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Distributions of vascular plants in the Czech Republic. Part 13

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Abstract: The thirteenth part of the series on the distributions of vascular plants in the Czech Republic includes grid maps of 88 taxa in the genera *Alcea*, *Ambrosia*, *Anacamptis*, *Anchusa*, *Anoda*, *Atocion*, *Ballota*, *Bothriochloa*, *Bunias*, *Conium*, *Epipogium*, *Kickxia*, *Kitaibela*, *Lavatera*, *Lawrencia*, *Limodorum*, *Listera*, *Malope*, *Malva*, *Neotinea*, *Nonea*, *Nuphar*, *Nymphaea*, *Peucedanum*, *Phlomis*, *Selinum*, *Sida*, *Silaum* and *Silene*. These maps were produced by taxonomic experts based on examined herbarium specimens, literature and field records. Particular attention was paid to rare and declining species. Altogether, 34 of the mapped species are on the national Red List. Critically threatened species, with the highest rates of decline and smallest population sizes, are mainly among orchids and aquatic plants. Two species, *Anacamptis coriophora* and *Peucedanum arenarium*, have been extirpated from this country and are classified as nationally extinct. In contrast, four of the mapped species have only recently been identified as new aliens to the Czech flora: *Kitaibela vitifolia*, *Lavatera punctata*, *Silene csereii* and *S. stricta*. Based on the analysis of the past distributions and circumstances of the earliest records, *Silene bupleuroides* and *S. conica* are proposed for reclassification from native to casual neophytes. Altogether, 47 archaeophytes and neophytes are discussed. Two of the neophytes, *Ambrosia artemisiifolia* and *Bunias orientalis*, have become invasive and at present they are widespread mainly in warm areas of the country. Spatial distributions and often also temporal dynamics of individual taxa are shown in maps and documented by records included in the Pladias database and available in the Supplementary materials. The maps are accompanied by comments that include additional information on the distribution, habitats, taxonomy and biology of the taxa.

Keywords: alien species, central Europe, chorology, Czech Republic, distribution atlas, distribution patterns, endangered species, endemic, flora, grid maps, herbarium, phytogeography, plant records, vascular plants

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Introduction

Ten years ago, in 2014, the mapping of the distributions of plants in the Czech Republic was initiated and the Pladias Database of the Czech Flora and Vegetation was established (Wild et al. 2019, Chytrý et al. 2021). Since then, twelve papers with altogether 1,098 grid-based distribution maps of vascular plants have been published (Kaplan et al. 2015, 2016a, b, 2017a, b, 2018a, b, 2019b, 2020, 2021, 2022, 2023). The Pladias Database now contains a huge amount of critically revised plant distribution records, which are used for follow-up studies such as inventory of the country's alien flora (Pyšek et al. 2022), an overview of the halophytic flora and vegetation (Danihelka et al. 2022) and an analysis of metacommunity dynamics of fen organisms (Peterka et al. 2022). The concept and infrastructure of the database also stimulated the development of the Database of Lichens and Bryophytes of the Czech Republic (DaLiBor; Man et al. 2022).

Since the publication of the previous instalment, the team of taxonomic experts involved in the mapping finished grid-based distribution maps for a further 88 taxa, based on examined herbarium specimens as well as critically evaluated and sorted literature, database and field records. These maps and accompanying commentaries are presented in this paper. The spectrum of taxa includes various ecological groups of plants, and both native and introduced species.

We focused on genera that include rare and declining species. Of the mapped taxa, 34 are on the national Red List (Grulich 2012). Not surprisingly, orchids are the most represented; of the ten species of this family included there, eight (*Anacamptis morio*, *A. palustris*, *A. pyramidalis*, *Epipogium aphyllum*, *Limodorum abortivum*, *Listera cordata*, *Neotinea tridentata* and *N. ustulata*) are critically threatened. They either have always been rare in this country or have experienced considerable decline and now have only small population sizes. Another group with a high proportion of vanishing species comprises aquatic plants; in this instalment they are represented by the critically threatened *Nuphar pumila*, *Nymphaea alba* and *N. candida*. Additionally, the conservation of the native *Nymphaea* populations is complicated by deliberate planting in the wild of the alien *Nymphaea* species and ornamental cultivars. *Peucedanum carvifolia*, growing at a single site at an edge of thermophilous forest, and *Silene viscosa*, restricted to dry grasslands in two small areas, are the other two species classified as critically threatened. Two species, *Anacamptis coriophora* and *Peucedanum arenarium*, have been extirpated from this country and are classified as nationally extinct, although the former has recently been found at several new sites as deliberately introduced.

Four of the mapped species have only recently been identified as new aliens to the Czech flora. *Kitaibela vitifolia* was found at a single site in Prague (Sádlo 2022) while *Lavatera punctata* was observed in an abandoned orchard in central Bohemia (Vaníček 2020). Two additional species, *Silene csereii* and *S. stricta*, were introduced in the early 1960s but they have been recognized among examined herbarium specimens only recently (Danihelka & Hlisnikovský 2021a, b).

Based on the analysis of the earliest records, past distributions and other circumstances, we suggest reclassification of two rare species, *Silene bupleuroides* and *S. conica*, from native to casual neophytes. Most of the occurrences were only temporary and in man-made habitats.

The other alien species studied for this paper include various cases that differ in geographic origin, residence time category, invasion status, pathways of introduction, habitat affiliation, distribution and abundance. Rather widespread naturalized archaeophytes are represented by *Anchusa officinalis*, *Ballota nigra*, *Conium maculatum*, *Malva neglecta* and *Silene latifolia* subsp. *alba*. In contrast, neophytes, which are rare and often with only temporary occurrences, include e.g. *Ambrosia psilostachya*, *Anchusa azurea*, *Anoda cristata*, *Bunias erucago*, *Lavatera trimestris*, *Lawrencia glomerata*, *Malope trifida*, *Nonea rosea*, *Sida rhombifolia* and *Silene cretica*.

Particular attention is deserved by species that have become invasive. *Ambrosia artemisiifolia* is native to North America but has been accidentally introduced into many countries and presently is widely distributed in temperate regions across the world. In the Czech Republic it colonizes disturbed sites and bare ground particularly in large cities, but it also grows in man-made habitats in landscapes in the warm lowlands and at middle elevations almost across the country. *Bunias orientalis* grows mainly in man-made habitats in warm areas of the country, but recently it has spread to higher elevations, probably due to the global climate change.

Materials and methods

Taxonomic scope

The following groups of vascular plants are mapped: native taxa, naturalized aliens, most casuals and certain hybrids. Distribution maps are produced for species and subspecies, and in exceptional cases also for varieties or infrageneric taxa (e.g. sections). Plants of species groups that are difficult to assign to species may be mapped as species aggregates. Field crops and plants deliberately cultivated in gardens and parks are not included in the mapping project. Nomenclature, taxonomic concepts and delimitation of species aggregates mostly follow Kaplan et al. (2019a), with differences indicated where necessary. For taxa not included in that source, a taxonomic reference is given. Publication of maps does not follow any alphabetical or systematic order, but mainly the maps resulting from recent revisions are included.

Data sources

All relevant floristic data sources are used. Major national herbaria and some local and foreign collections, incl. BRNL, BRNM, BRNU, CB, CBFS, CESK, CHEB, CHOM, FMM, GM, HOMP, HR, KMKV, LIM, LIT, MJ, MMI, MP, MZ, NJM, OL, OLM, OMJ, OP, OSM, OVMB, PL, PR, PRA, PRC, ROK, ROZ, SOB, SOKO, SUM, VM, VYM, W, WU and ZMT (acronyms follow NYBG 2023), were consulted as the main sources of taxonomically examined records. Most records for maps of common and easy-to-identify taxa came from the Pladias database (Wild et al. 2019, Chytrý et al. 2021), which has integrated data from five large national databases, several regional projects and unpublished field records from the maps' authors and regional contributors.

Mapping procedure

All records used for mapping are entered into the Pladias database and geographically sorted according to the traditionally used CEBA (Central European Basic Area) grid template (Niklfeld 1997, Schönfelder 1999) divided into quadrants of 5 × 3 arc minutes (corresponding to approximately 5.5 × 5.9 km). The territory of the Czech Republic is covered by 2,551 quadrants, of which 2,181 are completely within the borders of this country. Individual records and the whole distribution of each taxon are checked and evaluated by the author of a particular map in a web-based mapping interface of the Pladias database. Maps of taxonomically critical groups are based solely or mainly on herbarium specimens examined by taxonomic experts; these cases are indicated in the text accompanying the particular map. Maps of all other taxa are based on records from databases, literature and herbaria, which were scrutinized by the authors of the respective maps. Records used for producing maps are listed in Supplementary materials S1–S85. In selected maps, native versus introduced occurrences are distinguished, and corresponding records in the database classified accordingly. Draft distribution maps and the background records are released in a web-based review process for scrutiny by field botanists, regional collaborators and members of the Czech Botanical Society. Their comments and additional records are collected in the database and returned to the responsible specialists for consideration before producing the distribution maps.

Final maps and comments

The treatment of each taxon consists of a grid distribution map and accompanying text; the maps' authors, indicated in the figure captions, also had major roles in writing the first drafts of the texts for the subject taxa. Maps are displayed using a spherical Mercator projection (EPSG:3857), in which meridians and parallels appear as straight lines, and the fields of the mapping grid are thus displayed as squares. The background relief was derived from SRTM data (http://www2.jpl.nasa.gov/srtm/, the version provided by http://srtm.csi.cgiar.org), and the river network was adapted from data provided by CENIA (www.cenia.cz). When appropriate, different symbols are used on the maps to distinguish between the following alternative attribute states: (i) recent versus old records, (ii) native occurrences versus introductions, and (iii) records based on examined herbarium specimens versus all other records. These classifications of records are used only for those taxa where such distinction provides important information and the amount and quality of records are sufficient. The mapping symbols used to indicate the different attributes of the records in particular grid cells are shown in Table 1. Symbols specific to individual maps are explained in their captions. In the caption for each map, the counts of occupied quadrants are indicated according to the symbols used in the map; uncertain occurrences are not included in the counts. The accompanying text includes the accepted scientific name, a brief outline of the general distribution, information on habitats occupied by the species and a description of its distribution in the Czech Republic. Where appropriate, comments on taxonomy, biology and details of the spatial and temporal dynamics of the distribution are given.

Table 1. The symbols used in the distribution maps to indicate the different attributes of occurrence in particular grid cells.

Attribute distinguished	Symbol	Attribute state
None	●	All records
Time	●	Recent occurrence (at least one record since 2000)
	◍	Old occurrence (all records before 2000, or demonstrably extirpated from all localities after 2000, or all records undated)
Origin	●	Native (at least one record)
	×	Alien
Source of data	●	Examined herbarium specimen (at least one record)
	▲	All other
All	?	Only record(s) uncertain regarding identification and/or locality

Distribution maps and comments

Alcea biennis (Fig. 1)

Alcea biennis is distributed in east-central and south-eastern Europe, with its range extending westwards to Moravia and eastern Austria, eastwards to southern Ukraine, northwards to Moravia and southern Slovakia, and southwards to Greece; outside Europe it is reported from Anatolia and Syria. It has been introduced into the Italian Peninsula, Sardinia, France and Bavaria (Valdés & Raab-Straube 2011b, Pignatti et al. 2017, Lippert & Meierott 2018). In the Czech Republic it grows on grassy slopes, in shrub communities, abandoned vineyards, on river banks, road and railway embankments and at other ruderal sites; soils are dry to fresh, soft, often rich in calcium. It occurs in warm, dry, hilly areas and less frequently in the lowlands of southern Moravia, northwards to the city of Brno, mainly in the surroundings of the towns of Znojmo, Miroslav, Moravský Krumlov, Mikulov and Hustopeče. There exists also a specimen allegedly collected in 1947 by K. Domin near the village of Domašov north-west of the city of Brno, originally identified as *Althaea rosea* (= *Alcea rosea*). However, this herbarium voucher might have resulted from a later labelling mistake, because it is the only record of this species from this area, situated outside the local range of thermophilous flora. Furthermore, the confusion of these well-defined species (*Alcea rosea* and *A. biennis*) is unlikely. *Alcea biennis* has vanished from some of its sites in this country. On the other hand, it has recently been found in hedgerows and at ruderalized sites near the natural occurrences in south-western Moravia (Bravencová et al. 2007). It is classified as endangered because of its rarity and decline (Grulich 2012).

Alcea rosea (Fig. 2)

The native distribution of *Alcea rosea* is unclear. It is thought to have originated either in south-western China or in the eastern Mediterranean area, but is apparently not known in the wild (Webb 1968, POWO 2023). It may be of hybrid origin, most likely derived from the parental combination *A. biennis* and *A. setosa*. It has been grown in Europe since at least the 15th century as an ornamental and medicinal plant; currently it is essentially cosmopolitan in cultivation. In the Czech Republic *A. rosea* is widely cultivated in gardens

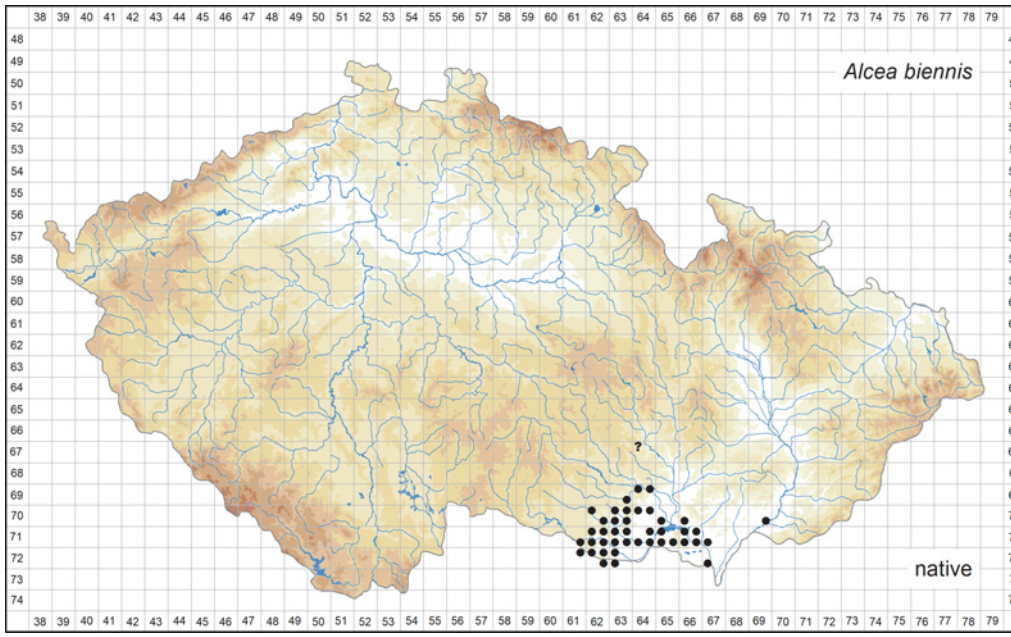

Fig. 1. Distribution of *Alcea biennis* in the Czech Republic (41 occupied quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

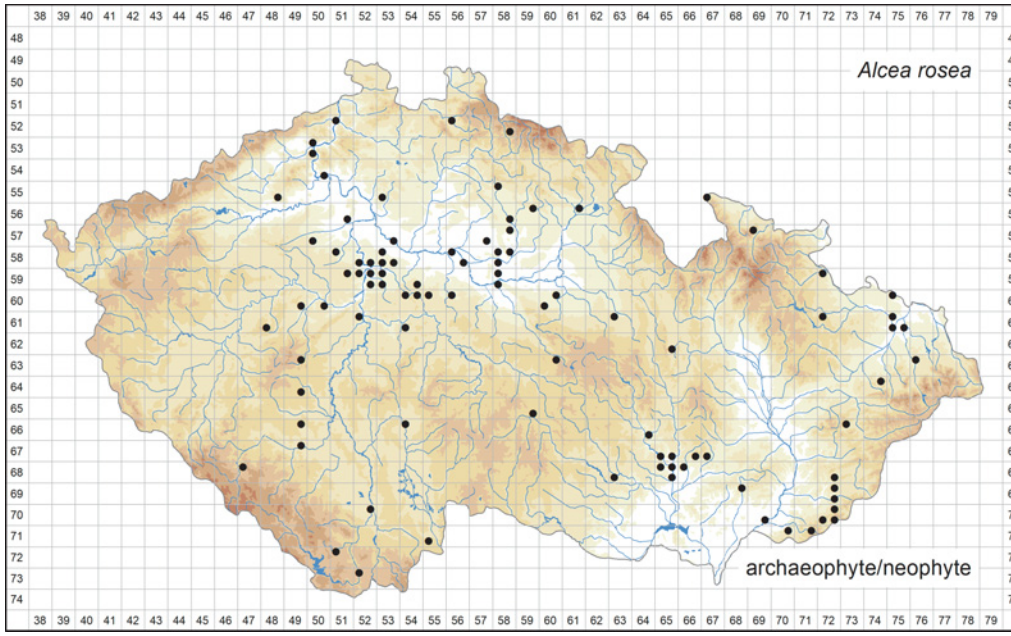

Fig. 2. Distribution of *Alcea rosea* in the Czech Republic (93 occupied quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

and public places in mainly rural settlements and sometimes escapes in their vicinity at rubble sites, soil heaps and on garden waste throughout this country. *Alcea rosea* is classified as a naturalized archaeophyte/neophyte in this country (Pyšek et al. 2022).

Ambrosia artemisiifolia (Fig. 3)

Ambrosia artemisiifolia is native to North America and is currently widespread in the USA and Canada except for Yukon and Nunavut (Basset & Crompton 1975, Strother 2006, Iamonico 2016a). It has been accidentally introduced into many countries and presently is widely distributed in temperate regions across the world while it is rare in subtropical and tropical regions (Meusel & Jäger 1992, Makra et al. 2015, Iamonico 2016a, Montagnani et al. 2017). Its range expansion accelerated considerably in the late 20th century (Essl et al. 2015, Mang et al. 2018). It has become invasive in many countries and is still spreading both at global and local scales (Smith et al. 2013, Essl et al. 2015, Ortmans et al. 2017). *Ambrosia artemisiifolia* is a species of concern for public health in both its native and invasive ranges because of its highly allergenic pollen (D'Amato & Spieksma 1992, D'Amato et al. 2007, Kazinczi et al. 2008) and is therefore recognized as one of the most noxious invasive weeds. It was first introduced into Europe deliberately to botanical gardens in the 18th century and later repeatedly as a contaminant of agricultural products from North America, which enabled its broad spread (Chauvel et al. 2006, Essl et al. 2015, Montagnani et al. 2017). In the wild, it was first recorded as casual in Britain in 1836 (Essl et al. 2015), with the earliest record in the European mainland from Germany in 1860 (Ascherson 1874). It has been introduced into all European countries but occurs most frequently in the temperate zone ranging from the British Isles and France in the west to the southern part of European Russia in the east (Cunze et al. 2013, Essl et al. 2015, Iamonico 2016a). The largest populations recorded after 2000 are in the Pannonian Basin in Hungary, Croatia and Serbia (Kazinczi et al. 2008), Ukraine (Song & Prots 1998) and Russia (Iamonico 2016a). A considerable increase in populations has also been recorded in southern and central France, in particular along the Rhône valley as well as in the plains of northern Italy (Chauvel et al. 2006, Essl et al. 2015). In the Czech Republic *A. artemisiifolia* colonizes disturbed sites and bare ground such as railway stations, railway embankments and roadsides along roads and motorways, which provide not only suitable habitats but also serve as a source for rapid spread by vehicles. It also occurs on waste grounds, at ruderal sites in towns, in arable fields, yards of agricultural and industrial facilities, sand pits, on gravel bars in riverbeds, soil and sand heaps, at transit sheds and places used for temporary storage of timber. It prefers permeable, slightly acidic to slightly basic soils that are rich in nutrients. In this country the species was first recorded in 1883 when it was found in a field at a village of Doudlevce, now a suburb of the city of Plzeň in western Bohemia, and in a clover field at the town of Třeboň in southern Bohemia; in both cases it was introduced with contaminated seed. For several decades, the species remained rare, but since the 1960s the number of its sites has sharply increased (Skálová et al. 2017), apparently as a result of the import of soybeans (Hejný et al. 1973, Jehlík 1998). Its spread in southern Moravia in recent decades is probably due to the frequent occurrence of the species in the Pannonian Basin (Mang et al. 2018). At present *A. artemisiifolia* is most frequent in large cities such as Prague, Brno, Olomouc and Ostrava, and in warm lowlands along large rivers, mainly in southern Moravia and along

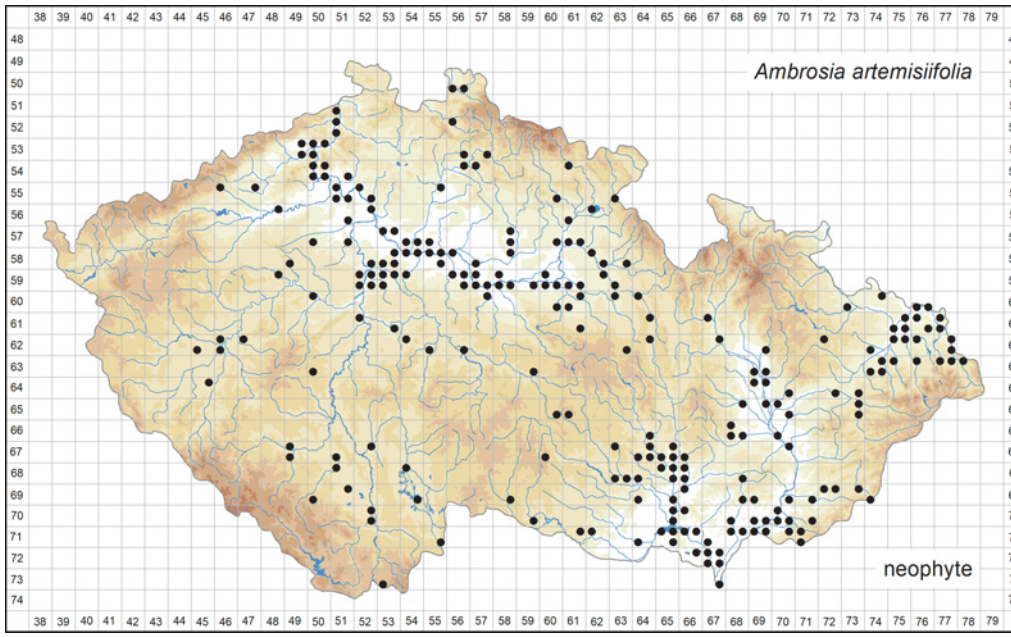

Fig. 3. Distribution of *Ambrosia artemisiifolia* in the Czech Republic (239 occupied quadrants). Prepared by Hana Skálová and Zdeněk Kaplan.

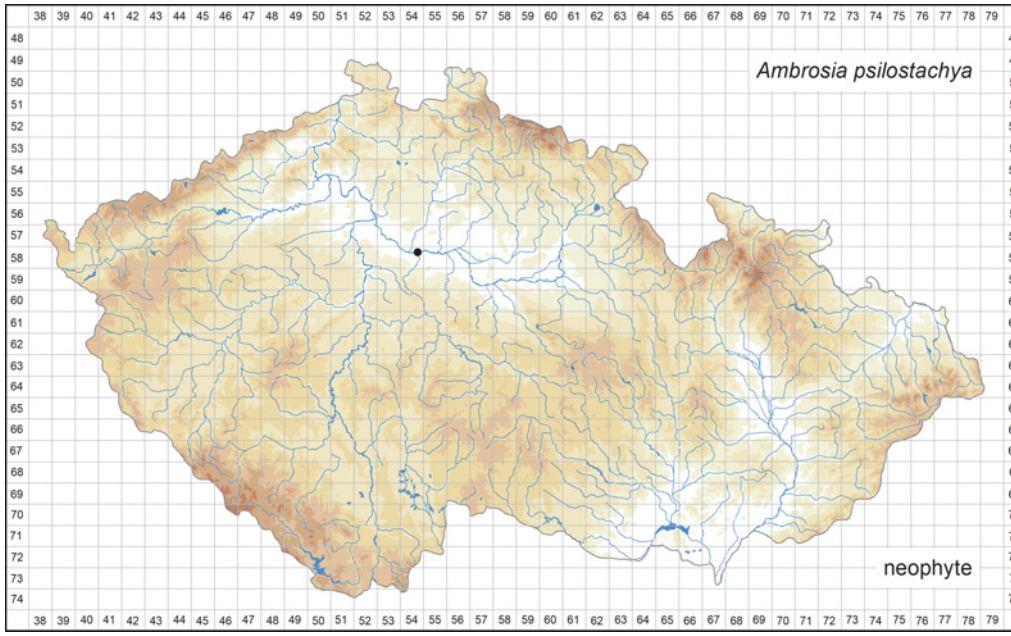

Fig. 4. Distribution of *Ambrosia psilostachya* in the Czech Republic (1 occupied quadrant). Prepared by Zdeněk Kaplan.

the Labe river in Bohemia. It is also scattered at middle elevations almost across the entire country. Predictive modelling indicates that many suitable areas are still unoccupied and thus further spread of *A. artemisiifolia* in the Czech Republic is highly probable (Skálová et al. 2017). This species is spreading much faster than the recording of new sites by field botanists, making the distribution map inevitably incomplete. This species is classified as an invasive neophyte (Pyšek et al. 2022).

Ambrosia psilostachya (Fig. 4)

Ambrosia psilostachya is native to western North America and is now widespread in the USA and southern and south-eastern Canada (Basset & Crompton 1975, Strother 2006). As a seed contaminant in cereal grain it has been introduced into Europe, western and eastern Asia, northern and southern Africa and southern Australia (Meusel & Jäger 1992, CABI 2022). However, it is not as aggressive as *A. artemisiifolia* and shows invasive behaviour in only seven countries of the secondary range (Montagnani et al. 2017), probably due to its spreading predominantly by rootstocks rather than by seeds, done by its more invasive congeners. On the other hand, the extensive underground organs may stabilize the populations. In Europe *A. psilostachya* was first found in the United Kingdom in the 1880s where it was probably introduced with poultry feed (Rich 1994). In the Czech Republic it was recorded at a single site, namely on a road verge on a bank of the Labe river at the town of Čelákovice in central Bohemia in 2000 (Červinka & Sádlo 2000). The population included about 150 individuals and persisted there till 2020 when it was destroyed during the reconstruction of the nearby railway bridge across the river. *Ambrosia psilostachya* is classified as a casual neophyte (Pyšek et al. 2022).

Ambrosia trifida (Fig. 5)

Ambrosia trifida is native to eastern North America; at present it is found throughout much of the USA and southern and south-eastern Canada (Basset & Crompton 1982, Strother 2006). As a seed or commodity contaminant it has been introduced into the temperate zones in Europe and Asia. It has colonized almost 40 countries but is invasive in only three of them (Iamonico 2016b, Montagnani et al. 2017). In many areas, its presence is largely dependent on repeated introductions. The species was introduced to European botanical gardens as early as the 17th century. However, in the wild it was first recorded in Germany in 1877. Elsewhere *A. trifida* was first recorded substantially later (Follak et al. 2013). In the Czech Republic it was first found in the city of Brno in southern Moravia in 1958–1961, where it was introduced with wool (Dvořák & Kühn 1966). In this country it is found at railway stations and along railway tracks, at transit sheds, river ports, along roads, in yards of agricultural and industrial facilities, arable fields, abandoned sand pits and on ruderalized river banks. The soils are dry to moderately humid and often rich in nutrients. Only a single or a few individuals have been found at most of the sites, but rather large populations occasionally develop on arable land. Most of the records in this country come from the Labe river basin in central and northern Bohemia, where the species used to be introduced with soybeans (Hejný et al. 1973, Jehlík 1998). While in the lower sections of the river there are ports with transit sheds, there was a factory processing soybeans in the town of Kolín, and in the 1960s the soybean waste was distributed to farms in the area and used to feed livestock (Jehlík 1998, Rydlo et al. 2011). Elsewhere

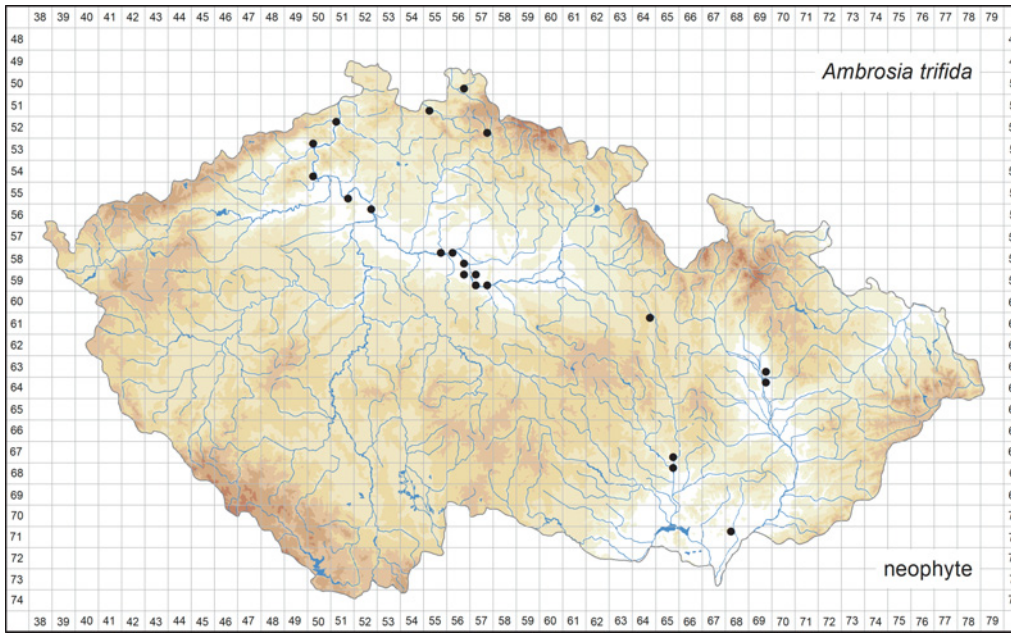

Fig. 5. Distribution of *Ambrosia trifida* in the Czech Republic (21 occupied quadrants). Prepared by Zdeněk Kaplan.

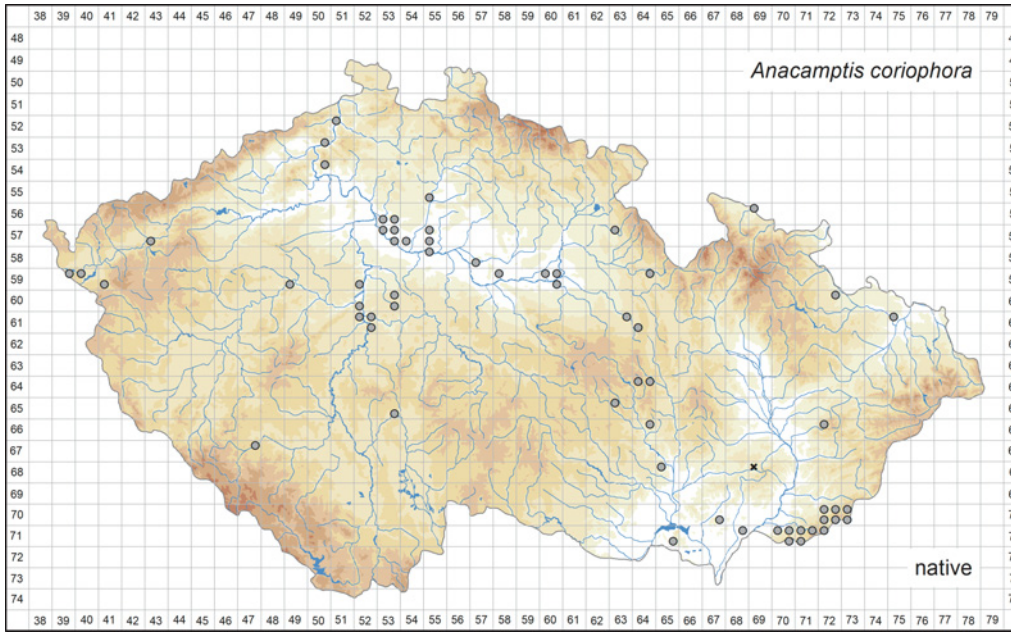

Fig. 6. Distribution of *Anacamptis coriophora* in the Czech Republic: ● pre-2000 records only (61 quadrants), × deliberate introductions only (1 quadrant). Prepared by Vojtěch Taraška.

the species is very rare, and it is absent from the south-western half of the country. The occurrences are mostly only temporary, and after cessation of import of soybeans in the 1980s the number of extant sites rapidly dropped. Abundant, persistent populations are only found at the villages of Velký Osek and Veltruby in central Bohemia. *Ambrosia trifida* is classified as a casual neophyte (Pyšek et al. 2022).

Anacamptis coriophora (Fig. 6)

Anacamptis coriophora occurs mainly in the mountains of the Mediterranean area, with its range extending to the Atlantic coast of France, central and eastern Europe, northern Africa, Anatolia, the Caucasus Mts and the Middle East. The southern limits of its occurrence are unclear due to confusion with *A. fragrans*. It is rare and declining in its whole range and extirpated from several countries (Buttler 2000, Delforge 2006, Dusak & Prat 2010) including the Czech Republic. The species occupied a wide scale of non-forest habitats, including fens, wet to mesic meadows, pastures, and dry grasslands, without a clear preference in terms of substrate humidity or reaction. It is, however, intolerant to increase in soil nutrients and suffers from competition. Drainage of fen meadows, use of mineral fertilizers and overall environmental pollution are considered the causes of the species' decline (Tlusták & Jongepierová-Hlobilová 1990, Štípková & Kindlmann 2021). Most of its former sites were in the southern vicinity of Prague, in the Labe river basin in central and eastern Bohemia and in the Bílé Karpaty Mts in south-eastern Moravia. Elsewhere it was rare or absent. The last herbarium voucher was collected in the village of Rabí in south-western Bohemia in 1960. The last record dates to 1970 when *A. coriophora* was observed in the village of Javorník in the Bílé Karpaty Mts (Tlusták & Jongepierová-Hlobilová 1990). The species is therefore classified as nationally extinct (Grulich 2012). However, it has recently been found at several new sites as a result of a deliberate introduction (e.g. Šrámek & Lustyk 2022).

Anacamptis morio (Fig. 7)

Anacamptis morio is a Euro-Mediterranean species distributed from the British Isles and southern Scandinavia southwards to the Mediterranean area, the Caucasus Mts and the Middle East (Buttler 2000, Delforge 2006). Ambiguities concerning its precise distribution result mainly from different species' circumscriptions and unclear delimitation of some closely related taxa in the Mediterranean area (cf. Baumann et al. 2009, GIROS 2009, Dusak & Prat 2010). In the Czech Republic *A. morio* occupies a wide range of non-forest habitats, including wet to mesic meadows, dry grasslands, low-intensity pastures, and mountain *Nardus*-grasslands. It is extremely sensitive to eutrophication and requires regular mowing (Jersáková & Kindlmann 2004). In the past *A. morio* was scattered to locally abundant throughout this country from the lowlands to the low mountains and was considered one of the most common representatives of the orchid family. The number of its populations and their abundances have decreased rapidly since the 1950s because of changes in landscape management such as the intensification of agriculture, including the application of mineral fertilizers, wetland drainage and conversion of grasslands into arable land, or, in contrast, the abandonment of mowing and grazing, and afforestation. Currently the species still has a relatively high number of extant populations in the foothills of the Šumava Mts, at the south-eastern edge of the Českomoravská vrchovina highlands

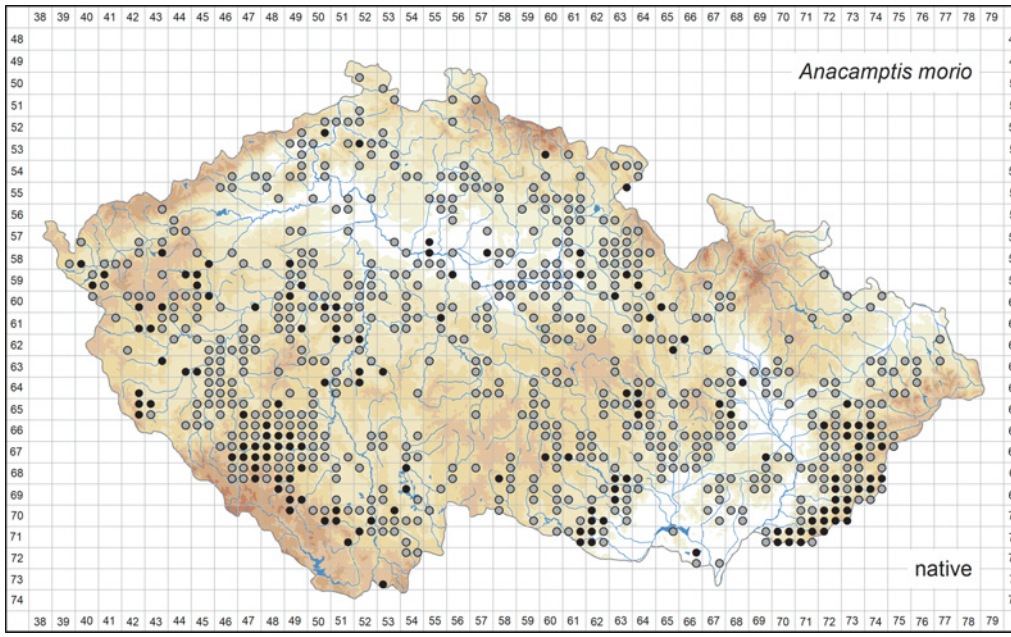

Fig. 7. Distribution of *Anacamptis morio* in the Czech Republic: ● at least one record in 2000–2023 (143 quadrants), ● pre-2000 records only (602 quadrants). Prepared by Vojtěch Taraška.

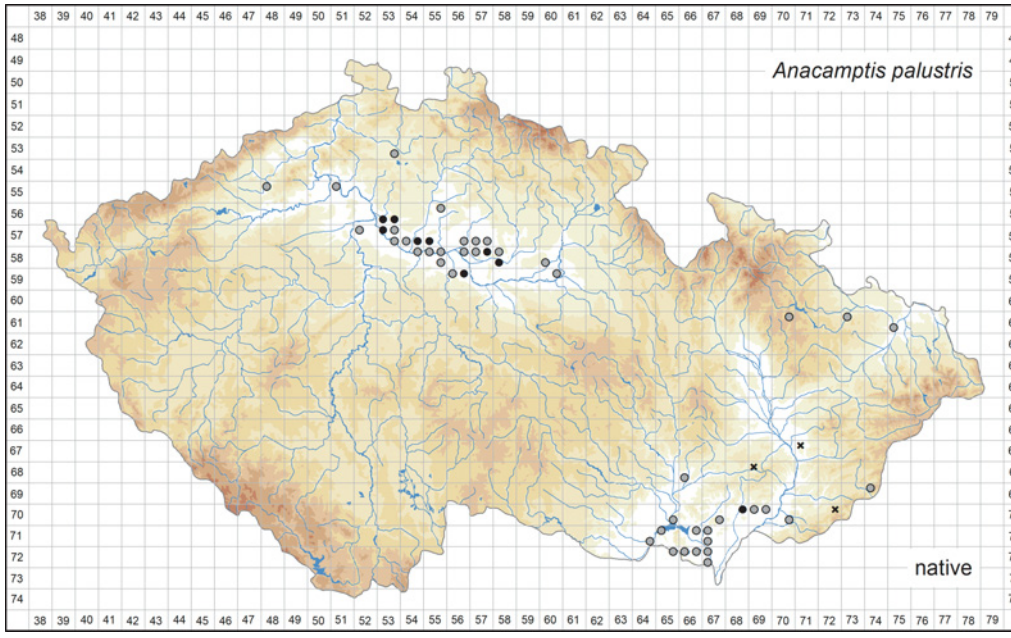

Fig. 8. Distribution of *Anacamptis palustris* in the Czech Republic: ● at least one record in 2000–2023 (9 quadrants), ● pre-2000 records only (41 quadrants), × deliberate introductions only (3 quadrants). Prepared by Vojtěch Taraška.

and in the Carpathians, while it is rare in or absent from the other parts of the Czech Republic. The remaining populations of *A. morio* are often small and isolated from each other, and the decline in their number in the Czech Republic continues. *Anacamptis morio* is thus classified as critically threatened (Grulich 2012).

Anacamptis palustris (Fig. 8)

Anacamptis palustris is a species with a Euro-Mediterranean range, stretching from the European Atlantic coast to Anatolia and from Gotland to northern Africa (Buttler 2000, Delforge 2006). The south-eastern limits of its distribution area are unclear because of confusion with similar taxa, mainly *A. laxiflora*. Moreover, both the abovementioned taxa are sometimes merged at the species level, and *A. palustris* used to often be recognized as *Orchis laxiflora* (a synonym of *A. laxiflora*; see Bateman et al. 1997) in central Europe, which resulted in further ambiguities. In the Czech Republic *A. palustris* usually grows in damp to waterlogged habitats exposed to full sun, particularly calcareous fens and wet meadows, including sites with saline substrate. The species was also found in wet railway ditches, where it may have survived for a long time after destruction of nearby natural habitats. The Labe river basin in Bohemia and the lowlands in southern Moravia are the two main areas of the species' occurrence in the Czech Republic. Several additional occurrences, typically documented by single and rather old herbarium vouchers, were scattered in northern Bohemia, north-eastern Moravia and Silesia. During the 20th century *A. palustris* disappeared from most of its sites mainly due to wetland drainage, habitat destruction by bog mining and succession after landscape management changes (Jersáková & Kindlmann 2004, Štípková & Kindlmann 2021). Its presence has been recently confirmed at only seven localities in Bohemia and four in Moravia. Three of the Moravian sites have been discovered only since 2020, and these occurrences probably result from deliberate introductions. The only extant spontaneous population in Moravia accounts for less than 20 individuals. Although most of the localities of *A. palustris* are situated within protected areas, the species remains at high risk of extirpation. It is thus classified as critically threatened (Grulich 2012).

Anacamptis pyramidalis (Fig. 9)

Anacamptis pyramidalis occurs mainly in the Mediterranean area, extending northwards to western and central Europe as far as the Baltic Sea, eastwards to the Caucasus and Alborz Mts, and southwards to northern Africa (Knapp 1985, Buttler 2000, Delforge 2006). In the Czech Republic it grows in broad-leaved semi-dry grasslands and forest-steppe vegetation on nutrient-poor and calcareous soils in hilly areas. In Bohemia *A. pyramidalis* has been known only from several localities in the Český kras karst area between the towns of Karlštejn and Svatý Jan pod Skalou. In the past it grew mainly on south-west facing hill slopes with semi-open thermophilous forests and steppe patches, where it rarely still occurs. Recent finds from this area also come from abandoned limestone quarries, including the somewhat remote limestone pit of Na Kobyle near the village of Koněprusy. Most of the populations of *A. pyramidalis* in this country are, however, found in eastern and south-eastern Moravia, mainly in the peripheral parts of the Carpathians with thermophilous vegetation on calcareous flysch sediments. Moravian populations have decreased rapidly during recent decades because of changes in landscape management

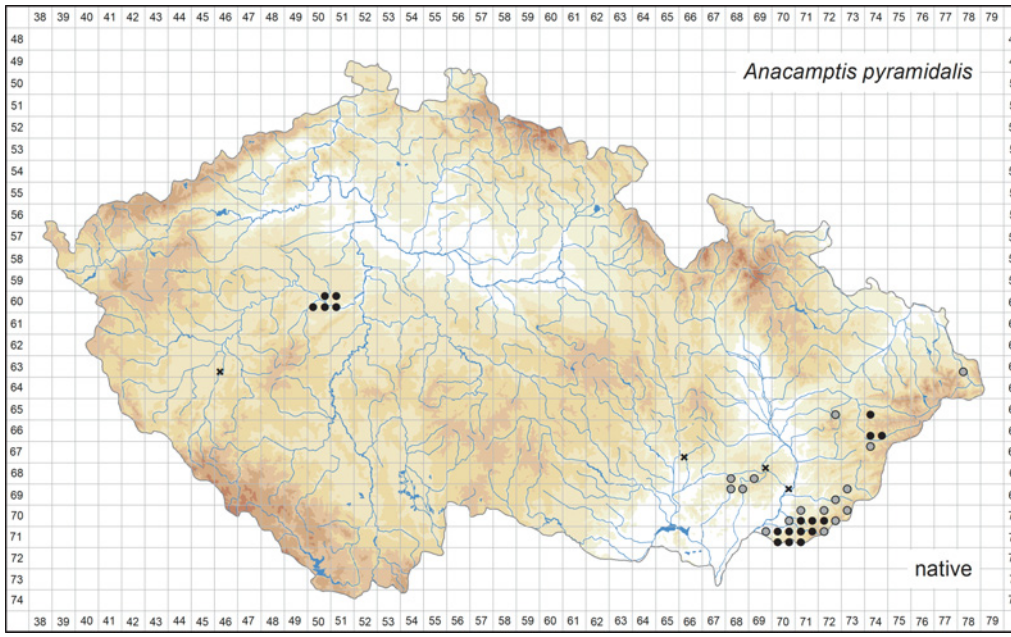

Fig. 9. Distribution of *Anacamptis pyramidalis* in the Czech Republic: ● at least one record in 2000–2023 (18 quadrants), ◍ pre-2000 records only (16 quadrants), × probable deliberate introductions only (4 quadrants). Prepared by Vojtěch Taraška.

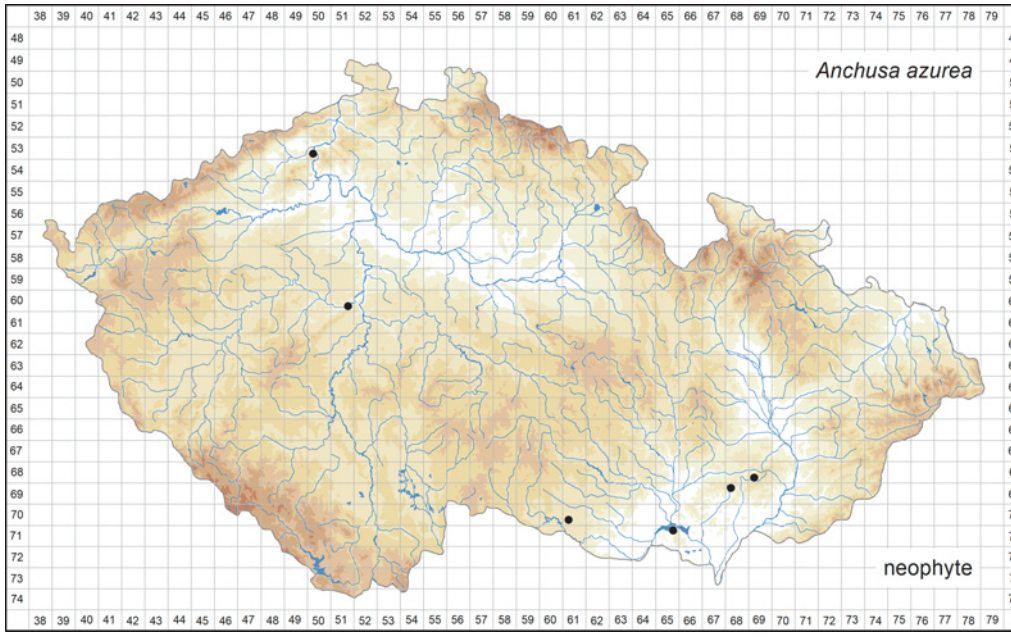

Fig. 10. Distribution of *Anchusa azurea* in the Czech Republic (6 occupied quadrants). Prepared by Kateřina Šumberová.

including direct destruction of meadows by ploughing (Tlusták & Jongepierová-Hlobilová 1990). The species still occurs at several sites in the southern part of the Bílé Karpaty Mts, whereas it was extirpated from the Ždánický les hills and the surrounding areas as well as the Vsetínské vrchy Mts and the Hostýnské vrchy Mts during the second half of the 20th century; even earlier it vanished from the Slezské Beskydy Mts. *Anacamptis pyramidalis* has, however, been rediscovered after 2000 at several sites in the Vsetínské vrchy Mts, which may be the result of either spontaneous spread or recovery of local populations. Single plants of *A. pyramidalis* have also been recently reported from two localities significantly remote from its earlier sites, namely near the city of Plzeň in western Bohemia and in the Moravský kras karst area close to the city of Brno (Šmiták 2011); these occurrences, in contrast, probably resulted from deliberate introduction. *Anacamptis pyramidalis* is classified as critically threatened (Grulich 2012).

Anchusa azurea (Fig. 10)

Anchusa azurea is considered native to southern and south-eastern Europe, extending towards the north and east to Hungary, Romania, Moldova, Crimea, the Caucasus, south-western Asia and central Asia; it also occurs in northern Africa. It might also be native to Slovakia. In the countries of western and central Europe, from France and the United Kingdom in the west to Poland in the east, it is considered introduced. Secondary occurrences are also known from the Russian Far East, Bangladesh, southern Africa and South America (Valdés & Raab-Straube 2011a, POWO 2023). Some records at the eastern limit of its native distribution may be based on misidentifications of similar *Anchusa* species. The first record of *A. azurea* in this country dates back to 1895 when it was found near the railway station in the town of Dobřichovice in central Bohemia. Several other records originate from warm regions where the species occupies semi-dry and dry habitats such as edges of arable fields, ruderal sites along with steppic slopes and fringes of thermophilous forests. *Anchusa azurea* is considered a casual neophyte (Pyšek et al. 2022).

Anchusa officinalis (Fig. 11)

Anchusa officinalis is now widespread in most of Europe except the Iberian Peninsula and northern Russia, but in some countries, particularly in western and northern Europe, it is considered introduced. Outside Europe it is native to the Caucasus and Turkey. It has been introduced to the Americas (Valdés & Raab-Straube 2011a, POWO 2023). In the Czech Republic it occupies various types of dry and semi-dry grasslands on slightly acidic to slightly basic permeable substrates. It is common in natural and semi-natural vegetation on sand dunes, heathlands and in thermophilous forest fringes as well as on railway embankments, road verges, on margins of stone quarries and sand pits, fallows and edges of arable fields and vineyards. *Anchusa officinalis* is common in lowlands and at warm middle elevations across this country. In mountains it occurs only scarcely and probably as recently introduced. One such site, in the vicinity of the village of Kvilda in the Šumava Mts at 1,060 m a. s. l., probably represents the species' elevational maximum in the Czech Republic. It is considered an archaeophyte (Pyšek et al. 2022).

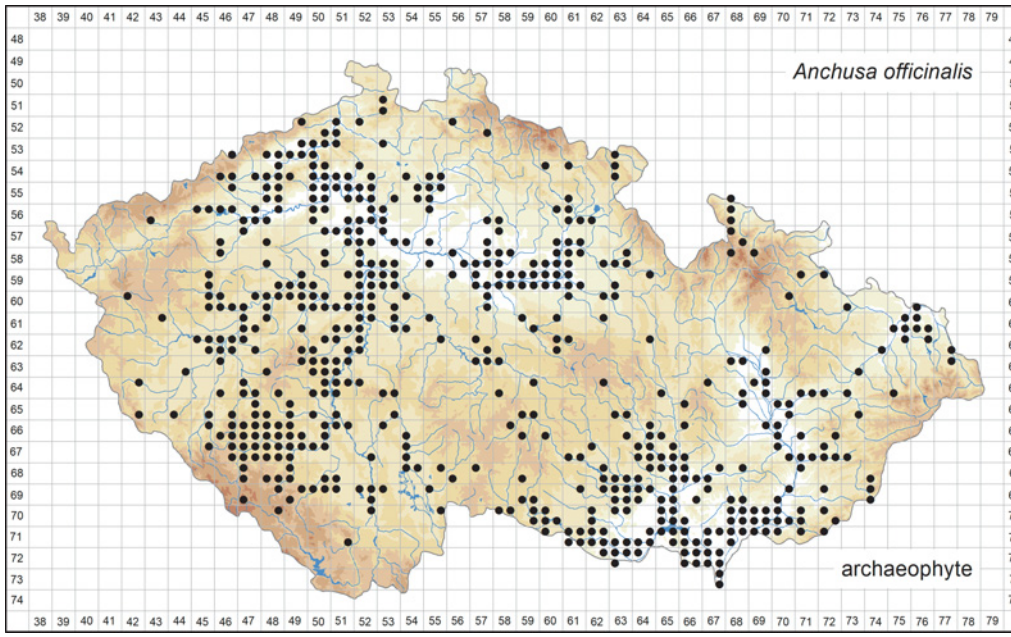

Fig. 11. Distribution of *Anchusa officinalis* in the Czech Republic (564 occupied quadrants). Prepared by Kateřina Šumberová.

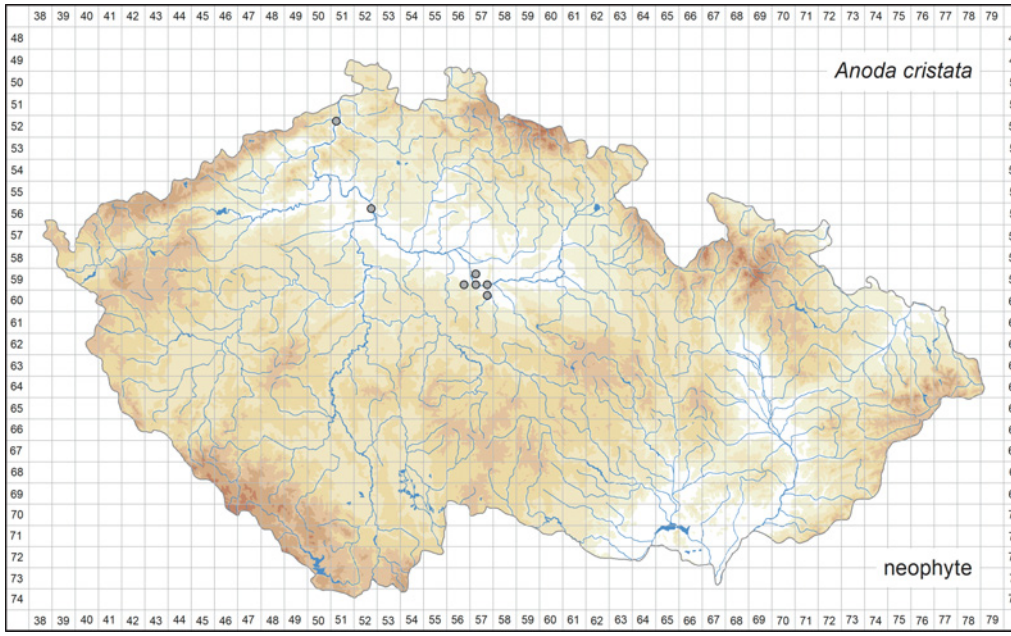

Fig. 12. Distribution of *Anoda cristata* in the Czech Republic: ◍ pre-2000 records only (7 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

Anoda cristata (Fig. 12)

Anoda cristata is native to eastern and southern North America, Central America, the West Indies and western and central South America (Fryxell 1987, USDA, NRCS 2023). In its native range it grows along streams, in damp meadows, fence rows, agricultural fields and at various disturbed sites. *Anoda cristata* is reported as introduced in some European countries, including France, Italy, Belgium, the Netherlands and Germany, mainly as a grain alien. Outside Europe it has been introduced into Israel, India, Sri Lanka, central Asia, the Russian Far East and Australia (Valdés & Raab-Straube 2011b, Pignatti et al. 2017, POWO 2023). It is also cultivated ornamentally. In the Czech Republic it was first found in 1973 near a poultry farm in the village of Velký Osek in central-eastern Bohemia. In the 1980s it was collected in the town of Kolín at a factory processing imported soybeans and at farms in the nearby villages of Zibohlavy, Libenice (both 1984) and Starý Kolín (1984, 1988 and 1989) where soybean waste was fed to livestock. Further records come from a transit shed at the river port of Nové Loubí at the Labe river north of the town of Děčín in northern Bohemia (1982, 1983, 1985) and from the river port in the town of Mělník in central Bohemia (1983). All these occurrences are associated with soybean import from the Americas (Slavík 1992). *Anoda cristata* is considered a casual neophyte in this country (Pyšek et al. 2022).

Atocion armeria (Fig. 13)

Atocion armeria is native to mountains of the Mediterranean area from southern France in the west to Romania in the east; in addition, the occurrences in eastern Poland, southern Lithuania and Belarus are also sometimes considered as native. The species is widely cultivated, and has secondary occurrences elsewhere across Europe, mainly in its central part. It has also been introduced into northern Africa, India, China, Japan, North America and Brazil (Jalas & Suominen 1986, Mereďa 2012). In the Czech Republic *A. armeria* used to be grown as an ornamental plant and occasionally escaped around gardens, cemeteries, chapels, churches, in places with garden waste, on soil heaps, along roads, at railway stations and other ruderal sites in villages and towns. Escaped plants have been recorded in all major parts of this country. The earliest record is from Mt Milešovka in the České středohoří Mts and dates back to 1846. The number of records has somewhat declined with less frequent cultivation during the second half of the 20th century. However, it has started to be recorded again during the past decade with the growing popularity of annual flower seed mixtures, which include *A. armeria* and are sown in public spaces in towns and even outside settlements, mainly along paths and during restoration of previously abandoned places. The records from gardens were not included in the map. The species is classified as a casual neophyte (Pyšek et al. 2022).

Atocion rupestre (Fig. 14)

Atocion rupestre has a disjunct European range. It occurs in Scandinavia, Finland and a small adjacent part of Russia, and also in the mountains of western, central and southern Europe, mainly in the Pyrenees, Massif Central, Vosges Mts and the Alps (Meusel et al. 1965, Hultén & Fries 1986, Jalas & Suominen 1986). In the Czech Republic its occurrence was documented by herbarium specimens from two sites in the Krkonoše Mts in

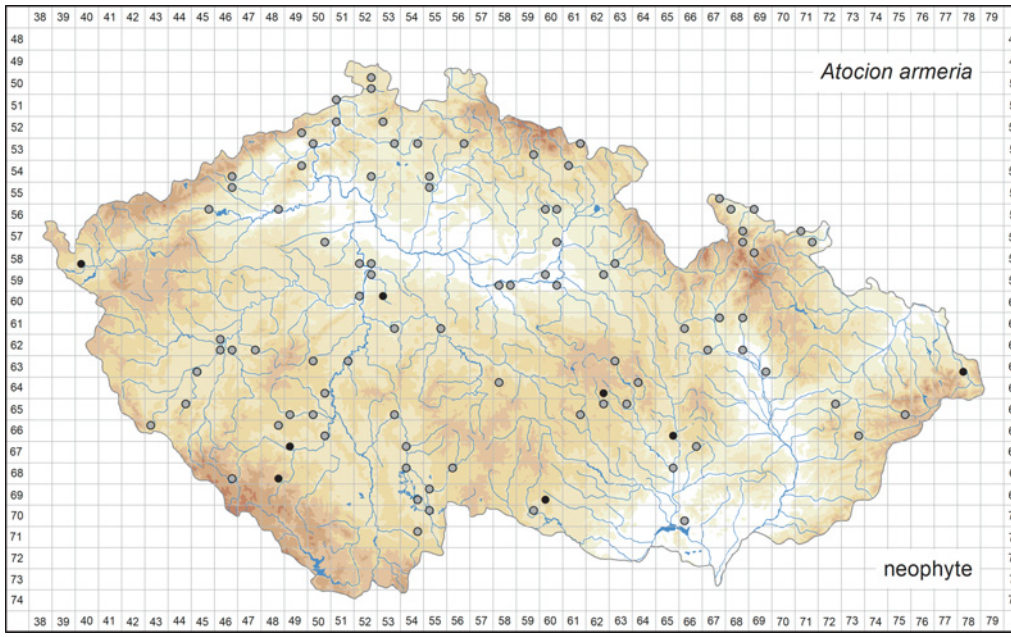

Fig. 13. Distribution of *Atocion armeria* in the Czech Republic: ● at least one record in 2000–2023 (8 quadrants), ◍ pre-2000 records only (87 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

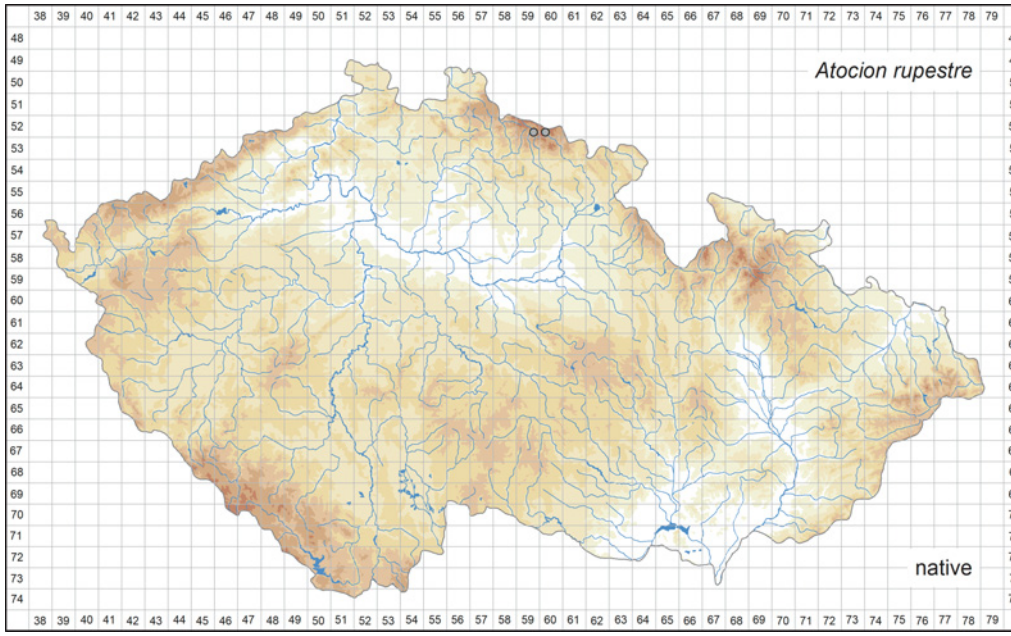

Fig. 14. Distribution of *Atocion rupestre* in the Czech Republic: ◍ pre-2000 records only (2 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

north-eastern Bohemia. The first record is from the Obří důl glacial cirque, where it was collected in 1946, the other from the Kozí hřbety ridge from 1952. At the latter site, its occurrence was confirmed in 1981 and 1982 (Šourková 1990c). No details on habitats are given on the herbarium labels, but considering the local conditions, *A. rupestre* may have grown there on shallow, stony soil on siliceous bedrock. The species is classified as missing in this country (Grulich 2012), but considering the time that has passed since its last observation it would be better classified as nationally extinct. However, the indigenous status of this species in the Czech Republic is somewhat doubtful, as the plants, discovered rather late in a botanically well-explored area, may represent remnants of experimental introductions of plants from the Alps and Scandinavia in the early 20th century (Šourková 1990c).

Ballota nigra (Fig. 15)

Ballota nigra is mainly a European species, with its range extending from the Mediterranean area northwards to southern Scandinavia and eastwards to European Russia, the Caucasus Mts, Transcaucasia and south-western Asia. It also occurs in northern Africa (POWO 2023). It is unclear which part of this range represents its native distribution and where *B. nigra* was introduced during development of rural landscapes. Recent introductions of *B. nigra* have been reported for Great Britain, Kyrgyzstan, the eastern part of the USA, Argentina and New Zealand (POWO 2023). Delimitation of the original range of *B. nigra* is complicated by its morphological variation: six to eight subspecies are distinguished in Europe (Patzak 1972, POWO 2023), and their status may be different in different countries. In the Czech Republic the prevailing subsp. *nigra* is considered an archaeophyte (Pyšek et al. 2022). It is a common ruderal weed, colonizing nitrophilous fringes of forests and shrub (particularly of *Robinia pseudoacacia* groves), semi-dry to dry ruderal grasslands, construction sites, walls, ruins, waste grounds, vineyards, edges of dirt roads and railways and other ruderal habitats with rather dry, nutrient-rich soils. *Ballota nigra* subsp. *nigra* is common throughout the country, with the exception of high elevations. The gaps on the map in the lowlands and at middle elevations are likely due to lack of records rather than true absences. Besides the typical subspecies, subsp. *meridionalis* (often given under the name of subsp. *foetida*) was also reported for this country. It is considered a neophyte (Pyšek et al. 2022), native to southern parts of Europe, while in central Europe it is scarce in habitats under strong human influence. Herbarium specimens assigned to subsp. *meridionalis* have been collected at several sites in central Bohemia and central and southern Moravia. However, during the examination of numerous herbarium specimens of *B. nigra* we found that the characters considered as diagnostic for the two subspecies do not correlate with each other and that there are continuous morphological transitions between the subspecies, even among individuals occurring at the same site. At least for the populations in the Czech Republic we consider the assignment of all the populations of *B. nigra* to the typical subspecies to be more appropriate. Similar observations have been made also in Slovenia (Frajman & Bačič 2011). The species needs further taxonomic study within its overall geographic range.

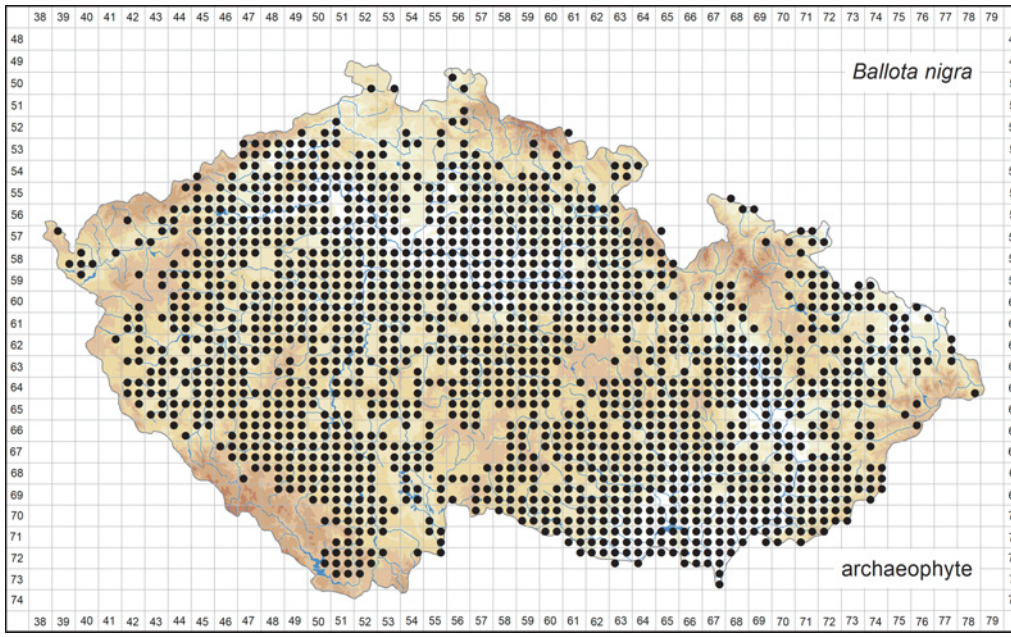

Fig. 15. Distribution of *Ballota nigra* in the Czech Republic (1628 occupied quadrants). Prepared by Kateřina Šumberová.

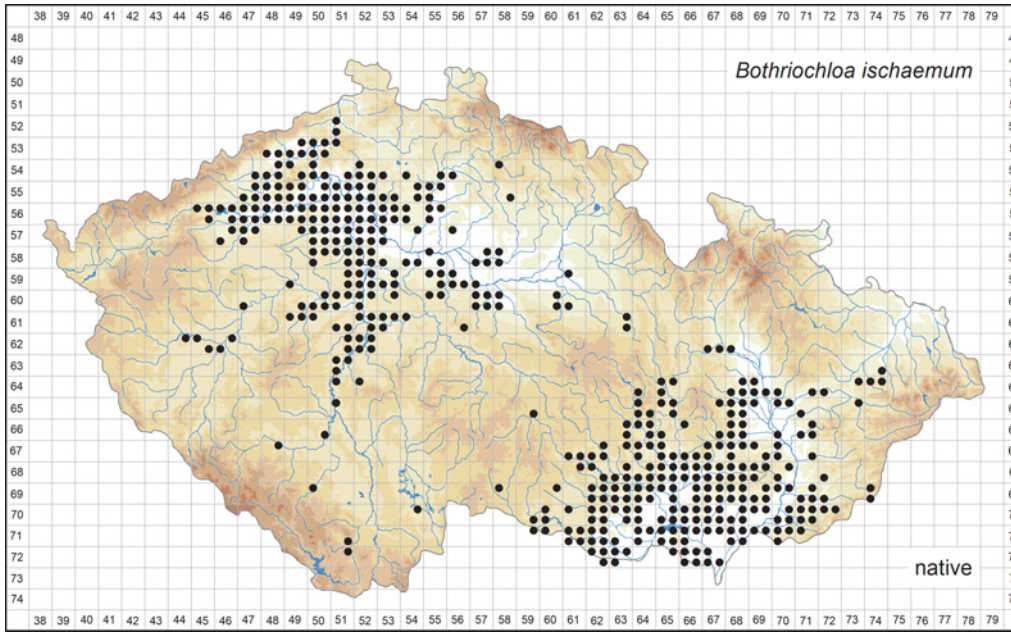

Fig. 16. Distribution of *Bothriochloa ischaemum* in the Czech Republic (452 occupied quadrants). Prepared by Kateřina Šumberová.

Bothriochloa ischaemum (Fig. 16)

Bothriochloa ischaemum is a thermophilous steppic grass native to most of Europe except its westernmost and northern parts, as well as temperate and subtropical zones of Asia and north-western Africa. It has been introduced into North and South America, Japan, Philippines and Indonesia (POWO 2023). In many countries it used to be cultivated as a forage crop and erosion-prevention plant. Recently it has become a dangerous invasive weed, presenting a threat to native biodiversity in some parts of the world (Wilson 2015). In the Czech Republic *B. ischaemum* grows in various types of dry grasslands, particularly in basiphilous steppic vegetation on deep soils formed over loess. It also occurs in ruderalized habitats such as edges of vineyards and dirt tracks. It is supported by mechanical disturbances, e.g. by activity of wild rabbit colonies, as it is advantaged by its very dense and strong root system, whereas competitive grasses such as *Calamagrostis epigejos* are eliminated. Because of the decline of rabbit populations and along with them small-scale disturbances in dry grasslands, *B. ischaemum* is threatened by fast succession. However, this species still occurs at many dozens of sites in north-western and central Bohemia and southern and central parts of Moravia that it is sufficiently frequent to be classified as vulnerable (Grulich 2012).

Bunias erucago (Fig. 17)

Bunias erucago is a Mediterranean species, native to southern Europe, Anatolia and northern Africa (Algeria and Morocco); northwards its range extends to central France, southern Switzerland, Serbia and Bulgaria. It has also been found as an introduced species in Germany, Austria, the Czech Republic, Ukraine and the eastern USA (Meusel et al. 1965, Jalas & Suominen 1994, Verloove 2006, Al-Shehbaz 2010, Marhold 2011). In its native range it grows in disturbed sites, on roadsides, landfills, field edges, pastures and other ruderal habitats. In the Czech Republic *B. erucago* was recorded reliably only once, as introduced along a railway line near the town of Mladá Boleslav in central Bohemia in 1896. The species has also been reported from several other localities in this country (Smejkal 1992), but these records are undocumented by herbarium specimens and probably erroneous. *Bunias erucago* is considered a casual neophyte (Pyšek et al. 2022).

Bunias orientalis (Fig. 18)

The native range of *Bunias orientalis* is disputable. Some authors consider the species to be native only to the Armenian highlands, while according to others, its native range covers the entire eastern part of Europe and extends as far east as central Siberia. The species began to spread westwards from eastern Europe in the second half of the 18th century and now occurs almost throughout Europe except for the Mediterranean area and Iceland (Meusel et al. 1965, Jehlík & Slavík 1968, Jalas & Suominen 1994, Marhold 2011). Particularly in northern and central Europe, it is currently considered a highly invasive species (Harvey et al. 2010). Outside Europe it was introduced to eastern North America, British Columbia, China, Mongolia and the Russian Far East (Hultén & Fries 1986, Zhou et al. 2001, Al-Shehbaz 2010). In the Czech Republic *B. orientalis* grows mainly in man-made habitats such as roadsides, railway stations and embankments, soil and rubble dumps, surroundings of agricultural buildings and factories, margins of arable fields and

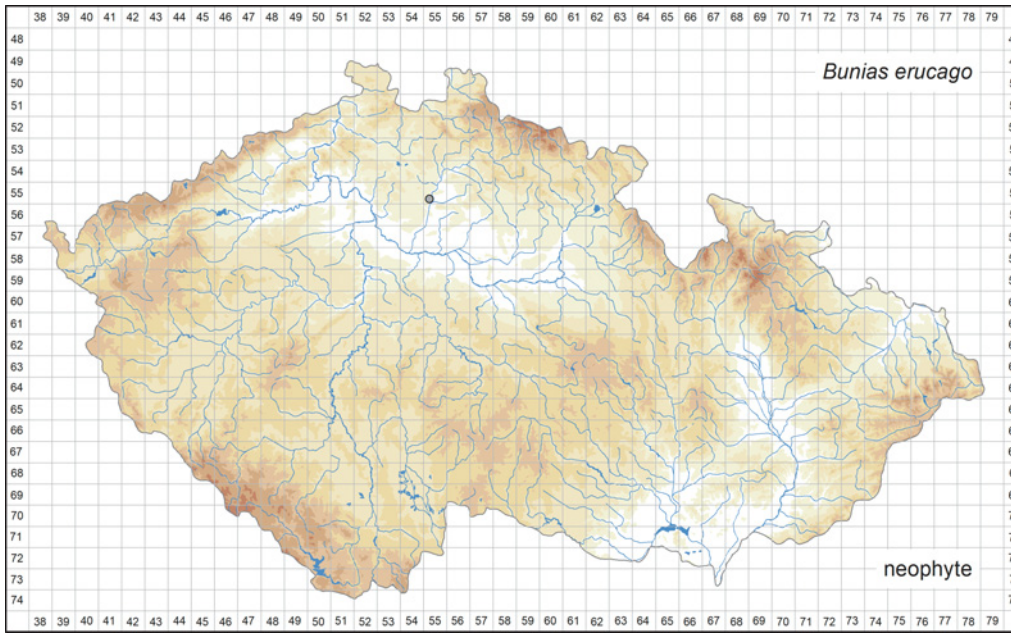

Fig. 17. Distribution of *Bunias erucago* in the Czech Republic: ● pre-2000 records only (1 quadrant). Prepared by Jan Prančl.

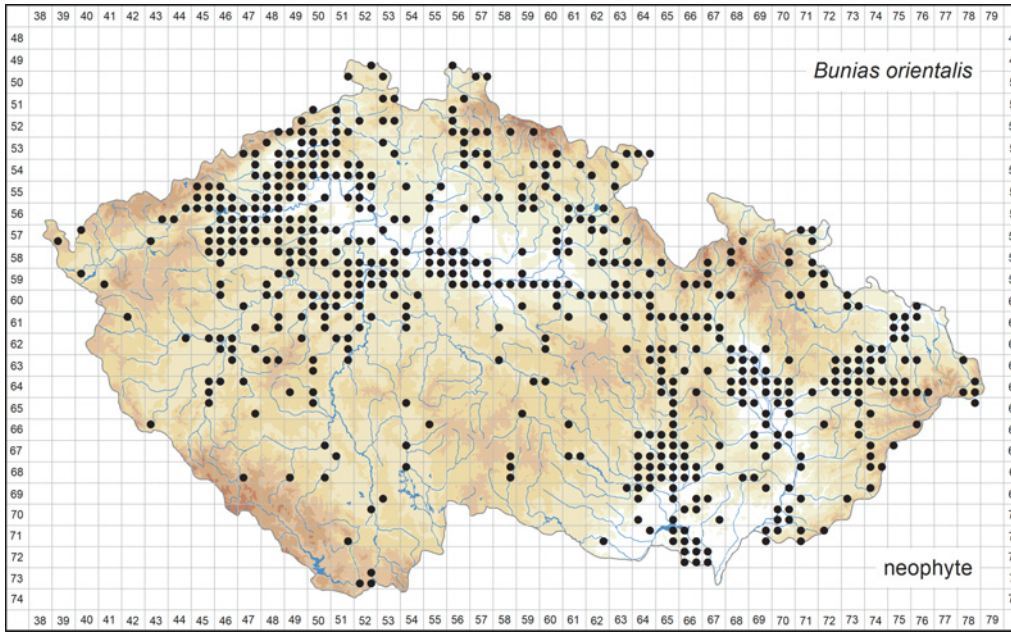

Fig. 18. Distribution of *Bunias orientalis* in the Czech Republic (572 occupied quadrants). Prepared by Jan Prančl.

dirt roads, channelized stream banks, ruderal grasslands in cities and towns and other ruderal sites and waste places. It has also recently expanded to semi-natural meadows and pastures disturbed by floods or animals, e.g. by burrowing activity of moles (Křivánek 2004, Kiełtyk & Mirek 2015, Corli et al. 2021). It occurs on dry to moist, nutrient-rich soils under regular disturbance, on both acidic and basic substrates. In this country the species was first recorded in 1884 near the settlement of Lužerady north of the town of Louny in north-western Bohemia. Soon after the discovery it was found escaped in other areas, namely near the towns of Chrudim and Pardubice in eastern Bohemia (1885) and Plzeň in western Bohemia (1896); in 1902 it was for the first time found in Moravia near the village of Blučina, south of the city of Brno. The species' spread accelerated after World War II, when it became widespread in warm areas of the country, being particularly abundant in north-western Bohemia, around Prague, in southern and central Moravia and in the Odra river basin in north-eastern Moravia and adjacent Silesia. Recently the species has spread to higher elevations (likely due to global climate change), reaching a current elevational maximum of 965 m on the top of Mt Velká Javořina in the Bílé Karpaty Mts. The spread of the species is faster than the recording of new sites by field botanists; thus, the distribution map is certainly incomplete. *Bunias orientalis* is considered an invasive neophyte (Pyšek et al. 2022).

Conium maculatum (Fig. 19)

Conium maculatum is now distributed in many parts of the world. Due to unintentional dispersal of seeds by humans since the early Middle Ages it is difficult to delimit its native distribution. According to Pyšek et al. (2022) *C. maculatum* probably originated in the Mediterranean area and parts of Asia extending to the western Himalayas. In central and eastern Europe, including the Czech Republic, it should be considered an archaeophyte (see also GBIF 2023). However, other authors consider it as native to most of Europe except its northernmost parts (Tutin 1968, Meusel et al. 1978, POWO 2023) along with northern Africa. Recent introductions of the species are known from the British Isles, Norway, western Siberia, the Russian Far East, the Korean Peninsula, Japan, southern Africa, North and South America, Tasmania and New Zealand (POWO 2023). *Conium maculatum* is a successful and dangerous invader, competing with native plant species and having toxic influences on various organisms (Parker 2015). In this country it started to spread invasively a few decades ago after the period of naturalization; however, recently this process seems to have stopped (Pyšek et al. 2022). The species occurs in tall, usually unmown nitrophilous vegetation in mesophilous habitats such as abandoned meadows, ditches, waste places, road verges, railway embankments, field and vineyard edges, and surroundings of silage pits and pigsties. In this country *C. maculatum* is common in the lowlands and at warm middle elevations in north-western, central, eastern and southern Bohemia, and southern and central Moravia. Elsewhere it is scattered, but it is absent from the mountains.

Epipogium aphyllum (Fig. 20)

Epipogium aphyllum occurs in most of Europe except for its westernmost and southernmost parts, with its distribution uneven, being most frequent in its boreal parts and in the Alps, Carpathians and adjacent mountain ranges, and extending eastwards across southern

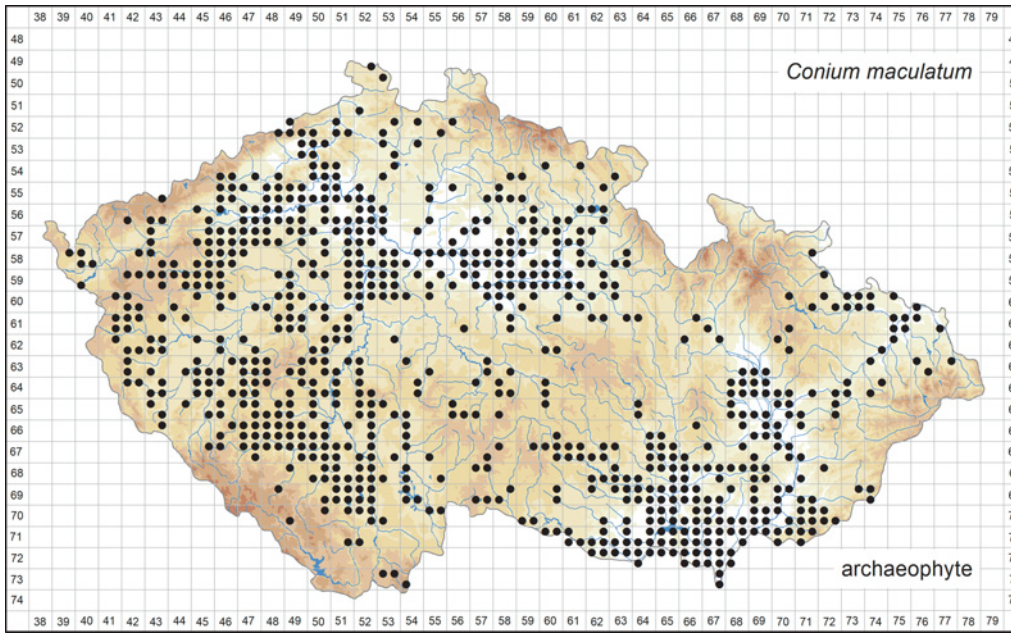

Fig. 19. Distribution of *Conium maculatum* in the Czech Republic (786 occupied quadrants). Prepared by Kateřina Šumberová.

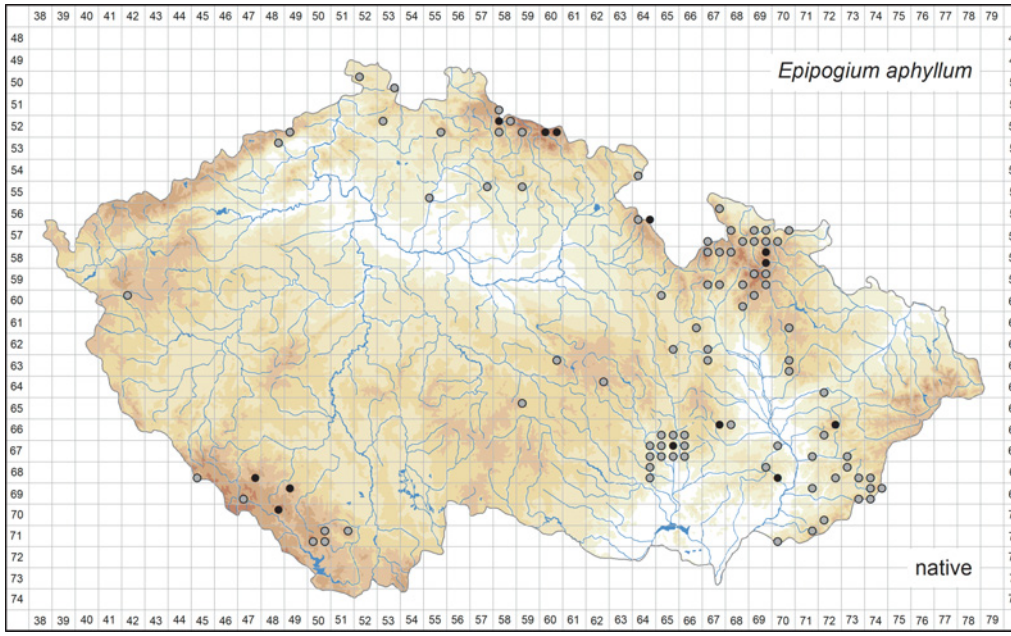

Fig. 20. Distribution of *Epipogium aphyllum* in the Czech Republic: ● at least one record in 2000–2023 (13 quadrants), ● pre-2000 records only (85 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

Siberia as far as the Russian Far East and Japan; isolated occurrences are mainly in the Caucasus and Himalayas Mts (Meusel et al. 1965, Hultén & Fries 1986). In the Czech Republic *E. aphyllum* grows mainly around springs and along small streams in beech and spruce forests, often at places covered by mosses. The soils are humid, basic to slightly acidic and rich in humus and nutrients. In Bohemia it is almost restricted to the high mountains along this country's border. It used to be more frequent in Moravia, particularly in the mountains in its northern part, around the city of Brno and in the hilly landscapes of south-eastern Moravia. It had been considered on the verge of extinction from this country in the 1990s but since 2000 it has been (re)discovered at about a dozen sites. This may be at least partly explained by its mycoheterotrophy: such plants can develop no aboveground parts over several successive years and then unexpectedly reappear (see Taylor & Roberts 2011 for references). However, *E. aphyllum* is rare in this country, and its populations are small. Therefore, it is classified as critically threatened (Grulich 2012).

Kickxia elatine (Fig. 21)

Kickxia elatine occurs in southern, western, central and south-eastern Europe, towards the north reaching as far as ~55°N. In central Europe it is usually considered an archaeophyte; further towards the north a neophyte. It is also found in Macaronesia, some parts of northern Africa and south-western Asia, reaching as far as Afghanistan, western Pakistan and Kashmir. The populations from the southern part of this species' range are separated as subsp. *crinita* (incl. *K. caucasica* and other putative taxa), while those in the northern part of the range correspond to the typical subspecies. *Kickxia elatine* has been introduced into and become naturalized in the Americas, South Africa, Australia, Tasmania and New Zealand (Meusel et al. 1978, Sutton 1988, GBIF 2023, POWO 2023). In the Czech Republic *K. elatine* grows mainly on arable and fallow land, less frequently on river banks, bottoms of drained fishponds, at railway stations and in some other ruderal habitats. The soils are loamy, less often sandy, usually wet in the spring but often turning dry in the summer, slightly acidic to basic, moderately rich or rich in nutrients, sometimes slightly saline. In this country *K. elatine* occurs in north-western, central and eastern Bohemia, as well as in southern, south-eastern, central and northern Moravia, including the adjacent part of Silesia. The single, usually short-lasting occurrences elsewhere, particularly those in southern Bohemia, represent introductions with grain (used for feeding fish) and probably also with commercial seed. *Kickxia elatine* is found from lowlands up to elevations of ~450 m, with its elevational maximum of 630 m found above the village of Huslenky in eastern Moravia. All the plants found in the Czech Republic correspond to the typical subspecies (see Sutton 1988 for diagnostic characters); the record of subsp. *crinita* (see Chrtek 1984) is erroneous. *Kickxia elatine* considerably declined after World War II, with the main cause being the intensification of agriculture. It is considered a naturalized archaeophyte (Pyšek et al. 2022) and classified as endangered due to its decline (Grulich 2012).

Kickxia spuria (Fig. 22)

Kickxia spuria occurs in southern, western, central and south-eastern Europe, towards the north reaching southern England, the Netherlands, central Germany, southern Poland

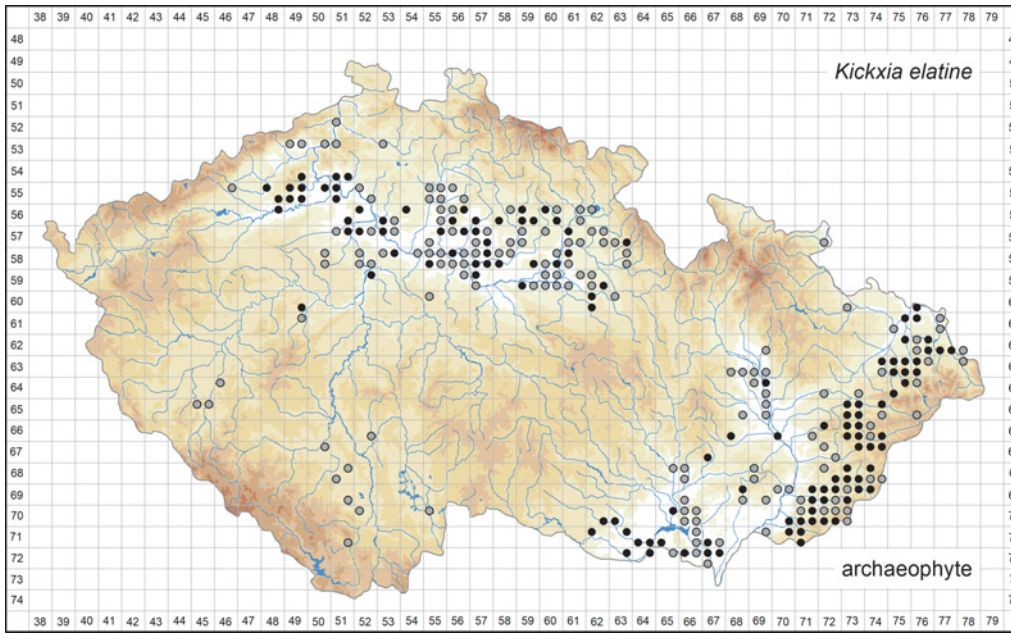

Fig. 21. Distribution of *Kickxia elatine* in the Czech Republic: ● at least one record in 2000–2023 (124 quadrants), ● pre-2000 records only (150 quadrants). Prepared by Olga Rotreklová & Jiří Danihelka.

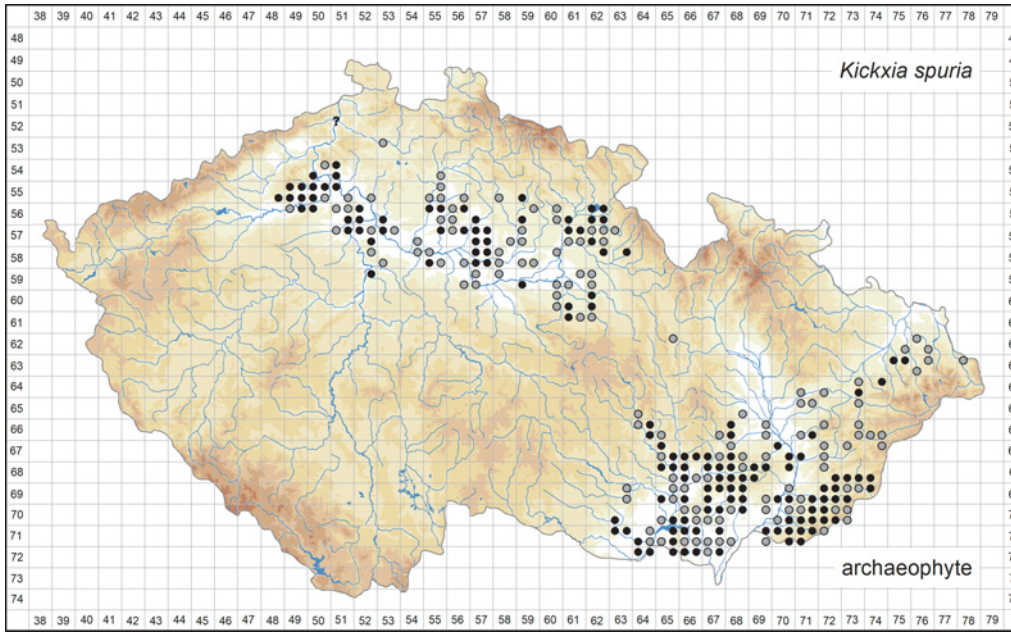

Fig. 22. Distribution of *Kickxia spuria* in the Czech Republic: ● at least one record in 2000–2023 (143 quadrants), ● pre-2000 records only (133 quadrants). Prepared by Olga Rotreklová & Jiří Danihelka.

and northern Romania. It is native to the Mediterranean area, while the occurrences in central Europe are considered archaeophytic and those more northern neophytic. This species also occurs in Macaronesia, northernmost Africa and south-western Asia. It has been introduced into and become naturalized in North America, South Africa, Australia, Tasmania and New Zealand (Meusel et al. 1978, Sutton 1988, GBIF 2023, POWO 2023). The populations found in central Europe belong to the typical subspecies; subsp. *integrifolia* occurs mainly in the Mediterranean area (Sutton 1988, POWO 2023). In the Czech Republic *K. spuria* grows as a weed on arable and fallow land, less frequently in adjacent disturbed dry grasslands and ruderal habitats. The soils are usually loamy, less often sandy, sometimes wet in the spring but usually dry in the summer, slightly acidic to basic, moderately rich or rich in nutrients, sometimes slightly saline. In this country *K. spuria* occurs almost continuously in north-western, central and eastern Bohemia, as well as southern, southern central and south-eastern Moravia (particularly in the Bílé Karpaty Mts), with scattered occurrences as far as northern Moravia. There are only a few remote occurrences elsewhere and, in general, *K. spuria* seems not to be prone to accidental introductions outside its local range. It is found from lowlands up to elevations of ~400 m, reaching its elevational maximum at 490–500 m between the villages of Všemina and Liptál in eastern Moravia. This species is classified as a naturalized archaeophyte (Pyšek et al. 2022) and as endangered due to its decline (Grulich 2012) related to the intensification of agriculture.

Kitaibela vitifolia (Fig. 23)

Kitaibela vitifolia is native to Croatia, Bosnia and Herzegovina, Serbia, Kosovo, North Macedonia and Albania (Tomović et al. 2007, Barina et al. 2013); the origin of the occurrences in Anatolia is unclear (Tunçkol et al. 2020). It is occasionally cultivated in gardens and parks and escapes, e.g. in Belgium, Germany, Slovakia, Austria, Hungary and Romania (Petridean 1985, POWO 2023, Verloove 2023a). In its native range *K. vitifolia* grows in open deciduous forests, forest fringes, scrub and grasslands, and also on road verges, vineyards and orchards, often in river valleys and gorges (Stevanović et al. 1991, Tomović et al. 2007). In the Czech Republic it was found in 2020 in Prague's city district of Krč in nitrophilous vegetation on a mound of soil piled on land abandoned after the closure of a horticultural school (Sádlo 2022). *Kitaibela vitifolia* is considered a casual neophyte in this country (Pyšek et al. 2022).

Lavatera punctata (Fig. 24)

Lavatera punctata is native to the Mediterranean area, the Caucasus Mts, Transcaucasia, northern Iran and Turkmenistan (Valdés & Raab-Straube 2011b, POWO 2023). It occurs there on grassy slopes, in scrub, cultivated fields, on path and roadsides and in other disturbed sites. It is only occasionally found as an ephemeral alien outside of this range, such as in Belgium (uncertain vector of introduction; Verloove 2023b) and the British Isles (associated with grain and wool; Clement & Foster 1994). *Lavatera punctata* is only rarely cultivated ornamentally. In the Czech Republic a single specimen was observed in 2016 in an abandoned orchard near the village of Pohoří in central Bohemia (Vaníček 2020). The mode of introduction is not known. The species is considered a casual neophyte in this country (Pyšek et al. 2022).

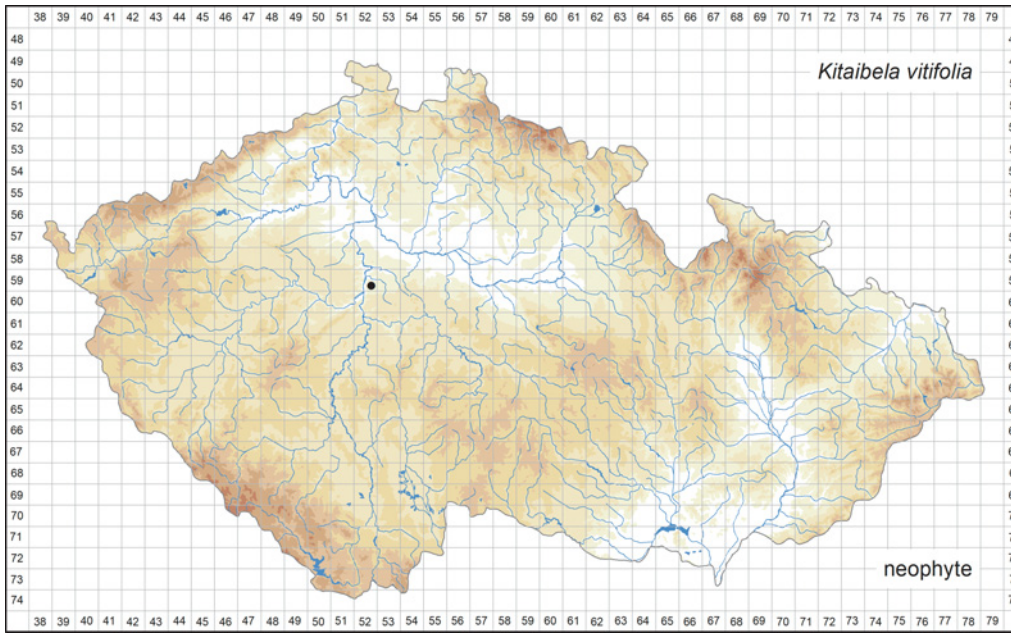

Fig. 23. Distribution of *Kitaibela vitifolia* in the Czech Republic (1 occupied quadrant). Prepared by Jindřich Chrtek and Michal Ducháček.

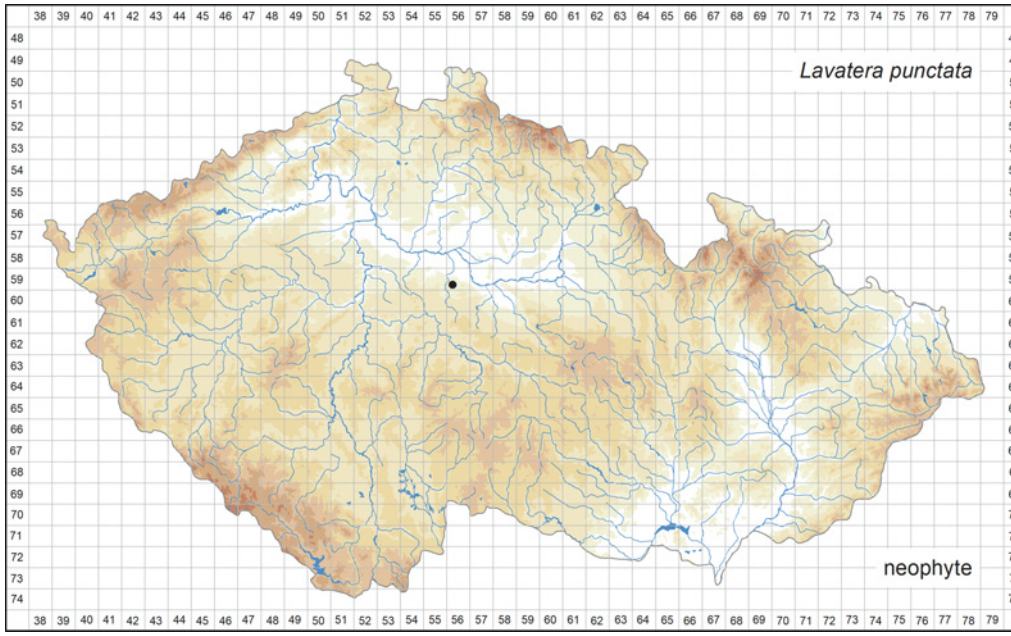

Fig. 24. Distribution of *Lavatera punctata* in the Czech Republic (1 occupied quadrant). Prepared by Jindřich Chrtek and Michal Ducháček.

Lavatera thuringiaca (Fig. 25)

The native range of *Lavatera thuringiaca* extends from central Europe in the west to the Altai Mts in the east; westwards it reaches the Czech Republic, Austria and northern Italy (occurrences in central Germany are also considered native by some authors, see Brandes 2000), southwards southern Italy, Greece, northern Iran and Kazakhstan. The northern limit of its native distribution is unclear, and is likely in southern Poland, Ukraine, the southern part of European Russia and southern Siberia. It is a rare alien or escape from (or relict of) cultivation, sometimes more or less established in western and northern Europe and central temperate North America (Valdés & Raab-Straube 2011b, POWO 2023). In the Czech Republic *L. thuringiaca* occurs in ruderal thermophilous dry grasslands and scrub, in the fringes of thermophilous forests, vineyards, along roads, in stone quarries, at various semi-ruderal sites and on fallow land, around castles, castle ruins and country holy crosses. It usually grows on dry, basic soils, moderately supplied with nutrients and often well supplied with calcium, sometimes even saline. It is scattered throughout the warm, dry hilly areas and less frequently lowlands in southern Moravia, extending westwards to the Oslava, Jihlava, Rokytná and Dyje river valleys, northwards to the surroundings of the city of Olomouc and to the limestone area east of the town of Hranice, and eastwards to the Bílé Karpaty Mts; a few occurrences are known elsewhere. In Bohemia *L. thuringiaca* is rare in warm hilly landscapes in its north-western part, westwards reaching the surroundings of the town of Kadaň, and in the Labe river basin and surrounding hilly areas in its central part, eastwards reaching the surroundings of the towns of Chlumec nad Cidlinou and Kutná Hora. It reaches its elevational maximum at ~600 m near the village of Štítná nad Vláří in the Bílé Karpaty Mts; temporary occurrence was documented at 790 m near the town of Nové Město na Moravě. *Lavatera thuringiaca* is probably native only in southern Moravia. It is classified as of lower risk – near threatened in this country (Grulich 2012).

Lavatera trimestris (Fig. 26)

Lavatera trimestris is native to the Mediterranean area, where it occurs in disturbed grasslands, arable fields and on roadsides. Elsewhere it is cultivated as an ornamental and occasionally escapes or naturalizes in many European countries, South Africa, the USA and south-eastern Asia (POWO 2023, Verloove 2023c). In the Czech Republic the first reliable record of escaped plants came from the village of Sloupnice in eastern Bohemia (Fleischer in Domin 1918), but there are some earlier specimens of uncertain status. Further records of temporary escaped plants have come from ruderal sites in settlements and allotments in mainly warmer parts of central, eastern and southern Bohemia and eastern Moravia. *Lavatera trimestris* is considered a casual neophyte in this country (Pyšek et al. 2022).

Lawrencia glomerata (Fig. 27)

Lawrencia glomerata is native to Australia, where it grows mainly in saline or subsaline succulent steppe, grasslands, open woodland and around coastal inlets and inland lakes (Lander 1984). In the Czech Republic it was found in the city of Brno in 1958–1961 in allotments in strawberry beds fertilized with waste from wool cleaning (Dvořák & Kühn 1966). *Lawrencia glomerata* is considered a casual neophyte in this country (Pyšek et al. 2022).

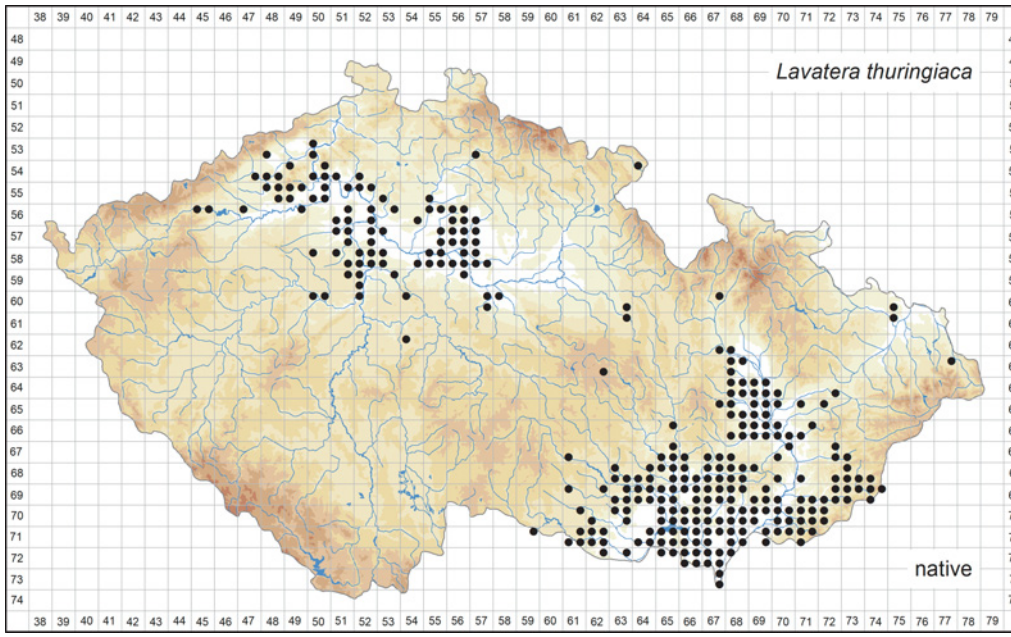

Fig. 25. Distribution of *Lavatera thuringiaca* in the Czech Republic (299 occupied quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

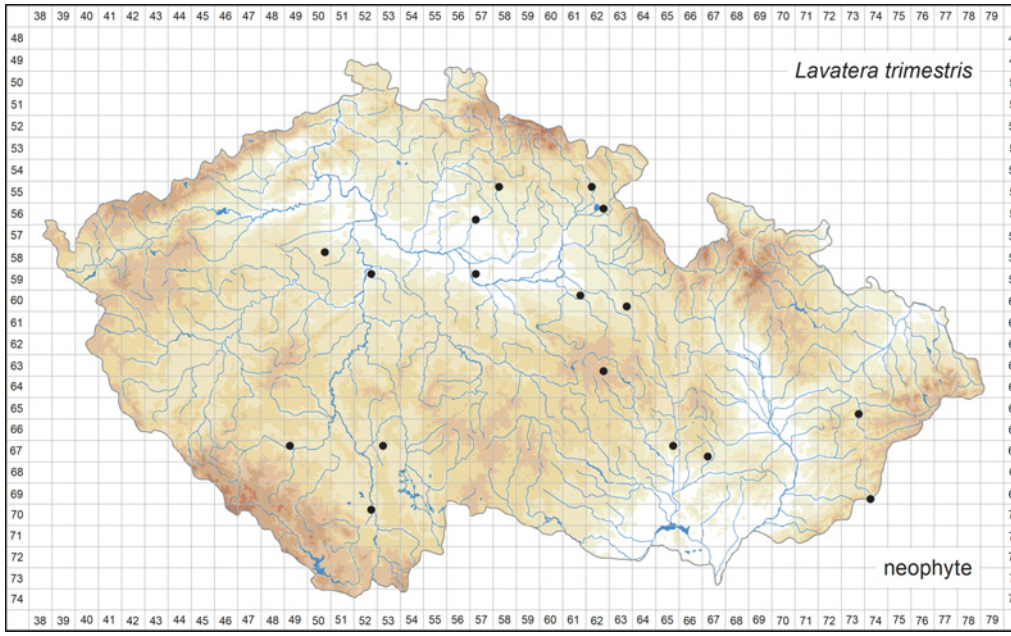

Fig. 26. Distribution of *Lavatera trimestris* in the Czech Republic (17 occupied quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

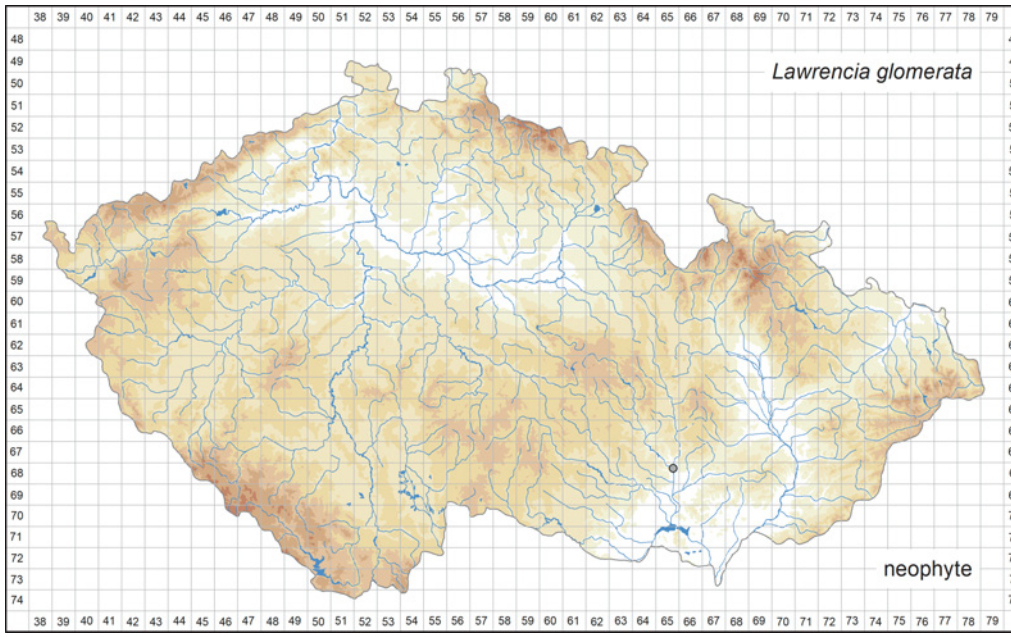

Fig. 27. Distribution of *Lawrencia glomerata* in the Czech Republic: ● pre-2000 records only (1 quadrant). Prepared by Jindřich Chrtek and Michal Ducháček.

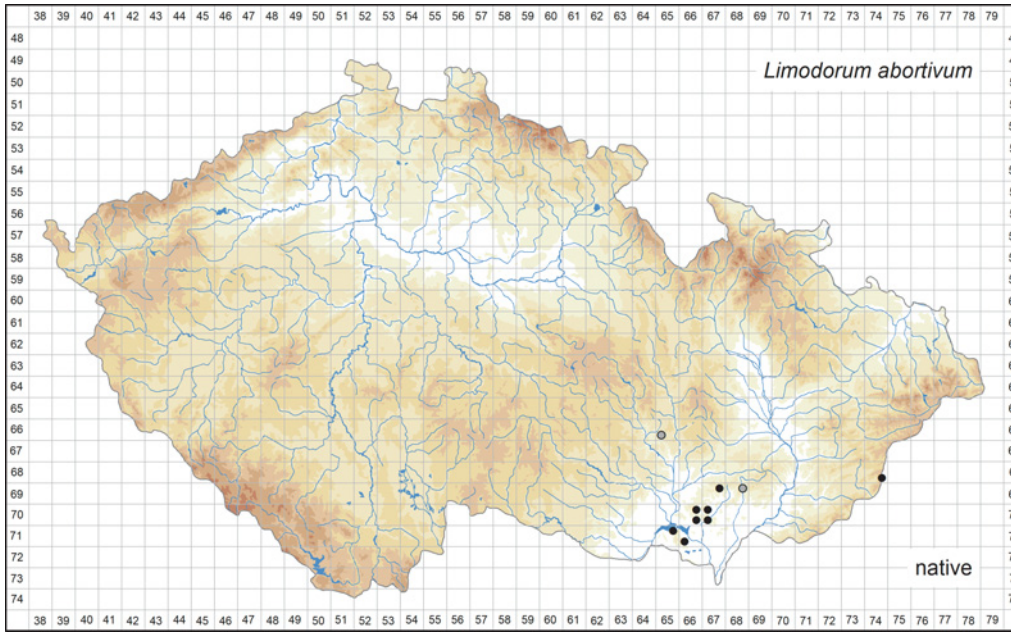

Fig. 28. Distribution of *Limodorum abortivum* in the Czech Republic: ● at least one record in 2000–2023 (8 quadrants), ● pre-2000 records only (2 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

Limodorum abortivum (Fig. 28)

Limodorum abortivum occurs mainly in the Mediterranean area, in its European part from south-western Spain in the west to Greece and Bulgaria in the east, extending northwards to northern France, Belgium, south-western Germany, south-eastern Czech Republic, Slovakia, Romania and Crimea, in its African part in the northernmost areas of Morocco, Algeria and Tunisia, and in its Asian part in Anatolia, Syria, Lebanon and Israel; it also occurs in the Caucasus Mts, Iraq and Iran (Knapp 1985). In the Czech Republic *L. abortivum* grows in open-canopy thermophilous oak forests, their margins and fringes as well as on forest-steppe slopes. The soils are usually basic, developed over limestone or loess. In this country this species is rare, restricted to southern Moravia, with the majority of the populations located in the hilly landscapes of the Pavlovské vrchy hills and the Ždánický les hills and the area between them. *Limodorum abortivum* has been recorded at about two dozen sites, of which it has been observed at only eight since 2000. However, as a mycoheterotrophic species, it may survive at a site for several consecutive years without forming aboveground parts. As the populations are small, and the species is generally rare, it is classified as critically threatened (Grulich 2012).

Listera cordata (Fig. 29)

Listera cordata has a circumpolar boreal-montane distribution in the Northern Hemisphere. In Europe it is found widely in its northern parts, whereas in central Europe and the adjacent sub-Mediterranean areas it is restricted to the mountains between the Pyrenees in the west and the eastern and southern Carpathians in the east. In Asia it is found mainly in the Caucasus Mts, western Siberia, the Russian Far East and Japan. In North America it is distributed from the Aleutian Islands and the western coast of the USA to the Atlantic coast of the continent (Meusel et al. 1965, Hultén & Fries 1986). In the Czech Republic *L. cordata* grows in moss-rich waterlogged spruce forests, at edges of ombrotrophic peat bogs and occasionally in dwarf mountain pine scrub with a thick moss layer. The substrate is wet, slightly to moderately acidic and nutrient-poor. In this country the species is more or less restricted to the mountains along its borders, namely to the Novohradské hory Mts, Šumava Mts, Český les hills, Slavkovský les hills, Krušné hory Mts, Jizerské hory Mts, Krkonoše Mts, Orlické hory Mts, Králický Sněžník Mts, Hrubý Jeseník Mts, Slezské Beskydy Mts and Moravskoslezské Beskydy Mts. Most of its populations have vanished, and the extant ones are small. *Listera cordata* is therefore classified as critically threatened (Grulich 2012).

Listera ovata (Fig. 30)

Listera ovata is distributed across most of Europe except the extreme north and southeast; towards its southern distribution limit it grows mainly in montane areas. From Europe it extends to western Siberia and the Caucasus Mts, and several isolated occurrences are dispersed in Anatolia as well as in the Alborz, Tian Shan, Sayan and western Himalayas (Hultén & Fries 1986). It has been introduced into the Canadian province of Ontario (Magrath & Coleman 2002). In the Czech Republic *L. ovata* occupies a relatively wide range of habitats. It grows in sunny places such as meadows, orchards, grassy slopes along roads, open scrub communities and forest fringes as well as semi-shaded habitats

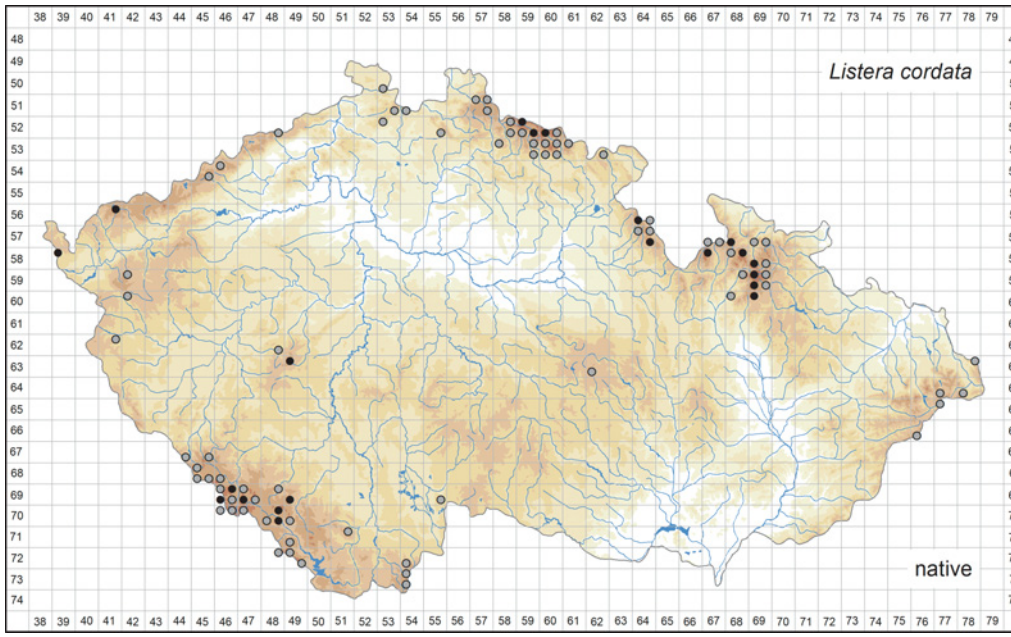

Fig. 29. Distribution of *Listera cordata* in the Czech Republic: ● at least one record in 2000–2023 (21 quadrants), ● pre-2000 records only (72 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

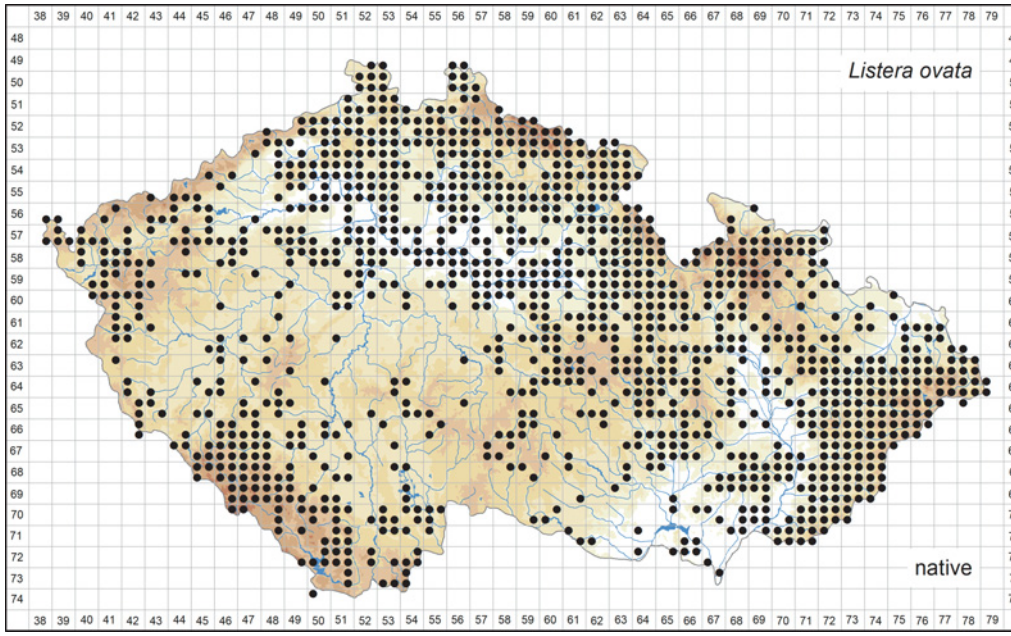

Fig. 30. Distribution of *Listera ovata* in the Czech Republic (1202 occupied quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

including open-canopy oak-hornbeam forests and ash-alder alluvial forests. It prefers humid, slightly acidic to basic, nutrient-rich deep soils. In this country it is one of the most common orchids, but its distribution is uneven. It occurs mainly in northern and eastern Bohemia and in eastern Moravia, and is still fairly common at low elevations in the Šumava Mts, westernmost Bohemia and north-western Moravia. In contrast, it is rare in or absent from the western and southern parts of central Bohemia, south-western Moravia and lowland Silesia. It has locally declined slightly and is therefore classified as of lower risk – near threatened (Grulich 2012).

Malope trifida (Fig. 31)

Malope trifida is native to north-western Africa. It is widely cultivated for ornament and reported as a rare ephemeral alien associated with garden waste and birdseed from some European countries; locally it has become naturalized, e.g. in Spain, Portugal and France (Valdés & Raab-Straube 2011b, POWO 2023, Verloove 2023d). In its native range it occurs in fields and waste places. In the Czech Republic this ornamental garden plant escapes only occasionally. It was reported for the first time by Krist (1935) from a rubble site in the city of Brno. Later, *M. trifida* was collected near the village of Hejná in south-western Bohemia, in the surroundings of the towns of Kladno and Slaný in central Bohemia, in the city of Pardubice in eastern Bohemia, in the town of Krnov in northern Moravia, and in railway stations of the towns of Horažďovice in south-western Bohemia and Česká Třebová in eastern Bohemia. Recently the species has become a constituent of commercially sold seed mixtures that are intentionally sown in public places, e.g. along roads. The species is considered a casual neophyte in this country (Pyšek et al. 2022).

Malva alcea (Fig. 32)

Malva alcea is native to Europe from the Iberian Peninsula in the west to the westernmost part of European Russia in the east; northwards the native range probably extends to southern Sweden, southernmost Finland and the vicinity of the city of Saint Petersburg, southwards to Corsica, southernmost part of the Italian Peninsula and Anatolia. It is an old horticultural species, grown as a medicinal and ornamental plant and for magical purposes, and thus many occurrences within the native range represent garden escapes or relicts of former cultivation. Outside its native range, it occurs in Great Britain, Scandinavia and European Russia eastwards to the Volga river basin, and it has also been introduced into North America (Slavík in Ponert 1966, GBIF 2023, POWO 2023). In the Czech Republic *M. alcea* is found mainly on grassy slopes, in scrub, forest fringes, on stony slopes and at various secondary sites, including stone quarries, surroundings of railway stations, railway embankments, ruderal grasslands along roads, dump sites, castle ruins, less often meadows, pond dams and river embankments. Soils are usually fresh to moderately dry, well-drained, neutral to basic, moderately to well supplied with nutrients. *Malva alcea* occurs mainly in warm and moderately warm hilly areas and river valleys, especially in some parts of south-central, south-western, southern and eastern Bohemia, while it is rare in or probably locally absent from southern and central parts of Moravia. It is also rare in the highlands; its elevational maximum is at about 850 m near the Ramzovské sedlo pass in northern Moravia. *Malva alcea* is classified as of lower risk – near threatened (Grulich 2012). As it is hardly possible to delimit its native distribution

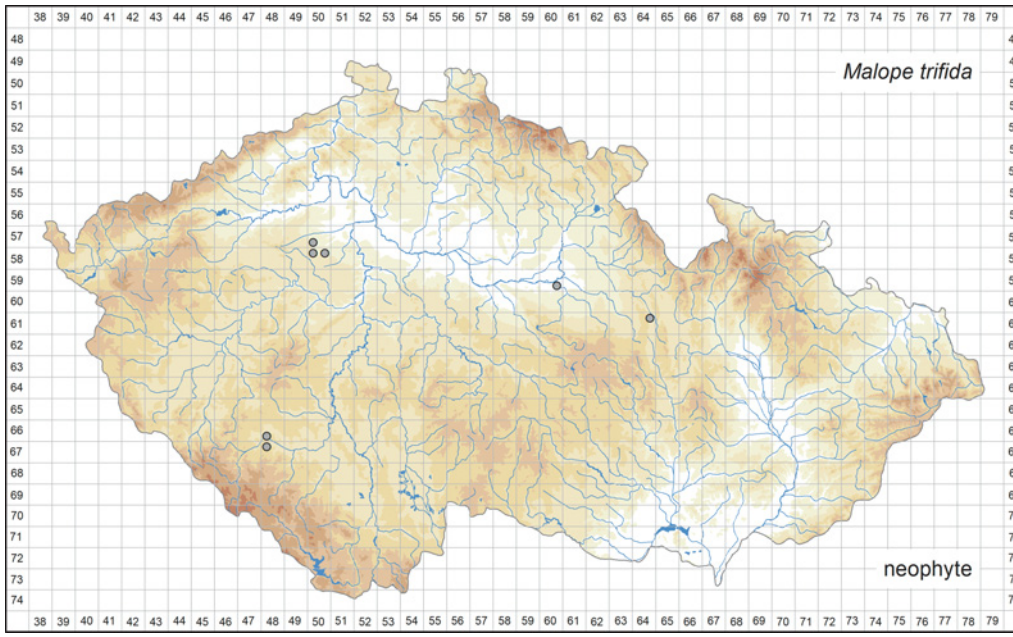

Fig. 31. Distribution of *Malope trifida* in the Czech Republic: ◍ pre-2000 records only (7 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

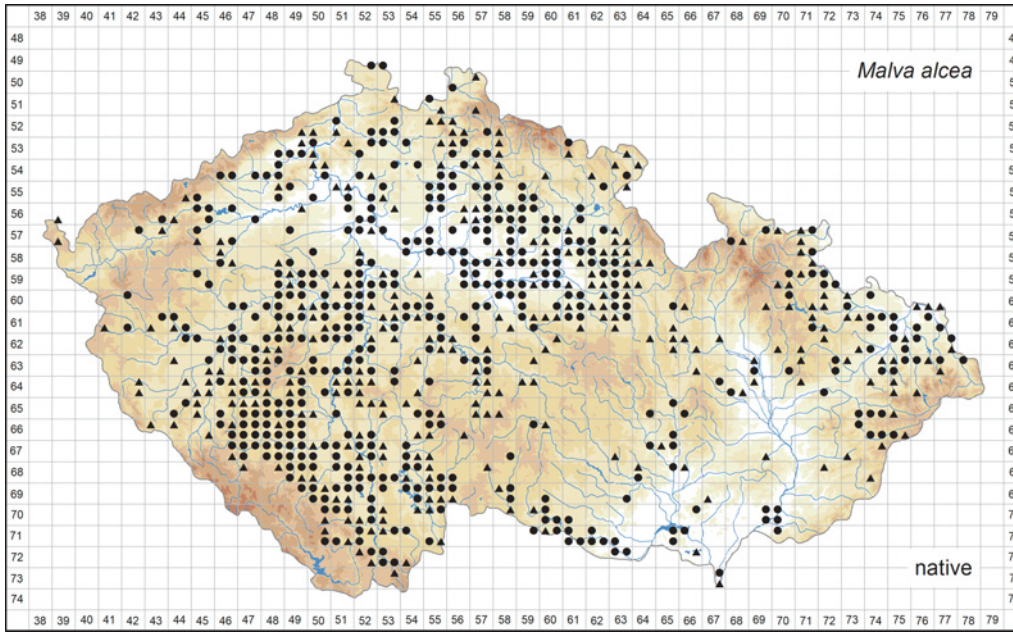

Fig. 32. Distribution of *Malva alcea* in the Czech Republic: ● occurrence documented by herbarium specimens (460 quadrants), ▲ occurrence based on other records (301 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

in this country with certainty, the native and secondary occurrences are not distinguished on the map.

Malva moschata (Fig. 33)

Malva moschata is native to Europe, probably from the northern part of the Iberian Peninsula and southern England in the west to Bulgaria, Greece and westernmost Turkey in the east and Sicily in the south; the northern boundary runs through central Germany. It is cultivated ornamentally and has been introduced into northern parts of the British Isles, Scandinavia (up to 64°N), Finland, Belarus, Ukraine, the southern part of the European Russia eastwards to the Volga river basin, the Russian Far East, Japan and also to North America, southernmost South America and Australia (Slavík in Ponert 1966, Meusel et al. 1978, POWO 2023). In the Czech Republic *M. moschata* is found mainly on dry grassy slopes, in scrub, forest fringes and at various secondary sites, such as on railway embankments, river banks, in sand pits, road ditches and dump places. It prefers fresh to moderately dry, well-drained, slightly acidic to slightly basic soils, moderately rich in nutrients, developed over siliceous bedrock. *Malva moschata* occurs mainly at middle elevations and in highlands almost throughout this country, especially in those with a tendency towards a sub-Atlantic climate, while it is only rare to scattered in warm, dry lowlands and hilly areas, e.g. in southern and central Moravia and central Bohemia. It reaches its elevational maxima at about 1,180 m near the town of Špindlerův Mlýn in the Krkonoše Mts and at 1,315 m on Mt Lysá hora in the Moravskoslezské Beskydy Mts. It may be native to south-western Bohemia and to highlands in south-eastern Moravia, while localities elsewhere are probably related to former cultivation, especially in mountain areas that were inhabited primarily by the German-speaking population. As it is hardly possible to delimit its native distribution in this country with certainty, the native and secondary occurrences are not distinguished on the map.

Malva neglecta (Fig. 34)

Malva neglecta is probably native to south-western and central Asia. Elsewhere it occurs as an archaeophyte, in almost all but the northernmost part of Europe, in north-western Africa (Morocco, Algeria) and the Canary Islands. It has also been introduced into India, the Korean Peninsula, Japan, southern Africa, North and South America, Australia and New Zealand (GBIF 2023, POWO 2023). In the Czech Republic *M. neglecta* grows mostly on various kinds of disturbed ground in villages as well as in towns and cities, often at sites under traditional management such as trampled village yards, poultry yards, the edges of rubble sites, ruderal sites around farmhouses, and gardens; it also occurs on road verges, on the edges of dirt roads, in fallow land, waste places, and margins of arable fields. Soils are usually moderately humid, slightly acidic to basic, well supplied with nutrients, especially nitrogen. *Malva neglecta* is common in the lowlands and hilly areas, scattered on lower mountains and occasionally introduced into higher elevations. It is classified as a naturalized archaeophyte in this country (Pyšek et al. 2022).

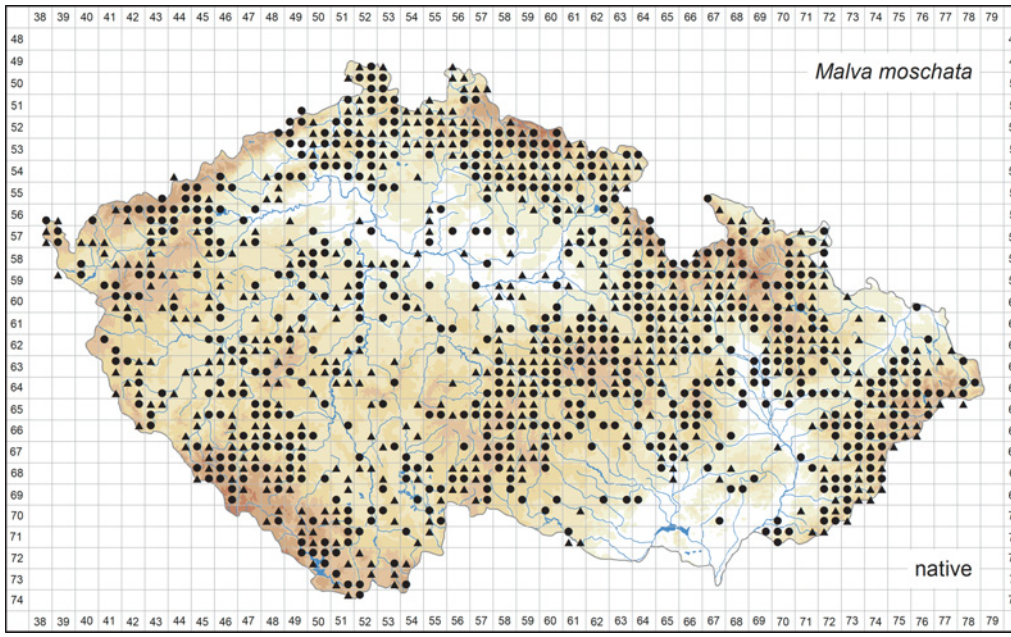

Fig. 33. Distribution of *Malva moschata* in the Czech Republic: ● occurrence documented by herbarium specimens (603 quadrants), ▲ occurrence based on other records (520 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

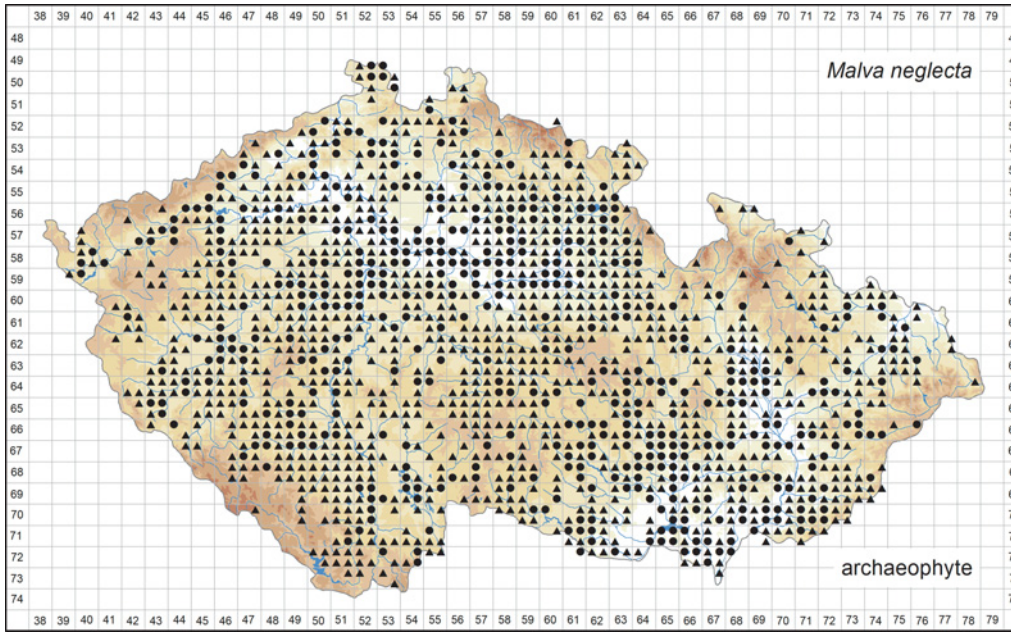

Fig. 34. Distribution of *Malva neglecta* in the Czech Republic: ● occurrence documented by herbarium specimens (472 quadrants), ▲ occurrence based on other records (1013 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

Malva parviflora (Fig. 35)

Malva parviflora is native to south-western Europe, Macaronesia, the Mediterranean Basin, the Caucasus Mts, south-western Asia, western-central Asia and eastern Africa, and has been introduced into north-western and central Europe, the Russian Far East, the Korean Peninsula, Japan, southern Africa, North and South America and New Zealand (FloraWeb 2023, GBIF 2023, POWO 2023). In its native range, the species grows in ruderal grasslands, cultivated and fallow fields and waste places. In the Czech Republic it was collected in 1957 in a disused limestone quarry near the village of Raspenava in northern Bohemia, having been introduced with wool waste; also, in 1964 at the railway station in the town of Turnov, in 1990 at a dump site near the town of Nejdek in western Bohemia, introduced with wool waste, and in 2017 and 2018 at a deer feeding crib in a forest close to the village of Želízy in central Bohemia. It is classified as a casual neophyte in this country (Pyšek et al. 2022).

Malva pusilla (Fig. 36)

Malva pusilla is a Euro-Siberian species, westwards extending to Belgium and north-western Italy, northwards reaching continuously to southern Sweden and Finland (isolated occurrences to 69°N) and southern Siberia, southwards to central Italy, Greece, the Caucasus Mts and north-western Iran; eastwards it extends to central Asia, Mongolia and China. It is probably native to southern Siberia and some parts of western Asia, elsewhere in its range occurring as an archaeophyte. In many other parts of the world it is considered a neophyte, e.g. in France, Great Britain, north-western Russia, the Russian Far East, the Korean Peninsula, temperate North America, southern Africa and Australia (Meusel et al. 1978, POWO 2023). In the Czech Republic *M. pusilla* mainly occurs in ruderal vegetation in villages and peripheries of towns. It is characteristic of places under traditional management, such as poultry yards, trampled places and ruderal sites around farmhouses, mills and sugar factories, composts and manure heaps; it also occurs on road verges, on the edges of dirt roads, margins of arable fields and rarely also in damp places in fields, locally also around deer feeding cribs. Soils are usually dry to moderately humid, sandy-loamy, poor in calcium and rich in nitrogen. *Malva pusilla* is rare to scattered in warm, dry parts of this country, in Bohemia particularly in its north-western and central-western parts, while it is very rare or absent elsewhere. In Moravia it occurs in its southern, south-eastern and central parts, northwards reaching up to the vicinity of the town of Zábřeh, with occasional occurrences in its north-eastern part. *Malva pusilla* has vanished from many of its former sites, mostly due to structural changes in villages and changes in agricultural techniques, especially in the western part of this country (Bohemia), while in southern and central Moravia it still remains locally scattered. It is classified as a naturalized archaeophyte (Pyšek et al. 2022) and also as endangered (Grulich 2012).

Malva sylvestris (Figs 37–39)

Malva sylvestris is probably native to the eastern Mediterranean area and south-western and central Asia. From ancient times it has been cultivated and spread as a medicinal plant, less often as a vegetable. Nowadays, it grows in most of Europe except its northernmost part and in northernmost Africa, where it is considered an archaeophyte, and has

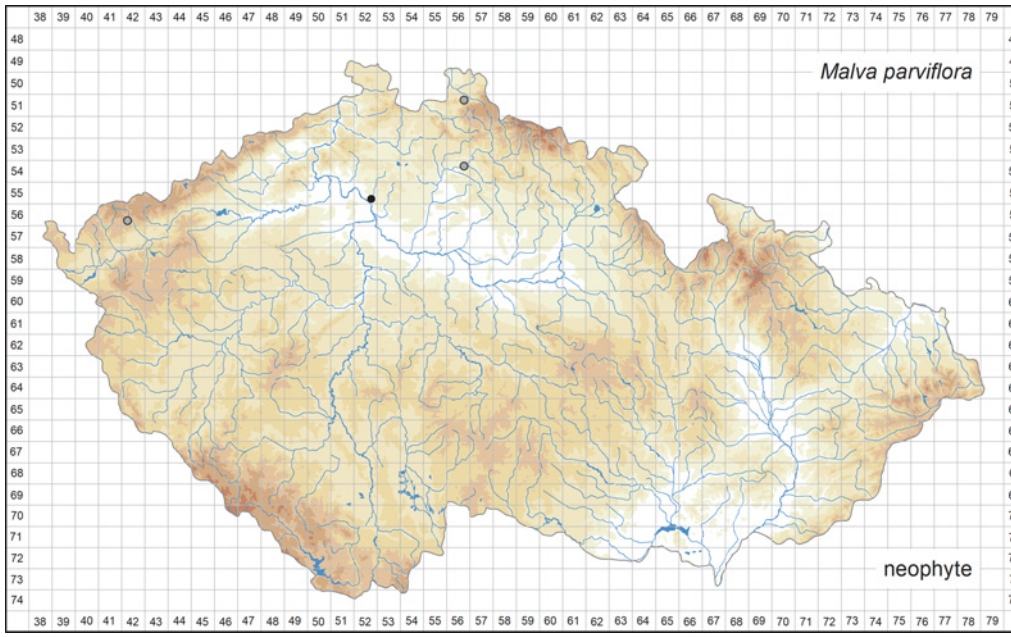

Fig. 35. Distribution of *Malva parviflora* in the Czech Republic: ● at least one record in 2000–2023 (1 quadrant), ◍ pre-2000 records only (3 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

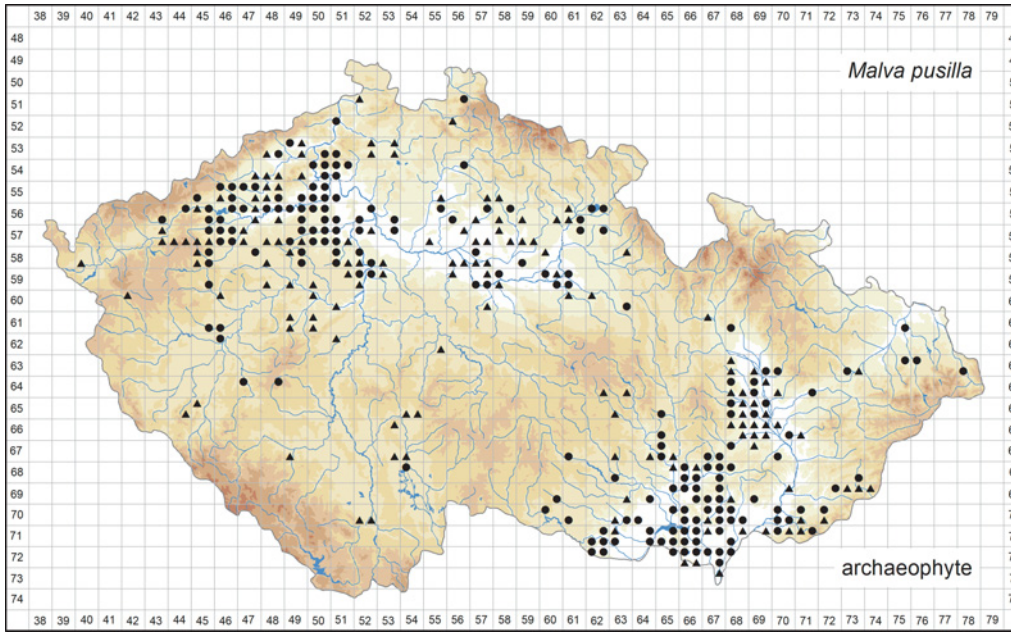

Fig. 36. Distribution of *Malva pusilla* in the Czech Republic: ● occurrence documented by herbarium specimens (188 quadrants), ▲ occurrence based on other records (149 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

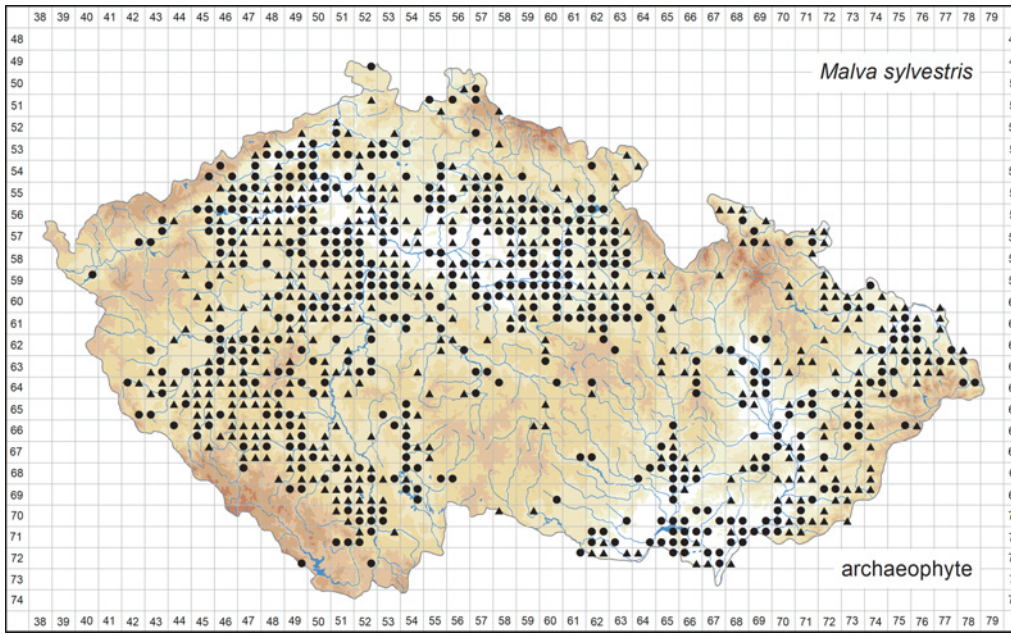

Fig. 37. Distribution of *Malva sylvestris* in the Czech Republic: ● occurrence documented by herbarium specimens (446 quadrants), ▲ occurrence based on other records (444 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

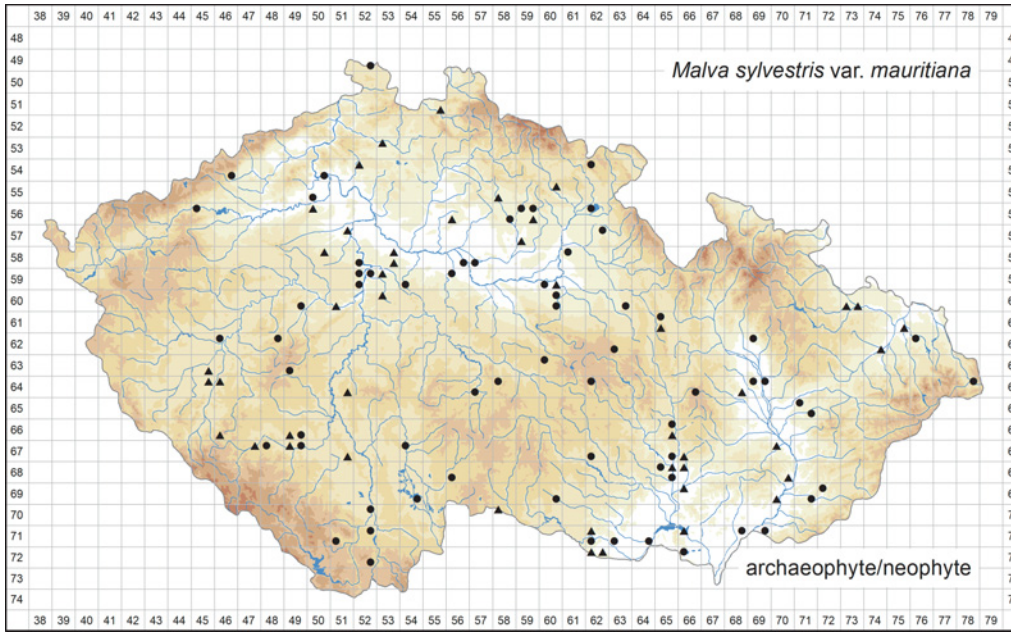

Fig. 38. Distribution of *Malva sylvestris* var. *mauritiana* in the Czech Republic: ● occurrence documented by herbarium specimens (66 quadrants), ▲ occurrence based on other records (45 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

been introduced into the Russian Far East, the Korean Peninsula, Japan, North, Central and South America, southern Africa, Australia and New Zealand (Hultén 1971, Meusel et al. 1978, POWO 2023). Based mainly on size, colour and shape of petals, two varieties are recognized in this country, namely *M. sylvestris* var. *sylvestris* and *M. sylvestris* var. *mauritiana*.

Malva sylvestris var. *sylvestris* (Fig. 39) grows on fallow land, in dump and waste places, on roadsides and dirt roads, along walls and fences, sometimes also in the margins of arable fields and around manure heaps. Soils are usually fresh to dry, slightly acidic to basic, rich in nutrients. This variety occurs mainly in lowlands and warm hilly areas such as in north-western, central, south-western and eastern Bohemia, and southern, central and north-eastern Moravia, and is scattered to rare in or absent from the highlands. It reaches its elevational maximum at about 1,000 m on Mt Bukovec in the Jizerské hory Mts in northern Bohemia. It is classified as a naturalized archaeophyte (Pyšek et al. 2022).

Malva sylvestris var. *mauritiana* (Fig. 38) seems to be a selection derived from *M. sylvestris* var. *sylvestris* or other types. It is occasionally cultivated as a medicinal and ornamental plant and escapes in ruderal places in settlements, in dump sites, on roadsides and dirt roads, along rivers and in ruderal grasslands, especially in lowlands and warm hilly areas. With increasing popularity of flower mixtures during the past two decades, it has been occasionally observed to occur in flower strips along roads in towns, as well as outside built-up areas. It is classified as a casual archaeophyte or neophyte (Pyšek et al. 2022).

Three maps were prepared for *M. sylvestris*. The maps of each variety are based on examined herbarium specimens and only selected reliable literature and database records; thus, the map of *M. sylvestris* var. *sylvestris* is inevitably incomplete. The map of the entire species (Fig. 37) derives from all the available literature and database records as well as all data accepted for the varieties.

Malva verticillata (Figs 40–41)

Malva verticillata is native to eastern Asia, particularly China, and has a long history of cultivation there for use as a foodstuff and in traditional medicine. It is cultivated (now mostly as a forage crop, vegetable and ornamental plant) and escapes throughout Europe (except for its northernmost parts), south-western Asia, Siberia, the Russian Far East, the Korean Peninsula, Japan, eastern and southern Africa, North America, Australia and New Zealand (GBIF 2023, POWO 2023). Based mainly on leaf margins, two varieties, sometimes classified at subspecies or even species level, are recognized within *M. verticillata* in Europe. Plants with flatter, not undulate, notched leaf margins are assigned to *M. verticillata* var. *verticillata*, while plants with conspicuously undulate, finely dentate leaf margins are classified as *M. verticillata* var. *crispa*.

Malva verticillata var. *verticillata* (Fig. 41) has been occasionally cultivated in this country for a long time as a forage crop and ornamentally and is found as a relict of cultivation or as escaped at dump sites, on roadsides, along railways and as a weed on arable fields and in vineyards, mainly in lowlands and hilly areas. Over the last two decades it has been reported from the city of Brno and its surroundings, the town of Telč, the village of Zvole in the Českomoravská vrchovina highlands, near the villages of Šumice and

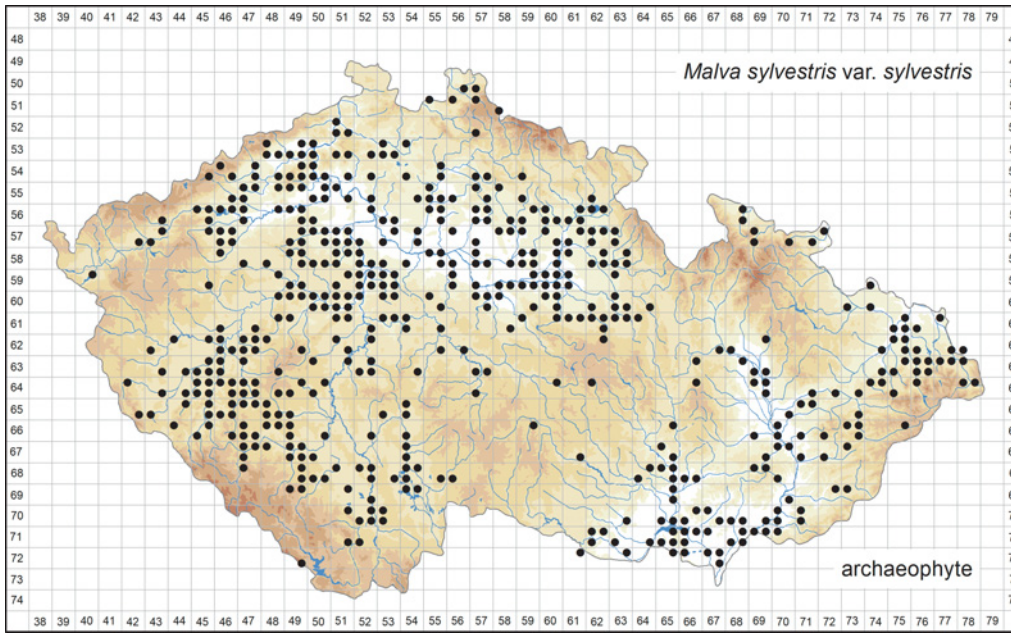

Fig. 39. Distribution of *Malva sylvestris* var. *sylvestris* in the Czech Republic (517 occupied quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

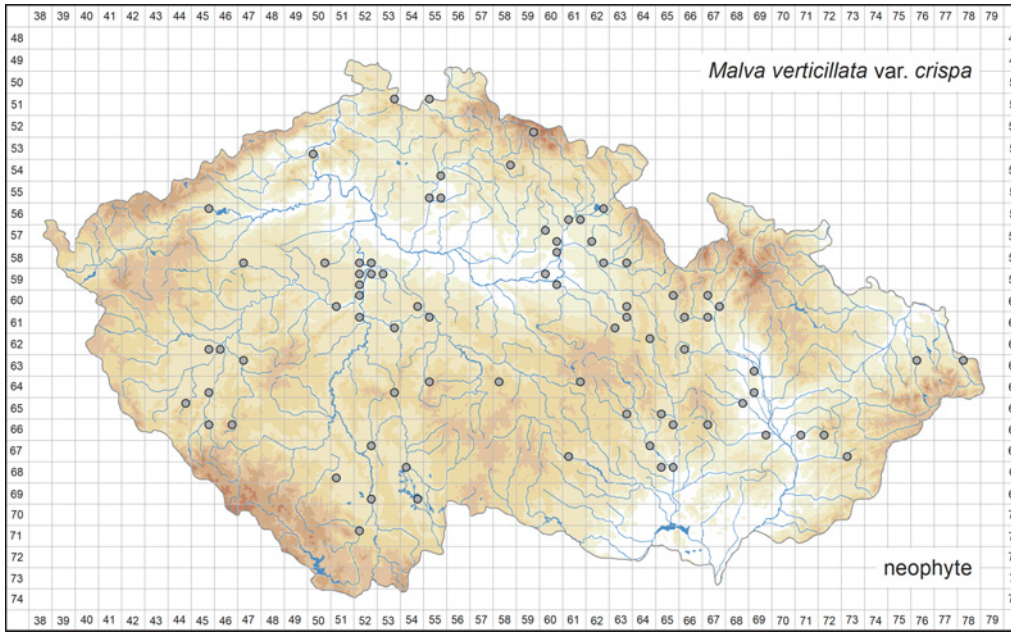

Fig. 40. Distribution of *Malva verticillata* var. *crispa* in the Czech Republic: ● pre-2000 records only (78 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

Hnanice in southern Moravia and villages of Dubany and Bystročice in central Moravia. *Malva verticillata* var. *verticillata* is considered a casual neophyte in this country (Pyšek et al. 2022).

Malva verticillata var. *crispa* (Fig. 40) appears to be a selection derived from *M. verticillata* var. *verticillata* and is unknown in the wild. It is more widely cultivated than the typical variety (forage crop, vegetable, ornamental plant), and also more commonly found (especially in the past) as an escaped or naturalized plant. In the Czech Republic it has been found occasionally from the lowlands to the highlands throughout the country, mainly around gardens, at dump sites, on railway embankments, in parks and in the vicinity of arable fields. The last record dates back to 1989 when this variety was collected as escaped from experimental plots of the Research Institute for Fodder Crops in the village of Troubsko near the city of Brno. *Malva verticillata* var. *crispa* is classified as a casual neophyte in this country (Pyšek et al. 2022).

Neotinea tridentata (Fig. 42)

Neotinea tridentata is most common in southern Europe, including the Apennine and Balkan Peninsulas, but its distribution extends to western and central Europe, the Mediterranean coast of Africa, Anatolia, the Caucasus and the Middle East as far as the Caspian Sea (Buttler 2000, Delforge 2006). Nevertheless, populations from the eastern part of this range probably represent a separate evolutionary lineage of unclear taxonomic status, while *N. tridentata* s. str. has been confirmed only in Italy, the western Balkan Peninsula and central Europe, including the Czech Republic (Trávníček et al. 2021). The northern limit of this species' distribution runs through this country, where it was found to grow mainly on full-sun slopes in dry grasslands and pastures, rarely also in open thermophilous forests, on nutrient-poor, basic to neutral soils. *Neotinea tridentata* has been known from southern (steppic) part of the Bílé Karpaty Mts and several isolated localities throughout central and northern Moravia, but it vanished from most of its sites several decades ago. At the end of the 20th century, this species survived at four localities in Moravia, and only a single population (Strabišov-Oulehla near the village of Lísky) seemed to be viable for the long term, while the others harboured just a few individuals. The decline may be attributed to the abandonment of pastures, excessive use of fertilizers, direct habitat destruction, but also illegal collecting of the plants (Dostalík et al. 2011). Surprisingly, several new populations have been discovered during recent years in the Czech Republic (including one site in northern Bohemia) as well as in the neighbouring countries (e.g. Očka 2010, Pluciński 2012). This may be a result not only of spontaneous spread induced by climate change but also of deliberate introduction (e.g. Dostalík et al. 2011, Popelářová 2017). *Neotinea tridentata* is classified as critically threatened because of its rarity and small populations (Grulich 2012).

Neotinea ustulata (Fig. 43)

Neotinea ustulata is a Euro-Siberian species with its distribution delimited by the Atlantic, Baltic and Mediterranean coasts, and reaching the Caucasus and central Siberia eastwards (Buttler 2000, Delforge 2006). Early and late flowering populations are traditionally recognized as separate subspecies (Kubát 2010) or, more often, varieties (Danihelka et al. 2012, Kaplan 2019), namely var. *ustulata* and var. *aestivalis*. These taxa

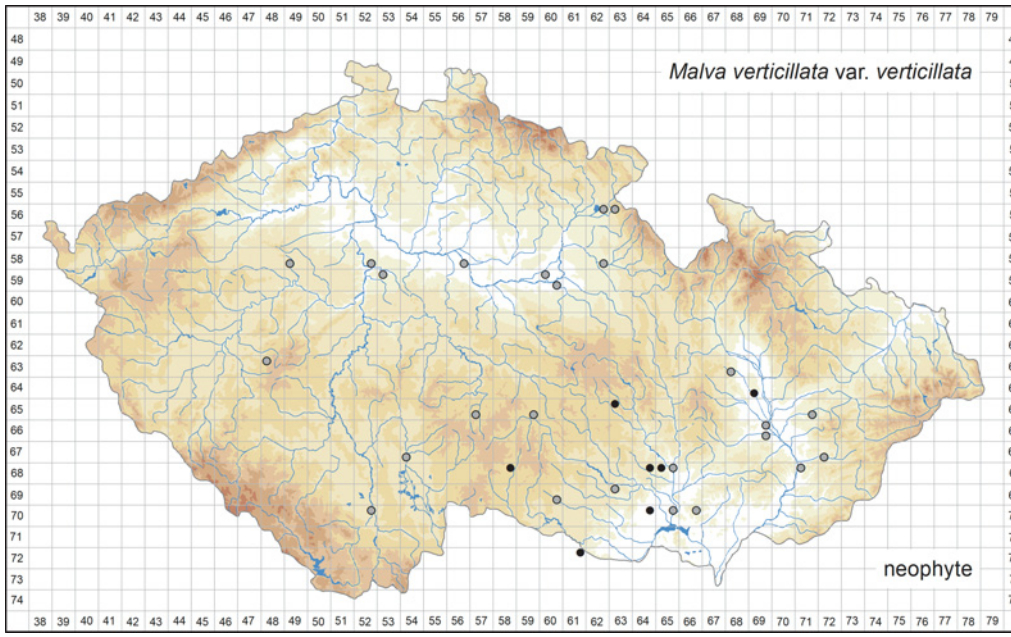

Fig. 41. Distribution of *Malva verticillata* var. *verticillata* in the Czech Republic: ● at least one record in 2000–2023 (7 quadrants), ◍ pre-2000 records only (25 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

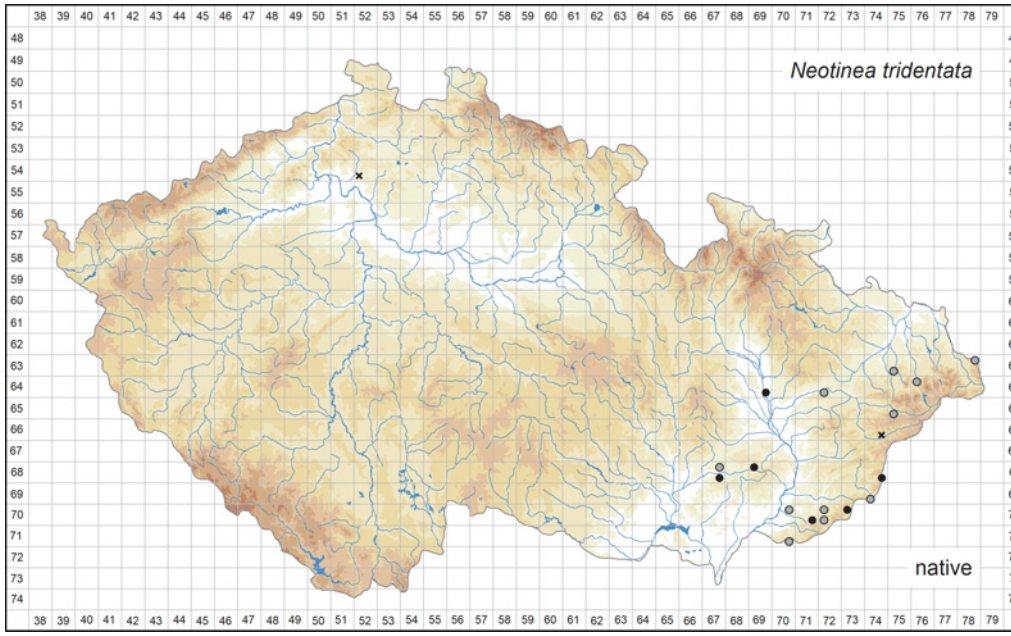

Fig. 42. Distribution of *Neotinea tridentata* in the Czech Republic: ● at least one record in 2000–2023 (6 quadrants), ◍ pre-2000 records only (11 quadrants), × deliberate introductions only (2 quadrants). Prepared by Vojtěch Taraška.

are considered to differ not only in phenology but also in morphology: var. *ustulata* is reported to be generally less robust and to blossom from May to June, while var. *aestivalis* is described as more robust, having a longer inflorescence and more cauline leaves, with its flowering peak coming as late as in July (Haraštová-Sobotková et al. 2005). Nevertheless, these morphological distinctions are not associated with genetic differentiation, as var. *aestivalis* is likely to have arisen polytopically (Tali et al. 2016, Trávníček et al. 2021). The taxonomic value of both taxa is thus rather low. Moreover, they were not recognized in earlier literature and distinguishing between them in the herbarium is often impossible due to incomplete label information or imperfect preparation. Only the map of the species is thus presented here. In this country *N. ustulata* grows mainly in broad-leaved semi-dry grasslands, mesic meadows and pastures, rarely also in scrub and forest margins. It prefers rather dry, neutral to basic substrates, while avoiding nutrient-rich soils. It was distributed unevenly throughout most of the Czech Republic, being more frequent in the České středohoří Mts and the Bílé Karpaty Mts, while rare mainly in the Českomoravská vrchovina highlands and Silesia. Populations corresponding to var. *ustulata* probably prevailed in Bohemia, while only var. *aestivalis* has been reported from northern Moravia and Silesia (Kubát 2010, Průša 2019). *Neotinea ustulata* has rapidly declined during the second half of the 20th century due to changes in landscape management, including the abandonment of pastures followed by succession towards scrub and forests, application of mineral fertilizers in agriculture, artificial afforestation and general eutrophication of the landscape. Although new finds of mostly small populations have been reported even in the past decade, both varieties of *N. ustulata* are now classified as critically threatened due to their overall decline (Grulich 2012).

Nonea lutea (Fig. 44)

Nonea lutea is an annual ornamental forb native to Ukraine, southern parts of European Russia, the Caucasus Mts, Transcaucasia, Turkey and Iran (Valdés & Raab-Straube 2011a, POWO 2023). In most of the countries of southern, western and central Europe it has been cultivated, particularly in botanical gardens, from where it has escaped and established populations in urban habitats (Dvořák et al. 2019). Non-native occurrences outside Europe are reported from the eastern USA, Japan, Australia and Tasmania (Eberwein 2011, POWO 2023). The given secondary distribution is probably rather incomplete, as escapes within the botanical gardens or in their close surroundings are not always recorded. Eberwein (2011) points out the aggressive behaviour of this species and its potential invasiveness even in undisturbed natural habitats. In the Czech Republic *N. lutea* started to be cultivated in botanical gardens in the 1850s and was first observed escaping from cultivation in a botanical garden in Prague in 1875. Recently established populations are known from urban habitats such as city gardens, lawns and railway embankments. They have been reported from the city of Brno in southern Moravia and particularly from the city of Olomouc in central Moravia. Ephemeral populations may be found also elsewhere. *Nonea lutea* is classified as a naturalized neophyte (Pyšek et al. 2022).

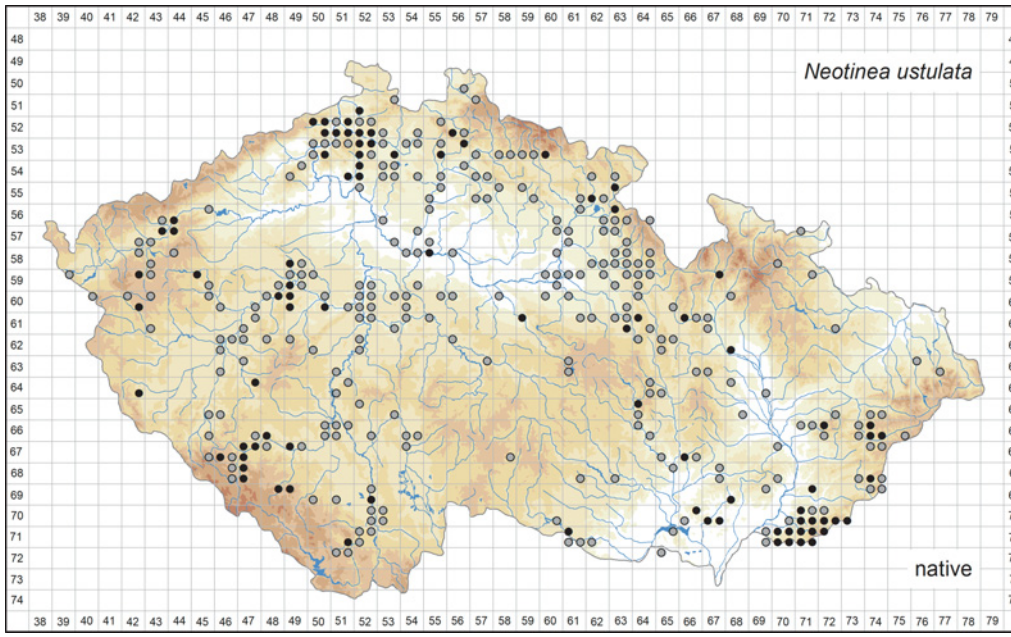

Fig. 43. Distribution of *Neotinea ustulata* in the Czech Republic: ● at least one record in 2000–2023 (85 quadrants), ● pre-2000 records only (259 quadrants). Prepared by Vojtěch Taraška.

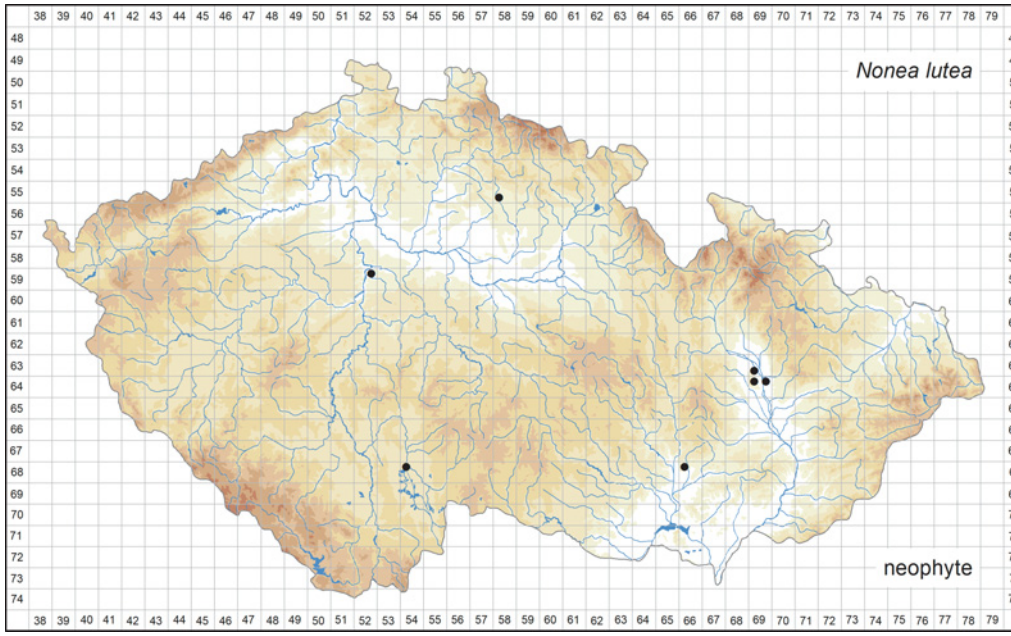

Fig. 44. Distribution of *Nonea lutea* in the Czech Republic (7 occupied quadrants). Prepared by Kateřina Šumberová.

Nonea pulla (Fig. 45)

Nonea pulla is an annual to short-lived perennial forb with native distribution extending from central Europe (Germany and Czech Republic) in the west, through the north-eastern Balkan Peninsula, Ukraine, European Russia and south-western Asia as far as southern Siberia and eastern Mongolia in the east (Valdés & Raab-Straube 2011a, POWO 2023). In western and northern Europe it is considered introduced. The geographic range of the species is probably imprecisely delimited in its eastern part due to possible confusion with closely related Asian *Nonea* species. The published maps may differ also because of various taxonomic treatments of *N. rossica*, which is nowadays usually considered only as a subspecies or a variety of *N. pulla* (e.g. Güzel et al. 2019, POWO 2023). Moreover, the status of *N. pulla* populations at the north-western distributional limit in Europe is also difficult to assign, as the spread of *N. pulla* westwards is supposed to have occurred already during development of European rural landscapes. Whereas in the earlier literature (Meusel et al. 1978) this species is considered as an archaeophyte in central Europe, today it is mainly accepted as native (Valdés & Raab-Straube 2011a, Pyšek et al. 2022, POWO 2023). In this country *N. pulla* occupies dry disturbed habitats on deep calcium-rich soils such as open dry grasslands, semi-ruderal vegetation at field and vineyard edges, on railway embankments and in open-canopy thermophilous forests and scrub. Until the late 1990s, the species thrived particularly in steppic sites with numerous wild rabbit populations, which formed fine-scaled habitat mosaics suitable for the coexistence of short-lived species in stands dominated by perennials. After a strong decline of rabbits, some of the former sites of *N. pulla* disappeared as a consequence of elimination of disturbances, followed by the succession of competitive grasses and forbs. However, *N. pulla* still occurs at dozens of sites, particularly in north-western, central and eastern Bohemia, and central and southern Moravia, rarely also elsewhere in suitable habitats in warm areas. Therefore, it is classified as of lower risk – near threatened (Grulich 2012)

Nonea rosea (Fig. 46)

Nonea rosea is an annual forb native to Anatolia, Armenia, Georgia and the adjacent part of Russia (Valdés & Raab-Straube 2011a, Chadaeva et al. 2021) where it grows in mountain grasslands (Chadaeva et al. 2021). As an ornamental it was introduced probably during 19th century to Europe where it was documented as escaped from cultivation in Belgium, France, Germany, the Czech Republic, Slovakia, Italy and Poland (Verloove 2006, Urbisz 2011, Valdés & Raab-Straube 2011a, Cecchi & Selvi 2017). Outside Europe it is reported as introduced into the USA (POWO 2023). It may occur also elsewhere as a casual, depending on its cultivation and local escape (Chater 1972). In the Czech Republic its occurrence outside cultivation was always ephemeral. The first escape of *N. rosea* dates back to 1853, when it was collected at ruderal sites in the town of Mariánské Lázně in western Bohemia. Further records come e.g. from Prague or the town of Broumov in north-eastern Bohemia. Similarly to many other garden plants, *N. rosea* usually occupies waste places in gardens and various secondary habitats in the urban landscape. It is classified as a casual neophyte (Pyšek et al. 2022).

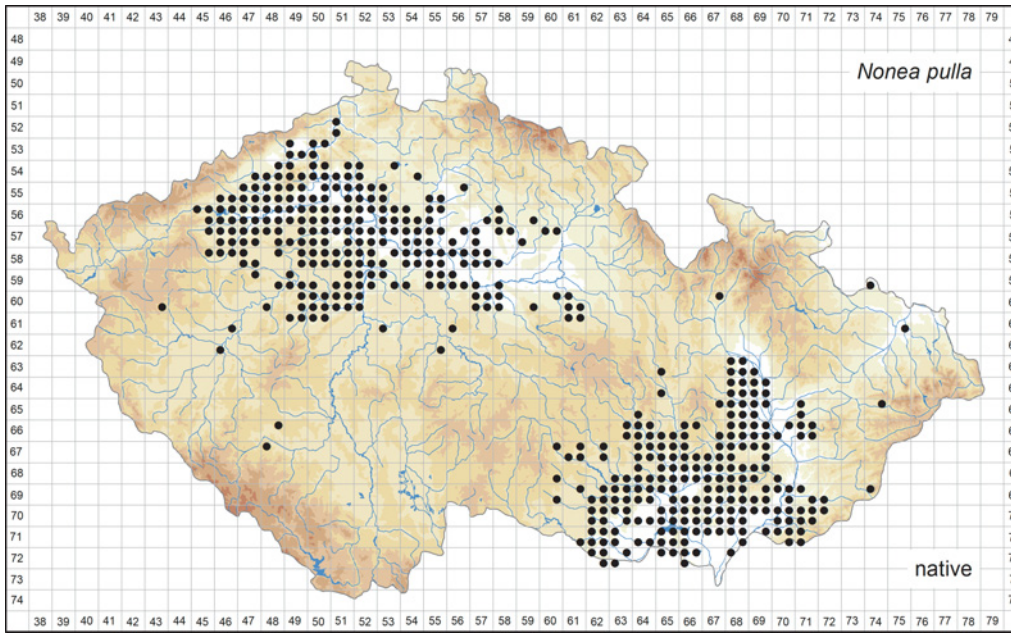

Fig. 45. Distribution of *Nonea pulla* in the Czech Republic (464 occupied quadrants). Prepared by Kateřina Šumberová.

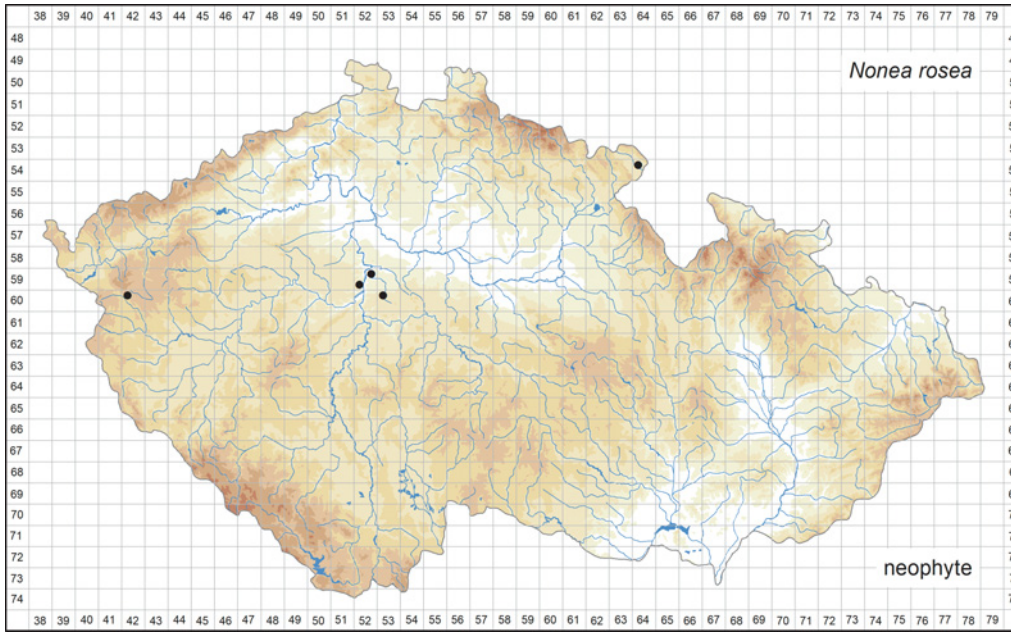

Fig. 46. Distribution of *Nonea rosea* in the Czech Republic (5 occupied quadrants). Prepared by Kateřina Šumberová.

Nuphar lutea (Fig. 47)

Nuphar lutea is distributed over most of Europe except its northern parts and dry Mediterranean areas, extending more or less continuously eastwards through south-western Siberia and northern Kazakhstan to the Lake Baikal area. Isolated localities are in Morocco, Algeria, Tunisia, Israel, Syria and western Iran (Meusel et al. 1965, GBIF 2023). In the Czech Republic *N. lutea* grows mainly in sunny aquatic habitats with mesotrophic to eutrophic, standing or slowly running water and with a thick layer of sapropelic mud on the bottom, such as oxbow lakes, ponds and other water reservoirs, and along banks of slowly flowing rivers, where it often forms large dominant stands. Exceptionally it is found in moderately fast-flowing rivers where it produces submerged sterile forms. *Nuphar lutea* is tolerant of water pollution and wave disturbances caused by shipping on large rivers. It mainly occurs in lowland floodplains of large rivers, being most frequent along the Labe, Ohře and Berounka rivers in Bohemia, and along Morava, Dyje and Odra rivers in Moravia. It is scattered in fishpond landscapes of southern, northern and eastern Bohemia. Elsewhere in this country it is rare at middle elevations and only exceptionally recorded in mountains due to a lack of suitable habitats. Some of its occurrences in man-made habitats such as fishponds might be remnants of former deliberate introductions. *Nuphar lutea* is classified as of lower risk – near threatened (Grulich 2012).

Nuphar pumila (Fig. 48)

Nuphar pumila has a boreal distribution from Scandinavia in the west to Siberia, Japan and central China in the east. In addition, isolated occurrences in Europe are known in the British Isles, Spain, France, Switzerland, southern Germany, Austria, the Czech Republic, and possibly also Croatia and Romania (Meusel et al. 1965). In most European countries at the southern limit of the species' distribution, *N. pumila* is endangered to some degree (France, Switzerland, Germany, Austria; Bétrisey et al. 2020). In the Czech Republic the species grows in mesotrophic to dystrophic, standing or slowly flowing waters on peaty or muddy substrates, mainly in alluvial pools, oxbow lakes and small ponds. Its distribution in this country is restricted to the south-eastern part of the Šumava Mts and the Budějovická pánev and Třeboňská pánev basins in southern Bohemia, and the adjacent part of the Česko-moravská vrchovina highlands in south-western Moravia. Together with the populations on the Austrian side of the mountains, the Czech populations constitute an isolated outpost of the species' range. Several earlier literature records from other parts of this country are erroneous, probably based on weak plants of *N. lutea* with small flowers and leaves. *Nuphar pumila* is sensitive to water pollution and mechanical disturbances. It is also competitively weak, and particularly under high nutrient loads and high summer temperatures, it is negatively affected by fast-growing aquatics (Vydrová 2013). Hybridization, supported by eutrophication and climate change, which made colonizing by *N. lutea* of sites with populations of *N. pumila* possible, is recognized as another threat in the Alps (Bétrisey et al. 2020, Keller et al. 2020). Most of the Czech populations have vanished, and only 9–11 populations were found extant during the past decade. Besides these, about four introduced populations still persist in the Třeboňská pánev basin. At most of the remaining sites, *N. pumila* exhibits further decline due to strong damage by growing beaver populations and at one also as a consequence of management intensification. The species is therefore classified as critically threatened (Grulich 2012).

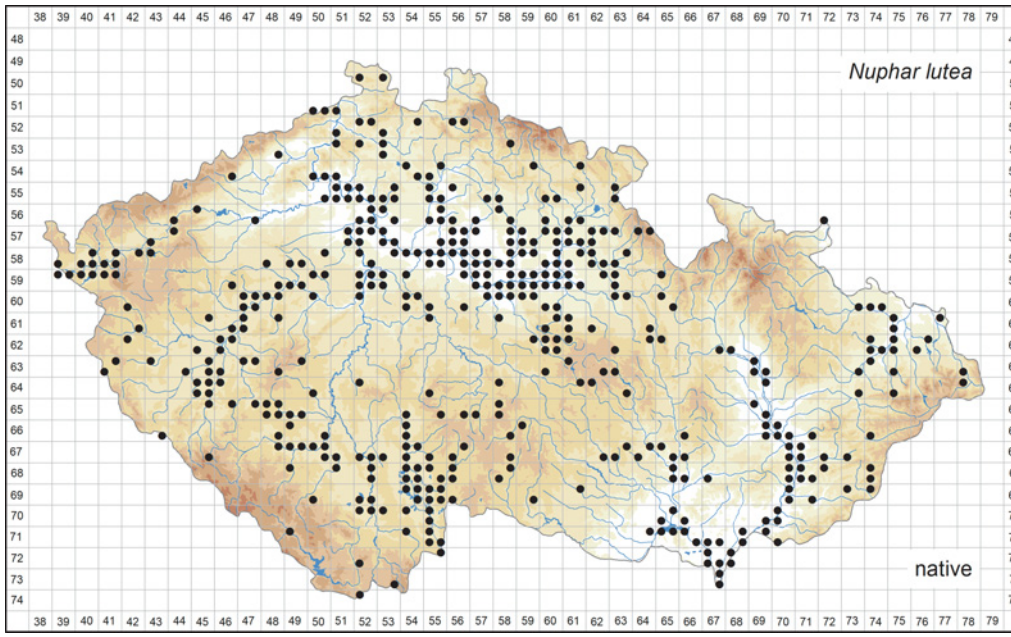

Fig. 47. Distribution of *Nuphar lutea* in the Czech Republic (442 occupied quadrants). Prepared by Klára Nunvářová Kabátová.

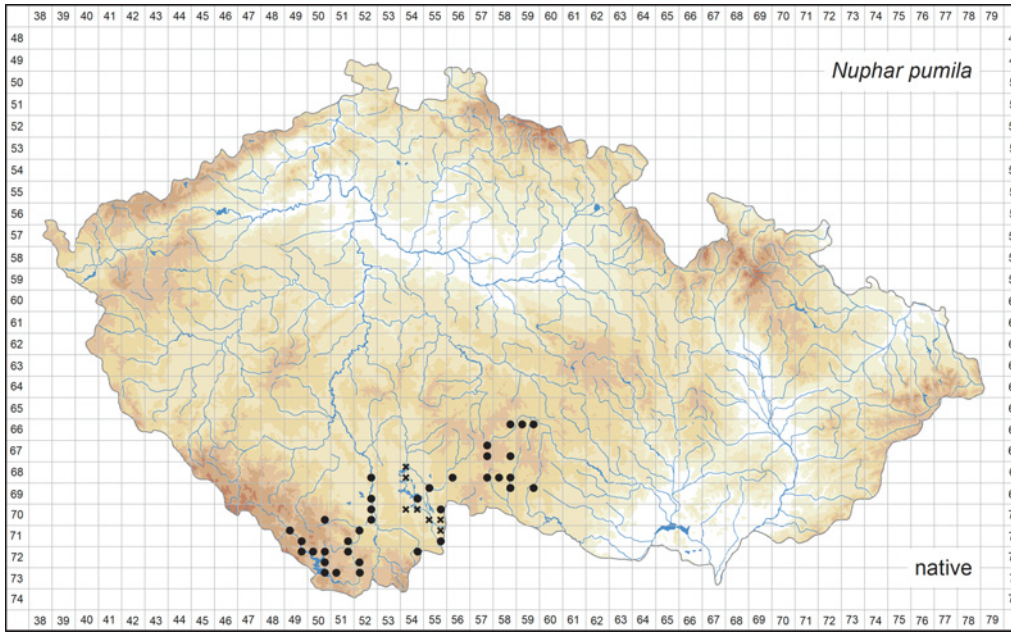

Fig. 48. Distribution of *Nuphar pumila* in the Czech Republic: ● native (35 quadrants), × alien (7 quadrants). Prepared by Klára Nunvářová Kabátová.

Nuphar ×spenneriana (Fig. 49)

Nuphar ×spenneriana is a fertile hybrid of *N. pumila* and *N. lutea* observed in the areas where the parental species co-occur (France, Germany, Switzerland, Fennoscandia, Estonia, western Siberia; Bétrisey et al. 2020, GBIF 2023). In the Alps this hybridization is described as quite frequent (Bétrisey et al. 2020), probably as a consequence of fast environmental changes supporting more frequent co-occurrence of the parental species (Keller et al. 2020). In contrast, in eastern Europe and Siberia the hybridization seems to be very rare (Volkova et al. 2018). The hybrid co-occurs with the parental species, persists in the areas where *N. pumila* has vanished or even spreads independently as it is more resistant to eutrophication. In the Czech Republic it is restricted to a small part of southern Bohemia and an adjacent part of the Českomoravská vrchovina highlands. The hybrid is intermediate both in appearance and in ecology. Using flow cytometry, two populations have recently been discovered in the Šumava Mts (Koutecký 2022). Identification of herbarium specimens is difficult as it relies only on quantitative characters; the map is therefore incomplete.

Nymphaea alba (Fig. 50)

Nymphaea alba is found across much of Europe, but is absent from the northernmost and eastern parts of this continent as well as from most of the Iberian Peninsula. In Asia it occurs in Syria, Israel, northern Iran, the South Caucasus, Kashmir and the Himalayas, and in Africa in Morocco, Algeria and Tunisia (Meusel et al. 1965, GBIF 2023). In the Czech Republic *N. alba* prefers sunny aquatic habitats with eutrophic to mesotrophic standing to slowly flowing waters and a thick layer of mud on the bottom, such as alluvial oxbow lakes, along banks of lowland rivers and irrigation canals. The presumed native occurrences are in the floodplains of large rivers in southern and central Moravia, particularly along the Morava and Dyje rivers, and in central to eastern Bohemia along the Labe and Orlice rivers. However, this species is also found elsewhere in the lowlands and at middle elevations in this country, being most frequent in fishpond basins of southern Bohemia, as this ornamental plant has been frequently planted in the countryside, mainly in ponds. Nowadays *N. alba* is rare and critically threatened in the Czech Republic (Grulich 2012) due to the vanishing of its habitats and intensification of fishpond management, while most of its extant populations are secondary. The exact distribution of this species is obscured by the occurrence of numerous similar cultivars, which have also been deliberately introduced to ponds both within and outside settlements (Kabátová et al. 2014, see also below). Consequently, the taxonomic identity and indigenous status of many populations are unclear. Due to frequent misidentifications, the map is based mainly on examined herbarium specimens, records of plants with genome size estimated by flow cytometry (Kabátová et al. 2014) and field records of botanists familiar with this group.

Nymphaea candida (Fig. 51)

Nymphaea candida is an allopolyploid derived from the hybrid *N. alba* × *N. tetragona* (Volkova et al. 2010). It is more or less continuously distributed in central and northern Europe northwards to northern Sweden and Finland, southwards to France, southern

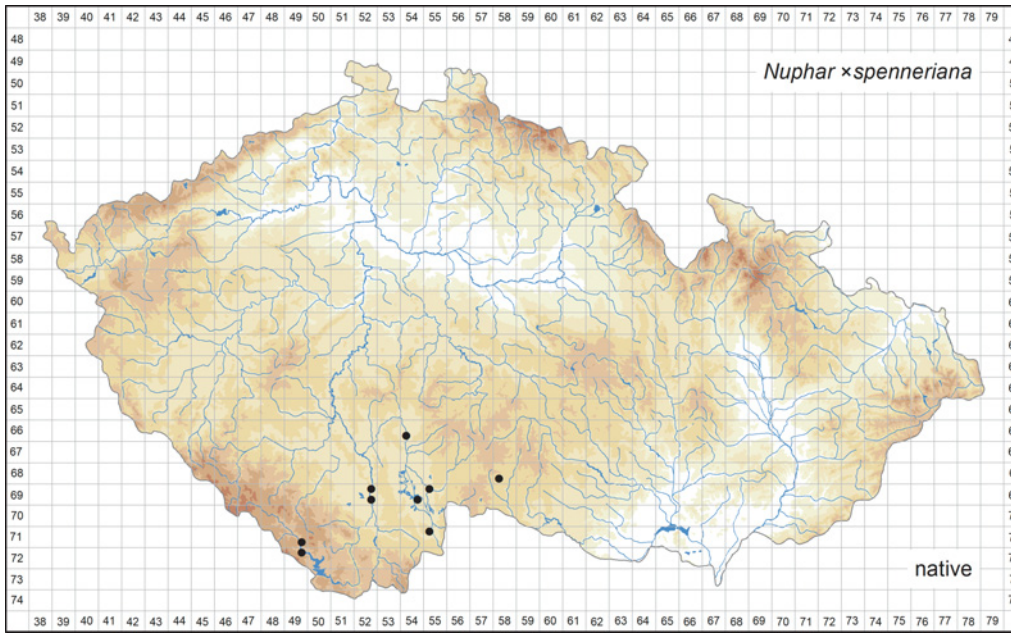

Fig. 49. Distribution of *Nuphar ×spenneriana* in the Czech Republic (9 occupied quadrants). Prepared by Klára Nunvářová Kabátová.

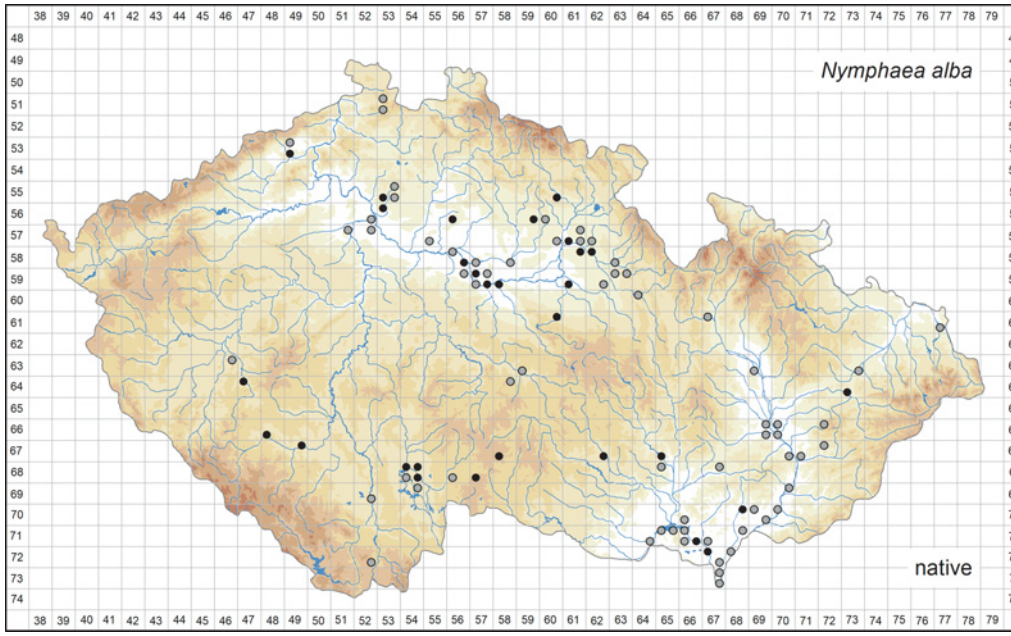

Fig. 50. Distribution of *Nymphaea alba* in the Czech Republic: ● at least one record in 2000–2023 (29 quadrants), ◍ pre-2000 records only (63 quadrants). Prepared by Klára Nunvářová Kabátová.

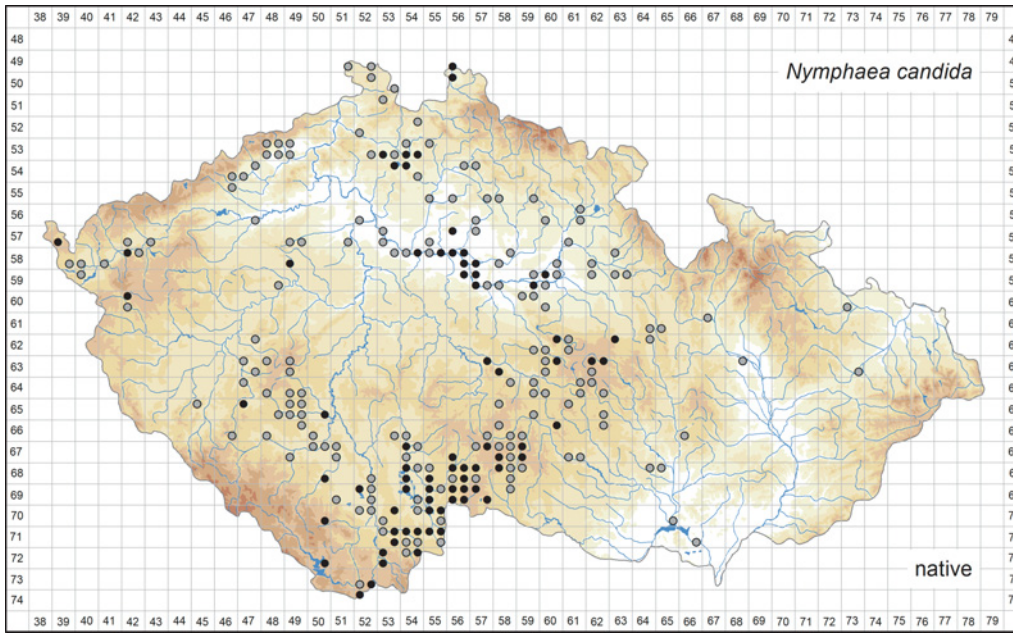

Fig. 51. Distribution of *Nymphaea candida* in the Czech Republic: ● at least one record in 2000–2023 (74 quadrants), ● pre-2000 records only (167 quadrants). Prepared by Klára Nunvářová Kabátová.

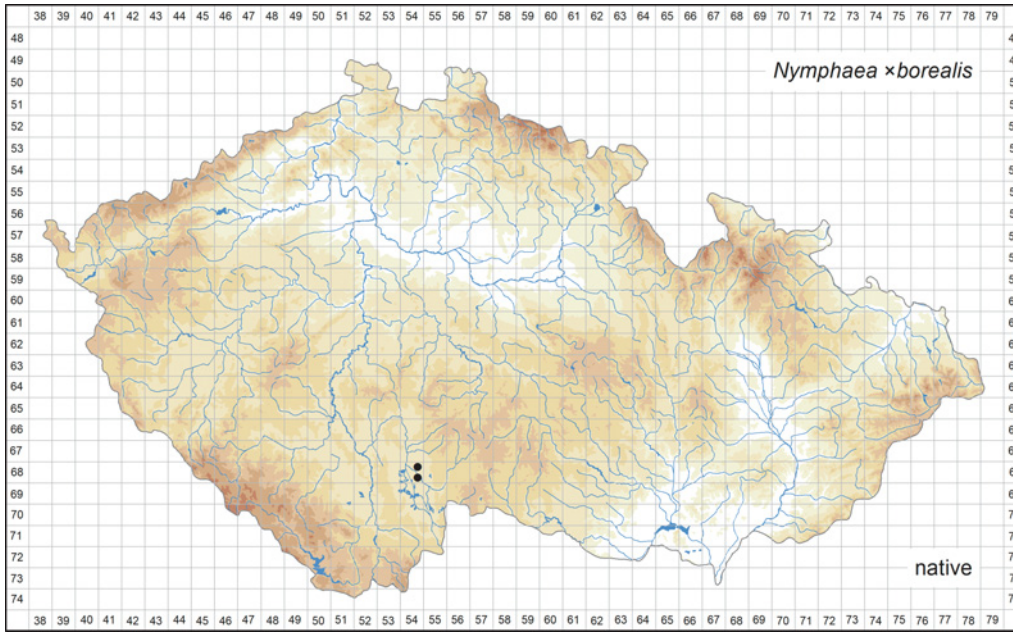

Fig. 52. Distribution of *Nymphaea ×borealis* in the Czech Republic (2 occupied quadrants). Prepared by Klára Nunvářová Kabátová.

Germany, Austria and southern Ukraine, extending eastwards through the southern part of European Russia to Siberia as far as Lake Baikal. Isolated occurrences are in the South Caucasus and Kazakhstan (Meusel et al. 1965, GBIF 2023). In the Czech Republic *N. candida* prefers rather clear, mesotrophic to oligotrophic waters with muddy or peaty bottoms, such as ponds, pools in peat bogs and mires, less frequently in oxbow lakes and slowly flowing lowland rivers. It is almost entirely restricted to Bohemia, being most frequent in the Labe river basin and the fishpond landscapes in northern, eastern and southern Bohemia and the Českomoravská vrchovina highlands, from where it only rarely extends to northern and western Moravia, reaching there its local south-eastern distribution limit. Most of the occurrences are at middle elevations. *Nymphaea candida* has vanished rapidly since 1960s due to changes in fishpond management, particularly high fish stocks and fertilizing, but it may also be threatened by liming and in dry years by intended drainage of fishponds as well as natural wetland desiccation. The species is therefore classified as critically threatened (Grulich 2012). Due to frequent misidentifications, the map is based mainly on examined herbarium specimens, records of plants with genome size estimated by flow cytometry (Kabátová et al. 2014) and field records of botanists familiar with this group.

Nymphaea ×*borealis* (Fig. 52)

Nymphaea ×*borealis* is a hybrid of *N. alba* and *N. candida*. It has been recorded from areas of co-occurrence of the parental species, including the Czech Republic (Neuhäusl & Tomšovic 1957, Tomšovic 1988), Poland (Ejankowski & Małysz 2011) and Russia (Komarov 1970). Nevertheless, the identification of this hybrid is difficult, and many herbarium specimens were assigned to *N.* ×*borealis* incorrectly. There is only a single study that has provided molecular evidence for this hybridization (Werner & Hellwig 2006), which detected a few hybrid plants in Germany and Sweden. In the Czech Republic *N.* ×*borealis* was reported from the Třeboňská pánev basin in southern Bohemia and from the village of Rybniště in the northernmost Bohemia (Tomšovic 1988), but voucher specimens supporting these records have not been found in herbaria studied. The only conclusive hybrid plants were detected by flow cytometry in three fishponds in the Třeboňská pánev basin where the parental species co-occurred (Kabátová et al. 2014). The hybrids had reduced pollen fertility and seed set, and probably represented F1 hybrids.

Non-native *Nymphaea* species and ornamental cultivars (Fig. 53)

Water lilies are popular ornamental aquatic plants and many new cultivars have been produced by hybridization. These include multiple cultivars derived from hybridization involving *N. alba*, which are difficult to distinguish from each other and also from other white-flowering water lilies including the North American *N. odorata* and *N. tuberosa* and their cultivars. Other non-native *Nymphaea* plants are easily distinguished by their coloured flowers. Most of the cultivars are of unknown origin. They are grown in ponds in gardens, village squares and parks, but also often introduced outside settlements to fishponds and lakes in abandoned quarries and even to natural habitats such as slowly flowing rivers and oxbow lakes, where they can thrive for a long time. They are often sterile but they can spread vegetatively by rhizomes and may be more competitive than the native species. Numerous occurrences of non-native waterlilies in the landscape have

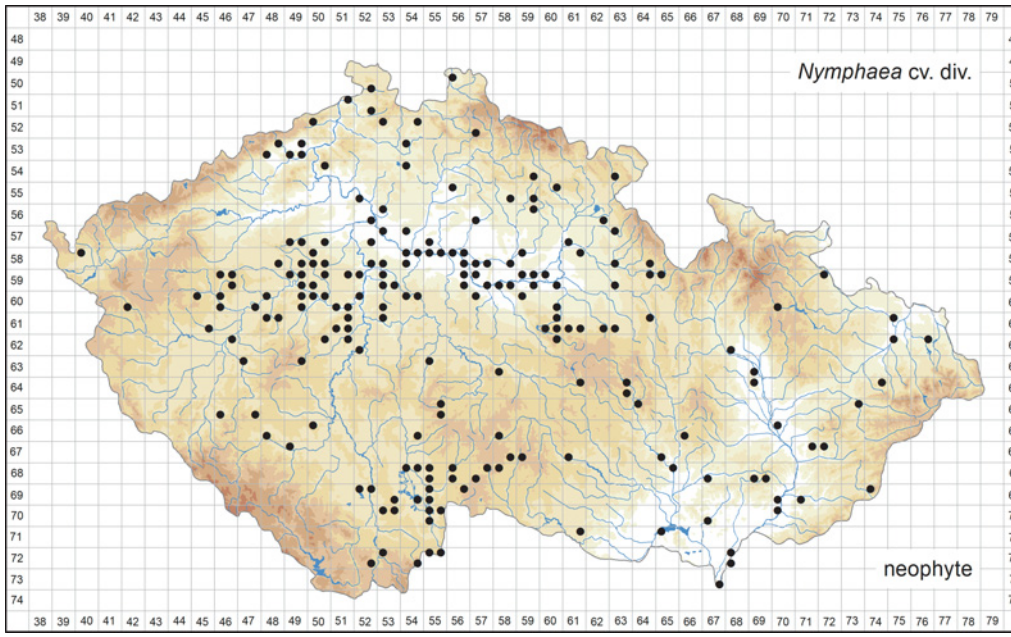

Fig. 53. Distribution of non-native *Nymphaea* species and ornamental cultivars in the Czech Republic (201 occupied quadrants). Prepared by Klára Nunvářová Kabátová.

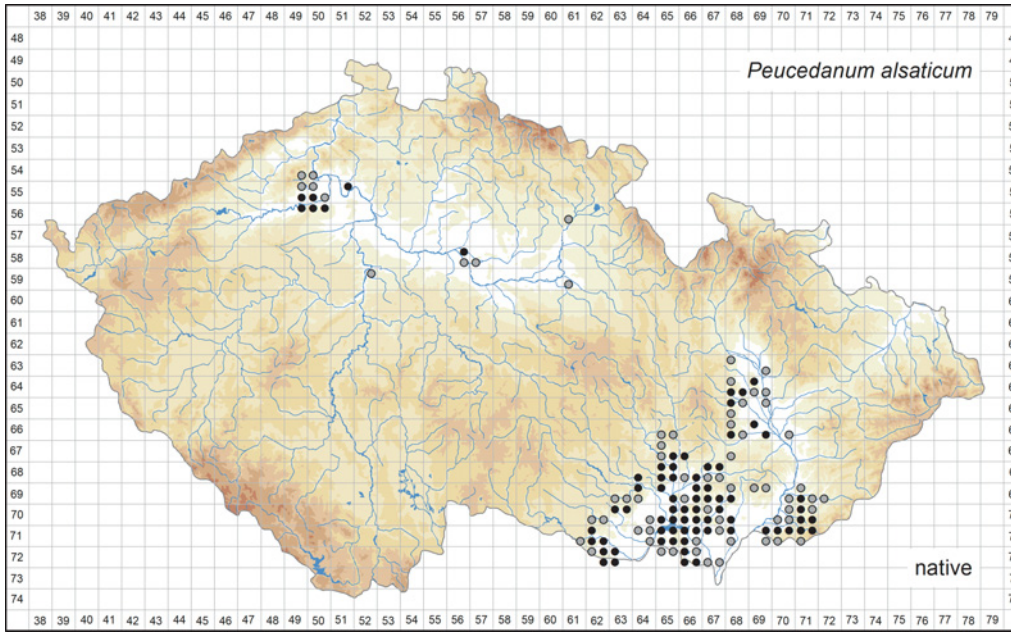

Fig. 54. Distribution of *Peucedanum alsaticum* in the Czech Republic: ● at least one record in 2000–2023 (73 quadrants), ● pre-2000 records only (65 quadrants). Prepared by Jan Prančl.

been detected recently. However, especially in village square ponds, waterlilies are often not collected by botanists and the actual number of localities is probably much higher. Most of the records are from central Bohemia, but this pattern may be due to the more intensive recording effort and targeted field surveys in this area. We have found that confusion between native and non-native water lilies has in some cases caused conservation efforts aimed at the former to be undertaken at sites where actually only the latter are present.

Peucedanum alsaticum (Fig. 54)

The distribution of *Peucedanum alsaticum* extends from France in the west to the Russian province of Omsk and eastern Kazakhstan in the east. The species is characteristic of a temperate continental climate, being only locally dispersed in central Europe and absent from northern Europe and most of the Mediterranean area, where the southern limit runs through southern France, the mountains of the Balkan Peninsula, the northern shores of the Black Sea, the Caucasus Mts and Lake Aral. In the southern Alps and the Apennines, the species is replaced by the closely related *P. venetum* (Meusel et al. 1978, Hand 2011). In the Czech Republic *P. alsaticum* occurs in dry grasslands, thermophilous shrub vegetation and forest fringes, and also in semi-ruderal habitats such as the margins of dirt roads, vineyards, fallow land and other slightly disturbed sites. It grows on rather deep, heavy, base- and nutrient rich soils, e.g. on loess, limestone, calcareous flysch and basalt; it prefers sunny to semi-shaded, warm sites but avoids very dry habitats. In this country the species is distributed in the warmest areas, especially in southern Moravia, where it is relatively common in the hilly landscapes rich in steppe vegetation, while it is rare in or absent from the flat lowlands. It is much rarer in central Moravia, where it has already disappeared from many former sites. In Bohemia it is very rare, occurring in a small outpost in the south-eastern foothills of the České středohoří Mts in northern Bohemia and the adjacent lowland around the town of Libochovice. Elsewhere it is known only from Sovice hill near the town of Roudnice nad Labem in northern Bohemia and from a few isolated sites in central and eastern Bohemia, of which only one has survived near the village of Křečkov east of the town of Nymburk. *Peucedanum alsaticum* reaches its elevational maximum at ~450 m in the Pavlovské vrchy hills in southern Moravia. It is endangered by abandonment of traditional management in grasslands followed by the succession of scrub, and many of its populations have disappeared due to the conversion of dry grasslands to arable land. It has vanished especially from the peripheral areas of its local range; therefore, it is classified as vulnerable (Grulich 2012).

Peucedanum altissimum (Fig. 55)

The range of *Peucedanum altissimum* includes the northern Apennines, the Alps in northern Italy, eastern Switzerland, Austria and Slovenia, eastwards extending to north-western Croatia and south-western Hungary. It has also been accidentally introduced to Germany and the Czech Republic (Hand 2011). In its native range it grows in open-canopy forests, riverbeds, the banks of streams, stony grounds and ravines. In the Czech Republic *P. altissimum* was recorded only in the city of Brno, where it occurred at several places in unmown lawns in the city district of Černá Pole between 1957 and 1970. However, the corresponding herbarium specimen has not been found yet. It is considered a casual neophyte (Pyšek et al. 2022).

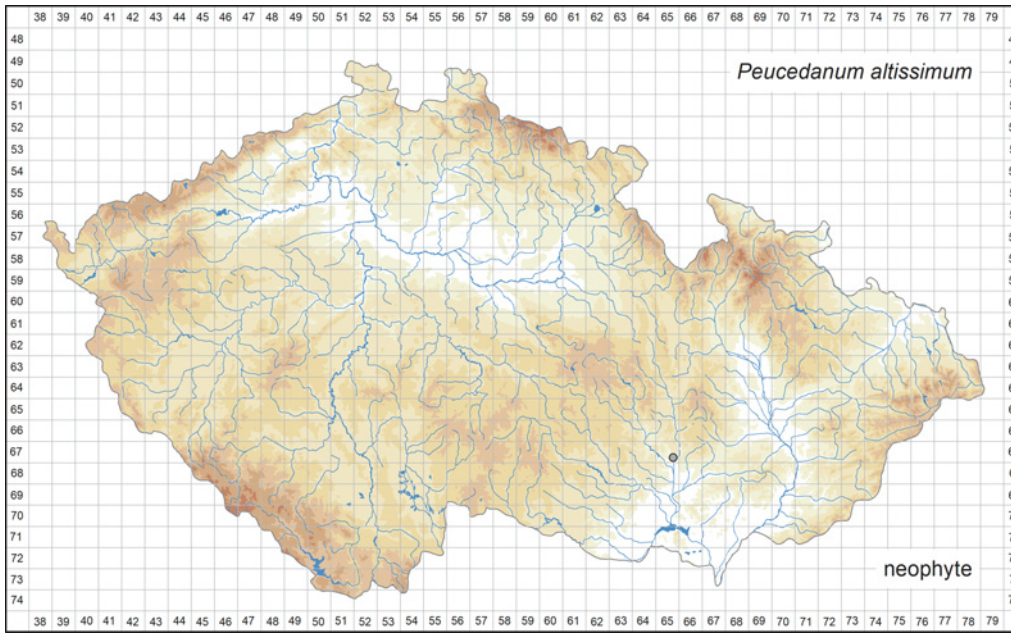

Fig. 55. Distribution of *Peucedanum altissimum* in the Czech Republic: ● pre-2000 records only (1 quadrant). Prepared by Jan Prančl.

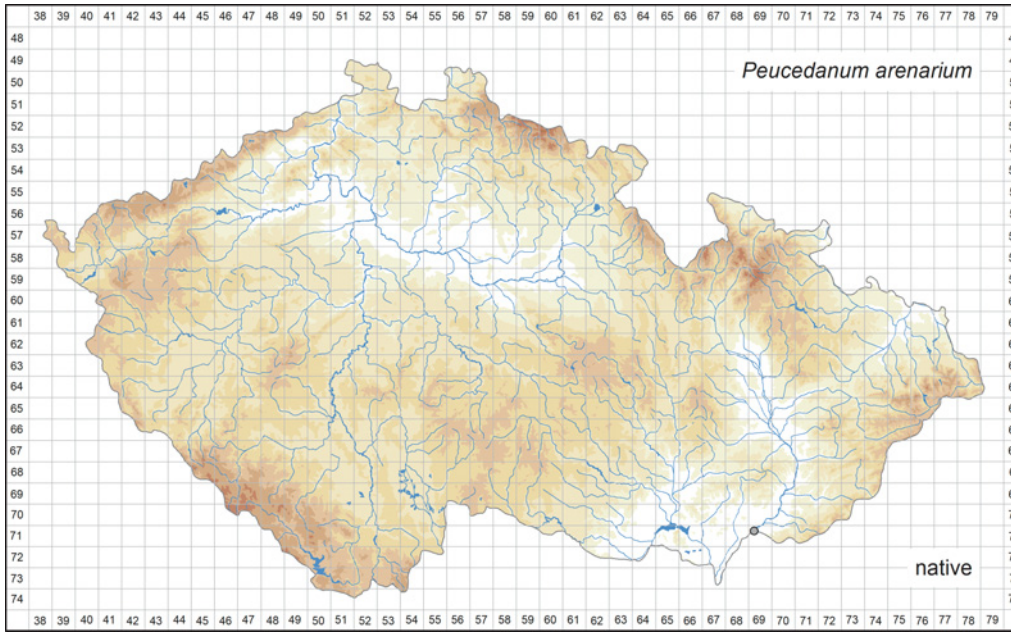

Fig. 56. Distribution of *Peucedanum arenarium* in the Czech Republic: ● pre-2000 records only (1 quadrant). Prepared by Jan Prančl.

Peucedanum arenarium (Fig. 56)

Peucedanum arenarium occurs mainly in south-eastern Europe. Its distribution extends from the Czech Republic, Slovakia, Hungary and Croatia in the west to the southern part of European Russia, Ukraine and Anatolia in the east. Three subspecies are recognized, of which only subsp. *arenarium* is reported from central Europe (Hand 2011). The species grows in open dry habitats such as sandy steppes, sunny slopes, open-canopy oak and pine forests and their fringes, mostly on sand but also on loess. In the Czech Republic *P. arenarium* reaches the north-western limit of its distribution. It was found at a single site at the edge of the Dúbrava forest near the village of Rohatec in southern Moravia, where it was first recorded by S. Staněk in 1925, but its occurrence has never been confirmed since then. Unfortunately, the corresponding herbarium specimen is currently missing. It is classified as extinct (Grulich 2012).

Peucedanum austriacum (Figs 57–58)

Peucedanum austriacum is endemic to the mountains of central and southern Europe. Two subspecies are recognized, subsp. *austriacum* and subsp. *rablense*; however, some authors distinguish *P. rablense* as a separate species (e.g. Spalik et al. 2004, Fischer et al. 2008) whereas other authors consider it as a variety or attribute no taxonomic value to it. The species grows on rocky and shrubby slopes, in open-canopy pine and deciduous forests on limestone, most often in relict stands or near-natural vegetation, occasionally occupying man-made habitats such as stone walls and vineyards.

The native range of *P. austriacum* subsp. *austriacum* extends from Lower Austria in the north to southern Italy and Greece in the south, and from eastern France in the west to Romania and Bulgaria in the east. It has been introduced into Germany and the Czech Republic (Hand 2011). In this country a single but quite large population of *P. austriacum* subsp. *austriacum* is known on Ptačí hrádek, a limestone hill on the western outskirts of the town of Český Krumlov in southern Bohemia (Fig. 57). It was first collected there in 1981, but was misidentified as *Laserpitium prutenicum*, and its correct identification was not made until more than three decades later (Marek et al. 2015). This site is located about 130 km from the nearest native occurrence in the foothills of the Alps in Austria. Although it cannot be entirely ruled out that the population is indigenous there, it is more likely that it was introduced, e.g. with imported saplings of the non-native *Pinus nigra*. Therefore, it is considered a casual neophyte (Pyšek et al. 2022).

Peucedanum austriacum subsp. *rablense* has a smaller range than the typical subspecies, being native to Switzerland, Austria, Italy and Slovenia; casual introductions have been reported from the Czech Republic and Germany (Lauber & Wagner 2001, Hand 2011). In the Czech Republic this taxon was collected only once, in 1837 near the village of Hlubočepy, now a district of Prague (Fig. 58). No details are known about the nature of this occurrence and it may have arisen from an accidental or deliberate introduction. It is considered a casual neophyte (Pyšek et al. 2022).

Peucedanum carvifolia (Fig. 59)

Peucedanum carvifolia is distributed mainly in southern Europe as well as in the southern parts of western, central and eastern Europe. The overall range of this species extends

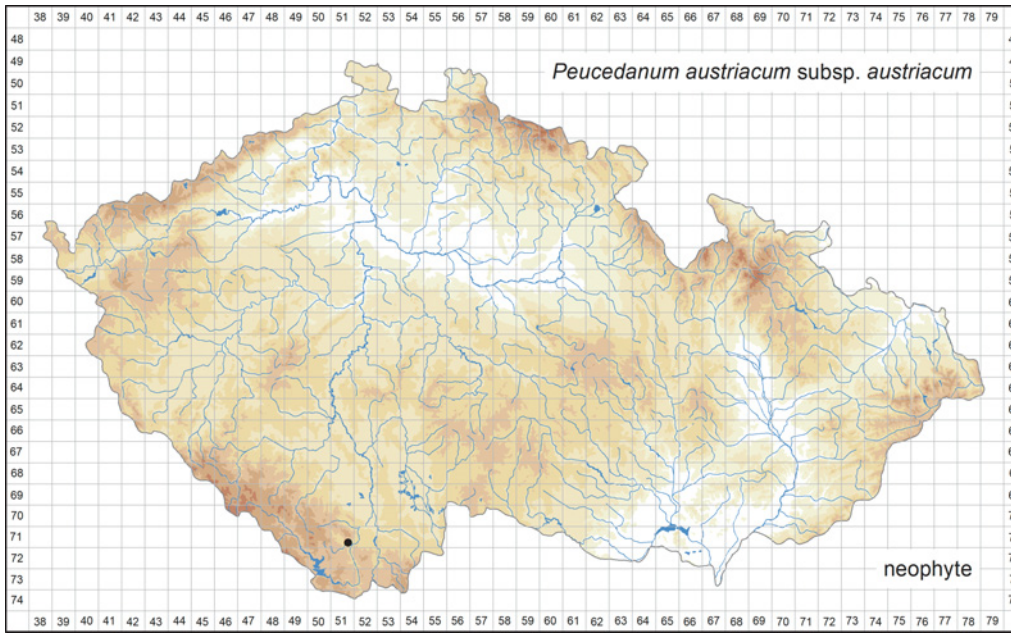

Fig. 57. Distribution of *Peucedanum austriacum* subsp. *austriacum* in the Czech Republic (1 occupied quadrant). Prepared by Jan Prančl.

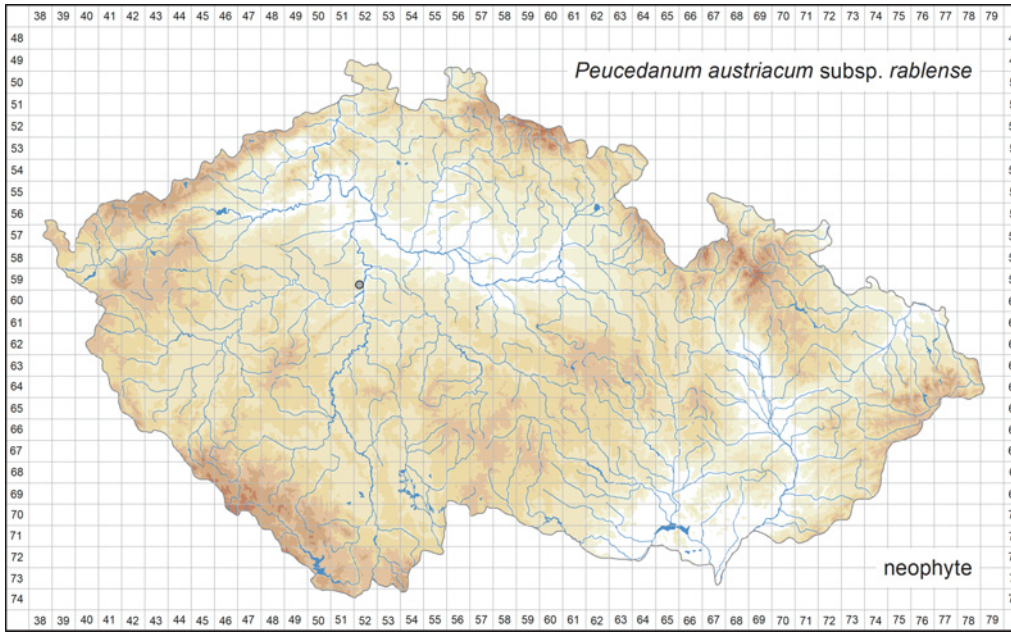

Fig. 58. Distribution of *Peucedanum austriacum* subsp. *rablense* in the Czech Republic: ● pre-2000 records only (1 quadrant). Prepared by Jan Prančl.

from Portugal in the west to Anatolia and the foothills of the Caucasus Mts in the east. It is absent from northern Europe and the British Isles and rare in the southernmost parts of the European Mediterranean area (Frey 1989, Hand 2011). It grows in open-canopy thermophilous forests, their fringes, shrub communities and meadows adjacent to these habitats, on calcareous, deeper and heavy, but also drier stony soils. In the Czech Republic *P. carvifolia* reaches the northern limit of its distribution. In this country a single but large native population is known at the northern edges of the Lipiny forest near the village of Nivnice in the Bílé Karpaty Mts in south-eastern Moravia at an elevation 300–360 m. It is classified as critically threatened due to its rarity (Grulich 2012). In 1974, the species was found introduced on the north-eastern outskirts of the city of České Budějovice in southern Bohemia but was misidentified as *Silaum silaus* and correctly determined only recently (Lepší & Lepší 2016). Since its discovery, its occurrence has never been confirmed again at this secondary site.

Peucedanum cervaria (Fig. 60)

Peucedanum cervaria is distributed mainly in temperate and sub-Mediterranean parts of Europe. Its range extends from northern Spain in the west to Ukraine and adjacent parts of European Russia in the east, perhaps as far as the North Caucasus. The species is absent from the British Isles and northern Europe (except Latvia and formerly Lithuania, where it is now considered nationally extinct), and southernmost Europe, and is rare in the Alps and the northern parts of central Europe. A small isolated outpost is reported to exist in northern Algeria (Meusel et al. 1978, Hand 2011). In the Czech Republic *P. cervaria* occurs in forest fringes, dry open-canopy forests, particularly in thermophilous oak forests, less often in pine plantations, also in dry grasslands and meadows, open shrub vegetation, occasionally in rather dry parts of intermittently wet meadows. It grows on basic substrates such as limestone, loess, marlstone, siltstone, basalt and calcareous flysch, preferring deep, nutrient-rich, often heavy soils but also occurs on rather shallow skeletal substrates on rock outcrops. It is distributed throughout the warm regions of Bohemia and Moravia, where it is particularly common in landscapes rich in thermophilous vegetation but rather rare in flat deforested lowlands. Outside these areas it occurs in the surroundings of the city of Plzeň in western Bohemia, in rather warm parts of southern Bohemia and in the warmest parts of Silesia. Elsewhere it is very rare, being absent from the areas with hard siliceous bedrock. *Peucedanum cervaria* reaches its elevational maximum at ~800 m on Mt Holý vrch near the town of Brumov-Bylnice in the Bílé Karpaty Mts. It has declined somewhat due to abandonment or intensive use of grasslands and the succession of open-canopy forests to dense stands. It is classified as of lower risk – near threatened (Grulich 2012).

Peucedanum oreoselinum (Fig. 61)

Peucedanum oreoselinum is almost exclusively distributed in temperate and sub-Mediterranean parts of Europe. It occurs from Portugal in the west as far as the Ural Mts and the northern foothills of the Caucasus Mts in the east. It is rare in western and south-eastern Europe and in the northern parts of central Europe, and is absent from the British Isles and most of northern Europe. The northern limit of its range runs through Denmark, southernmost Scandinavia, Estonia and the adjacent parts of European Russia (Meusel et

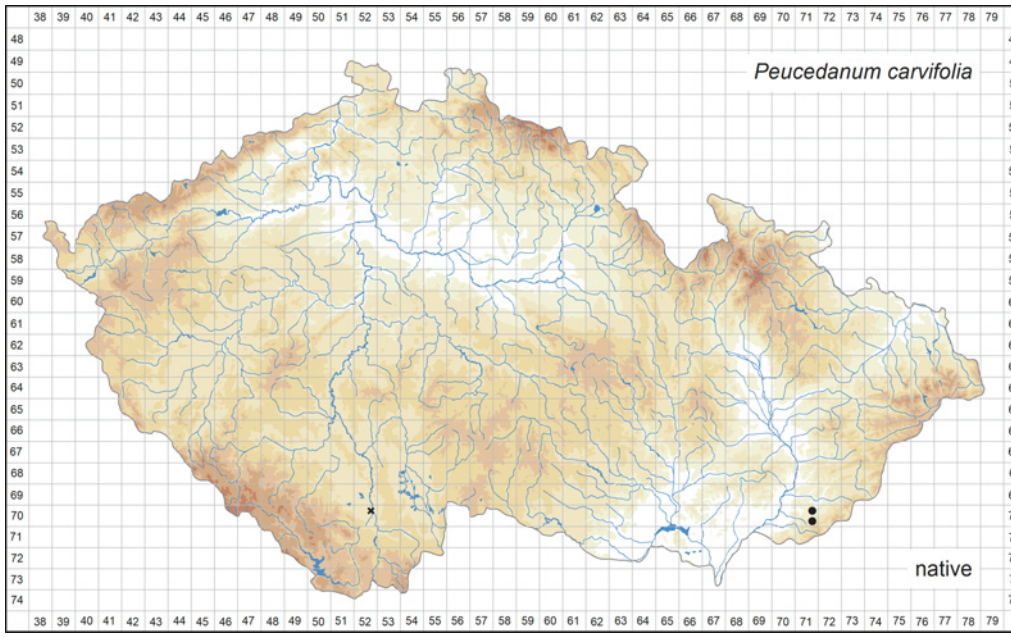

Fig. 59. Distribution of *Peucedanum carvifolia* in the Czech Republic: ● native (2 quadrants), × alien (1 quadrant). Prepared by Jan Prančl.

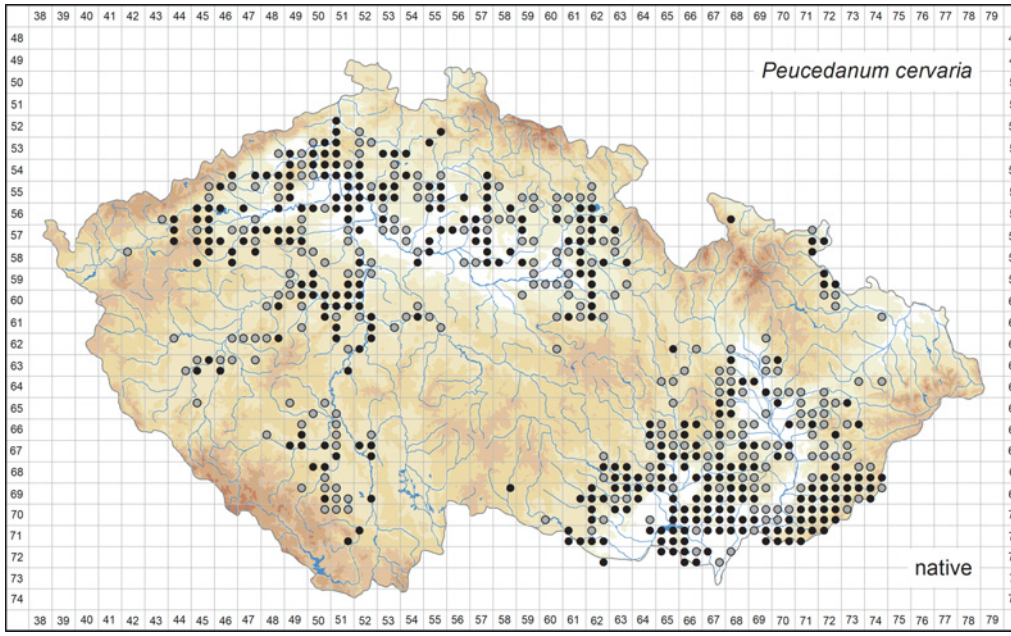

Fig. 60. Distribution of *Peucedanum cervaria* in the Czech Republic: ● at least one record in 2000–2023 (327 quadrants), ● pre-2000 records only (242 quadrants). Prepared by Jan Prančl.

al. 1978, Hultén & Fries 1986, Hand 2011). In the Czech Republic *P. oreoselinum* grows in dry open-canopy oak and pine forests, forest fringes, shrub communities, dry grasslands and river banks. It prefers acidic to slightly basic, nutrient-poor, dry sandy substrates, being particularly common on sandstone bedrock of old river terraces; less often it occurs also on shallow skeletal soils. In this country the species occurs predominantly in warm areas. It is most abundant in warm to moderately warm parts of Bohemia, especially in the Labe river basin and in the sandstone area of the Ralská pahorkatina hills between the towns of Česká Lípa in northern Bohemia and Mělník in central Bohemia. Numerous sites are also found in the surroundings of the town of Plzeň in western Bohemia, in the Džbán hills and along the Berounka and Sázava rivers. In Moravia it occurs almost exclusively in its southern part, particularly in the sandy area between the towns of Kyjov, Hodonín and Bzenec, in the lower Dyje river basin and on outcrops of hard rocks between the city of Brno and the town of Znojmo. Elsewhere in this country it is rare, and many isolated occurrences have already disappeared. The elevational maximum of the species has been recorded at ~720 m near the village of Ovesné Kladruby in western Bohemia. *Peucedanum oreoselinum* has declined due to the eutrophication of landscape, retreat of open-canopy forests, abandonment of dry grasslands, and also by the construction of dams on rivers. It is classified as vulnerable (Grulich 2012).

Peucedanum ostruthium (Fig. 62)

The native range of *Peucedanum ostruthium* is probably restricted to the mountains of south-western Europe and south-western parts of central Europe, extending from northern and central Spain through the Massif Central, Corsica, the northern Apennines and the Alps to north-western Croatia. The species has been cultivated elsewhere as a medicinal herb since the Middle Ages and is now also known from the British Isles, Belgium, central Germany, the Czech Republic, Poland, Denmark, the southern half of Scandinavia, Romania and Crimea, perhaps also from Lithuania and Bulgaria (Hultén & Fries 1986, Hand 2011). The species has been introduced into the Czech Republic by settlers coming from the Alps in the 16th and 17th century (Kopecký 1973). It has naturalized on mountain meadows and pastures, along streams, roadsides, very often also on ruderal sites around ruins of abandoned buildings, most often in the areas inhabited by the German-speaking population that was displaced after World War II. It grows mainly on acidic, mesic to wet soils rich in nutrients and humus. In the Czech Republic *P. ostruthium* is particularly abundant in the Smrčiny Mts in westernmost Bohemia, the Krušné hory Mts in north-western Bohemia, the Sudetes mountain ranges along the Czech-Polish border and in the northern half of the Žďárské vrchy hills along the historical border of Bohemia and Moravia. It is slightly less abundant in the northern half of the Šumava Mts in south-western Bohemia, while it grows only rarely in its southern half and in the adjacent Novohradské hory Mts. In Moravia it occurs scattered in the Králický Sněžník Mts and rarely in the Hrubý Jeseník and Beskydy Mts. It usually grows at elevations above 600 m; the elevational maximum has been recorded at about 1,410 m near the former mountain hut of Rennerova bouda in the Krkonoše Mts. At low elevations it escapes very rarely and only temporarily. *Peucedanum ostruthium* is classified as a naturalized archaeophyte or neophyte (Pyšek et al. 2022).

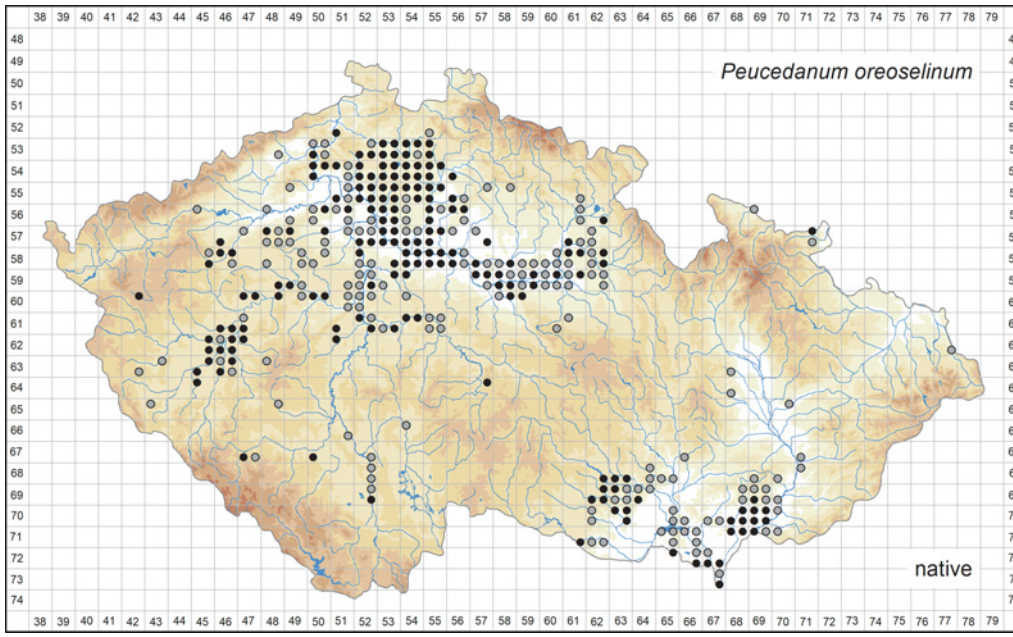

Fig. 61. Distribution of *Peucedanum oreoselinum* in the Czech Republic: ● at least one record in 2000–2023 (174 quadrants), ● pre-2000 records only (165 quadrants). Prepared by Jan Prančl.

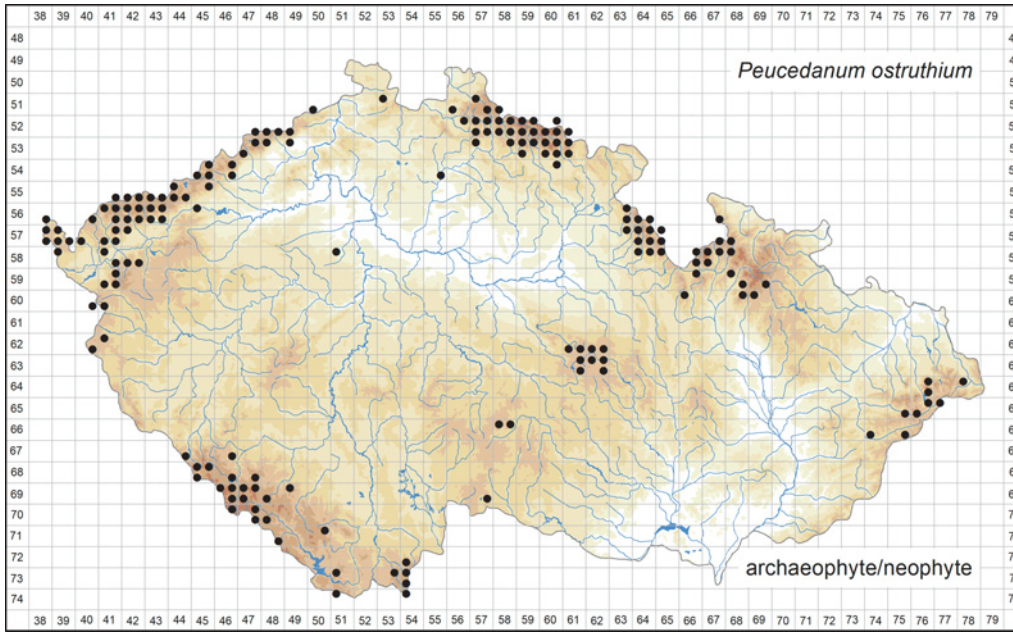

Fig. 62. Distribution of *Peucedanum ostruthium* in the Czech Republic (174 occupied quadrants). Prepared by Jan Prančl.

Peucedanum palustre (Fig. 63)

Peucedanum palustre is a Eurasian species occurring mainly in the temperate and boreal zones. It is distributed from Great Britain and France in the west as far as western Siberia and the Altai Mts in the east. It is absent from Iceland, Ireland, northernmost Scandinavia and most of southern and south-eastern Europe (Meusel et al. 1978, Hultén & Fries 1986, Hand 2011). In the Czech Republic *P. palustre* grows in wet meadows, often on peaty substrates such as fens and transitional mires, also in the margins of reed stands and fishponds, in tall sedge stands, willow scrub and alder carrs. Although it grows most abundantly on slightly acidic to neutral soils, it can occur also in calcium-rich fens. Compared to other similar central-European species of the *Apiaceae* family (namely *Selinum carvifolia*, *Silaum silaus*, *Laserpitium prutenicum* and *Cnidium dubium*), it has higher moisture requirements and usually does not occur in intermittently wet meadows; on the other hand, it tolerates temporary flooding well. In this country *P. palustre* is very unevenly distributed; it is most abundant from middle elevations to low mountains in wetland-rich areas such as the upper Ohře river basin in western Bohemia, the surroundings of the towns of Česká Lípa and Doksy in northern Bohemia, the Labe and Orlice river basins in eastern Bohemia, the Železné hory and Žďárské vrchy hills at the Bohemian-Moravian border, the fishpond basins in southern Bohemia as well as in and the Vltava river basin in the Šumava Mts in southern Bohemia, where it reaches its elevational maximum at ~900 m near the settlement of České Žleby. In the eastern part of the Czech Republic the species is rarer, occurring mainly in the Ostravská pánev basin, the surroundings of the town of Vidnava in Silesia, in Morava river basin in central Moravia and between the towns of Bzenec and Hodonín in southern Moravia. *Peucedanum palustre* is still abundant in some areas, whereas it has markedly declined from lowlands due to abandonment, drainage, eutrophication and reclamation of wetlands; some areas of its range were also affected by coal mining.

Phlomis tuberosa (Fig. 64)

Phlomis tuberosa is a Eurasian species distributed mainly in the steppe zone in the Pontic region and southern Russia, extending westwards to eastern Austria and eastwards to southern Siberia, Mongolia and the Ussuri region. Northwards it reaches Moravia, southern Slovakia and central parts of the European Russia, southwards northern Greece, Anatolia, Iran and central Asia (Meusel et al. 1978, Hilbig & Knapp 1983, POWO 2023). In the Czech Republic *P. tuberosa* grows in dry grasslands, fringes of thermophilous oak forests, scrub, abandoned orchards and margins of vineyards, mostly at open to semi-shaded sites on slopes of hills. It prefers loamy, sometimes skeletal, basic to neutral soils well supplied with nutrients, developed over loess, limestone or Tertiary calcareous sediments. In this country its distribution is restricted to the warm, dry hilly areas of southern and central Moravia. *Phlomis tuberosa* is classified as endangered because of its rarity and recent decline (Grulich 2012).

Selinum carvifolia (Fig. 65)

The range of *Selinum carvifolia* extends from the Iberian Peninsula in the west to the Ural Mts and western Kazakhstan in the east. It is mainly distributed in the temperate regions,

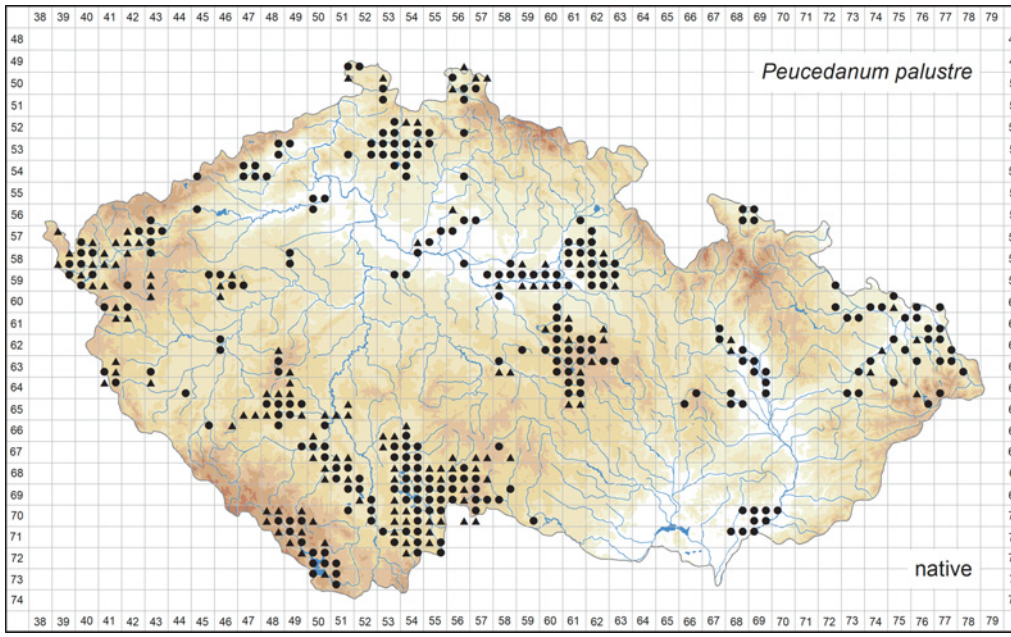

Fig. 63. Distribution of *Peucedanum palustre* in the Czech Republic: ● occurrence documented by herbarium specimens (275 quadrants), ▲ occurrence based on other records (133 quadrants). Prepared by Jan Prančl.

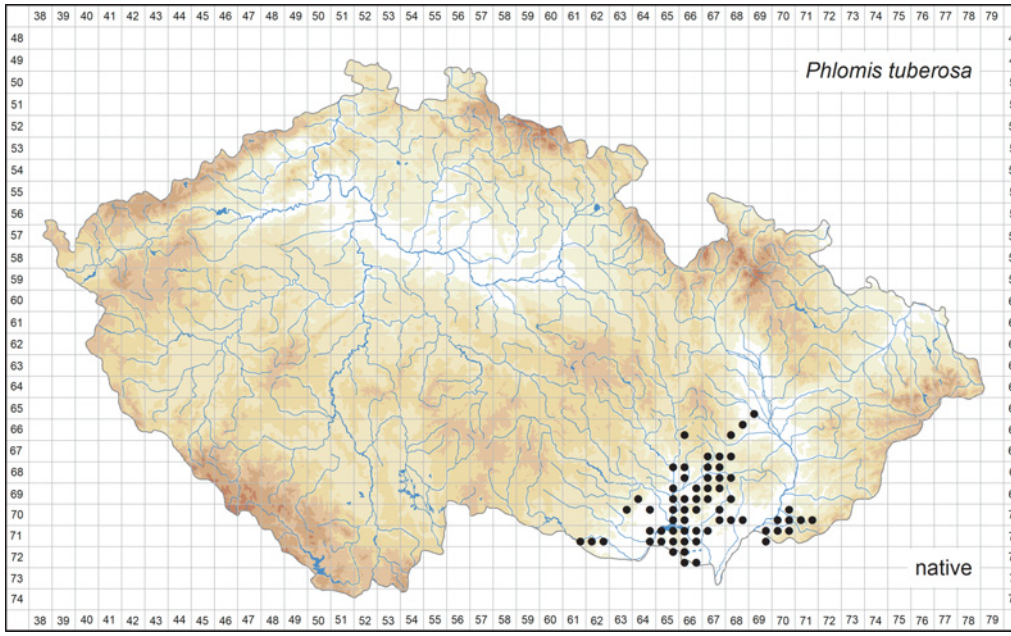

Fig. 64. Distribution of *Phlomis tuberosa* in the Czech Republic (63 occupied quadrants). Prepared by Jindřich Chrtek.

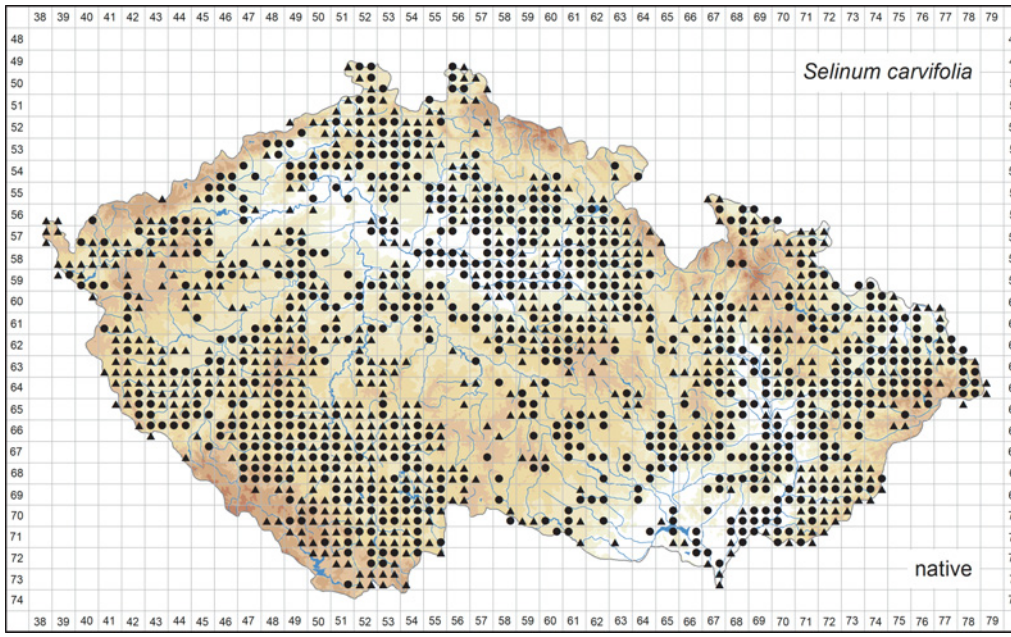

Fig. 65. Distribution of *Selinum carvifolia* in the Czech Republic: ● occurrence documented by herbarium specimens (725 quadrants), ▲ occurrence based on other records (683 quadrants). Prepared by Jan Prančl.

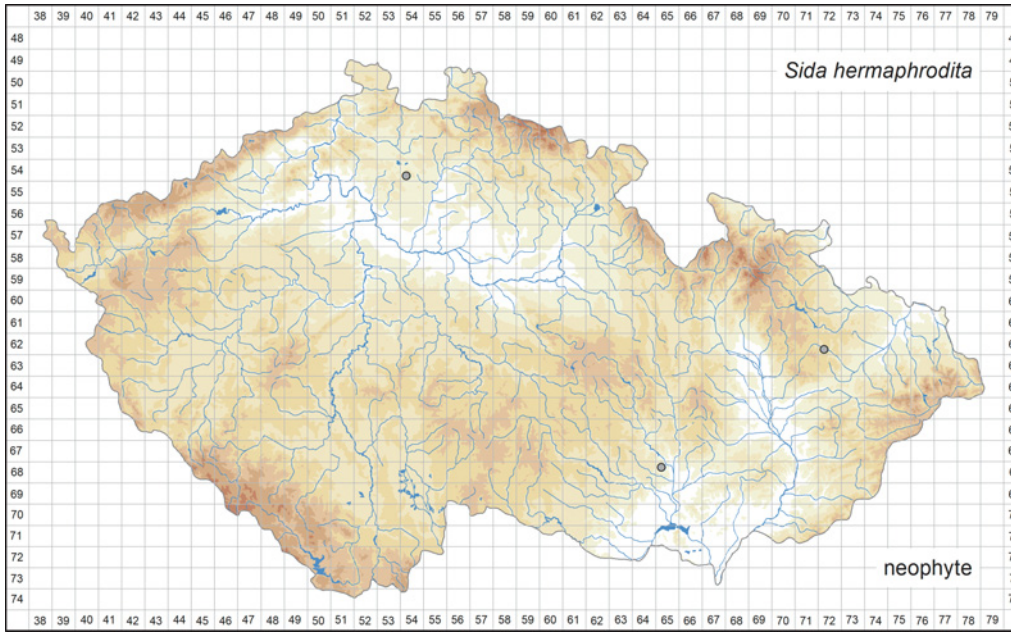

Fig. 66. Distribution of *Sida hermaphrodita* in the Czech Republic: ◍ pre-2000 records only (3 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

being absent from most of the Mediterranean area and south-eastern Europe; northwards the species reaches southern England and southern Scandinavia. Two subspecies are recognized, sometimes being classified as separate species: subsp. *carvifolia* is widespread except for the Iberian Peninsula, whereas subsp. *broteri* is restricted to Portugal, Spain and Brittany (Meusel et al. 1978, Hultén & Fries 1986, Gómez 2003, Hand 2011). In the Czech Republic *Selinum carvifolia* most often grows on intermittently wet soils that dry out during summer, preferring slightly acidic to basic substrates. It occurs in various types of wetlands such as alluvial meadows, wet meadows in spring areas, rather dry parts of fens and transitional mires, alder carrs, banks of water bodies, streams and ditches, and also grows in open-canopy oak and oak-hornbeam forests. It is distributed throughout this country, being rare only in mountains, the driest lowland areas and the areas with a predominance of hard acidic substrates. It reaches its elevational maximum at 1,075 m near the settlement of Zhůří in the Šumava Mts. Compared to other ecologically similar central European species of the *Apiaceae* family occurring in intermittently wet meadows (namely *Silaum silaus*, *Laserpitium prutenicum* and *Cnidium dubium*), *Selinum carvifolia* is more tolerant to eutrophication and temporary cessation of management. The species is still present in most of the quadrants in which it has been recorded, yet it has undoubtedly declined due to habitat destruction, drainage, reclamation and management changes of wetlands, as well as the retreat of open-canopy forests.

Sida hermaphrodita (Fig. 66)

Sida hermaphrodita is native to the north-eastern USA and south-eastern Canada, where it grows in open, moist, sunny to partly shaded riverine habitats (Spooner et al. 1985). In some European countries, it is grown for its fibre, as a source of fodder for livestock and nectar for beekeeping, as a soil stabilizer and an ornamental. It is also currently being investigated as an energy crop. It rarely escapes from cultivation, e.g. in Austria (Gilli et al. 2020), Germany (Hand et al. 2023) and in some eastern-European countries (Valdés & Raab-Straube 2011b). In the Czech Republic it was repeatedly collected and recorded in 1958–1965 on the Svratka river bank in the Brno's city district of Pisárky, in 1976 on the Odra river bank near the village of Klokočůvek in northern Moravia and in the 1980s in the village of Žďár south of the town of Doksy in northern Bohemia. *Sida hermaphroditica* is considered a casual neophyte in this country (Pyšek et al. 2022).

Sida rhombifolia (Fig. 67)

Sida rhombifolia is native to the Old World tropics and subtropics. It has been introduced into and become naturalized in southern, central and south-eastern North America, the Korean Peninsula, Australia and New Zealand and also in some European countries, e.g. in Portugal, Spain, Italy (Sicily) and Croatia. It is also reported as a casual and ephemeral species in several other European countries, namely in France, Great Britain, the Netherlands, Belgium, Lithuania, Denmark, Sweden, Norway and Ukraine (for references see Cambria et al. 2022). In its native range it occurs in pastures and other types of grasslands, open woodlands, crops, waste areas, along footpaths and on roadsides. In the Czech Republic *S. rhombifolia* was found in 1979–1991 in a transit shed at the river port of Nové Loubí at the Labe river north of the town of Děčín, in 1992 at a railway station Ústí nad Labem-Střekov, in 1979 and 1991 in river ports in the towns of Ústí nad Labem (1979, 1991) and

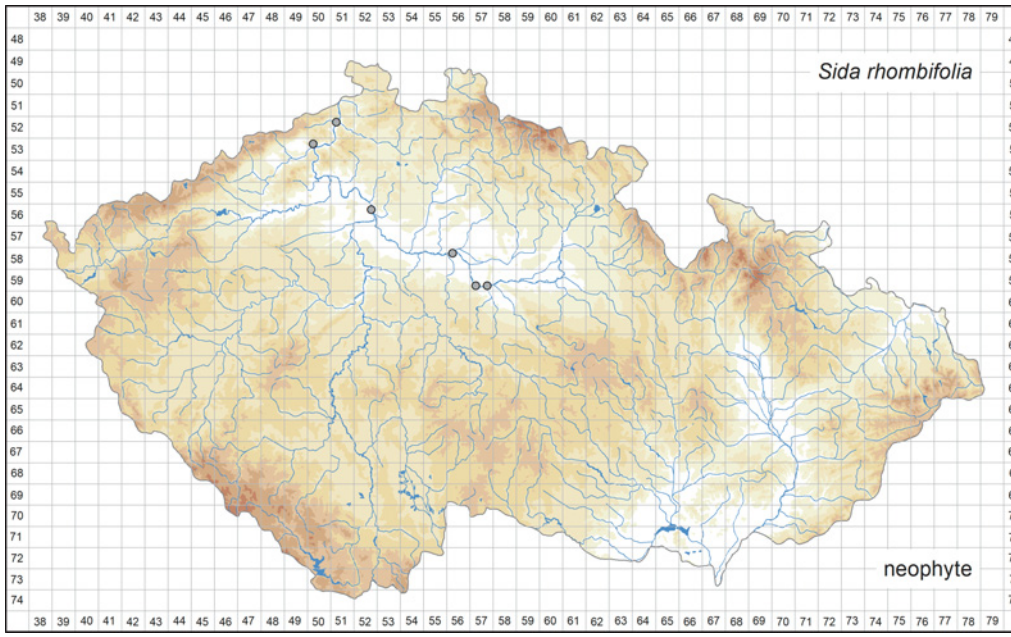

Fig. 67. Distribution of *Sida rhombifolia* in the Czech Republic: ● pre-2000 records only (6 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

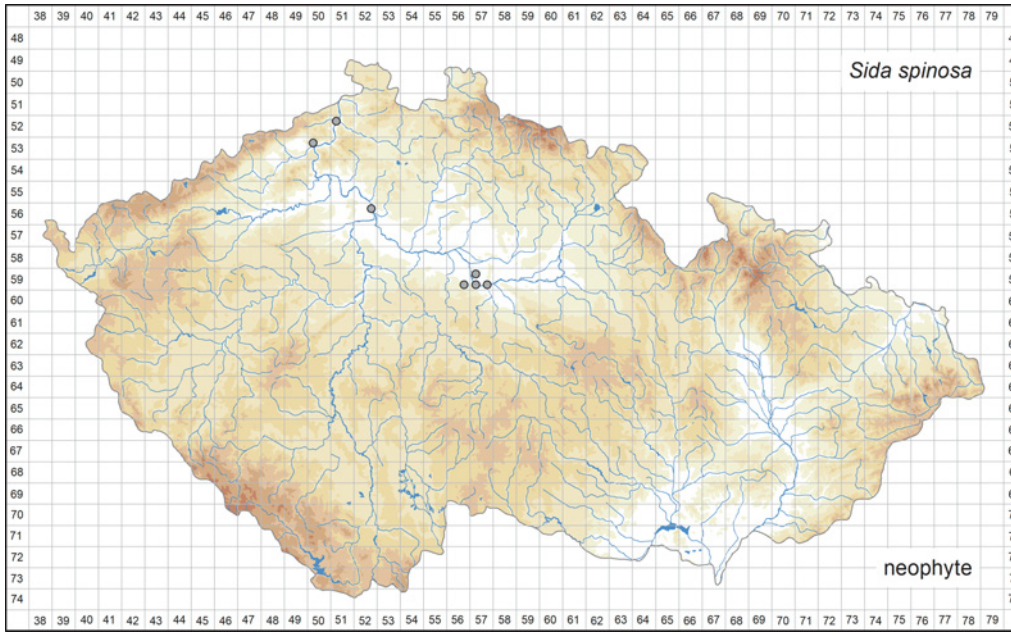

Fig. 68. Distribution of *Sida spinosa* in the Czech Republic: ● pre-2000 records only (7 quadrants). Prepared by Jindřich Chrtek and Michal Ducháček.

Mělník (1983, 1984), in 1985 and 1987 at a railway station in the town of Nymburk, in 1984 in the yard of a former factory that processed imported soybeans in the town of Kolín and in a farm in the nearby village of Starý Kolín, where soybean waste was fed to livestock. All occurrences are associated with soybean importation from the Americas (Slavík 1992). *Sida rhombifolia* is considered a casual neophyte in this country (Pyšek et al. 2022).

Sida spinosa (Fig. 68)

Sida spinosa is native to tropical and subtropical regions of both the Old and the New Worlds. It has been introduced into Spain, France, Belgium, the Netherlands, Lithuania, Romania, Moldova, Italy (Sicily), Greece, Georgia, the European part of Russia, Egypt, the Korean Peninsula, the Russian Far East, Japan, temperate eastern North America and Australia (Valdés & Raab-Straube 2011b, Fryxell & Hill 2015, POWO 2023, Verloove 2023e). In its native range it occurs in savannas, damp thickets, brushy and grassy slopes and on arable land. In the Czech Republic *S. spinosa* was discovered in 1972 near a poultry farm in the village of Velký Osek and near a farmhouse in the village of Veltruby in eastern-central Bohemia. Later, it was collected in the same region in the town of Kolín in a factory processing soybeans imported from North America (1975–1989) and in several villages in surroundings of this town (Starý Kolín 1982–1989, Štítary 1975, 1982, Zibohlavy 1984, 1988) on farms where soybean wastes were fed to livestock. In the 1980s *S. spinosa* was found in a transit shed at the port of Nové Loubí at the Labe river north of the town of Děčín (1981, 1983 and 1985), in the city of Ústí nad Labem (1982, 1983, 1986) and in the river port in the town of Mělník (1983). All occurrences are associated with soybean importation from North America (Slavík 1992). *Sida spinosa* is considered a casual neophyte in this country (Pyšek et al. 2022).

Silaum silaus (Fig. 69)

In its broad circumscription, *Silaum silaus* is a Eurosiberian species, being distributed from northern Spain in the west as far as western Siberia and the Altai Mts in the east. Most of the species' range is situated in areas with temperate climates. It is absent from most of the Mediterranean area, Iceland, Ireland and Scandinavia except its southernmost part. It has been introduced into Denmark, Finland, Slovenia and south-eastern China. Some authors distinguish a related species, *S. besseri*, which is thought to occur in the eastern part of the range of *S. silaus* (s. l.), approximately from Romania eastwards (Meusel et al. 1978, Hultén & Fries 1986, She 2005, Hand 2011). In the Czech Republic *S. silaus* is characteristic of intermittently wet meadows that dry out during summer, most often on heavy clayey soils on basic-rich substrates such as siltstone, mudstone, marlstone and calcareous flysch. It also grows in drier parts of fens and lowland alluvial meadows, on edges of ditches, as well as in sloping wet meadows in hilly areas. In this country most of the species' populations are concentrated in five separate areas. In Bohemia it occurs in the České středohoří Mts, Labe river basin, the area between the towns of Mladá Boleslav, Dolní Bousov, Loučeň and Rožďalovice in central Bohemia and the base-rich parts of eastern Bohemia between the towns of Česká Skalice, Dobruška, Pardubice and Vysoké Mýto. The largest area of continuous distribution is situated in central and southern Moravia, including the Morava and Dyje river basins, the western half of the Bílé Karpaty Mts, Chřiby hills and the western part of the Hostýnské vrchy

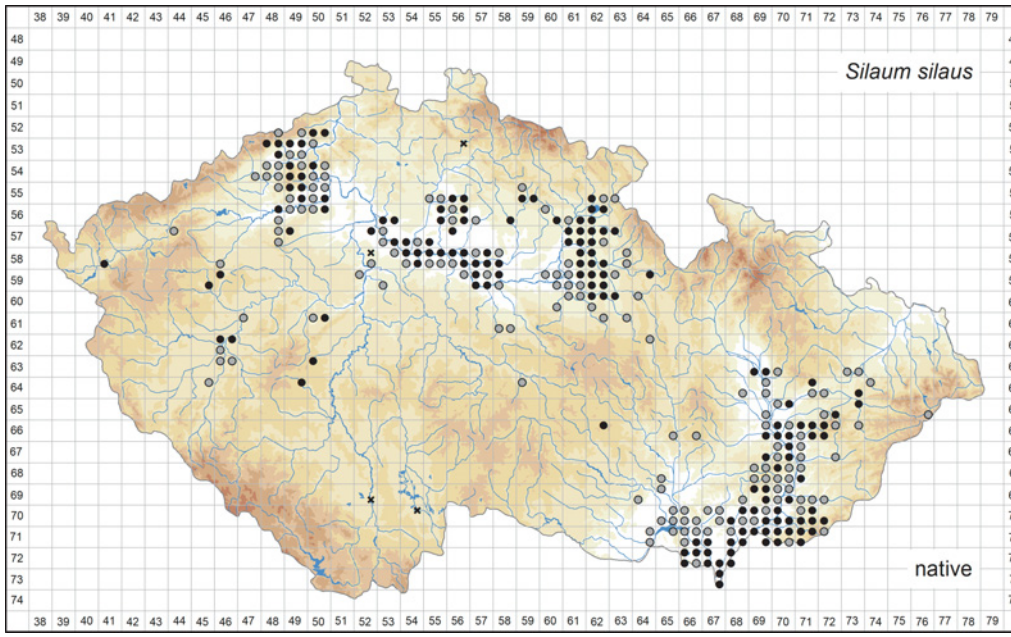

Fig. 69. Distribution of *Silaum silaus* in the Czech Republic: ● native, at least one record in 2000–2023 (147 quadrants), ◍ native, pre-2000 records only (148 quadrants), × alien only (4 quadrants). Prepared by Jan Prančl.

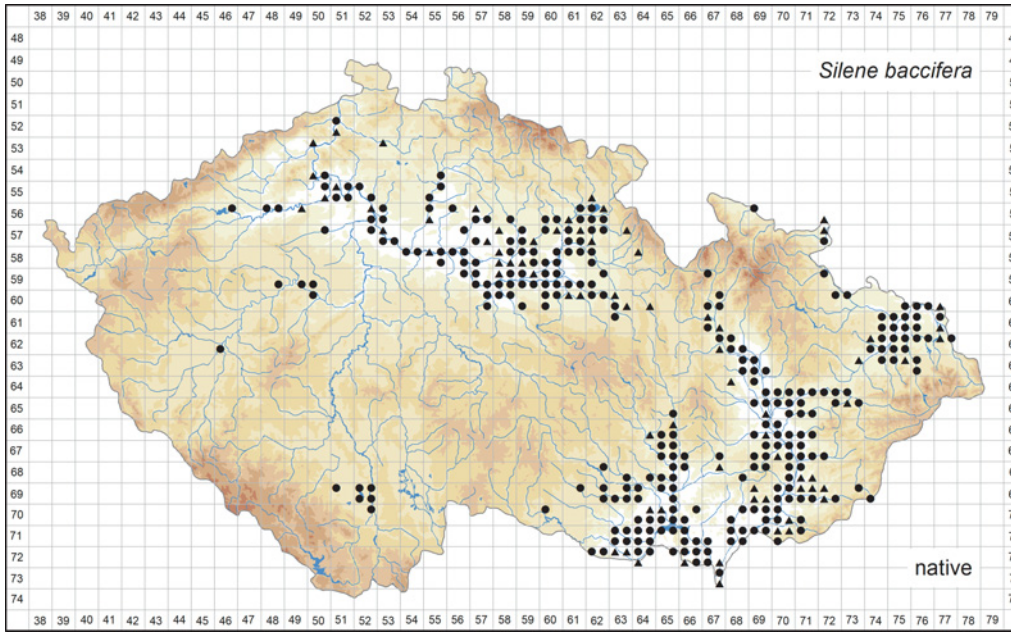

Fig. 70. Distribution of *Silene baccifera* in the Czech Republic: ● occurrence documented by herbarium specimens (276 quadrants), ▲ occurrence based on other records (73 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

Mts. Elsewhere it is rare, and many isolated occurrences have already vanished. The elevational maximum of the species is situated at ~660 m on Lesná hill in the Bílé Karpaty Mts. *Silaum silaus* has declined due to either abandonment or intensive use of wet meadows, their drainage, fertilization and conversion to arable land. It is therefore classified as vulnerable (Grulich 2012).

Silene baccifera (Fig. 70)

Silene baccifera occurs in the temperate and submeridional zones in Europe, from the northern Iberian Peninsula in the west to the central part of European Russia in the east, extending northwards to northern Germany, northern Poland and the Baltic countries, and southwards to the Italian and Balkan Peninsulas. It is also found in south-western Asia, the Caucasus Mts, Iran and westernmost Siberia (Meusel et al. 1965, Hultén & Fries 1986, Jalas & Suominen 1986). In the Czech Republic *S. baccifera* occurs on river and fishpond banks, in margins and clearings of alluvial and other humid forests, sometimes also in humid scrub and semiruderal sites not associated with rivers, streams and water reservoirs. Soils are usually wet continuously through the year or at least in spring, and rich in nutrients. The occurrences in this country are concentrated in the valleys and basins of main rivers and low reaches of their tributaries, i.e. the Labe and Ohře rivers in Bohemia, as well as the Dyje, Svratka, Morava, Bečva and Odra rivers in Moravia and Silesia. The isolated occurrences elsewhere may be partly indigenous (e.g. along the Berounka river in western central Bohemia) and also partly due to accidental introductions. However, some of these occurrences, e.g. in the fishpond landscape north of the city of České Budějovice, have lasted for more than a century. *Silene baccifera* occurs from the lowlands up to the elevations of about 350 m, reaching its elevational maximum at 410 m near the village of Příštpo in south-western Moravia. *Silene baccifera* is considered vulnerable (Grulich 2012), probably due to its limited distribution and local decline.

Silene bupleuroides (Fig. 71)

Silene bupleuroides occurs in south-eastern Europe, mainly in the Balkan Peninsula and the Pannonian Basin, extending northwards to southern Slovakia and eastwards to Ukraine, the Caucasus Mts, Iran and central Asia. Casual occurrences in central Europe north-west of the Pannonian Basin were recorded in Germany, the Czech Republic and Austria. Two subspecies are distinguished in Europe, with subsp. *bupleuroides* having more northern distribution than subsp. *staticifolia*, which is restricted to the south-western part of the Balkan Peninsula (Jalas & Suominen 1986, Chater et al. 1993). In its primary range *S. bupleuroides* occurs in various types of dry grasslands, usually on shallow soils. In this country this species was recorded from margins of arable fields and vineyards and from "narrow grassland strips of dirt roads" (Tomaschek 1934). It occurred at two sites in the České středohoří Mts in northern Bohemia and at one site north of the village of Hrádek east of Znojmo in southern Moravia. The occurrences in the České středohoří Mts are documented by herbarium specimens from 1870–1906 (the records from the 1930s in the town of Litoměřice probably refer to cultivated plants), while the occurrence near Hrádek was discovered in 1925 and confirmed for the last time in 1934. All the specimens we have seen from this country correspond to the typical subspecies. Although *S. bupleuroides* is considered nationally extinct (Grulich 2012), its indigenous

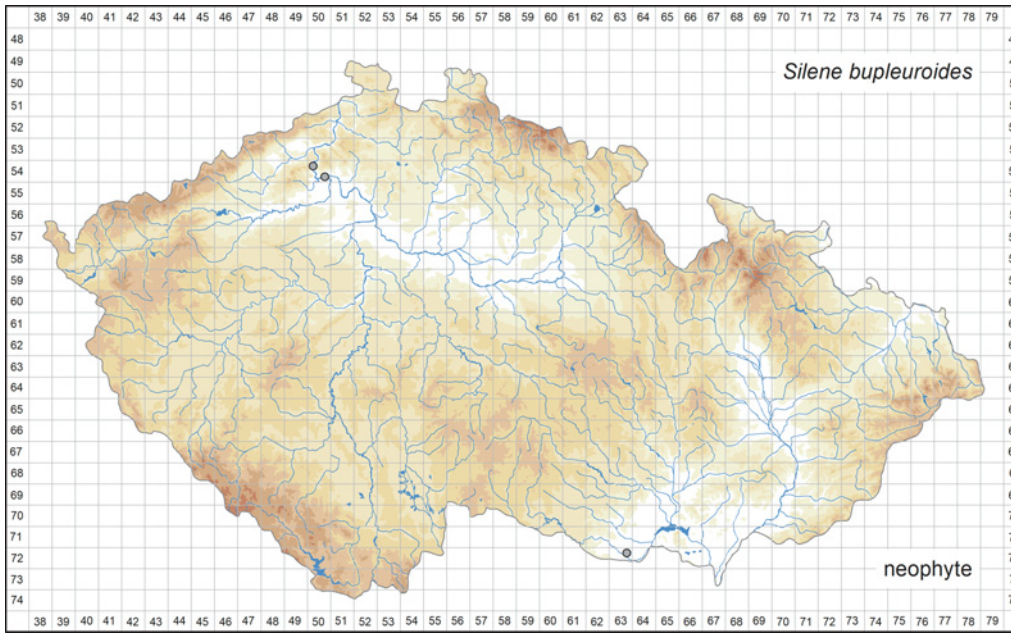

Fig. 71. Distribution of *Silene bupleuroides* in the Czech Republic: ● pre-2000 records only (3 quadrants). Prepared by Jiří Danihelka and Zdeněk Kaplan.

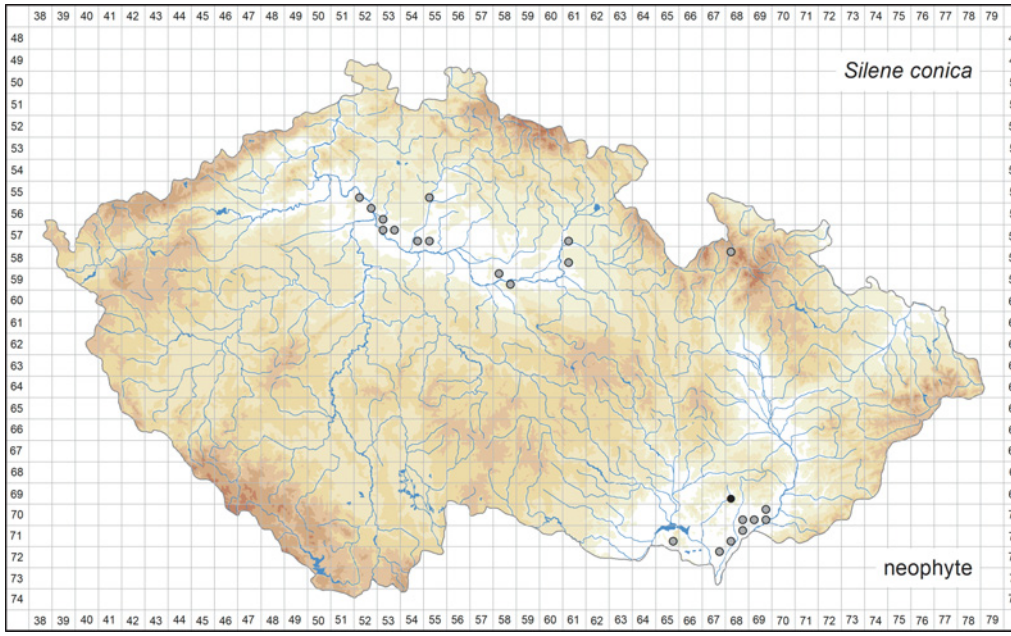

Fig. 72. Distribution of *Silene conica* in the Czech Republic: ● at least one record in 2000–2023 (1 quadrant), ● pre-2000 records only (21 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

status in the Czech Republic is quite unlikely, based on the general distribution of this species and nature of its occurrences in this country. Therefore, we suggest its reclassification as a casual neophyte.

Silene conica (Fig. 72)

Silene conica is mainly distributed in the European part of the Mediterranean area, extending northwards to the British Isles, the Netherlands, Germany, the Czech Republic, Slovakia and southern Ukraine, with more northern occurrences in Denmark, southern Sweden and Poland being considered as secondary. It also occurs in northernmost Africa. The reports from Anatolia, the Caucasus Mts, northern Iran and central Asia are uncertain due to unresolved taxonomic difficulties. It has been introduced into North America, south-eastern Australia and New Zealand (Meusel et al. 1965, Hultén & Fries 1986, Jalas & Suominen 1986). Of the three subspecies distinguished in Europe, subsp. *conica* is distributed almost throughout the range of the species but is absent from most of south-eastern Europe and Ukraine, subsp. *subconica* occurs in the Italian and Balkan Peninsulas and in Romania and Ukraine, and subsp. *sartorii* is endemic to the central Aegean Islands (Jalas & Suominen 1986, Chater et al. 1993). In the Czech Republic *S. conica* occurred in dry grasslands, sometimes disturbed, along railways and dirt roads, in field margins and rarely in open pine forests, usually on sandy soils. All the plants we have seen from this country correspond to subsp. *conica*. The records are more or less restricted to central and eastern Bohemia, and south-eastern Moravia. Šourková (1990b) considered at least the occurrences in sandy habitats of the Labe river basin and north of the town of Mladá Boleslav in Bohemia and also those near the town of Hodonín in south-eastern Moravia native rather than secondary. However, the earliest records in Bohemia date back only to the 1880s and are associated with the railway, which renders the indigenous status of *S. conica* there rather unlikely. In south-eastern Moravia, this species was first recorded in the mid-1850s on the railway embankment near the town of Bzenec (Sapetza 1856), but Oborny (1885) reported that it had not been re-recorded there since then and considered the occurrence as vanished or even temporary. Currently, *S. conica* is classified as nationally extinct (Grulich 2012), but based on the association of the most records with the railway and other man-made habitats, and also on its rather temporary occurrences, we prefer classifying this species as a casual neophyte. It was apparently introduced accidentally, most likely as a contaminant of various commodities (forage grain and hay) and seed.

Silene cretica (Fig. 73)

Silene cretica is probably native to the eastern Mediterranean area, westwards to the Italian Peninsula and Sicily. It has been introduced with flax into Spain and Portugal, where it is locally naturalized, and into France and the Czech Republic, where it is casual (Šourková 1978, Jalas & Suominen 1986, Chater et al. 1993). In the Czech Republic *S. cretica* was recorded as a weed in flax fields north of the village of Kateřinice in the Hostýnské vrchy Mts in eastern Moravia and near the village of Louka at the foothills of the Bílé Karpaty Mts in south-eastern Moravia. In the former locality it was collected in 1941–1943, in the latter in 1941–1946. It is classified as a casual neophyte (Pyšek et al. 2022).

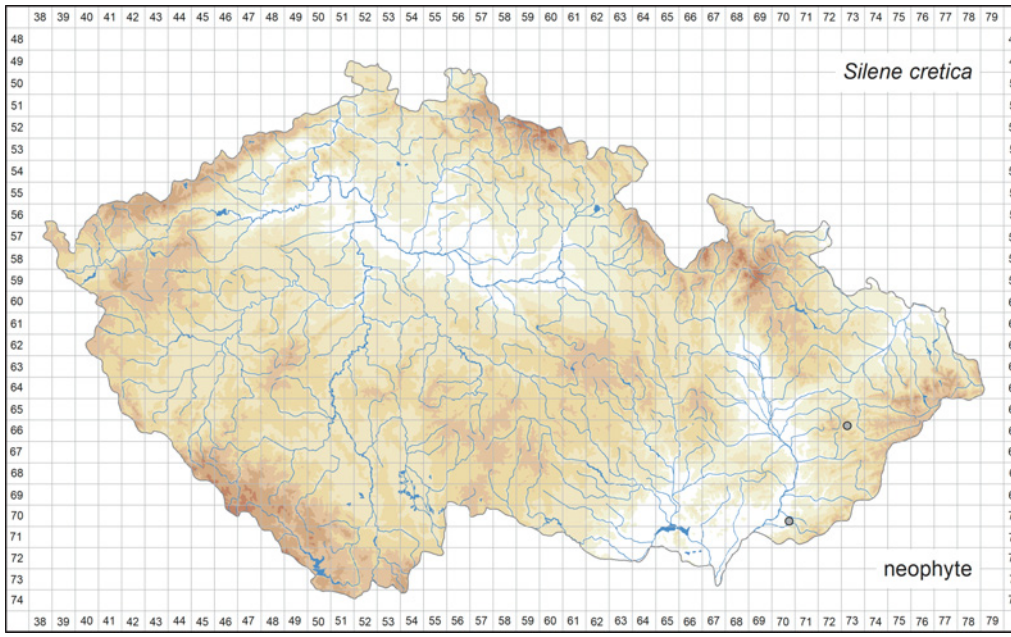

Fig. 73. Distribution of *Silene cretica* in the Czech Republic: ● pre-2000 records only (2 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

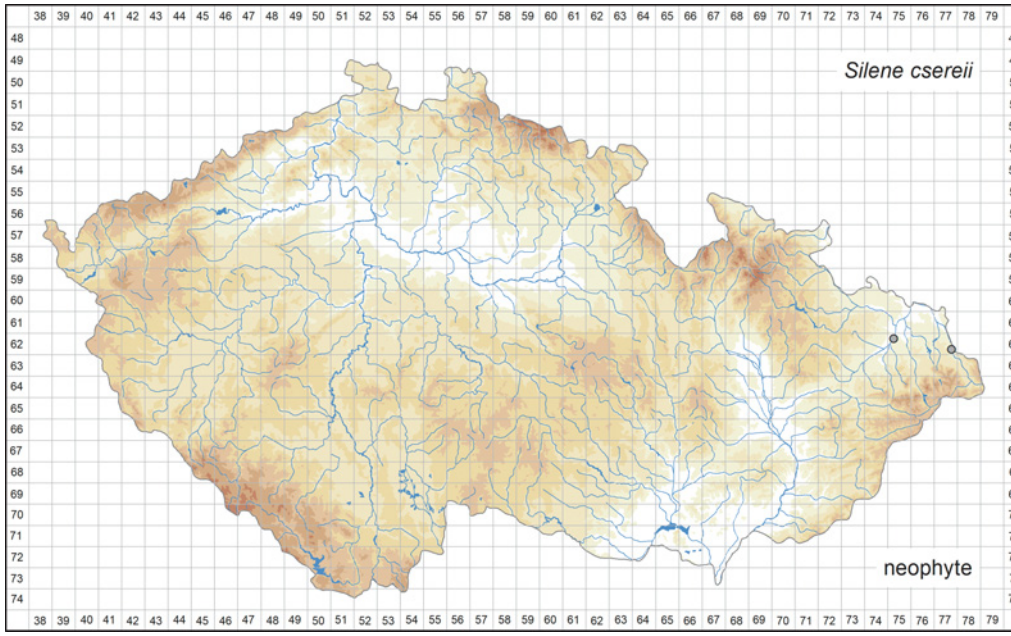

Fig. 74. Distribution of *Silene csereii* in the Czech Republic: ● pre-2000 records only (2 quadrants). Prepared by Jiří Danihelka and Zdeněk Kaplan.

Silene csereii (Fig. 74)

Silene csereii is native to eastern Bulgaria, Romania, southern Ukraine, southern European Russia, the Caucasus Mts and Anatolia. Secondary occurrences have been recorded in several countries including the United Kingdom, the Netherlands, Sweden, Denmark, Germany, Austria, Poland, the USA and Canada (Jalas & Suominen 1986, Mereďa et al. 2012, Wallnöfer et al. 2012, Danihelka & Hlisnikovský 2021a). In its native range *S. csereii* occurs in steppes, openings and margins of forests, sometimes also on roadsides. In the Czech Republic it occurred on iron ore heaps in the Moravian-Silesian industrial region. It was collected in the town of Třinec and probably also in Ostrava's city district of Vítkovice in 1961, and in Ostrava's city district of Polanka nad Odrou in 1964. Its seeds were most likely imported with iron ore from southern Ukraine. *Silene csereii* is classified as a casual neophyte (Pyšek et al. 2022).

Silene dichotoma (Fig. 75)

Silene dichotoma is native to south-western and eastern Europe and south-western Asia. It has been introduced into central Europe and probably from there northwards to southern Sweden and westwards to France; it also has been introduced into North America, southern Australia and New Zealand (Hultén & Fries 1986, Jalas & Suominen 1986, Morton 2005). Sometimes, three subspecies are recognized, of which only subsp. *dichotoma* has been recorded in central Europe (Jalas & Suominen 1986). In the Czech Republic *S. dichotoma* occurs as a weed on arable land and in vineyards, in disturbed and semiruderal dry grasslands, at ruderal places in settlements, in railway stations and along railways, usually on rather dry soils. In Bohemia it was first collected in the village of Poříčí south of the city of České Budějovice in 1841, and in Moravia not until 1877, in Brno's city district of Staré Brno. It was most likely introduced as a contaminant of clover seeds imported from southern Europe. *Silene dichotoma* has become locally naturalized in central Bohemia and southern and south-eastern Moravia at elevations up to 350–400 m, whereas occurrences elsewhere in this country have turned out to be only temporary. This species is classified as a naturalized neophyte (Pyšek et al. 2022).

Silene dioica (Fig. 76)

Silene dioica is a boreal-montane species with an almost continuous distribution in western, central and northern Europe, extending eastwards to Finland, westernmost Russia and the Eastern Carpathians and southwards to the Pyrenees, the Apennines and the Dinarids. It has been introduced into Crimea, the Caucasus Mts, western Siberia, North America and New Zealand (Hultén & Fries 1986, Jalas & Suominen 1986, Morton 2005). In the Czech Republic *S. dioica* grows in subalpine grasslands, mountain meadows, around springs, in tall-forb communities along streams, nitrophilous forb stands around mountain chalets, openings and clearings of mountain beech and spruce forests, and humid scrub, at low elevations in ravines and narrow river valleys, alluvial forests, alder carrs and in various types of riparian vegetation. Soils are usually fresh to moderately humid, rich in humus and nutrients, moderately to slightly acidic. In the Czech Republic *S. dioica* occurs in all mountain ranges along the country's borders, including their foothills, as well as in the eastern part of the Českomoravská vrchovina highlands. At lower elevations, it

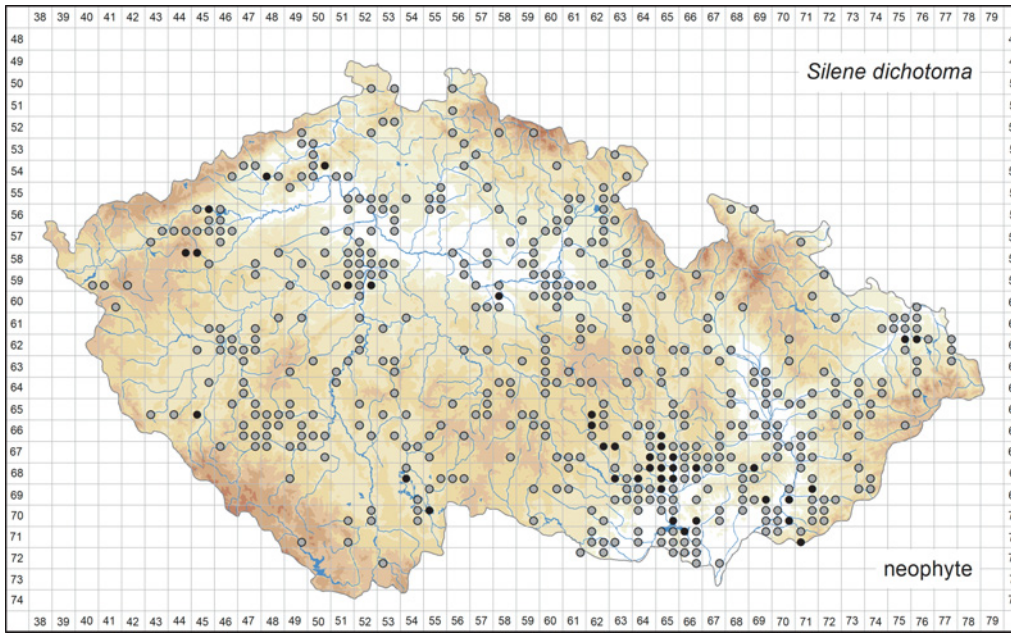

Fig. 75. Distribution of *Silene dichotoma* in the Czech Republic: ● at least one record in 2000–2023 (39 quadrants), ● pre-2000 records only (456 quadrants). Prepared by Jiří Danihelka and Zdeněk Kaplan.

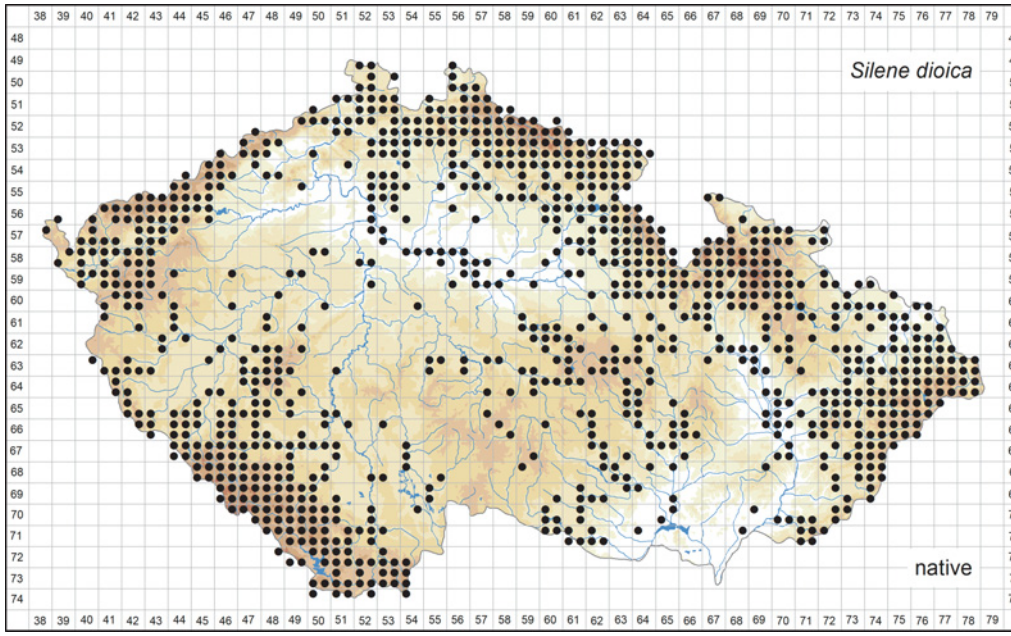

Fig. 76. Distribution of *Silene dioica* in the Czech Republic (999 occupied quadrants). Prepared by Jiří Danihelka and Zdeněk Kaplan.

is found along rather large rivers, e.g. the Labe, Orlice, Morava and Odra, and their tributaries. It reaches its elevational minimum at about 150 m near the village of Hřensko in northern Bohemia and its elevational maximum at the top of Mt Sněžka at 1,602 m.

Silene ×*hampeana* (*S. dioica* × *S. latifolia*) occurs rarely at sites where the parental species co-occur (Šourková 1990c). However, many plants with pinkish corollas represent a variant of *S. latifolia*, not this hybrid, which is particularly difficult to recognize in the herbarium. For this reason, no distribution map of the hybrid is provided here.

Silene gallica (Fig. 77)

Silene gallica is native to western Europe and the Mediterranean area, extending northwards to the British Isles, central France, the southern foothills of the Alps, south-eastern Austria, south-western Hungary and Romania. It has been introduced northwards as far as northern Germany, northern Poland and western Belarus, and outside Europe into all other continents (Jalas & Suominen 1986). In the Czech Republic *S. gallica* grows on arable land, mainly as a weed of flax, cereal and potato fields, less frequently also in ruderal habitats, including railway stations and rubble heaps. Soils are usually sandy, rather poor in nutrients and slightly to moderately acidic. This species once occurred widely in the north-eastern part of the country, including the foothills of the Orlické hory Mts in Bohemia, and the Králický Sněžník Mts, Rychlebské hory Mts, Hrubý Jeseník Mts, Moravskoslezské Beskydy Mts and Bílé Karpaty Mts in Moravia and Silesia, all being areas with rather oceanic climates. The records from other parts of the Czech Republic, many of them from the 19th century, represent temporary occurrences due to introductions (probably with commercial seed). *Silene gallica* has strongly declined after World War II due to the intensification of agriculture. There have been only a dozen records since 2000, most of them from the north-east of this country. This species is classified as a casual archaeophyte (Pyšek et al. 2022) and as critically threatened due to its decline (Grulich 2012).

Silene latifolia subsp. *alba* (Fig. 78)

Silene latifolia includes four subspecies in Europe, of which subsp. *latifolia* is restricted to the Mediterranean area, subsp. *mariziana* is endemic to the western Iberian Peninsula, subsp. *eriocalycina* is endemic to southern Romania, Bulgaria and an adjacent part of Turkey, and only the subsp. *alba* is widespread almost throughout the range of the species (Jalas & Suominen 1986, Chater et al. 1993). It occurs in most of Europe with the exceptions of its northernmost areas and major parts of Ukraine and southern European Russia, as well as in south-western Asia and Siberia. It has been introduced into North America, New Zealand and Tasmania (Hultén & Fries 1986, Jalas & Suominen 1986, Morton 2005). In the Czech Republic *S. latifolia* occurs in ruderal grasslands, along roads and walking paths, as a weed in field margins, on fallows, waste land and rubble heaps. The soils are dry to moderately humid, moderately acidic to basic, usually rich in nutrients. *Silene latifolia* is widespread and common from the lowlands up to the middle elevations, becoming progressively rare towards high elevations, where its occurrences are usually secondary and temporary. While the gaps in the lowlands may be due to under-recording, those at middle and high elevations represent mostly true absences. This species is classified as a naturalized archaeophyte (Pyšek et al. 2022).

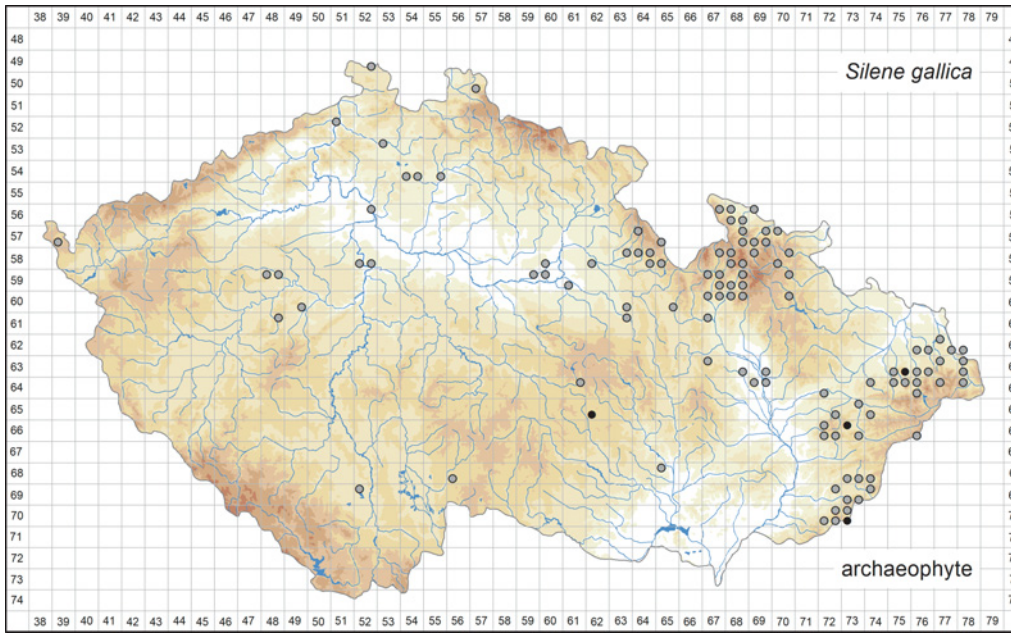

Fig. 77. Distribution of *Silene gallica* in the Czech Republic: ● at least one record in 2000–2023 (4 quadrants), ◍ pre-2000 records only (108 quadrants). Prepared by Jiří Danihelka and Zdeněk Kaplan.

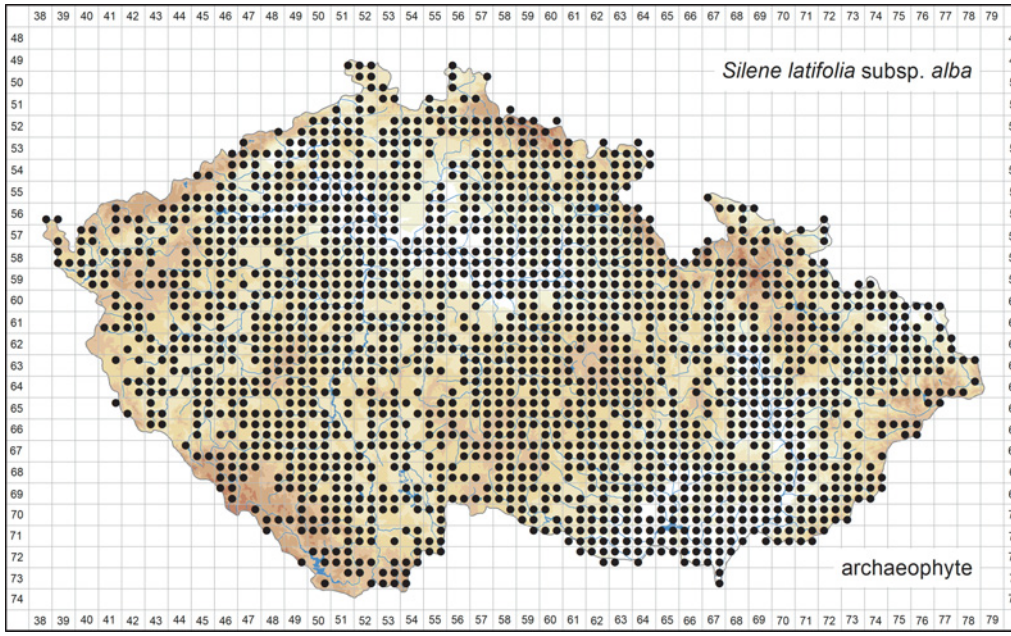

Fig. 78. Distribution of *Silene latifolia* subsp. *alba* in the Czech Republic (1879 occupied quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

Silene nemoralis (Fig. 79)

Silene nemoralis is native to the mountains of southern and southern-central Europe, including the Pyrenees, Alps, Apennines, Dinarids and Carpathians, and extends northwards to Bohemia, where it reaches its northern limit of native distribution. The occurrences in Germany are secondary (Jalas & Suominen 1986). In the Czech Republic *S. nemoralis* grows on grassy slopes, along scrub and forest margins and in forest openings as well as in various types of semiruderal and ruderal grasslands, most frequently on railway embankments and along roads. The soils are dry to moderately humid, slightly acidic to basic, often rich in calcium but rather poor in nutrients. In Bohemia *S. nemoralis* occurs in the České středohoří Mts and Český kras karst area; these occurrences are traditionally considered native (Šourková 1990c). All other records in the Czech Republic, scattered mainly over the northern part of Bohemia and central and southern Moravia, refer to introduced plants. Whereas some of these occurrences were only temporary, at some sites *S. nemoralis* managed to establish and occurred there for decades. Its seeds were accidentally introduced probably with hay, particularly via railway. The assumed occurrence on Štramberk hill in north-eastern Moravia, considered native by Šourková (1990c) is not documented by a herbarium specimen, and we consider this record erroneous. *Silene nemoralis* is classified as endangered due its rarity and decline (Grulich 2012). Due to numerous misidentifications of *S. nutans* as *S. nemoralis*, only a few records not supported by herbarium specimens were accepted.

Silene noctiflora (Fig. 80)

Silene noctiflora is most frequent in central Europe, extending westwards to the British Isles, northwards to Sweden and Finland, eastwards with scattered occurrences to European Russia and southwards to Italy and the Balkan Peninsula. In Asia it is found in Anatolia, the Caucasus Mts, Iran, central Asia and south-western Siberia. It has been introduced into North America and New Zealand (Hultén & Fries 1986, Jalas & Suominen 1986, Morton 2005). In the Czech Republic *S. noctiflora* is most often found as a weed on arable land, less frequently at railways stations, on soil heaps, edges of dirt roads, in yards of sugar factories and in vineyards. It prefers neutral to basic, loamy to clayey nutrient-rich soils well supplied with calcium, developed on loess, marl or limestone. It is most frequent in the lowlands and adjacent warm hilly landscapes, in Bohemia mainly in the Ohře and Labe river basins, around Prague and in eastern Bohemia, as well as in southern and central Moravia and the Odra river basin in north-eastern Moravia. An isolated area of distribution is in the calcareous landscape in south-western Bohemia. Elsewhere at middle elevations it is scattered to rare. It does not extend to mountains. *Silene noctiflora* is classified as a naturalized archaeophyte (Pyšek et al. 2022) and as of lower risk – near threatened (Grulich 2012).

Silene nutans (Fig. 81)

Silene nutans is distributed mainly in the temperate zone of Eurasia, extending from England, France and Portugal in the west to Lake Baikal in the east. In Europe it reaches Scotland and central Sweden in the north; it is restricted to mountains in the Mediterranean area (Meusel et al. 1965, Hultén & Fries 1986, Jalas & Suominen 1986). In the Czech

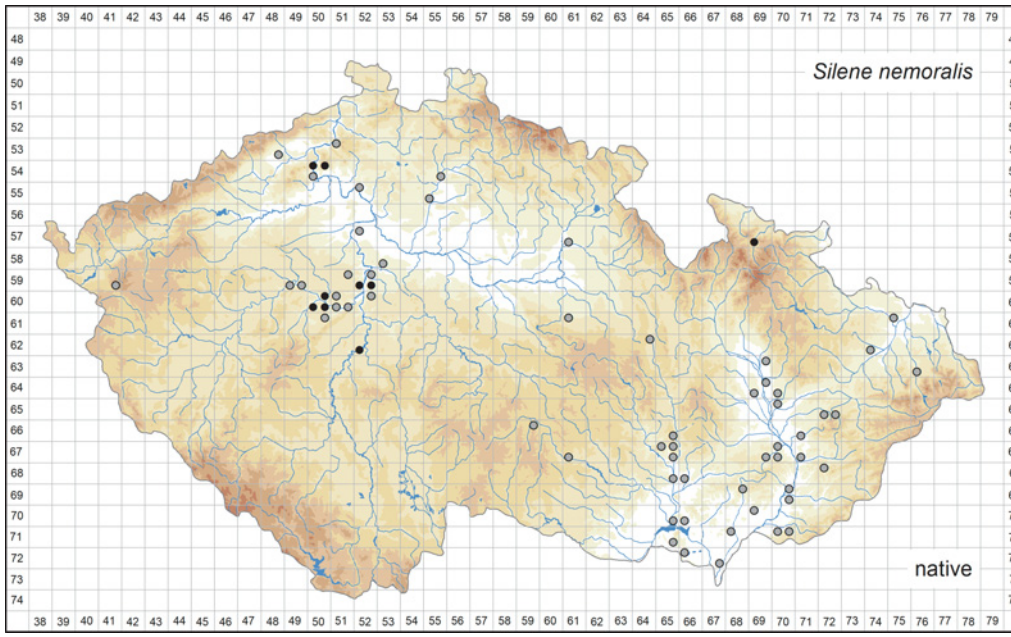

Fig. 79. Distribution of *Silene nemoralis* in the Czech Republic: ● at least one record in 2000–2023 (9 quadrants), ◍ pre-2000 records only (57 quadrants). Prepared by Jiří Danihelka and Zdeněk Kaplan.

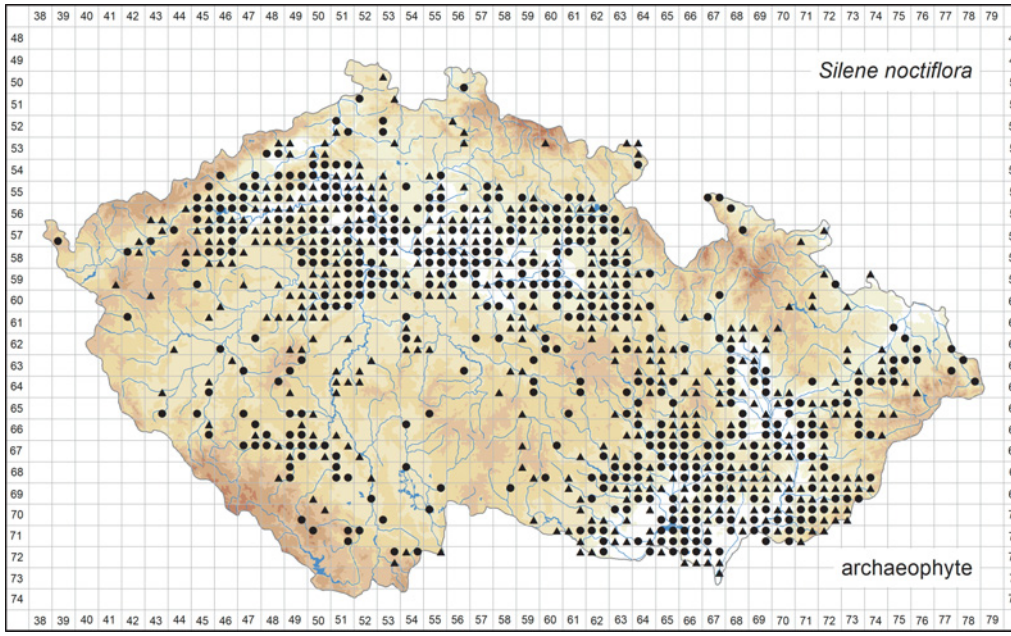

Fig. 80. Distribution of *Silene noctiflora* in the Czech Republic: ● occurrence documented by herbarium specimens (454 quadrants), ▲ occurrence based on other records (429 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

Republic only the typical subspecies is found; subsp. *dubia* is endemic to the Carpathians in Poland, Slovakia, Ukraine and Romania (Mereďa et al. 2012). *Silene nutans* grows mainly in open deciduous forests and along their margins, in scrub, fringe communities and in some types of dry grasslands. Soils are rather dry to fresh, moderately acidic to slightly basic, poor to moderately rich in nutrients. *Silene nutans* is widespread and locally common in the Czech Republic, occurring almost continuously from the lowlands up to the middle elevations, i.e. 800–900 m. In the lowlands it is absent from deforested areas with prevailing arable land, probably due to the lack of suitable habitats, and from areas with acidic soils very poor in nutrients, such as the highest parts of the Česko-moravská vrchovina highlands. *Silene nutans* reaches its elevational maximum near the town of Boží Dar in the Krušné hory Mts at about 1,100 m. The records from elevations of 1,300–1,400 m in the Krkonoše Mts refer to introduced plants.

Silene otites (Fig. 82)

Silene otites is a member of a taxonomically complex group. The entire group, now classified as subsect. *Otites*, includes 13–17 species distributed in the temperate zone of Eurasia from eastern England, France and Spain in the west to Lake Baikal in the east; the highest diversity is in Ukraine and the southern part of European Russia (Meusel et al. 1965, Hultén & Fries 1986, Jalas & Suominen 1986, Wrigley 1986, Šourková 1994, Mereďa et al. 2012). *Silene otites* s. str. occurs mainly in western and central Europe north of the Alps, with its eastern distribution limit in the Baltic countries, the Western Carpathians and Balkan Peninsula (Jalas & Suominen 1986, Wrigley 1986, Mereďa et al. 2012). In the Czech Republic only subsp. *otites* is currently recognized (Danihelka 2019). Another infraspecific taxon, subsp. *hungarica*, previously reported also from the Czech Republic under the name *S. pseudotites* (Šourková 1990c), is distributed in easternmost Austria, southern Slovakia, Hungary and westernmost Ukraine (Jalas & Suominen 1986, Wrigley 1986, Mereďa et al. 2012). In the Czech Republic *S. otites* grows on and around rock outcrops, in dry grasslands on sand or loess, sometimes also in open-canopy pine forests. The soils are usually permeable, dry, slightly acidic to basic and poor in nutrients. *Silene otites* occurs in the lowlands and hilly landscapes of north-western, central and eastern Bohemia and central, southern and south-western Moravia. A few records from other parts of the country refer to secondary occurrences. While most of the species' records are from elevations below 450 m, it reaches its elevational maximum of about 550 m on Lovoš hill and Úhošť hill in north-western Bohemia and on Děvín hill in the Pavlov hills in southern Moravia. *Silene otites* is classified as vulnerable (Grulich 2012), which is justified due to its local decline.

Silene pendula (Fig. 83)

Silene pendula is native to Italy. It is reported as introduced or escaped from cultivation from many European countries between Spain in the west, central Scandinavia in the north and the European part of Russia in the east, and it has also been introduced into south-western Asia, China, Japan, northern and southern Africa, Australia, New Zealand and North America (Jalas & Suominen 1986, Mereďa et al. 2012, Tashev et al. 2022). In the Czech Republic *S. pendula* is rather seldom grown as an ornamental plant in gardens and rarely escapes. The escaped plants were found around gardens, on soil heaps, garden

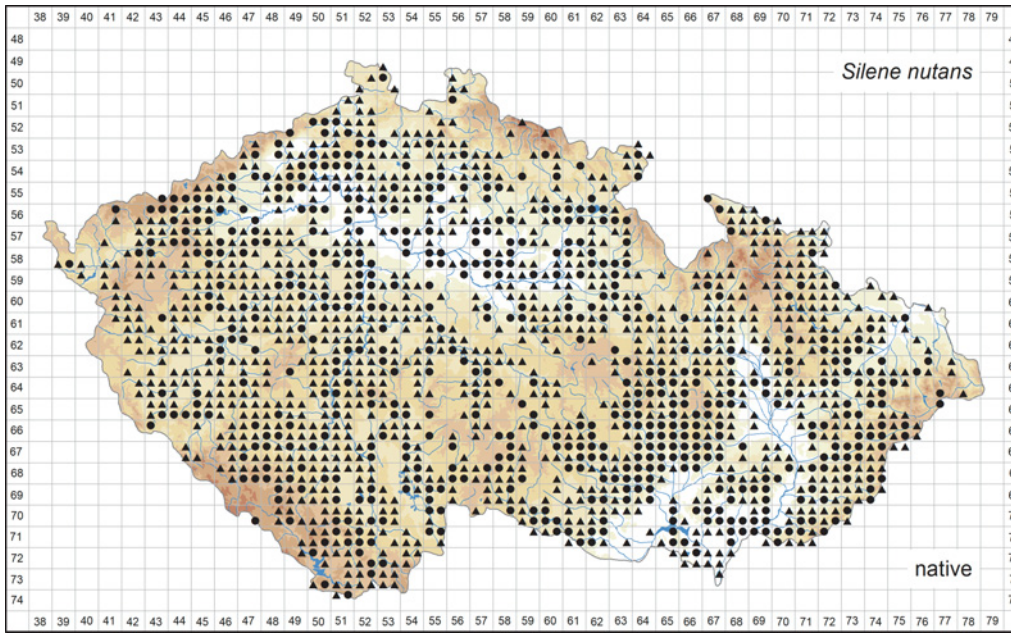

Fig. 81. Distribution of *Silene nutans* in the Czech Republic: ● occurrence documented by herbarium specimens (559 quadrants), ▲ occurrence based on other records (1025 quadrants). Prepared by Jiří Danihelka and Zdeněk Kaplan.

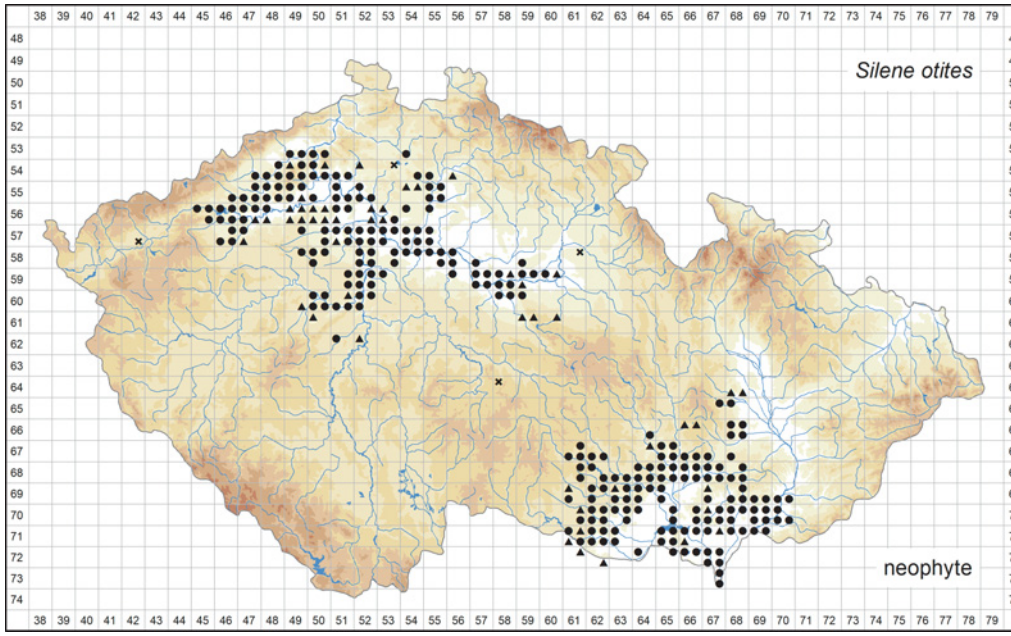

Fig. 82. Distribution of *Silene otites* in the Czech Republic: ● native, occurrence documented by herbarium specimens (250 quadrants), ▲ native, occurrence based on other records (50 quadrants), × alien only (4 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

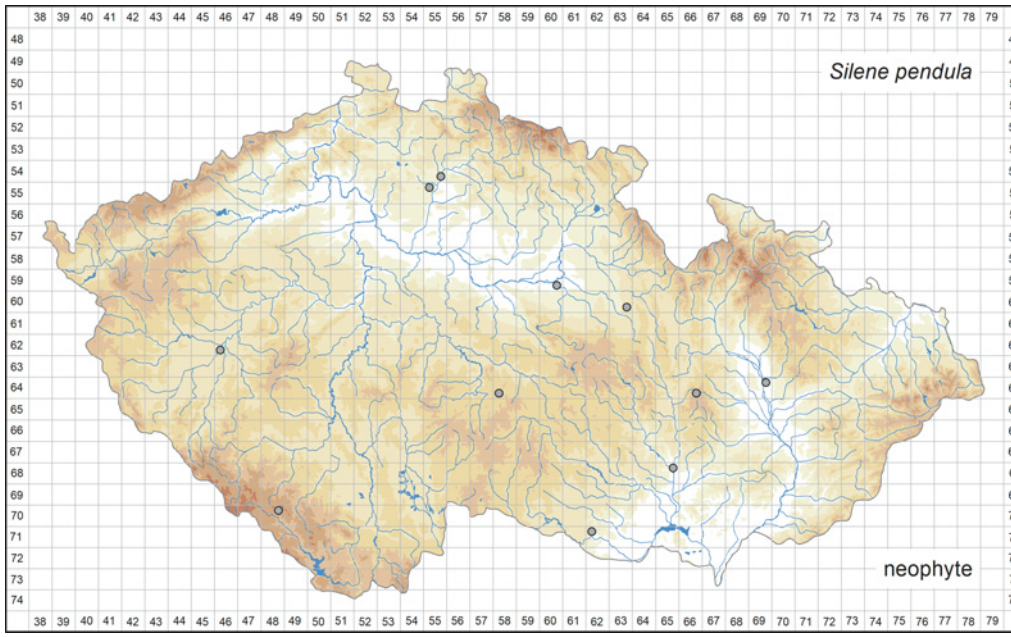

Fig. 83. Distribution of *Silene pendula* in the Czech Republic: ● pre-2000 records only (11 quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

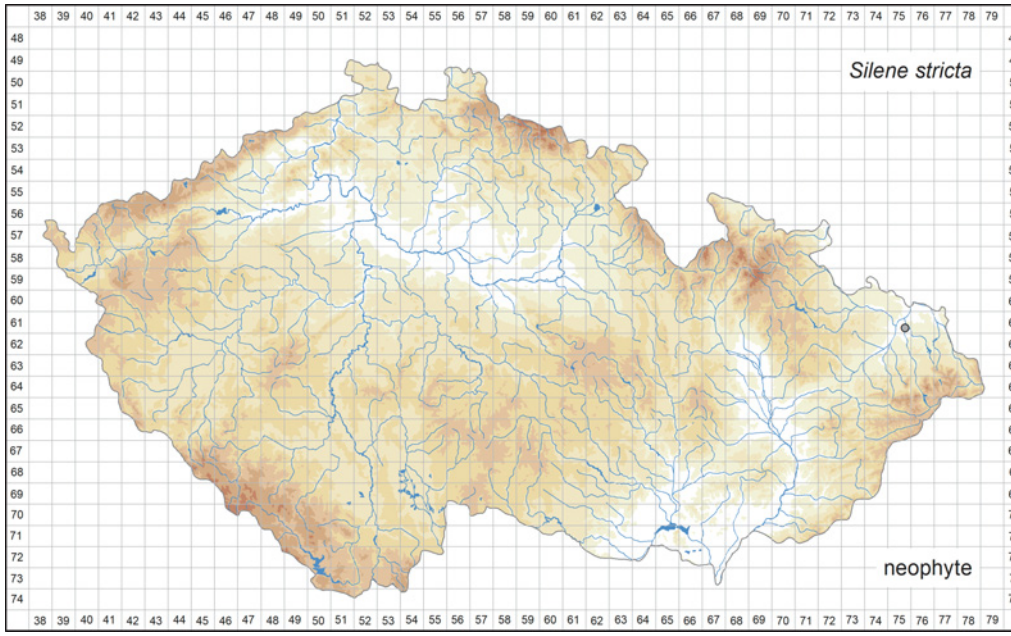

Fig. 84. Distribution of *Silene stricta* in the Czech Republic: ● pre-2000 records only (1 quadrant). Prepared by Jiří Danihelka and Zdeněk Kaplan.

waste, at a railway station and in flower beds in public spaces and private gardens at places where they were not sown. The earliest escape is from 1896, when *S. pendula* was found at the village of Josefův Důl near the town of Mladá Boleslav in north-central Bohemia. The distribution map is based on herbarium records and includes only unambiguous occurrences outside intentional cultivation. The species is classified as a casual neophyte (Pyšek et al. 2022).

Silene stricta (Fig. 84)

Silene stricta is native to the southern part of the Iberian Peninsula, Morocco and Algeria (Jalas & Suominen 1986, Talavera 1990). Secondary occurrences have been recorded in the United Kingdom, Belgium, the Netherlands, Germany, Norway and Sweden (reviewed by Danihelka & Hlisnikovský 2021b). In its primary range it occurs mainly as a weed of arable fields, usually on heavy soil. In the Czech Republic *S. stricta* was collected on iron ore in an ore yard in Ostrava's city district of Vítkovice in 1960 but identified only recently. It is considered a casual neophyte (Pyšek et al. 2022).

Silene viridiflora (Fig. 85)

Silene viridiflora is native to the Mediterranean area from north-eastern Spain in the west to Crimea and Turkey in the east, extending northwards to Slovakia, which represents the northern limit of its distribution. It also occurs in the Caucasus Mts and central Asia. It is occasionally cultivated and escapes, e.g. in France, Denmark and the Czech Republic (Jalas & Suominen 1986, Mereďa et al. 2012). In its native range *S. viridiflora* grows in open deciduous forests and scrub. In the Czech Republic it was found on a steep slope in an open oak forest next to Brno's city district of Nový Lískovec in southern Moravia (Smejkal 1973). Its occurrence at the site is documented by herbarium specimens collected in 1971–1980. At the time of its discovery, the population consisted of 20–25 vigorous flowering plants. Based on the geographic location, habitat and occurrence of some other exotic species (*Salvia verbenaca* and *Scrophularia vernalis*) and *Chaerophyllum aureum* nearby, *S. viridiflora* may have been intentionally introduced to this site. Along with *S. viridiflora*, its hybrid with *S. nutans* (*S.* ×*grecescui*) was recorded at the site (Smejkal 1973). *Silene viridiflora* is classified as a casual neophyte (Pyšek et al. 2022).

Silene viscosa (Fig. 86)

Silene viscosa has a highly disjunct European range. It occurs along the coast of the Baltic Sea in Denmark, south-eastern Sweden and southern Finland, with other rather large patches in the Pannonian Basin, in southern Ukraine and in the southern part of European Russia. Isolated occurrences are mainly in Bohemia, the Baltic countries and Romania. It is also found in Turkey, the Caucasus Mts, Syria, northern Iran, central Asia, south-western Siberia and westernmost Mongolia (Hultén & Fries 1986, Jalas & Suominen 1986, Yildiz & Çirpici 2013). In the Czech Republic *S. viscosa* grows in dry grasslands, usually on sand, less frequently also on loess, additionally on road verges and along railways. The soils are usually permeable, moderately to slightly acidic, poor or moderately rich in nutrients. In this country *S. viscosa* occurs only in its warmest and driest parts. In Bohemia it is rare and restricted to the warm, dry areas in its north-western and north-central

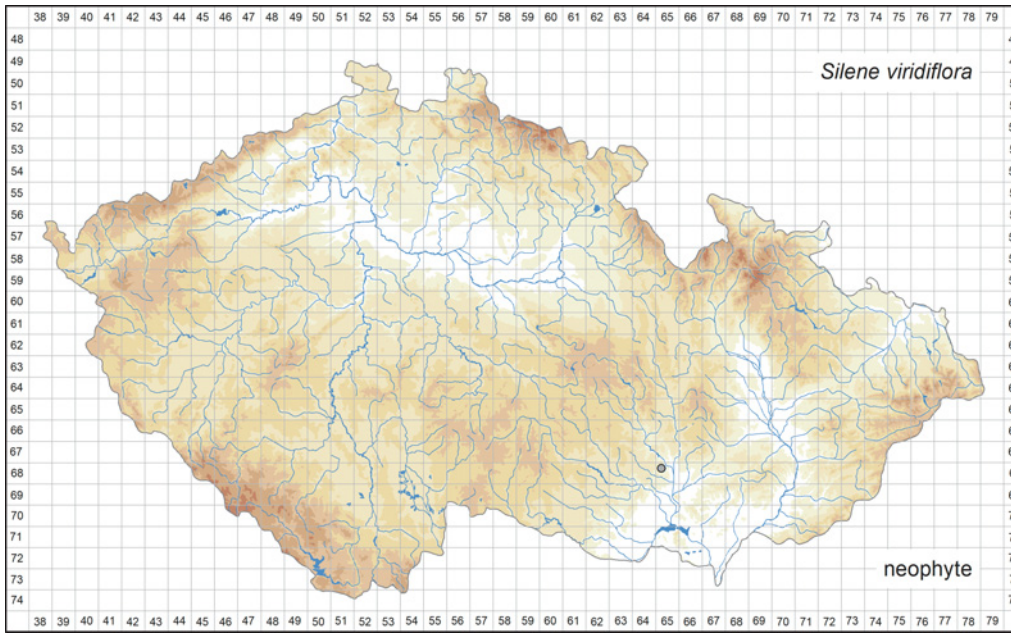

Fig. 85. Distribution of *Silene viridiflora* in the Czech Republic: ● pre-2000 records only (1 quadrant). Prepared by Jiří Danihelka and Zdeněk Kaplan.

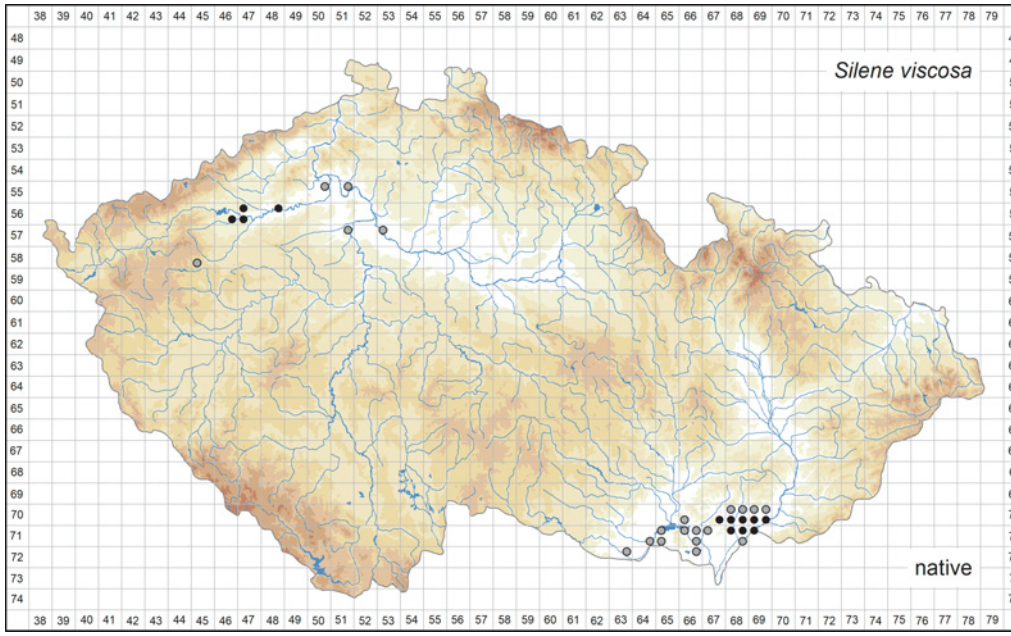

Fig. 86. Distribution of *Silene viscosa* in the Czech Republic: ● at least one record in 2000–2023 (12 quadrants), ● pre-2000 records only (20 quadrants). Prepared by Jiří Danihelka and Zdeněk Kaplan.

parts. In Moravia the populations are confined to a small area between the towns of Znojmo in the west and Hodonín in the east. However, recent records exist only from the eastern half of this area between the towns of Čejč, Bzenec and Hodonín. A large population of this species still exists in sandy grasslands along the railway between the towns of Rohatec and Moravský Písek. The main causes of the species' decline are most likely the abandonment of pastures followed by succession, afforestation and general eutrophication of the landscape. Because of numerous erroneous records in electronic databases probably caused by confusion of the similar names *Steris viscaria* and *Silene viscosa* and misapplications of the name *S. viscosa* to the glandular *S. nutans*, the distribution map is based mainly on studied herbarium specimens. *Silene viscosa* is classified as critically threatened due to its rapid decline (Grulich 2012).

Silene vulgaris (Figs 87–88)

Silene vulgaris is a highly variable species distributed across Europe, extending through southern Siberia eastwards as far as the Russian Far East, and southwards to south-western Asia and the Himalaya Mts. It also occurs in northern Africa. It has been introduced into North and South America, southern Australia and New Zealand (Hultén & Fries 1986, Morton 2005). Up to about 10 subspecies are recognized in Europe (Jalas & Suominen 1986, Chater et al. 1993), of which two are distinguished in the Czech Republic (Danihelka 2019): subsp. *vulgaris*, which is widespread within the range of the species, and subsp. *antelopum*, which is restricted to the Czech Republic, Slovakia, eastern Austria, Hungary and the north-western part of the Balkan Peninsula (Šourková 1990a, Mereďa et al. 2012).

In the Czech Republic *S. vulgaris* subsp. *vulgaris* grows in a wide range of habitats, both natural, such as rock outcrops, rocky slopes, screes, open-canopy pine forests, and dry and subalpine grasslands, as well as man-made ones, including road verges, railway stations and embankments, soil and spoil heaps, pastures, mountain meadows, abandoned stone quarries, forest clearings, waste places and other ruderal and semiruderal sites. It is found mostly on shallow, gravely or stony soils over siliceous, limestone, basalt or serpentine rocks. This subspecies is widespread throughout this country from the lowlands to the high mountains (Fig. 88). Gaps on the map are frequent, but some of them are most likely due to a lack of records rather than true absences.

In contrast, *S. vulgaris* subsp. *antelopum* is restricted both in distribution and in habitats occupied. It grows in open-canopy thermophilous oak and oak-hornbeam forests and their fringes, scrub, and on rocky and scree slopes. The soils are shallow to rather deep, stony, slightly acidic to slightly basic. It occurs at low and middle elevations, mainly in areas with rugged relief, often on hills and in river valleys. Most of the sites are in southern Moravia northwards to the Drahanská vrchovina highlands. Elsewhere in Moravia it is rare. Its occurrence in Bohemia is documented by herbarium specimens from a dozen sites in its northern part and in the middle Vltava valley south of Prague (Fig. 87). This subspecies may be slightly more frequent than indicated in the map because only records supported by herbarium specimens were included in the map and this taxon is likely under-recorded. For this reason it is also classified as of lower risk – data deficient (Grulich 2012).

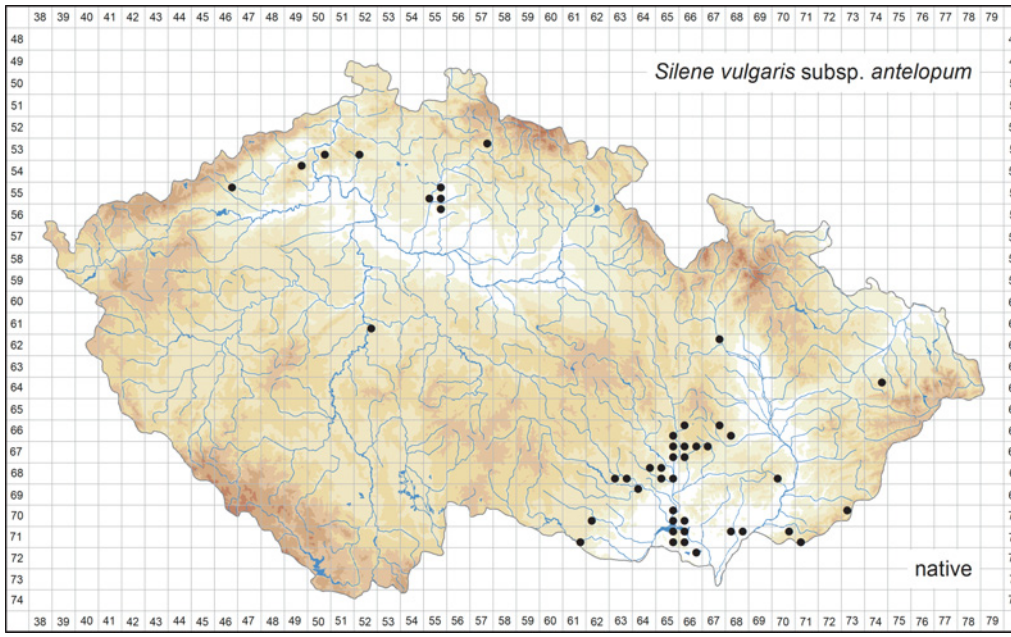

Fig. 87. Distribution of *Silene vulgaris* subsp. *antelopum* in the Czech Republic (45 occupied quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

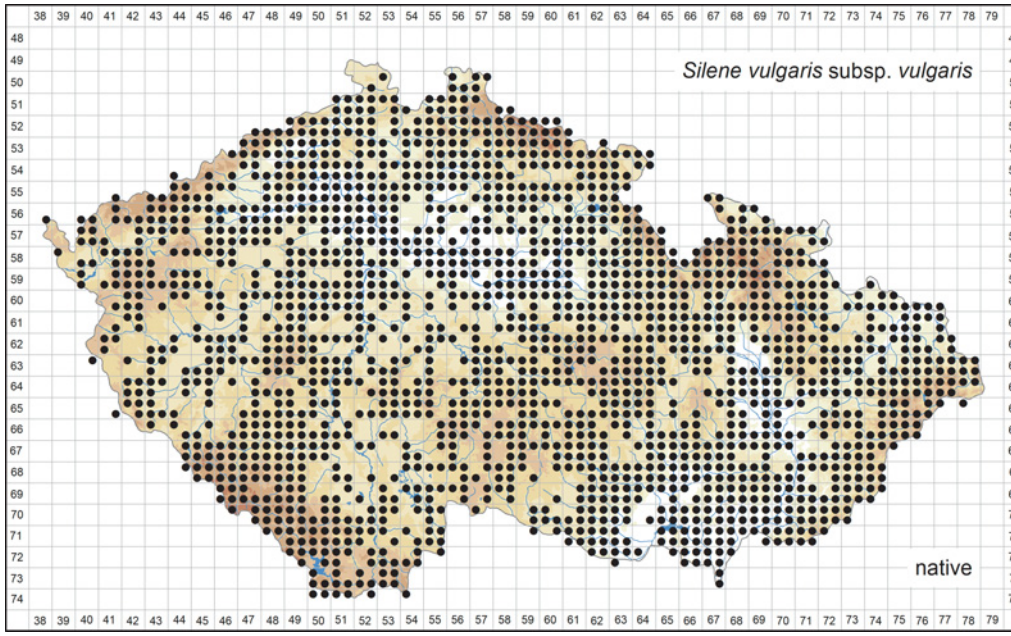

Fig. 88. Distribution of *Silene vulgaris* subsp. *vulgaris* in the Czech Republic (1819 occupied quadrants). Prepared by Zdeněk Kaplan and Jiří Danihelka.

Supplementary materials

Data S1–S88. Records used for producing maps.

Supplementary materials are available at www.preslia.cz

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Rozšíření cévnatých rostlin v České republice. Část 13

Třináctá část ze série prací o rozšíření cévnatých rostlin v České republice obsahuje síťové mapy a komentáře k 88 taxonům rodů *Alcea*, *Ambrosia*, *Anacamptis*, *Anchusa*, *Anoda*, *Atocion*, *Ballota*, *Bothriochloa*, *Bunias*, *Conium*, *Epipogium*, *Kickxia*, *Kitaibela*, *Lavatera*, *Lawrencia*, *Limodorum*, *Listera*, *Malope*, *Malva*, *Neotinea*, *Nonea*, *Nuphar*, *Nymphaea*, *Peucedanum*, *Phlomis*, *Selinum*, *Sida*, *Silaum* a *Silene*. Základem jsou údaje získané excerpcí herbářů a literatury, terénní zápisy a databázové údaje, které prověřili taxonomičtí experti. Zvláštní pozornost při výběru druhů byla věnována rodům se vzácnými a mizejícími druhy. 34 mapovaných druhů je s různou mírou ohrožení zařazeno do červeného seznamu. Kriticky ohrožené rostliny, které se obvykle vyznačují výrazným ústupem a většinou početně slabými populacemi, byly nejvíce zastoupeny mezi orchidejemi a vodními rostlinami. Dva původní druhy, *Anacamptis coriophora* a *Peucedanum arenarium*, dnes patří mezi druhy vyhynulé, ačkoliv u prvního z nich byly nedávno zaznamenány výsadby rostlin neznámého původu do přírody. Naopak nové přírůstky se v poslední době objevily mezi nepůvodními druhy. Zatímco *Kitaibela vitifolia* a *Lavatera punctata* byly nedávno nalezeny v přírodě, *Silene csereii* a *S. stricta* byly rozpoznány během expertní revize starších herbářových sběrů. Na základě analýzy rozšíření a okolností prvonálezů a dlouhodobé dynamiky populací navrhujeme přeřazení silenek *Silene bupleuroides* a *S. conica* z původních druhů mezi neofyty. Celkem je v příspěvku zhodnoceno rozšíření 47 archeofytů a neofytů. Dva nepůvodní druhy, *Ambrosia artemisiifolia* a *Bunias orientalis*, se u nás staly invazními v uplynulých desetiletích a dnes jsou široce rozšířeny především v teplejších územích celého státu. Celkový obraz rozšíření zpracovávaných taxonů v České republice poskytují mapy; konkrétní floristické údaje, které zachycují frekvenci výskytu v různých oblastech a v různých obdobích, případně dokumentují ústup, nebo naopak šíření některých druhů, jsou uloženy v databázi Pladias a dostupné v přílohách tohoto článku. Každou mapu doprovází komentář, který obsahuje nástin celkového areálu, výčet nejčastějších stanovišť a stručnou charakteristiku rozšíření v České republice, případně i doplňující informace k taxonomii, biologii, změnám v rozšíření a míře ohrožení.

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