

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Abstract

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The lack of well-documented records on rare and endangered species often poses the problem of determining whether a species is native to the area. The aim of this study was to review and evaluate all existing data on the occurrence of *Groenlandia densa* (L.) Fourr. (Potamogeonaceae), a species thought to be extinct in Lithuania. Literature sources from the 18th century onwards and herbarium specimens kept in Lithuanian herbaria (WI, BILAS), were studied and critically evaluated. The analysis of the literature data showed that the site in the Nemunas River is not related to the recent territory of Lithuania. The only herbarium specimen of this species, considered a collection of plants growing naturally in "a stream near the village of Melnyčėlė", was misidentified. The herbarium specimens collected from the fishponds represented introduced plants. Therefore, *Groenlandia densa* should be treated as a casual alien species in Lithuania, and there is no confirmed information on the former natural populations of the species.

Keywords: distribution, herbarium, extinct, native species, Lithuania.

INTRODUCTION

The abundance of a species has generally been found to be higher in populations occurring in the central part of the range and lower at the edges (Hengeveld & Haeck, 1982; Brown, 1984). Species, especially rare ones at the edges of their range, are most sensitive to anthropogenic pressure and changes in various ecological factors, including those influenced by climate change, which can obviously affect species range shifts (Viana, 2017; Moran et al., 2022). It has been noted that populations at the edge of their range are often understudied (Caissy et al., 2020). Such species are usually classified as "Data Deficient" when assessing their conservation status according to IUCN criteria (IUCN, 2024). Many data-deficient species are threatened (Borgelt et al., 2022). Without well-documented records of the range-edge species *Groenlandia densa* (L.) Fourr. in Lithuania, it was necessary first to find reliable data confirming its occurrence in the country and only then to decide on the threat category.

Groenlandia densa (Potamogetonaceae) is distributed in Europe, North Africa, the Middle East and the Caucasus (Akhani, 2014). Although the IUCN considers this species to be of Least Concern, different rates of decline have been observed in different parts of its range. The IUCN treated *Groenlandia*

densa as common in the south, especially in the Mediterranean region (Akhani, 2014). However, the most recent study by Šegota et al. (2019) has stated that the species is extremely rare even in the entire Western Balkan region. The decline of this species is evident in the northern European range. It is now considered extinct in Denmark, Sweden, Lithuania (Akhani, 2014), Norway (POWO, 2024) and eastern Germany (Puchalski et al., 2016). The status of this species is also critical in Poland, the closest country to the south of Lithuania (Żukowski, 2014; Kaźmierczakowa et al., 2016; Puchalski et al., 2016).

One of the most recent species distribution sources, POWO (2024), shows the distribution of *Groenlandia densa* in the Baltic region. According to the plant database Euro+Med PlantBase (Uotila, 2009), this species is only recorded in Lithuania. In the same database, *Groenlandia densa* is considered a doubtful native species in the Kaliningrad region bordering Lithuania. In local floras, this species has been reported for Lithuania (Galinis, 1963; Sinkevičienė, 2003) and mentioned for the territory of Latvia in the 19th century (Klinge, 1885; Gavrilova, 2011).

As mentioned above, Lithuania is listed by Akhani (2014) as one of the countries where *Groenlandia densa* is extinct. *Groenlandia densa* has been listed as a protected plant species in Lithuania since 1962 and has always been considered extinct (Naujalis, Tupčiauskaitė, 1992; Sinkevičienė, 2007). This species has not been included in the latest Red Data Book of Lithuania (Rašomavičius, 2021), based on the first assessment of rare and endangered plant species according to IUCN criteria. All available data on the occurrence of *Groenlandia densa* in Lithuania were carefully reviewed and re-evaluated. The aim of this study was to confirm or deny the natural occurrence of *Groenlandia densa* on the territory of Lithuania.

MATERIALS AND METHODS

Literature sources from the 18th century onwards were studied and critically evaluated. The primary attention was paid to revising the herbarium specimens stored in the Herbaria of Vilnius University (WI) and the Nature Research Centre (BILAS). In addition, a search for place names on herbarium labels was carried out. Potential habitats of the species were checked in the field.

RESULTS AND DISCUSSION

Literature sources about *Groenlandia densa*

The species name first appeared in the botanical literature of Lithuanian authors at the end of the 18th century. At that time, the territory of the Grand Duchy of Lithuania included several modern states. *Groendlandia densa* was first mentioned as *Potamogeton setaceum* L. by Jundziłł (1791), but the locality given (the Ditva River) was not in present-day Lithuania but in the neighbouring modern Belarus. However, subsequent surveys have never confirmed the occurrence of the species in this country (Dubovik, 2013).

In another publication by Jundziłł (1811), no locations of *Potamogeton setaceum* were given. *Groendlandia densa* as *Potamogeton densum* L. was first reported on the territory of Lithuania (Paluknė) by Wolfgang (1822), but later refuted by himself (Wolfgang, 1824), stating that it was a form of *Potamogeton perfoliatus*. This may be why later Jundziłł (1830) and Gorski (1830) omitted this species from their lists. Thus, the main publications by Lithuanian authors from the 18th and 19th centuries do not provide reliable information on the occurrence of *Groenlandia densa* not only in Lithuania, but also in neighbouring Belarus.

The most important source of data on the flora of Lithuania in the middle of the 20th century was the manual of plant identification by Snarskis (1954). He mentioned two localities of *Potamogeton densus*: "the Nemunas River near Sovetsk" and "lakes near Druskininkai". Later, Snarskis (1968) specified the Druskininkai locality as "the stream Melnytėlė" and added a new locality "Vokė ponds". Galinis (1961, 1963, 1969) reported the same localities, referring to Snarskis (1954) and stating that the latter two localities were supported by herbarium specimens. These data were later cited by other authors (Naujalis & Tupčiauskaitė, 1992; Sinkevičienė, 2003, 2007).

We tried to trace the origin of the locality "the Nemunas River near Sovetsk" (formerly German Tilsit, Lithuanian Tilžė). The most appropriate source seemed to be the flora of former Prussia (Abromeit et al., 1940). The nearest to Lithuania locality of *Groenlandia densa* (as "*Potamogeton densa* L.") mentioned in this publication is in Tilžė (now Sovet-

sk). However, the habitat reported by Abromeit et al. (1940) is not "the Nemunas River", but "the Nemunas River meadows" (Memelwiesen b. Tilsit). These could be ditches, oxbow lakes or other small bodies of water in the River Nemunas valley. The authors consider this locality "very doubtful due to the lack of supporting documentation" (possibly herbarium specimens). The species has never been recorded in the vicinity of this site in Lithuania, although similar habitats exist in the valley on the right bank of the Nemunas River.

Further from Lithuania, "near Königsberg," the species was reported in a "ditch on the bank of the Pregolya River (German Pregel; Lithuanian Prieglius) between Cosse and Dammkrug" (Abromeit et al., 1940), where *Groenlandia densa* later disappeared after the ditch was cleared and drained. Thus, Abromeit et al. (1940) do not mention any localities of *Groenlandia densa* on the territory of Lithuania and do not provide reliable data on its occurrence in the present-day Kaliningrad region. Doubts about the occurrence of *Groenlandia densa* in the Kaliningrad region have also been expressed by Uotila (2009).

Revision of herbarium specimens

A specimen identified as *Potamogeton densus* was found in the Herbarium of Vilnius University (WI). It was collected by P. Snarskis in 1946 and labelled by his hand (Appendix I). The location indicated on the label was "a stream near the village of Melnyčėlė". However, the specimen found in this herbarium sheet belongs to the genus *Elodea*. The other species collected at the same time and place were missing from this herbarium sheet as well as the other Potamogetonaceae plant specimens in the herbarium. Possible misidentifications of *Groenlandia densa* are mentioned in the literature (Šegota et al., 2019), but this is more common with *Potamogeton perfoliatus* and less likely with *Elodea*.

The location indicated on the label as "a stream near the village of Melnyčėlė" varied from source to source: "in a stream Melnytėlė" (Snarskis, 1968), "in a stream Ratnyčia" (Galinis, 1963), "Druskininkai, at the village Melnyčėlė" (Naujalis & Tupčiauskaitė, 1992), "in a stream Melnytėlė" (Sinkevičienė, 2007). The Melnyčėlė farmstead is listed in the geographical register (Jekentienė et al., 1959; Wikipedia, 2025a). Later, it was merged with the village of Kalviškės (Melnyčia) and currently covers the northeastern part of Druskininkai (Wikipedia, 2025b). The list of water bodies (Savukynas et al., 1963) confirms that the stream Melnyčėlė is "a right tributary of the Nemunas, located in the vicinity of Druskininkai, at the village of Neravai". The stream flowing through the territory of Kalviškės (Melnyčia) is now called Grūda and has been considerably modified – dammed, straightened and urbanised. Another stream, which flows through the village of Neravai, has also been dammed and straightened. It is difficult to say which of these streams was called Melnyčėlė. A vegetation survey of the lower part of the stream at Neravai revealed no submerged vegetation at all. Only *Elodea canadensis* was particularly abundant in the pond above.

Three specimens of *Potamogeton densus* were found in the Herbarium of the Institute of Botany (BILAS), collected by M. Natkevičaitė in 1946, P. Snarskis in 1956 and V. Galinis in 1960 (Appendix I). The labels on all three specimens are handwritten by the collectors. Despite slight differences in the characterisation of the location on the labels, all three specimens were collected from the same fish farming ponds in Trakų Vokė. Galinis (1961) reported that he found *Groenlandia densa* more widespread, in the ponds and in the streams flowing out of them. According to Galinis (1961, 1963), the species was introduced here for pisciculture purposes and then began to spread. Recently, after having checked the ponds, the stream and the Vokė River several times, these plants were not found in any of the waters he mentioned.

The short-term persistence of the artificially introduced *Groenlandia densa* has been confirmed by reintroduction attempts in Poland (Puchalski et al., 2016; Wróbel et al., 2020). It is likely that the northern limit of the range of this species passes through Poland, where native *Groenlandia densa* occurred until 1987 (Puchalski et al., 2016). Data from the 19th century on the occurrence of the species in Latvia (Liepaja) by Klinge (1885) are not supported by herbarium specimens or later records (Gavrilova, 2011). Galinis (1961) considered only the locality of *Groenlandia densa* at Druskininkai, reported by Snarskis (1954, 1968) as natural in Lithuania. However, this study showed that there is no evidence to

support this. The only preserved herbarium specimen from this natural habitat was misidentified.

Based on the analysis of the literature data and the revision of the herbarium specimens, as well as the verification of the stated localities in nature, we conclude that *Groenlandia densa* has never occurred naturally in the water bodies of the country and is not a native species of the flora of Lithuania.

Species range shifts are one of the most predicted or observed effects of climate change on biodiversity (Viana, 2017). It seems that global warming should favour a northward range shift of *Groenlandia densa* as a southern species. This process also requires dispersers of vegetative propagules and suitable habitats. So far, only a decline of *Groenlandia densa* populations at the northern edge of the range has been observed. Moreover, the species is scarce in the Western Balkans and is threatened to varying degrees in other countries near the centre of its range (Šegota et al., 2019). This may indicate that *Groenlandia densa* is a relatively rare species throughout its range and has specific environmental requirements that are not fully understood. Therefore, there is a low probability that this species will be able to reach the territory of Lithuania even under conditions of climate warming. Many water bodies are modified, eutrophicated or covered with aquatic vegetation. In the most optimistic scenario, the most suitable water bodies could be those in the lower Nemunas valley, given the previous distribution of *Groenlandia densa* in the south-eastern Baltic countries, closer to the sea.

Based on this study, *Groenlandia densa* should be treated as a casual alien species in Lithuania as there is no confirmed information on the former natural populations of the species.

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Author contributions. All research was performed, data analysed, and text written by the author. The author agreed to the final version of the manuscript.

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APPENDIX I

A list of revised herbarium specimens of *Groenlandia densa* collected in Lithuania. The contents of the herbarium specimen labels were translated from Lithuanian into English.

Potamogeton densus L., Druskininkai, in a stream near the village Melnyčėlė, 17 August 1946, leg. & det. P. Snarskis. WI, P07340 [misidentified specimen of *Elodea canadensis*].

Potamogeton densus L., Pond, Soviet Farm (former Tiškevičius estate), Vokė, 1 September 1946, leg. et det. M. Natkevičaitė. BILAS, 18029.

Potamogeton densus L., T. [Trakų] Vokė, Fishpond, 6 September 1956, leg. et det. P. Snarskis. BILAS, 18030.

Potamogeton densus L., Pond Vokė, 30 August 1960, leg. et det. V. Galinis. BILAS, 65200.

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