

Distributions of vascular plants in the Czech Republic. Part 7

Rozšíření cévnatých rostlin v České republice. Část 7

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The seventh part of the series on the distributions of vascular plants in the Czech Republic includes grid maps of 104 taxa in the genera *Anthriscus*, *Callitriche*, *Cochlearia*, *Dittrichia*, *Egeria*, *Elodea*, *Elymus*, *Epilobium*, *Gentianella*, *Gnaphalium*, *Gymnocarpium*, *Hordeum*, *Hydrocharis*, *Limonium*, *Najas*, *Phleum*, *Phragmites*, *Polypodium*, *Pseudognaphalium*, *Rubus*, *Sedum*, *Senecio*, *Setaria*, *Stratiotes*, *Trichomanes* and *Woodsia*. These maps were produced by taxonomic experts based on examined herbarium specimens, literature and field records. Many of the studied native species are on the national Red List. The genus most affected by decline in abundance is *Gentianella*, which includes six taxa extirpated from this country and six taxa critically threatened. Another group with a high proportion of endangered species comprises aquatic and wetland plants, which are represented by *Callitriche hermaphrodita*, *Hydrocharis morsus-ranae*, *Najas minor*, *Pseudognaphalium luteoalbum* and *Stratiotes aloides*. Other ecologically specialized groups include mainly montane wetland plants (*Epilobium anagallidifolium*, *E. nutans* and *Rubus chamaemorus*) and plants of rocky habitats (*Polypodium interjectum*, *Trichomanes speciosum* and *Woodsia ilvensis*). The previously rare *Woodsia alpina* has been extirpated from this country. Alien species mapped in this paper include both archaeophytes and neophytes, mainly from the genera *Anthriscus*, *Cochlearia*, *Elodea*, *Epilobium*, *Hordeum* and *Phleum*. *Cochlearia danica*, *Dittrichia graveolens* and *Limonium gmelinii* have recently colonized habitats along the roads treated by de-icing salt. *Senecio inaequidens* has also spread mainly along motorways. *Epilobium adenocaulon* is another successful neophyte; it is now widespread

throughout this country and the most successful hybrid parent within the genus. Neophyte aquatics are represented by *Egeria densa*, *Elodea canadensis* and *E. nuttallii*. 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 electronic appendices. The maps are accompanied by comments that include additional information on the distribution, habitats, taxonomy and biology of the taxa.

Key words: alien species, central Europe, chorology, Czech Republic, distribution atlas, distribution patterns, endangered species, endemic, flora, grid maps, herbaria, phytogeography, plant record, vascular plants

Introduction

The mapping of the distributions of plants in the Czech Republic was initiated within the PLADIAS project (www.pladias.org) five years ago. Since then, a new central Pladias database has been established and a web-based mapping interface developed. Based on critically evaluated and sorted records stored in the database, the team of taxonomic experts has produced grid-based distribution maps of 570 vascular plants, which have been published in six papers (Kaplan et al. 2015, 2016a, b, 2017a, b, 2018).

From March to August 2018 the Pladias database increased by about 51,000 new records. Of these, nearly 25,000 resulted from the critical examination of herbarium specimens by taxonomic experts. Maps for a further 104 taxa were finished by the beginning of August 2018 and are included in this paper.

Increasing human impact on the environment is the main source of changes in the flora. Many of the native species are threatened or even on the verge of extirpation (Grulich 2012), while new alien species are being introduced (Pyšek et al. 2012). The Pladias database and the maps resulting from taxonomic revisions reflect these changes. The genus discussed in this paper that is most affected by decline in abundance is *Gentianella*. Among the twelve taxa recorded in the Czech Republic, six have been extirpated and six are critically threatened. Another group with a high proportion of endangered species comprises aquatic and wetland plants. A serious decline is documented here for *Pseudognaphalium luteoalbum*, a century ago a rather widespread species, and *Callitriche hermaphroditica*, *Najas minor* and *Stratiotes aloides* are also rare and critically threatened. Some of the montane wetland species, such as *Epilobium anagallidifolium*, *E. nutans* and *Rubus chamaemorus*, and specialists of rocky habitats, such as *Polypodium interjectum*, *Trichomanes speciosum* and *Woodsia ilvensis*, are classified as endangered. The previously rare *Woodsia alpina* has been extirpated from this country.

In contrast, the Czech flora is being enriched by introduced plants. The genera with two or more aliens dealt with in this paper are *Anthriscus*, *Cochlearia*, *Elodea*, *Epilobium*, *Hordeum* and *Phleum*. These include naturalized archaeophytes (e.g. *Anthriscus cerefolium* var. *trichocarpus*, *Hordeum murinum* subsp. *murinum*, *Setaria pumila* and *S. verticillata*), casual archaeophytes (e.g. *Anthriscus caucalis*, *A. cerefolium* var. *cerefolium* and *Setaria italica*), naturalized neophytes (e.g. *Hordeum jubatum*, *Sedum hispanicum* and *Setaria faberi*) and casual neophytes (e.g. *Epilobium brachycarpum*, *E. komarovianum*, *Hordeum brevisubulatum*, *H. secalinum*, *Phleum paniculatum* and *Ph. subulatum*). Three species have been introduced only recently and colonized habitats affected by de-icing salt along roads: while *Cochlearia danica* and *Dittrichia graveolens*

have already spread to many sites, *Limonium gmelinii* has been recorded at only four sites to date. Another neophyte, *Senecio inaequidens*, has also spread mainly along motorways. *Epilobium adenocaulon* is another successful neophyte; it is now widespread throughout this country and has become the most frequent hybrid parent within the genus. Neophytes are also represented among aquatics: the casual *Egeria densa* and naturalized *Elodea canadensis* and *E. nuttallii*.

In addition to the flora of the Czech Republic changing, our knowledge of it has increased. Genera that have undergone recent taxonomic revisions include *Callitriche* (Prančl 2012, 2013, Prančl et al. 2014) and *Rubus* (e.g. Krahulcová et al. 2013, Velebil et al. 2016, Király et al. 2017). Maps resulting from these revisions are also included in this paper. The distribution of the species-rich genus *Epilobium*, whose records are often erroneous due to frequent misidentifications, was mapped based mainly on examined herbarium specimens directly for the purpose of this paper; the number of examined specimens amounts to about 18,000.

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 Danihelka et al. (2012), with differences indicated where necessary. For taxa not included in that checklist, 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, KHMS, KM, LIM, LIT, MJ, MMI, MP, MZ, NJM, OH, OL, OLM, OMJ, OMP, OP, OSM, OVMB, PL, PR, PRA, PRC, ROZ, SOB, SOKO, SUM, VM, VYM, W, WA, WU and ZMT (acronyms follow Thiers 2018), were consulted as the main sources of taxonomically examined records. Most records for maps of common and easy-to-identify taxa came from the recently developed Pladias database (hosted at the Institute of Botany, Průhonice), which has integrated all the available records on the distribution of vascular plants in the Czech Republic. Among the most important incorporated databases are: the Database of the Distribution of Vascular Plants in the Czech Republic (FLDOK), the Czech National Phytosociological Database (CNPD), plant records from the Floristic Summer Schools and other activities of the Czech Botanical Society, the Species Occurrence Database of the Nature Conservation Agency of the Czech Republic (NDOP), the Database of Forest Typology of the Forest Management

Institute of the Czech Republic (DLT) and the Floristic Database of the South Bohemian Branch of the Czech Botanical Society (JCP CBS). Unpublished field records previously entered into the Pladias database by the maps' authors or regional contributors were also considered.

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 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 2551 quadrants, of which 2181 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 Electronic Appendices 1–104. 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: (1) recent versus old records; (2) native occurrences versus introductions; and (3) 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. To save space, rare taxa of the genera *Cochlearia*, *Epilobium*, *Hordeum* and *Phleum* with distinct distributions are shown in maps in groups of two, with symbols and annotations of individual taxa on the maps distinguished using different colours. 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 total 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

Anthriscus caucalis (Fig. 1)

Anthriscus caucalis is a winter annual species, which occurs in Europe and adjacent parts of northern Africa, the Caucasus Mts and the Middle East (Meusel et al. 1978, Hultén & Fries 1986, Hand 2011). It has been introduced into North America, Chile, Argentina, India and New Zealand (Castro et al. 2010, Tekin & Civelek 2017). In the Czech Republic *A. caucalis* grows in ruderal habitats on sandy and other permeable soils that are rich in nutrients, mostly in slightly shaded disturbed places with sparse vegetation such as the edges of shrub communities, mesic *Robinia pseudoacacia* woodlands, windbreaks and hedges. It also occurs in dry ditches and roadcuts, vineyards and waste places. This species can also grow as a weed on the edges of arable fields. It is found in the warmest areas in Bohemia, mainly in the vicinity of the town of Žatec in north-western Bohemia, in the karst area of Český kras, in the Labe river basin and in Prague, in which it appears to have spread during the last two decades. In southernmost Moravia the continuous distribution of *A. caucalis* is bounded on the north by a line connecting the towns of Znojmo, Brno and Veselí nad Moravou, where it locally forms abundant populations. *Anthriscus caucalis* is classified as a casual archaeophyte (Pyšek et al. 2012) and as endangered (Grulich 2012). This species may be somewhat overlooked due to its occurrence in unattractive habitats and its relatively short life cycle. It blooms in April and early May, then quickly disappears after ripening and is overgrown by taller vegetation. *Anthriscus caucalis* and *A. cerefolium* sometimes co-occur and may be confused with each other.

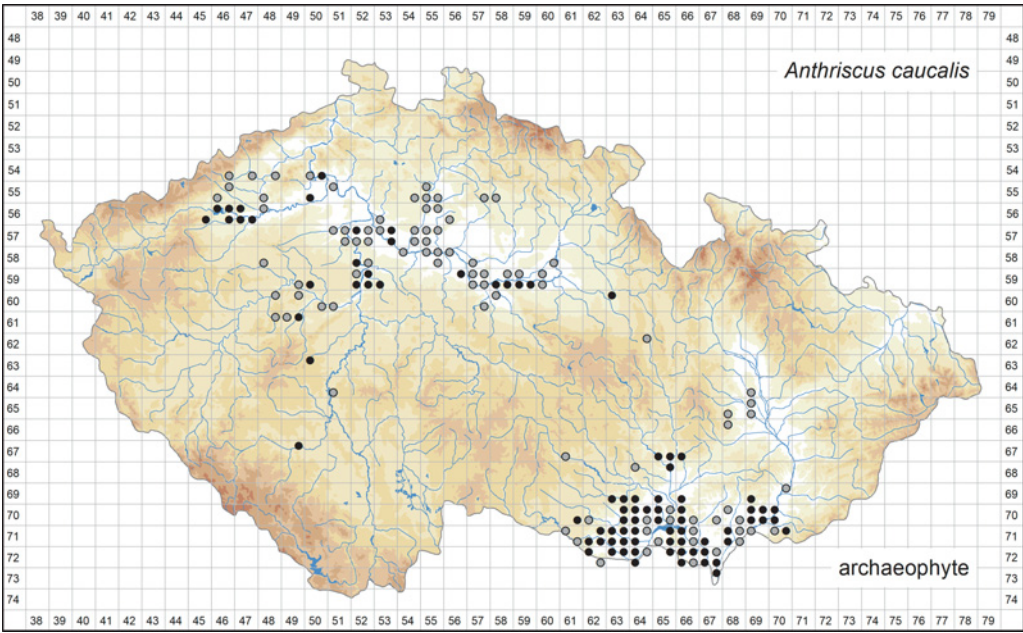


Fig. 1. – Distribution of *Anthriscus caucalis* in the Czech Republic: ● at least one record in 2000–2018 (83 quadrants), ○ pre 2000 records only (90 quadrants). Prepared by Pavel Dřevojan & Jan Prančl.

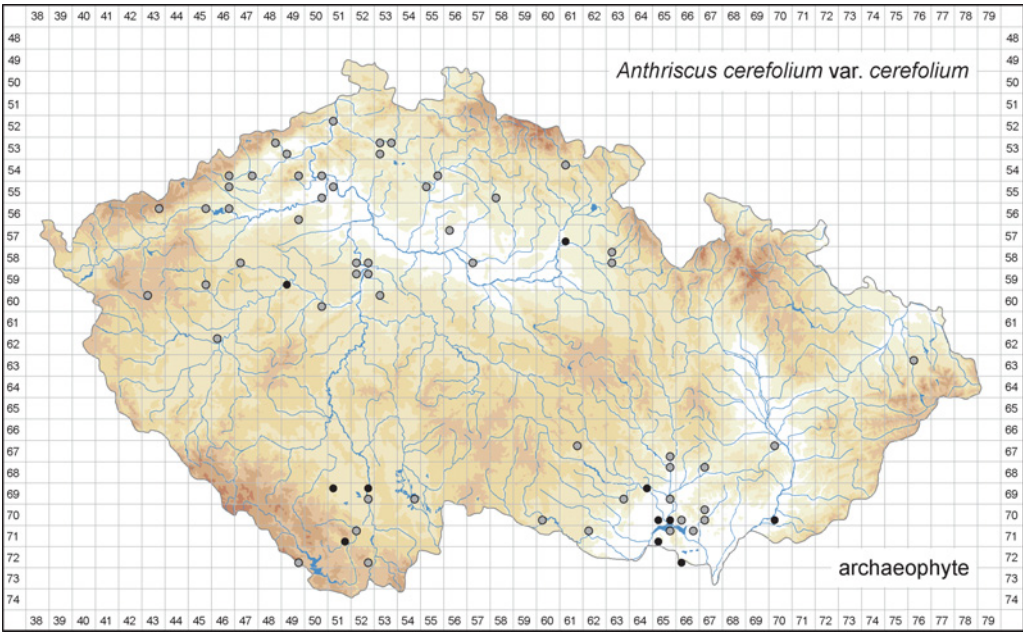


Fig. 2. – Distribution of *Anthriscus cerefolium* var. *cerefolium* in the Czech Republic: ● at least one record in 2000–2018 (11 quadrants), ○ pre 2000 records only (53 quadrants). Prepared by Pavel Dřevojan & Jan Prančl.

Anthriscus cerefolium (Figs 2–3)

Anthriscus cerefolium is distributed mainly in south-eastern Europe, the southern part of eastern Europe, the Caucasus Mts and south-western and central Asia (Spalik 1997, Hand 2011, Tekin & Civelek 2017). It is reported as an introduced species from many European countries, northern Africa, the western and eastern parts of the USA and Greenland (Hand 2011, USDA, NRCS 2018). Detailed distributions of its varieties, the cultivated and escaping *A. c. var. cerefolium* as well as the spontaneously growing *A. c. var. trichocarpus*, are still imperfectly known. Both varieties occur sympatrically across most of the species' distribution range. *Anthriscus cerefolium* prefers light permeable soils that are rich in nutrients. It thrives in partial shade and moderately sunny habitats.

In the Czech Republic *A. c. var. cerefolium* was grown as a vegetable in the past. After World War II it almost disappeared from cultivation. Recently, it has started to be cultivated again, which is reflected in the number of finds in recent years. Occasionally, it escapes from cultivation and grows as a weed in gardens and along fences and walls in settlements in warmer areas of this country. The map includes only cases of spontaneous escapes.

The other variety, *A. c. var. trichocarpus*, is by far more widespread in this country, being frequent in warm areas in southernmost Moravia, especially in the vicinity of the town of Znojmo and the limestone area of the Pavlovské vrchy hills. In these areas it is considered native by some sources (e.g. Slavík 1997, Hand 2011) but was probably also often cultivated in the past, as was *var. cerefolium*. It is much rarer in warm areas in Bohemia, where it has been continuously documented over a long period from some sites (e.g. in the karst area of Český kras, in the České středohoří Mts and in Prague). This taxon occupies semi-shaded habitats such as thermophilous ravine and rock-outcrop forests, *Robinia pseudoacacia* groves and shrub communities. It also occurs around ruins, along roads and fences.

The type variety is classified as a casual archaeophyte, whereas *A. c. var. trichocarpus* is considered a naturalized archaeophyte (Pyšek et al. 2012) and at lower risk – near threatened (Grulich 2012).

Anthriscus nitidus (Fig. 4)

Anthriscus nitidus is distributed in European mountains and their foothills from the Jura and Vosges Mts in the west through the Alps and Carpathians to the Rila and Rhodope Mts in the east. Northwards it extends to the Harz Mts, Sudetes Mts and southern Poland (and is also recorded from Latvia); southwards it is distributed through the Dinarids to northern Greece and also occurs in the Apennine Peninsula southwards to Napoli (Spalik 1997, Hand 2011). In the Czech Republic *A. nitidus* grows in montane, especially beech and ravine, forests on humid, nutrient-rich soils. It has spread locally into lower elevations along streams and rivers and frequently grows in nutrient-rich habitats along stream banks and forest paths; sometimes it is also found in settlements. It also occurs in tall-forb subalpine vegetation along mountain streams and in *Pinus mugo* scrub, especially in glacial cirques, up to 1350 m a.s.l. It is distributed mainly in the Sudetes and Carpathians, including their foothills. Locally it is also continuously distributed at lower elevations, such as in the Bečva and Odra river basins in north-eastern Moravia, occasionally extending to the lowland floodplain forests, with an elevational minimum at 175 m in the

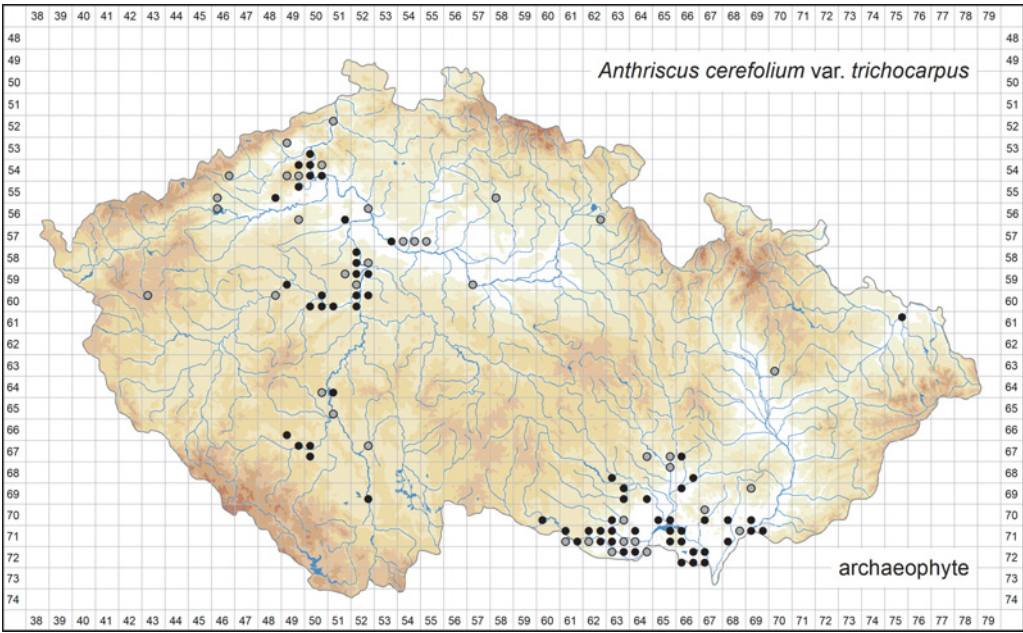


Fig. 3. – Distribution of *Anthriscus cerefolium* var. *trichocarpus* in the Czech Republic: ● at least one record in 2000–2018 (64 quadrants), ○ pre 2000 records only (38 quadrants). Prepared by Pavel Dřevojan & Jan Prančl.

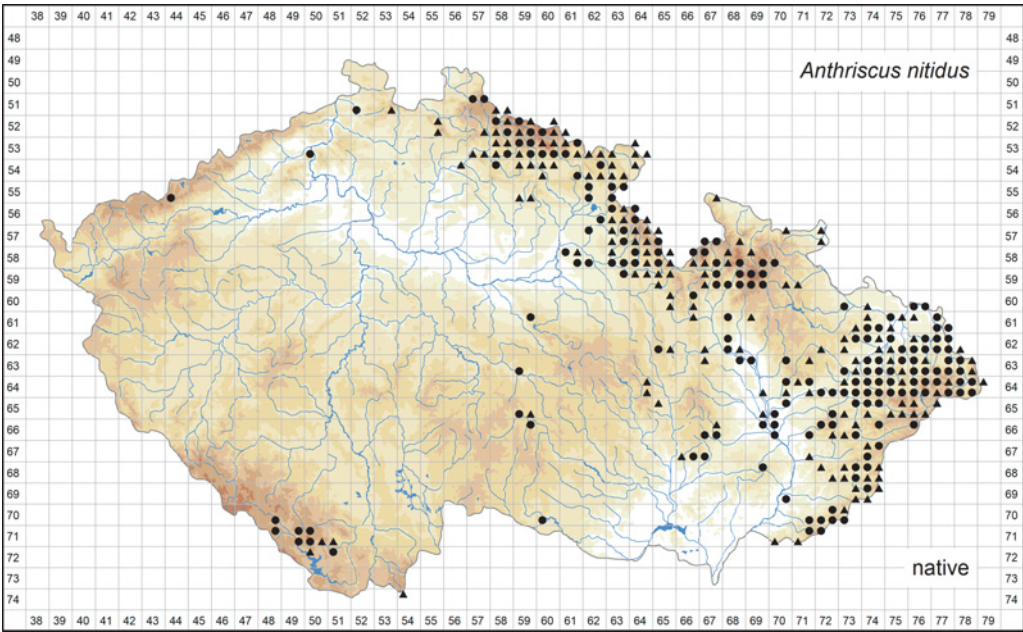


Fig. 4. – Distribution of *Anthriscus nitidus* in the Czech Republic: ● occurrence documented by herbarium specimens (174 quadrants), ▲ occurrence based on other records (158 quadrants). Prepared by Pavel Dřevojan & Jan Prančl.

Morava river floodplain near the town of Kunovice. An isolated outpost of this species' presence, linked to its occurrence in the Eastern Alps, is situated in the south-eastern part of the Šumava Mts. Elsewhere in this country *A. nitidus* is rare, being confined to several isolated localities with suitable microclimatic conditions, especially in ravines and deep valleys.

Anthriscus sylvestris (Fig. 5)

Anthriscus sylvestris is a holarctic species with an extensive range covering Europe, temperate and boreal Asia eastwards to the Far East, and northern, eastern and southern Africa and the Arabian Peninsula. The species is distributed across Europe but is rare in its southernmost part, where it occurs mainly in mountains; it has been naturalized in Iceland. It has also become naturalized in North America and Macaronesia (Hultén & Fries 1986, Spalik 1997). Several subspecies are distinguished, of which only *A. s.* subsp. *sylvestris* occurs in central Europe (Spalik 1997). *Anthriscus sylvestris* grows in a wide range of habitats, including meadows, forest fringes, open humid forests, stream banks, ditches, scrubs, waste places, railways, roadsides and other ruderal habitats. It prefers humid soils rich in nutrients, mainly nitrogen. *Anthriscus sylvestris* is the most common species of the *Apiaceae* family in the Czech Republic, being widespread throughout this country. However, it is less frequent in the mountains, where it is largely confined to man-made habitats. Most of the gaps on the map are due to under-recording.

Callitriche cophocarpa (Fig. 6)

Callitriche cophocarpa occurs in central, northern and eastern Europe. It is distributed from Norway, Denmark, Germany and Switzerland in the west (apparently extirpated from the Netherlands and Belgium) to western Siberia in the east. It extends northwards to the Scandinavian coast of the Arctic Ocean; in the south it occurs as far as northern Italy, Serbia, Bulgaria and Crimea (Schotsman 1967, 1972, Lansdown 2008). In the Czech Republic *C. cophocarpa* has a wide ecological amplitude. It is a perennial species growing in a range of aquatic and wetland habitats, such as pools, oxbows, littoral zones of fishponds and other water reservoirs, ditches, drainage channels, brooks, alder carrs and puddles on forest paths. It prefers shallow (but occasionally up to 1 m deep) waters, often with strongly fluctuating water levels. It tolerates eutrophic and polluted (although not strongly turbid) habitats, often with a thick layer of sapropelic mud on the bottom, but also occurs in oligotrophic or even dystrophic habitats on acidic peat substrates (Prančl 2013). It is frequent throughout this country, being the most common *Callitriche* species in the lowlands and agricultural landscapes and also in some mountains, reaching its elevational maximum at 1260 m in the Jeseníky Mts. It is rare or locally absent from the driest lowlands lacking suitable habitats, and also from the northernmost projections of Bohemia, where it is replaced by *C. platycarpa* and *C. hamulata*. Other gaps on the map are due to under-recording rather than true absences of the species. Because of frequent misidentifications of *Callitriche* species, the distribution map was based solely on examined herbarium specimens and on plants determined using flow cytometry (Prančl et al. 2014).

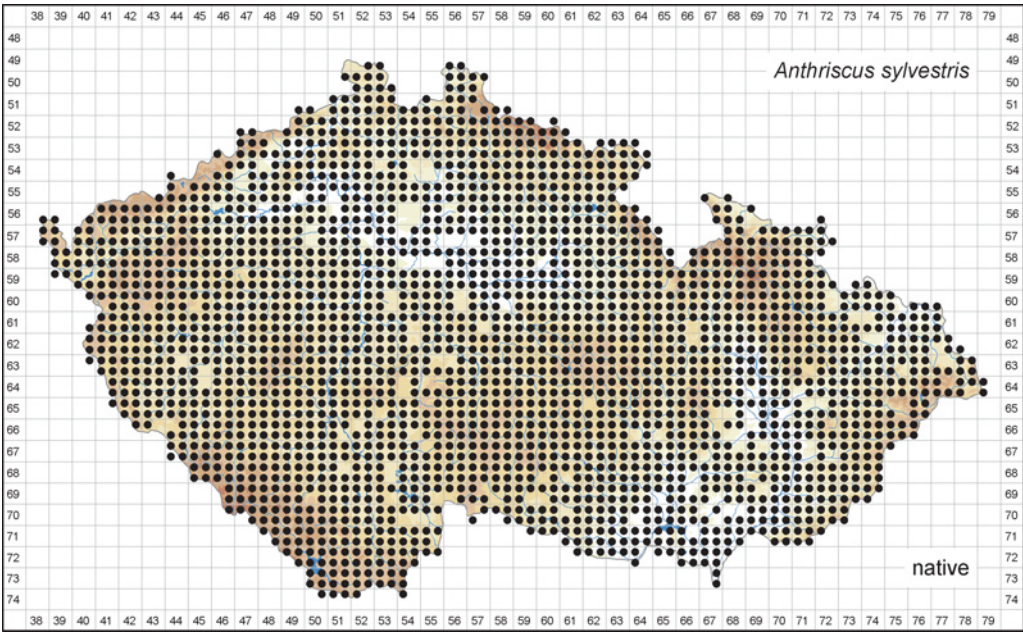


Fig. 5. – Distribution of *Anthriscus sylvestris* in the Czech Republic (2293 occupied quadrants). Prepared by Pavel Dřevojan & Jan Prančl.

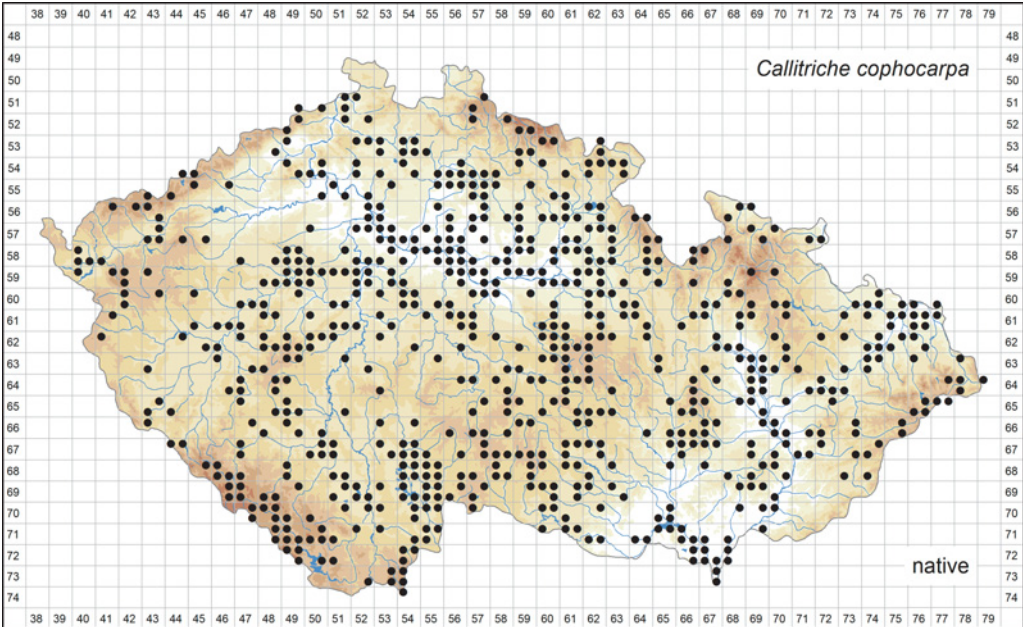


Fig. 6. – Distribution of *Callitriche cophocarpa* in the Czech Republic (714 occupied quadrants). Prepared by Jan Prančl.

Callitriche hamulata (Fig. 7)

Callitriche hamulata is mainly a European species with a clearly sub-Atlantic distribution, distributed northwards to Greenland, Iceland and northern Scandinavia. The southern limit of the species' distribution is unclear due to the difficulties in distinguishing it from the closely related Atlantic-Mediterranean species *C. brutia*, which results in frequent classification of *C. hamulata* as a variety of *C. brutia*. *Callitriche hamulata* is probably very rare or absent from the whole of southern Europe and has not yet been reliably proved to occur in the Balkan Peninsula. The eastern limit of this species' range is also poorly known. It has been recorded from Finland, the Baltic countries, Poland, Slovakia and Hungary, but there is also a single specimen from Kamchatka. It has become naturalized on the west coast of North America from Oregon northwards to British Columbia (Schotsman 1967, Lansdown 2008, Prančl et al. 2014). In the Czech Republic *C. hamulata* is a common component of vegetation of running waters, most frequently growing in upper and middle river courses, brooks and millraces with cool, oligotrophic to mesotrophic water and a sandy or less often clayey bottom. It is also frequent in pools, fishponds, ditches and puddles on forest paths, usually in clear water, often in habitats with strongly fluctuating water levels or on exposed wet substrates (Prančl 2012). The species is most frequent in the westernmost and northernmost parts as well as in colder and humid forested areas of Bohemia, including at up to 1040 m a.s.l. in the Šumava Mts. It is scattered to rare in the eastern part of this country, being absent from most of southern Moravia. It is rare in warm lowlands, being confined there mostly to rivers and alluvial pools. Because of frequent misidentifications of *Callitriche* species, the distribution map was based predominantly on examined herbarium specimens and on plants determined using flow cytometry (Prančl et al. 2014).

Callitriche hermaphroditica (Fig. 8)

Callitriche hermaphroditica has a circumboreal distribution, occurring throughout the Northern Hemisphere, predominantly north of 53°N. The species' distribution includes North America, Greenland, northern Europe, and boreal and mountain areas of Asia eastwards as far as the Chukchi Peninsula. In Europe it is known from Iceland, the British Isles, Scandinavia, and from Denmark and northern Germany eastwards through Poland and the Czech Republic to Ukraine, the Baltic countries and Russia (Hultén & Fries 1986, Lansdown 2008). Two subspecies are recognized, of which only subsp. *hermaphroditica* occurs in central Europe (Lansdown 2008, Prančl et al. 2014). The occurrence of *C. hermaphroditica* in the Czech Republic is isolated, being situated southwards of the species' continuous range. It appears that this species has occurred in this country only in certain periods. It was collected two times in the 19th century (in Prague and eastern Bohemia) and then it was not re-recorded for almost 100 years. However, since 1973, *C. hermaphroditica* has been found again in eastern Bohemia, being recorded reliably from about 20 localities. Unlike other central-European water-starworts, *C. hermaphroditica* is an obligatory submerged, late-flowering species, most developed in the late summer and autumn. In Bohemia it prefers clear, mesotrophic, still waters in the initial stages of succession, such as fishponds with low-intensity management and newly established reservoirs. It has been recorded only twice in rivers. The species is a weak competitor, often forming rich and dense stands but usually disappearing completely after several

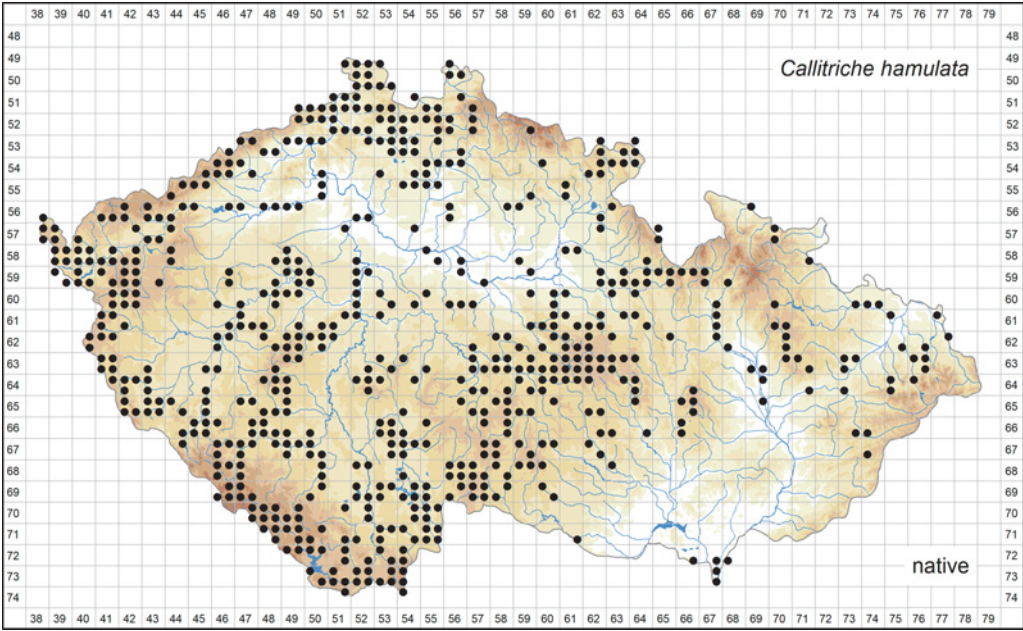


Fig. 7. – Distribution of *Callitriche hamulata* in the Czech Republic (632 occupied quadrants). Prepared by Jan Prančl.

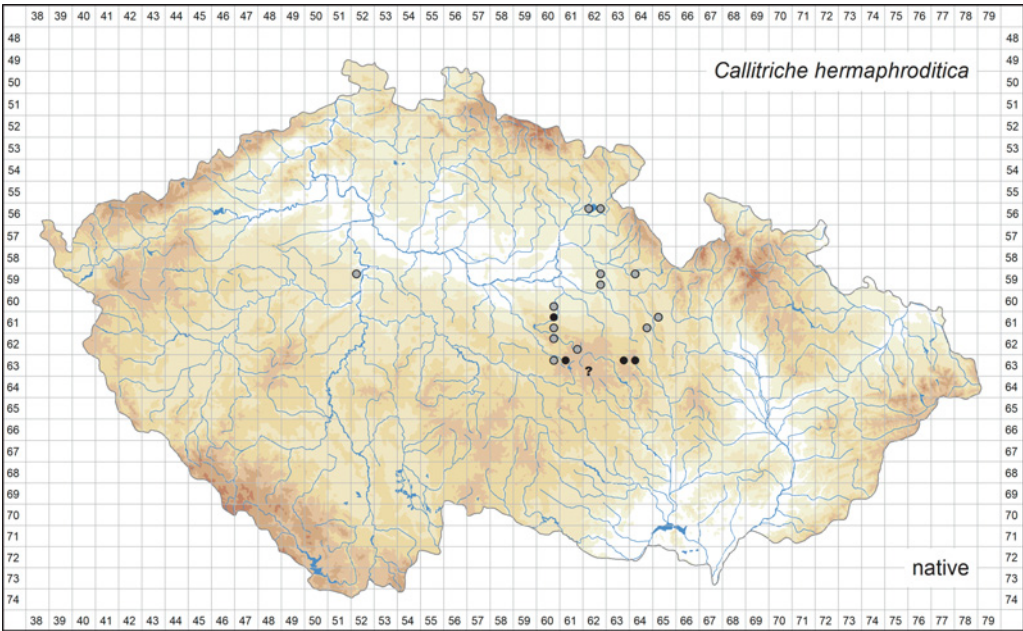


Fig. 8. – Distribution of *Callitriche hermaphroditica* in the Czech Republic: ● at least one record in 2000–2018 (4 quadrants), ● pre 2000 records only (13 quadrants). Prepared by Jan Prančl.

years (Prančl 2012). At present, *C. hermaphroditica* is critically threatened in the Czech Republic (Grulich 2012). In the last ten years it has been observed only in the Malé Dářko fishpond in the Žďárské vrchy hills and in six small ponds near the town of Polička near the Bohemian-Moravian border.

Callitriche palustris (Fig. 9)

Callitriche palustris is a holarctic species with a remarkably large distribution range covering North America, Europe, and Asia eastwards to Kamchatka, China and Malaysia. It has been also reported from Australia, where it apparently has been introduced. It is distributed across Europe, extending northwards to Iceland and the Scandinavian coast of the Arctic Ocean but is rare in western Europe and almost absent from the British Isles and the Mediterranean area (Mason 1959, Lansdown 2008). In the Czech Republic *C. palustris* appears usually to be an annual species. It is frequent on periodically exposed bottoms of fishponds, where it grows on various substrates from sand to eutrophic sapropelic mud. However, it probably avoids mineral-rich and saline habitats. It often also grows in puddles on forest paths and in other aquatic habitats with fluctuating water levels, including littoral zones of fishponds, wetlands in meadows and arable fields and on sediment accumulations in rivers. It prefers shallow, mesotrophic to eutrophic water that is warm and not shaded in summer. In the Czech Republic it has never been recorded as occurring in running water (Prančl 2012). *Callitriche palustris* is distributed throughout this country, being most frequent in fishpond basins in southern Bohemia and in other fishpond-rich areas, such as the Českomoravská vrchovina highlands. It is also common in forested areas at middle elevations but rather rare in the warmest lowlands and in mountains. The distribution map was based predominantly on examined herbarium specimens. Most of the gaps at middle elevations are due to under-recording rather than true absences.

Callitriche platycarpa (Fig. 10)

Callitriche platycarpa is an allotetraploid species whose diploid parents are *C. cophocarpa* and *C. stagnalis* (Bączkiewicz et al. 2007). It is a European species with a distinctive sub-Atlantic distribution. It occurs from the British Isles and France eastwards to Denmark, southernmost Sweden, western Poland, the Czech Republic and Austria, southwards to the Pyrenees, southern France and Switzerland, with small outposts in north-western Spain, southern Italy and the Aegean Islands (Lansdown 2008, Lansdown & Strid 2011, Prančl et al. 2014). In the Czech Republic *C. platycarpa* reaches the eastern limit of its continuous range, representing a sub-Atlantic floristic element. It is a perennial species occurring in various aquatic and wetland habitats such as brooks and upper courses of rivers (often together with *C. hamulata*), ditches and drainage channels, pools, oxbows, littoral zones of fishponds and puddles on forest paths. It is most common in mesotrophic to eutrophic waters with muddy bottoms but it occasionally grows also in oligotrophic habitats on sandy substrate (Prančl 2013). It is frequent in northernmost Bohemia where it is partially a vicariant of *C. cophocarpa*. It is scattered in the rest of northern Bohemia (eastwards to the vicinity of the town of Turnov) and in the westernmost part of this country. An isolated area of occurrence is situated in the southern part of the Český les hills. It has been recorded at elevations ranging from 155 m (Obrtka stream

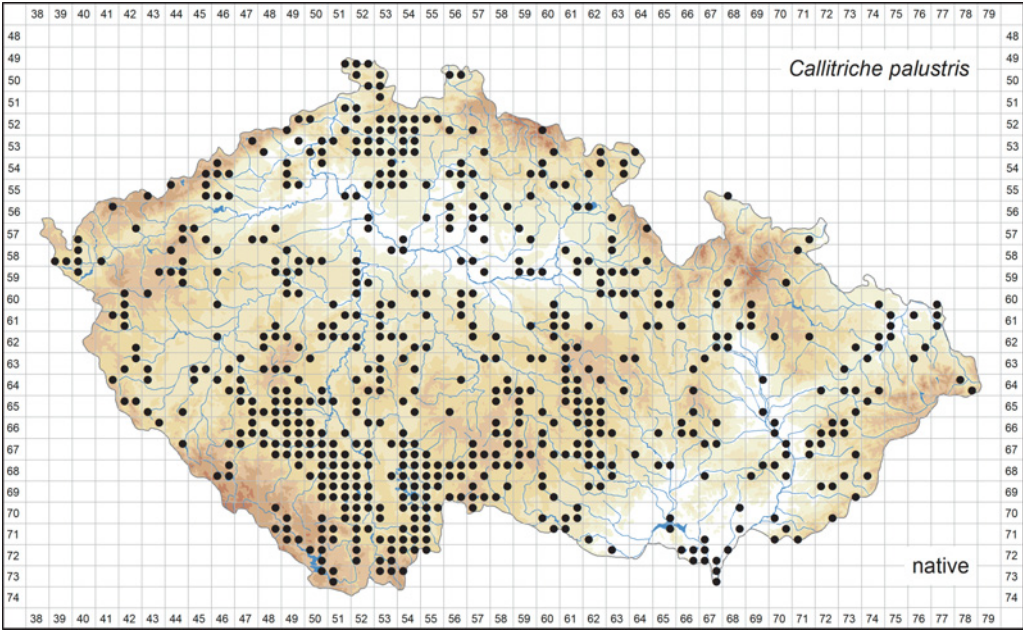


Fig. 9. – Distribution of *Callitriche palustris* in the Czech Republic (621 occupied quadrants). Prepared by Jan Prančl.

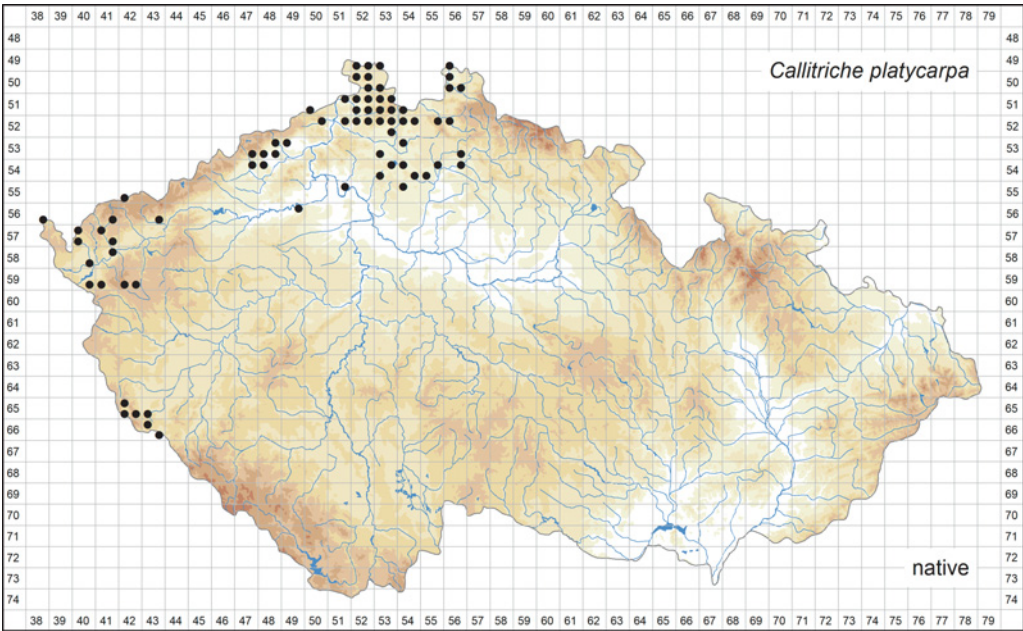


Fig. 10. – Distribution of *Callitriche platycarpa* in the Czech Republic (73 occupied quadrants). Prepared by Jan Prančl.

near the town of Litoměřice) to 820 m (Slavkovský les hills). *Callitriche platycarpa* is classified as vulnerable in the Czech Republic (Grulich 2012). As this species has been recognized only recently in this country, the distribution map is certainly still not comprehensive. Due to frequent misidentifications of this taxonomically challenging species, the map was based solely on examined herbarium specimens and on plants determined using flow cytometry (Prančl et al. 2014).

Callitriche stagnalis (Fig. 11)

Callitriche stagnalis is distributed throughout Europe from the Azores and Iceland in the west to western Russia in the east, but the eastern limit of its range is poorly known. Northwards it extends to the coastal parts of Norway, southern Sweden and the Baltic countries. It is widespread in the Mediterranean area and occurs also in northern Africa (Lansdown 2008). The occurrence in the Pannonian Basin is uncertain due to the absence of reliable records from Hungary (Király 2009), southern Slovakia (Zahradníková 1982) and southern Moravia (see below). The species is also known from North America, Japan, Australia, New Caledonia and New Zealand, having probably been introduced into all these areas (Mason 1959, Morita & Lee 1998, Philbrick et al. 1998). In the Czech Republic *C. stagnalis* is mostly an annual species, largely confined to very shallow muddy waters and similar sub-terrestrial habitats. Most of its occurrences are in puddles on forest paths. It is also frequent in small forest wetlands, muddy depressions, shallow ditches and edges of small forest ponds; less often it grows in brooks, channels and on muddy sediment accumulations in rivers (Prančl 2013). It is common in forested areas, often being the most common representative of the genus there. It is absent from southern Moravia and the lowlands of central Moravia. It may also be locally absent from deforested agricultural landscapes in central Bohemia. Most of the gaps at middle elevations are due to under-recording rather than true absences. The species reaches its elevational maximum at about 1000 m in the Šumava Mts, but it is rather rare in mountains.

Callitriche ×vigens (Fig. 12)

Callitriche ×vigens is a primary triploid sterile hybrid of *C. cophocarpa* and *C. platycarpa*. Its occurrence has been confirmed in southernmost Sweden, Denmark, the Netherlands, Germany, western Switzerland and the Czech Republic (Lansdown 2008, Prančl et al. 2014). It arises in areas where both parental species co-occur but it spreads vegetatively and can survive also in places from which either of the parental species has vanished. In the Czech Republic the hybrid seems to be relatively frequent in some areas of northern Bohemia and scattered in western Bohemia. However, it is also frequent in the alluvial pools of the Otava river in southern Bohemia, i.e. in the area from which *C. platycarpa* is absent. The hybrid is ecologically similar to the parental species, being found in more permanent waters that do not dry out completely in summer and do not freeze to the bottom in winter, such as in streams, ditches, water reservoirs and pools (Prančl 2013). Identification of *C. ×vigens* is very difficult. It has been recognized only recently in the Czech Republic; therefore, the distribution map is certainly incomplete.

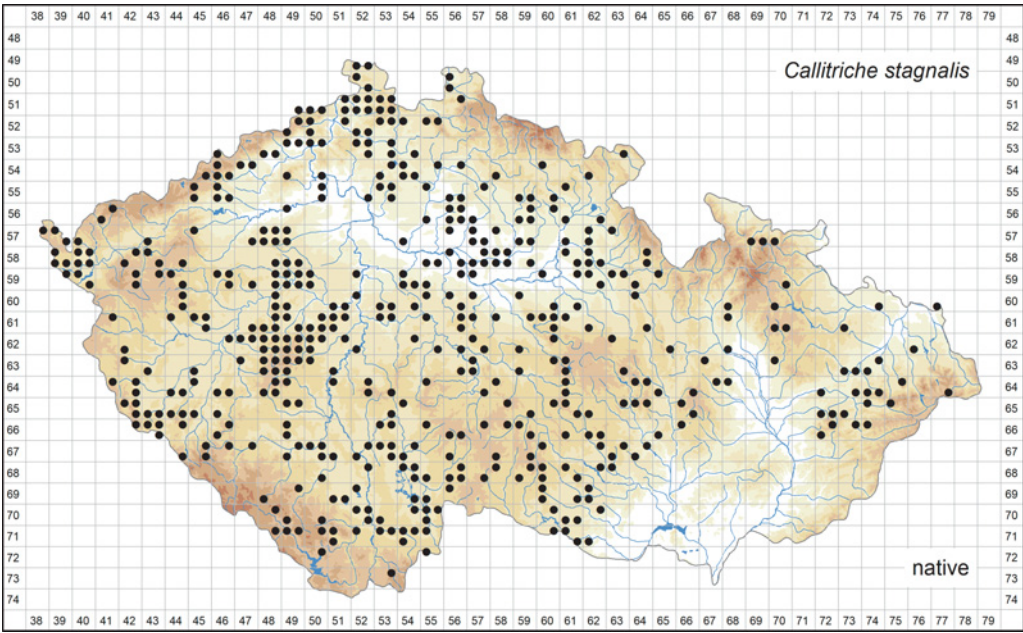


Fig. 11. – Distribution of *Callitriche stagnalis* in the Czech Republic (492 occupied quadrants). Prepared by Jan Prančl.

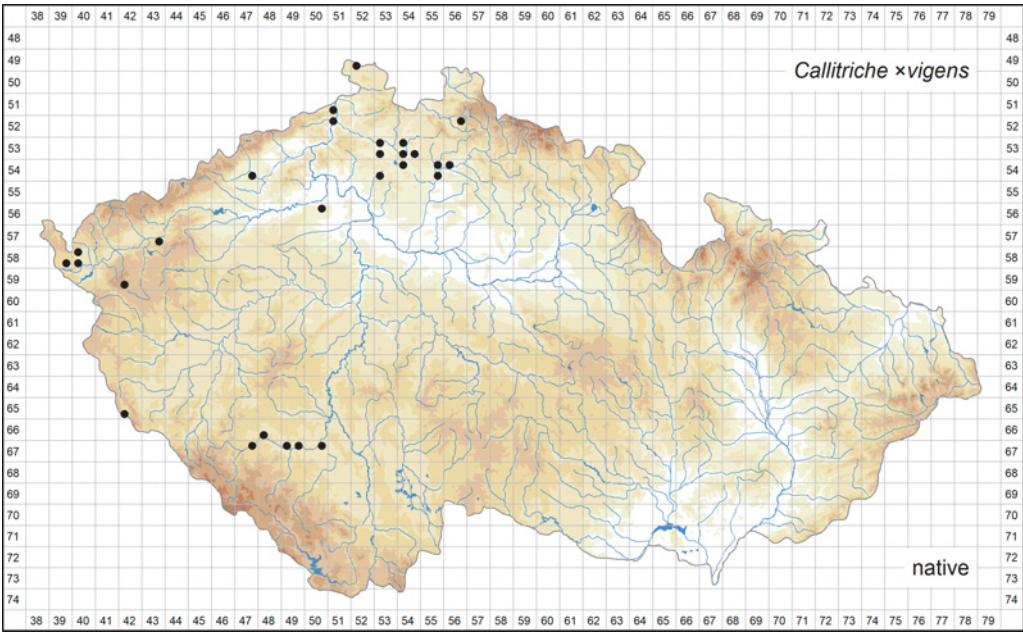


Fig. 12. – Distribution of *Callitriche xvigens* in the Czech Republic (27 occupied quadrants). Prepared by Jan Prančl.

Cochlearia danica (Fig. 13)

Cochlearia danica is an annual or biennial, early-flowering species that is native to saline coastal habitats of western and northern Europe, namely in Portugal, Spain, France, Ireland, Great Britain, Belgium, the Netherlands, Germany, Denmark, Norway, Sweden and the Baltic countries (Chater et al. 1993). It has been introduced into Poland (Sychowa 1985, Mirek et al. 2002). Recently, the species has been spreading rapidly along salted verges of roads and motorways in Great Britain (Scott & Davison 1982), Belgium (Olivier 1996), Germany (Dunkel et al. 2001), France (Cochard 2005), Austria (Hohla & Raabe 2012) and Hungary (Raab-Straube & Raus 2016). In the Czech Republic *C. danica* was recorded for the first time in 2016 (Ducháček et al. 2017). It grows in narrow strips on the verges of roads or motorways and in central reservations of motorways, occasionally forming vast and dense populations. Although it is a maritime species, it does not avoid rather high elevations. The highest reported locality is located near the town of Humpolec at the elevation of 605 m. About 40 occurrences are currently known, and it is likely that their number will further increase.

Cochlearia officinalis (Fig. 13)

Cochlearia officinalis is a biennial or short-lived perennial. Its distribution area is similar to that of *C. danica*, i.e. seacoasts of western and northern Europe (Hultén 1971). It grows on nutrient-rich cliffs, and in seasonally inundated coastal grasslands and brackish marshes (Gill 2007). As in the case of *C. danica*, *C. officinalis* is known to spread along salted road verges (Scott & Davison 1982). In the Czech Republic the species used to be cultivated as a vegetable and a medicinal plant in the 19th and the early 20th centuries. It has been recorded as escaped from cultivation only once, near the town of Kostelec nad Orlicí in eastern Bohemia (Rohlena 1929, Smejkal 1968). At present, the species is only rarely cultivated in this country, in botanical gardens. It is not grown by hobby gardeners, and is also not offered by any garden shops. Further finds of the species are therefore unlikely.

Dittrichia graveolens (Fig. 14)

Dittrichia graveolens is native to and widespread in the Mediterranean area, extending marginally to the western Atlantic coast of Europe and to the Middle East (Brullo & de Marco 2000). It has been introduced into the USA, South Africa, Australia and New Zealand (Csurhes & Zhou 2008). *Dittrichia graveolens* has been recorded as an alien invasive species in several central-European countries. In the Czech Republic it was found for the first time along the D1 motorway in 2008 (Raabe 2009). Currently, it is abundant along the Czech motorway network. However, its initial phase of invasion remained unnoticed. It is widespread along the D5 motorway (in western and central Bohemia) and D1 motorway (between Prague and the city of Brno). Many localities have also been recorded along the D2 and D1 motorways in Moravia. It grows on disturbed sites along roads (abundant linear populations along road verges and central reservations of motorways) mostly on gravely saline soils. The species is classified as a naturalized neophyte (Pyšek et al. 2012).

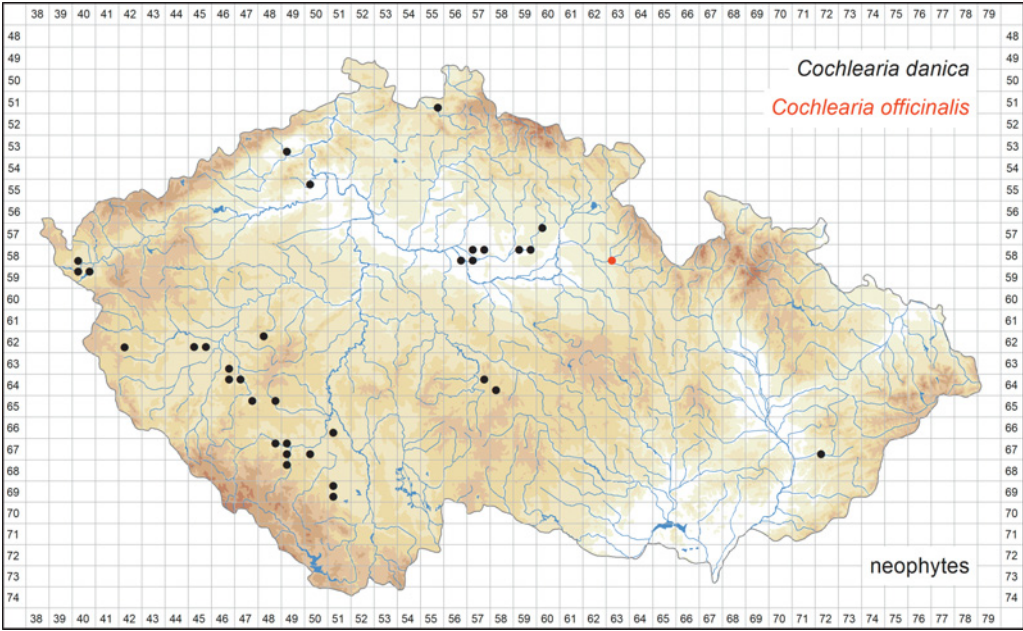


Fig. 13. – Distribution of *Cochlearia danica* (33 occupied quadrants) and *C. officinalis* (1 occupied quadrant) in the Czech Republic. Prepared by Michal Ducháček, Pavel Kúr, Radim Paulič & Jiří Brabec (*C. d.*) and by Michal Ducháček (*C. o.*).

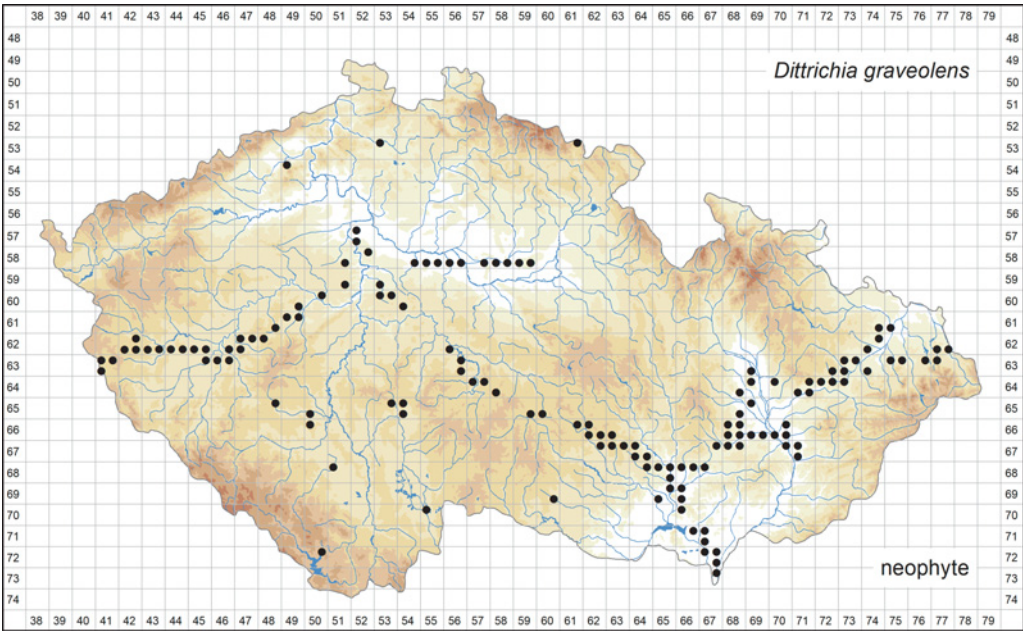


Fig. 14. – Distribution of *Dittrichia graveolens* in the Czech Republic (137 occupied quadrants). Prepared by Michal Ducháček, Petr Kocián & Pavel Kúr.

Egeria densa (Fig. 15)

Egeria densa is native to south-eastern Brazil, Uruguay and adjacent parts of Argentina, but it has been introduced into and has become naturalized in other warm-temperate and cool-subtropical parts of the world including North and other parts of South America, Europe, Japan, south-eastern and southern Africa, south-eastern Australia and New Zealand (Cook & Urmi-König 1984). It has become a very popular and perhaps the most universally available aquarium plant because it used to be considered as an important and attractive “oxygenator” essential for raising fish (Cook & Urmi-König 1984). In Europe it was first recorded outside cultivation in 1910 in a canal near Leipzig, Germany (Wolff 1980). It has been recorded from most countries of western and central Europe, and also in Italy and the European part of Turkey (Uotila 2009). Because only male plants of this dioecious species have been observed outside its native range, *E. densa* reproduces only vegetatively there, and most new occurrences in distant areas become established after intentional planting of aquarium plants in the countryside. In the Czech Republic *E. densa* is documented to have been cultivated in greenhouse aquaria already in 1932, and the earliest record of escaped plants dates back to 1963 when this species was collected (but at that time not correctly recognized) at the village of Kozojedy near the town of Chrudim in eastern Bohemia. Later it was recorded in a park pond in Prague in 1991 and in the village of Borek in the suburb of the city of České Budějovice in southern Bohemia. At each of these sites, *E. densa* apparently occurred only for one season because in very shallow water it probably does not survive central-European winters with frost and snow cover. Based on these observations, *E. densa* was classified as a casual neophyte (Pyšek et al. 2012). However, it was found in a rather deep fishpond in the city of Plzeň in western Bohemia in 2011, where it has become naturalized. Now it is abundant over most of the fishpond and has to be constantly eliminated by an aquatic weed harvester.

Elodea canadensis (Fig. 16)

Elodea canadensis is native to temperate North America where it occurs in most of the USA and in southern Canada (Cook & Urmi-König 1985, Haynes 2000a). It has become naturalized in Europe, Australia and New Zealand, and also has been introduced into a few countries of Asia, Africa and South America (Cook & Urmi-König 1985, Josefsson 2011, Dawson & Popay 2014). Europe has been particularly affected by its invasion. *Elodea canadensis* was first discovered there in 1836 in Northern Ireland. Further spread across the continent was initially facilitated by botanists and botanical gardens. For example, plants of *E. canadensis* were sent from England to the Berlin botanical garden in 1852, and several other German gardens had it in cultivation within the next decade (Cook & Urmi-König 1985). As of now, this species has invaded almost all of Europe (Uotila 2009, Josefsson 2011). *Elodea canadensis* is dioecious in its native range, but all plants recorded to date in Europe have been female with the exception of male plants discovered in 1879, in a pond near Edinburgh. In the Czech Republic *E. canadensis* occurs in mesotrophic to eutrophic, transparent, cold, slightly acidic to slightly basic, preferably calcareous, standing or very slowly flowing waters, most frequently in ponds, rivers, streams, drainage and irrigation channels, oxbow lakes and lakes in sand pits. It reproduces vegetatively and is effectively dispersed even without specialized propagules,

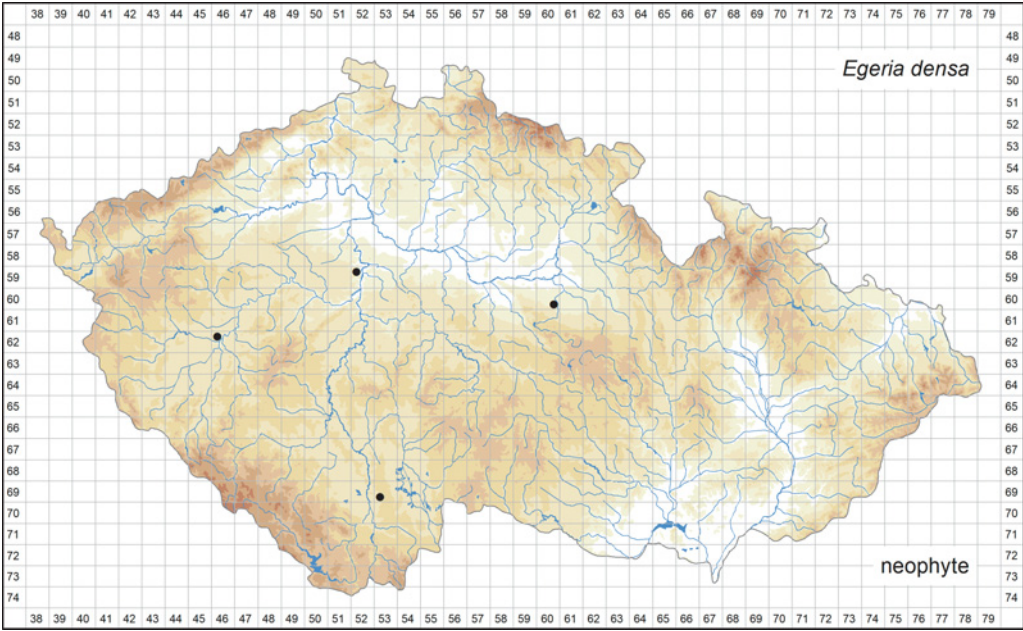


Fig. 15. – Distribution of *Egeria densa* in the Czech Republic (4 occupied quadrants). Prepared by Zdeněk Kaplan.

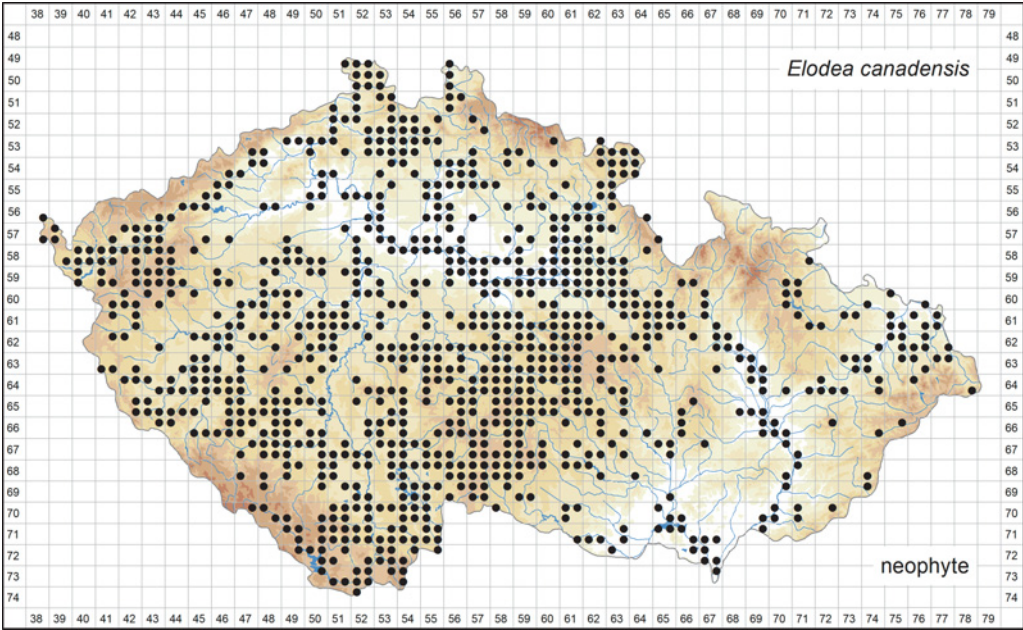


Fig. 16. – Distribution of *Elodea canadensis* in the Czech Republic (960 occupied quadrants). Prepared by Zdeněk Kaplan.

being capable of fast growth and often forming dense stands. In this country *E. canadensis* was collected for the first time in 1878, almost simultaneously in the village of Roudná near the town of Soběslav in southern Bohemia and in the village of Křimice near the city of Plzeň in western Bohemia. Within the next decade it was discovered in some other parts of Bohemia and also in Moravia. In the late 19th and early 20th centuries, *E. canadensis* became widespread throughout Bohemia, being most frequent at middle elevations, particularly in western Bohemia, fishpond landscapes in south-western and southern Bohemia and in the Českomoravská vrchovina highlands. It became a noxious weed mainly in small ponds with clear water, particularly those supplying water to local breweries. In Moravia *E. canadensis* has always been less frequent, with most localities being confined to the lowland floodplains of the Morava, Dyje and Odra rivers. It is rare in or even locally absent from the warmest and driest parts of this country, particularly north-western Bohemia and southern Moravia (except the floodplains of the Morava and Dyje rivers), as well as from the mountains where suitable habitats are absent. This species has somewhat declined during past decades due to intensification of fishpond management, eutrophication and increase in water turbidity. *Elodea canadensis* is currently classified as a naturalized neophyte (Pyšek et al. 2012).

Elodea nuttallii (Fig. 17)

Elodea nuttallii is native to temperate North America, where it occurs in most of the USA except the southern states and is also found in southernmost Canada (Cook & Urmi-König 1985, Haynes 2000a). It has been introduced into and has become locally naturalized in Europe, China and Japan (Cook & Urmi-König 1985, Xu et al. 2007). Generally female plants are found in Europe, whereas only male plants have been found in Japan. In Europe *E. nuttallii* was first collected outside cultivation in 1914 in Great Britain, then in 1939 in Belgium, in 1941 in the Netherlands, in 1961 in Germany, in 1973 in Switzerland, with subsequent records from other countries (Wolff 1980, Josefsson 2011). However, male plants were in cultivation in the botanical garden in Bonn as early as before 1910 (Cook & Urmi-König 1985). Female *E. nuttallii* has been spreading in many parts of Europe and even seems to be replacing *E. canadensis* at many sites (Cook & Urmi-König 1985). At present, *E. nuttallii* occurs in most countries of western and central Europe, and is also found in Denmark, Sweden, Norway, Italy and Romania (Uotila 2009, Duenas 2010, Josefsson 2011). In the Czech Republic *E. nuttallii* was first observed in 1988 in a park pond in Prague but this occurrence (obviously intentional planting) vanished soon. In 1991 it was collected from two fishponds in the Žďárské vrchy hills and in 1992 in the Novohradské hory Mts. In 2013–2014 it was found to be already frequent in the Ohře river and adjacent oxbow lakes in western Bohemia, occupying an approximately 95 km stretch of this river, with well established colonies there. A few additional sites have been recently discovered in western and central Bohemia, southern Moravia and in Silesia. It is almost certainly more frequent now but remains neglected because of its similarity with the widespread *E. canadensis*. In the last review on the alien plants in this country *E. nuttallii* was classified as a casual neophyte (Pyšek et al. 2012), but now it meets criteria for a naturalized species.

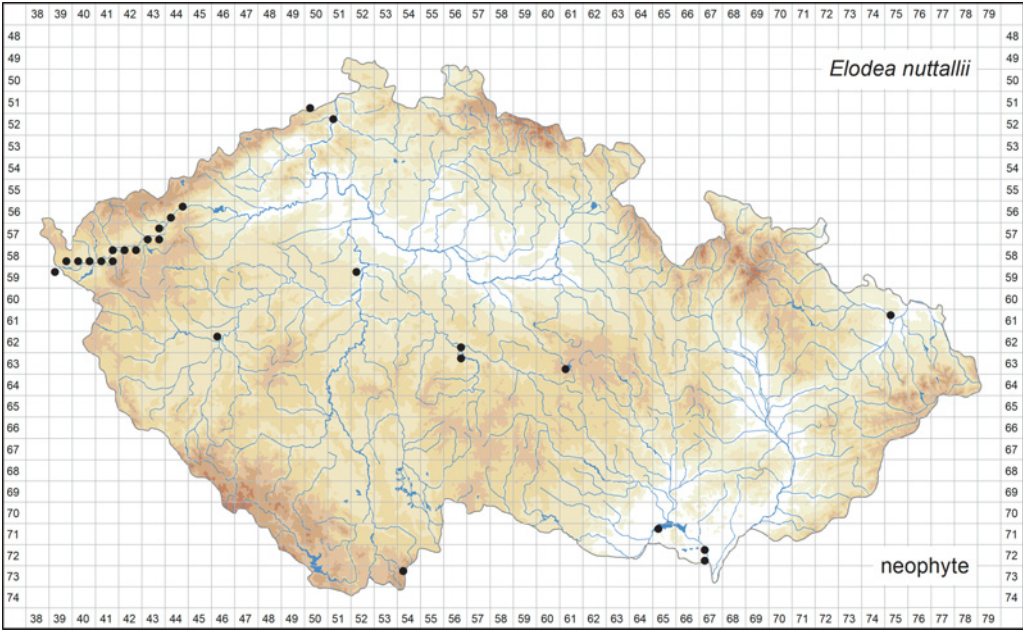


Fig. 17. – Distribution of *Elodea nuttallii* in the Czech Republic (26 occupied quadrants). Prepared by Zdeněk Kaplan.

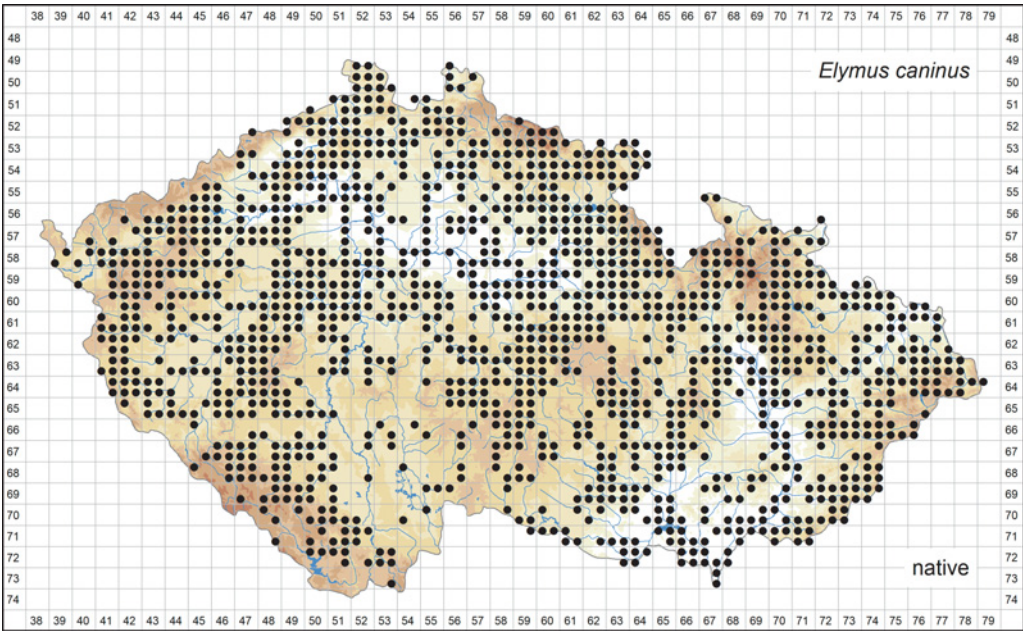


Fig. 18. – Distribution of *Elymus caninus* in the Czech Republic (1367 occupied quadrants). Prepared by Jindřich Chrtěk Jr.

Elymus caninus (Fig. 18)

Elymus caninus is distributed throughout Europe except for its northernmost parts, the southern part of the Iberian Peninsula, central and southern Greece and Crete. Outside Europe it occurs in Anatolia, Transcaucasia and further eastwards to central Asia, western China and Siberia; it has been introduced into Japan and New Zealand (Meusel et al. 1965, Hultén & Fries 1986). In the Czech Republic it occurs in moderately humid to humid deciduous and mixed forests, their clearings, shrub communities along river and stream banks, and on verges of forest roads. It prefers loam to clay, moderately humid to moist soils that are moderately acidic to neutral and rich in nutrients. *Elymus caninus* occurs almost throughout this country but with varying frequencies. It is common in forested areas at lower and middle elevations over bedrock that is more-or-less nutrient-rich, becoming progressively rarer with increasing elevation. It reaches its elevational maxima in lower parts of glacial cirques and along timberline in the Krkonoše Mts and the Hrubý Jeseník Mts. It is much less common in warm and dry, largely deforested lowlands and hilly areas, and in areas with nutrient-poor substrates. Distributional gaps in the lowlands with predominantly arable land and in the fishpond basins in southern Bohemia might indicate true absences, whereas those at middle elevations in forested landscapes are rather due to under-recording.

Elymus hispidus (Fig. 19)

Elymus hispidus is distributed in southern, central and eastern Europe, south-western and central Asia and north-western Africa, and as an introduced species also in North America (USDA, NRCS 2018). In the Czech Republic it occurs in semi-dry to dry, usually partly ruderalized or otherwise somewhat disturbed grasslands, in open steppic shrub communities, vineyard edges and thermophilous forests. It grows on dry, loamy to stony, sometimes also sandy soils that are neutral to basic, moderately supplied with nutrients and humus, usually over limestone, loess, volcanic or other nutrient-rich bedrock. *Elymus hispidus* is scattered in warm and dry hilly areas of north-western Bohemia, north, north-west, south-west and south of Prague, and in central, south-western, southern and south-eastern Moravia. It is very rare in warm areas east of Prague (in the middle Labe river basin and in surrounding hilly areas) and absent from eastern Bohemia; an isolated occurrence is known from serpentine outcrops near the village of Borovsko in south-eastern Bohemia. Two subspecies or varieties are sometimes distinguished in the Czech Republic: *E. hispidus* subsp./var. *hispidus* and *E. h.* subsp. *barbulatus* (*E. h.* var. *villosus*). However, due to frequent occurrence of morphologically intermediate plants, only a map for the species is presented here.

Elymus repens (Fig. 20)

Elymus repens is distributed throughout Europe, except for Spitsbergen and Crete, in the temperate zone in Asia eastwards as far as the Russian Far East and Japan, southwards to Anatolia, the Caucasus Mts, Transcaucasia, Afghanistan, northern India and China, and it also occurs in north-western Africa and Macaronesia. It has been introduced (probably as a contaminant of hay or straw) into and has become naturalized in the Americas, southern Africa, Australia, New Zealand and other regions (Hultén & Fries 1986). In the Czech

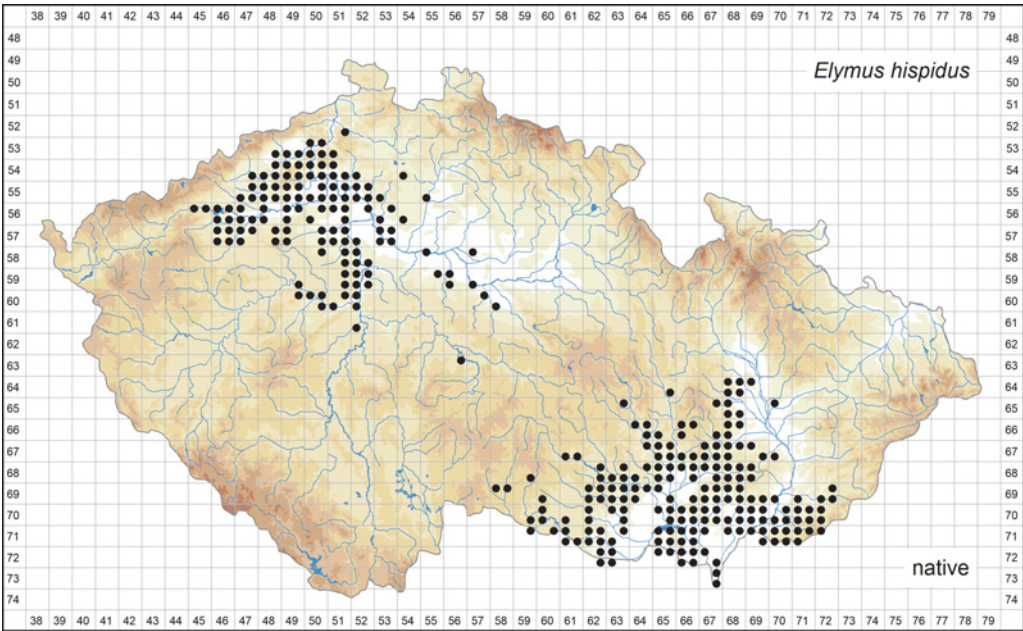


Fig. 19. – Distribution of *Elymus hispidus* in the Czech Republic (307 occupied quadrants). Prepared by Jindřich Chrtěk Jr.

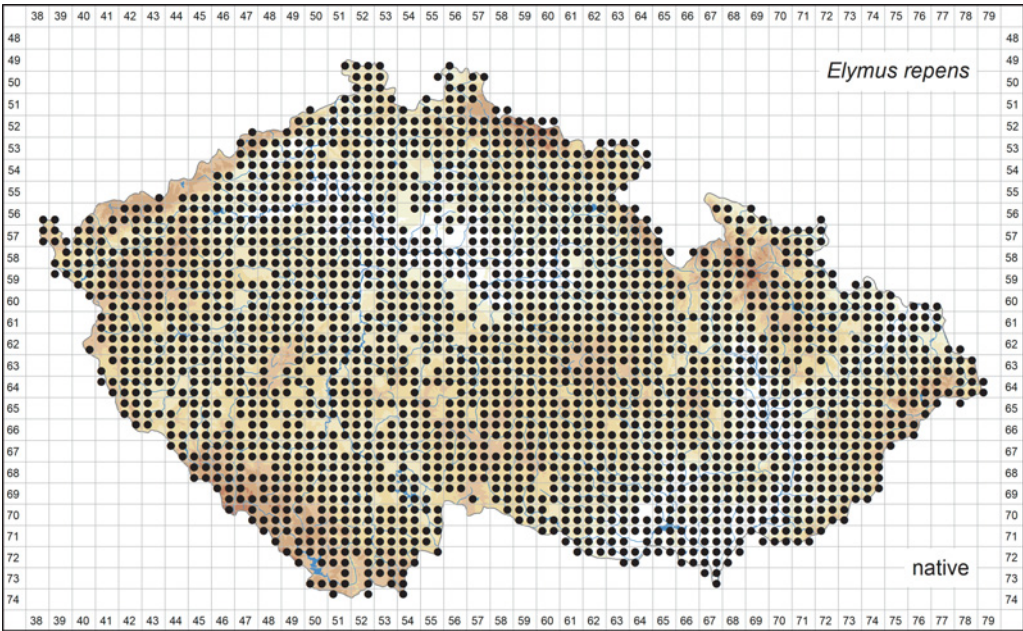


Fig. 20. – Distribution of *Elymus repens* in the Czech Republic (2218 occupied quadrants). Prepared by Jindřich Chrtěk Jr.

Republic *E. repens* occurs in arable fields, gardens, disturbed grasslands, waste places, shrub communities and on roadsides. It prefers moderately humid to dry soils that are moderately acidic to basic and usually rich in nutrients. *Elymus repens* is common throughout this country from the lowlands up to the lower mountains; it is also occasionally found up to the subalpine belt due to local introductions. Most of the gaps on the map are due to under-recording. *Elymus repens* is a highly competitive agricultural weed, being able to reduce crop yields. It spreads by long, creeping rhizomes, which enable it to grow rapidly across sites at a rate of up to 3 m/year (Werner & Rioux 1977). The plants produce allelopathic toxins that help outcompete co-occurring plants (Sánchez-Moreiras et al. 2004).

Epilobium adenocaulon (Fig. 21)

Epilobium adenocaulon is a member of a taxonomically difficult group native to North America. Of this group, *E. adenocaulon* (incl. *E. pseudorubescens*), *E. ciliatum* and *E. glandulosum* have become naturalized in Europe, the latter two with certainty only in the Nordic countries and Germany (Snogerup 2010, Raab-Straube 2018). To date, only *E. adenocaulon* has been recorded in the Czech Republic. Its native distribution is imperfectly known due to taxonomic confusion, which applies also to its secondary range in Europe and northern Asia. However, it has become naturalized in most of Europe except most of the Mediterranean area (Hultén & Fries 1986, Snogerup 2010, Ebel' 2013, Raab-Straube 2018). In the Czech Republic *E. adenocaulon* occurs in various, mainly secondary habitats, including ditches, roadsides, reed beds and sedge stands in the margin of fishponds, exposed bottoms of fishponds, forest clearings, disturbed places in forests used for temporary storage of logs, usually disused stone quarries, railway embankments and stations, yards of industrial and agricultural facilities, and gardens, often in sites that are at least partly shaded. It is most frequently found on humid to wet soils regardless of their pH and nutrient content, but at least in shaded places it is able to also grow on rather dry soils. The earliest record of *E. adenocaulon* from the Czech Republic dates to 1926 (near the town of Lázně Bělohrad in eastern Bohemia) but there is some doubt about the actual year of its collection; interestingly, further records followed only in the late 1950s. This species is now widespread all over this country from the lowlands up to the mountains, and there are numerous records from elevations over 1400 m, including the top of Mt Sněžka. *Epilobium adenocaulon* is particularly common at middle elevations in areas with humid climates, and in some parts of this country it is the most common species of the genus. In contrast, it is only rare in or absent from deforested and rather dry areas in the lowlands. However, even in these areas some of the gaps on the map probably represent under-recording. *Epilobium adenocaulon* readily hybridizes with most of the co-occurring native species and is often confused with some of them, most frequently *E. montanum*; some of the undocumented records may therefore refer to the latter. *Epilobium adenocaulon* is classified as a naturalized neophyte (Pyšek et al. 2012).

Epilobium alpestre (Fig. 22)

Epilobium alpestre has a discontinuous distribution in rather high mountain ranges of central and southern Europe, including the Pyrenees, Massif Central, Vosges Mts, Jura Mts, Schwarzwald Mts, Krušné hory Mts, Sudetes, Carpathians and mountains of the

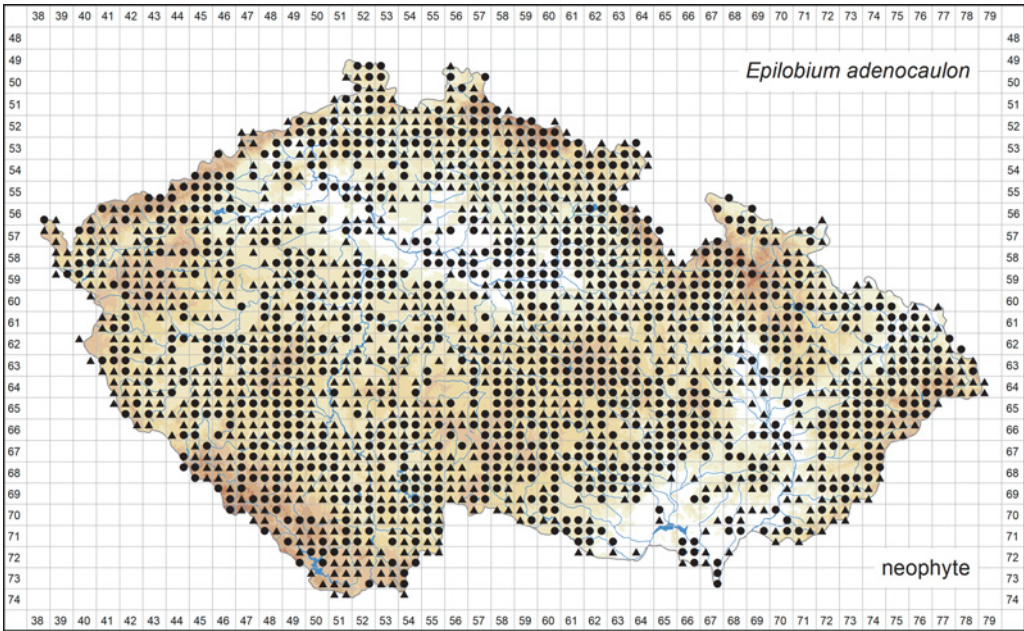


Fig. 21. – Distribution of *Epilobium adenocaulon* in the Czech Republic: ● occurrence documented by herbarium specimens (960 quadrants), ▲ occurrence based on other records (975 quadrants). Prepared by Jiří Danihelka.

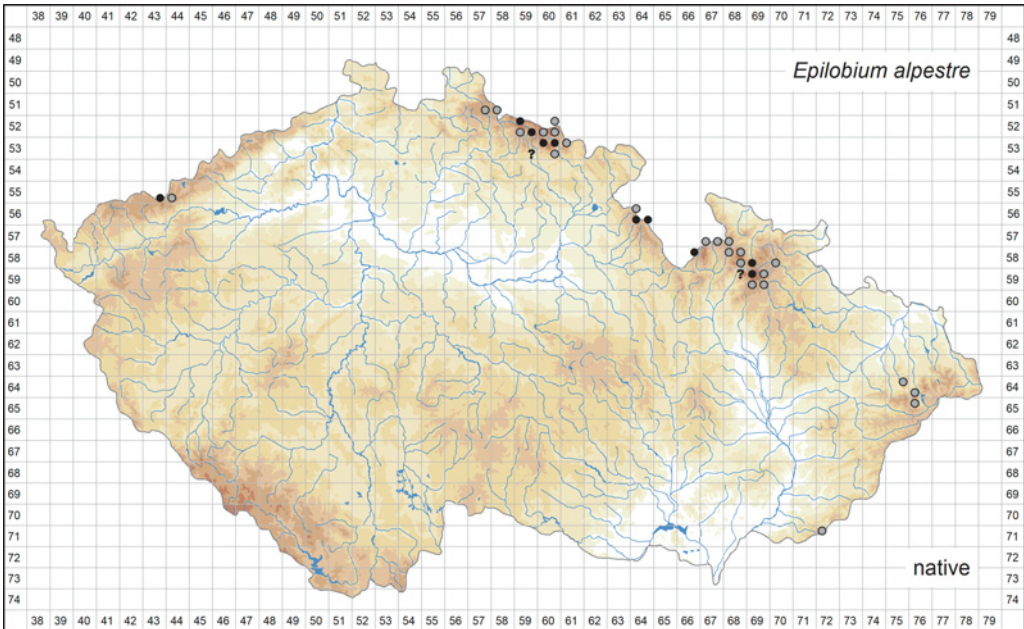


Fig. 22. – Distribution of *Epilobium alpestre* in the Czech Republic: ● at least one record in 2000–2018 (10 quadrants), ● pre 2000 records only (24 quadrants). Prepared by Jiří Danihelka.

Balkan Peninsula except Greece; it is also found in the Caucasus Mts (Smejkal 1997, Raab-Straube 2018). In the Czech Republic *E. alpestre* occurs mainly in tall-forb communities, on banks of mountain streams, on humid screes, in forest ravines and gaps, and in subalpine scrub. It prefers humid soils, usually nutrient- and probably also base-rich. This species' distribution in the Czech Republic is confined to the Krušné hory Mts, high Sudetes, Orlické hory Mts, Mt Ondřejník in north-eastern Moravia, the Moravskoslezské Beskydy Mts and Mt Velká Javořina in the Bílé Karpaty Mts. Most of the records are from elevations above 1000 m, with a maximum at 1430 m on Mt Petrovy kameny in the Hrubý Jeseník Mts; however, this species sometimes spreads along rivers and streams to lower elevations, and it occurs as low as 630 m a.s.l. on the bank of the Úpa river upstream of the village of Temný Důl in the Krkonoše Mts. *Epilobium alpestre* is occasionally confused with aberrant specimens of *E. montanum* having leaves in whorls of three, and also hybrids of the two species are sometimes found. Recent records are probably lacking from the Jizerské hory Mts, Mt Králický Sněžník, Mt Ondřejník, Moravskoslezské Beskydy Mts and Mt Velká Javořina, while elsewhere this species' populations seem to be more or less stable. *Epilobium alpestre* is classified as vulnerable (Grulich 2012).

Epilobium alsinifolium (Fig. 23)

Epilobium alsinifolium is a European species with one outpost in Greenland. It occurs in northern Europe including Iceland, northern Great Britain, northern Scandinavia and north-western European Russia. It is also found in high mountain ranges of central and southern Europe including the Pyrenees, Alps, Sudetes, Carpathians and mountains of the Balkan Peninsula (Meusel et al. 1978, Snogerup 2010). In the Czech Republic *E. alsinifolium* is found mainly in meadow springs and on the banks of mountain streams and less frequently in forest springs and gaps or on humid screes. The soils are permanently humid to wet, neutral to moderately acidic. This species' distribution in this country is confined to the high Sudetes (including the Rýchory ridge) and the Šumava Mts, where it has been recorded at four sites. Most of the populations are situated at elevations above 1000 m, with maxima at 1400–1440 m; however, it also rarely occurs on the banks of rivers and streams at lower elevations, with a minimum recorded at 630 m on the bank of the Úpa river upstream of the village of Temný Důl in the Krkonoše Mts. *Epilobium alsinifolium* is classified as vulnerable (Grulich 2012) probably because of its scarcity, but most of its populations seem stable.

Epilobium anagallidifolium (Fig. 24)

Epilobium anagallidifolium is an arctic-alpine circumpolar species with a fairly discontinuous distribution mainly in the arctic regions of North America and Eurasia, in northern Great Britain, the mountains of central and southern Europe, the Caucasus Mts and the mountains of southern Siberia and central Asia (Meusel et al. 1978, Snogerup 2010). In the Czech Republic *E. anagallidifolium* occurs in springs in mountain meadows, on the banks of mountain streams and in crevices of moist rocks on substrates that are permanently wet and neutral to moderately acidic. Its distribution in this country is limited to the central part of the Krkonoše Mts and the highest part of the Hrubý Jeseník Mts. It also occurred at two or three sites in the Šumava Mts but the last time it was collected from

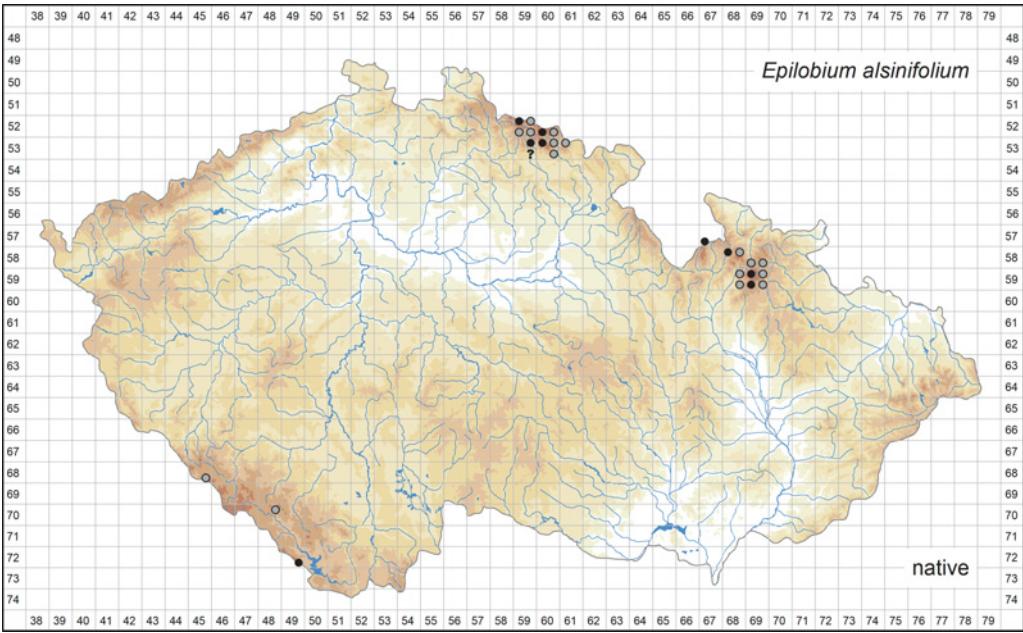


Fig. 23. – Distribution of *Epilobium alsinifolium* in the Czech Republic: ● at least one record in 2000–2018 (9 quadrants), ○ pre 2000 records only (16 quadrants). Prepared by Jiří Danihelka.

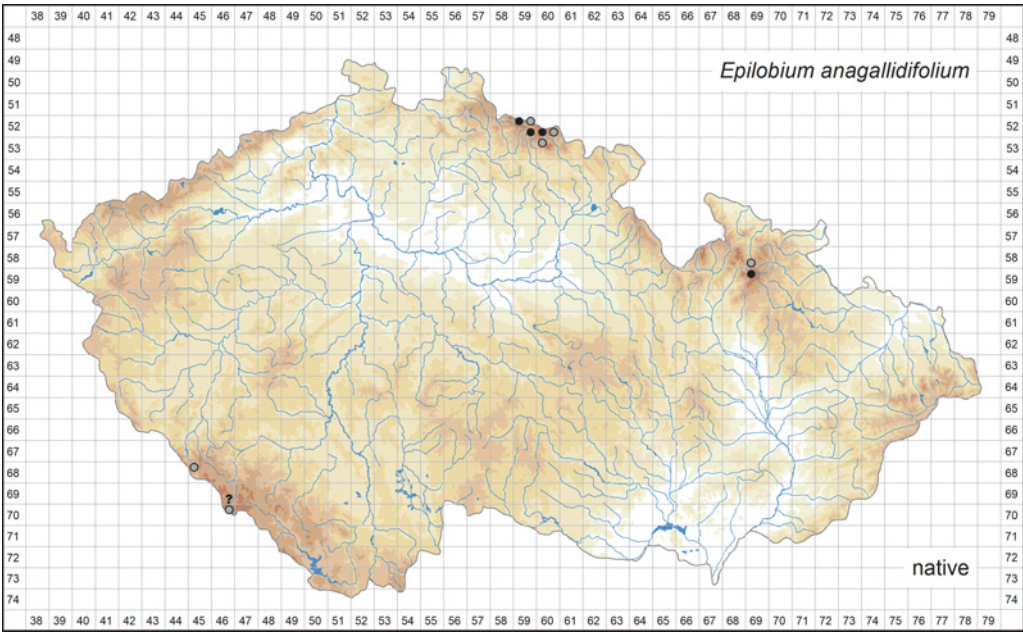


Fig. 24. – Distribution of *Epilobium anagallidifolium* in the Czech Republic: ● at least one record in 2000–2018 (4 quadrants), ○ pre 2000 records only (6 quadrants). Prepared by Jiří Danihelka.

there was in 1914. Most localities are situated above timberline, but there are also a few records from open habitats in the upper montane belt, with an absolute minimum at 700–900 m a.s.l. below the village of Malá Úpa in the Krkonoše Mts. This species is classified as endangered due to its rarity (Grulich 2012).

Epilobium angustifolium (Fig. 25)

Epilobium angustifolium is a circumboreal species continuously distributed in boreal zones in Eurasia and North America, the Caucasus Mts, south-western Asia and the mountains of central Asia (Meusel et al. 1978). In Europe it is absent only from large parts of the Iberian Peninsula, the islands in the Mediterranean Sea and the southernmost part of the Balkan Peninsula. In the Czech Republic *E. angustifolium* occurs mainly in forest clearings, most frequently after logging of stands of Norway spruce, in forest gaps and fringes, montane tall-forb communities, on screes, in disused stone quarries, on railway embankments and on ruins of houses and industrial facilities. The soils are usually rich in nitrogen from decomposing litter and at least moderately humid. This species is widespread all over this country from the lowlands up to the mountains, being most common at middle and rather high elevations. Still, it is rare in or even absent from some warm and dry and largely deforested areas in central Bohemia and central and southern Moravia. However, even in those areas some gaps on the map are due to lack of records, and *E. angustifolium* may occur in such places at least temporarily due to its efficient long-distance dispersal by wind.

Epilobium brachycarpum (Fig. 26)

Epilobium brachycarpum is native to North America, namely the western part of the USA and southern provinces of Canada. It has been introduced into Argentina and quite recently also to New Zealand. It has become naturalized also in Europe, namely in northern Spain, France and Germany, and there is also a record from southern England (Gregor et al. 2013). It is a tall, annual species with a ruderal strategy, in its native range growing in open disturbed woodlands, grasslands, on roadsides and screes, and as a weed in vineyards and olive and grapefruit plantations. It was first recorded in Germany in 1994 near the town of Kirchheimbolanden in Rhineland-Palatinate, and since then it has spread over a large part of that state and since 2002 also in northern Bavaria (Gregor et al. 2013). In 2016 it was found at four sites in the surroundings of the town of Sokolov in western Bohemia (Salák & Hadínek 2017). All these records are from railway stations and railway tracks, which is also a frequent habitat of *E. brachycarpum* in Germany (Gregor et al. 2013). Further spread is very likely, but for the time being this species is best classified as a casual neophyte of the Czech flora.

Epilobium collinum (Fig. 27)

Epilobium collinum is a European species whose distribution area consists of two major parts. In the north it is found in Iceland, Scandinavia, the Baltic countries, and the north-western and central parts of European Russia. The southern part of its range extends from the Pyrenees in the west to the Carpathians in the east, in the north reaching central Germany and in the south northernmost Italy; there are some outposts in the Iberian Peninsula, the

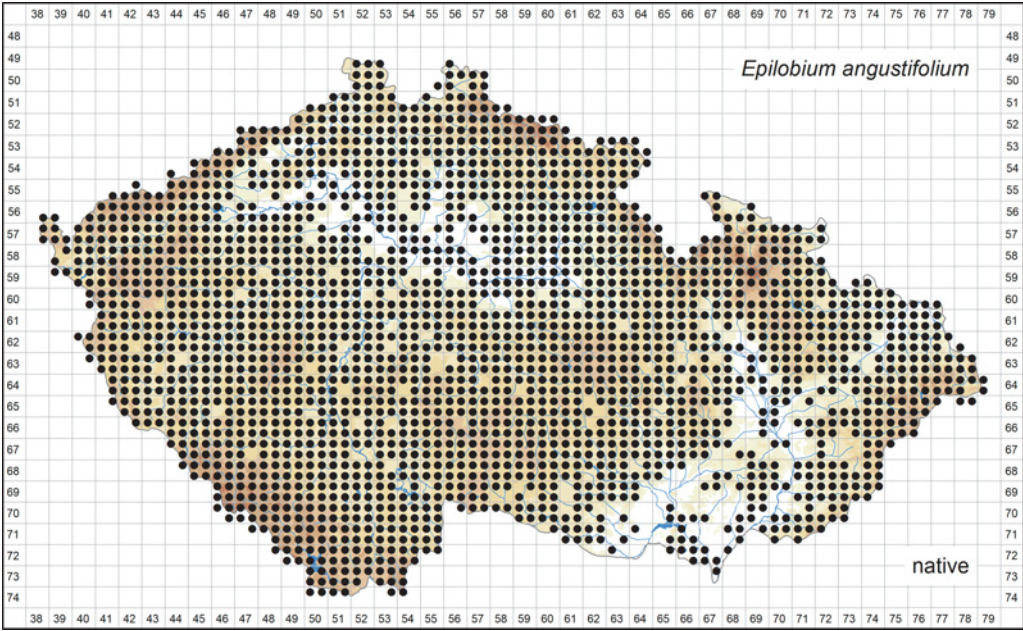


Fig. 25. – Distribution of *Epilobium angustifolium* in the Czech Republic (2187 occupied quadrants). Prepared by Jiří Danihelka.

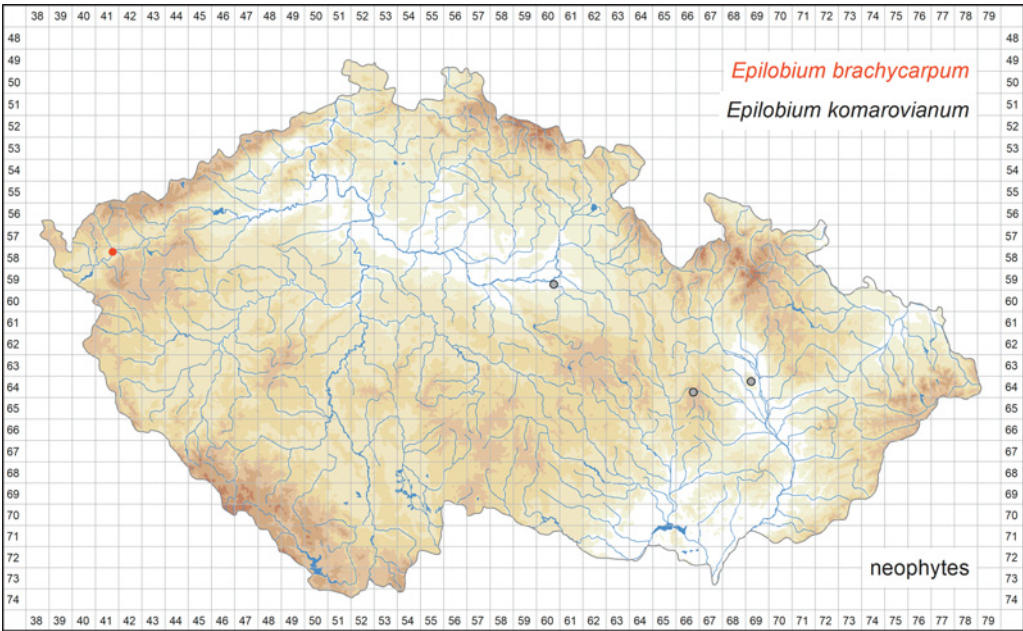


Fig. 26. – Distribution of *Epilobium brachycarpum* (1 occupied quadrant) and *E. komarovianum* (● pre 2000 records only: 3 quadrants) in the Czech Republic. Prepared by Jiří Danihelka.

Apennines and the mountains of the Balkan Peninsula (Meusel et al. 1978). In the Czech Republic *E. collinum* occurs in stony and grassy slopes, often in river valleys, on screes, in roadcuts, forest margins and clearings, on stone piles and rock outcrops in arable fields, in disused stone quarries, on walls, in railway stations and on railway embankments. The soils are rather dry and permeable, often gravelly or stony and poor in nutrients, at least at low elevations usually on acidic bedrock. *Epilobium collinum* is found all over this country mainly at middle and high elevations, being rather common in the mountains. In contrast, it is absent from the dry and warm lowlands and hilly, largely deforested areas of north-western, central and eastern Bohemia, and northern, central and southern Moravia, especially if warm and dry climates are combined with base- and nutrient-rich soils. However, even in these areas *E. collinum* sometimes occurs due to long-distance dispersal by wind. Though it is morphologically distinct and easily distinguishable from *E. montanum* by the fruit indumentum lacking erectopate glandular hairs, many undocumented records may be erroneous, based on misidentification of the latter.

Epilobium dodonaei (Fig. 28)

Epilobium dodonaei has a disjunct distribution in and around the rather high mountain ranges of western, central and south-eastern Europe, the Caucasus Mts and Anatolia. In Europe it extends to the Pyrenees in the west, the Carpathians in the east, southern Germany and southern Poland in the north, and central Italy and mountains of Greece in the south (Meusel et al. 1978, Slavík 1986). Stony, gravelly and sandy river deposits are considered as the natural habitats of this species in the Czech Republic. However, it readily colonizes stone quarries, sand and gravel pits, railway and roadcuts with rock outcrops, railway embankments, spoil heaps and other similar man-made, always open and sun-exposed habitats. The soils are gravelly or sandy, always permeable, poor in nitrogen and usually rich in calcium (Slavík 1986). In this country *E. dodonaei* is probably native to gravel bars in riverbeds in north-eastern Moravia and adjacent Silesia. However, since the turn of the 19th century it has colonized many suitable man-made habitats in that area and elsewhere in this country. Still, most of the records are concentrated in the eastern half of the Czech Republic, while in the west large sustainable populations have been known only from disused stone quarries in the karst area of Český kras. Further spread is likely to occur both naturally by wind and via transportation of gravel from stone quarries where this species occurs.

Epilobium hirsutum (Fig. 29)

Epilobium hirsutum is native to the temperate zone in Europe, northern Africa, Macaronesia and western Asia. It has been introduced into other parts of the world, including eastern Africa, south-eastern Asia and North America, where it has become naturalized both in the eastern and western USA and in the adjacent provinces of Canada (Raven 1967, Meusel et al. 1978, USDA, NRCS 2018). In the Czech Republic *E. hirsutum* occurs mainly on shores and exposed bottoms of fishponds and other water reservoirs, often in reed beds, on banks of rivers and streams, along ditches in meadows and in roadsides, on humid and wet waste ground, in wet depressions on arable land and in yards of agricultural and industrial facilities, usually in sunny or partly shaded places. The soils are

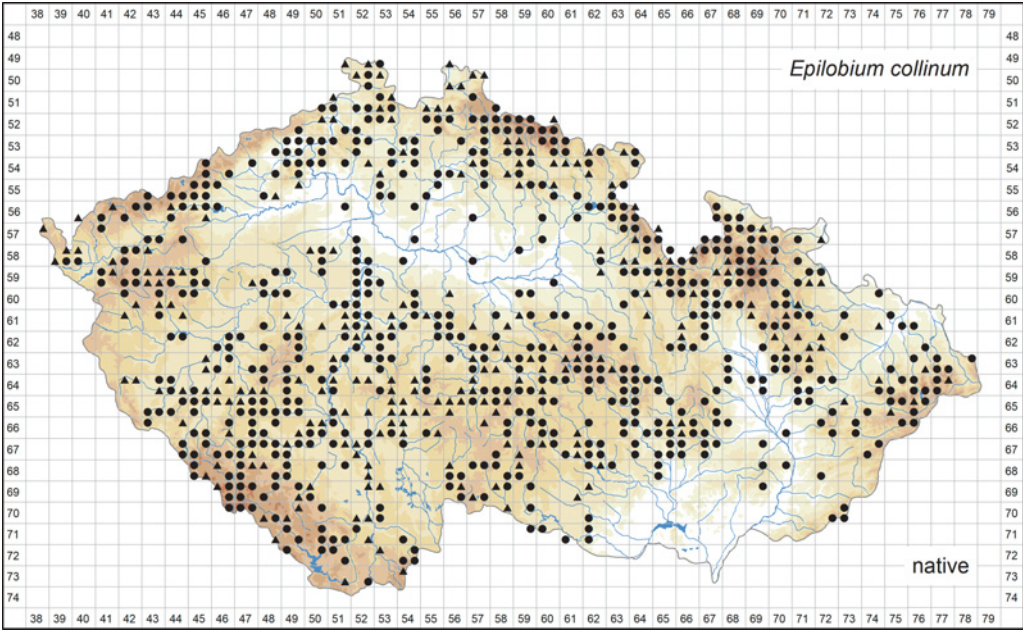


Fig. 27. – Distribution of *Epilobium collinum* in the Czech Republic: ● occurrence documented by herbarium specimens (594 quadrants), ▲ occurrence based on other records (239 quadrants). Prepared by Jiří Danihelka.

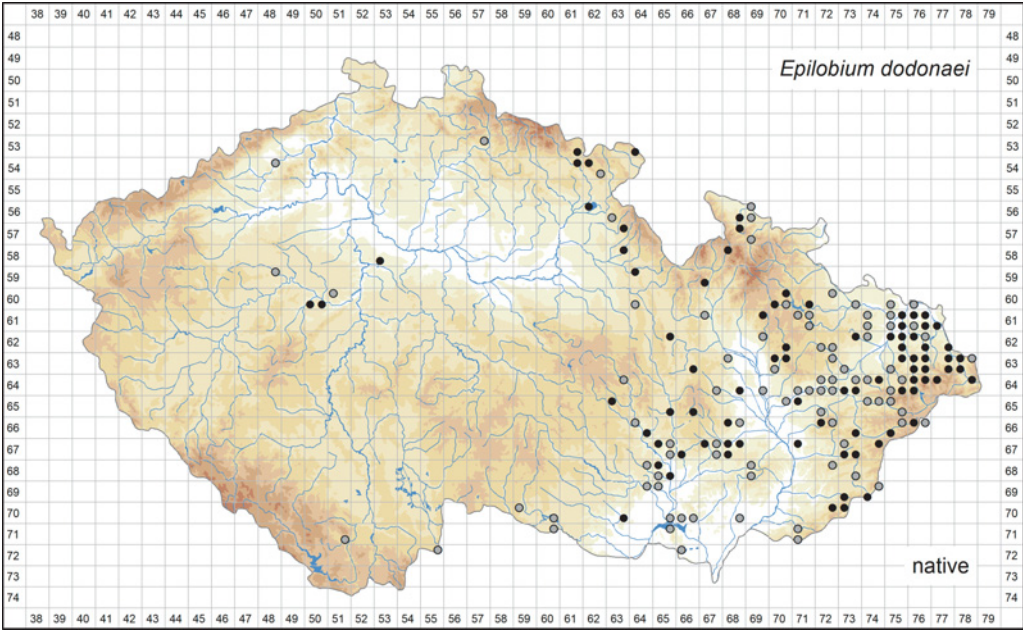


Fig. 28. – Distribution of *Epilobium dodonaei* in the Czech Republic: ● at least one record in 2000–2018 (83 quadrants), ● pre 2000 records only (86 quadrants). Prepared by Jiří Danihelka.

usually humid or wet, and may be rich or poor in nutrients. *Epilobium hirsutum* is a wide-spread species in this country, occurring in the lowlands and at middle elevations up to about 600 m. It becomes progressively rarer with increasing elevation, but there are numerous records from elevations up to 1100 m, particularly in the Krkonoše Mts, although most of them may represent temporary introductions. This species is particularly common in areas with rather humid climates, fishponds and wetlands. The gaps on the map in dry and warm lowlands with prevailing arable land are partly true absences due to lack of suitable habitats and partly due to under-recording. This species is easy to identify, and only a few undocumented records may be based on misidentified specimens of *E. parviflorum*. Hybrids with other *Epilobium* species are rather rare.

Epilobium komarovianum (Fig. 26)

Epilobium komarovianum is a small procumbent species native to New Zealand. It is a member of a taxonomically difficult group, of which *E. brunnescens* and *E. pendunculare* also were grown ornamentally in European gardens. All three species have repeatedly escaped from cultivation and are at least locally established in some countries of western, north-western and northern Europe (Snogerup 2010, Raab-Straube 2018). Of the three species, only *E. komarovianum* has been found in the Czech Republic. There is one instance of collection dating from 1931 of plants cultivated in the town of Rýmařov (Holub 1978), and three records of plants that escaped from cultivation but were still confined to particular gardens, twice in an ornamental garden and once in a botanical garden. At all three places this species was cultivated and escaped, behaving as a garden weed. *Epilobium komarovianum* is therefore classified as a casual neophyte (Pyšek et al. 2012).

Epilobium lamyi (Fig. 30)

Epilobium lamyi is a member of the *E. tetragonum* agg., together with *E. tetragonum* and the Mediterranean *E. tournefortii*. *Epilobium lamyi* and *E. tetragonum* are quite similar but can usually be separated well based on the indumentum of the middle and lower cauline leaves, which are hairy on the midrib on the underside and also on the margins in *E. lamyi*, and glabrous or almost so in *E. tetragonum*. Based on this main character, more specimens of the *E. tetragonum* agg. were assigned to *E. lamyi* than would be the case using the characters considered diagnostic in the Flora of the Czech Republic (Smejkal 1997). The general distribution of *E. lamyi* is imperfectly known due to confusion with *E. tetragonum*, but it with certainty occurs in most of western, central and south-eastern Europe, including the British Isles and southern Scandinavia. It is also found in the Caucasus Mts and Anatolia, and probably also in Morocco in north-western Africa (Hultén & Fries 1986, Raab-Straube 2018). In the Czech Republic *E. lamyi* occurs in moderately disturbed habitats such as roadsides, wet depressions and margins of arable fields, abandoned fields, disused stone quarries, alluvial meadows, dams and exposed margins of fishponds, railway embankments and stations, ruins of structures and waste ground. The soils are usually rather dry (drier than those favoured by *E. tetragonum*), at least later in the season, and moderately rich in nutrients. *Epilobium lamyi* is rather widespread in this country at low and middle elevations, being locally common to rare. However, it is difficult to say whether the areas with almost continuous distribution, such as in north-western, eastern and southern Bohemia, on the one hand, and gaps, such south-west and

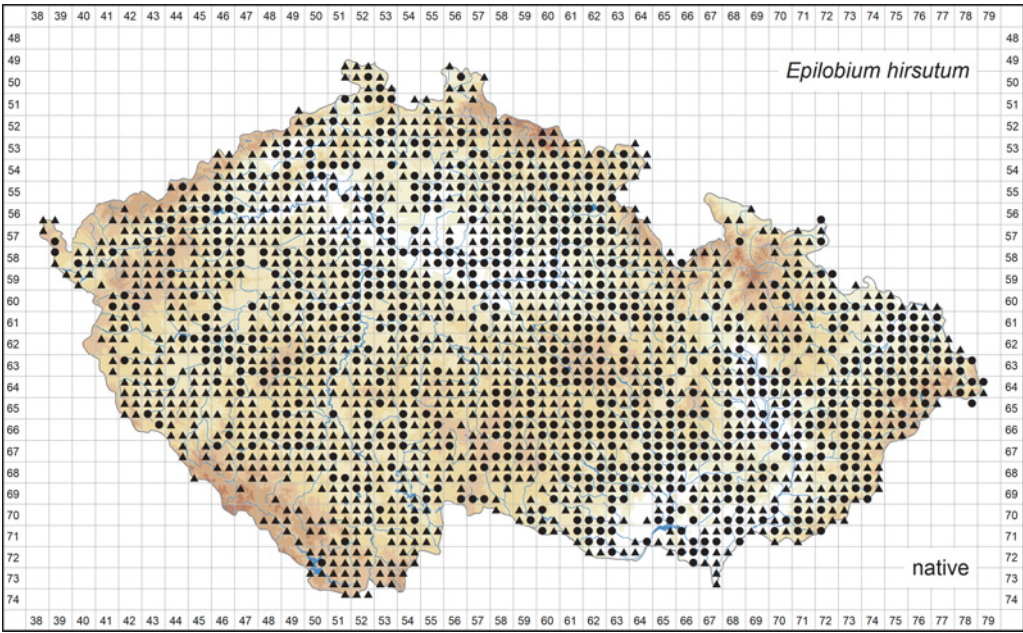


Fig. 29. – Distribution of *Epilobium hirsutum* in the Czech Republic: ● occurrence documented by herbarium specimens (726 quadrants), ▲ occurrence based on other records (1262 quadrants). Prepared by Jiří Danihelka.

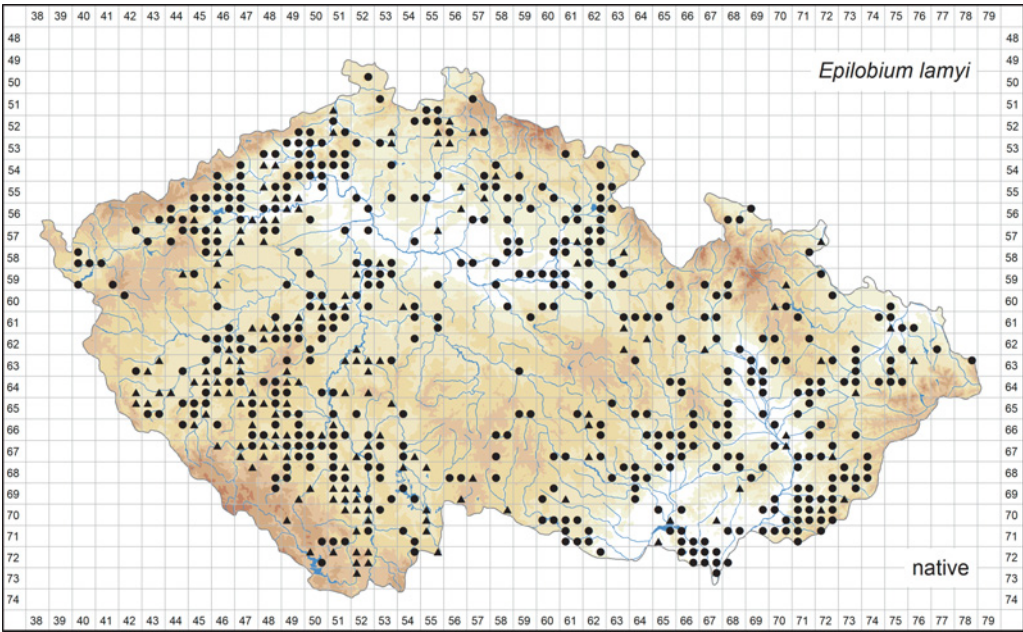


Fig. 30. – Distribution of *Epilobium lamyi* in the Czech Republic: ● occurrence documented by herbarium specimens (463 quadrants), ▲ occurrence based on other records (157 quadrants). Prepared by Jiří Danihelka.

south-east of Brno, on the other hand, reflect different sampling efforts, or the species' actual distribution. Still, this species is very rare in or absent from the mountains and large parts of the Českomoravská vrchovina highlands. Further, many undocumented records may be based on misidentified specimens of *E. tetragonum*, *E. obscurum* and even of *E. adeno-caulon*. Due to frequent misidentifications, the map is based on examined herbarium specimens and field records by botanists reasonably familiar with the genus. This species is probably more widespread than indicated by the map, but reliable records are lacking.

Epilobium lanceolatum (Fig. 31)

Epilobium lanceolatum is native to western, central and south-eastern Europe, including the whole European Mediterranean area; it is also found in the Caucasus Mts, Cyprus, Anatolia and the adjacent parts of westernmost Asia, and there are isolated occurrences in the Atlas Mts in Algeria in northern Africa (Meusel et al. 1978). The localities in the south-eastern Czech Republic are situated at the northern limit of the total species' distribution. In this country *E. lanceolatum* occurs on screes and in openings in thermophilous oak forests and rather dry oak-hornbeam forests. Most of the sites are situated on slopes of river valleys. The soils are stony or gravelly, dry in the summer and probably poor in nutrients and calcium (Smejkal 1997). *Epilobium lanceolatum* was repeatedly collected in the 1880s–1920s at three sites in the Dyje river valley west of the town of Znojmo. From the 1880s to the 1950s it was found at five sites in the city of Brno and its broader surroundings, with single instances of collection from each site. Consequently, this species was classified as extirpated (Grulich 2012). Surprisingly, however, a small population of *E. lanceolatum* was discovered by J. Hruban in the valley of the Oslava river south-west of the village of Ketkovice in south-western Moravia in 2016, and the population has been monitored since then. *Epilobium lanceolatum* may be easily overlooked due to confusion with *E. collinum* and *E. montanum*, but targeted search may result in discovery of further populations elsewhere in south-western Moravia. There are also two records from Bohemia, both based on undated specimens from the 19th century, one from the vicinity of the city of Karlovy Vary in western Bohemia and another from Mt Ralsko in northern Bohemia. If the plants were not mislabelled, these records may represent results of long-distance dispersal; the closest occurrences (no longer extant) were in the eastern part of the Erzgebirge Mts in Saxony (Hardtke & Ihl 2000). In addition to these, there are two records from southern Bohemia (Houfek 1951), both of which are erroneous, based on poorly developed specimens of *E. montanum* affected by a virus or fungal infection.

Epilobium montanum (Fig. 32)

Epilobium montanum is native to most of Europe apart from northernmost Scandinavia, northern and south-eastern European Russia, and some parts of the Mediterranean area. It is also found in the Caucasus Mts, Anatolia, southern Siberia and Japan (Meusel et al. 1978, Hultén & Fries 1986). It has been introduced into Canada (USDA, NRCS 2018). In the Czech Republic *E. montanum* occurs in various types of forests, their openings and fringes, along forest roads, in scrub, gardens, along walls, in railway stations, on railway embankments, in yards of industrial facilities and in other somewhat ruderalized and at least partly shaded places. The soils are humid to moderately dry, usually rich in nutrients.

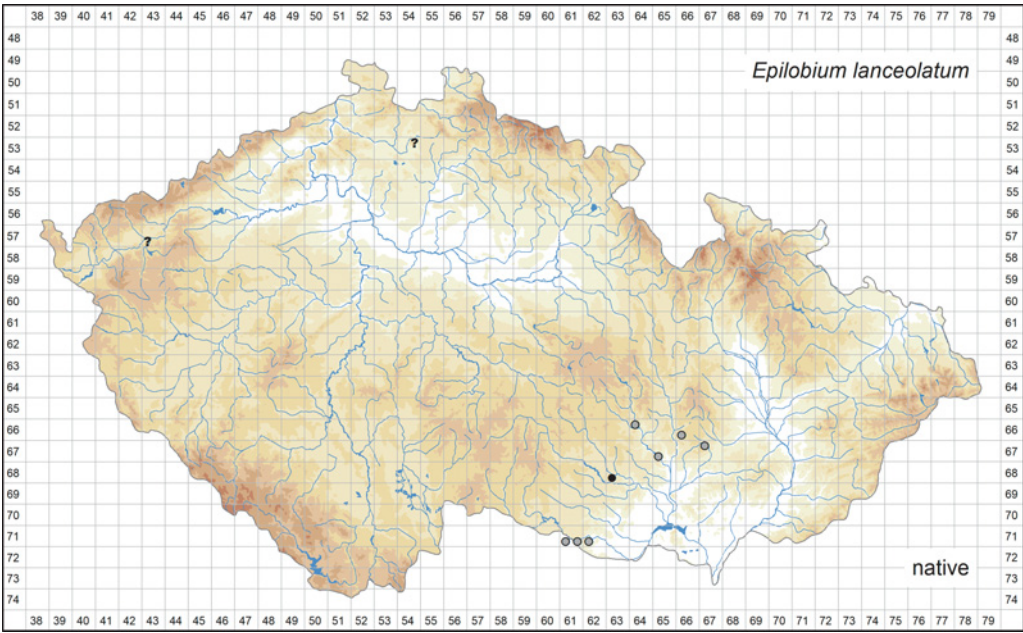


Fig. 31. – Distribution of *Epilobium lanceolatum* in the Czech Republic: ● at least one record in 2000–2018 (1 quadrant), ○ pre 2000 records only (7 quadrants). Prepared by Jiří Danihelka.

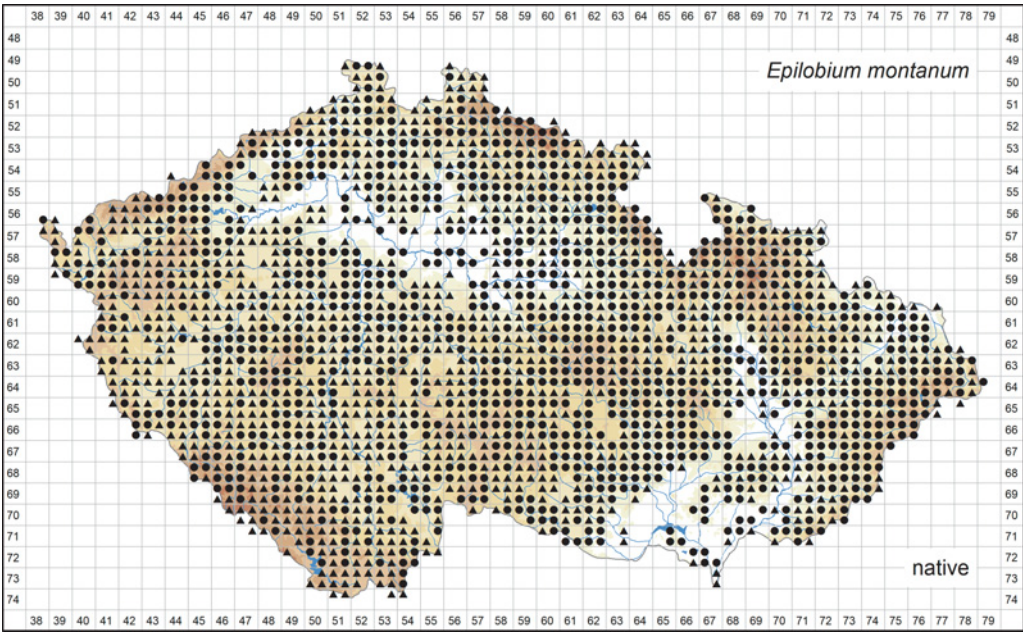


Fig. 32. – Distribution of *Epilobium montanum* in the Czech Republic: ● occurrence documented by herbarium specimens (1131 quadrants), ▲ occurrence based on other records (999 quadrants). Prepared by Jiří Danihelka.

It is the most widespread species of *Epilobium* in the Czech flora, occurring from the lowlands up to the mountains. It is only rare in or absent from warm and dry areas of central Bohemia and central and southern Moravia with prevailing arable land. However, even there it may occur temporarily due to long-distance seed dispersal by wind. *Epilobium hypericifolium*, a variant of *E. montanum* with entire leaves, was collected in the 19th century at two sites in northern Bohemia and cultivated in the university botanical garden in Prague. In contrast to Smejkal (1997), it is not recognized here as a species or subspecies of its own.

Epilobium nutans (Fig. 33)

Epilobium nutans is a European species distributed in the high mountains of western, central and eastern Europe from the Pyrenees in the west to the Eastern Carpathians in the east and from the Sudetes in the north to the Alps in the south. It is also reported to occur in Bulgaria and Macedonia (Smejkal 1997, Raab-Staube 2018). In the Czech Republic *E. nutans* grows in mountain meadow springs, on the banks of mountain streams and on wet rocks, and in the upper montane belt also in forest springs (Smejkal 1997). The soils are humid to permanently wet, usually poor in nutrients and acidic. *Epilobium nutans* occurs in this country in the Šumava Mts, Krušné hory Mts, Jizerské hory Mts, Krkonoše Mts, Orlické hory Mts, Mt Králický Sněžník, the Hrubý Jeseník Mts and the Moravskoslezské Beskydy Mts; however, there are recent records only from the Šumava Mts, Krkonoše Mts and Hrubý Jeseník Mts. The reported occurrence in the Žďárské vrchy hills, repeatedly mentioned in various sources, including the latest national flora (Smejkal 1997), is not documented by a herbarium specimen and seems to be erroneous; it is probably based on a carelessly cited late 19th-century record of *E. obscurum*. Most records are from the upper montane and subalpine belts up to elevations of around 1400 m; however, this species rarely occurred also at lower elevations at about 800 m, but these populations no longer exist. It is often confused with *E. alsinifolium*, *E. anagallidifolium* and particularly with dwarfish specimens of *E. palustre*; many undocumented records may therefore be erroneous. *Epilobium nutans* has always been rare in the Czech Republic. It has also declined considerably, probably due to direct destruction of its habitats by drainage and recently due to eutrophication and succession. For both reasons, it is classified as endangered (Grulich 2012).

Epilobium obscurum (Fig. 34)

Epilobium obscurum is mainly a western- and central-European species present also in the British Isles and southern Scandinavia, in the west extending to the mountains of the Iberian Peninsula, in the east the Eastern Carpathians, and in the south the southern Alps and the mountains of the Balkan Peninsula. A few outposts are reported from Anatolia, northern Africa, Madeira and the Canary Islands (Raven 1967, Hultén & Fries 1986, Raab-Straube 2018), but some of the outlying records are uncertain. In the Czech Republic *E. obscurum* occurs in meadow and forest ditches, other wet places in meadows, on the shores of fishponds and their exposed bottoms, in wet forest clearings, disused stone quarries and clay pits, roadsides, less frequently also on humid waste ground and in railway stations. Soils are permanently wet and moderately rich to poor in nutrients. *Epilobium obscurum* is rather widespread in this country, being fairly common at middle

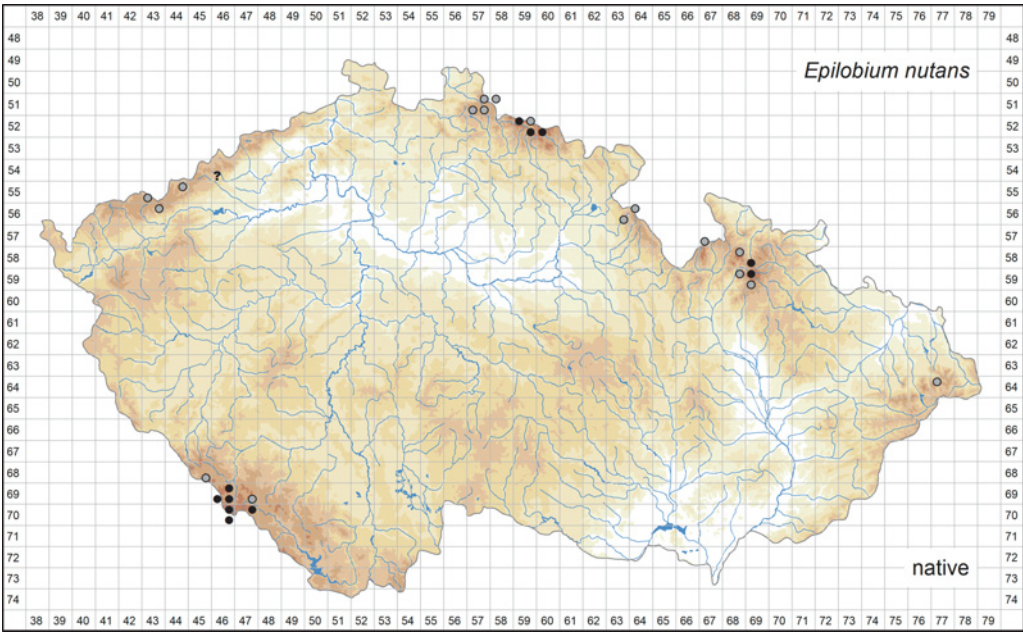


Fig. 33. – Distribution of *Epilobium nutans* in the Czech Republic: ● at least one record in 2000–2018 (11 quadrants), ○ pre 2000 records only (17 quadrants). Prepared by Jiří Danihelka.

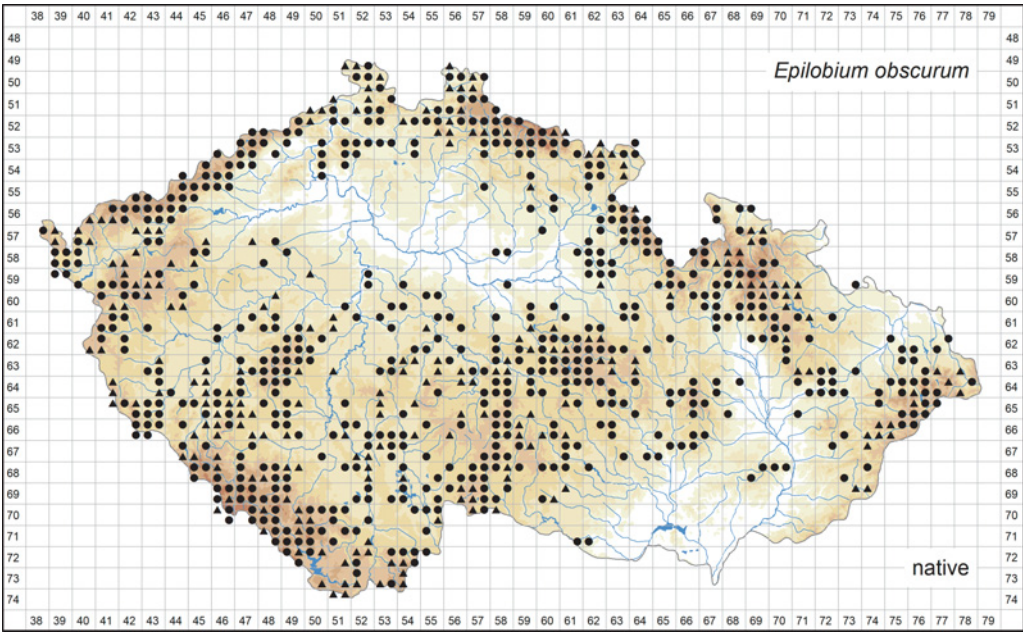


Fig. 34. – Distribution of *Epilobium obscurum* in the Czech Republic: ● occurrence documented by herbarium specimens (580 quadrants), ▲ occurrence based on other records (230 quadrants). Prepared by Jiří Danihelka.

and high elevations, ascending to about 1200 m, with an absolute maximum at about 1350 m on Mt Krállický Sněžník. In contrast, this species' occurrence in the warm and dry areas of north-western, central and eastern Bohemia, and central and southern Moravia is confined to a few sites. *Epilobium obscurum* frequently hybridizes with *E. adenocaulon*, *E. palustre* and *E. parviflorum*. It is often neglected or confused with *E. lamyi*, *E. tetragonum* and, surprisingly enough, also with *E. adenocaulon*, which makes undocumented records less reliable. *Epilobium obscurum* has declined somewhat, mainly at lower elevations, probably due to drainage and destruction of wet meadows, and it is therefore classified as vulnerable (Grulich 2012).

Epilobium palustre (Fig. 35)

Epilobium palustre is a circumboreal species, in Europe absent only from large parts of the Mediterranean area (Meusel et al. 1978, Hultén & Fries 1986). In the Czech Republic *E. palustre* occurs in fen meadows and fens, in meadow ditches and around wet depressions, on the shores of fishponds, in meadow springs and around peatbogs, less frequently also in wet places of disused stone quarries and sand pits. The habitats of *E. palustre* are sunny or partly shaded, with soils permanently wet, usually rich in organic matter, moderately acidic to acidic and poor in nitrogen and phosphorus. *Epilobium palustre* is widespread in the Czech Republic, being particularly common at middle and rather high elevations, in the mountains ascending to about 1350 m a.s.l. In contrast, it is scarce in the lowlands with warm and dry climates, and with arable land as prevailing land use, i.e. in north-western and central Bohemia, and central and southern Moravia. In addition, many of the populations once found in the lowlands no longer exist, having been destroyed by drainage and later also by abandonment of wet meadows and general eutrophication of the landscape. However, *E. palustre* survives as one of the last species typical of fen meadows even in strongly damaged meadow fragments. This species is morphologically distinct and straightforward to identify. It quite often hybridizes with *E. adenocaulon*, *E. obscurum* and *E. parviflorum*, and its dwarfish specimens are sometimes misidentified as *E. nutans*, but also undocumented records seem reasonably reliable. *Epilobium palustre* is classified as lower risk – near threatened (Grulich 2012), probably because of its local decline.

Epilobium parviflorum (Fig. 36)

Epilobium parviflorum is native to Europe and some parts of western and central Asia. In Europe it is absent only from Iceland, large parts of Scandinavia, northern and south-eastern European Russia and southern Ukraine. It additionally occurs in the Caucasus Mts and Anatolia, and scattered also in western and central Asia, as well as northern Africa (Hultén & Fries 1986). It has been introduced into North America (USDA, NRCS 2018). In the Czech Republic *E. parviflorum* occurs on the shores of fishponds and other water reservoirs, on exposed bottoms of temporarily drained fishponds, in reed beds, meadow ditches and meadow springs, and sometimes also in wet places of disused stone quarries and on humid waste ground. The soils are wet either permanently or at least early in the season, usually neutral or slightly basic, moderately rich in nutrients. *Epilobium parviflorum* is quite widespread in this country, mainly at lower and middle elevations. It is fairly frequent in landscapes with numerous fishponds, particularly on heavy Cretaceous

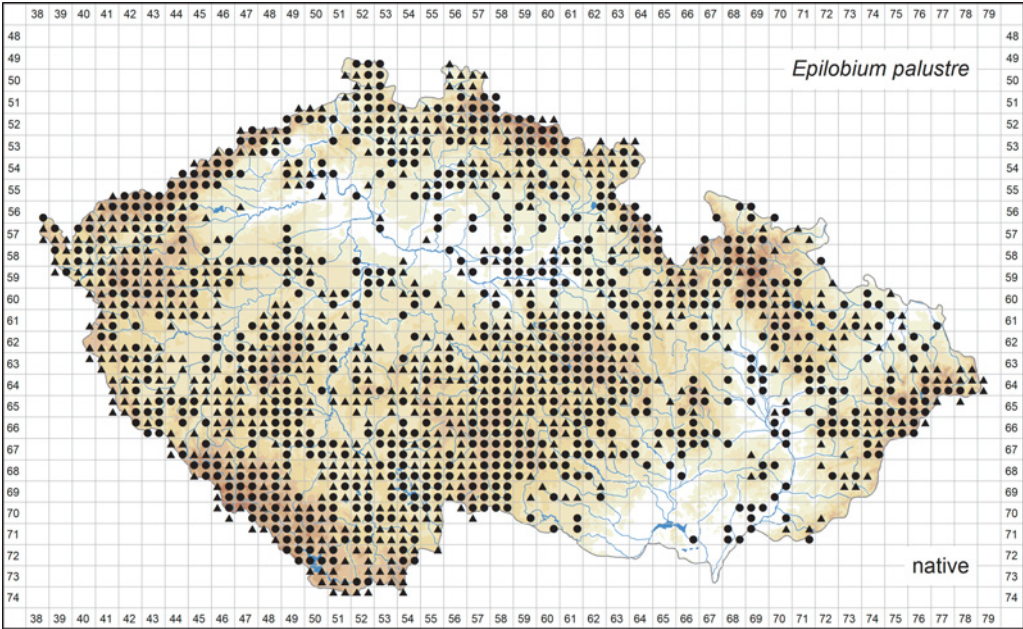


Fig. 35. – Distribution of *Epilobium palustre* in the Czech Republic: ● occurrence documented by herbarium specimens (809 quadrants), ▲ occurrence based on other records (661 quadrants). Prepared by Jiří Danihelka.

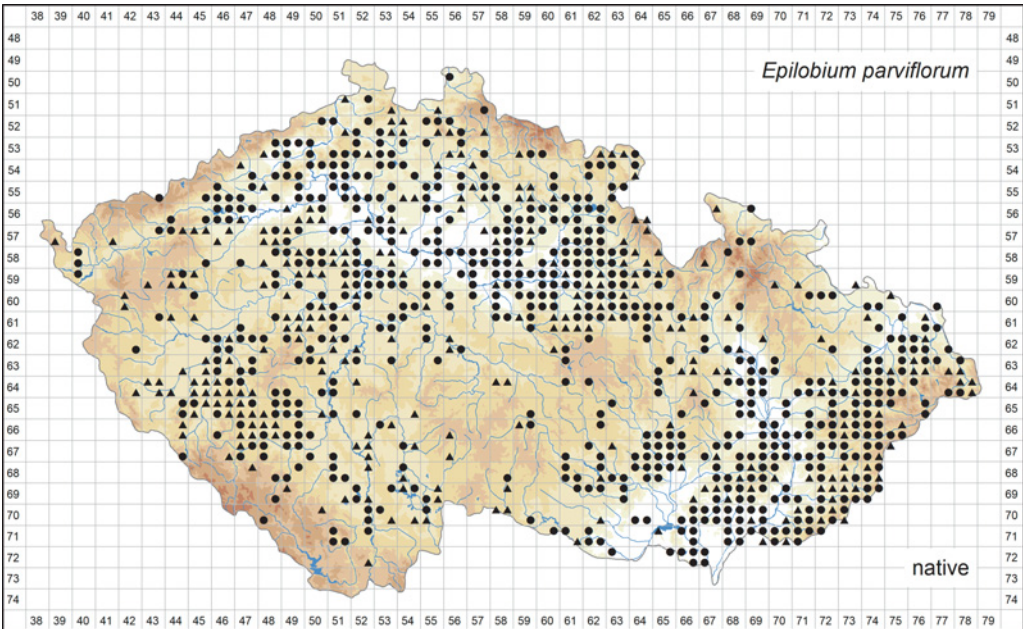


Fig. 36. – Distribution of *Epilobium parviflorum* in the Czech Republic: ● occurrence documented by herbarium specimens (635 quadrants), ▲ occurrence based on other records (284 quadrants). Prepared by Jiří Danihelka.

deposits rich in calcium, such as in central and eastern Bohemia. Most of the sites are situated at elevations up to about 600 m, and this species is progressively rarer above this elevation. It hybridizes quite often with *E. palustre* and *E. roseum*. Some of the undocumented records may actually refer to *E. montanum* or *E. hirsutum*, as indicate numerous herbarium specimens of these two species originally misidentified as *E. parviflorum*. *Epilobium parviflorum* is classified as vulnerable (Grulich 2012), probably due to its assumed decline.

Epilobium roseum (Fig. 37)

Epilobium roseum is widely distributed in Europe, western and central Asia, south-western Siberia and China, but the Asian part of this species' distribution is strongly fragmented. In Europe it is absent from the northernmost part of the continent, the Iberian Peninsula and some parts of the Mediterranean area (Hultén & Fries 1986). In the Czech Republic *E. roseum* occurs in ditches in meadows and on roadsides, on the banks of streams and rivers, on sand and gravel banks in their beds, on shores of fishponds, in parks, along walls in settlements, on humid waste ground, as a weed in gardens and in root crops, in railway stations and in other disturbed habitats. Its habitats are often partly shaded, the soils wet or humid at least early in the season, and usually rich in nutrients. *Epilobium roseum* is widespread in this country from the lowlands up to the mountains, more or less continuously up to about 750 m a.s.l. There are undocumented records from elevations up to 1300 m, particularly from the Krkonoše Mts, which may represent temporary introductions or colonizations of disturbed sites, and numerous herbarium specimens from elevations over 800 m from the Šumava Mts, Krkonoše Mts, Orlické hory Mts and Hrubý Jeseník Mts. *Epilobium roseum* is frequently confused with other species: along with 1335 examined specimens of this species there were about 194 specimens of *E. adenocaulon* and about 130 of *E. montanum* originally identified as *E. roseum*. Therefore, undocumented records may be used for mapping only with care.

Epilobium tetragonum (Fig. 38)

Epilobium tetragonum is, together with *E. lamyi*, another member of the *E. tetragonum* agg. in the Czech flora. It is native to most of Europe except its northernmost parts, to the Caucasus Mts, Anatolia, some parts of central Asia and south-western Siberia, and to northern Africa, Madeira, the Canary Islands and South Africa (Hultén & Fries 1986). In the Czech Republic *E. tetragonum* occurs mainly in wet and alluvial meadows, margins of fishponds and on their temporarily exposed bottoms, in fish storage ponds, disturbed places along reed beds, wet places in disused stone quarries, depressions on arable land, saline marshlands, on roadsides, dump waste ground, in pavement joints, railway stations and various disturbed places in settlements. The soils are usually humid to wet, at least early in the season (they are more humid than is the case with the similar *E. lamyi*), usually slightly basic to moderately acidic and rich in nutrients. *Epilobium tetragonum* is widespread in this country. It is found mainly in the lowlands and at middle elevations, while being rare in or absent from most of the mountains; the records from higher elevations, such as at about 810 m in the Krkonoše Mts and at 1050 m in the Hrubý Jeseník Mts, represent temporary introductions. This species seems to be frequent in north-western and eastern Bohemia, in the fishpond landscapes of southern Bohemia and also in the lowlands

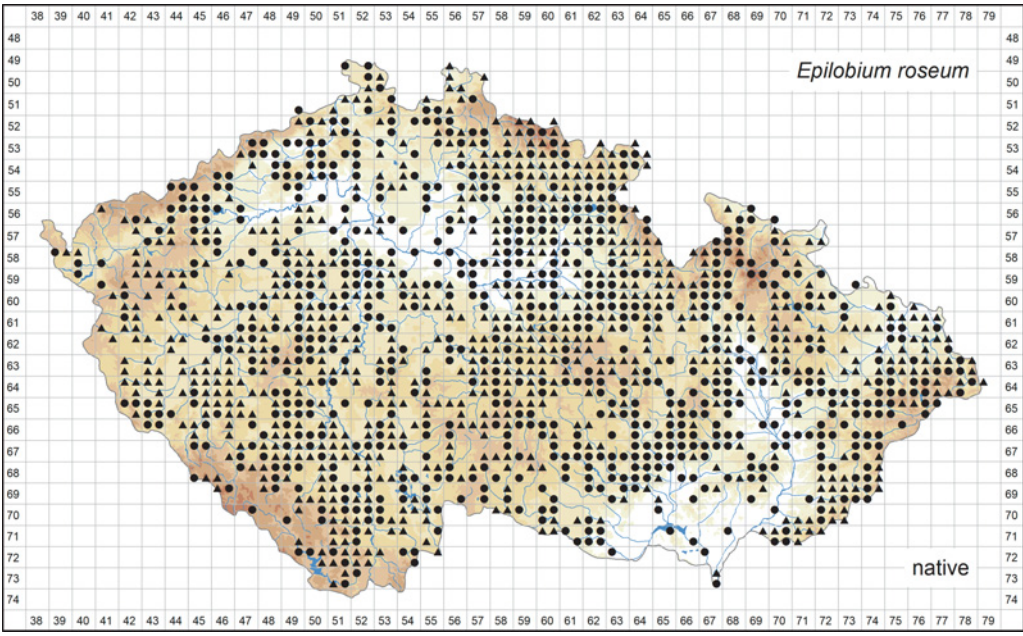


Fig. 37. – Distribution of *Epilobium roseum* in the Czech Republic: ● occurrence documented by herbarium specimens (723 quadrants), ▲ occurrence based on other records (705 quadrants). Prepared by Jiří Danihelka.

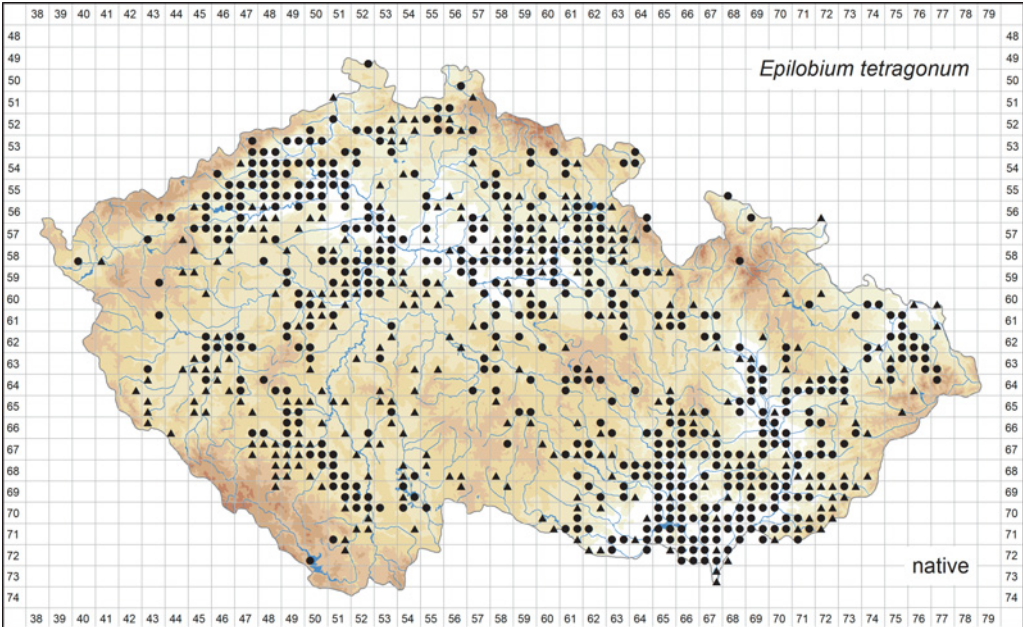


Fig. 38. – Distribution of *Epilobium tetragonum* in the Czech Republic: ● occurrence documented by herbarium specimens (511 quadrants), ▲ occurrence based on other records (289 quadrants). Prepared by Jiří Danihelka.

of Moravia; however, this may partly reflect sampling effort, while some gaps elsewhere in the lowlands are certainly due to under-recording. *Epilobium tetragonum* is frequently confused with *E. lamyi* (see that species for comments on morphological characters), *E. obscurum* and surprisingly also with *E. adenocaulon*, which renders the undocumented records rather unreliable. Due to these misidentifications, the map is based on examined herbarium specimens and field records by botanists familiar with the genus, which necessarily resulted in under-recording.

Gentianella

One of the diversity hotspots of *Gentianella* is situated in central Europe, mainly in the Alps. There are numerous species (six in the Czech Republic), but the diversity is considerably increased by the peculiar pattern of intraspecific variation: most of the species developed seasonal races, recognized as subspecies in the present text. So called “aestival races” flower in June and early July, and have a relatively simple stem with few long internodes. In contrast “autumnal races” flower from late July to September, sometimes also in October, and usually are richly branched with more numerous internodes. The variation is further complicated by the existence of annual forms (*G. campestris* subsp. *baltica* in the Czech Republic) and (outside our territory) “mountain races” not diversified by seasons. Out of twelve taxa in the Czech flora, six have been extirpated, the rest being in serious decline (Kirschner & Kirschnerová 2000). With the exception of the Alps and northern Europe, a similar situation is found in other western and central European countries, probably because of the vanishing suitable lowland habitats.

Gentianella amarella subsp. *amarella* (Fig. 39)

Gentianella amarella subsp. *amarella*, an autumn-flowering race, is one of the most widely distributed taxa of the genus, with its geographical range extending from the British Isles and northern Europe through the eastern part of central Europe to European Russia, and covering large areas in mostly temperate and boreal zones in Siberia, with its eastern limit at Lake Baikal (Meusel et al. 1978, Hultén & Fries 1986, Kirschner & Kirschnerová 2000). In the Czech Republic it grows in various types of meadows and pastures ranging from intermittently wet meadows to dry grassy slopes on basic as well as acidic bedrock. It also occurs in forest fringes, on scree slopes, in abandoned quarries and clay pits. It requires low-intensity disturbances such as grazing, mowing or soil drying, which maintain patches of bare soil necessary for seedling recruitment. It has a relatively wide distribution from the lowlands to the mountains, mainly in the northern half of the Czech Republic, and there is also a group of localities in a triangle between the towns of Strakonice, Vimperk and Sušice in southern Bohemia. Further localities are scattered in the Českomoravská vrchovina highlands and north of that area, and in eastern and south-eastern Moravia. Over 400 localities were reliably documented, but a serious decline has been observed, and since 2000 *G. a.* subsp. *amarella* has been only recorded at 68 sites. This decline is attributed to the change in farming methods (a decline of small-scale pasturing, particularly goat grazing, and general eutrophication; see Brabec 2017). It is classified as critically threatened (Grulich 2012).

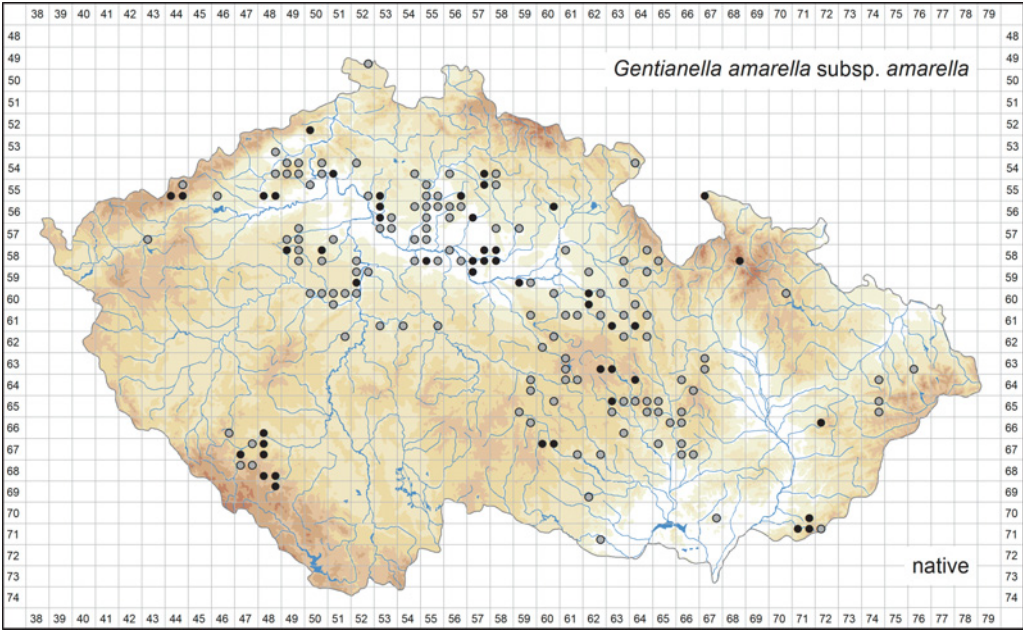


Fig. 39. – Distribution of *Gentianella amarella* subsp. *amarella* in the Czech Republic: ● at least one record in 2000–2018 (48 quadrants), ○ pre 2000 records only (126 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

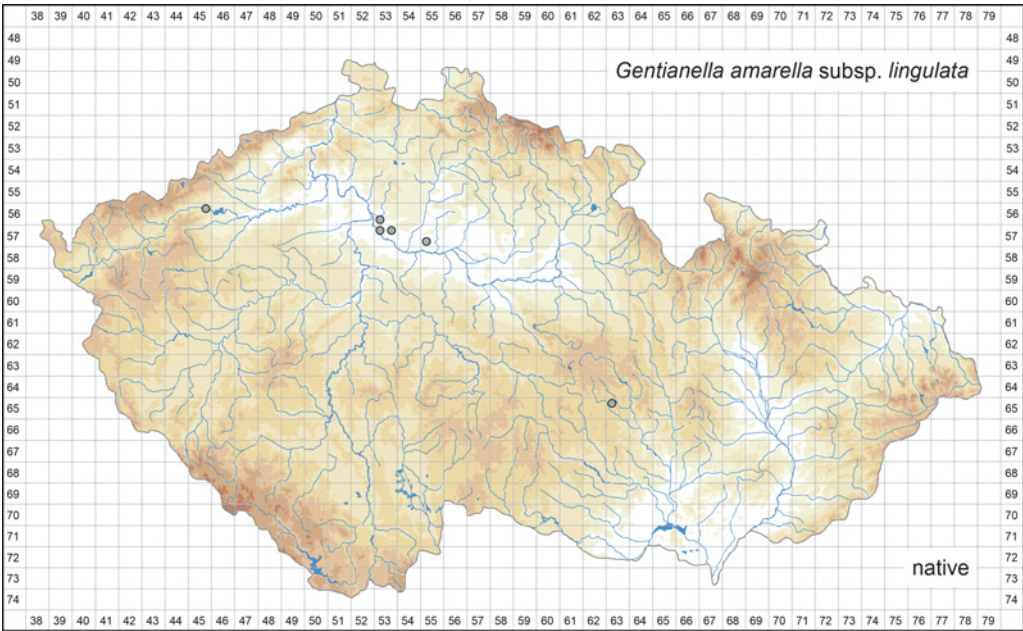


Fig. 40. – Distribution of *Gentianella amarella* subsp. *lingulata* in the Czech Republic: ● pre 2000 records only (6 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

Gentianella amarella subsp. *lingulata* (Fig. 40)

Gentianella amarella subsp. *lingulata* is an aestival, i.e. summer-flowering taxon, which is less clearly differentiated morphologically than other autumnal/aestival pairs of taxa in *Gentianella*. Its geographical range, due to frequent misidentifications and also the fact that not all regional flora accounts recognize this taxon, remains to be studied. In all likelihood, *G. a.* subsp. *lingulata* occurs in the eastern part of the Baltic area, western part of northern European Russia and in central Europe (Kirschner & Kirschnerová 2000). The occurrence in eastern European Russia and western Siberia is very probable; in fact Tzvelev (1978) reports an even wider distribution, but other taxa are probably also included in his concept of subsp. *lingulata*. In the Czech Republic *G. a.* subsp. *lingulata* used to grow mainly in wet calcareous meadows and pastures. Until recently it occurred at a single site near the village of Mělnická Vrutice in central Bohemia (now only autumnal intermediates and subsp. *amarella* are found there), after having disappeared from another five or six sites (Kadaň, the vicinity of Všetaty and Lysá nad Labem, and Strážná near Žďár nad Sázavou). It is now classified as extinct in this country (Grulich 2012).

Gentianella campestris subsp. *baltica* (Fig. 41)

Gentianella campestris subsp. *baltica* is an autumnal annual form of *G. campestris*. Its distribution range is intercalated between the central-European and Scandinavian-British distribution areas of subsp. *campestris* and extends from the Baltic countries and Poland to Germany, the Netherlands, northern France and southern England (Meusel et al. 1978, Kirschner & Kirschnerová 2000). Its occurrence in the Czech Republic represents a southern limit of its distribution range. There are only a few areas where subsp. *baltica* and subsp. *campestris* overlap geographically, and one of them is in Bohemia. *Gentianella campestris* subsp. *baltica* usually grew on mesic pastures, frequently on lime-rich substrates, but it also occurred on relatively oligotrophic sites and more humid pastures. In the Czech Republic *G. c.* subsp. *baltica* was most common in northernmost Bohemia (near the town of Šluknov and around the city of Liberec) and in the foothills of the Krkonoše Mts. In the past, there were numerous sites in western Bohemia and scattered occurrence was recorded in the Brdy hills and the Křivoklátsko area, and extended to the Orlické hory Mts in the east. The isolated occurrence in the town of Vimperk was temporary, being associated with building activities. This subspecies has nearly been extirpated from this country and survives only at three localities, namely in the Křivoklátsko area, on Mt Bukovec in the Jizerské hory Mts and in the eastern part of the Krkonoše Mts. It is therefore classified as critically threatened (Grulich 2012).

Gentianella campestris subsp. *campestris* (Fig. 42)

Gentianella campestris subsp. *campestris* is an autumnal biennial form of *G. campestris* that exhibits a relatively large but conspicuously disjunct geographical distribution. It is found in the southern and western Alps, northern Apennines and western Pyrenees; another spatially separated distribution area is north of the Danube in Bavaria, in Saxony and the adjacent parts of Bohemia (Meusel et al. 1978, Kirschner & Kirschnerová 2000). The largest part of its distribution range is situated in northern Europe (Scandinavia, northern Great Britain, Ireland and Iceland). According to the literature and herbaria,

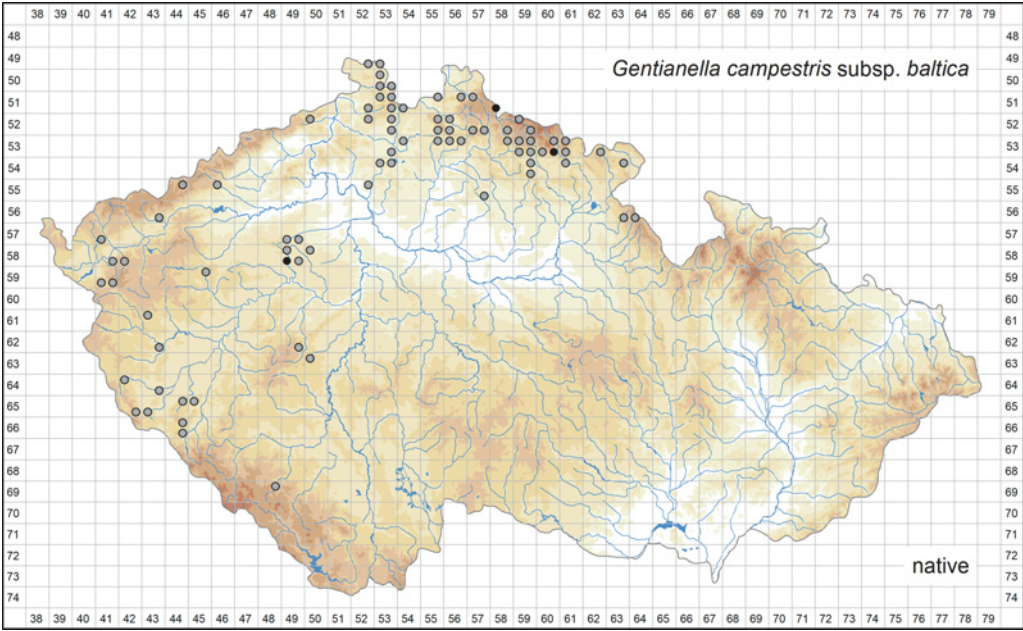


Fig. 41. – Distribution of *Gentianella campestris* subsp. *baltica* in the Czech Republic: ● at least one record in 2000–2018 (3 quadrants), ○ pre 2000 records only (78 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

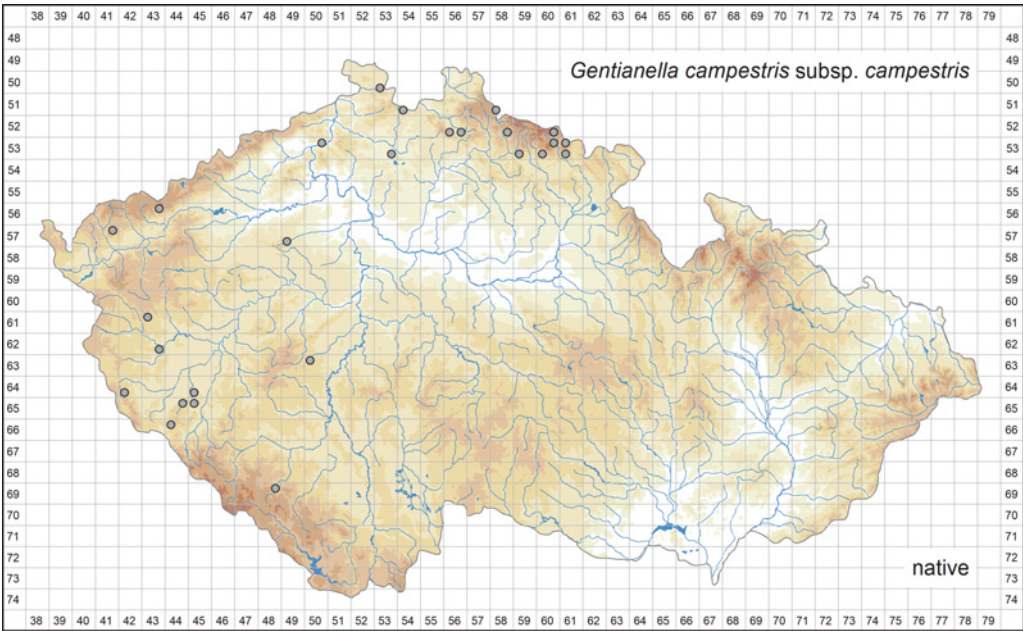


Fig. 42. – Distribution of *Gentianella campestris* subsp. *campestris* in the Czech Republic: ○ pre 2000 records only (26 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

G. c. subsp. *campestris* was more frequently found in submontane to montane pastures on various substrates. The Czech Republic is one of the few areas where all three subspecies of *G. campestris* occurred, and literature data and field notes are therefore of limited value. *Gentianella campestris* subsp. *campestris* was extirpated from the Czech Republic; its last occurrence was recorded in the 1970s on Mt Bukovec in the Jizerské hory Mts in northern Bohemia. Its earlier distribution was confined to south-western Bohemia, the Krušné hory Mts and northernmost Bohemia, with two isolated sites near the towns of Příbram and Rakovník in west-central Bohemia. It is now classified as extinct in this country (Grulich 2012).

Gentianella campestris subsp. *suecica* (Fig. 43)

Gentianella campestris subsp. *suecica*, an aestival biennial race, is, according to reliable records and herbarium specimens (Wettstein 1896, Kirschner & Kirschnerová 2000), distributed mainly in Scandinavia including Iceland and Finland; in central Europe it is scattered throughout Germany and extends to western and central France in the west and to Bohemia in the south-east. It probably almost completely avoids the Alps. Its occurrence in the Czech Republic represents a southern limit of its distribution range. Most probably it grew on oligotrophic mountain pastures, but exact information is lacking. It was collected from two localities in the Krušné hory Mts, from the Labe waterfall and the Rýchory ridge in the Krkonoše Mts and from a single site near the town of Mariánské Lázně in western Bohemia. The latest record dates back to 1970. Consequently, *G. c.* subsp. *suecica* is classified as extinct in this country (Grulich 2012).

Gentianella germanica subsp. *germanica* (Fig. 44)

The name *Gentianella germanica* is among the most frequently misinterpreted ones in *Gentianella*. Regarding the Czech populations, it was used particularly for those later described as *G. praecox* subsp. *bohémica* and *G. lutescens* subsp. *carpatica*. Nowadays, we understand *G. g.* subsp. *germanica* as a taxon occurring in the northern and western Alps, most of western Europe (southern England, northern France and Belgium) and most of western and central Germany, while its occurrence in Poland is rather questionable (Meusel et al. 1978). Its occurrence in the Czech Republic represents an eastern limit of its distribution. Marginally, it extends to northern and north-eastern Bohemia. The majority of the herbarium specimens studied was collected in the 19th century near the town of Česká Lípa, in the Krkonoše Mts and their foothills and near the town of Náchod. The easternmost site was situated near the town of Rokytnice v Orlických horách. The last records come from 1994, one from a calcareous grassland near the village of Černý Důl and another from the Rýchory ridge, both in the Krkonoše Mts. The most common habitat of this subspecies may have been rather dry pastures. It is classified as missing (Grulich 2012).

Gentianella germanica subsp. *solstitialis* (Fig. 45)

Published records of *Gentianella germanica* subsp. *solstitialis* are rather scant and unreliable (with the exception of Wettstein 1896). According to the herbarium specimens studied (PR, PRC, W and WU), this taxon occurs in the northern half of the Alps and

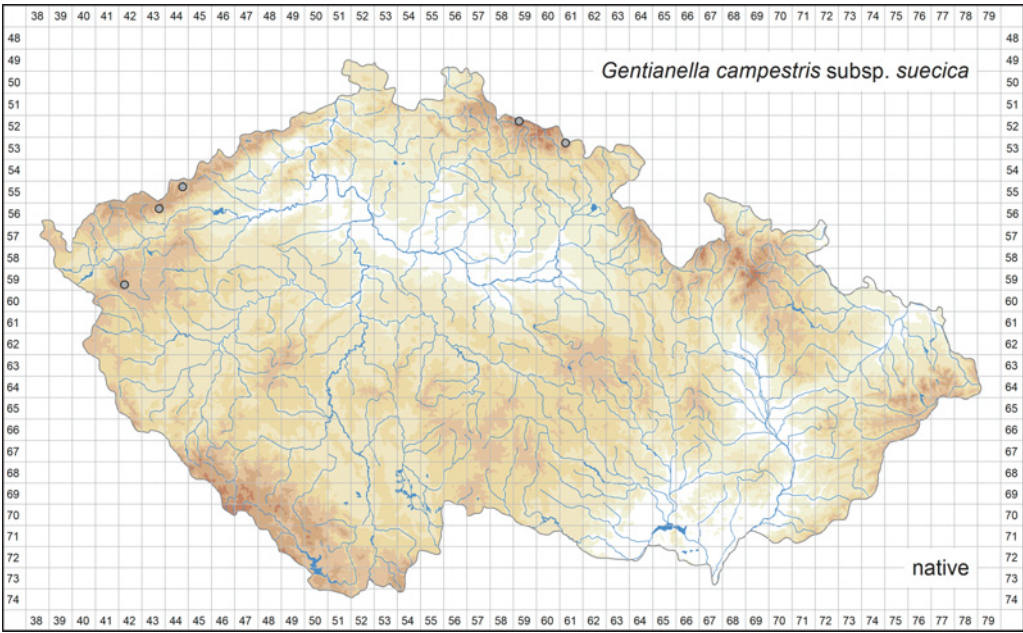


Fig. 43. – Distribution of *Gentianella campestris* subsp. *suecica* in the Czech Republic: ● pre 2000 records only (5 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

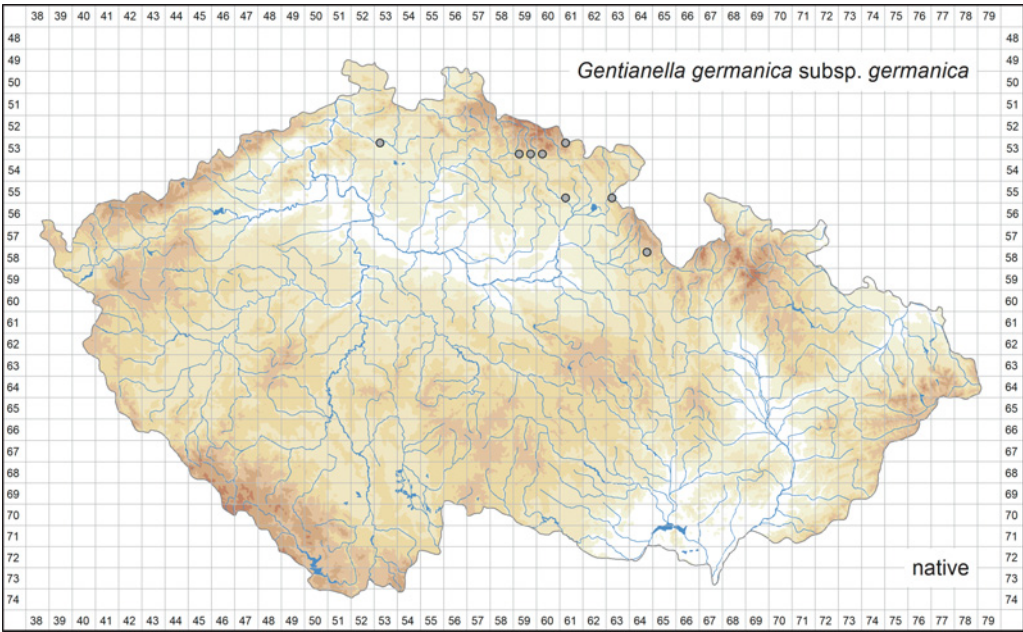


Fig. 44. – Distribution of *Gentianella germanica* subsp. *germanica* in the Czech Republic: ● pre 2000 records only (8 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

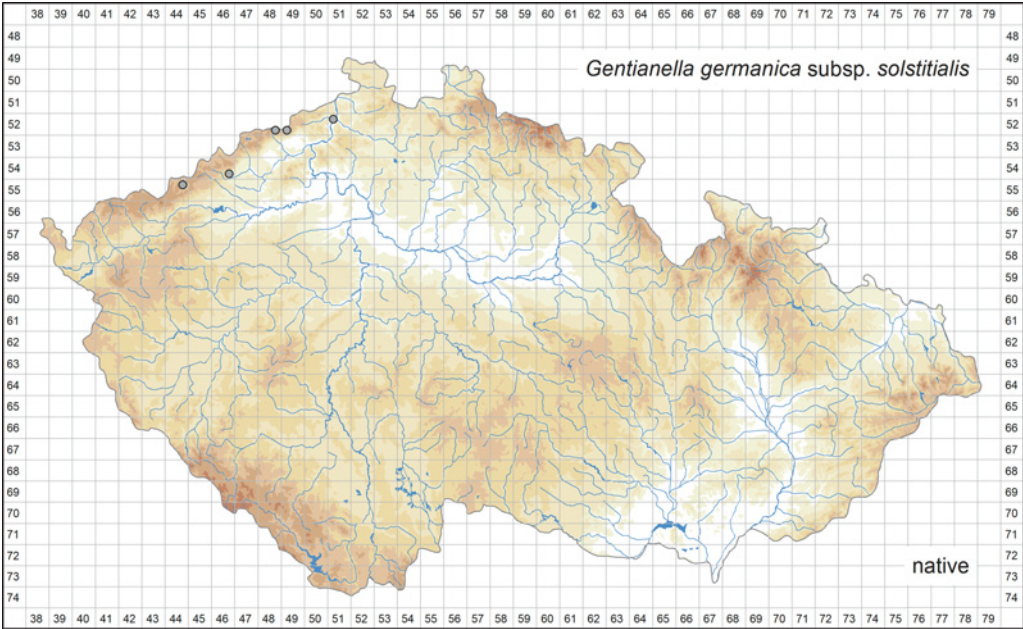


Fig. 45. – Distribution of *Gentianella germanica* subsp. *solstitialis* in the Czech Republic: ● pre 2000 records only (5 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

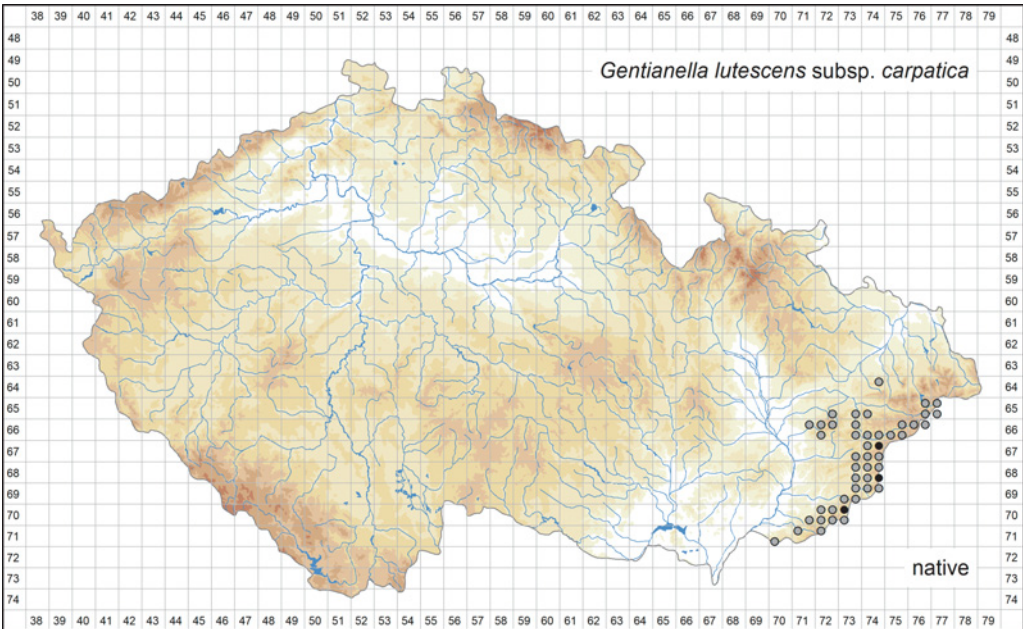


Fig. 46. – Distribution of *Gentianella lutescens* subsp. *carpatica* in the Czech Republic: ● at least one record in 2000–2018 (3 quadrants), ○ pre 2000 records only (44 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

extends to northern Bavaria and Saxony, reaching Bohemia in the Krušné hory Mts. Its occurrence in the Czech Republic represents the eastern limit of its distribution range. It is an aestival subspecies, characterized by an almost unbranched or sparsely branched stem with few long internodes. Based on the localities, we can infer that this subspecies grew in mountain pastures. *Gentianella germanica* subsp. *solstitialis* disappeared from the Czech Republic a long time ago: the last reliable records and specimens date to the 1890s, all of them situated in the Krušné hory Mts and their foothills. This subspecies is therefore classified as extinct in this country (Grulich 2012).

Gentianella lutescens subsp. *carpatica* (Fig. 46)

Gentianella lutescens subsp. *carpatica*, an autumnal taxon, has an overall distribution almost the same as that of the type subspecies: from south-eastern Moravia through the Carpathians in Slovakia, Ukraine and Romania as far as Bulgaria (Kirschner & Kirschnerová 2000). It was often confused with *G. praecox* subsp. *bohémica* and reported from outside its Moravian distribution range, which is confined to the Bílé Karpaty Mts, Javorníky Mts, the hilly area in the vicinity of the town of Vsetín, the Hostýnské vrchy Mts and Moravskoslezské Beskydy Mts. Its occurrence in the Czech Republic represents the western limit of its distribution range (Kirschnerová & Kirschner 2003). This autumnal subspecies occupies habitats very similar to those of subsp. *lutescens*, i.e. temporarily wet or mesic pastures or meadows. It has been recorded altogether from 47 quadrants, but its strong decline left only six sites extant since 2000. It is therefore classified as critically threatened (Grulich 2012).

Gentianella lutescens subsp. *lutescens* (Fig. 47)

Gentianella lutescens subsp. *lutescens* is an aestival subspecies with a distribution range extending from south-eastern Moravia along the arch of the Carpathians through Slovakia, Ukraine and Romania to Bulgaria, with possible occurrence in adjacent parts of the Balkan Peninsula (Kirschner & Kirschnerová 2000). It used to be reported erroneously from other regions, including the Saxon part of the Erzgebirge (Krušné hory Mts), based on confusion with other aestival taxa. In the Czech Republic it occurs in short-grass, temporarily wet meadows and pastures. Localities of *G. l.* subsp. *lutescens* are concentrated in the south-eastern and eastern parts of this country, from the Bílé Karpaty Mts in the south to the Moravskoslezské Beskydy and Hostýnské vrchy Mts in the north. Occurrences outside that area are very rare. Its localities in the Czech Republic are situated at the western limit of its general distribution (Kirschnerová & Kirschner 2003). This subspecies has been recorded at almost 100 sites, but since 2000 its presence was confirmed only at nine of them. Consequently, it is now classified as critically threatened (Grulich 2012).

Gentianella obtusifolia subsp. *sturmiana* (Fig. 48)

Gentianella obtusifolia subsp. *sturmiana* is an autumnal taxon; its distribution range includes the northern part of the Alps (Kirschner et al. 2007) and extends to the north to Bavaria, Saxony and Thuringia; the second main distribution area is western Bohemia (Meusel et al. 1978). Its occurrence in the Czech Republic represents the eastern limit of its distribution. Its habitats in Bohemia include wet or temporarily wet pastures and

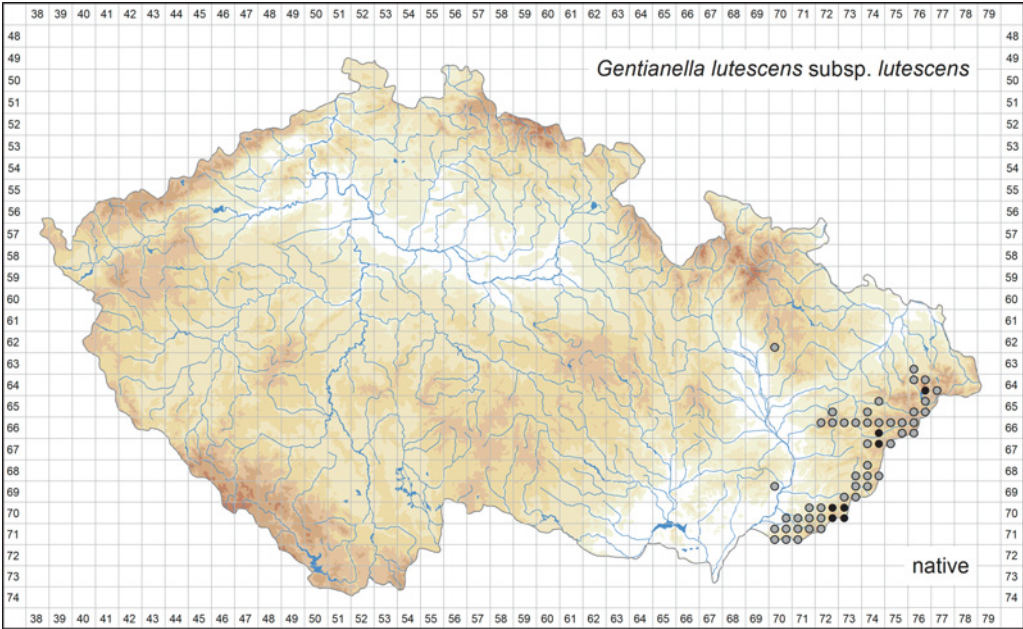


Fig. 47. – Distribution of *Gentianella lutescens* subsp. *lutescens* in the Czech Republic: ● at least one record in 2000–2018 (7 quadrants), ○ pre 2000 records only (47 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

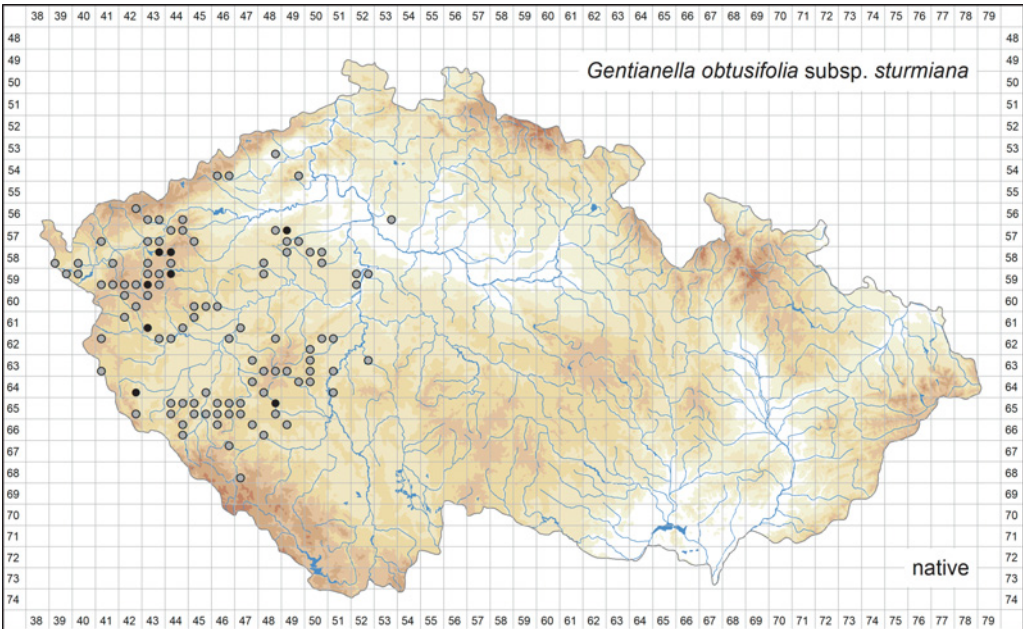


Fig. 48. – Distribution of *Gentianella obtusifolia* subsp. *sturmiana* in the Czech Republic: ● at least one record in 2000–2018 (8 quadrants), ○ pre 2000 records only (96 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

meadows at lower elevations. The area originally occupied by *G. o.* subsp. *sturmiana* in Bohemia included its south-western part between the north-western Šumava Mts to the westernmost extremity of the Czech Republic, the south-western Krušné hory Mts, the area covering the basin of the Mže river and the hilly landscapes west of the middle Vltava river, and, the north-western part of central Bohemia. The considerable decline of *G. o.* subsp. *sturmiana* in Bohemia, from 150 known localities to the currently existing ten populations (Kirschnerová & Kirschner 1997, Kirschner & Kirschnerová 2000, Brabec 2017), is undoubtedly associated with the destruction of wet or mesic meadows and pastures since the 1950s. This subspecies is therefore classified as critically threatened (Grulich 2012). The aestival race of this species, *G. o.* subsp. *norica*, was collected in 1901 in the Rýchory Mts, most likely temporarily introduced (record not displayed on the map).

Gentianella praecox subsp. *bohemica* (Fig. 49)

Before the relatively recent recognition of the majority of the Czech autumnal *Gentianella* plants as a new taxon, *G. praecox* subsp. *bohemica* used to be referred to as *G. germanica* or *G. carpathica*, or often as *G. austriaca*. *Gentianella praecox* subsp. *bohemica* has a relatively restricted geographical range covering Bavaria (north-east of the Danube towards the Czech border), the northern part of Upper Austria, with an isolated group of localities on Mt Jauerling west of Krems an der Donau, and a substantial part of the Bohemian Massif (Meusel et al. 1978); the major part of the subspecies' overall distribution is situated in the Czech Republic. Habitats of *G. p.* subsp. *bohemica* are quite varied, the most common being unfertilized short-grass pastures, both on acidic and limestone bedrock. *Gentianella praecox* subsp. *bohemica* is most common in the Šumava Mts and their foothills and adjacent parts of southern Bohemia, roughly from the Úhlava river towards the east and south-east (Kirschner & Kirschnerová 2000). Another area with common occurrence of this subspecies is the Českomoravská vrchovina highlands and the Drahanská vrchovina highlands. Scattered occurrences are also found in central and north-eastern Bohemia, being more common in the foothills of the Krkonoše Mts and eastwards of them, and in north-westernmost Moravia in the Hrubý Jeseník Mts and the Nízký Jeseník Mts. It has been recorded at more than 600 localities; of these, 76 were documented since 2000. Nowadays, about 40 sites of *G. p.* subsp. *bohemica* remain, and the subspecies is classified as critically threatened (Grulich 2012).

Gentianella praecox subsp. *praecox* (Fig. 50)

Gentianella praecox subsp. *praecox*, an aestival taxon, is known from the foothills of the Alps in Lower and Upper Austria and in the Šumava Mts in Bohemia (Kirschner & Kirschnerová 2000). Its occurrence in the Czech Republic represented the northern and north-western limit of its overall distribution range. The most common habitats were wet mountain pastures on acidic bedrock. This subspecies' past distribution in the Šumava Mts covered a rather small area between the villages of Zátoň near Horní Vltavice in the south-east and Dobrá Voda near the town of Hartmanice in the north-west. The last record is from 1991, and this subspecies is now classified as extinct in this country (Grulich 2012).

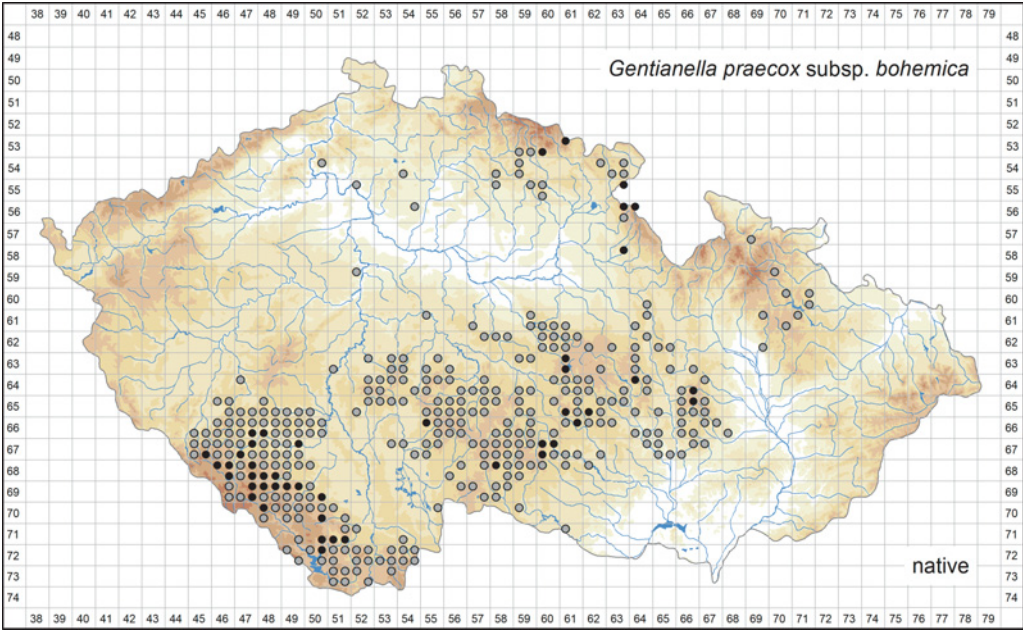


Fig. 49. – Distribution of *Gentianella praecox* subsp. *bohemica* in the Czech Republic: ● at least one record in 2000–2018 (45 quadrants), ○ pre 2000 records only (310 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

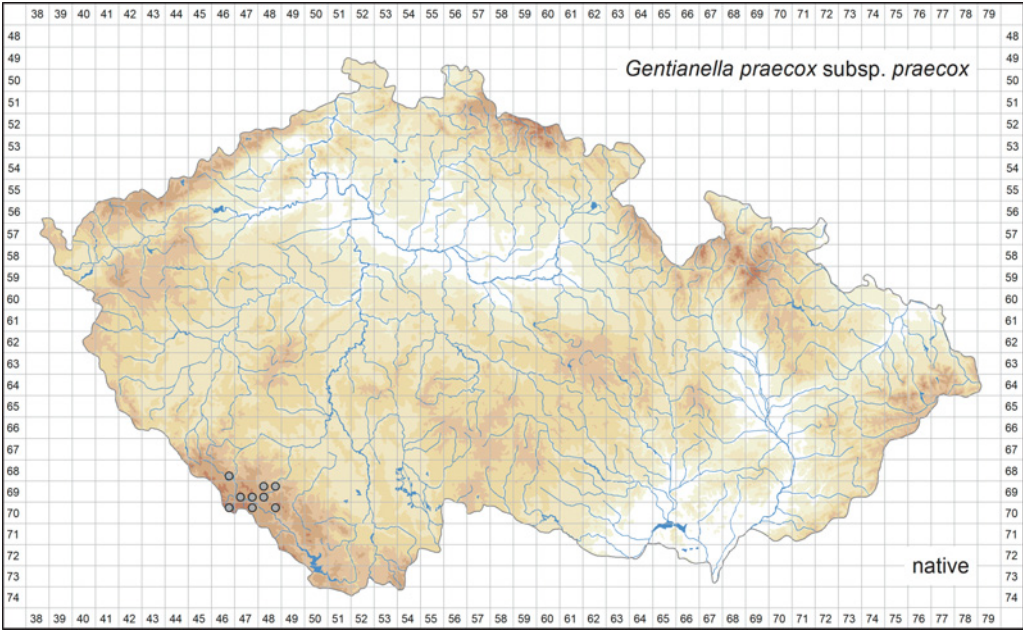


Fig. 50. – Distribution of *Gentianella praecox* subsp. *praecox* in the Czech Republic: ○ pre 2000 records only (9 quadrants). Prepared by Jan Kirschner & Jiří Brabec.

Gnaphalium uliginosum (Fig. 51)

Gnaphalium uliginosum is a wetland annual species, sometimes treated as a complex of several closely related species with more or less distinct geographical ranges (Meusel et al. 1965). However, this concept is now mostly abandoned (cf. Chen et al. 2011), and the taxa of this complex are included in a single species (Hultén & Fries 1986, Lampe 1996). The native distribution of *G. uliginosum* involves temperate and boreal zones in Eurasia, with easternmost occurrences on the Chukchi Peninsula. Southwards it extends to the Mediterranean area in Portugal, northern Spain, Italy (including Sicily), northern parts of the Balkan Peninsula and Anatolia; isolated outposts are also known from Egypt. Populations in North America, Greenland, Iceland, Kamchatka and New Zealand are by some authors considered as introduced (Meusel et al. 1965, Lampe 1996), but according to some others the status at least of some of these populations is unclear (Hultén & Fries 1986). In central Europe *G. uliginosum* is among the most common wetland annual herbs, colonizing a range of periodically flooded or at least intermittently wet habitats such as exposed bottoms of fishponds, fish storage ponds, sand, loam and clay pits, river beds and oxbows, wetlands on arable land, field and forest tracks, wet road verges, shallow ditches and shallow depressions in wet meadows and pastures. The species does not exhibit a preference for specific soils and occurs on sandy, loamy, clayey, sapropelic or peaty substrate of acidic to basic soil reaction. It is able to grow even in highly eutrophic conditions or in habitats occasionally sprayed by herbicides where it is favoured by its fast life cycle (about 6–8 weeks). This ability, along with its broad ecological range, easy dispersal and persistent soil seed bank (Thompson et al. 1997, Šumberová et al. 2012), are probably the reasons this species has survived even in the present-day landscape affected by overall eutrophication, drainage and fast succession. *Gnaphalium uliginosum* is frequent in the lowlands and at middle elevations up to about 800 m and scattered in the mountains throughout this country at elevations up to about 1000 m (maximum at about 1300 m in the Krkonoše Mts). It is rare in or absent from warm and dry areas such as north-western Bohemia and southern Moravia. However, some of the gaps on the map are due to under-recording rather than true absences.

Gymnocarpium dryopteris (Fig. 52)

Gymnocarpium dryopteris is an allotetraploid species whose assumed diploid parents are *G. appalachianum* and *G. disjunctum* (Pryer & Haufler 1993, Rothfels et al. 2014). It is widely distributed in the temperate zones in the Northern Hemisphere, including Europe (except the southernmost parts but including Iceland), western, central and eastern Siberia, the Russian Far East, eastern China and North America including Greenland. Outside of its main range, *G. dryopteris* occurs in the Caucasus Mts, Himalayas, the Korean Peninsula and Japan (Hultén & Fries 1986). In the Czech Republic it inhabits stony screes or rock crevices and humid and mesic sites in spruce, beech, fir, oak-hornbeam, ravine or alder forests. *Gymnocarpium dryopteris* occurs commonly throughout this country at middle and high elevations. The gaps on the map at middle elevations are certainly due to both lower frequency of the species occurrence and under-recording. It is almost absent from deforested lowlands.

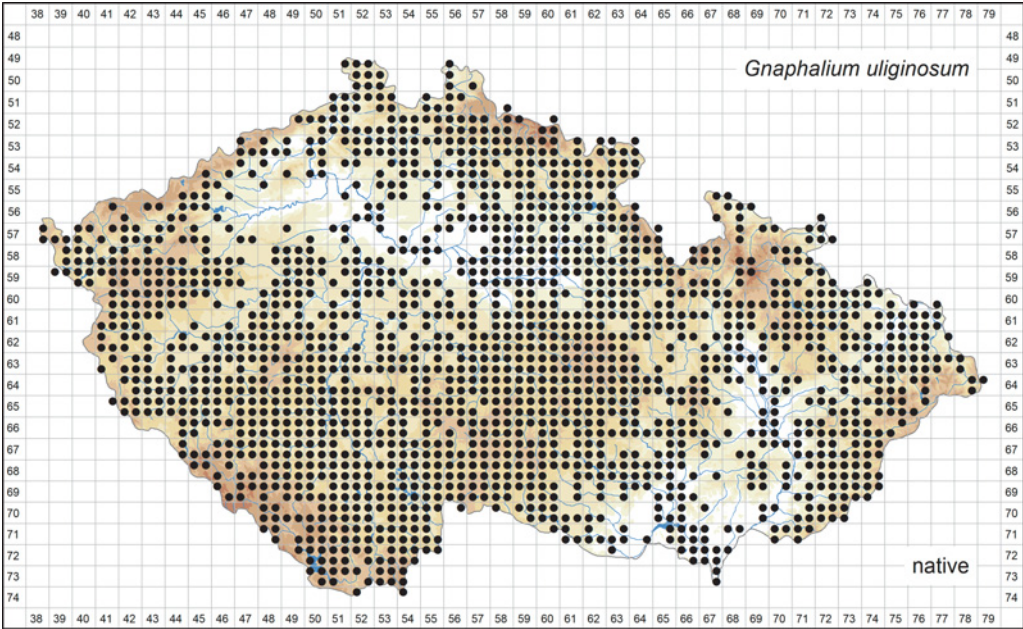


Fig. 51. – Distribution of *Gnaphalium uliginosum* in the Czech Republic (1717 occupied quadrants). Prepared by Kateřina Šumberová.

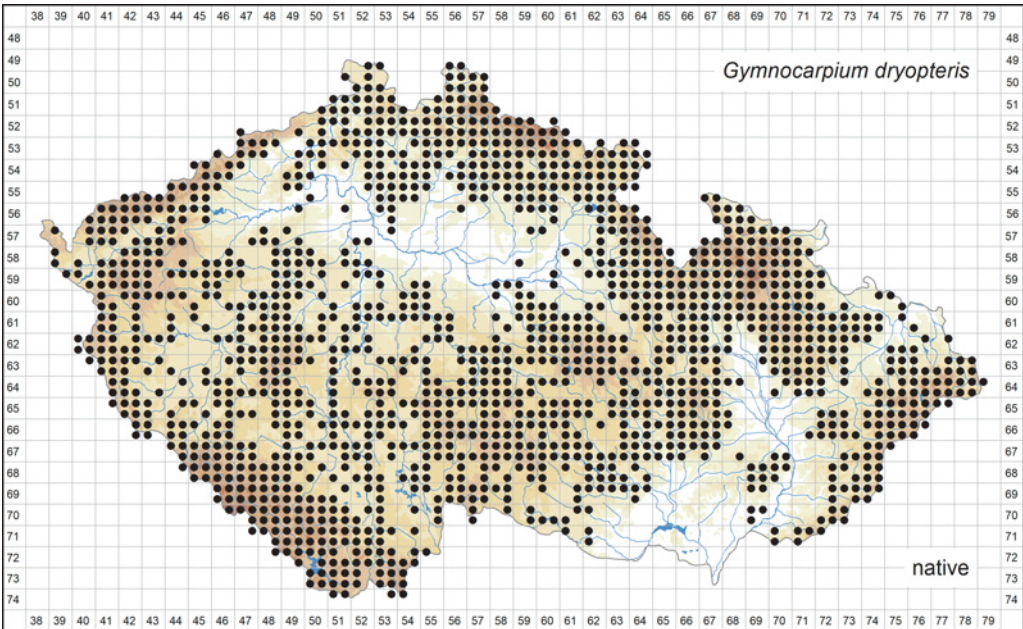


Fig. 52. – Distribution of *Gymnocarpium dryopteris* in the Czech Republic (1497 occupied quadrants). Prepared by Libor Ekrť.

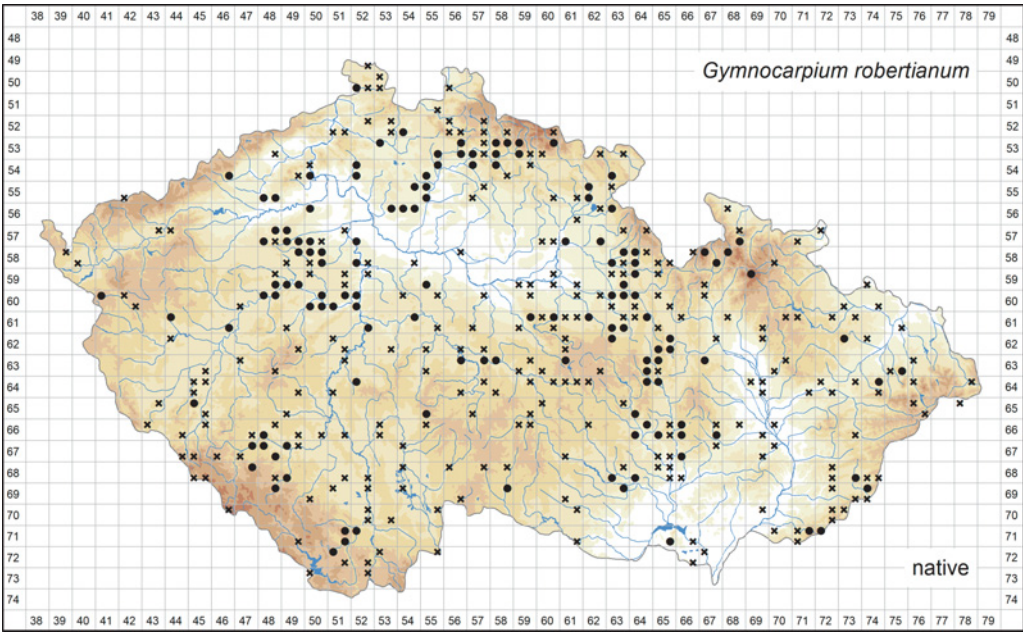


Fig. 53. – Distribution of *Gymnocarpium robertianum* in the Czech Republic: ● natural habitats (135 quadrants), × secondary habitats (257 quadrants). Prepared by Libor Ekrť.

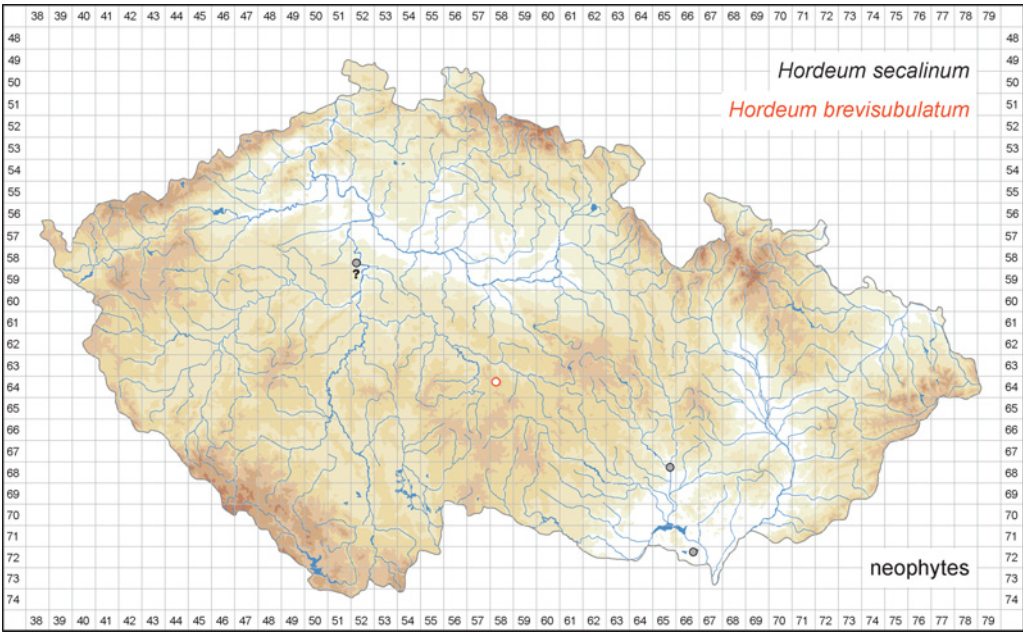


Fig. 54. – Distribution of *Hordeum brevisubulatum* (● pre 2000 records only: 1 quadrant) and *H. secalinum* (● pre 2000 records only: 3 occupied quadrants) in the Czech Republic. Prepared by Jiří Danihelka (*H. b.*) and by Michal Ducháček (*H. s.*).

Gymnocarpium robertianum (Fig. 53)

Gymnocarpium robertianum is an allotetraploid species whose diploid progenitors remain unidentified (Rothfels et al. 2014). It has a circumtemperate disjunct distribution. It occurs in Europe (except the southernmost parts), in Asia extending in a wide belt from the Ural Mts to the Russian Far East, eastern China and Japan; in North America it is found in Canada and the western and north-eastern USA. There are several outposts in the Caucasus Mts, Himalayas and southern China (Hultén & Fries 1986). *Gymnocarpium robertianum* occurs mainly in crevices of basic or ultrabasic rocks (limestone, marlstone, basalt, serpentine or other basic rocks) usually in oak-hornbeam and beech forests, and on walls with basic mortar. In the Czech Republic it grows in natural habitats in northern, central, eastern and southern Bohemia, central, north-western and south-eastern Moravia and sporadically in Silesia. It is capable of colonizing walls; in these secondary habitats it is scattered almost throughout the country.

Hordeum brevisubulatum (Fig. 54)

Hordeum brevisubulatum is a perennial grass native to south-eastern European Russia, the Caucasus Mts, Anatolia, the Middle East, Central Asia, southern Siberia, the Russian Far East, Mongolia and north-eastern China. It was found as an introduced species in Latvia. In its native range it occurs mainly in saline meadows and on gravel deposits along rivers and streams (Tsvelev 1976). In the Czech Republic *H. brevisubulatum* was collected in 1974 at a textile factory in the settlement of Brunka near the town of Humpolec in southern Bohemia (Danihelka 2009). Of the four subspecies recognized by Tsvelev (1976), the plants collected in Brunka most likely correspond to the type subspecies distributed mainly in Central Asia and southern Siberia. The seeds were probably introduced as a wool contaminant from that area. *Hordeum brevisubulatum* is classified as a casual neophyte of the Czech flora (Pyšek et al. 2012).

Hordeum geniculatum (Fig. 55)

Hordeum geniculatum is native to the Mediterranean area, Pannonian Basin (northwards reaching as far as southern Slovakia), the Balkan Peninsula, Romania, southern Ukraine, the southern part of European Russia, the Caucasus Mts, south-western Asia, Uzbekistan, Iran, Afghanistan and western Pakistan; it is also found in the Azores and Madeira (Bothmer et al. 1989, 1995, Conert 1998). In general, its occurrence is much less associated with the sea coast than that of the similar and closely related *H. marinum*. The populations from most of the Mediterranean area are diploid, while tetraploids are found from central Anatolia eastwards (Jakob et al. 2007). *Hordeum geniculatum* has been introduced into some more northern European countries including Germany, Estonia and the Czech Republic, and became naturalized in the western part of North America. In its native range it grows in saline meadows and pastures, some rich in nitrates, and in coastal and inland saline marshes (Bothmer et al. 1995). The earliest record of *H. geniculatum* in this country is from the city of Jihlava and dates back to 1851. In Prague it was found in 1917 and 1918 near brickworks between the city districts of Košíře and Jinonice. In the city of Brno this species was collected in 1959 as a weed in gardens fertilized by wool waste from a textile factory. The latest records in this country date from the 1960s when it

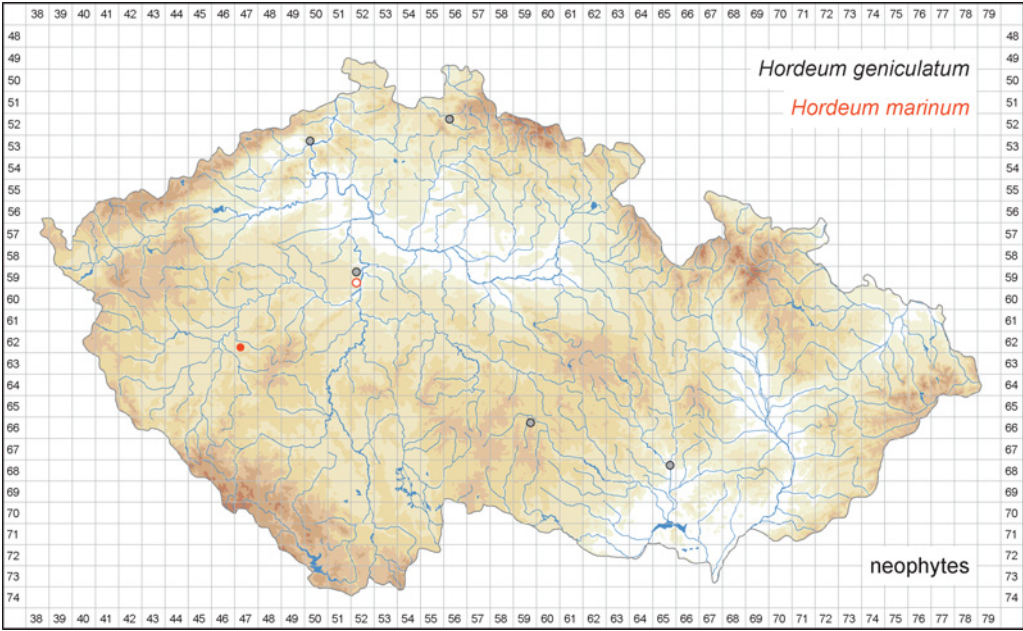


Fig. 55. – Distribution of *Hordeum geniculatum* (● pre 2000 records only: 1 occupied quadrant) and *H. marinum* (● at least one record in 2000–2018: 1 occupied quadrant, ● pre 2000 records only: 1 quadrant) in the Czech Republic. Prepared by Jiří Danihelka and Michal Ducháček.

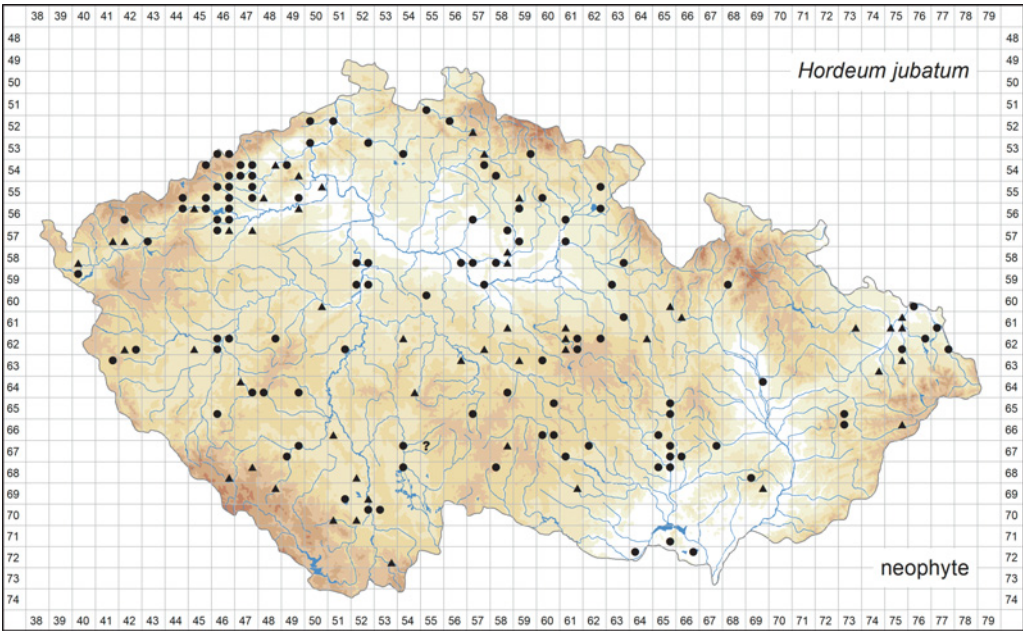


Fig. 56. – Distribution of *Hordeum jubatum* in the Czech Republic: ● occurrence documented by herbarium specimens (109 quadrants), ▲ occurrence based on other records (51 quadrants). Prepared by Michal Ducháček.

was found in a river port in the city of Ústí nad Labem and in a dump site by a wool spinning-factory in the city of Liberec. It is therefore classified as a casual neophyte (Pyšek et al. 2012).

Hordeum jubatum (Fig. 56)

Hordeum jubatum is native to North America (from Mexico northwards through the USA to Canada and Alaska), eastern Siberia, the Russian Far East and north-eastern China (Tsvelev 1976, Bothmer et al. 1995, Da 2006). It has been introduced into South America, Europe and Central Asia (Bothmer et al. 1995). Its natural habitats are meadows, prairies along river beds and around seasonal lakes; it is often found in saline habitats and also on roadsides and in other man-made habitats (Bothmer et al. 1995). In the Czech Republic most records refer to temporary occurrences in ruderal habitats, railway stations and other man-made habitats in human settlements, where it has been introduced in various ways. Most frequently it escaped from gardens, where it is sometimes grown as an ornamental. Since the 1970s, *H. jubatum* has been spreading to dump sites and around coal mines in north-western Bohemia. Recently, it has also been reported from saline sites along motorway D5 in south-western Bohemia. It is classified as a naturalized neophyte (Pyšek et al. 2012).

Hordeum marinum (Fig. 55)

Hordeum marinum s. str. is native mainly to the sea-coasts of Germany, western Europe and the Mediterranean area, as well as the coasts of the Black and Caspian Seas. In Europe it has been introduced into the sea-coasts of Scandinavia and the Baltic countries, as well as to Poland and the Czech Republic. Records of introduced plants also exist from North America (Bothmer et al. 1989, 1995, Conert 1998, Jakob et al. 2007). In its native range *H. marinum* grows mainly in coastal marshes (Bothmer et al. 1995). In the British Isles it has been also recorded from saline roadsides (Scott & Davison 1982). In the Czech Republic *H. marinum* was first collected in 1929 in Prague on waste ground in Zlíchov. Recently, a small population was found under a bridge of motorway D5 by the village of Klabava near the town of Rokycany in western Bohemia. *Hordeum marinum* co-occurs there with halophilous and salt-tolerant species spreading along motorways (e.g. *Atriplex micrantha*, *Dittrichia graveolens*, *Plantago coronopus*, *Spergularia salina* and *Suaeda salsa*). It is classified as a casual neophyte (Pyšek et al. 2012).

Hordeum murinum subsp. *leporinum* (Fig. 57)

Hordeum murinum subsp. *leporinum* is native to the Mediterranean area and south-western Asia, eastwards extends as far as to Afghanistan, and it has been introduced into most parts of the world (Bothmer et al. 1995). In the Czech Republic this subspecies has been sporadically recorded only as a casual alien. The earliest reports from this country from the towns of Náměšř nad Oslavou and Holešov date to the 19th century. However, both are rather unreliable, and there is no information about the way of introduction. The first unambiguous report, from a disused lime-stone quarry near the village of Raspenava in northern Bohemia, originates from 1957; the plants were introduced there with wool waste. *Hordeum murinum* subsp. *leporinum* was further recorded at a ruderal site at

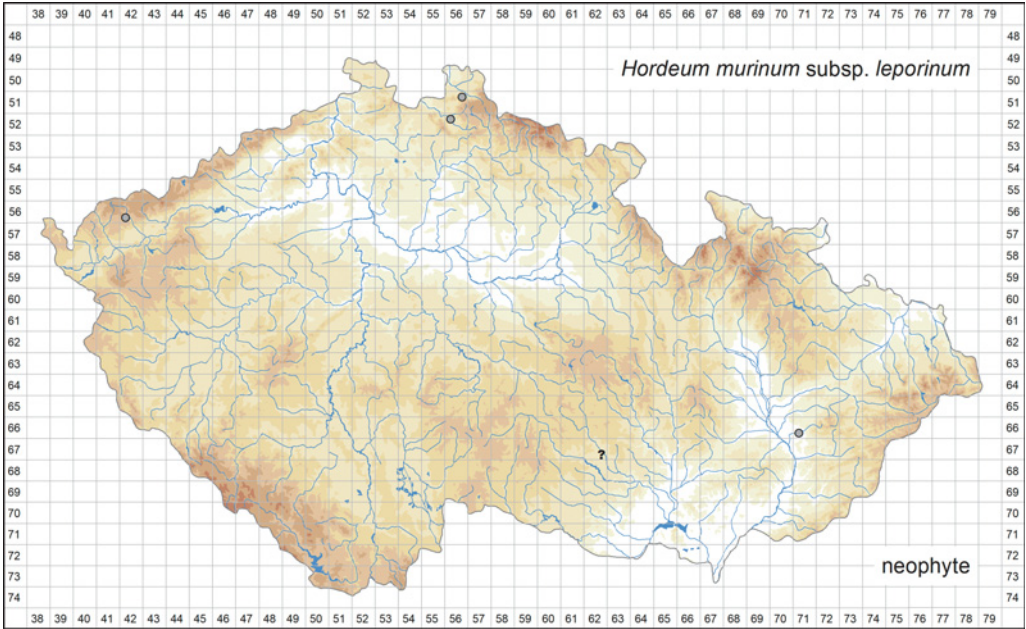


Fig. 57. – Distribution of *Hordeum murinum* subsp. *leporinum* in the Czech Republic: ● pre 2000 records only (4 occupied quadrants). Prepared by Michal Ducháček.

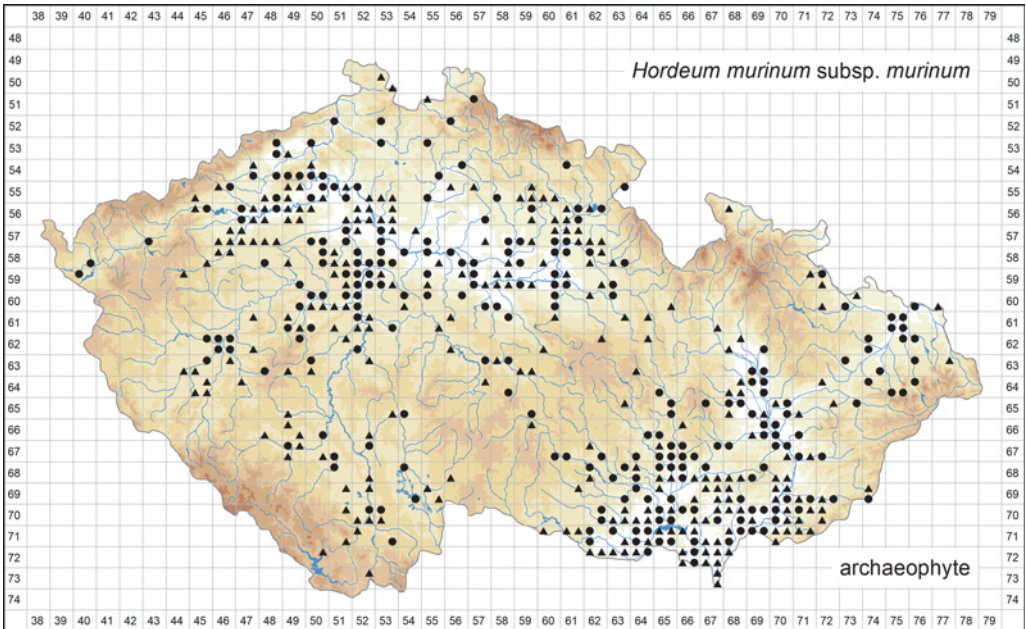


Fig. 58. – Distribution of *Hordeum murinum* subsp. *murinum* in the Czech Republic: ● occurrence documented by herbarium specimens (237 quadrants), ▲ occurrence based on other records (259 quadrants). Prepared by Michal Ducháček.

a wool-spinning factory in the city of Liberec in 1964–1967. The latest find is from the surroundings of the village of Lesík near the town of Nejdek in western Bohemia; other notable alien species recorded there include *Lepidium africanum*, *L. didymus* and *H. jubatum*. *Hordeum murinum* subsp. *leporinum* is classified as a casual neophyte (Pyšek et al. 2012). The distribution map is based solely on examined herbarium specimens.

Hordeum murinum subsp. *murinum* (Fig. 58)

Hordeum murinum subsp. *murinum* occurs in most of Europe with the exceptions of its northern part and a major part of Ukraine and Russia. It has been introduced as a weed into most parts of the world (Bothmer et al. 1995). In the Czech Republic it is frequent in settlements, occurring usually on lawns, at ruderal sites, in parks, along roads and pavements, in railway stations and at dump sites; it is sometimes found also in edges of arable fields, in vineyards and along roads and at forest edges. *Hordeum murinum* subsp. *murinum* is rather widespread in warm areas in the lowlands, but it also occurs at middle elevations. This subspecies is classified as a naturalized archaeophyte (Pyšek et al. 2012).

Hordeum secalinum (Fig. 54)

Hordeum secalinum is native to the Atlantic coast of Europe from Spain in the west to Denmark and southernmost Sweden in the north-east; it is scattered across the Mediterranean area and inland Europe, and a few occurrences are known in North Africa. It grows in moist saline habitats such as seashore meadows, and rarely also inland saline meadows (Bothmer et al. 1995). In the Czech Republic *H. secalinum* has been found only at four places, as a casual alien. The earliest report, dating to 1929, is from a ruderal site in Prague's city district of Dejvice. In 1959–1964 this species was repeatedly recorded in a subsaline meadow below the Mlýnský fishpond east of the village of Lednice in southern Moravia. In 1961 it was collected at a textile factory in Brno, and in 1963 in the nearby town of Kuřim; the source of both introductions was wool waste. *Hordeum secalinum* is classified as a casual neophyte (Pyšek et al. 2012).

Hydrocharis morsus-ranae (Fig. 59)

Hydrocharis morsus-ranae is native to Europe and the neighbouring parts of Asia. Its range extends from Portugal, western France and the British Isles in the west to European Russia in the east, northwards to southern Sweden and central Finland, and southwards to northern Italy and the Balkan Peninsula. In Asia it is present but scarce in Turkey, the Caucasus Mts, along the southern shore of the Caspian Sea and in south-western Siberia; isolated collections are reported from central Siberia and Kazakhstan, and in Africa from northernmost Morocco and Tunisia (Cook & Lüönd 1982, Hultén & Fries 1986, Timokhina 1988). In North America it escaped from cultivation in Ottawa in the 1930s, started to spread rapidly and currently is naturalized and a noxious weed in parts of Quebec, Ontario, Michigan, New York, Vermont and Washington (Catling et al. 2003). In the Czech Republic *H. morsus-ranae*, a free-floating aquatic, grows in standing or very slowly flowing waters such as oxbow lakes, alluvial pools, shallow edges of fishponds with low-intensity management, and sheltered edges of slowly flowing rivers and drainage and irrigation channels, where it can form dense floating mats of interlocking plants.

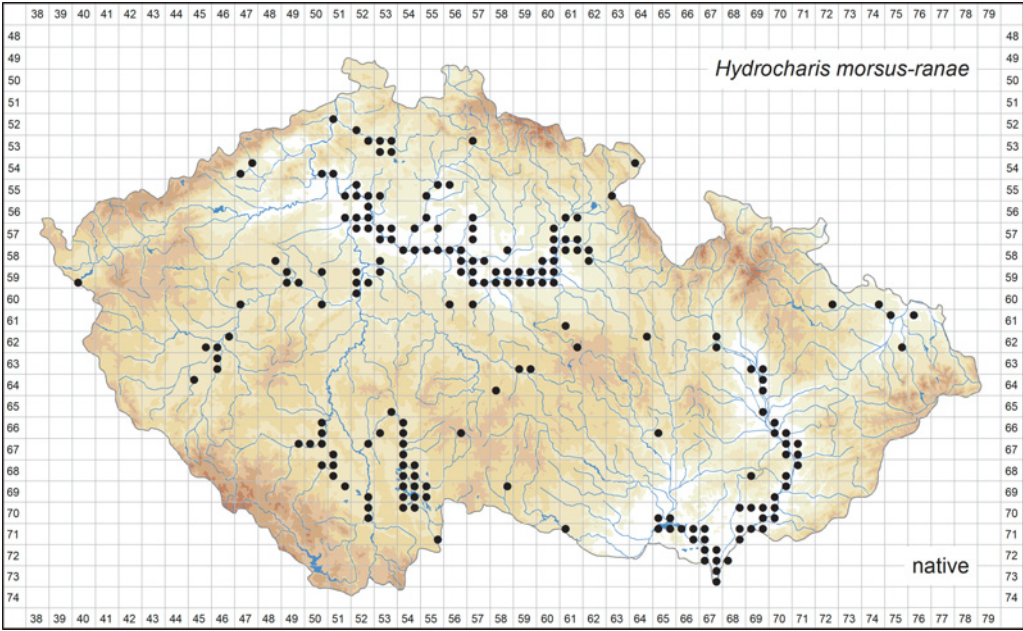


Fig. 59. – Distribution of *Hydrocharis morsus-ranae* in the Czech Republic (192 occupied quadrants). Prepared by Zdeněk Kaplan.

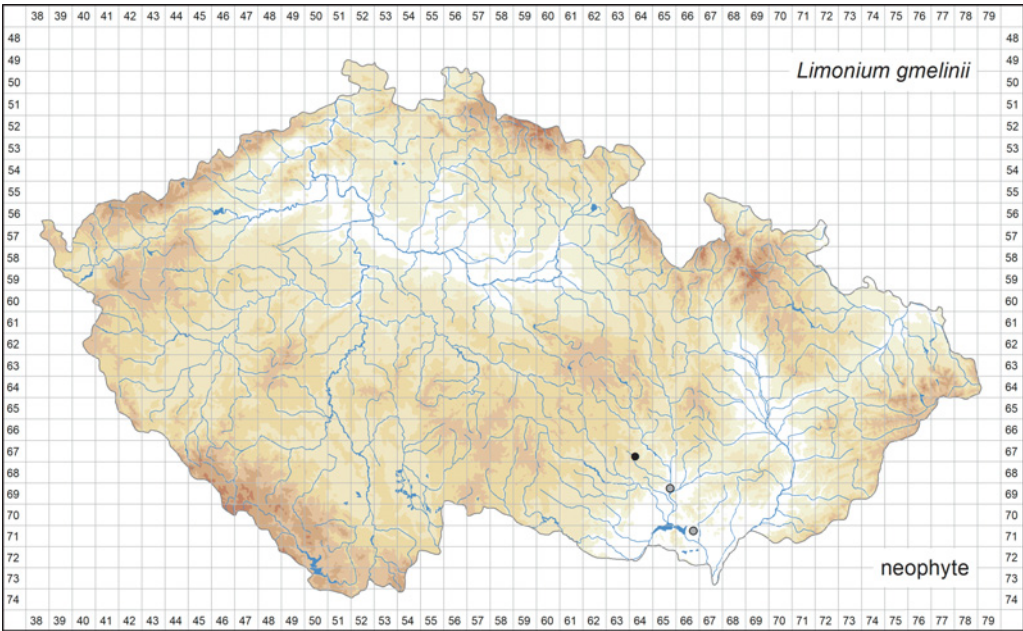


Fig. 60. – Distribution of *Limonium gmelinii* in the Czech Republic: ● extant occurrence (1 quadrant), ● extirpated occurrences (2 quadrants). Prepared by Jiří Danihelka & Petr Kocián.

It prefers mesotrophic to naturally eutrophic, slightly acidic to slightly basic, calcium-poor water above a thick layer of sapropelic mud or organic silt on the bottom (Šumberová 2011a). *Hydrocharis morsus-ranae* occurs mainly in the floodplains along the Labe river in central and eastern Bohemia and along the lower stretches of the Dyje and Morava rivers in southern Moravia. It is also found in fishpond landscapes in south-western and southern Bohemia, around the city of Plzeň in western Bohemia, in the surroundings of the town of Česká Lípa in northern Bohemia and around the city of Ostrava in north-eastern Moravia and the adjacent part of Silesia; elsewhere it is very rare. This species has vanished from many of its sites due to habitat destruction, river regulation, silting of alluvial pools, eutrophication and drainage. It is also sensitive to most kinds of pollution (Richards & Blakemore 1975, Cook & Lüönd 1982). It is therefore classified as endangered (Grulich 2012).

Limonium gmelinii (Fig. 60)

Limonium gmelinii has a wide Eurasian distribution in the west extending as far as southern Slovakia, Hungary and Serbia and in the east as far as north-western China and Mongolia (Malekmohammadi et al. 2017). Its populations in the westernmost part of its range are sometimes separated as *L. hungaricum* or *L. hypanicum* (Domina 2011), but this splitting is probably not justified. Although *L. gmelinii* occurs in all countries of south-eastern Europe and in Anatolia, its distribution there is fairly discontinuous, confined to small islands of inland salt marshes. In central Europe *L. gmelinii* is sometimes grown ornamentally. It has also recently been found in Austria along motorways treated with de-icing salt (Hohla et al. 2015). In the Czech Republic this species was first collected in 2009 on a motorway west of the city of Brno, and in 2013–2015 it was recorded at additional three sites along a motorway south of Brno (Kocián et al. 2016). Whereas the three populations on the motorway south of Brno, all found in the central reservation, were recently destroyed during renovation work, the single plant found in 2009 on the road verge near the village of Ostrovačice west of Brno still survives. The seeds of this species were probably introduced only recently by traffic from south-eastern Europe. We therefore suggest classifying *L. gmelinii* as a casual neophyte of the Czech flora.

Najas marina (Fig. 61)

Najas marina is a cosmopolitan species. In Europe it is distributed northwards to eastern England and southern Scandinavia, in Asia mainly in the south, extending northwards to southern Siberia; in Africa it occurs in the areas outside of tropical rain forests and deserts; it is also found in Australia and the Americas (Hultén & Fries 1986, Lowden 1986, Triest 1988). Within its overall range this species appear to be variable. Triest (1988) distinguished 12 subspecies in the Old World. Only *N. m.* subsp. *marina* is found in the Czech Republic, this subspecies occurring mainly in western, central, south-eastern and eastern Europe, in Anatolia and in central Asia (Triest 1988). In the Czech Republic *N. marina* grows on bottoms of fishponds, pools and lakes in abandoned sand pits, slowly flowing lowland rivers and their oxbows, and seldom also in pools formed by land subsidence after underground coal mining. It prefers early successional stages in mesotrophic to eutrophic, slightly acidic to slightly basic, transparent, standing or very slowly flowing waters on sandy, gravelly or loamy substrates. This species occurs mainly

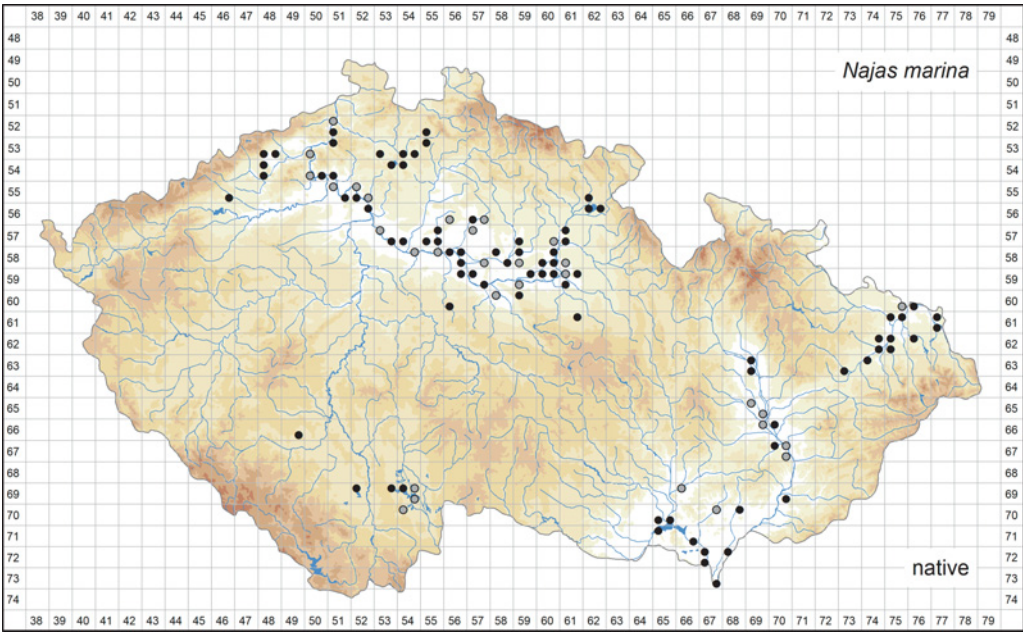


Fig. 61. – Distribution of *Najas marina* in the Czech Republic: ● at least one record in 2000–2018 (81 quadrants), ○ pre 2000 records only (30 quadrants). Prepared by Zdeněk Kaplan.

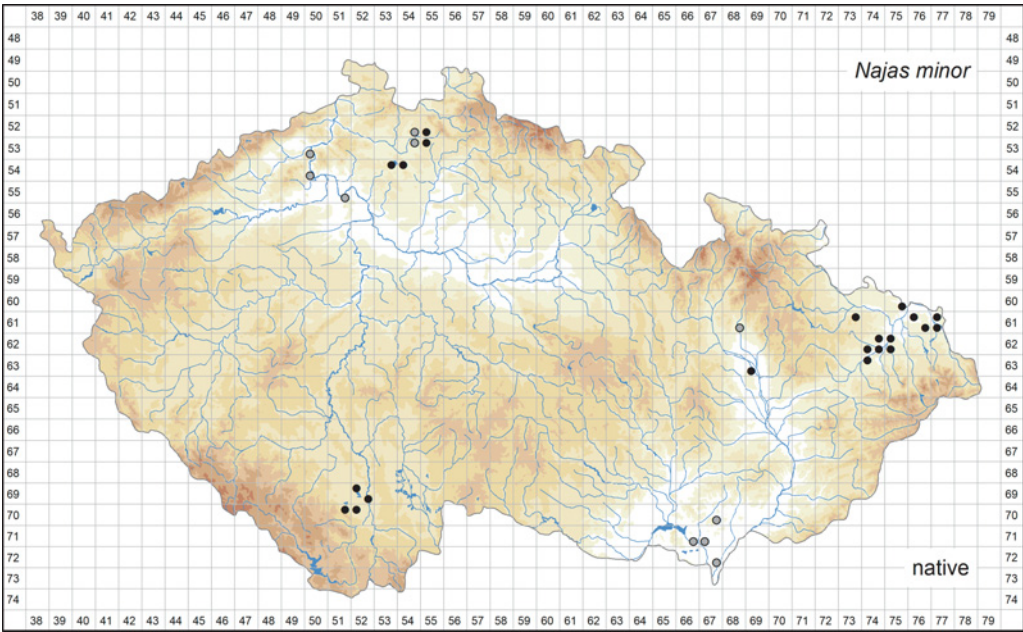


Fig. 62. – Distribution of *Najas minor* in the Czech Republic: ● at least one record in 2000–2018 (21 quadrants), ○ pre 2000 records only (10 quadrants). Prepared by Zdeněk Kaplan.

in the lowlands along the Labe river in northern, central and eastern Bohemia, the Morava river in central Moravia and the Odra river in north-eastern Moravia and adjacent Silesia. Small numbers of sites were recorded also in the surroundings of the town of Doksy in northern Bohemia, in fishpond landscapes in southern Bohemia and in southern Moravia; elsewhere this species is very rare. *Najas marina* exhibits remarkably strong population dynamics with periods of massive growth and spreads alternating with (sometimes long) periods of decline or even disappearance (Kaplan 2009). Although this species has vanished from some of its former sites, it has appeared in a few new areas during past decades: in southern Bohemia it was recorded for the first time as late as in the 1970s, in the floodplain of the Morava river in the 1980s and in north-eastern Moravia and Silesia in the 1990s, partly in response to emergence of new water bodies not used for intensive fish farming. *Najas marina* is currently classified as vulnerable (Grulich 2012).

Najas minor (Fig. 62)

Najas minor occurs in Europe northwards to northern France, Belgium, northern Germany, Lithuania and Latvia, in Asia mainly in its temperate zone from Turkey in the west as far as Japan in the east, and also in the Mediterranean part of northern Africa (Hultén & Fries 1986, Triest 1988). It has been introduced into the eastern USA, where it has become naturalized (Haynes 2000b, Les et al. 2015). In the Czech Republic *N. minor* occurs mainly in fishponds, less frequently in fish storage ponds, alluvial pools and pools formed by land subsidence after underground coal mining, and rarely in oxbows of lowland rivers, in lakes in abandoned sand pits and in the past also in a saline lowland lake. The waters are usually shallow, warm in summer, mesotrophic to eutrophic, rich in calcium and phosphorus, often with elevated concentrations of chlorides, and with bottoms formed by clayey, loamy or gravel substrates covered with a layer of organic mud (Šumberová 2011b). *Najas minor* is rare in this country. In the 19th century, it was recorded only along the lower stretches of the Labe river in northern Bohemia and in a single saline lake in southern Moravia; all these occurrences vanished long ago. During the 20th century, five sites were found in the floodplain of the Dyje river in southern Moravia (no longer extant) and four at the towns of Doksy and Stráž pod Ralskem in northern Bohemia. The first occurrence of *N. minor* in north-eastern Moravia and in Silesia was recorded in 1994. Since then, this species has spread in this area and to date about four dozen sites have been found there. In the early 2000s it was discovered in the fishpond landscape near the city of České Budějovice in southern Bohemia, where seven populations are known now. Two sites are also known from the surroundings of the city of Olomouc in central Moravia. *Najas minor* is currently classified as critically threatened (Grulich 2012). It is a thermophilous annual species and its populations best develop in extraordinarily hot summers such as those that have occurred several times during the past two decades. A gradual climate change towards more frequent warm summers may facilitate fast growth, seed production and spread of this species.

Phleum alpinum (Fig. 63)

Phleum alpinum was listed in the Czech botanical literature of the second half of the 20th century and in Kubát et al. (2002) as *Ph. rhaeticum*, partly based on disputed taxonomy and nomenclature of this group. The latter name refers to plants whose core distribution

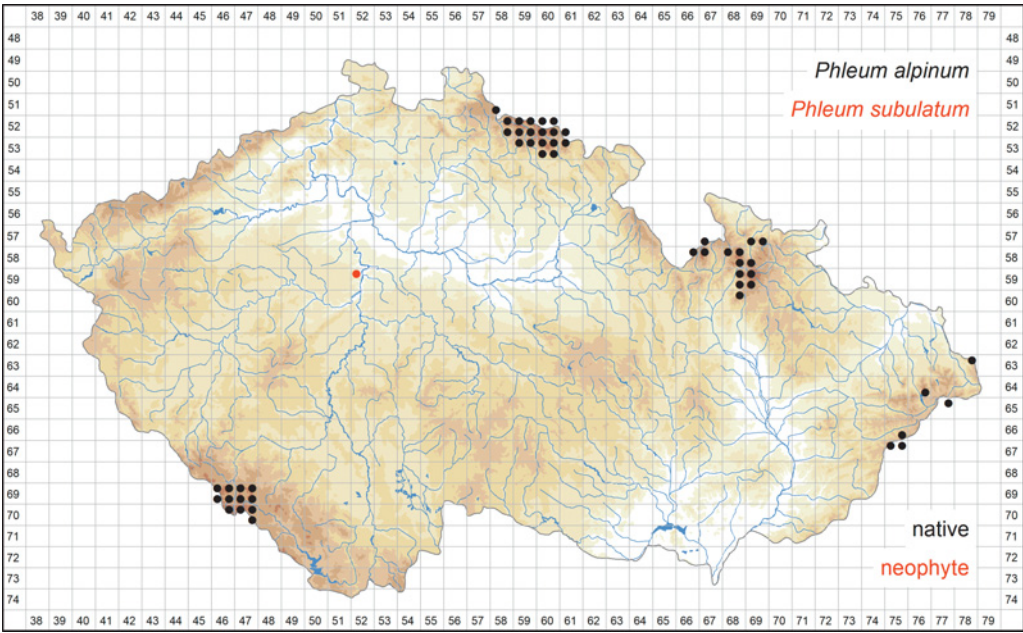


Fig. 63. – Distribution of *Phleum alpinum* (51 occupied quadrants) and *Ph. subulatum* (1 occupied quadrant) in the Czech Republic. Prepared by Jindřich Chrtěk Jr. (*Ph. a.*) and by Jindřich Chrtěk Jr. & Michal Ducháček (*Ph. s.*).

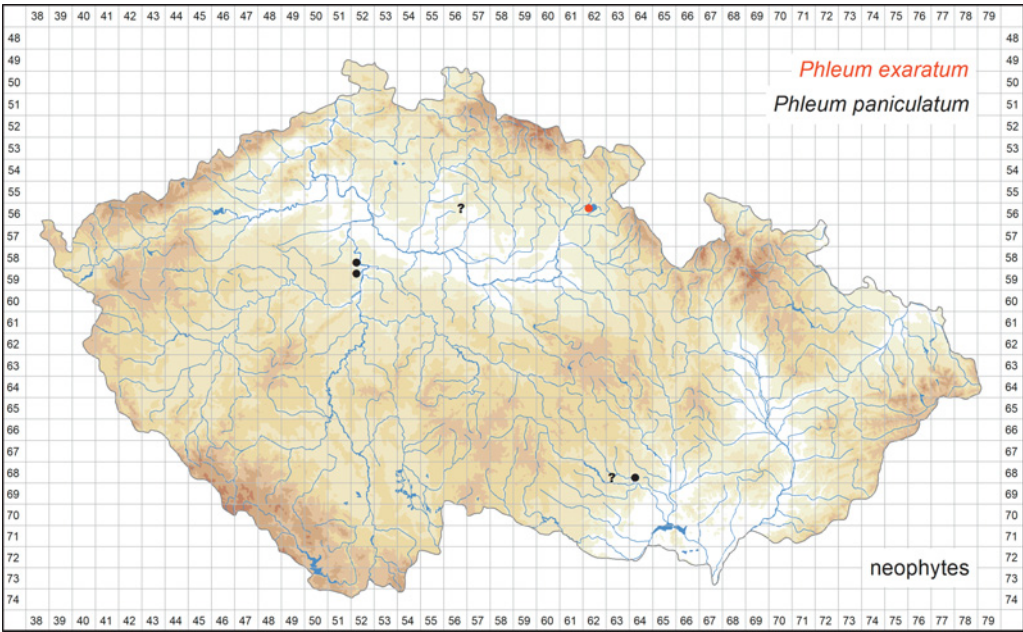


Fig. 64. – Distribution of *Phleum exaratum* (1 occupied quadrant) and *Ph. paniculatum* (3 occupied quadrants) in the Czech Republic. Prepared by Jindřich Chrtěk Jr. and Michal Ducháček.

range is in the Alps and adjacent south-eastern European mountains. Conert (1998) erroneously reported both species from the Czech Republic. *Phleum alpinum* has a large bipolar disjunct distribution range. It occurs in northern Europe and in the mountains of western, central and south-eastern Europe, in south-western and central Asia, China, southern Siberia, the Korean Peninsula, Japan, the Kamchatka Peninsula and the Kuril Islands, in the temperate zone in North America, including an outpost in Mexico, and in Greenland; in the Southern Hemisphere it is distributed in the southern part of the Andes and on South Georgia Island (Meusel et al. 1965, Hultén & Fries 1986, USDA, NRCS 2018). In the Czech Republic *Ph. alpinum* occurs in mountain meadows and subalpine, rarely alpine grasslands, on moderately humid, less often humid, acidic to neutral soils that are moderately rich in nutrients. It is scattered to locally common in the Šumava Mts, the Krkonoše Mts, the Králický Sněžník Mts (with an outpost in the Rychlebské hory Mts) and in the Hrubý Jeseník Mts, while being rare in the highest parts of the Moravskoslezské Beskydy Mts and the Javorníky Mts. *Phleum alpinum* has also been recorded at a handful of sites at lower elevations in the foothills of the Hrubý Jeseník Mts, eastwards to the village of Horní Benešov, but at least some of these records might be erroneous. The species' decline, especially in the Hrubý Jeseník Mts, can be attributed to changes in land use, most often abandonment of meadows and pastures (Bureš 2013). It is therefore classified as endangered (Grulich 2012).

Phleum exaratum (Fig. 64)

Phleum exaratum is native to south-eastern Europe and south-western Asia, and it has been recorded as casual in western and central Europe (Verloove & Vandenberghe 1995). In its native range it is found in dry open grasslands and pine forests. In the Czech Republic several tens of plants of *Ph. exaratum* were found in 2003 in fine-grained gravel at a railway station in the town of Česká Skalice in eastern Bohemia, probably introduced by traffic (Ducháček & Chrtěk 2017). The population has strongly declined since then.

Phleum nodosum (Fig. 65)

Phleum nodosum is native to Europe, being absent only from its northernmost part as well as, Corsica and Crete, and is also native to Anatolia, Transcaucasia, northern Iran, central Asia (north-western part), south-western Siberia and northern Africa; it has been introduced into North America (Hultén & Fries 1986). In the Czech Republic it is found in meadows, pastures, edges of arable fields, stony slopes, roadsides, forest fringes, in both open and semi-shaded places, on rather permeable, dry to moderately humid soils, acidic to basic, usually moderately supplied with nutrients (it seems to be less nutrient-demanding than *Ph. pratense*). *Phleum nodosum* is scattered across this country, especially at middle elevations, reaching its elevational maximum in the Krkonoše Mts at about 730 m. The distribution is still imperfectly known, partly due to under-recording and to frequent misidentifications of smaller plants of *Ph. pratense* as *Ph. nodosum*. The map is based on examined herbarium specimens supplemented with selected literature records.

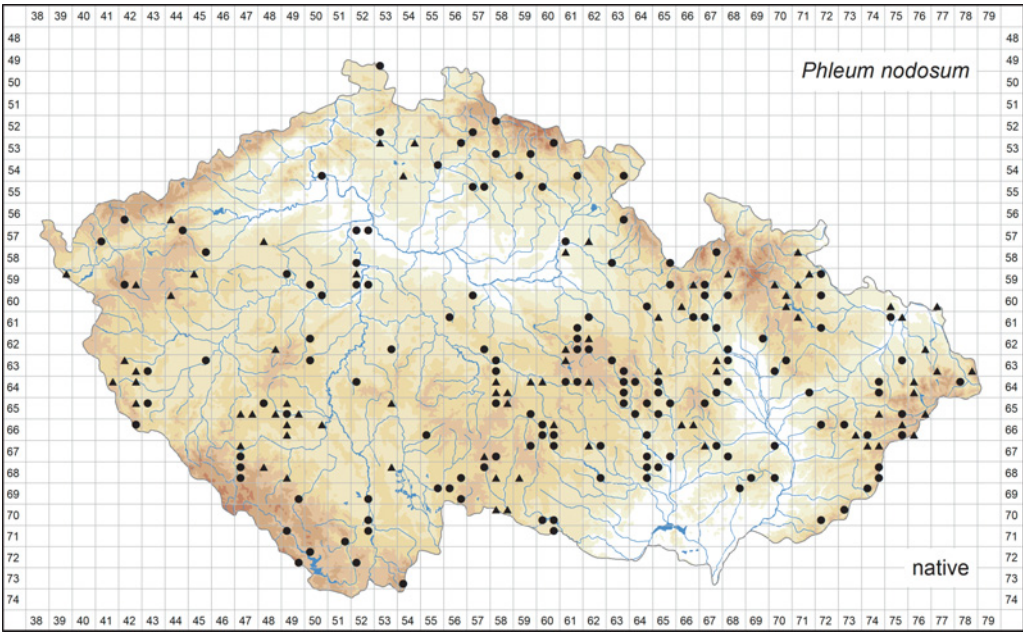


Fig. 65. – Distribution of *Phleum nodosum* in the Czech Republic: ● occurrence documented by herbarium specimens (147), ▲ occurrence based on other records (80 quadrants). Prepared by Jindřich Chrtěk Jr.

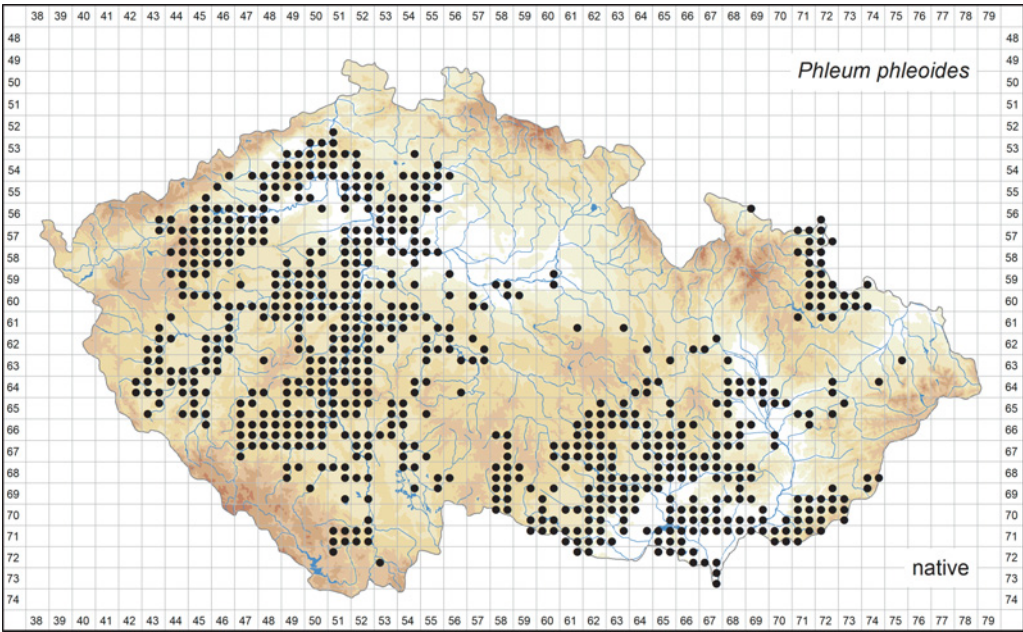


Fig. 66. – Distribution of *Phleum phleoides* in the Czech Republic (720 occupied quadrants). Prepared by Jindřich Chrtěk Jr.

Phleum paniculatum (Fig. 64)

Phleum paniculatum is distributed in southern Europe, with both well-established, probably native occurrences and casual introductions northwards as far as central Germany, the Czech Republic, Romania and Crimea (Valdés et al. 2009). In Asia it occurs in Anatolia, Transcaucasia, Iran and further eastwards in central Asia, China and Japan; it was also introduced into North America (Bor 1968, Doğan 1985, Lu & Phillips 2006). In its natural range it is found in dry open grassland, waste places, on walls and in vineyards. In the Czech Republic it was collected in the early 19th century in Prague. Probably in the mid-19th century it was reported from the vicinity of the town of Náměšť nad Oslavou, and in 1882 it was collected in the town of Ivančice, both in south-western Moravia. All these occurrences turned out to be temporary, and the species has not been recorded from this country since. *Phleum paniculatum* is therefore classified as a casual neophyte of this country's flora (Pyšek et al. 2012).

Phleum phleoides (Fig. 66)

Phleum phleoides is found in Europe westwards to the Iberian Peninsula and south-eastern England, northwards to southern Finland and eastwards to the Ural Mts; the southern distributional limit runs through southern Spain, northern Italy (with an outpost in the Gargano Peninsula), central Greece and the Caucasus Mts; it also occurs in south-western and central Asia, southern Siberia and Mongolia and in northern Africa (Meusel et al. 1965, Hultén & Fries 1986). In the Czech Republic it is found most often in dry grasslands, rocky slopes, dry heathlands, fringes of thermophilous forests, rarely also in open-canopy forests, usually on shallow soils that are poor to moderately rich in nutrients and slightly acidic to basic. *Phleum phleoides* is scattered to locally common in warm and dry hilly areas in central and north-western Bohemia with extensions to western, south-western and southern Bohemia, in south-western, southern, south-eastern and central Moravia and in Silesia; it is nearly absent from the lowlands and hilly areas of eastern and north-eastern Bohemia. The species is threatened by abandonment of meadows and pastures on nutrient-poor soils and by overall eutrophication of the landscape; its most striking decline has been observed in Silesia.

Phleum pratense (Fig. 67)

Phleum pratense is widely distributed in Europe and is less common in the Caucasus Mts, south-western and central Asia, Siberia, China and north-western Africa. It has been introduced either unintentionally by settlers or on purpose as a pasture or fodder grass and has become naturalized in the Russian Far East, Japan, North and South America, southern Africa, Australia and New Zealand (Hultén & Fries 1986, USDA, NRCS 2018). In the Czech Republic it is found in a wide range of grasslands, including meadows, pastures, roadsides and waste places on rather heavy and moderately humid soils, usually well supplied with nutrients, most often moderately acidic to moderately basic. *Phleum pratense* is widespread in this country, being most frequent at middle elevations and humid areas. It is an important fodder grass, grown in pure stands or meadow mixtures; in the past it was also sown in mixtures with legumes such as alfalfa or clover for better performance.

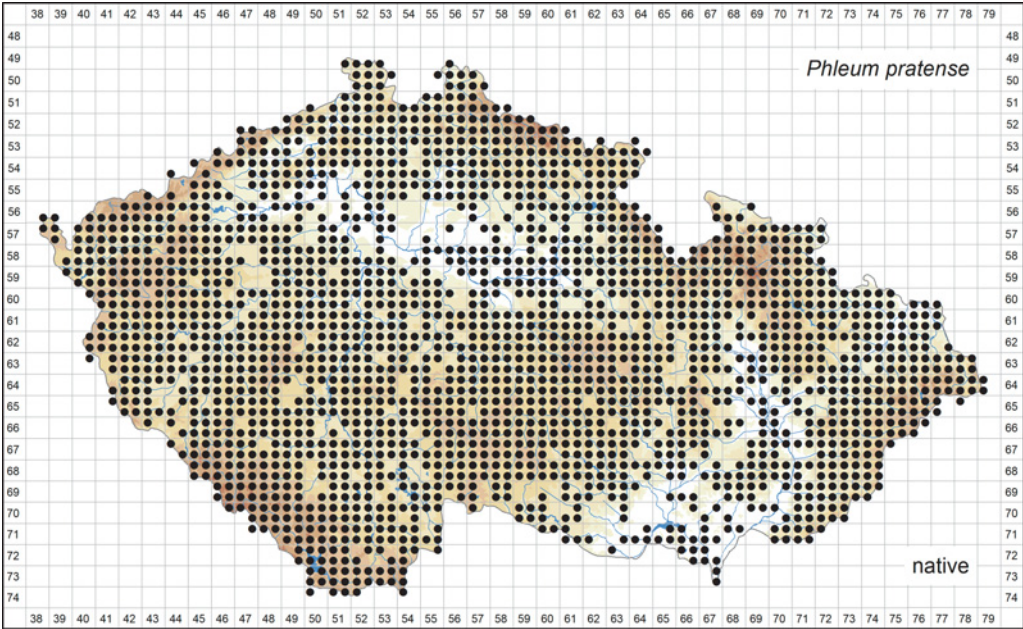


Fig. 67. – Distribution of *Phleum pratense* in the Czech Republic (2046 occupied quadrants). Prepared by Jindřich Chrtěk Jr.

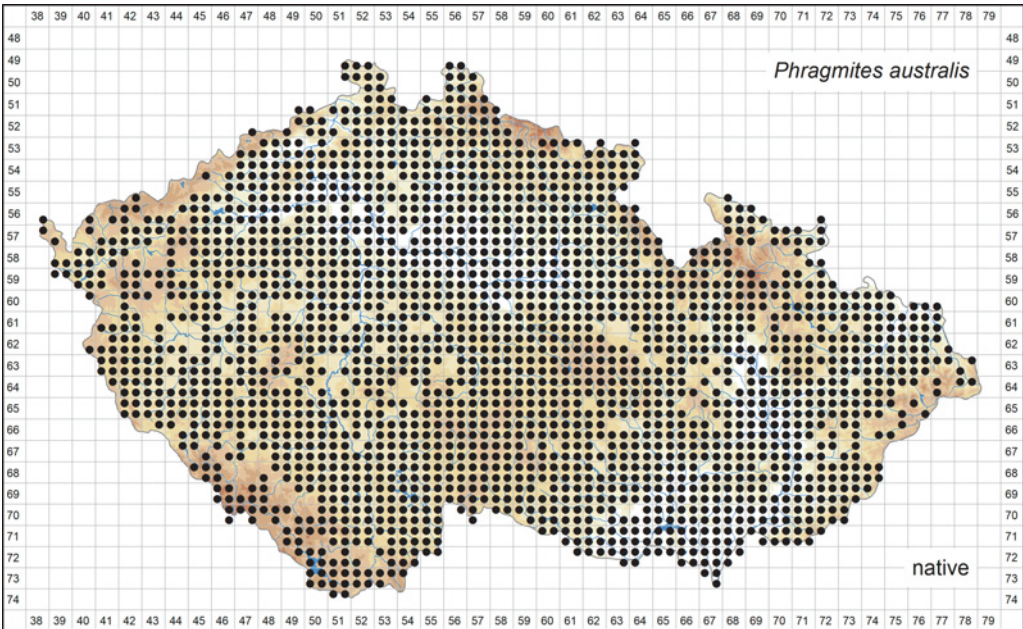


Fig. 68. – Distribution of *Phragmites australis* in the Czech Republic (2096 occupied quadrants). Prepared by Zdeněk Kaplan.

Phleum subulatum (Fig. 63)

Phleum subulatum is native to south-western, southern, south-eastern and eastern Europe, south-western Asia and northern Africa, where it occurs in dry grasslands and open shrub communities (Bor 1968, Doğan 1985, Valdés et al. 2009). Temporary introductions were recorded in central Europe; it has also been introduced into North America and Australia. In the Czech Republic *Ph. subulatum* was collected only once in 1926 at the Smíchov railway station in Prague. It is classified as a casual neophyte in this country (Pyšek et al. 2012).

Phragmites australis (Fig. 68)

Phragmites australis is a cosmopolitan species, one of the most widespread plants in the world, being most frequent in temperate zones in both hemispheres (Hultén & Fries 1986, Clevering & Lissner 1999). It is highly variable in morphology, chromosome number and life-history traits, and currently two or three subspecies are distinguished (Clevering & Lissner 1999, Saltonstall et al. 2004). Molecular analyses have revealed many genotypes (Lambertini et al. 2008, 2012), of which some have been repeatedly introduced from Europe into North America and at least one has become invasive there (Meyerson & Cronin 2013). In the Czech Republic this species is represented only by *Ph. a.* subsp. *australis*. It occupies a wide range of oligotrophic to eutrophic, acidic to basic, or even brackish habitats, including littoral zones of fishponds, oxbow lakes, alluvial pools, lowland rivers, drainage and irrigation channels, abandoned wet meadows, springs, wet or flooded bottoms of abandoned quarries and sand pits, road ditches, permanently wet depressions in arable fields and other wetlands, but it sometimes occurs also in rather dry habitats along railways, in industrial areas and settlements. *Phragmites australis* is widespread throughout this country, being particularly frequent in fishpond landscapes and at middle elevations. It is rare in or absent from the highest mountains, where suitable habitats are absent. Still, it occasionally attains high elevations and reaches its maximum at 1280 m in the Velká kotlina glacial cirque in the Hrubý Jeseník Mts in northern Moravia. The map is based mainly on records from various databases, and the gaps on the map are most likely due to a lack of records rather than true absences.

Polypodium interjectum (Fig. 69)

Polypodium interjectum is an allohexaploid species whose assumed parents are the tetraploid *P. vulgare* and the diploid *P. cambricum* (Shivas 1961). It is an exclusively European species preferring oceanic and suboceanic climates. Being very similar to *P. vulgare*, it remains under-recorded all over its distribution range. It occurs most frequently in the Atlantic western Europe, Corsica, Italy and Croatia; it is scattered in Scandinavia, the Baltic countries, Germany, Poland, the Czech Republic, Austria, Slovakia, and Hungary. Only several outposts are reported from Ukraine and western Russia (Jalas & Suominen 1972, Nielsen & Johnsen 2000, Harmaja 2012, Szczęśniak et al. 2015). In the Czech Republic it prefers shady basic to neutral substrates such as limestone, basalt, sandstone and gneiss rocks in deep and narrow valleys and rocky slopes covered by deciduous forests. It is scattered in northern, central and south-western Bohemia, and central and southern Moravia, but some of its occurrences may remain unnoticed. The

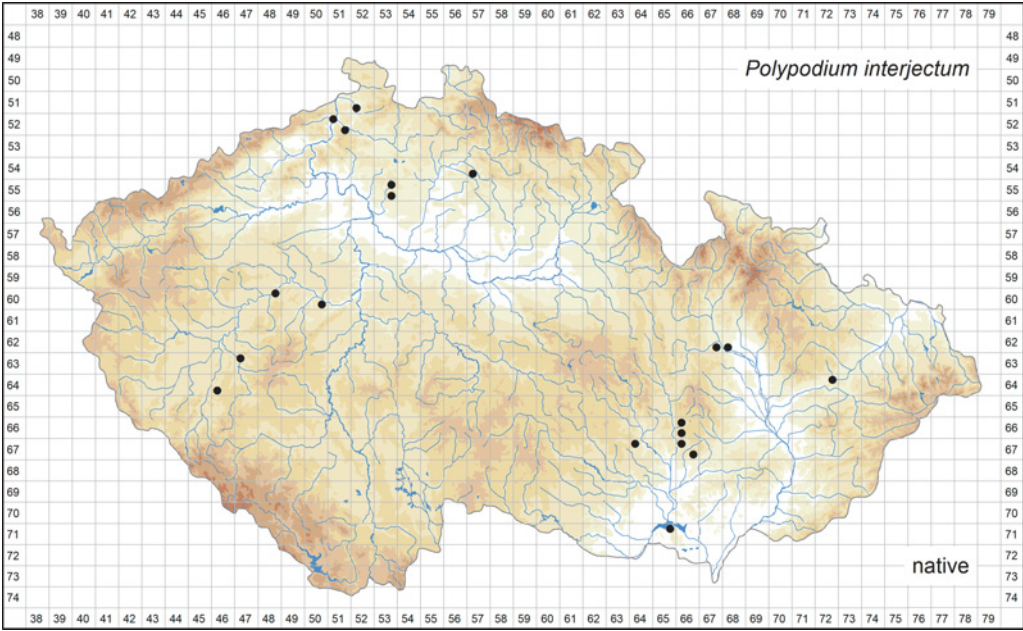


Fig. 69. – Distribution of *Polypodium interjectum* in the Czech Republic (19 occupied quadrants). Prepared by Libor Ekrť.

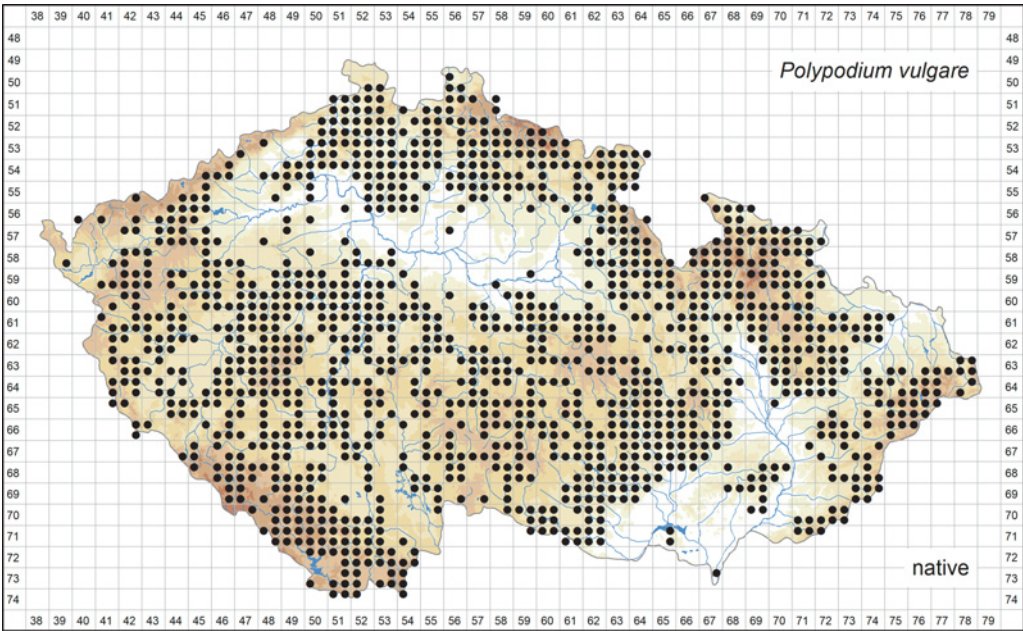


Fig. 70. – Distribution of *Polypodium vulgare* in the Czech Republic (1284 occupied quadrants). Prepared by Libor Ekrť.

map is based exclusively on examined herbarium specimens and records of plants with genome size estimated by flow cytometry (Bureš et al. 2003). Because of its limited distribution, it is considered endangered (Grulich 2012).

Polypodium vulgare (Fig. 70)

Polypodium vulgare is an allotetraploid species probably derived from the hybridization of the diploid species *P. sibiricum* and *P. glycyrrhiza* (Haufler et al. 1995). It is continuously distributed in temperate North America, Europe, North Africa and Anatolia. However, at rather high elevations its distribution is disjunct, extending from eastern Europe as far as eastern Asia. Several outposts are found in the Southern Hemisphere in southernmost Africa and the Kerguelen Islands (Meusel et al. 1965). In the Czech Republic *P. vulgare* usually occurs on shaded rocks and forested stony slopes, very often in river valleys. It may rarely grow as an epiphyte on trunk bases or bases of lower branches, on old decomposing wood or in wall crevices, and locally also on shallow sandy soils in pine-oak forests. *Polypodium vulgare* is found with different frequencies throughout the country. It is frequent in hilly or mountainous areas from middle to rather high elevations, while being rare in or absent from the warm, largely deforested lowlands with prevailing arable land in western, central and eastern Bohemia, southern Moravia and Silesian basins, and the highest parts of the mountains. Most of the gaps on the map at middle elevations are due to under-recording.

Pseudognaphalium luteoalbum (Fig. 71)

Pseudognaphalium luteoalbum is a thermophilous wetland plant behaving as a summer- or winter-annual. It has an extensive distribution across temperate to tropical zones in Europe, Africa, south-western Asia, India, south-eastern Asia, Australia and New Zealand. Occurrences in the Americas are considered as introductions. In Europe this species extends to southern Scandinavia and south-eastern England in the north and north-west; non-native populations in man-made habitats have been documented even further north in Scotland and central Scandinavia (Hultén & Fries 1986, Lampe 1996, Chen et al. 2011). Its distribution exhibits an oceanic tendency, avoiding strongly continental regions (it is absent from most of Russia). It is also reported to avoid calcareous substrates (Meusel et al. 1965); however, this is probably true of only some parts of its range (cf. Lampe 1996). *Pseudognaphalium luteoalbum* grows on sandy, loamy or clayey soils, sometimes rich in humus, but it avoids sapropelic mud. As its development is rather long and slow, compared to the majority of wetland annuals, this species requires sites remaining for several months without cover of tall, competitively strong herbs. Until the time of flowering it also has high demands for moisture. Therefore, it has mainly been found on wet margins of fishponds, in fish storage ponds, wet bottoms of sand pits, depressions and ditches in arable fields, on field and forest tracks, pastures, in forest clearings and in similar habitats where the soil remains wet until summer months. In the past, *P. luteoalbum* occurred from the lowlands to the hilly areas throughout the Czech Republic, with most records in fishpond landscapes in southern and south-western Bohemia, in the middle Labe river basin and surrounding hilly areas in eastern and central Bohemia, in the Morava and Dyje river basins in central and southern Moravia, the karst area of Moravský kras, the Dražanská vrchovina highlands and lower parts of the Carpathians. Due to continual eutrophication of the environment along

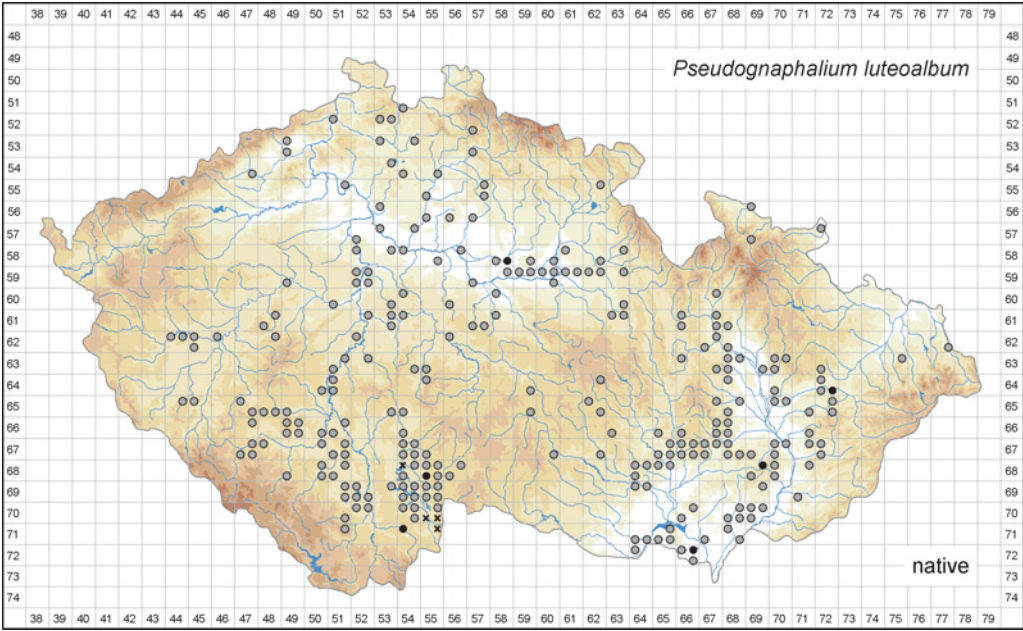


Fig. 71. – Distribution of *Pseudognaphalium luteoalbum* in the Czech Republic: ● at least one record in 2000–2018 (6 quadrants), ○ pre 2000 records only (256 quadrants), x deliberate introductions only (4 quadrants). Prepared by Kateřina Šumberová.

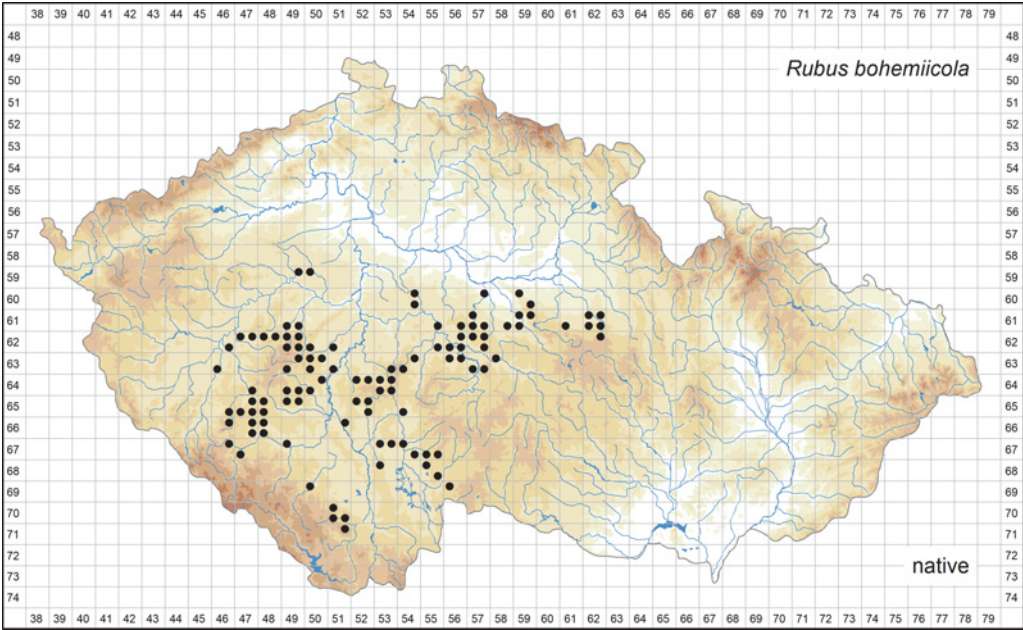


Fig. 72. – Distribution of *Rubus bohemicola* in the Czech Republic (104 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

with land-use change (e.g. large-scale abandonment of sheep grazing and drainage) the species started to decline already at the turn of the 19th and 20th centuries (cf. Hřčka 2004). Fish-farming and agriculture intensification after World War II, characterised by e.g. the restriction of the length in summer drainage of fishponds, application of high amounts of fertilizers and use of herbicides, caused fast decline of this species' populations. Recent reports have documented only six extant spontaneous populations in this country: two of them are situated in southern Bohemia, one in eastern Bohemia and three others in southern and central Moravia. Several populations in the surroundings of the town of Třeboň in southern Bohemia and a single population near the city of Hradec Králové in eastern Bohemia originate from rescue cultivations (Kučerová et al. 2016). For the above reasons, the species is classified as critically threatened (Grulich 2012).

Rubus

In the flora of the Czech Republic, the genus *Rubus* is represented by native members of four subgenera: *R. subg. Chamaerubus* (*R. chamaemorus*), *R. subg. Cylactis* (*R. saxatilis*), *R. subg. Idaeobatus* (*R. idaeus*) and *R. subg. Rubus* (currently 115 formally described native species). The last subgenus is divided into three sections: *R. sect. Rubus* (88 species), *R. sect. Caesii* (only *R. caesius*) and *R. sect. Corylifolii* (26 hybridogenous species derived from crosses between *R. caesius* and various members of sect. *Rubus*). *Rubus caesius*, *R. chamaemorus*, *R. idaeus* and *R. saxatilis* are sexual, diploid or polyploid, while *R. sect. Rubus* (*R. fruticosus* agg. in narrower sense, i.e. without *R. corylifolius* agg.) and *R. sect. Corylifolii* (*R. corylifolius* agg.) are represented only by apomictic polyploids. In this series of maps, each subgenus and each section of *R. subg. Rubus* is represented by at least one species. The distribution maps of the species of the sections *Rubus* and *Corylifolii* are based solely on examined herbarium specimens, field records of the authors and botanists with good knowledge of the genus.

Rubus bohemiicola (Fig. 72)

Rubus bohemiicola is a tetraploid species of ser. *Discolores* (Krahulcová & Holub 1998b, Krahulcová et al. 2013). It is considered endemic to the Czech Republic (Holub 1995, Kurtto et al. 2010), being scattered in south-western, southern, southern-central and southern part of eastern Bohemia. *Rubus bohemiicola* grows in open-canopy, most often mixed forests and tree plantations, their clearings, on waysides, in forest edges and openings, preferring moderately humid to mesic, usually slightly acidic soils above silicate bedrock. The localities of *R. bohemiicola* are situated mainly at elevations of 300–680 m. *Rubus bohemiicola* is classified as vulnerable due to its endemic status and small distribution (Grulich 2012).

Rubus caesius (Fig. 73)

Rubus caesius is a tetraploid species (Krahulcová & Holub 1997) widely distributed from the British Isles to western Asia, discontinuously also in the Altai Mts and Central-Asian mountains. In Europe it extends from the Mediterranean area to 63°N (Jäger in Weber 1995, Kurtto et al. 2010). *Rubus caesius* shows a broad ecological amplitude, inhabiting various types of habitats. It is frequent in floodplain forests, pine forests and some other

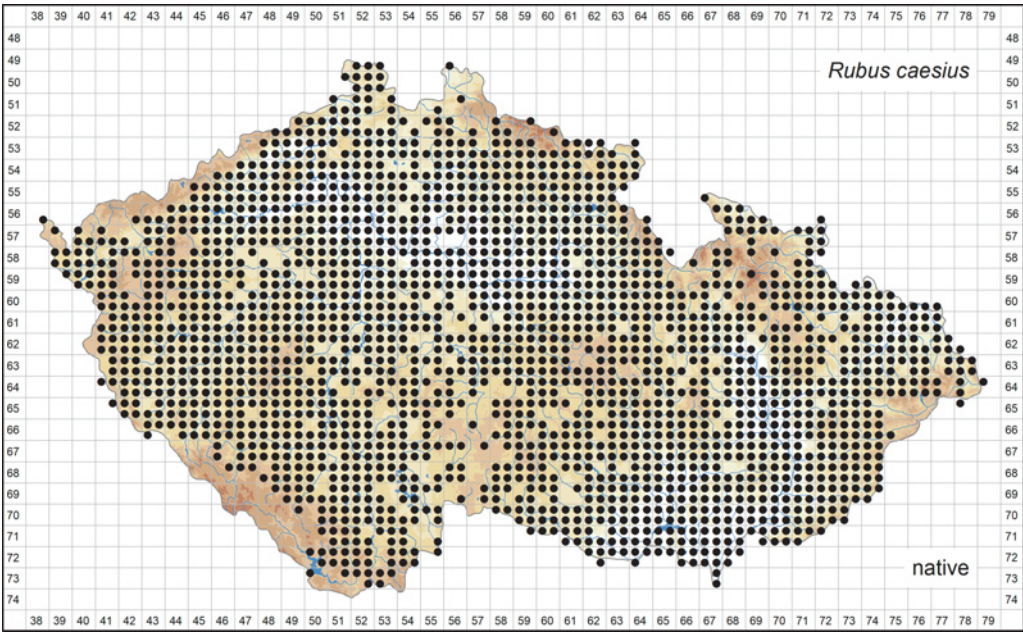


Fig. 73. – Distribution of *Rubus caesius* in the Czech Republic (2004 occupied quadrants). Prepared by Jiří Zázvorka, Bohumil Trávníček, Petr Havlíček & Vojtěch Žíla.

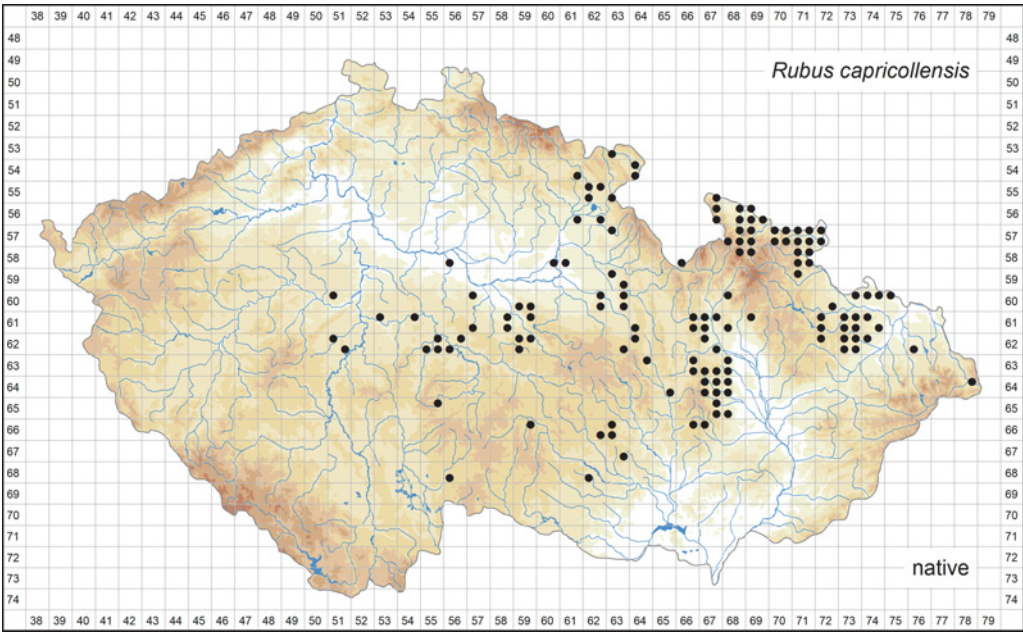


Fig. 74. – Distribution of *Rubus capricollensis* in the Czech Republic (132 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

types of forests, in their margins and in shrub communities. It is often also found along roads and paths, on pastures, at semi-ruderal sites in settlements, in ruderalized grasslands, abandoned fields, sometimes also as a weed on arable land and in many other, often secondary habitats. It grows in semi-shaded or sunny places on deep soils that are moderately supplied with mineral nutrients, often nitrogen-rich, loamy or loamy-sandy, skeletal, moderately acidic to basic, often developed above calcium-rich bedrock. In the Czech Republic *R. caesius* is common at low and middle elevations in warm and moderately warm areas. Rarely it is also found in the mountains: it was recorded in the Krkonoše Mts at 900 m a.s.l. and in the Hrubý Jeseník Mts at 1330 m a.s.l.; however, the distribution in submontane and montane areas is not precisely known.

Rubus capricollensis (Fig. 74)

Rubus capricollensis is a tetraploid species (Krahulcová et al. 2013) of ser. *Sprengeliani*, which occurs in south-western Poland (Silesia) and the Czech Republic (Kurtto et al. 2010). It grows in open-canopy forests and tree plantations, especially in their clearings and fringes, along forest tracks; in areas with humid climates it is found also in thickets outside forest. The soils are slightly acidic, usually mesic and moderately rich in nutrients. In the Czech Republic *R. capricollensis* is locally common at lower elevations in Silesia and northern Moravia, and in the Drahanská vrchovina highlands. It also occurs scattered through western Moravia, eastern and central Bohemia, reaching its absolute south-western distribution limit south of Prague. The species has been recorded at elevations of about 200–600 m.

Rubus chaerophyllus (Fig. 75)

Rubus chaerophyllus is a tetraploid species (Krahulcová et al. 2013) of ser. *Micantes*. Its distribution extends from northern Bavaria to Brandenburg in Germany and from Bohemia to south-western Poland (Kurtto et al. 2010). This species reaches the south-eastern limit of its general distribution in Bohemia. It occurs in deciduous, mixed and coniferous forests and tree plantations, where it prefers semi-shaded places in clearings and forest margins. The soils are permeable, moderately wet to mesic, slightly acidic to acidic, usually mineral-poor and humus-rich. In the Czech Republic *R. chaerophyllus* is found mainly in northern, central and southern Bohemia, where it is locally common. In western and eastern Bohemia its occurrence is restricted to a handful of sites. *Rubus chaerophyllus* is probably absent from Moravia, and the records from the vicinity of the towns of Opava and Znojmo (Weber 1995) may be erroneous. The species occurs at elevations of about 200 m to 600 m.

Rubus chamaemorus (Fig. 76)

Rubus chamaemorus is an octoploid species (Krahulcová & Holub 1997). It is an arctic-subarctic circumpolar plant distributed continuously in Europe and Asia between 54°N and 78°N and in North America between 50°N and 70°N (Jäger in Weber 1995). *Rubus chamaemorus* is widespread in northern Europe; in continental Europe the southern limit of its continuous distribution runs through north-western Germany, northernmost Poland and the Baltic countries (Kurtto et al. 2010). An isolated occurrence has been reported

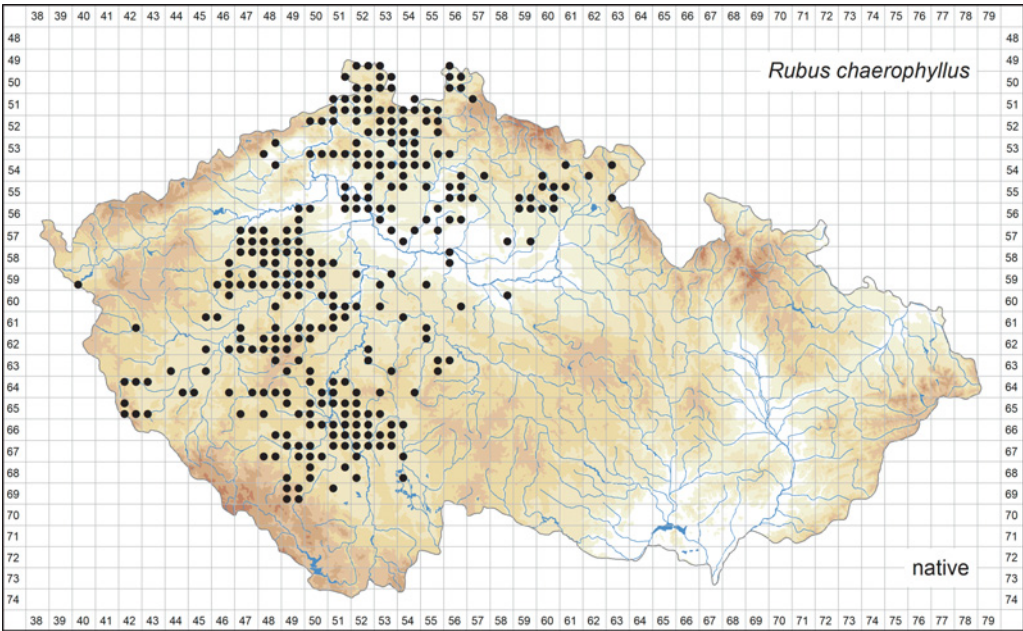


Fig. 75. – Distribution of *Rubus chaerophyllus* in the Czech Republic (300 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

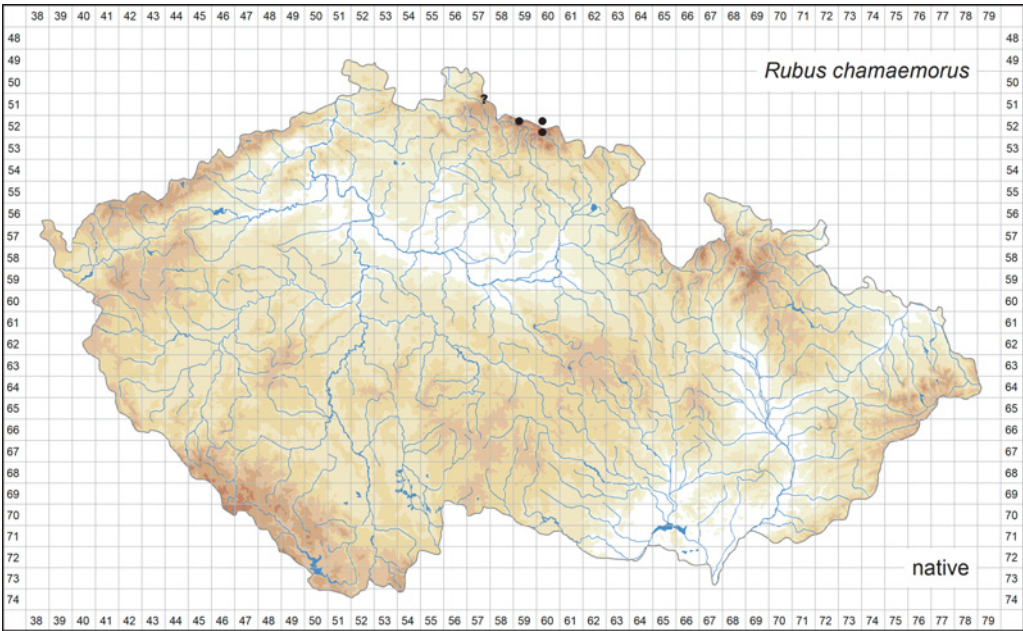


Fig. 76. – Distribution of *Rubus chamaemorus* in the Czech Republic (3 occupied quadrants). Prepared by Jiří Zázvorka.

from the Orawa-Nowy Targ Basin in the Western Carpathians in southern Poland (Koczur 2004). Another outpost is found in the Krkonoše Mts, where this species occurs in the subalpine belt at elevations of 1235–1445 m (Soukupová et al. 1991, Procházka & Štursa 1999), both on the Czech and Polish sides of the mountains. *Rubus chamaemorus* is found at many sites in peat bogs in subalpine meadows. Old records (Wimmer & Grabowski 1829, Schustler 1918) from the Jizerské hory Mts along the Czech-Polish border have not been confirmed recently (Holub 1995). In the Czech Republic *R. chamaemorus* occurs in subalpine peat bogs with a thick layer of humolite, which is permanently wet, acidic (pH 3.0–4.5) and poor in mineral nutrients. It is often found under shrubs or at edges of dwarf pine patches. The occurrence in the Krkonoše Mts is considered to be relict from the last glaciation. It is classified as critically threatened because of its rarity (Grulich 2012).

Rubus clusii (Fig. 77)

Rubus clusii is a tetraploid species (Krahulcová et al. 2013) of ser. *Micantes*. Its distribution extends from southern Germany (Bavaria), the Czech Republic and south-western Slovakia in the north through western Hungary and Austria to Slovenia in the south (Kurtto et al. 2010). An isolated occurrence was recently found in south-eastern Poland (Oklejewicz et al. 2013). The localities in the Czech Republic are situated at the northern limit of its distribution. *Rubus clusii* grows in forest clearings and openings, thickets and fringes of coniferous and mixed open-canopy forests and plantations of *Pinus sylvestris* in rather shaded to almost open places, often forming large, almost impenetrable stands. It is found on permeable (often sandy), moderately humid to slightly dry soils, which are slightly acidic to acidic. In the Czech Republic *R. clusii* occurs in the area between Prague and the towns of Domažlice and České Budějovice and in a strip between south-eastern Bohemia and central Moravia. It is absent from or rare in other parts of the country. The northernmost localities of *R. clusii* are situated between the towns of Litoměřice and Roudnice nad Labem and east of the town of Mladá Boleslav. The species grows from the lowlands up to elevations of about 900 m.

Rubus dollnensis (Fig. 78)

Rubus dollnensis is a pentaploid species (Krahulcová et al. 2013) of ser. *Hystricopses*. It occurs in the eastern part of central Europe, including Germany (eastern part, particularly Saxony), south-western Poland (especially Silesia), the Czech Republic and Lower Austria (Kurtto et al. 2010). There is also an uncertain record from Slovakia (Zieliński 2004). In the Czech Republic *R. dollnensis* grows in thickets, most often along paths and roads, in semi-ruderal to ruderal places, forest fringes, sometimes also in forest clearings and openings, especially in mixed or coniferous woods and tree plantations. It is found on moderately wet to semi-dry, slightly acidic to slightly basic soils, which are moderately rich in mineral nutrients, often somewhat eutrophied, and usually poor in humus. It is one of the most frequent species of the subg. *Rubus*, particularly in the Českomoravská vrchovina highlands and adjacent areas; it is rare in or absent from the mountains along this country's border, especially in western and south-western Bohemia, and in eastern and south-eastern Moravia. It has been found from the lowlands up to elevations of about 750 m, being most frequent at middle elevations.

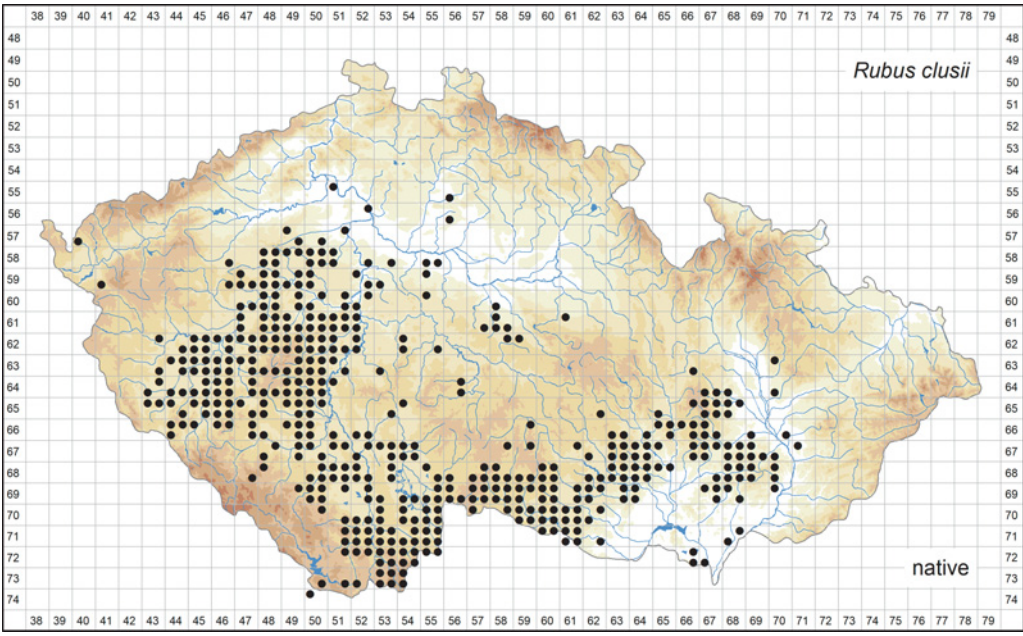


Fig. 77. – Distribution of *Rubus clusii* in the Czech Republic (464 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

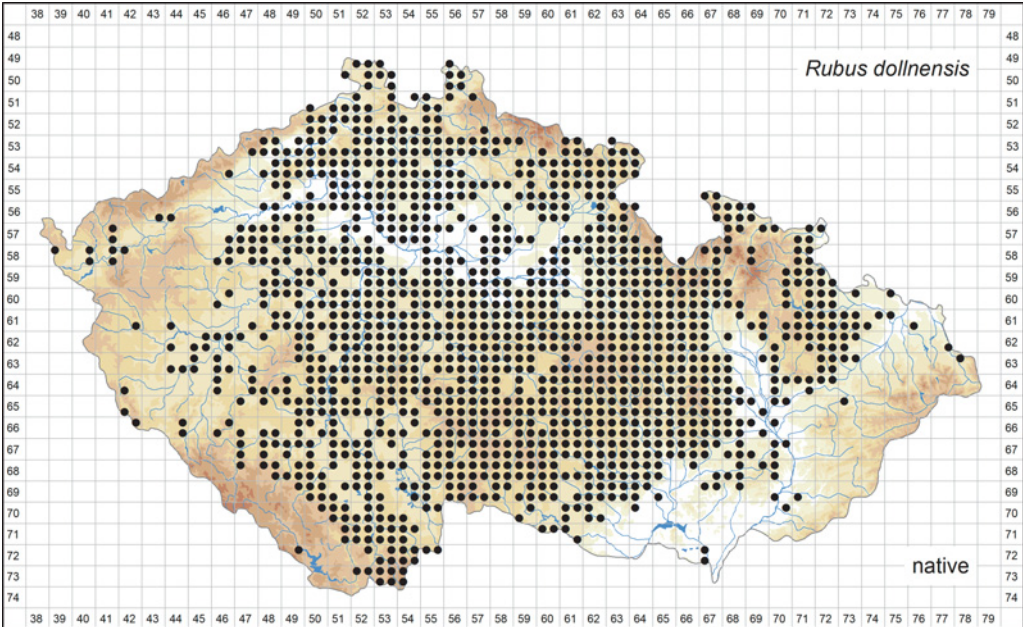


Fig. 78. – Distribution of *Rubus dollnensis* in the Czech Republic (1328 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

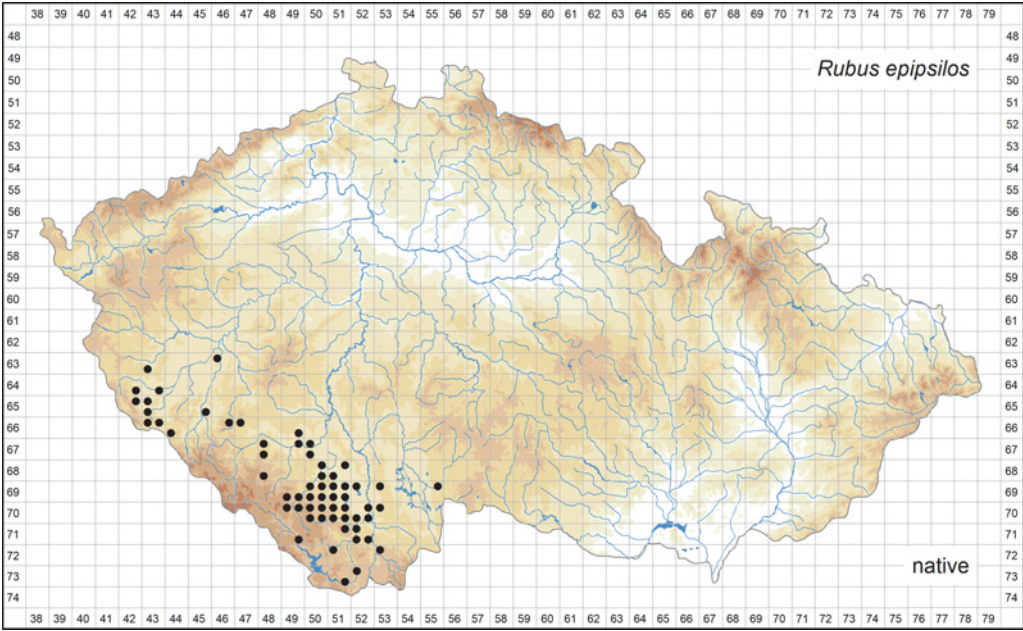


Fig. 79. – Distribution of *Rubus epipsilos* in the Czech Republic (60 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

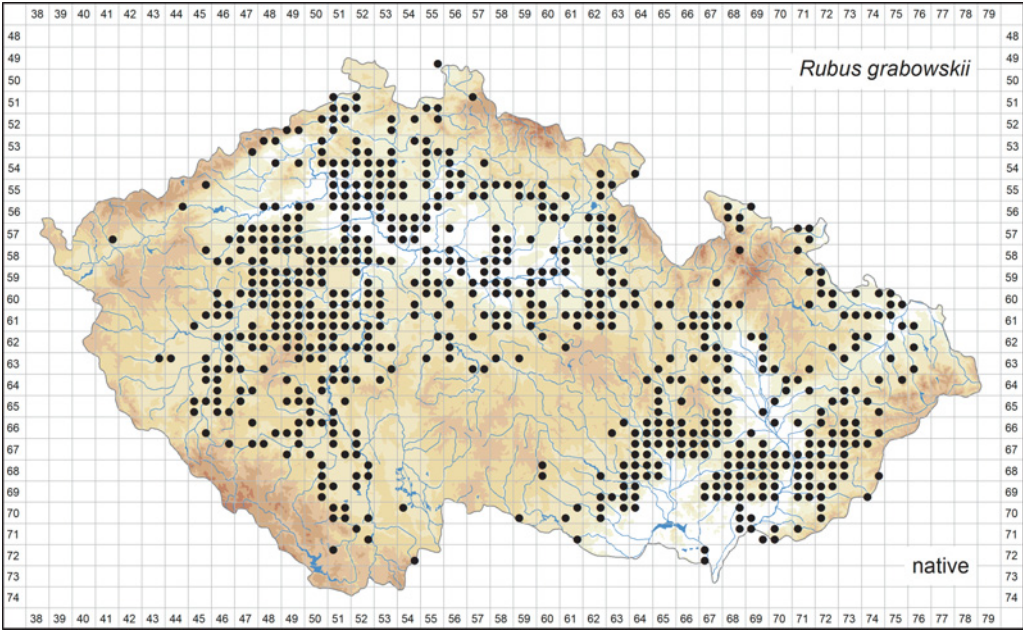


Fig. 80. – Distribution of *Rubus grabowskii* in the Czech Republic (678 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

Rubus epipsilos (Fig. 79)

Rubus epipsilos is a tetraploid species (Krahulcová et al. 2013) of ser. *Radula*. It is found in Bavaria in Germany and in the adjacent parts of Austria and the Czech Republic, where it reaches the north-eastern limit of its distribution (Kurtto et al. 2010); it has been found also in northern Italy (South Tyrol; Pagitz 2013). In the Czech Republic *R. epipsilos* grows in open-canopy, usually mixed or coniferous forests and tree plantations, usually in semi-shaded places in their clearings, margins, and along forest paths and roads. It prefers mesic to semi-dry, moderately acidic to acidic soils that are poor or moderately rich in nutrients. The occurrence of *R. epipsilos* in the Czech Republic is confined to southern and south-western Bohemia, where it is scattered (locally almost common) in the area between the cities and towns of České Budějovice, Český Krumlov and Plzeň and in the southern part of the Český les hills, at elevations of about 400–700 m. This species is classified as of lower risk – near threatened in this country (Grulich 2012).

Rubus grabowskii (Fig. 80)

Rubus grabowskii is a triploid species (Krahulcová et al. 2013) belonging to ser. *Discolores*. It occurs from France in the west to Transcarpathian Ukraine in the east and from southernmost Scandinavia and north-eastern Poland in the north to southern France, Austria and northern Hungary in the south, being most common in central Europe (Kurtto et al. 2010). In the Czech Republic *R. grabowskii* prefers semi-shady to almost open places in forests and their fringes. It is found along forest paths and roads, in forest clearings and edges, around stone quarries in woods, sometimes also in scrub on slopes. The soils are neutral to slightly basic, mesic to moderately dry, usually rather rich in nutrients. *Rubus grabowskii* is distributed throughout the Czech Republic, with most records concentrated in warm and moderately warm areas. It avoids deforested and dry areas and the areas with too acidic and mineral-poor substrates. Thus, it is partly an ecological vicariant of the acidophilous *R. plicatus*. It is typically found from lowlands up to elevations of about 500 m, and only rarely higher.

Rubus idaeus (Fig. 81)

Rubus idaeus is a boreal-temperate diploid species (Měsíček & Jarolímová 1992, Krahulcová & Holub 1997), widespread in the whole of Europe and western Asia except for the latter area's northern- and southernmost parts. It has been introduced into Greenland, eastern parts of North America and New Zealand. In Asia it is replaced by the polyploid *R. sachalinensis*, which extends westwards as far as the eastern part of European Russia, co-occurring there with *R. idaeus* (Hultén & Fries 1986, Jäger in Weber 1995). In the Czech Republic *R. idaeus* is found in open-canopy forests, forest clearings and margins. It prefers humid loamy soils rich in nutrients, basic to moderately acid. *Rubus idaeus* is widespread in this country, occurring from the lowlands up to the subalpine belt, but with different frequencies, being locally common in wooded areas at low and middle elevations. It reaches its elevational maxima at 1450 m on Mt Studniční hora in the Krkonoše Mts, at 1420 m in the Králický Sněžník Mts and at 1480 m on Mt Praděd in the Hrubý Jeseník Mts. It is rare in or absent from deforested areas such as the middle Labe river basin in central and eastern Bohemia, and southern and central Moravia. It is also cultivated as numerous cultivars, which occasionally escape from gardens.

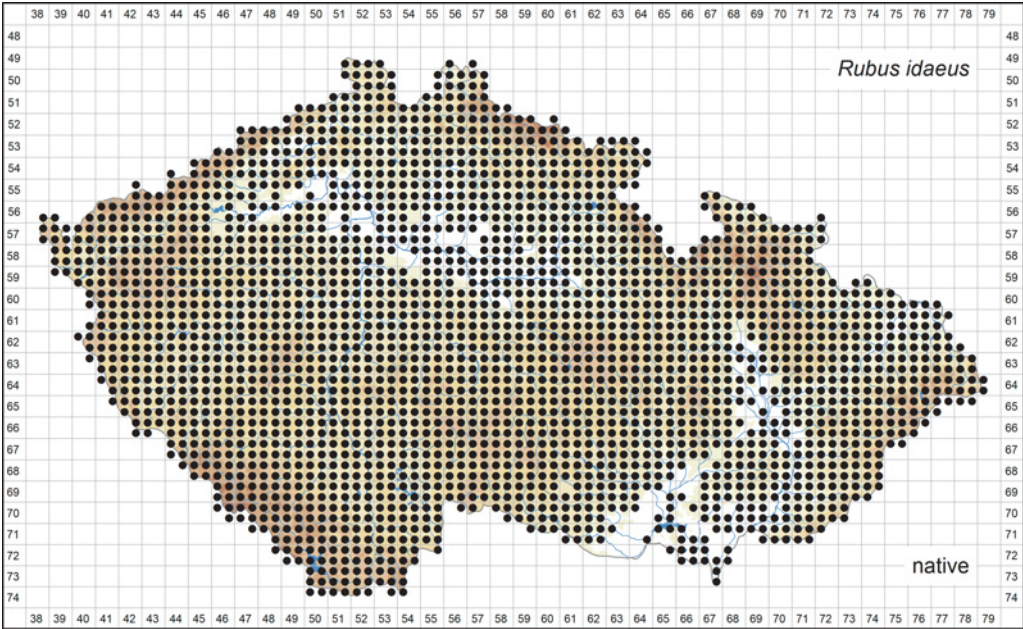


Fig. 81. – Distribution of *Rubus idaeus* in the Czech Republic (2400 occupied quadrants). Prepared by Jiří Zázvorka, Bohumil Trávníček, Petr Havlíček & Vojtěch Žíla.

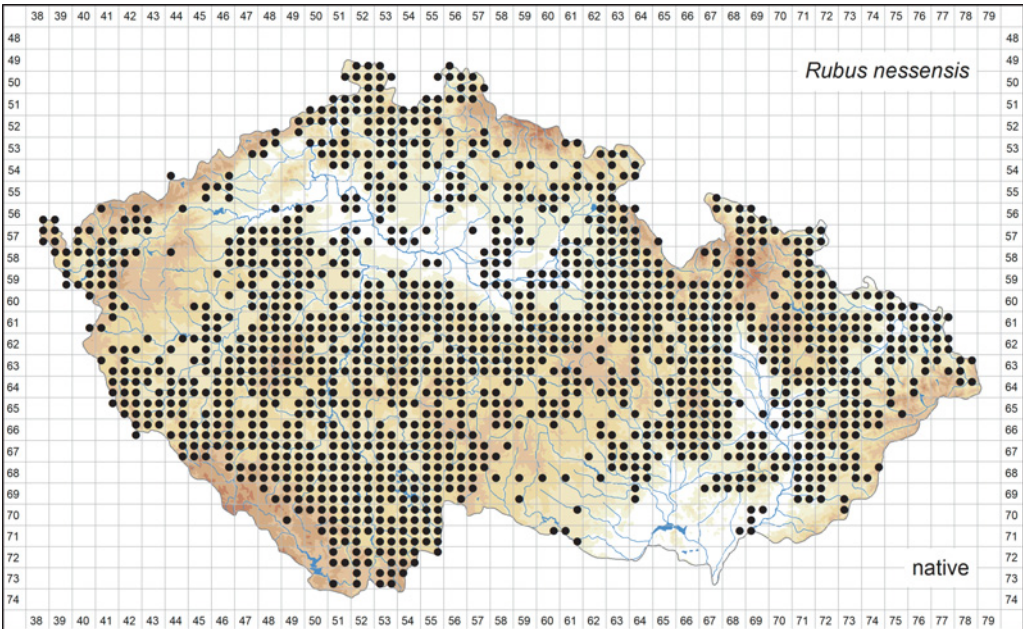


Fig. 82. – Distribution of *Rubus nessesensis* in the Czech Republic (1426 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

Rubus nessensis (Fig. 82)

Rubus nessensis is a tetraploid species (Krahulcová et al. 2013) classified in ser. *Nessenses*. In this treatment, the taxon is circumscribed in a narrow sense (i.e. excl. *R. scissoides*). It is widespread in the temperate zone in Europe, extending from the British Isles and France in the west to the basin of the central Volga river in European Russia and from southern parts of Scandinavia and Lake Ladoga in the north to northern Italy and central Romania in the south (Kurtto et al. 2010). It is most common in central Europe. In the Czech Republic *R. nessensis* grows in open-canopy deciduous, mixed or less often also coniferous forests, their clearings, fringes and shrub communities, and sometimes also in disused pastures. It is usually found on acidic to neutral, non-calcareous, most often moderately humid soils, poor to moderately rich in nutrients. *Rubus nessensis* occurs almost throughout this country. It is most frequent at middle elevations, being absent only from dry or deforested areas, areas with calcareous bedrock and mountains above 800 m in elevation.

Rubus pedemontanus (Fig. 83)

Rubus pedemontanus is a pentaploid species (Krahulcová et al. 2013) of ser. *Glandulosi*. It is a widespread species occurring from the British Isles and France in the west to Transcarpathian Ukraine in the east, and from Denmark, southern Sweden and north-eastern Poland in the north to southern France, Switzerland, western- and northernmost Austria in the south (Kurtto et al. 2010). The species' south-eastern distribution limit runs through Moravia. In the Czech Republic *R. pedemontanus* is found predominantly in mixed and coniferous forests and tree plantations, usually in shaded to semi-shaded places in their clearings, on waysides and in margins. Its preferred soils are permeable, moderately wet to mesic, often acidic, non-calcareous, and usually rich in humus. The species is common particularly in south-western and northern Bohemia, sometimes as the most frequent species of the subg. *Rubus*. In Bohemia it is rarer especially in areas with mineral-rich and basic bedrock. It additionally occurs scattered in northern Moravia and Silesia, and also west, north and east of the city of Brno. *Rubus pedemontanus* is most frequently found at middle elevations, and it is rare in or absent from the dry lowlands and the high mountains. It has been recorded at elevations of about 200–850 m.

Rubus plicatus (Fig. 84)

Rubus plicatus is a tetraploid species (Krahulcová et al. 2013) of ser. *Rubus*. It is a widespread species occurring from the British Isles and France in the west to the basin of the Dnieper river in Ukraine in the east, and from southern Scandinavia and Lithuania in the north to northernmost Italy and Croatia in the south. It is most common in north-western and central Europe, whereas its presence in Romania is uncertain (Kurtto et al. 2010). In the Czech Republic *R. plicatus* grows in various types of forests, less frequently also non-forest habitats, including open-canopy deciduous or coniferous (mostly secondary) forests, forest edges, clearings and openings, roadsides, pastures and shrub communities. It prefers permeable (often sandy), moderately acidic to acidic, always non-calcareous, slightly wet to moderately dry soils that are usually poor in nutrients. *Rubus plicatus* is dispersed throughout this country, being rather common in areas with acidic soils.

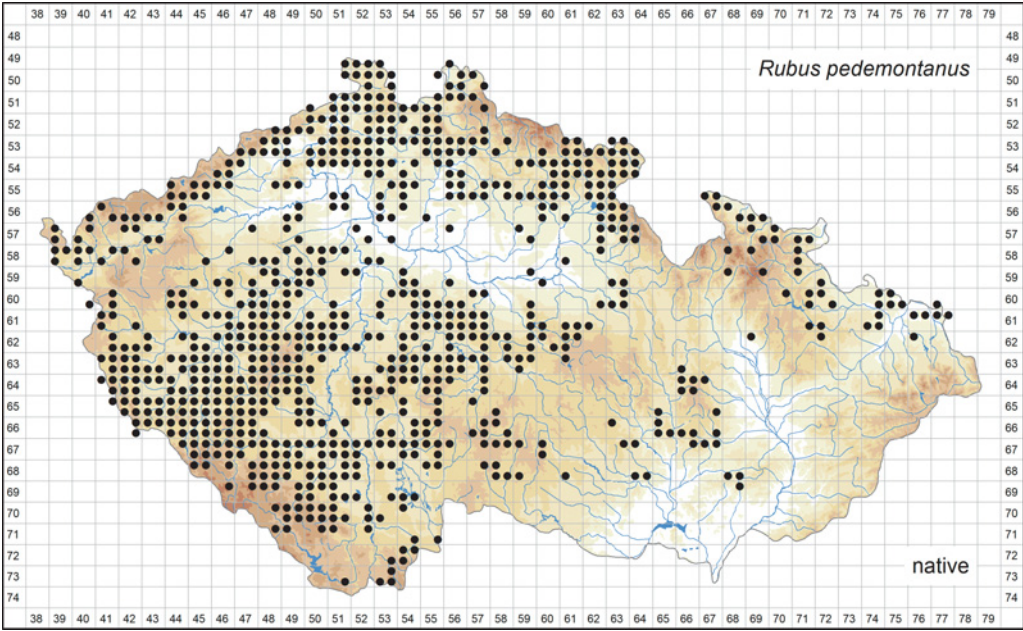


Fig. 83. – Distribution of *Rubus pedemontanus* in the Czech Republic (809 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

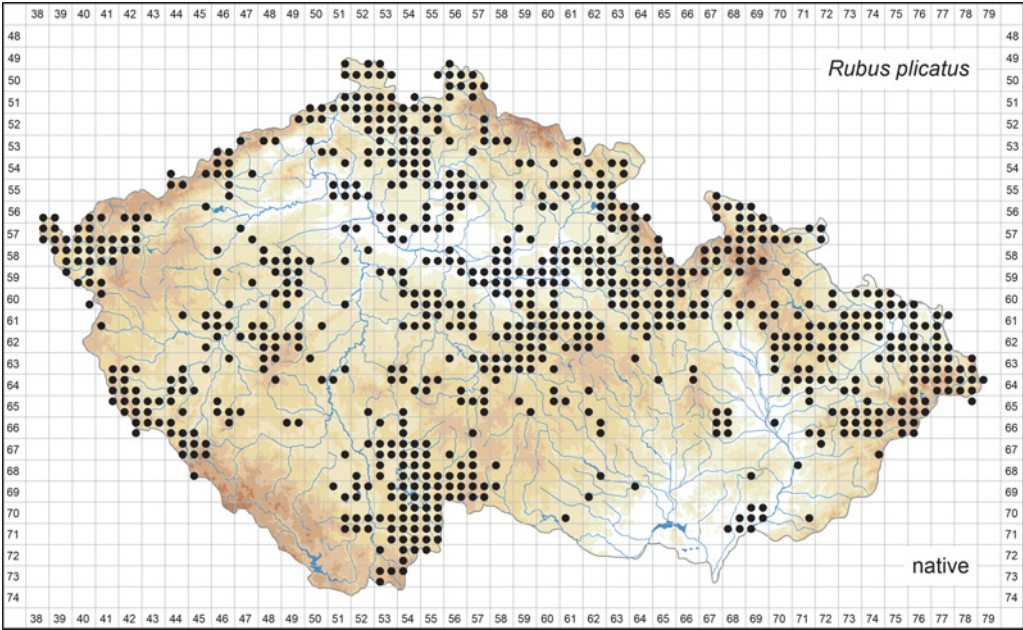


Fig. 84. – Distribution of *Rubus plicatus* in the Czech Republic (815 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

However, it is almost absent from deforested and rather dry areas, and areas with soils well supplied with calcium, for instance the Bílé Karpaty Mts in south-eastern Moravia. It occurs from the lowlands up to about 1000 m of elevation.

Rubus saxatilis (Fig. 85)

Rubus saxatilis is a tetraploid species (Krahulcová & Holub 1998a) distributed nearly throughout all of Eurasia. It is found in southern Greenland, Iceland, the British Isles and the whole of Scandinavia up to northernmost Norway, in the Pyrenees, eastern France and central Europe in the west; eastwards through European Russia and Siberia as far as the Russian Far East and northern Japan. Southwards it extends to northern Italy and Greece; isolated occurrences are in the Caucasus Mts and adjacent Turkey, the Altai Mts and the Himalayas (Hultén & Fries 1986, Kurtto et al. 2010). In the Czech Republic *R. saxatilis* grows mainly in open mixed forests, moist and shady places in various types of woods, on shrubby, grassy and rocky slopes, usually on deep, loamy, sandy or stony humid soils rich in humus and nutrients. It prefers moderately basic or moderately acidic soils, especially those over calcareous bedrock. This species is scattered throughout this country from the lowlands up to the subalpine belt, reaching its elevational maxima of 1450 m in the glacial cirque of Úpská jáma in the Krkonoše Mts and 1350 m in the Velká kotlina glacial cirque in the Hrubý Jeseník Mts. However, it is most frequent at middle elevations below 600 m in areas with moderately warm climates. *Rubus saxatilis* is classified as vulnerable because of its scarcity and decline (Grulich 2012).

Rubus wimmerianus (Fig. 86)

Rubus wimmerianus is a tetraploid species (Krahulcová et al. 2013) of ser. *Sylvatici*. It is confined to the eastern part of central Europe, occurring in south-eastern Poland, westernmost parts of Belarus and Ukraine, the whole of Slovakia (except for areas with calcareous bedrock or high mountains), the Czech Republic and the adjacent parts of Austria and Hungary (Kurtto et al. 2010). Its western distribution limit runs through central and southern Bohemia. In the Czech Republic *R. wimmerianus* grows in thickets along forest roads, in clearings and edges of deciduous, mixed and coniferous (often secondary) forests. The soils are moderately humid to mesic, acidic to neutral, usually moderately mineral-rich. In the Czech Republic the species is common in most of Moravia, particularly in its central, north-eastern and eastern parts, being there one of the most common brambles. In contrast, it is less frequent in or even absent from some parts of southern, south-western and western Moravia. Further towards the west it is found in eastern Bohemia, particularly at low elevations, and there are some records also from central and southern Bohemia. This species occurs from the lowlands up to elevations of about 750 m, being most frequent at middle elevations.

Sedum hispanicum (Fig. 87)

Sedum hispanicum is native to pastures and rock outcrops in southern and eastern Mediterranean and sub-Mediterranean Europe, particularly to the Balkan Peninsula, and to south-western Asia. The northern limit of its native range in Europe runs through Switzerland, the Eastern Alps, Hungary and the Eastern Carpathians, while it is alien in

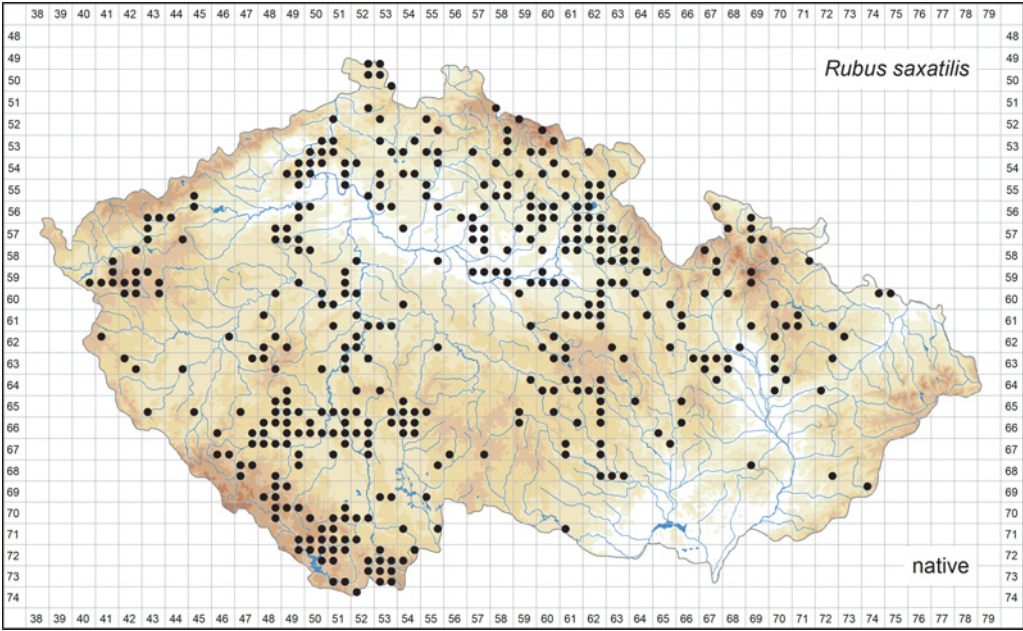


Fig. 85. – Distribution of *Rubus saxatilis* in the Czech Republic (399 occupied quadrants). Prepared by Jiří Zázvorka.

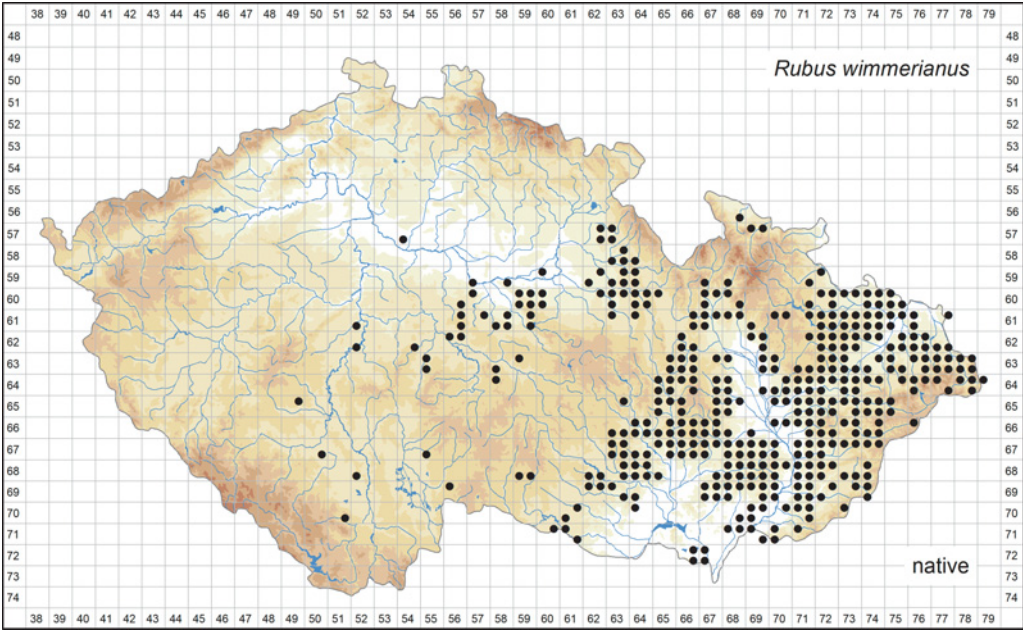


Fig. 86. – Distribution of *Rubus wimmerianus* in the Czech Republic (404 occupied quadrants). Prepared by Bohumil Trávníček, Jiří Zázvorka, Petr Havlíček & Vojtěch Žíla.

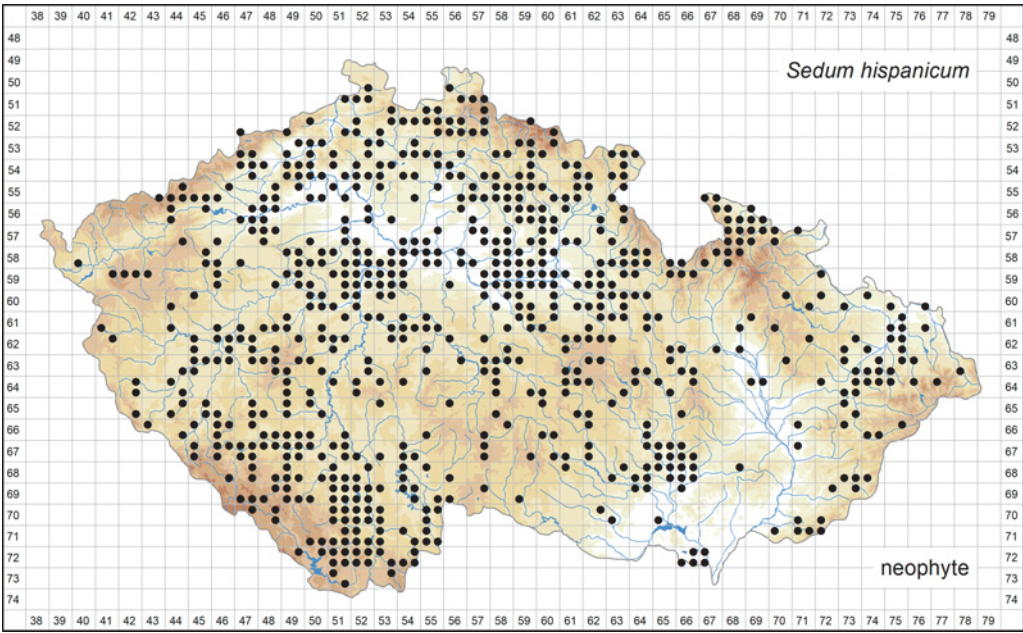


Fig. 87. – Distribution of *Sedum hispanicum* in the Czech Republic (726 occupied quadrants). Prepared by Petr Petřík & Vít Joza.

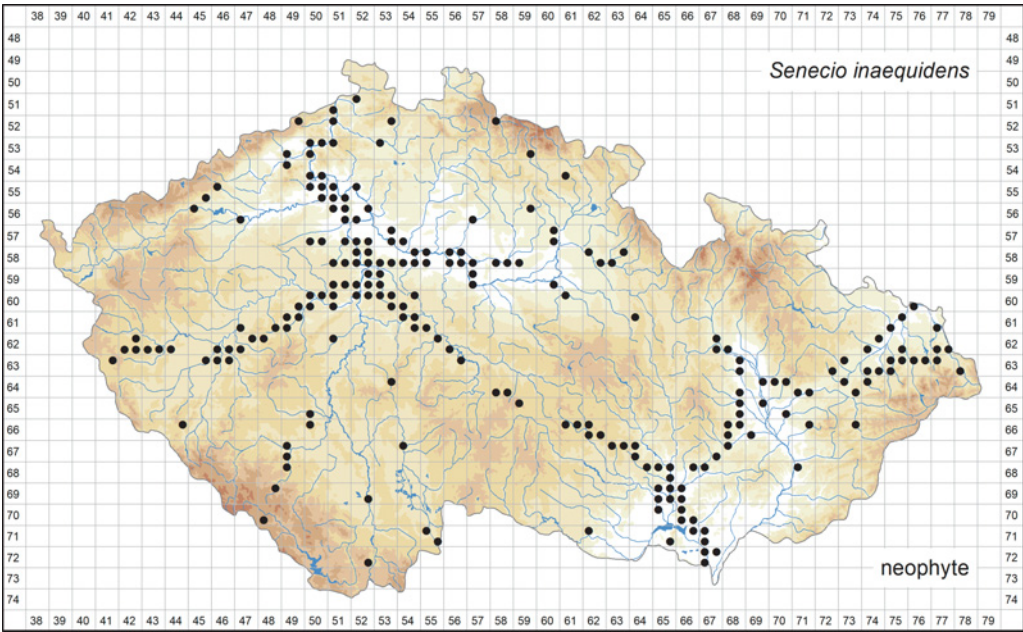


Fig. 88. – Distribution of *Senecio inaequidens* in the Czech Republic (220 occupied quadrants). Prepared by Michal Ducháček, Petr Kocián & Pavel Kúr.

central and northern Europe, eastern Asia and North America (Chamberlain 1972, Ohba 1981, 2009, Lippert 1995, Marhold 2011, Sarwar & Qaiser 2012). In the Czech Republic *S. hispanicum* most frequently occurs along paved roads (usually on roadsides covered by mosses) and along railways. It is cultivated in cemeteries and rock gardens, from which it escapes to stonewalls and pavement joints. Less frequently it occurs also on gravel river banks or in abandoned quarries (Kučera & Dostálek 2000). In this country the escaped plants of *S. hispanicum* were first collected in 1954 in the village of Vápenná in Silesia. At present this species occurs particularly at middle elevations, but it was once recorded even at 1280 m a.s.l. in the Krkonoše Mts. It is most frequent in cities and large towns, where it is likely to have persisted for more than 20 years already. In general, it is probably more common than indicated by the map because its habitats are not attractive to botanists, and many occurrences may therefore have remained unnoticed. In the Czech Republic *S. hispanicum* is classified as a naturalized neophyte (Pyšek et al. 2012) and listed as one of the widely planted species starting to spread. Indeed, it seems to have rapidly spread during the past 25 years, probably due to its high germination rate, succulence, which enables it to survive long periods of drought, and use of herbicides, which protects it from competition by perennial species.

Senecio inaequidens (Fig. 88)

Senecio inaequidens, a native to South Africa, was introduced into Europe at the end of the 19th century as a wool-borne alien and successfully invaded considerable parts of western and central Europe in the last quarter of the 20th century (Heger & Böhmer 2005). In the Czech Republic it was found for the first time in the Děčín riverport at the Labe river in 1997. In the beginning of its invasion it was recorded mainly along the railways. Currently, it is mostly recorded along the Czech motorway network, to which it was probably introduced by vehicular traffic. It is widespread along the D5 and D8 motorways (in western, northern and central Bohemia) as well as along the D1 motorway (from Prague to Brno), and many records are also from Prague. It is spreading eastwards, with newly recorded localities along the D2 and D1 motorways in Moravia. It grows mainly on disturbed sites along roads (verges and central reservations of motorways) and railways mostly on gravelly soils. The species is classified as a naturalized neophyte (Pyšek et al. 2012).

Setaria faberi (Fig. 89)

Setaria faberi is native to eastern Asia. In the 1920s it was introduced into North America, where it has become naturalized (USDA, NRCS 2018), and some 40 years later it was recorded also in Europe. It occurs at railway stations, ports, yards and surroundings of agricultural and industrial facilities, and also as a weed in arable fields and settlements. In the Czech Republic it was first collected in 1961 at a railway station in the city of Ústí nad Labem in north-western Bohemia. The earliest records from Moravia date back to 1973, when *S. faberi* was found in the town of Opava, the city of Olomouc and the village of Vrbice near the city of Ostrava. At present it is rare to locally scattered and partly naturalized in the floodplains and on hillsides along the Labe river in central and eastern Bohemia; it also occurs occasionally in north-western Bohemia, southern Moravia and elsewhere, reaching its elevational maximum at about 580 m in the town of Hlinsko in eastern

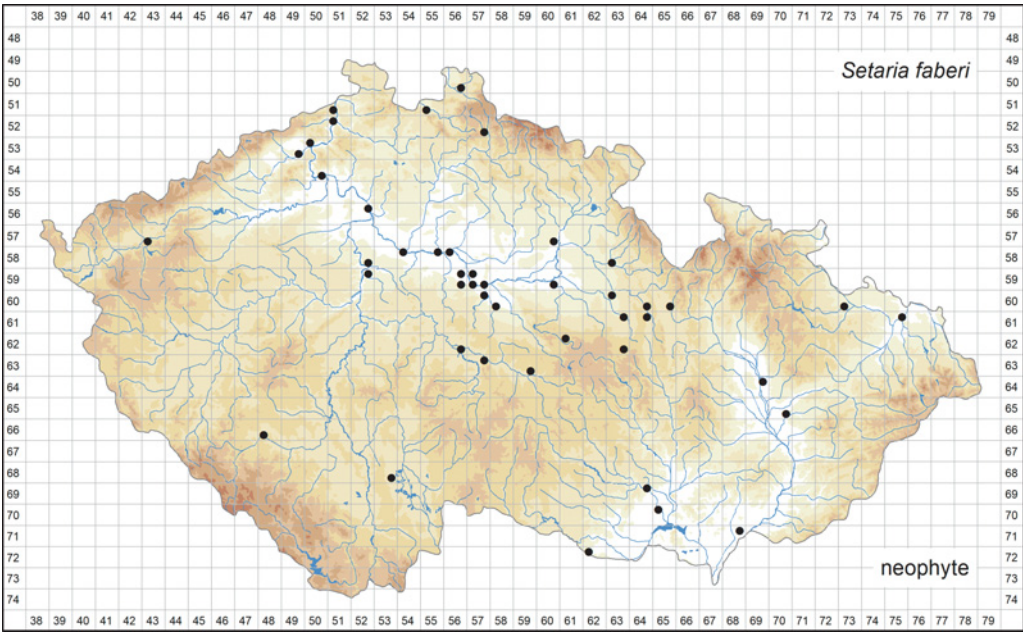


Fig. 89. – Distribution of *Setaria faberi* in the Czech Republic (45 occupied quadrants). Prepared by Jindřich Chrtek Jr.

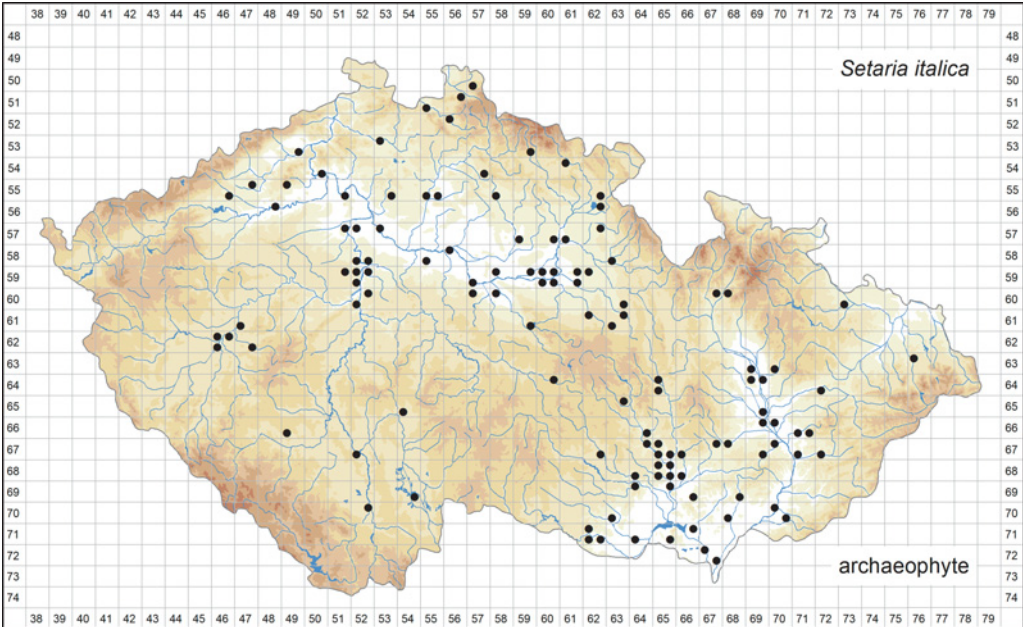


Fig. 90. – Distribution of *Setaria italica* in the Czech Republic (119 occupied quadrants). Prepared by Jindřich Chrtek Jr.

Bohemia (Jehlík 1998). It has been introduced with soya beans, grains and rapeseed. The species is considered a naturalized neophyte in this country (Pyšek et al. 2012).

Setaria italica (Fig. 90)

Setaria italica, probably derived from *S. viridis* (Li & Brutnell 2011), is among the oldest cereals. The earliest evidence of its cultivation comes from China, dating back to 5500 B. C. (Austin 2006, Zohary et al. 2012). Nowadays it is cultivated mainly in China, India and Afghanistan, but also in south-eastern Europe, south-eastern Asia, southern Africa, North America, Australia and elsewhere, as either cereal or a fodder crop. In the territory of the present Czech Republic, cultivation was reliably documented by macro-remains analysis from the Roman period (about 5th century), but it was probably cultivated already during the Bronze Age (Kočár & Dreslerová 2010). The importance of *S. italica* as a cereal gradually declined, but it was cultivated in many areas as green forage (and continues to be done so rarely, for instance, in Moravia). It is also a high-value bird-food ingredient and a popular ornamental grass. In the Czech Republic *S. italica* was locally cultivated and escaped outside of farmland; escaped or otherwise introduced plants (incl. plants grown from bird food) are found in field margins, railway stations, along railways, on roadsides and waste grounds. It is scattered in warm and moderately warm parts of this country, particularly in north-western, central and eastern Bohemia and central and southern Moravia, while being rare to absent from elsewhere. It reaches its elevational maximum at 475 m in south-western Bohemia. In the Czech Republic this species is considered to be a casual archaeophyte (Pyšek et al. 2012). Two cultivar groups are distinguished; they were formerly referred to as *S. italica* convar. *maxima* and *S. italica* convar. *moharia*, the latter being more widespread. Here they are mapped together. Because of confusion with similar *S. viridis*, the distribution map is based solely on examined herbarium specimens.

Setaria pumila (Fig. 91)

Setaria pumila is distributed in central, south-western, south-eastern and eastern Europe, and it has been introduced northwards into the British Isles, the Baltic countries and north-western Russia. Outside Europe it is found in temperate and tropical Asia, Africa and Macaronesia; it has also been introduced into the Americas, Australia and New Zealand (Hultén 1964, USDA, NRCS 2018). In the Czech Republic *S. pumila* occurs as a weed in root crops, less often in cereal crops, gardens and vineyards and also in ruderal habitats including waste places, roadsides and disturbed grasslands in settlements. It prefers moderately humid to dry soils, slightly acidic to basic, moderately supplied with nutrients and rather poor in humus. *Setaria pumila* is frequent in warm and moderately warm parts of this country, particularly in north-western, central and eastern Bohemia, and central and southern Moravia. It is scattered in south-western and southern Bohemia and north-eastern Moravia, while being rare to absent elsewhere. It has been accidentally introduced up to about 750 m a.s.l. in the town of Horní Planá in the Šumava Mts. In the Czech Republic this species is considered a naturalized archaeophyte (Pyšek et al. 2012).

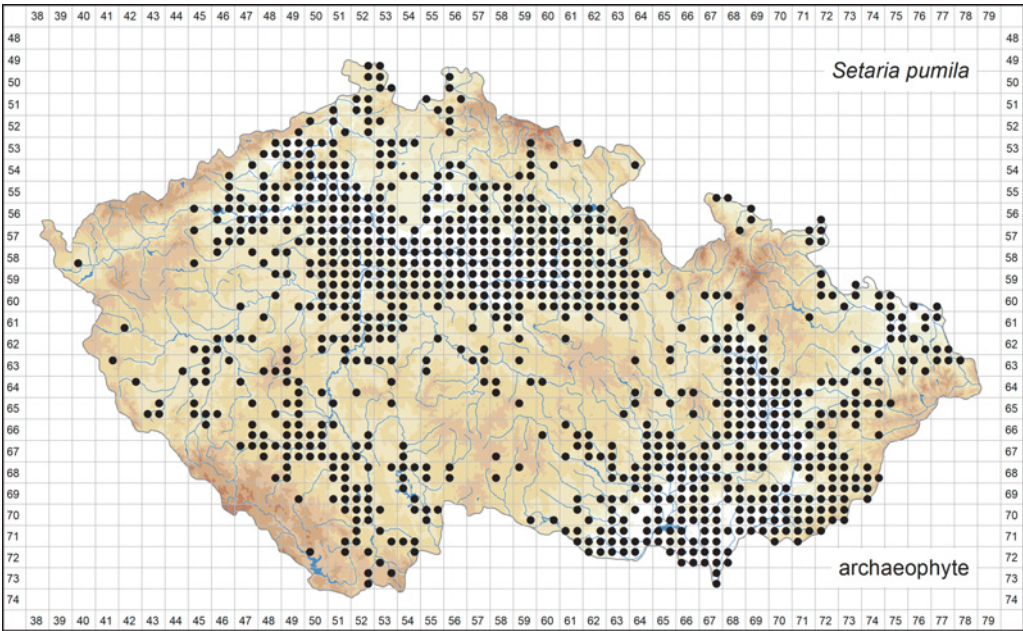


Fig. 91. – Distribution of *Setaria pumila* in the Czech Republic (947 occupied quadrants). Prepared by Jindřich Chrtěk Jr.

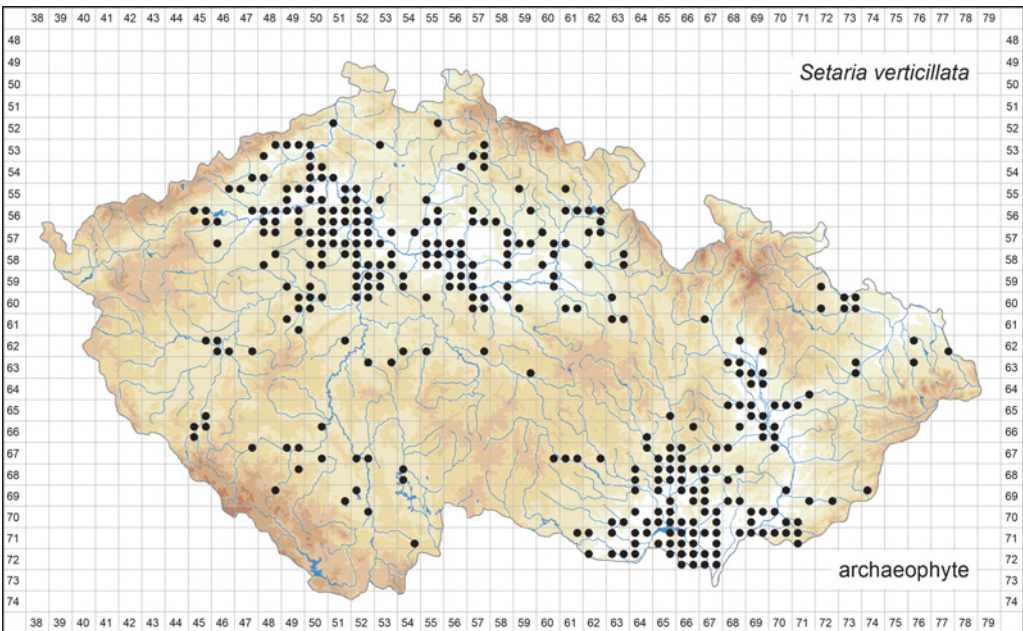


Fig. 92. – Distribution of *Setaria verticillata* in the Czech Republic (335 occupied quadrants). Prepared by Jindřich Chrtěk Jr.

Setaria verticillata (Fig. 92)

Setaria verticillata is a member of a taxonomically difficult group of diploid and polyploid foxtails represented in Europe by the tropical diploid *S. adhaerens* and the more temperate tetraploids *S. verticillata* and *S. verticilliformis*. It is distributed in south-western, central, southern and south-eastern Europe (and as an introduced species also in the British Isles and Scandinavia), in the Caucasus Mts, south-western and central Asia, China and eastern Asia; it has been introduced into and become naturalized in the Americas, Australia and New Zealand (USDA, NRCS 2018). Records from tropical regions of south-eastern Asia, Africa and Macaronesia probably refer to *S. adhaerens*. In the Czech Republic *S. verticillata* is found at ruderal sites such as roadsides, pavement joints, walls, railway stations, waste places, most frequently in settlements and their surroundings, locally (especially in the warmest areas) also in gardens, less frequently as a weed in arable fields mainly of root crops and vegetables, and in vineyards. It occurs on soils that are sandy to loamy, permeable, moderately humid to dry, neutral to basic, rich in nutrients, especially nitrogen, and rather poor in humus. *Setaria verticillata* is scattered over warm and moderately warm parts of north-western, central and eastern Bohemia, and of central and southern Moravia, and occurs scarcely in the city of Plzeň and its surroundings, in southern Bohemia and Silesia, and reaches its elevational maximum at 675 m at the railway station in the town of Vimperk in south-western Bohemia. In the Czech Republic this species is considered to be a naturalized archaeophyte (Pyšek et al. 2012).

Setaria verticilliformis (Fig. 93)

Setaria verticilliformis closely resembles *S. verticillata* and is often treated either as a variety of it or (incorrectly) as a stabilized hybrid between *S. viridis* and *S. verticillata*. It is distributed in southern and central Europe, as a casual also in northern Europe, in the Caucasus Mts, south-western Asia eastwards to western Iran, and in northern Africa; it has also been introduced into North America (USDA, NRCS 2018). In the Czech Republic it is found on roadsides and railway embankments, in pavement joints, waste places, less often as a weed in vineyards, on sandy to loamy, permeable soils that are moderately humid to dry, neutral to basic, rich in nutrients, especially nitrogen and rather poor in humus. In Bohemia *S. verticilliformis* has been recorded from several sites in Prague and in the cities of Ústí nad Labem and Liberec. In Moravia it was found at several sites in its central, southern and south-eastern parts. The species is considered an archaeophyte in this country (Pyšek et al. 2012). The residence time status is a matter of debate, as the earliest records date back to the 1920s (Mikulov) and 1930s (Valtice, both in southernmost Moravia); in Prague and north-western Bohemia it was collected for the first time in the 1970s. However, this does not necessarily reflect its past distribution, as the foxtails were often considered not worth collecting and recording. Because of confusion with the similar *S. verticillata* and also *S. viridis*, the distribution map is based solely on examined herbarium specimens.

Setaria viridis (Fig. 94)

Setaria viridis is widely distributed in the temperate zone in Eurasia, in north-western Africa and Macaronesia; it has been introduced into the Americas, southern Africa, Australia and New Zealand (Hultén 1964, USDA, NRCS 2018). In the Czech Republic it

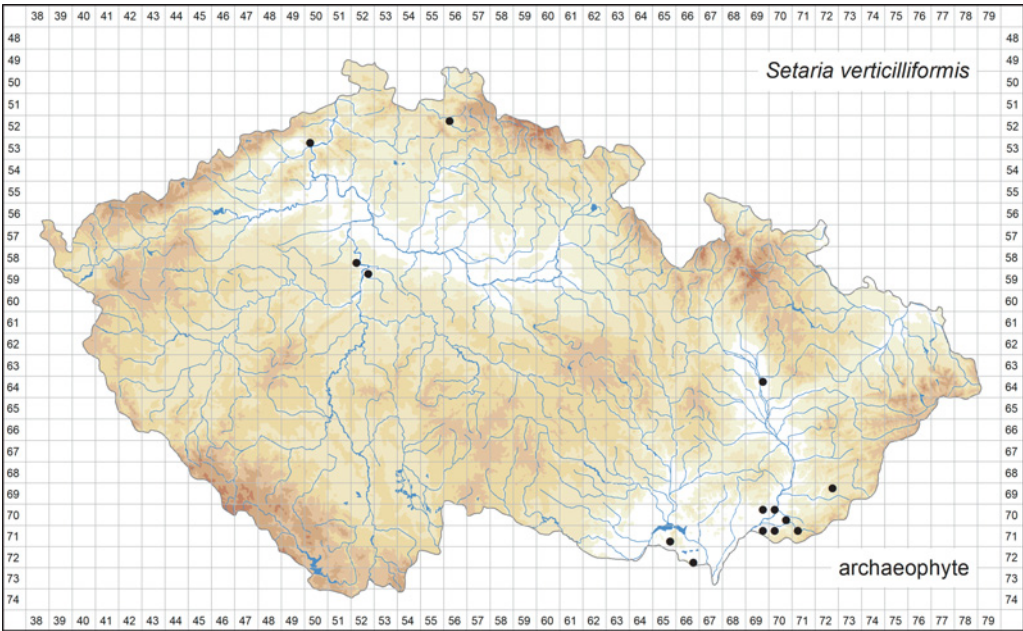


Fig. 93. – Distribution of *Setaria verticilliformis* in the Czech Republic (14 occupied quadrants). Prepared by Jindřich Chrtěk Jr.

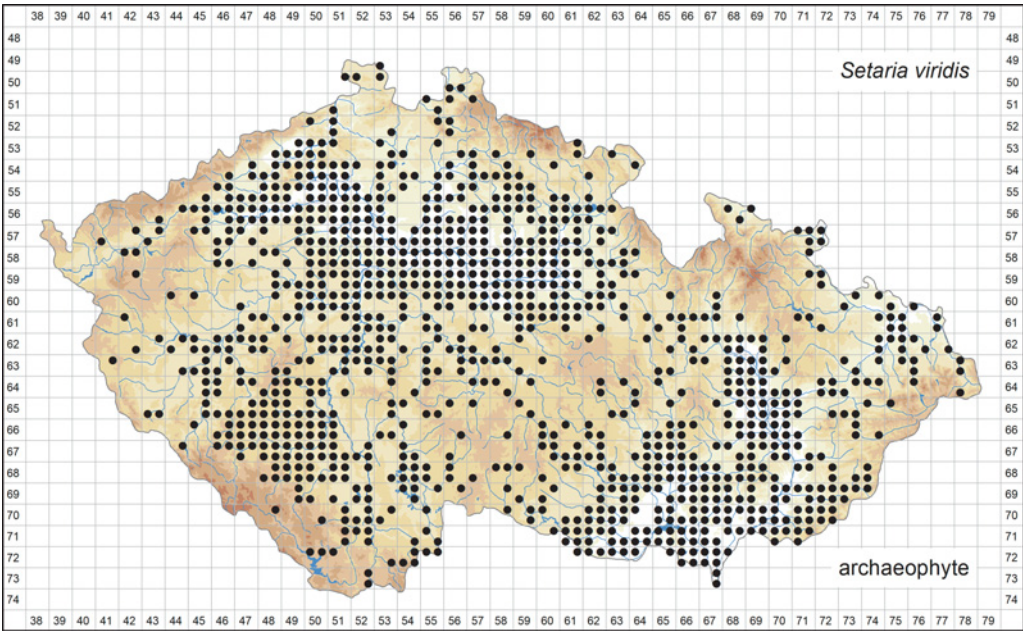


Fig. 94. – Distribution of *Setaria viridis* in the Czech Republic (1065 occupied quadrants). Prepared by Jindřich Chrtěk Jr.

occurs as a weed in root crops, less often in cereal crops, gardens and vineyards and also in ruderal habitats, including waste places, roadsides, railway embankments, gravel substrates and disturbed grasslands in settlements. It prefers well-drained, sandy to loamy soils that are moderately humid to dry, slightly acidic to basic, moderately rich to rich in nutrients, mainly in nitrogen, and rather poor in humus. *Setaria viridis* is common in the lowlands and at middle elevations, i.e. in areas with warm or moderately warm climates, and spreads locally to higher elevations, reaching its current elevational maximum at about 995 m at the railway station of Kubova Huť in the Šumava Mts. The species is probably under-recorded, as it has always been frequent at least in warm areas, and as such considered not worth recording. Two subspecies were recently recognized in the Czech Republic, namely *S. v.* subsp. *pynocoma* and *S. v.* subsp. *viridis*. Nevertheless, there are plants with unclear assignment and these subspecies are therefore not recognized here.

Stratiotes aloides (Fig. 95)

Stratiotes aloides is distributed in Europe northwards to the British Isles, southern Sweden, Finland and the north-western part of European Russia, and southwards to Spain, northern Italy and the Balkan Peninsula; eastwards it extends into Asia, where it occurs in the northern Caucasus Mts and in south-western Siberia (Cook & Urmi-König 1983, Hultén & Fries 1986, Timokhina 1988). It is a dioecious species, but in most of its range only one sex is present, reproducing there only vegetatively. Because of its long history of cultivation as an ornamental plant with an extraordinary appearance, it is difficult to determine what the pre-cultivation natural range might have been. However, in central Europe *S. aloides* seems to be native along the Danube river and many of its tributaries, as it is common there in backwaters, both sexes are present and seed-set is known. In contrast, its occurrences in France, Switzerland and Turkey are suspected or shown to have resulted from introductions (Cook & Urmi-König 1983). It has also been imported into and cultivated in Canada as an ornamental plant; recently it has been found escaped and persisting at five sites in south-central Ontario (Snyder et al. 2016). In the Czech Republic *S. aloides* occurs in submerged or seasonally (in late spring and in summer) floating or emerged populations mainly in shallow, standing or very slowly flowing waters, such as oxbow lakes, alluvial pools and drainage and irrigation channels; less frequently it is found in small ponds, and rarely in lakes in abandoned quarries and sand pits, and along the banks of lowland rivers. It grows in mesotrophic to naturally eutrophic, slightly acidic to neutral water and prefers habitats in an advanced stage of terrestrialization, on clayey, loamy or sandy substrates covered with a thick layer of sapropelic mud (Šumberová 2011a). The former populations of *S. aloides* along the lower stretches of the Dyje and Morava rivers in southern Moravia were considered native. Other occurrences apparently resulted from intentional introductions. There used to be a rather high number of sites along the Labe and Orlice rivers in eastern Bohemia in the 20th century, but almost all of them have vanished. Like other ornamental aquatics, e.g. *Nymphaea peltata* (Kaplan et al. 2016a), *Trapa natans* and *Hippuris vulgaris* (Kaplan et al. 2016b), *S. aloides* has become popular in garden pools and village ponds during the past three decades, and new sites have appeared even in areas where this species was previously unknown. Nowadays it is scattered in parts of Bohemia and rare in Moravia. The native populations in southernmost Moravia disappeared in 1980s due to habitat destruction, river regulation,

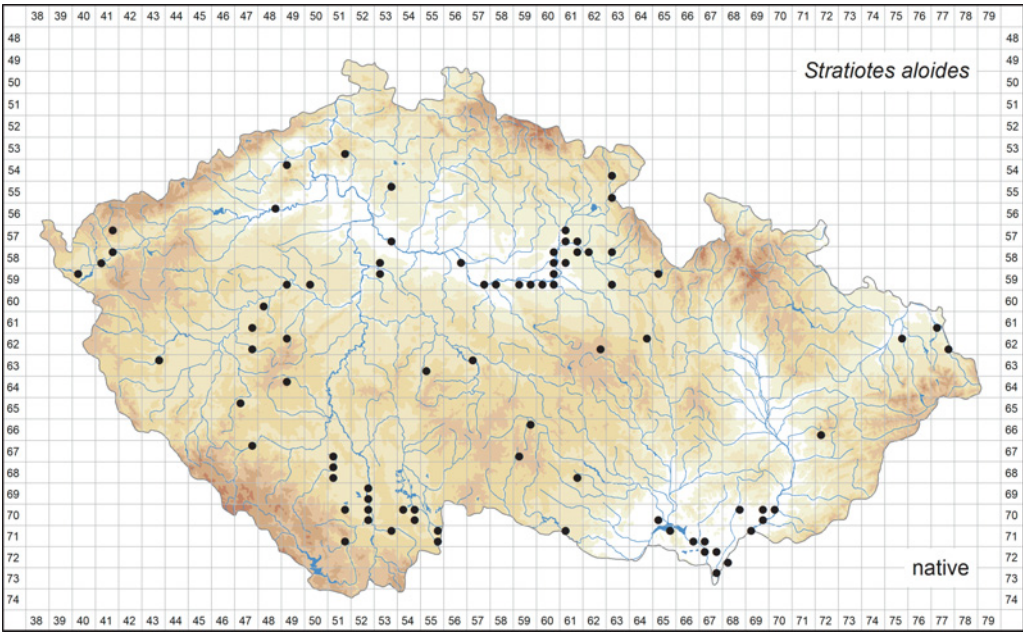


Fig. 95. – Distribution of *Stratiotes aloides* in the Czech Republic (82 occupied quadrants). Prepared by Zdeněk Kaplan.

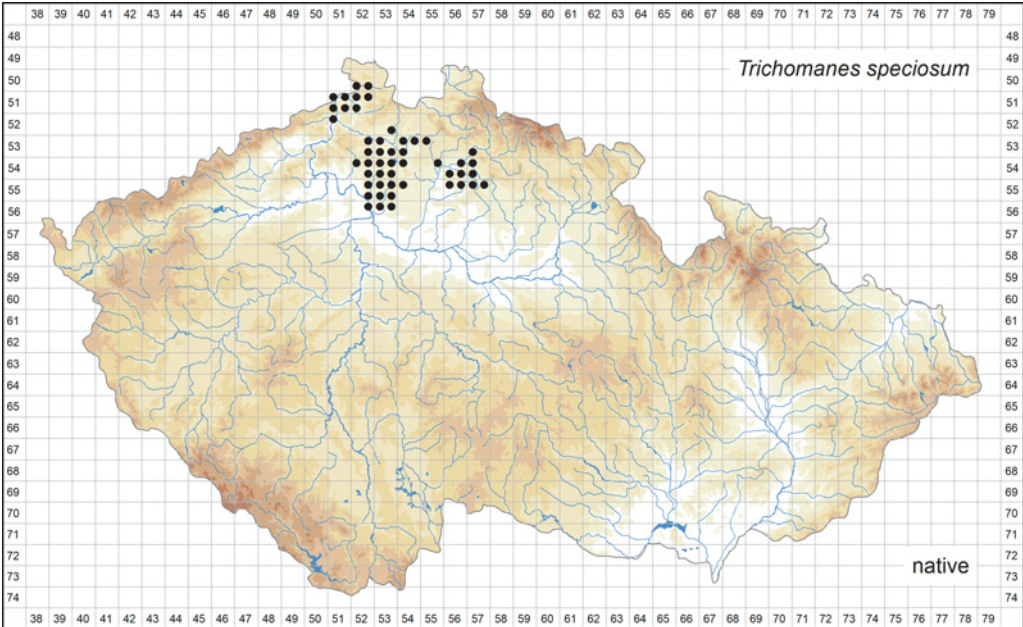


Fig. 96. – Distribution of *Trichomanes speciosum* in the Czech Republic (49 occupied quadrants). Prepared by Danuše Turoňová & Libor Ekrť.

eutrophication, disruption of regular flood dynamics and terrestrialization of alluvial pools. However, some of these occurrences have been re-established in restored wetlands using the plants from the original populations that were grown meanwhile in a botanical garden. These populations are classified as critically threatened (Grulich 2012).

Trichomanes speciosum (Fig. 96)

Trichomanes speciosum is a Macaronesian-European endemic. It is unique amongst European ferns in that its independent perennial gametophytes may grow and persist in the absence of the sporophytic generation. These gametophytes are not only perennial but, in addition to normal sexual reproduction, they are capable of forming specialized structures for vegetative propagation (gemmae), allowing the potential development of spatially separated large populations of gametophytes, which are often overlooked (Rumsey et al. 1998a). Sporophytes of *T. speciosum* are restricted to Macaronesia and strongly oceanic parts of western Europe including fringes of the Iberian Peninsula (very local), France (western Brittany), Ireland, northern and western England, north-western Wales, south-western Scotland and a few places on the western coast of Italy (Jalas & Suominen 1972, Ferrarini 1977, Rumsey et al. 1998a). Independent colonies of gametophytes occur more widely in Britain, Wales, Scotland, eastern France, south-eastern Belgium, Luxembourg, south-western Germany, south-western Poland and northern and north-eastern Bohemia (Vogel et al. 1993, Rumsey et al. 1998a, Krukowski & Świerkosz 2004, Turoňová 2005). The Czech Republic is situated on the easternmost limit of this species' distribution. *Trichomanes speciosum* represents an obvious Tertiary relict. However, it is suggested that the colonies of gametophytes in central Europe arose through colonization by long-distance dispersal from refugia in Macaronesia during the Atlantic period (Rumsey et al. 1998b). Gametophytes in central Europe inhabit crevices and small caves in acidic sandstone rocks. The gametophyte requires high relative humidity and stable temperature throughout the year to prevent freezing or drying out. The colonies of *T. speciosum* are capable of surviving in extreme shade because they are adapted to low light (<0.01% of full sunlight; Johnson et al. 2000). In the Czech Republic *T. speciosum* prefers cold narrow valleys or gorges, usually with streams, in areas with sandstone rocks. In suitable mesoclimates it is also sometimes capable of inhabiting caverns in the uppermost parts of rock outcrops. It usually does not co-occur with any other higher plants (Turoňová 2005). For the Czech flora, *T. speciosum* was discovered in 1993 in the Labské pískovce sandstone area in northern Bohemia (Vogel et al. 1993). Currently it is known from the majority of sandstone areas of the Bohemian Cretaceous Basin, including the Labské pískovce area north of Děčín, the Kokořínsko area, sandstone rocks around the towns of Doksy and Česká Lípa and the Český ráj area in north-eastern Bohemia. At present about 300 localities of *T. speciosum* are known in Bohemia, situated at elevations ranging from 130 m to 460 m, with the maximum at Vlhošť hill near the town of Česká Lípa. This species has been monitored by the nature conservancy (e.g. Turoňová 2005), with all quadrants in the map having at least one record from 2000–2018. Populations of *T. speciosum* are found in stable habitats and are usually not immediately threatened. Nevertheless, this species is classified as endangered because of its rarity (Grulich 2012).

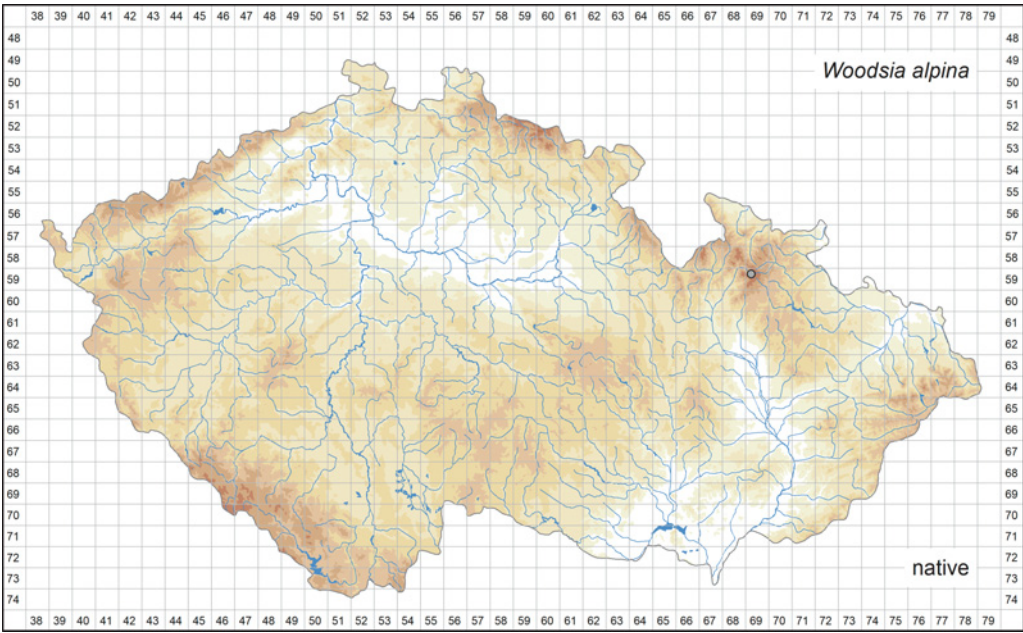


Fig. 97. – Distribution of *Woodsia alpina* in the Czech Republic: ● pre 2000 records only (1 quadrant). Prepared by Libor Ekrť.

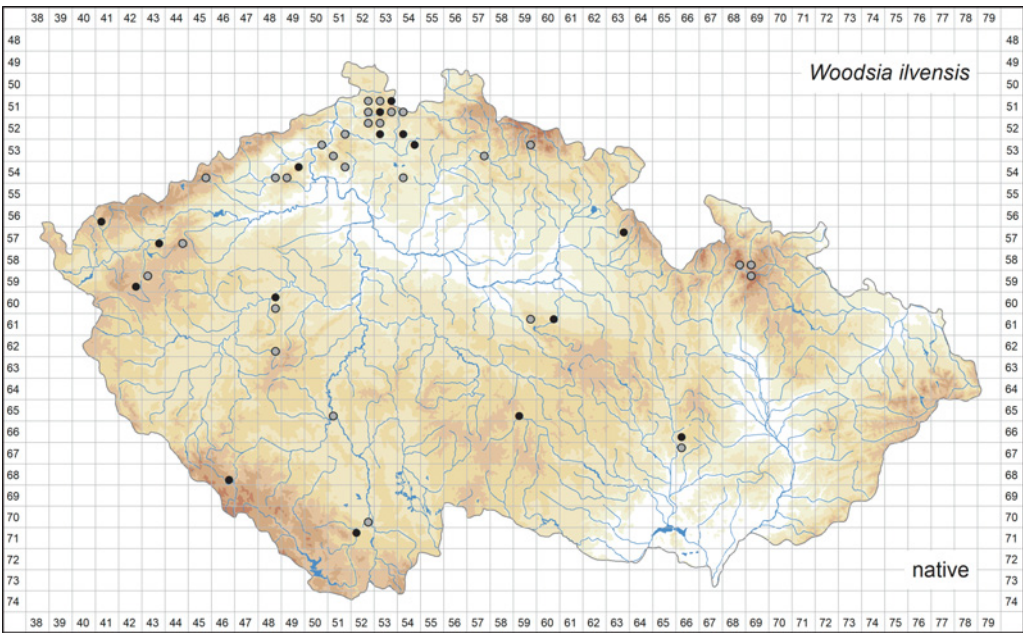


Fig. 98. – Distribution of *Woodsia ilvensis* in the Czech Republic: ● at least one record in 2000–2018 (16 quadrants), ○ pre 2000 records only (16 quadrants). Prepared by Libor Ekrť.

Woodsia alpina (Fig. 97)

Woodsia alpina is an allotetraploid derived from the hybridization of the diploid species *W. ilvensis* probably with *W. glabella* (Manton 1950). It has a circumboreal distribution in the Northern Hemisphere, being found at rather high elevations in northern Europe and Iceland, and in high European mountains such as the Pyrenees, the Alps, the Sudetes and the Carpathians. Toward the east this species is disjunctly distributed in the Caucasus Mts, western Himalayas, central and eastern Siberia, northern and eastern Canada, the north-eastern USA as well as Greenland (Hultén & Fries 1986). In the Czech Republic it was recorded in the 19th century and the first half of the 20th century on the rocks in the Velká Kotlina glacial cirque in the Hrubý Jeseník Mts. Its occurrence in the Krkonoše Mts is confined to the Śnieżne Kotły glacial cirques on the Polish side of the mountains; therefore it is not indicated in the map. In the Czech Republic it is classified as extinct (Grulich 2012).

Woodsia ilvensis (Fig. 98)

Woodsia ilvensis is a diploid saxicolous circumboreal species (Manton 1950). It is distributed widely in northern Europe, scattered in Iceland, the British Isles and central and eastern Europe; in Asia it occurs scattered in eastern and northern Siberia, the Russian Far East, north-eastern China and Japan; in North America it is found in Canada, the north-eastern USA and Greenland (Hultén & Fries 1986). In the Czech Republic *W. ilvensis* inhabits rocky crevices and open stony screes of gneiss, granite, granite-syenite, phonolite, basalt or serpentine rock; it is rarely found in disused quarries. It is scattered in northern Bohemia, rare in western and southern Bohemia, sparse in eastern Bohemia and the Českomoravská vrchovina highlands; in Moravia it is found in the Hrubý Jeseník Mts and the karst area of Moravský kras. Despite being a species of stable rocky habitats, the majority of records are old. The general pattern of distribution of *W. ilvensis* has remained almost unchanged over the past 40 years (compared to the map provided by Chrtek 1980). The species is threatened by succession of forest communities, which results in closed canopy and shading of rocky habitats. It is classified as endangered (Grulich 2012).

See www.preslia.cz for Electronic Appendices 1–104

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Souhrn

Sedmá část ze série prací věnovaných rozšíření cévnatých rostlin v České republice obsahuje síťové mapy a komentáře k 104 taxonům rodů *Anthriscus*, *Callitriche*, *Cochlearia*, *Dittrichia*, *Egeria*, *Elodea*, *Elymus*, *Epilobium*, *Gentianella*, *Gnaphalium*, *Gymnocarpium*, *Hordeum*, *Hydrocharis*, *Limonium*, *Najas*, *Phleum*, *Phragmites*, *Polypodium*, *Pseudognaphalium*, *Rubus*, *Sedum*, *Senecio*, *Setaria*, *Stratiotes*, *Trichomanes* a *Woodsia*. Základem jsou údaje získané excerpcí herbářů a literatury, terénní zápisy a nálezy dostupné v databázích, které prověřili taxonomičtí experti. Mnohé ze studovaných původních druhů patří mezi ohrožené rostliny. Ústup populací nejvíce postihl hořečky (*Gentianella*): z 12 u nás zaznamenaných taxonů je polovina dnes vyhynulá a druhá polovina v nejvyšším stupni ohrožení. Další skupinou s velkým podílem ohrožených druhů jsou vodní a mokřadní rostliny. V tomto příspěvku jsou zastoupeny např. druhy *Callitriche hermaphroditica*, *Hydrocharis morsus-ranae*, *Najas minor*, *Pseudognaphalium luteoalbum* a *Stratiotes aloides*. Z ostatních ekologických skupin lze jmenovat rostliny horských mokřadů (*Epilobium anagallidifolium*, *E. nutans* a *Rubus chamaemorus*) a skal (*Polypodium interjectum*, *Trichomanes speciosum* a *Woodsia ilvensis*). Dříve vzácná *Woodsia alpina* z naší přírody zcela vymizela. Na druhou stranu naši květenu obohacují zavlečené druhy. Největší podíl mají v rodech *Anthriscus*, *Cochlearia*, *Elodea*, *Epilobium*, *Hordeum* a *Phleum*. Tři druhy k nám byly zavlečeny na zasolené okraje dálnic: zatímco *Dittrichia graveolens* už roste na většině dálnic, *Cochlearia danica* je zatím známa ze 40 lokalit a *Limonium gmelinii* zůstává vzácné a jeho populace nestálé. *Senecio inaequidens* je další neofyt, který se rozšířil zejména podél dálnic. Mezi nejúspěšnější zavlečené druhy patří *Epilobium adenocaulon*, které je dnes hojně takřka po celém území státu a nezřídka se kříží s našimi původními druhy vrbovek. Celkový obraz rozšíření zpracovávaných taxonů poskytují mapy; konkrétní floristické údaje zachycující frekvenci výskytu v různých oblastech a v různých obdobích, a dokumentující tak ústup nebo naopak šíření některých druhů, jsou uloženy v databázi Pladias a dostupné v elektronických přílohách. Každou mapu doprovází textový 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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